MP2 PROJECT

Volume 2

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAIN DOCUMENT (PART 2)

COMHLACHT CHALAFORT ÁTHA CLIATH
DUBLIN PORT COMPANY

rps MAKING COMPLEX EASY

TABLE OF CONTENTS (CHAPTER 9 – 19)

GLOSSARY OF TERMS

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AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
AAGR	Average Annual Growth Rate
ABC	Construction noise assessment method
ABR	Alexandra Basin Redevelopment
ABP	An Bord Pleanála
ADCO	Archaeological Diving Company Ltd
ADCP	Acoustic Doppler Current Profilers
AEP	Annual Expedience Probability
AERMOD	Atmospheric dispersion modeling system
AG4	Air dispersion modelling from industrial installations ***guidance*** notes
BAT	Best Available Technique
Bankseat	Abutment to support a ramp in order to provide safe and fast access for loading and unloading a ship.
BCI	Bat Conservation Ireland
BCT	Bat Conservation Trust
bgl	below ground level
Break bulk	Loose cargoes such as reels of paper, bales of timber. Also includes project cargoes such as power transformers, wind turbine components.
BUGS	Bike User Groups
Bulk Liquid	Primarily comprises petroleum products (such as petrol, diesel, aviation fuel) but also includes products such as molasses.
Bulk solid	Products such as animal feed, grains, cereals, peat moss, scrap steel loaded / discharged using quay side cranes with grab attachments.
CD	Chart Datum, depths in the Port vary with tidal conditions and all depths (and heights) are referenced to an appropriate datum point called "chart datum".
CDL	Coal Distributors Limited also refers to a mooring structure on the south side of the River Liffey, near the Poolbeg power station owned by Coal Distributers Limited
CDM	CDM Smith, consulting engineers
CEMP	Construction Environmental Management Plan
CFRAM	Catchment Flood Risk and Management
CIÉ	Córas Iompair Éireann
CIEEM	Chartered Institute of Ecology & Environmental Management
CIRIA	Construction Industry Research and Information Association
CISS	cast-in-steel-shell, concrete piers fabricated within a steel shell.

CL	Conservation Limit, the number of adult fish of a particular species that are needed to return to a system each year to spawn in order to maintain a healthy sustainable population in the system.
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO2	Carbon Dioxide
CO_{2eq}	Total estimated greenhouse gas emissions
COSHH	Control of Substances Hazardous to Health
CPT	Carriage Paid To
CRTN	Calculation of Road Traffic Noise
CTMP	Construction Traffic Management Plan
cSAC	Candidate Special Area of Conservation
CSO	Central Statistics Office
DART	Dublin Area Rapid Transport
DAHG	Department of Arts, Heritage and the Gaeltacht
dB(A)	Decibel, expression of sound level. The (A) denotes that levels are "A"- weighted.
DBT	Dibutyltin
DDDA	Dublin Docklands Development Authority
Deadman	Buried structure to serve as an anchor for a quay wall
DEDs	District Electoral Divisions
DCC	Dublin City Council
DCIHR	Dublin City Industrial Heritage Record
DEHLG	***Department of the Environment Heritage and Local Government***
DFT	Dublin Ferry Terminal
DGPS	Differential Global Positioning System
DHI	Danish Hydraulic Institute
DIN	Dissolved Inorganic Nitrogen
DMRB	Design Manual for Roads and Bridges
DO	Dissolved Oxygen
DOS	Degree of Saturation
DPC	Dublin Port Company
Dry Bulk	Cargoes of free flowing dry solids such as grain or sand
DS	Directional Signage
Dublin Port Estate	DPC owned lands in the north port area bounded by the River Liffey to the south and East Wall Road to the west.
EA	Environment Agency
EAL	Environmental Assessment Level

EC	European Community
EEA	***European Environment Agency***
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement
EMEP	European Monitoring and Evaluation Programme, European policy to identify and measure air pollutants
EMS	Environmental Management System
EPA	***Environmental Protection Agency***
EQS	Environmental Quality Standard
ERBD	Eastern River Basin District
ES	Estuarine Species, fish species dependent on estuaries.
ESB	***Electricity Supply Board***, also refers to a mooring structure on the south side of the River Liffey, near the Poolbeg power station owned by the Electricity Supply Board
EU	European Union
EUNIS	European Nature Information System
FRA	Flood Risk Assessment
FRAM	Flood Risk Assessment Management
GDA	Greater Dublin Area
GDP	Gross Domestic Product
GES	Good Environmental Status
GGBS	Ground Granulated Blast Furnace Slag
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GPS	Global Positioning System
GSI	***Geological Survey of Ireland***
GHG	Green House Gas
Gross tonnes	Dublin Port measures cargo tonnage in gross tonne. The CSO , on the other hand, uses net tonnes. In the case of bulk liquid, bulk solid and break bulk, gross tonnes and net tonnes are the same. For unitised freight (Ro-Ro or Lo-Lo), gross tonnes includes the weight of the shipping container or trailer; net tonnes includes the weight of the goods themselves plus immediate packaging. For port operations, gross tonnes is a more useful measure as ship carrying capacity, crane handling capacities and road / rail capacities are determined by gross tonnage.
HCB	Hexachlorobenzene
HD	Hydro Dynamic
H_{mo}	Significant wave height
H_2S	Hydrogen sulphide
HAT	Highest Astronomical Tide
Hectare	Land areas in Dublin Port are referred to in hectares (where one hectare is equivalent to 2.47 acres and is equal to 10,000m^2).

HGV	Heavy Goods Vehicle
HS	Hydrographic Surveys Ltd., environmental and hydrographic survey company
HSA	***Health and Safety Authority***
Hz	Hertz, SI unit of frequency. It is defined as the number of cycles per second of a periodic phenomenon.
HV	Heavy Vehicle
ICAN	noise and vibration consultancy
ICOMOS	International Council on Monuments and Sites
ICPSS	Irish Coastal Protection Strategy Study
IFI	***Inland Fisheries Ireland***
IGSL	Ground investigation and geotechnical company
IMO	***International Maritime Organization***
INFOMAR	Integrated Mapping for the Sustainable Development of Ireland's Marine Resources.
INSS	Irish National Seabed Survey
IPPC	Integrated Pollution Prevention Control
ISO	International Standards Organisation
ISPS	International Ship and Port Security code, originally introduced by the IMO (International Maritime Organisation) and later incorporated into EU legislation.
IQI	***Infaunal Quality Index***, assessment of the ecological status based on the soft ***sediment*** infaunal communities of transitional and coastal waters.
ITAP	Institut für technische und angewandte Physik GmbH, a measuring body for noise emission
ITM	***Irish Transverse Mercator,*** geographic coordinate system for Ireland
IUCN	***International Union for Nature Conservation***
IUFT	Interim Unified Ferry Terminal
IWeBS	Irish Wetland Bird Survey
IWDG	***Irish Whale and Dolphin Group***
MS	Marine Stragglers, fish species which are fully marine and are only occasionally found in the lower reaches of estuaries.
JNCC	***Joint Nature Conservation Committee***
L_{Aeq}	The continuous equivalent A-weighted sound pressure level. This is an “average” of the sound pressure level.
L_{Amax}	This is the maximum A-weighed sound level measured during a sample period.
L_{Amin}	This is the minimum A-weighted sound level measured during a sample period.
$L_{night,outside}$	Threshold of night noise exposure for the purposes of assessing overall annoyance.
LAT	Lowest Astronomical Tide
LCS	Land Control Systems
LGV	Light Goods Vehicle

Linkspan	Structure to level the height difference between the quay and the cargo deck of a ship in order to provide safe and fast access for loading and unloading.
LV	Light Vehicle
Lo-Lo	Lift-on Lift-off , cargo mode which involves shipping containers lifted on and off ships with quayside cranes
LOI	Loss on Ignition, method of calculating organic matter content of soil samples
LVIA	Landscape and Visual Impact Assessment
MARPOL	International Convention for the Prevention of Pollution From Ships
MDS	Multidimensional Scaling
MEPC	Marine Environment Protection Committee
MHWM	Mean High Water Mark
MIKE	Coastal process modelling software
MM	Marine Migrant, marine fish species that use estuaries primarily as nursery grounds but usually spawn and spend much of their adult life at sea, while often returning seasonally to estuaries when adult.
MMP	Mobility Management Plan
MMO	Marine Mammal Observer, a qualified marine mammal observer is a visual observer who has undergone formal marine mammal observation training.
MOLA	Murray Ó Laoire Architects, architecture company
MRP	Molybdate Reactive Phosphorus
MSFD	Marine Strategy Framework Directive
MSL	Mean Sea Level
MTL	***Marine Terminals Ltd.,*** shipping & forwarding agents
NBDC	National Biodiversity Data Centre
NCEHD	National Civil Engineering Heritage Database
NCT	National Car Test
NHA	Natural Heritage Area
NIEA	***Northern Ireland Environment Agency***
NIR	Natura Impact Report
NMI	***National Museum of Ireland***
NNG	Night Noise Guideline
NO_2	Nitrogen Dioxide
NO_x	Oxides of nitrogen
NPWS	***National Parks and Wildlife Service***
NQE	North Quay Extension
NRA	***National Roads Authority***
NSS	National Spatial Strategy

NTA	National Transport Authority
NTS	Non-Technical Summary
NTS	Not To Scale (drawings)
OD	Ordnance Datum
ODOM	Single frequency portable hydrographic echo sounder
OEE	Office of Environmental Enforcement
OGV1	Other Goods Vehicle Type 1
OGV2	Other Good Vehicle Type 2
OMP	Odour Management Plan
OPW	***Office of Public Works***
OSPAR	Convention of fifteen Governments of the western coasts and catchments of Europe, together with the European Union, aiming to protect the marine environment of the North-East Atlantic.
P&O	Ferry operators
Pa	Pascal, SI derived unit of pressure. It is a measure of force per unit area, defined as one Newton per square meter.
PAH	Poly Aromatic Hydrocarbon
PAG	Project Appraisal Guidance
PCB	Polychlorinated Biphenyl
PCU	Passenger Car Units
PRC	Practical Reserve Capacity
PPV	Peak Particle Velocity
pNHA	Proposed Natural Heritage Area
$PM_{2.5}$	Particles measuring 2.5µm or less
PM_{10}	Particles measuring 10µm or less
PSA	Particle Size Assessment
PSD	Particle Size Distribution
PSV	Passenger Service Vehicle
pSPA	proposed Special Protected Area
PTS	Permanent Threshold Shift, a permanent elevation of the hearing threshold due to noise exposure
Ramsar	Convention on Wetlands of International Importance, an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
RMP	Record of Monuments and Places
RNLI	***Royal National Lifeboat Institution***
RPII	***Radiological Protection Institute of Ireland***
RPS	Rural Planning Service, consulting engineers

RPS	Record of Protected Structures
Ro-Ro	Roll-on Roll-off, cargo mode which includes freight trailers, tourist vehicles and trade car imports all of which are driven on or off ferries / specialised ships.
SAC	Special Area of Conservation
SECA	Sulphur Emission Control Area
SEA	Strategic Environmental Assessment
SEPA	***Scottish Environmental Protection Agency***
SEL	Sound Exposure Level, the constant sound level in one second, which has the same amount of acoustic energy as the original time-varying sound i.e., the total energy of a sound pulse
SFPA	***Sea Fisheries Protection Authority***
SMRU	Sea Mammal Research Unit
SNIFFER	Scotland and Northern Ireland Forum for Environmental Research
SPAR	Southern Port Access Route
Standard Depth	The Standard Depth is the minimum depth to which the navigation channel or berths will be maintained. It is the minimum depth available for vessels, measured from Chart Datum. The dredged depth during capital or maintenance dredging operations may be below the Standard Depth to allow for dredging tolerances
$S0_2$	Sulphur Dioxide
SPA	Special Protection Area
SPL	Sound Pressure Level, a logarithmic measure of the effective sound pressure of a sound relative to a reference value.
S/S	Solidification/Stabilisation, remediation technology that relies on the reaction between a reagent and soil to reduce the mobility of contaminants
SSC	Suspended Sediment Concentration
SW	Spectral Wave, simplification of surface conditions giving the distribution of wave energy among different wave frequencies of wave-lengths on the sea surface.
TEN-T	Trans-European Transport Networks, a set of integrated international road, rail, air and water transport networks in Europe.
TEU	Twenty Foot Equivalent Unit. Shipping containers come in many lengths including 20", 30", 40" and 45". TEU is used as an industry standard measurement for containers where a 20" is 1.0 TEU , a 40" 2.0 TEU and so forth. The TEU measurement particularly is useful when specifying container ship or container terminal capacities.
TICCIH	***The International Committee for the Conservation of the Industrial Heritage***
T_m	Mean wave period
TSAS	Trophic Status Assessment Scheme
TBT	Tributyltin
TBM	Temporary Benchmark
TII	Transport Infrastructure Ireland
TTA	Traffic and Transport Assessment

TSP	***Total Suspended Particulate***
TTS	Temporary Threshold Shift, a temporal elevation of the hearing threshold due to noise exposure
UN	***United Nations***
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UFT	Unified Ferry Terminal
Units Unitised	Freight can be in the form of shipping containers or trailers. The sizes of shipping containers vary and are measured in terms of TEU . Trailers vary to a lesser extent and are generally 13.6m long. Trailers are shipped either accompanied (by a road tractor unit and driver) or unaccompanied. In general each unit of unitised freight moved by road will generate at least one HGV movement into the Port and a second one out of the Port.
URPACTII	Programme funded by the European Regional Development Fund to develop a strategy for the development of cruise traffic and the urban regeneration of city ports.
USEPA	***United States Environmental Protection Agency***
UTC	Coordinated Universal Time
UWWT	Urban Waste Water Treatment
VDV	Vibration Dose Value
VMU	Vertical Mixed Use
VMS	Variable Message Signage
VOC	Volatile Organic Compound
W	Historic shipwreck inventory
WFD	Water Framework Directive
WHO	***World Health Organisation***
y-HCH	Lindane
ZVI	Zone of Visual Influence

9 WATER QUALITY & FLOOD RISK ASSESSMENT

This chapter assesses the potential impact of the MP2 Project on water quality within the receiving environment (Section 9.1). Existing water quality in the vicinity of the MP2 Project is established based on available water quality information. The likely significant effects of the project on water quality are determined and measures to reduce, avoid and prevent these likely significant effects are proposed, where they are necessary.

In addition, a Flood Risk Assessment (FRA) was carried out for the development in accordance with the Planning System and Flood Risk Management Guidelines for Planning Authorities (Section 9.2). The potential effects of the development on flooding are also considered as part of this assessment.

This assessment is based on the project description detailed in Chapter 3 and has been prepared in accordance with the European Commission's Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017) and the EPA Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2017).

9.1 Water Quality

9.1.1 Assessment Methodology

Baseline water quality within the receiving environment has been established through review of national monitoring data used to establish water quality status in the context of the EU Water Framework Directive (WFD) and supporting environmental standards. Recent high frequency monitoring data, collected during the Alexandra Basin Redevelopment (ABR) Project, has also been considered.

An assessment has then been made of the MP2 Project to determine the likelihood for significant impacts on water quality using criteria for rating significance and magnitude set out in the National Roads Authority (NRA) publication "*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*" (NRA, 2008). The significance of impact on surface water quality likely to occur during the construction and operation phases of the development are determined using a predominantly qualitative methodology supported, where appropriate, by quantitative assessment. The assessment is a consideration of a combination of receptor sensitivity (Table 9-1)

and the potential magnitude of the impact on the water environment (Table 9-2), in order to determine significance (Table 9-3).

Table 9-1: Criteria for Rating Receptor Sensitivity (NRA, 2008)

Value (Sensitivity)	Typical Descriptors
Extremely High	***Attribute has a high quality or value on an international scale.*** Examples: Examples: River, Wetland or surface water body ecosystem protected by EU legislation. I.e. designated under the Habitats, Birds, Shellfish, Bathing Water or Freshwater Fish, Drinking Water or Nitrate Directives.
Very High	***Attribute has a high quality or value on a regional or national scale.*** Examples: River, Wetland or surface water body ecosystem protected by national legislation (NHA status), Regional important potable water source supplying >2500 homes, nationally important amenity site for wide range of leisure activities, Quality Class A (Biotic Index Q4, Q5), Flood plain protecting more than 50 residential or commercial properties from flooding.
High	***Attribute has a high quality or value on a local scale.*** Examples: Salmon fishery, locally important potable water source supplying >1000 homes, Quality Class B (Biotic Index Q3-4), Flood plain protecting 5 to 50 residential or commercial properties from flooding, Locally important amenity site for wide range of leisure activities.
Medium	***Attribute has a medium quality or value on a local scale.*** Examples: Coarse fishery, Local potable water source supplying >50 homes, Quality Class C (Biotic Index Q3, Q2-3), Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Low	***Attribute has a low quality or value on a local scale.*** Examples: Locally important amenity site for small range of leisure activities, Local potable water source supplying <50 homes, Quality Class D (Biotic Index Q2, Q1), Flood plain protecting 1 residential or commercial property from flooding. Amenity site used by small numbers of local people.

Table 9-2: Criteria for Rating the Magnitude of Impact (NRA, 2008)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Loss or extensive change to a water body or water dependent habitat.
		Increase in predicted peak flood level >100mm.
		Extensive loss of fishery
		Extensive reduction in amenity value
		Potential high risk of pollution to water body from routine run-off
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Increase in predicted peak flood level >50mm
		Partial loss of fishery
		Potential medium risk of pollution to water body from routine run-off
		Partial reduction in amenity value
Minor Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Increase in predicted peak flood level >10mm
		Minor loss of fishery
		Potential low risk of pollution to water body from routine run-off
		Slight reduction in amenity value
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Negligible change in predicted peak flood level Negligible loss of amenity value Negligible loss of fishery

The approach to assessing the significance of impacts comprises assigning each impact to one of the four categories of magnitude as outlined in Table 9-2 enables different characteristics to be assessed based upon the same scale.

Table 9-3: Criteria for Rating the Significance of Environmental Impacts (NRA 2008)

Importance of Attribute	Magnitude of Impact			
	Negligible	Minor	Moderate	Large
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

The significance determination and assessment of the potential likely environmental effects of each component of the MP2 Project has been made based on the matrix presented in Table 9-3 and in Table 9-4.

Table 9-4: Defining Impact Significance (NRA, 2008)

Impact Level	Attribute Importance				
	Extremely High	Very High	High	Medium	Low
Profound	Any permanent impact on attribute	Permanent impact on significant proportion of attribute			
Significant	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute		
Moderate	Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute	
Slight		Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute
Imperceptible			Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute

To conclude the assessment, mitigation measures are proposed to reduce, avoid and prevent these likely significant effects, where appropriate. This enables a “with mitigation” assessment to be made of any residual impact as a result of the construction and operational phases of the MP2 Project and/or in combination with other existing or approved projects in the vicinity of Dublin Port.

9.1.2 Receiving Water Environment and Water Quality Simulations

A desk-based assessment of surface water quality in the vicinity of the MP2 Project application area was conducted. The sources of the water quality information include:

- Water Framework Directive water body status information arising from the Water Framework Directive monitoring programme. Water Quality in Ireland Report 2010-2015 (2017) supported by water quality information available on the EPAs online Water Framework Directive Application (www.catchments.ie);
- Protected areas datasets including:
  - bathing water quality information outlined in the EPA’s most recent bathing water quality report, Bathing Water Quality in Ireland, A Report for the Year 2017 (EPA, 2018);

  - information on Nutrient Sensitive Areas as outlined in the EPA's most recent Urban Waste Water Treatment Report (2017); and
  - the existing Register of Protected Areas (under Article 6 of the Water Framework Directive) for water dependent habitats and species in the SAC and SPA networks held by the EPA.
- Department of Environment, Community and Local Government - Marine Strategy Framework Programme of Measures Summary Report (2016);
- Water Quality in Ireland – An Indicators Report (2018);
- Marine Institute water quality monitoring data for Liffey Estuary Lower and Dublin Bay 2015 – 2018;
- Site specific water quality monitoring data was made available by Dublin Port Company's Monitoring Programme (ongoing for the Alexandra Basin Redevelopment (ABR) Project), these data are reported in DPC's annual environmental returns/baseline state of the environment reporting.

9.1.2.1 Project Area Water Bodies

For the purposes of monitoring and assessing the quality of surface waters, all rivers, lakes, coastal inter-basins, estuaries, and coastal waters (within 1 nautical mile of the shoreline) have been divided into management units called "water bodies". The condition of each water body must be reported to the European Commission in the form of ecological status and chemical status. Ground water bodies are similarly delineated with status identified.

Surface water bodies are grouped into sub-catchments for the purposes of water management, of which there are 583 nationally, which are further grouped into catchment management units of which there are 46 based on the hydrometric areas used by public authorities. As illustrated in Figure 9-1, the MP2 Project, including its capital dredging scheme, will take place within the Liffey Estuary and Dublin Bay. The works are located within two surface water bodies: 'Liffey Estuary Lower' transitional water body (EA_090_0300) and 'Dublin Bay' coastal water body (EA_090_0000). The 'Liffey Estuary Upper' (EA_090_0400) and the 'Tolka Estuary' (EA_090_0200) transitional water bodies are situated upstream of the works.

There are also several rivers that discharge into the Liffey Estuary and Dublin Bay; principally the Liffey itself along with the Dodder, Camac, Poddle and Tolka. The Royal Canal and the Grand Canal also discharge to the Liffey. In addition, several small streams flow from the surrounding areas directly into Dublin Bay.

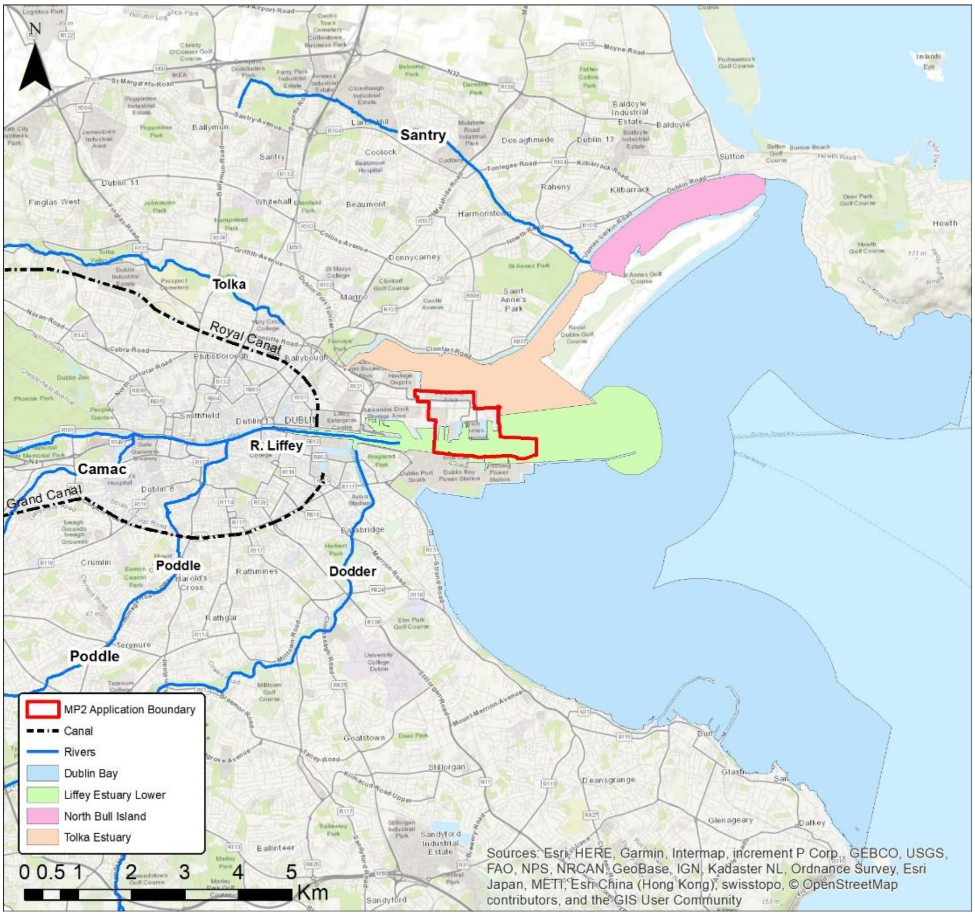


Figure 9-1: Site Location in the Context of the Wider Surface Water Environment

The MP2 Project lies within the 'Dublin Urban' groundwater body (EA-G-008). This water body has achieved and maintained 'good' status since the 2007-2012 WFD Monitoring Cycle as reported in 2017. All these waterbodies are grouped into the 'Liffey and Dublin Bay Catchment' (HA09) of the Irish River Basin District.

Due to the nature of the MP2 Project and the relatively limited scale of geotechnical activities in the application area, there are no likely significant water quality effects on groundwater expected and these have therefore not been assessed further in this Chapter. This is supported by the assessment presented in Chapter 8 which addresses Soils, Geology and Hydrogeology.

9.1.2.2 Water Framework Directive Water Body Status

Directive 2000/60/EC establishing a framework for community action in the field of water policy (the Water Framework Directive), and transposing regulations, establishes a legal framework for the protection, improvement and sustainable management of rivers, lakes, transitional waters (estuaries), coastal waters (to a distance of one nautical mile) and groundwater.

The fundamental objectives of the WFD are to maintain "high status" of surface waters where it exists, prevent deterioration in the existing status of waters, and achieve at least "good status" in relation to all waters by the end of the current river basin management cycle (2021) unless subject to extended deadlines. A water body must achieve both good 'ecological status' and good 'chemical status' before it can be considered to be at good overall status. An assessment of the risks to the achievement of these objectives for water bodies has been undertaken by the EPA through the extensive characterisation of water bodies and the key pressures acting upon them. This will allow the development of a programme of measures to allow the achievement of the WFD objectives.

The Programme of Measures (POMs) outlines the steps that will be taken to meet WFD objectives as applicable to each water body. This Programme is contained within an overarching River Basin Management Plan (RBMP). These measures will require implementation at strategic level but also at regional and local level through the establishment of Regional Integrated Catchment Management Programmes. Whilst none of the water bodies within the project area have been included amongst those 190 prioritised areas for action in the current River Basin Management Plan for Ireland 2018 - 2021 (DHPLG, 2018), it is noted that measures required to ensure compliance with existing legislation will be implemented during this river basin management cycle.

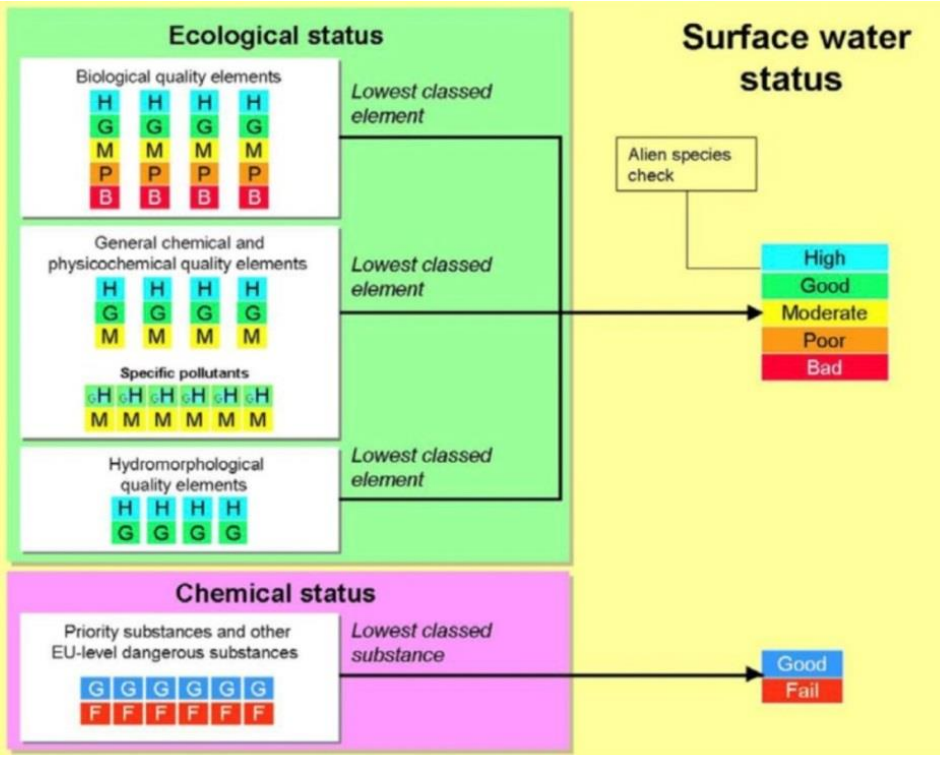


Figure 9-2: Elements of the Water Framework Directive Status

Environmental Quality Standards (EQSs) for classifying surface water status are established in the European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (SI No. 272 of 2009), as amended. These regulations set standards for biological quality elements, physico-chemical conditions supporting biological elements (including general conditions and specific pollutants), priority substances and priority hazardous substances.

As shown in Figure 9-2 the 'ecological status' of a water body is established according to compliance with the EQSs for biological quality elements, physico-chemical conditions supporting biological elements and relevant pollutants and hydromorphological quality elements. The 'chemical status' of a water body is established according to compliance with the EQSs for priority substances and priority hazardous substances.

In addition to achieving good ecological and chemical status, a water body must achieve compliance with standards and objectives specified for protected areas, which include areas designated by the Bathing Water Directive; the Urban Waste Water Treatment Directive; the Shellfish Waters Directive; the Habitats Directive and the Birds Directive. Waters bodies that are compliant with WFD standards, but that contain protected areas that are non-compliant with protected area standards are downgraded to 'less than good' status.

Based on monitoring information and data from 2010 to 2015, the current WFD status classification of transitional and coastal water bodies potentially affected by the MP2 Project is illustrated in Figure 9-3.

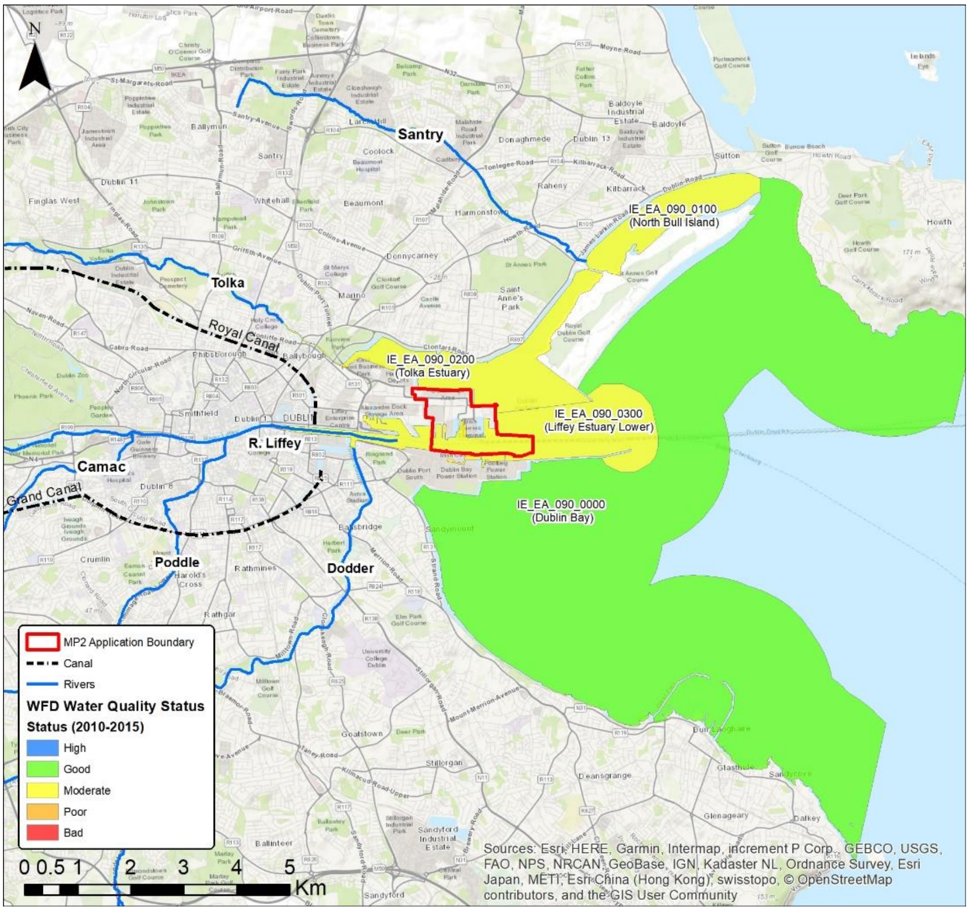


Figure 9-3: Water Framework Directive Water Body Status – Reported 2017

The WFD status classification between 2007 and 2015 is shown in Table 9-5 for each of these water bodies. In summary the Liffey Estuary Lower and Tolka Estuary transitional water bodies have most recently been reported as "moderate" in 2015, with the Liffey Estuary Lower reported as good in 2010-2012. The Dublin Bay coastal water body was reported as "moderate" in the 2007-2009 WFD monitoring cycle and in 2010-2012 it was reported as "good" and has since maintained that status, as reported in 2017. The Liffey Estuary Upper was reported as "poor" in the 2007-2009 WFD monitoring cycle. In the 2010-2012 monitoring cycle it was reported as "moderate" and has since maintained that status, as reported in 2017.

Table 9-5: WFD Status (2007-2015)

WFD Status 2007-2015	Liffey Estuary Lower WFD Status	Liffey Estuary Upper WFD Status	Tolka Estuary WFD Status	Dublin Bay WFD
	EA_090_0300	EA_090_0400	EA_090_0200	EA_090_0000
Overall WFD Water Quality Status (2007-2009)	Moderate	Poor	Moderate	Moderate
Overall WFD Water Quality Status (2010-2012 - Interim)	Good	Moderate	Moderate	Good
Overall WFD Water Quality Status (2010-2015)	Moderate	Moderate	Moderate	Good

A further breakdown of the ecological and chemical elements for the 2010-2015 WFD cycles is shown in Table 9-6. The Liffey Estuary Lower water body is currently at "moderate" Ecological Status but was at "good" status in the previous monitoring cycle. This resulted from a reduction in Biological Status from "good" to "moderate" due to a reduction in Fish Status from "good" to "moderate". Oxygenation conditions have also reduced from "high" in the 2007-2009 monitoring interval to "good" in the current 2010-2015 interval.

The Dublin Bay coastal water body has improved from "moderate" in the 2007-2009 monitoring cycle to "good" Ecological Status in the latest monitoring intervals. This resulted from an increase in Biological Status from "moderate" to "good" due to improving Invertebrate Status, notwithstanding the deterioration in Supporting Chemistry Conditions, including Oxygenation Conditions, from "high" to "good" status.

The Tolka Estuary has retained 'moderate' Ecological Status throughout all monitoring intervals although Fish Status has improved to "good" status in the last two monitoring intervals and Oxygenation Conditions have reduced to "moderate" status' from previous "good" status.

The Liffey Estuary Upper has improved Ecological Status from "poor" in the 2007-2009 monitoring cycle to "moderate" in the most recent monitoring period. The improvement reflects a change in Fish Status from "poor" to "moderate".

This assessment of likely significant effects on water quality has been undertaken having regard to the necessity to comply with the WFD and in doing so ensuring that the MP2 Project does not prevent the achievement of the WFD objectives for these water bodies in subsequent RBMP cycles. The water quality assessment therefore demonstrates that the MP2 Project will not cause deterioration in the status or prevent the improvement in status, where necessary, under the environmental objectives of the WFD.

Table 9-6: WFD Status Breakdown (2010-2015)

<table>
<tr><th colspan="3" rowspan="2">WFD Status 2010-2015</th><th>Liffey Estuary Lower</th><th>Liffey Estuary Upper</th><th>Tolka Estuary</th><th>Dublin Bay</th></tr>
<tr><th>EA_090_0300</th><th>EA_090_0400</th><th>EA_090_0200</th><th>EA_090_0000</th></tr>
<tr><td rowspan="9">Ecological Status</td><td rowspan="4">Biological Status</td><td>Phytoplankton Status</td><td>Good</td><td>Good</td><td>High</td><td>High</td></tr>
<tr><td>Other Aquatic Floras Status</td><td>Not Available</td><td>Not Available</td><td>Moderate</td><td>Good</td></tr>
<tr><td>Invertebrate Status</td><td>High</td><td>Not Available</td><td>Moderate</td><td>Good</td></tr>
<tr><td>Fish Status</td><td>Moderate</td><td>Moderate</td><td>Good</td><td>Not Available</td></tr>
<tr><td rowspan="3">Supporting Chemistry Conditions</td><td>Oxygenation Conditions</td><td>Good</td><td>Moderate</td><td>Moderate</td><td>Good</td></tr>
<tr><td>Nutrients Condition</td><td>Good</td><td>Moderate</td><td>Moderate</td><td>High</td></tr>
<tr><td>Relevant Pollutants</td><td>Pass</td><td>Not Available</td><td>Not Available</td><td>Pass</td></tr>
<tr><td>Hydromorphological Quality Element</td><td>Hydrology, Morphology, Continuity</td><td>Poor</td><td>Bad</td><td>Poor</td><td>Good</td></tr>
<tr><td colspan="2">Ecological Status (2010 – 2015)</td><td>Moderate</td><td>Moderate</td><td>Moderate</td><td>Good</td></tr>
<tr><td rowspan="2">Chemical Status</td><td colspan="2">Priority substances and other EU-level dangerous substances</td><td>Good</td><td>Not Available</td><td>Not Available</td><td>Good</td></tr>
<tr><td colspan="2">Chemical Status (2010 – 2015)</td><td>Good</td><td>Not Available</td><td>Not Available</td><td>Good</td></tr>
<tr><td colspan="3">Overall WFD Quality Status 2010 - 2015</td><td>Moderate</td><td>Moderate</td><td>Moderate</td><td>Good</td></tr>
</table>

9.1.2.3 Protected Areas

A significant proportion of the area of Dublin Bay and adjacent coastline is protected under existing EU legislation requiring special protection due to the sensitivity to pollution or particular environmental importance. All of the areas requiring special protection in the Irish River Basin District have been identified by EPA, mapped and listed in a national register of protected areas (required under Article 6 of the WFD Directive). The register of protected areas includes:

- areas designated for the abstraction of water for human consumption (Drinking Water Protected Areas);
- areas designated for the protection of economically significant aquatic species, i.e. Freshwater Fish and Shellfish;
- bodies of water designated as recreational waters, including areas designated as bathing waters;
- nutrient-sensitive areas, including areas identified as Nitrate Vulnerable Zones under the Nitrates Directive or areas designated as sensitive under Urban Waste Water Treatment Directive; as well as
- areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection including relevant Natura 2000 sites (Special Protection Areas (SPAs); and candidate Special Areas of Conservation (cSACs)).

These protected areas have their own monitoring and assessment requirements to determine their condition. They are often assessed for additional pollutants or requirements relevant to their designation. Protected areas within the Dublin Port and Dublin Bay area include areas of Bathing Water, Nutrient Sensitive Waters and Natura 2000 sites.

9.1.2.3.1 Bathing Waters

The Bathing Water Directive (2006/7/EC) came into force in March 2006, and was transposed into Irish law by the Bathing Water Quality Regulations, 2008, as amended. The previous 1976 Directive was repealed with effect from 31 December 2014. Since 2014, the annual water quality classification (rating) of a beach or lake has been based on water quality results covering a four-year period rather than a single previous season's data. Water quality at beaches and lakes is classified as Excellent; Good, Sufficient or Poor (Table 9-7). This approach is common across all EU Member States and there is a requirement to ensure that bathing waters are of 'Sufficient' standard or better. Any 'Poor' bathing water requires a programme of adequate management measures to be implemented. A minimum of 16 samples are required for formal annual assessment.

Table 9-7: Annual Assessment Criteria for Bathing Waters

Parameter	Excellent	Good	Sufficient
E. coli (Freshwater)	500*	1000*	900**
E. coli (Coastal)	250*	500*	500**
Intestinal enterococci (freshwater)	200*	400*	330**
Intestinal enterococci (Coastal)	100*	200*	185**

*based on 95-percentile value **based on 90-percentile value

The bathing areas in the immediate vicinity of the MP2 Project are Dollymount Strand, Sandymount Strand, Merrion Strand and Seapoint. Most recently, Dollymount Strand has been classified as Good; Sandymount and Merrion Strands have been classified as Poor; and Seapoint has been classified as Excellent (Figure 9-4). Sandymount Strand has deteriorated from Sufficient in the 2016 to Poor in the most recent 2017 monitoring period. The remaining sites showed no change over this interval.

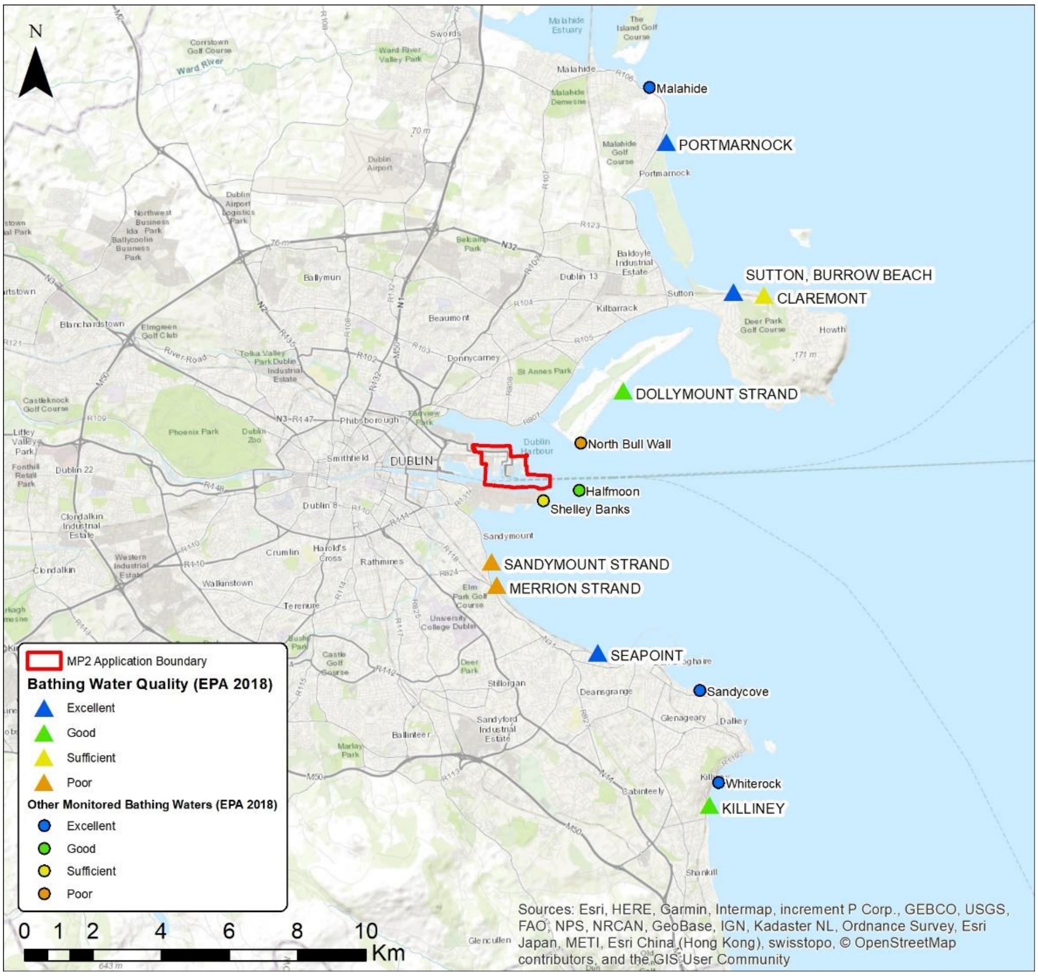


Figure 9-4: Bathing Water Quality in the Dublin Area 2017 (EPA, 2018)

Both Merrion and Sandymount Strands are considered vulnerable to pollution. The likely pollution sources are identified as arising from surface water inflows, drainage misconnections from domestic properties and fouling by large numbers of birds that roost on the extensive areas of exposed sand at these sites. Seabird droppings have as much as 10 million *E.coli* bacteria per gram so it is possible that they may be contributing to a decline in quality, particularly as microbiological standards have become stricter and bird numbers appear to be increasing.

In addition to the waters which Ireland has formally identified to the EU as bathing waters there are many locations around the country which are monitored by local authorities because swimming or recreational activities are known to take place there. Water quality results for other monitored waters for the period 2014-2017 shows the quality likely to be achieved at these waters.

Of the other monitored waters in the Dublin Bay area, the North Bull Wall Causeway on the River Liffey, is indicated as likely to be of Poor quality. The Half Moon bathing area is indicated as Good; Shelley Banks as Sufficient; White Rock and Sandycove as Excellent (Figure 9-4).

Table 9-8: Status of Individual Samples during the 2018 Monitoring Season

Date	Dollymount	Sandymount	Merrion	North Bull	Half Moon	Shelley Banks	Seapoint	Sandycove	Forty Foot	Shelley Banks
08/08/18-08/08/18	Green	Blue	Green	Blue	Blue	Blue	Blue	Blue	Blue	Blue
30/07/2018	Blue	Blue	Blue	Blue	Blue	Yellow				
25/07/2018							Blue	Blue	Blue	Blue
24/07/2018							Blue	Orange	Blue	Blue
23/07/2018	Blue	Blue	Green	Blue	Blue	Blue				
16/07/18 - 17/08/18	Blue	Blue	Blue	Blue	Blue	Blue				Blue
12/07/18 - 15/07/2018	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Orange
11/07/2018	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
10/07/2018	Blue	Blue	Blue	Blue	Blue	Blue				
01/07/2018	Blue	Blue	Blue	Blue	Green	Blue				
26/06/18-28/06/18					Blue		Blue	Blue	Blue	Blue
25/06/2018	Blue	Blue	Blue	Blue	Orange	Blue	Blue	Blue	Blue	Blue
24/06/2018	Blue	Blue	Blue	Blue	Blue	Blue				
17/06/2018	Blue	Blue	Blue	Blue	Blue	Blue				
13/06/2018	Blue	Blue	Blue	Green	Blue	Blue				
12/06/2018							Blue	Blue	Blue	Blue
11/06/2018	Blue	Blue	Blue	Blue	Blue	Orange	Blue	Blue	Blue	Blue
08/06/2018	Blue	Blue	Blue							
05/06/2018	Blue	Blue	Blue	Blue	Blue	Blue				
28/05/2018							Blue	Blue	Blue	Blue
23/05/2018	Blue	Blue	Blue	Orange	Blue	Blue				

Key: Blue: Excellent; Green: Good, Orange: Sufficient

Notwithstanding bathing restrictions at Merrion and Sandymount due to previous poor-quality bathing water, the results for all sites monitored during 2018 have been substantially excellent for individual samples during the 2018 monitoring season (Table 9-8).

9.1.2.3.2 Nutrient Sensitive Waters

The Urban Waste Water Treatment Regulations 2001, as amended (which transpose the Urban Wastewater Treatment Directive (91/271/EEC) into Irish law and update the Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regulations 1994, as amended) list nutrient sensitive waters in the Third Schedule.

The Liffey Estuary from Islandbridge weir to Poolbeg Lighthouse, including the River Tolka basin and South Bull Lagoon has been designated as a nutrient sensitive area (Figure 9-5). Ringsend WWTP currently discharges in the Lower Liffey Estuary.

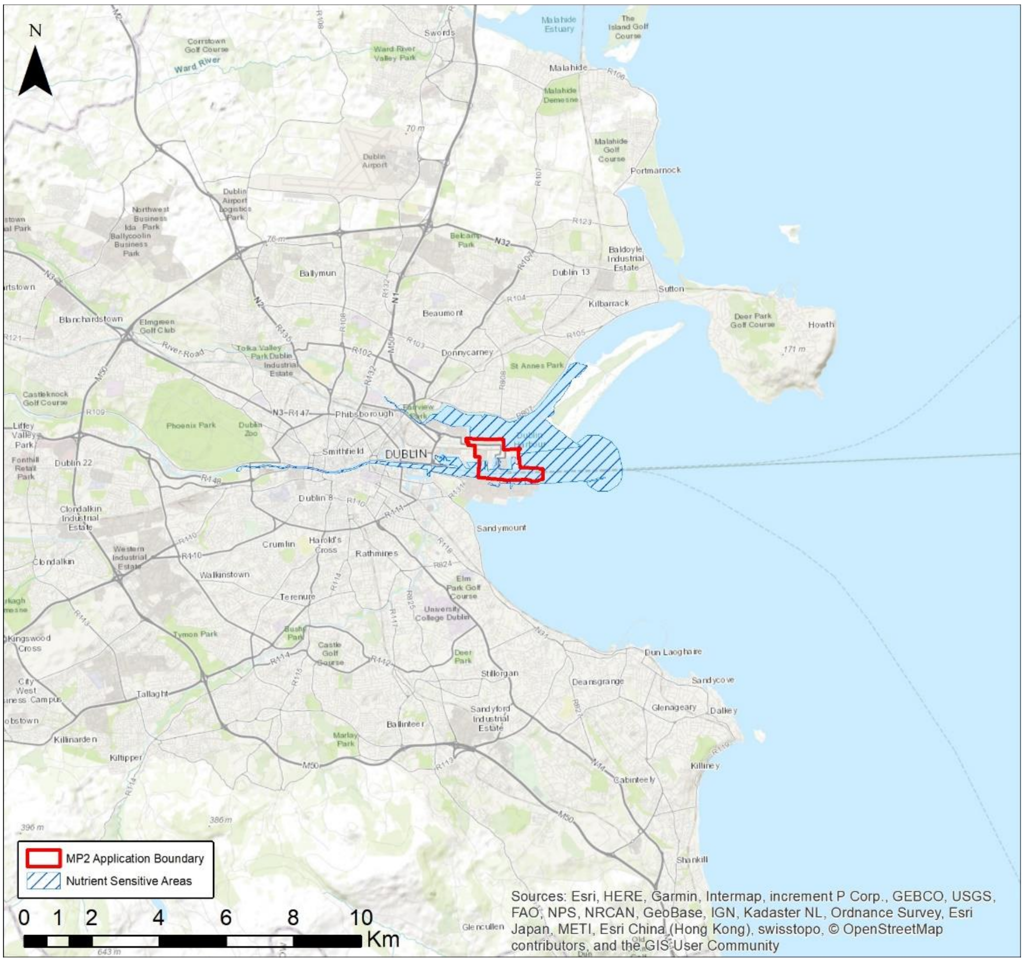


Figure 9-5: Nutrient Sensitive Areas

9.1.2.3.3 Natura 2000 Protected Areas

Natura 2000 is a European network of important ecological sites. The EU Habitats Directive (92/43/EEC) places an obligation on Member States of the EU to establish the Natura 2000 network. The network is made up of Special Protection Areas (SPAs), established under the EU Birds Directive (79/409/EEC), and cSACs, established under the Habitats Directive itself.

As illustrated in Figure 9-6, the MP2 Project activities within the Port area will not be within any Natura 2000 site (i.e. SPA or cSAC). The licensed dumping area is within the Rockabill to Dalkey SAC which is designated for the marine Annex I qualifying interest reefs and the Annex II species Phocoena phocoena (harbour porpoise). The potential of likely significant effects from the MP2 Project has been assessed in Chapter 7 Biodiversity. It should also be noted that, separately and distinctly, potential effects on Natura 2000 or “European” sites has been considered extensively in the Appropriate Screening Report and Natura Impact Statement submitted with the application for development consent in respect of the MP2 Project.

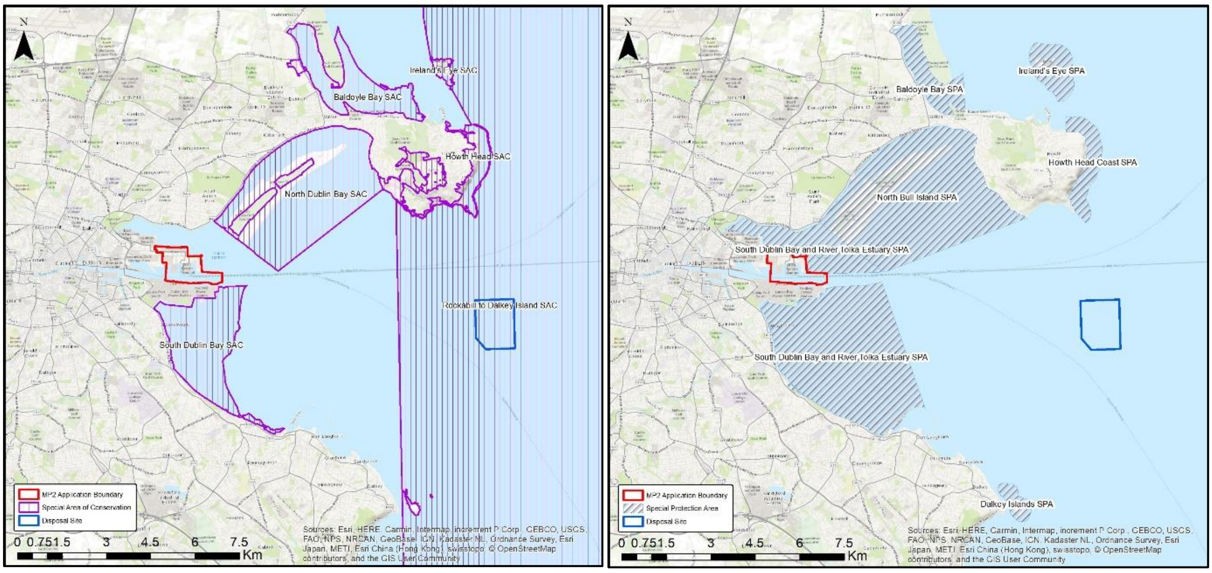


Figure 9-6: Natura 2000 Designated Sites

For the reasons set out in the Appropriate Assessment Screening Report and Natura Impact Statement, the MP2 Project will not have any adverse effects on the qualifying interests of any European site. The purpose of the water quality assessment contained in this chapter of the EIAR is to demonstrate that the development will not cause significant effects on the bathing waters, nutrient sensitive waters and, where necessary, water quality modelling and evaluation against relevant standards, has been undertaken.

9.1.2.4 Marine Strategy Framework Directive Environmental Status

The Marine Strategy Framework Directive (MSFD) (2008/56/EC) was formally adopted by the European Union in June 2008 and is transposed into Irish law by the European Communities (Marine Strategy Framework) Regulations 2011, as amended. The overarching aim of the Directive is to protect Europe's marine waters by applying an ecosystem-based approach to the management of human activities while enabling the sustainable use of the marine environment for present and future generations. The Directive establishes a legal framework for the development of marine strategies designed to achieve Good Environmental Status (GES) in the marine environment by the year 2020. The marine strategy involves defining GES, setting environmental targets and indicators, implementing monitoring programmes for ongoing assessment, and developing and implementing programmes of measures to achieve or maintain GES.

GES is defined as '*the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations'*.

The assessment of GES is undertaken by reference to qualitative descriptors which define overarching objectives in respect of key socio-economic or ecological aspects of the marine environment. These specifically require the consideration of the following:

- biodiversity;

- non-indigenous species;
- exploited fish and shellfish;
- food webs;
- human-induced eutrophication;
- sea-floor integrity;
- alteration of hydrographical conditions;
- contaminants in water and seafood;
- marine litter; and
- the introduction of energy including underwater noise.

To date, an Initial Assessment (constituting a comprehensive review of the physical, chemical and biological characteristics of the marine area, as well as the human pressures acting upon it) has been undertaken (DEHLG 2013)). A comprehensive set of environmental targets and associated indicators is under development. These will be used to demonstrate that GES has been achieved or is being maintained in accordance with the objectives of the MSFD. A monitoring programme will be established by the Department of Housing, Planning and Local Government and the Marine Institute to identify measures which will need to be taken in order to achieve or maintain GES in marine waters and a draft management plan prepared. To date, the extent of achievement of GES has not been established for individual water bodies, therefore this water quality assessment relies on the WFD water quality assessment to ensure that the MP2 Project will not cause conflict with the MSFD.

9.1.2.5 EPA Water Quality in 2016: An indicators Report

In 2018 the EPA published the Water Quality in 2017, An indicators Report. The intention of the report is to keep decision makers and the public informed by providing timely, scientifically sound information on water quality using a series of water quality indicators. Of the sixteen indicators three relate to Transitional and Coastal Waters located in close proximity to the MP2 Project;

- Indicator 9 – Trophic Status of Transitional and Coastal Waters,
- Indicator 10 – Nitrogen in Transitional and Coastal Waters,
- Indicator 11 – Phosphorus in Transitional and Coastal Waters.

9.1.2.5.1 Indicator 9 – Trophic Status of Transitional and Coastal Waters

The assessment of trophic status is used to identify waters that may be sensitive to nutrient enrichment and the occurrence of eutrophication. Trophic status is a measure of the amount of biomass in a water body at a certain time. Too much nutrient leads to too much biomass, which can severely impact the normal functioning of saline ecosystems and can cause changes to the biological communities and undesirable disturbance to the overall ecology. Eutrophication in estuaries and coastal waters can be caused by nitrogen and/or phosphorus. Phosphorus is generally considered the primary limiting nutrient in river-dominated estuaries while nitrogen is considered the primary limiting nutrient in coastal ecosystems.

The trophic status of transitional and coastal water bodies is assessed using the EPA's Trophic Status Assessment Scheme (TSAS) and is required for the EU Urban Waste Water Treatment Directive (91/271/EEC) and the EU Nitrates Directive (91/676/EEC). The scheme compares the compliance of individual parameters against a set of criteria indicative of trophic state (Table 9-9) and classifies water bodies as follows:

- ***Eutrophic*** water bodies are those in which criteria in each of the categories are breached, i.e. where elevated nutrient concentrations, accelerated growth of plants and undesirable water quality disturbance occur simultaneously;
- ***Potentially Eutrophic*** water bodies are those in which criteria in two of the categories are breached and the third falls within 15 per cent of the relevant threshold value;
- ***Intermediate*** status water bodies are those which breach one or two of the criteria;
- ***Unpolluted*** water bodies are those which do not breach any of the criteria in any category.

The Water Quality in 2016 Indicator Report has indicated that the Liffey Estuary lower and the Liffey Estuary Upper water bodies have been designated as being Intermediate, the Tolka Estuary has been designated as Eutrophic and Dublin Bay is Unpolluted.

Table 9-9: Parameters and criteria used in the Trophic Status Assessment Scheme (TSAS) for Irish Marine Water Bodies (EPC, 2010)

Category	TSAS criteria	Value from 3-year period	Threshold	Score
A: Nutrient enrichment	Nitrogen	DIN (Winter or Summer)	Salinity Corrected Threshold Value (see Appendix)	Pass/Fail
	Phosphorus	MRP (Winter or Summer)		Pass/Fail
B: Accelerated Growth	Chlorophyll	Median (Summer)		Pass/Fail
		90%ile (Summer)		Pass/Fail
	Macroalgae	WFD EQR[1] (Summer)		Pass/Fail
C: Undesirable Disturbance	Dissolved Oxygen	5%ile (Summer)		Pass/Fail
		95%ile (Summer)		Pass/Fail

[1] Ecological Quality Ratio for Good Status, derived from WFD compliant assessment method.

9.1.2.5.2 Indicator 10 – Nitrogen in Transitional and Coastal Waters

Nitrogen is generally considered the primary limiting nutrient in coastal ecosystems, meaning that the concentration of this nutrient can limit the growth of algae and aquatic plants. Increases in nitrogen can lead to elevated growth of phytoplankton and/or macroalgae. Levels of Dissolved Inorganic Nitrogen (DIN) are monitored in winter, when levels are expected to be at their seasonal maximum due to the absence of any significant plant or algal growth.

The EPA have defined salinity-dependent thresholds for DIN in transitional and coastal waters, and there is an environmental quality standard for coastal waters. These assessment thresholds range from ≤2.6 mg N/l at a salinity of 0 to ≤0.25 mg N/l at a salinity of 34.5, and are used to assess water quality of transitional and coastal waters around Ireland. Dissolved inorganic nitrogen concentrations above the assessment threshold indicate the presence of elevated nitrogen levels from anthropogenic sources. The indicator uses the median winter DIN concentration for the period 2014–2016 to assess number of exceedances against the assessment threshold.

The EPA 2016 Indicators Report has reviewed trends in some coastal and transitional water bodies. Liffey Estuary Lower, Tolka Estuary and Dublin Bay have been included in this analysis, but Liffey Estuary Upper has not. Indicator 10 reports that the Medium DIN Concentration trend between 2007 and 2016 has remained stable for all three water bodies. It also reports at that the Liffey Estuary Lower and Tolka Estuary have experienced between 1% to 50% exceedances of Winter DIN and Dublin Bay has experienced -14% to 0% exceedance of Winter DIN.

9.1.2.5.3 Indicator 11 – Phosphorus in Transitional and Coastal Waters

Phosphorus is important in transitional systems because it is limiting in lower salinity waters. Salinity-dependent thresholds have been defined for phosphorus in transitional and coastal waters and there is an environmental quality standard for transitional waters (S.I. 272, 2009). The assessment threshold is 0.060 mg P/l for fresh to intermediate salinity waters and ranges from 0.059–0.040 mg P/l for intermediate to full salinity waters. Phosphorus concentrations above these thresholds can indicate excess phosphorus being transported to surface waters due to anthropogenic activity. Levels of Molybdate Reactive Phosphorus (MRP) are monitored in winter, when levels are expected to be at their seasonal maximum due to the absence of any significant plant or algal growth. Winter (January–March) phosphorus exceedances give an indication of available nutrients without the influence of biological activity, which mainly occurs during the summer growth period.

Indicator 11 reported that the Median MRP concentration trend between 2007 and 2016 has remained stable for Liffey Lower Estuary and the Tolka Estuary while the concentration of Dublin Bay has decreased significantly. It also reports that the Liffey Estuary Lower and Tolka Estuary have experienced between -14% to 0% exceedances of Winter MRP and Dublin Bay has experienced -49% to -15% exceedance of Winter MRP.

In this water quality assessment consideration has been given to potential effects of the development on these nutrient related environmental indicators.

9.1.2.6 Marine Institute Monitoring

The Marine Institute (MI) monitors water quality at two locations in Dublin Bay and one location in the Liffey Estuary Lower (Figure 9-7). Available physico-chemical monitoring data from January 2015 to March 2018 have been collated and are summarised in Figure 9-8.

The mean turbidity measured by MI at Dublin Bay stations 1 and 2 is 8 NTU. This is in agreement with measurements made at the coastal monitoring buoys in the ABR Project where mean turbidity at four sites and at three depths was measured at 8 to 14 NTU. The mean turbidity measured in the Liffey Estuary Lower (based on data from September and November 2018 only) is 21 NTU. This compares with mean turbidity of 2.4 to 7.4 measured at four sites in the Liffey Estuary during the ABR Project. The slightly higher turbidity measured by MI may relate to the time of year when measurements were made at this site (September and November). It also reflects the greater variance in turbidity in the dynamic port area.

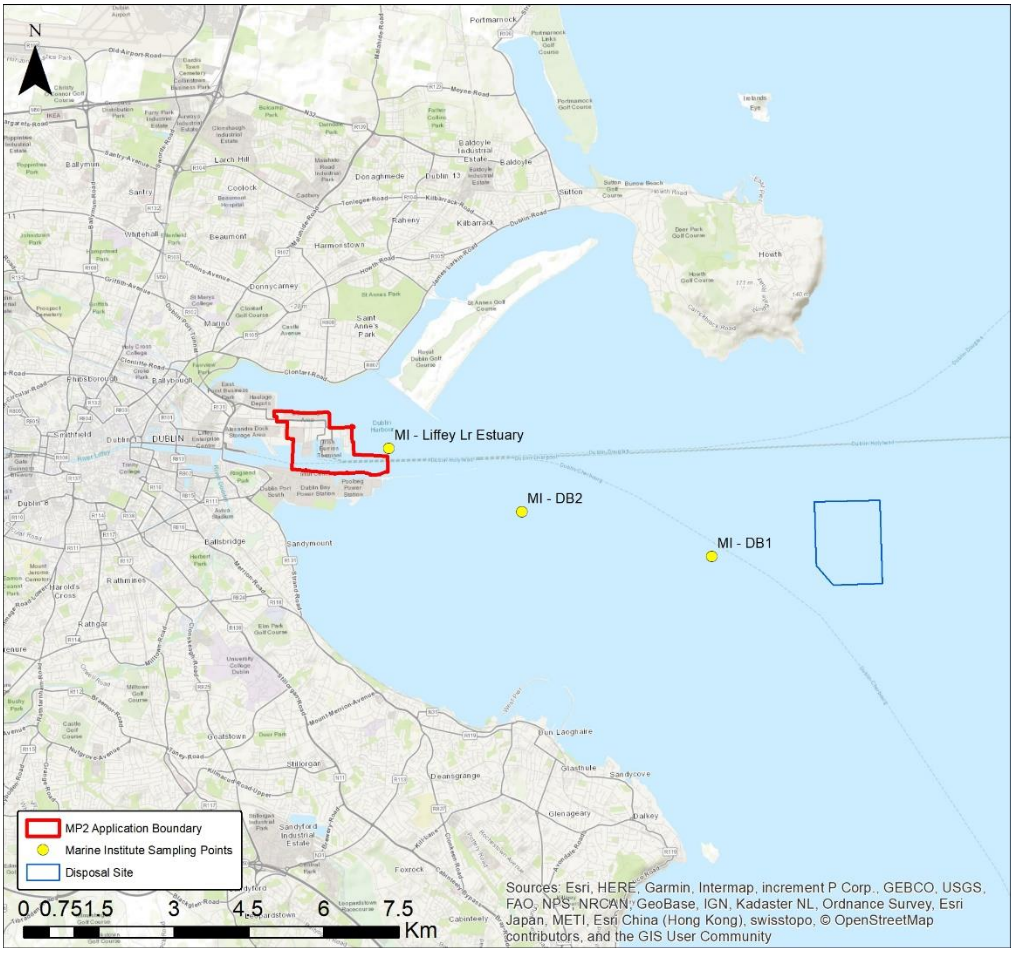


Figure 9-7: Marine Institute Monitoring Locations and the Licenced Dumping Site

Dissolved oxygen levels are 8.9 mg/l at both Dublin Bay sites and slightly lower in the Liffey Estuary at 8.3 mg/l. This compares with average dissolved oxygen levels of 8.5 to 9.0 mg/l measured in the Liffey Estuary by the ABR Project and confirms that dissolved oxygen is typically around saturation levels.

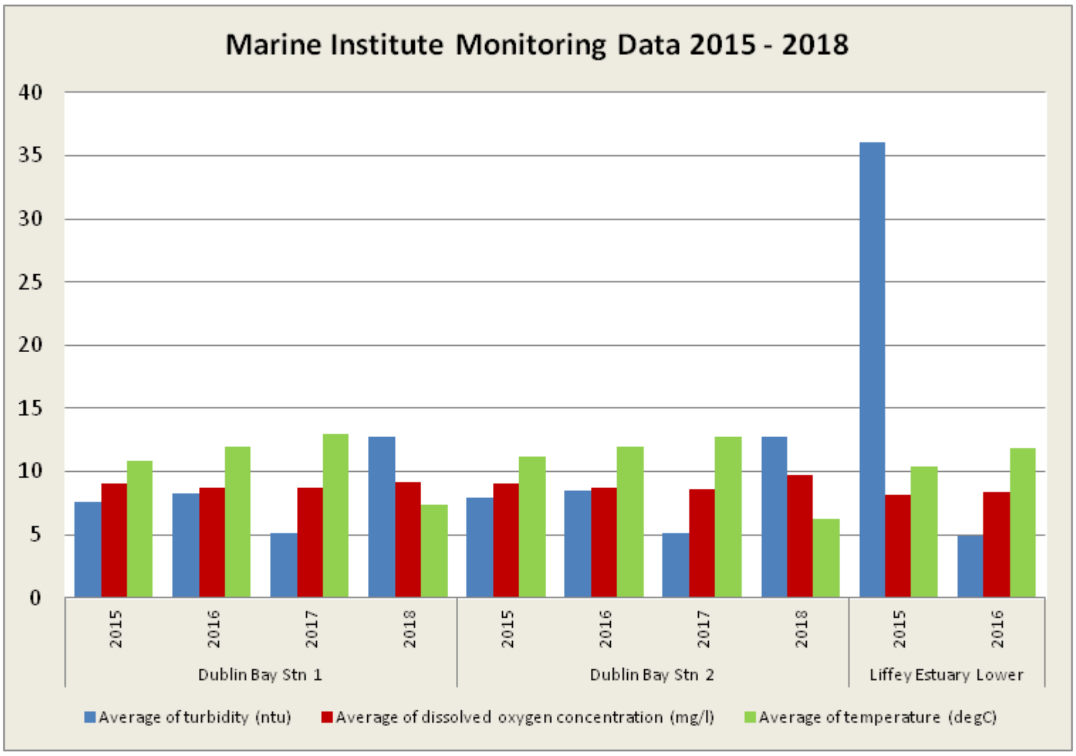


Figure 9-8: Marine Institute Summary Water Quality Data 2015 – 2018

This Marine Institute monitoring data provides a baseline of existing turbidity levels and variations giving context for the assessment of potential construction and operational activities.

9.1.2.7 Dublin Port Company Monitoring Programme (ABR Project)

Dublin Port Company is carrying out extensive monitoring of water quality in Dublin Port and Dublin Bay as part of its Alexandra Basin Redevelopment (ABR) Project.

Monitoring stations have been established in the port to provide detailed information on relevant water quality parameters. The locations of these stations have been agreed with the Planning Authority. They measure real time water quality and continuously relay the data to a shore-based location. Trigger levels that initiate investigations have been set for key water quality indicators to allow a quick response and remedial actions, including the temporary cessation of the works where appropriate.

Monitoring stations have also been established in Dublin Bay at the licensed dredge dumping site as required by Dumping at Sea Permit S00024-01 to provide for the protection of the marine environment by way of monitoring of the impacts associated with the loading and dumping at sea activity during dredging operations. Continuous real-time turbidity monitoring is carried out at four stations and at various depths along with tidal current and wave climate.

9.1.2.7.1 Within Dublin Port

Monitoring Stations

Four water quality monitoring stations have been established at locations within the Liffey Estuary (Figure 9-9). The sites chosen represent ambient surface water quality in the Liffey Estuary Lower and in the Tolka Estuary water bodies. The monitoring station at the Tolka Estuary is mounted on an OSIL Micro Field buoy. At the East Link, Poolbeg Sludge Jetty and North Bank Light stations the monitoring apparatus has been secured to permanent in-river structures. Monitoring data is available for 2017 and 2018.

Four parameters are measured at each of the water quality stations (turbidity, temperature, dissolved oxygen and salinity). In addition, water level is measured at the Poolbeg Sludge Jetty station. Measurements are made every 15 minutes using a Hydrolab Multiparameter HL4 Sonde with integrated sensors. A secure stilling tube maintains the sonde at a fixed point below the surface and a watertight compartment on the structure houses a data-logger and communications hardware. Data are relayed from the monitoring stations via a 3G connection and web-based telemetry software (ADCON addVANTAGE pRO 6.6) is used to visualize process and distribute the information.

Figure 9-9: Water Quality Monitoring Stations in the Dublin Port Area

Turbidity and Total Suspended Solids

Turbidity is monitored as a proxy for total suspended solids (TSS) in water due to the ease and frequency with which it can be measured. Turbidity is a measure of the cloudiness or haziness of water caused by material suspended in the water such as soil particles, sediment, or small floating algae. Particles are often small and can remain in suspension in the water for lengthy periods. Turbidity can be caused by natural events such as flooding, algal growth, water currents, wind and wave action as well as human activities.

Turbidity is measured in NTU (Nephelometric Turbidity Units), which is basically a measure of the amount of light scattered by particles in suspension. It is readily measured on site and can be used to give a rapid estimate of the total amount of suspended solids in the water. Measuring the total suspended solids concentration requires taking water samples for filtration, weighing and drying in the laboratory.

The relationship between turbidity and suspended solids in water is site-specific. It is influenced by the type of sediment in suspension, its colour, shape and reflectivity. Therefore, a sediment sample from the Liffey at East Link Bridge was taken and used to establish a relationship between turbidity and suspended solids for the Port area. The sediment consisted of sandy silt and suspensions were prepared from this sample to provide turbidity in the range 0 to 150 NTU. Turbidity (NTU) and TSS (mg/l) were measured for 75 suspensions to allow construction of a calibration curve (Figure 9-10).

This relationship can be used to estimate total suspended solids from turbidity readings at the monitoring stations in the Port area. Based on this relationship a factor of 2.5 is used to convert turbidity (units of NTU) to Total Suspended Solids (units of mg/l).

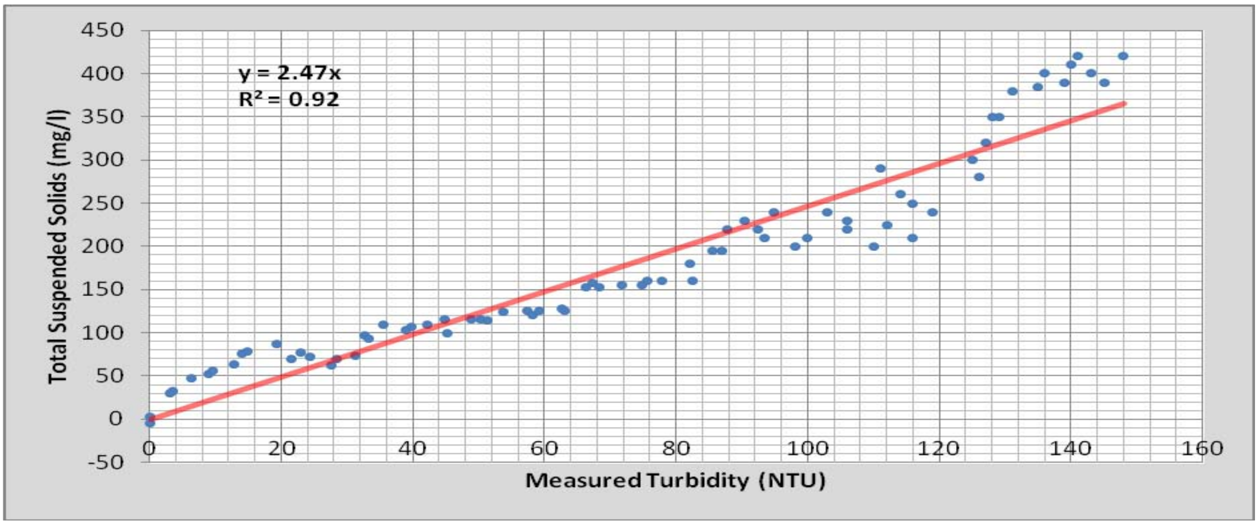


Figure 9-10: Relationship Established between Turbidity and Total Suspended Solids (Inner Liffey Channel)

Dissolved Oxygen, Temperature and Salinity

The amount of oxygen dissolved in the water is reported as milligrams per litre (mg/l). Aquatic animals breathe using the oxygen dissolved in the water. The level is therefore critically important, particularly for fish. Salmon and trout begin to be affected by low oxygen levels at about 6 mg/l (around 50% saturation), and at dissolved oxygen levels below 1.7 mg/l death of some adult fish is likely.

Temperature is one of a number of factors that can affect oxygen levels in water. When freshwater is saturated with oxygen it can hold about 12.7 mg/l of oxygen at a temperature of 5°C; this reduces to 9.1 mg/l at 20°C. High temperatures also promote more rapid microbiological breakdown of organic wastes and this can also use up oxygen in the water.

Other factors, including salinity and atmospheric pressure, can also affect dissolved oxygen levels. For example, seawater holds about 20% less oxygen than freshwater when saturated, and algae produce oxygen during the daylight hours when they are photosynthesising but use it up during darkness when respiring. These factors produce daily and tidal rhythms of higher and lower dissolved oxygen levels.

Salinity is measured in PSU (practical salinity units). Full seawater has a salinity of about 35 PSU, while freshwater has a value close to zero. As well as influencing the type of animals and plants that occur in the water, salinity affects many aspects of the water's chemistry and physical properties (including the amount of oxygen dissolved in the water as demonstrated above).

Summary statistics for the period 2017 – 2018 are set out in Table 9-10 to Table 9-13. Although maximum and minimum values are given for each parameter these reflect extreme outlier values that are highly unlikely to be representative of general ambient water quality. The percentile values listed give a more robust indication of the true dispersal of the measurements, and clearly most of the measurements (90% of them) lie between the 5 percentile and 95 percentile values listed.

The graphs in Figure 9-11 to Figure 9-14 show the 24-hour average values for turbidity, salinity, dissolved oxygen and temperature at each of the monitoring stations. The timing of dredging campaigns undertaken between 2017 and 2018 (capital and maintenance dredging) are also shown. Some data gaps occur due to several causes e.g. fouling of instruments, apparatus failure or damage.

Table 9-10: Summary Statistics for Dissolved Oxygen, Salinity, Temperature and Turbidity at Eastlink Monitoring Station (2017 – 2018) based on 24-hour average values

	Dissolved Oxygen (mg/l)	Salinity (PSU)	Temperature (°C)	Turbidity (NTU)
Mean	8.0	32.5	11.2	2.3
Max	11.1	34.9	18.6	10.0
Min	5.3	24.9	3.9	0.0
5%-ile	6.3	29.1	6.3	0.0
95 %-ile	9.8	33.9	17.1	7.0
n	636	626	643	647

Table 9-11: Summary Statistics for Dissolved Oxygen, Salinity, Temperature and Turbidity at Poolbeg Monitoring Station (2017 – 2018) based on 24-hour average values

	Dissolve Oxygen (mg/l)	Salinity (PSU)	Temperature (°C)	Turbidity (NTU)
Mean	8.5	32.6	12.3	7.5
Max	12.5	35.3	19.1	214.7
Min	5.8	22.7	6.3	0.0
5%-ile	6.8	29.8	7.2	0.0
95 %ile	9.6	34.7	17.5	33.2
n	642	637	642	641

Table 9-12: Summary Statistics for Dissolved Oxygen, Salinity, Temperature and Turbidity at Northbank Monitoring Station (2017 – 2018) based on 24-hour average values

	Dissolved oxygen (mg/l)	Salinity (PSU)	Temperature (°C)	Turbidity (NTU)
Mean	8.4	33.3	11.2	2.6
Max	10.8	34.9	18.7	43.5
Min	5.3	26.5	4.1	0.0
5%-ile	6.2	31.4	6.4	0.0
95 %ile	10.0	34.4	17.0	9.0
n	647	643	643	647

Table 9-13: Summary Statistics for Dissolved Oxygen, Salinity, Temperature and Turbidity, at Tolka Monitoring Station (2017 – 2018 based on 24-hour average values

	Dissolved Oxygen (mg/l)	Salinity (PSU)	Temperature (°C)	Turbidity (NTU)
Mean	8.9	31.7	12.0	3.9
Max	12.9	35.4	18.9	54.9
Min	5.0	22.2	4.2	0.0
5%-ile	7.9	26.4	6.2	0.0
95 %ile	10.2	34.4	17.3	15.0
n	484	452	484	458

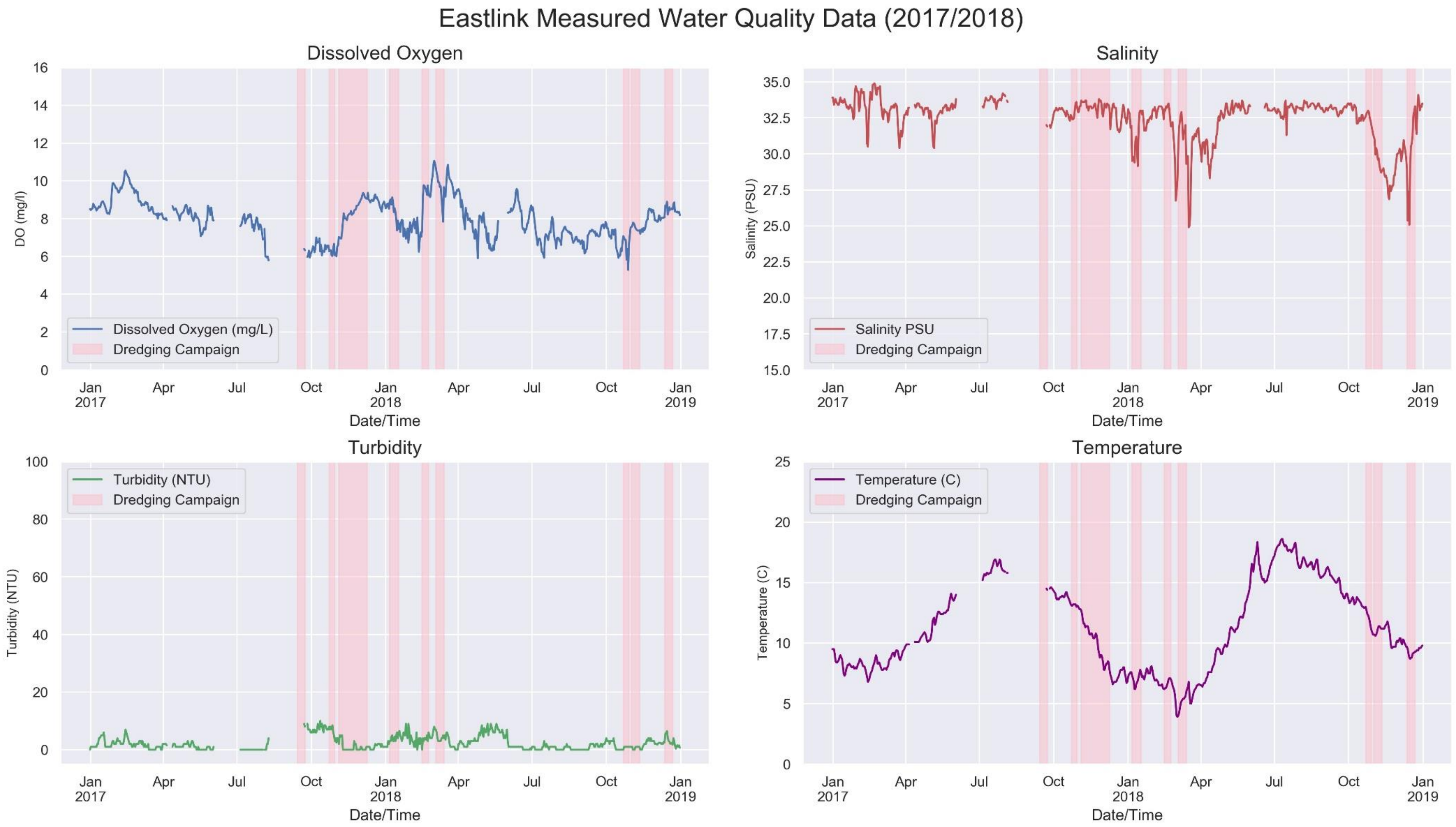


Figure 9-11: Plots of 24-Hour Averages for Water Quality measurements made at Eastlink Monitoring Station (2017-2018) -Dredging Periods shown by Pink Bars.

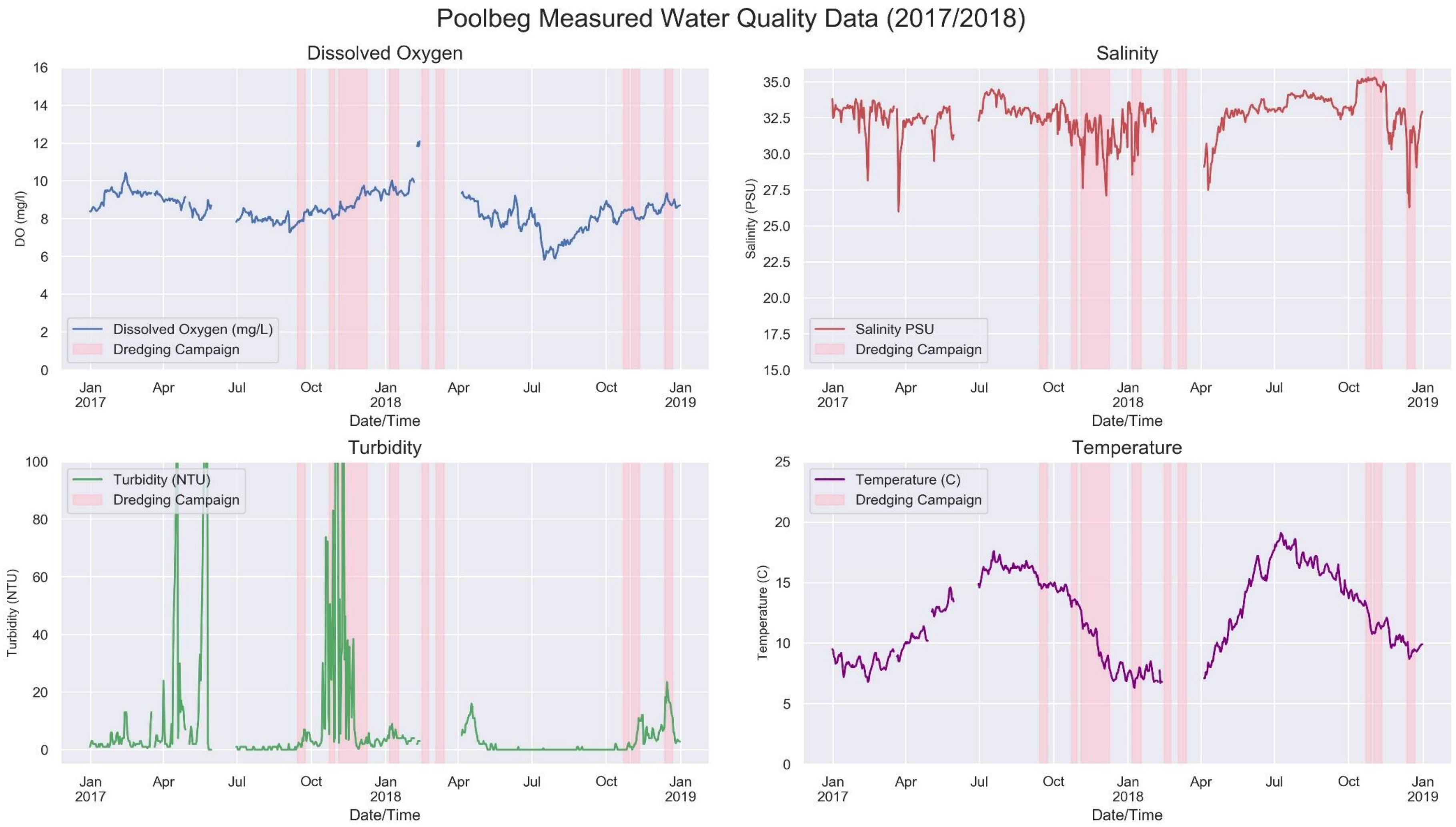


Figure 9-12: Plots of 24-Hour Averages for Water Quality measurements made at Poolbeg Monitoring Station (2017-2018) -Dredging Periods shown by Pink Bars.

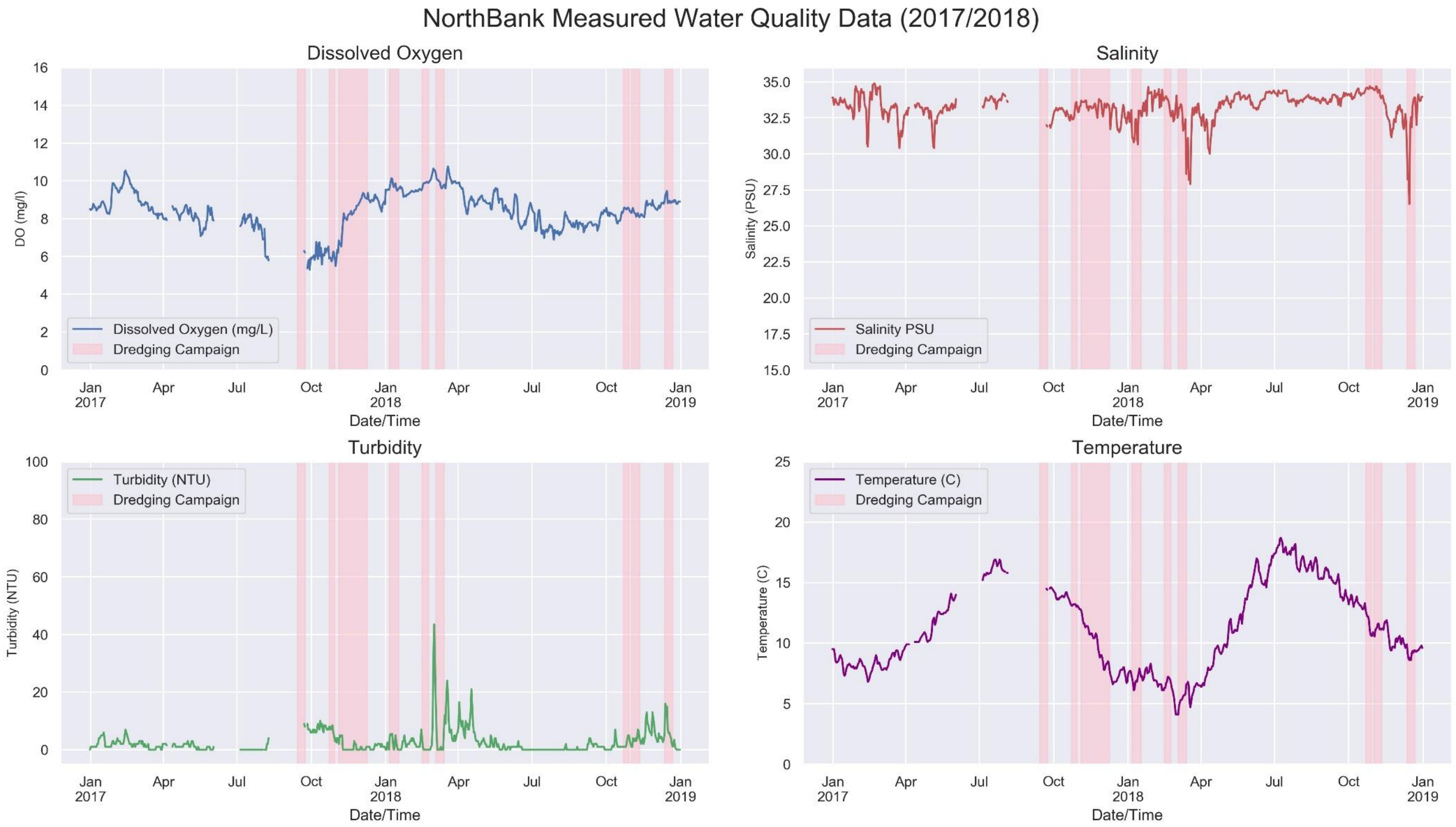


Figure 9-13: Plots of 24-Hour Averages for Water Quality measurements made at Northbank Monitoring Station (2017-2018) -Dredging Periods shown by Pink Bars.

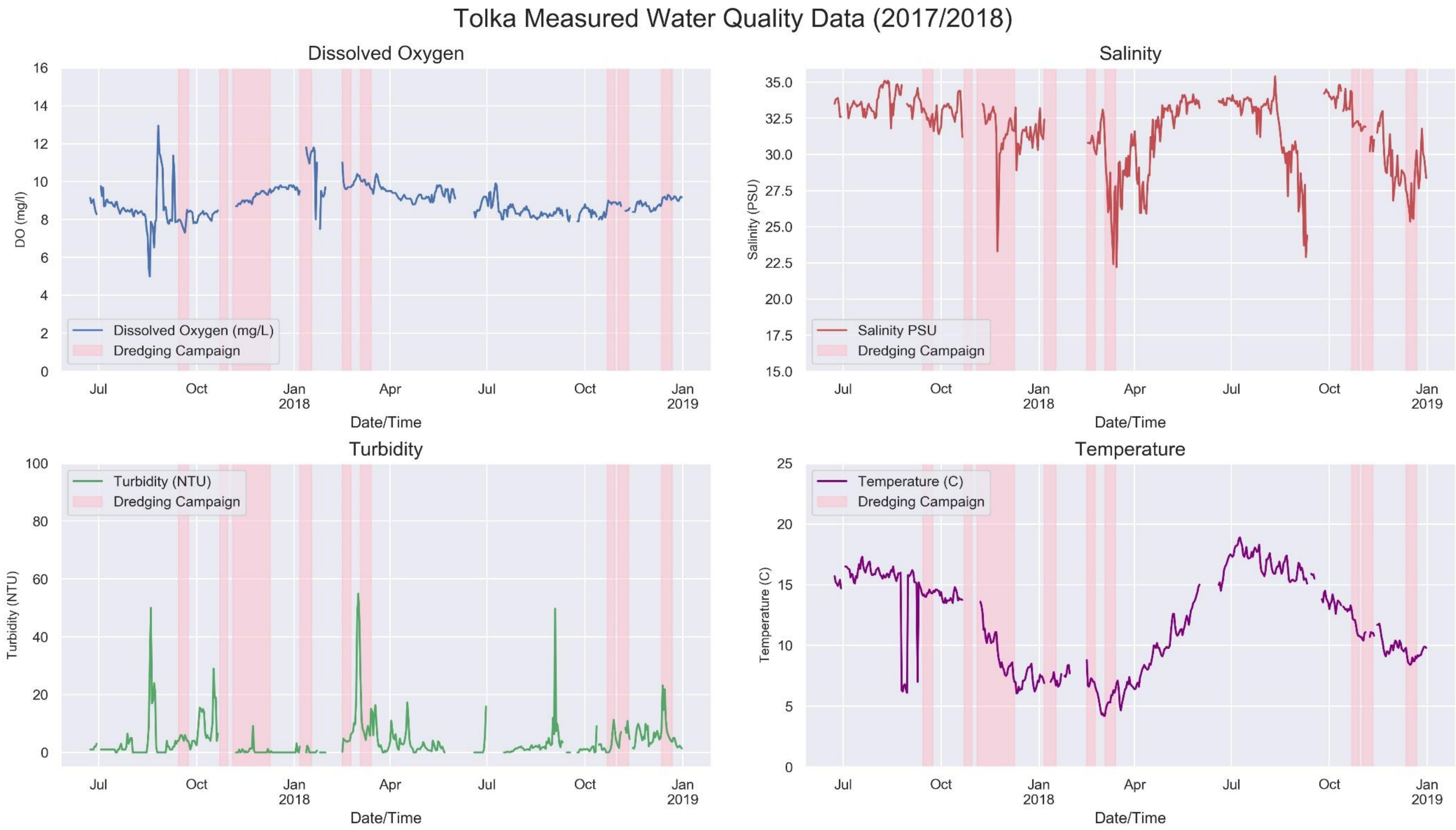


Figure 9-14: Plots of 24-Hour Averages for Water Quality measurements made at Tolka Monitoring Station (2017-2018) -Dredging Periods shown by Pink Bars

In general, salinity remains relatively high at all sites, between 22 and 35 PSU. However, on some occasions significant freshwater influences are obvious, such as at East Link during major storm events when riverine freshwater inputs increase.

Temperature shows the expected seasonal trend. Temperature peaks at about 19°C during July and August at East Link, North Bank Light and Tolka Estuary. The temperature at the Poolbeg site is slightly higher compared to the other three sites, the higher temperatures here probably reflecting the influence of the nearby cooling water stream.

The two water quality parameters of greatest significance are turbidity and dissolved oxygen. Figure 9-10–Figure 9-14 shows that at its extremes, turbidity is very variable, particularly at Poolbeg where very high spikes of turbidity are sometimes measured. However, 95% of turbidity measurements are less than 35 NTU at Poolbeg, and less than 15 NTU at East Link, North Bank and Tolka Estuary. Many of the higher turbidity readings recorded are transient and local and do not represent events of any environmental significance or diagnostic value in assessing potential impacts.

Some periods of higher turbidity are discernible particularly at Poolbeg (Figure 9-12). Turbidity is volatile at Poolbeg Jetty. This appears to be mainly due to site characteristics and tidal effects particularly during low spring tides. Turbidity at all sites are elevated during storm conditions. The October 2017 event results from the impact of storm Ophelia followed quickly by storm Brian. Maximum wave heights of 4.8m and 3.8m respectively were recorded in Dublin Bay during these storms. The impact of storm Ophelia on turbidity is illustrated in Figure 9-15. The February/March 2018 event was caused by storm Emma when a maximum wave height of 7.8m was recorded in Dublin Bay. This storm was extremely destructive and resulted in extensive damage to coastal and monitoring infrastructure.

Investigations during elevated turbidity events have confirmed that ABR Project activities were not implicated in these events. Comparisons of mean turbidity during periods of 'dredging' and 'no dredging' activity showed that here is little difference between absolute values and no apparent pattern i.e. no consistent increase in mean turbidity during dredging episodes as reflected in the plots above. In fact, mean turbidity is higher just as frequently during periods when no dredging was occurring. Measured turbidity results demonstrate that dredging campaigns in 2017/2018 did not cause any discernible increase in turbidity within the inner Liffey channel.

Finally, dissolved oxygen levels generally range between 5 and 12.8 mg/l. The mean dissolved oxygen values clearly indicate that oxygen levels are consistently close to saturation levels and no extended periods of oxygen sag.

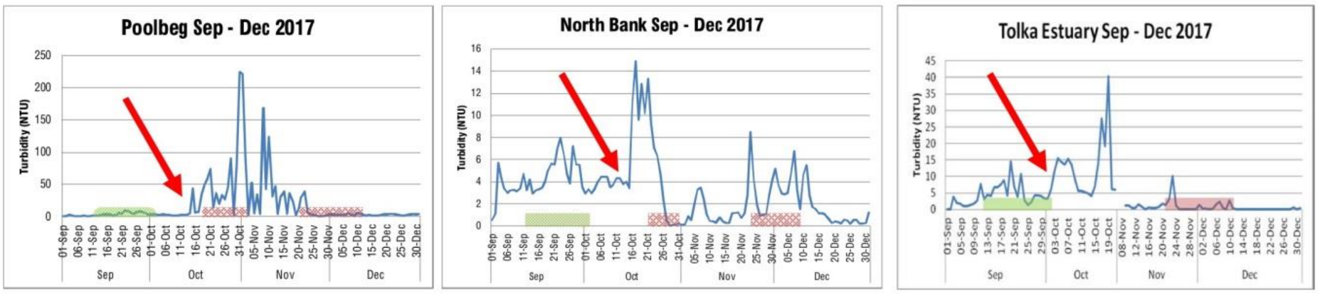


Figure 9-15: Mean daily turbidity September to December 2017 (periods of dredging are indicated by horizontal bars – green for maintenance dredging and red for capital dredging). The onset of storm Ophelia is shown by the red arrows

9.1.2.7.2 Within Dublin Bay

Turbidity is measured in the outer bay area using four Coast Eye Monitoring Buoys as part of the ABR Project monitoring programme. The buoys are shown in Figure 9-16 on the deck of the Commissioners of Irish Light vessel the ILV Granuaile at the time they were launched. Three of the buoys are positioned at the licensed dumping site near the Burford Bank (to the north, in the middle, and to the south). A fourth buoy is located about 2.5km to the northeast of Dalkey and acts as a control site. This fourth buoy gives an indication of the background conditions in Dublin Bay remote from the potential impact of dredging activities. All the buoys are moored in about 20m water depth. Their locations are shown in Figure 9-17.

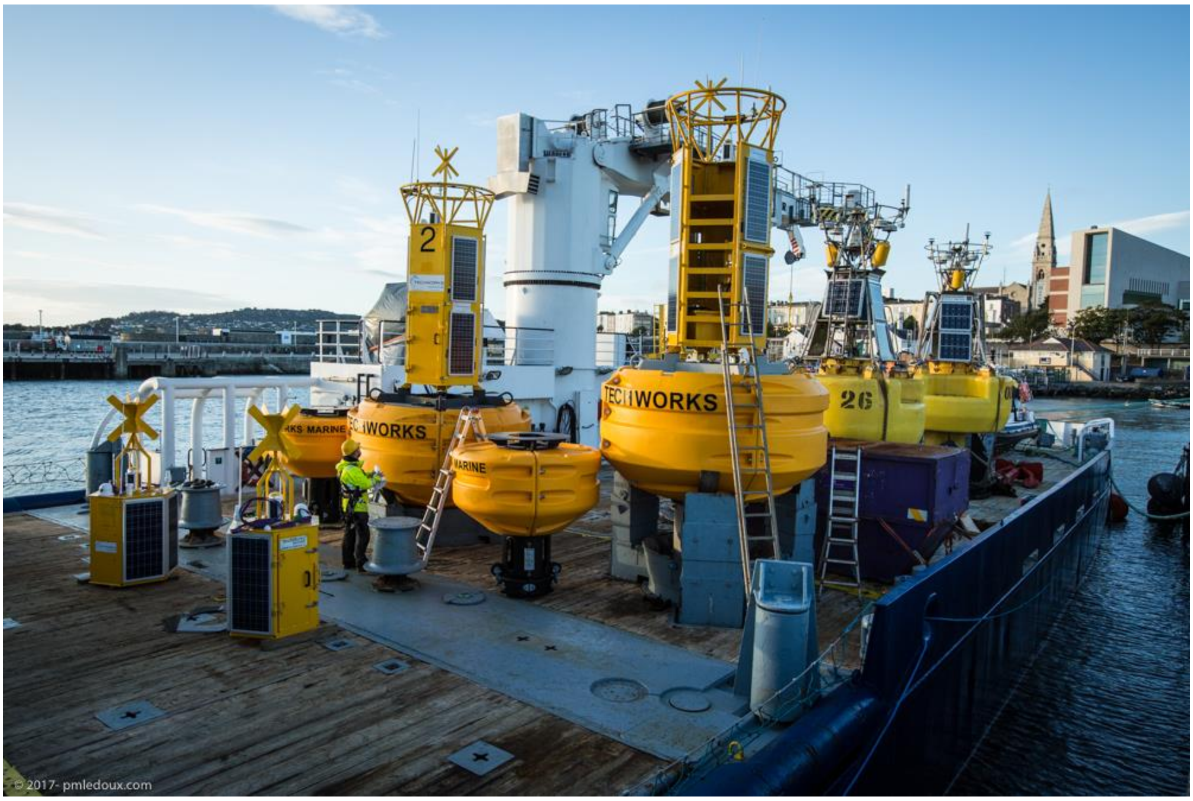


Figure 9-16: Coasteye Monitoring Buoys On Board the ILV Granuaile for Deployment in Dublin Bay

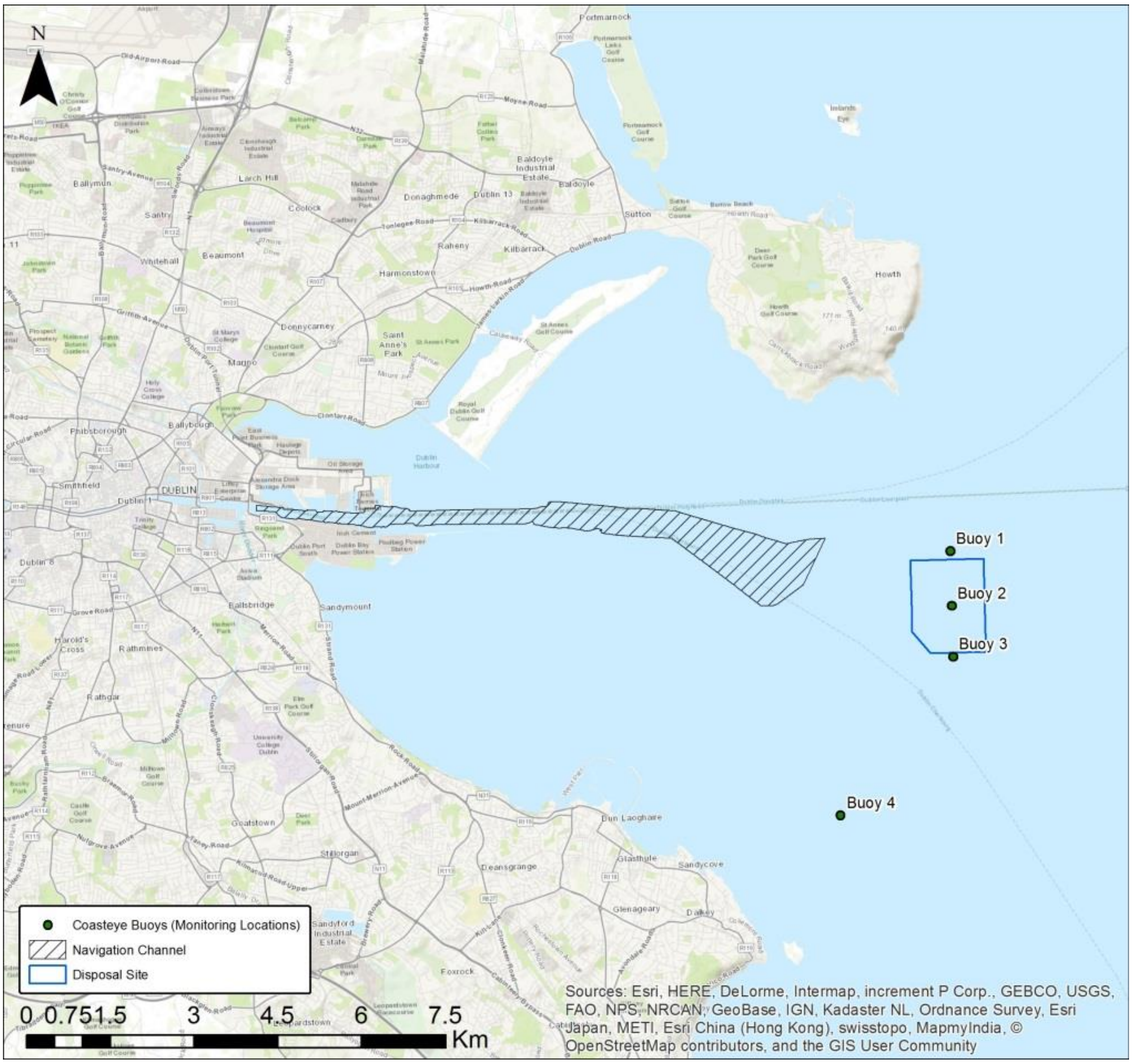


Figure 9-17: Locations of the offshore Coasteye Monitoring Buoys

Turbidity and Total Suspended Solids in the Bay

As described above the relationship between turbidity and suspended solids in water is site specific. Therefore, sediment from outside the breakwaters was sampled and used to establish a relationship between turbidity and suspended solids for the outer Bay area. The sediment consisted of fine sand and suspensions were prepared from this sample to provide turbidity in the range 0 to 150 NTU. Turbidity (NTU) and TSS (mg/l) were measured for 75 suspensions to allow construction of the blue calibration curve in Figure 9-18. The previous calibration curve for fine river sediments is also shown for comparison (red curve).

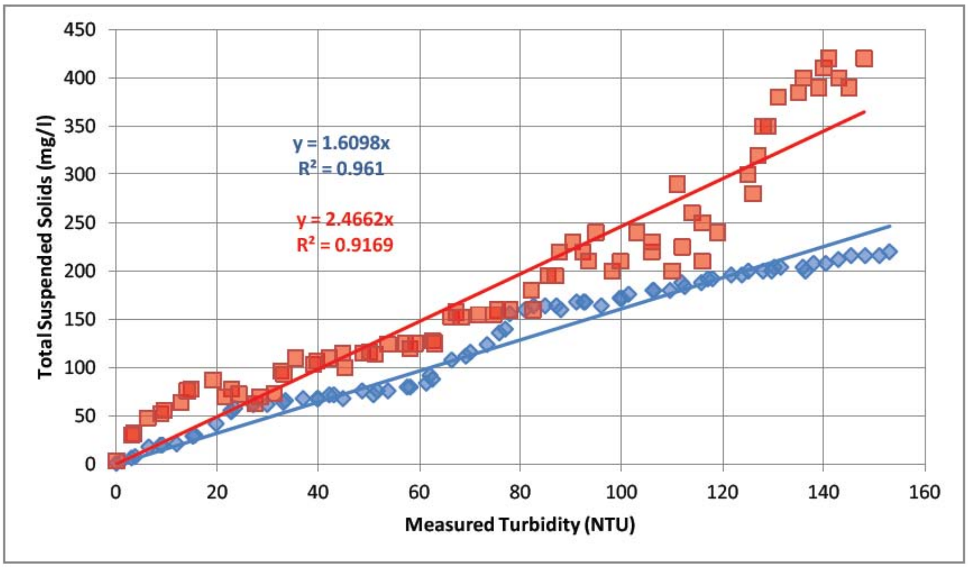


Figure 9-18: TSS versus Turbidity for suspensions of river bed silt sediment (red) and approach channel fine sand sediment (blue). Equations & r2 values in corresponding colours for each series

Total suspended solids (TSS) (mg/l) is estimated at 1.61 times the turbidity (NTU) for the approach channel sediments (fine sand). The correlation coefficients squared show very good relationships in both calibration series (r2 > 0.90). These relationships are site/sediment-specific but allow an estimate of TSS based on recorded turbidity. They indicate that turbidity increases more rapidly with increasing amounts finer sediments (silt) in suspension than with coarser sediments (fine sand).

Each of the monitoring buoys is equipped with three turbidity sensors: one near the water surface; one in mid water; and one nearer the bottom. Measurements at the buoys are made every fifteen minutes and are relayed to a shore-based computer for analysis and reporting. This gives a 3-dimensional record of water clarity and allows detection of any plume of sediment spreading from the dump site when dredge spoil is released. Data recording at each buoy began in September 2017.

Figure 9-19 to Figure 9-22 shows turbidity from September 2017 until December 2018 for all three depths at each of the four monitoring buoys. The pink vertical bars indicate periods when dredging took place and the grey lines highlights some of the storms that passed through Ireland during 2017 and 2018.

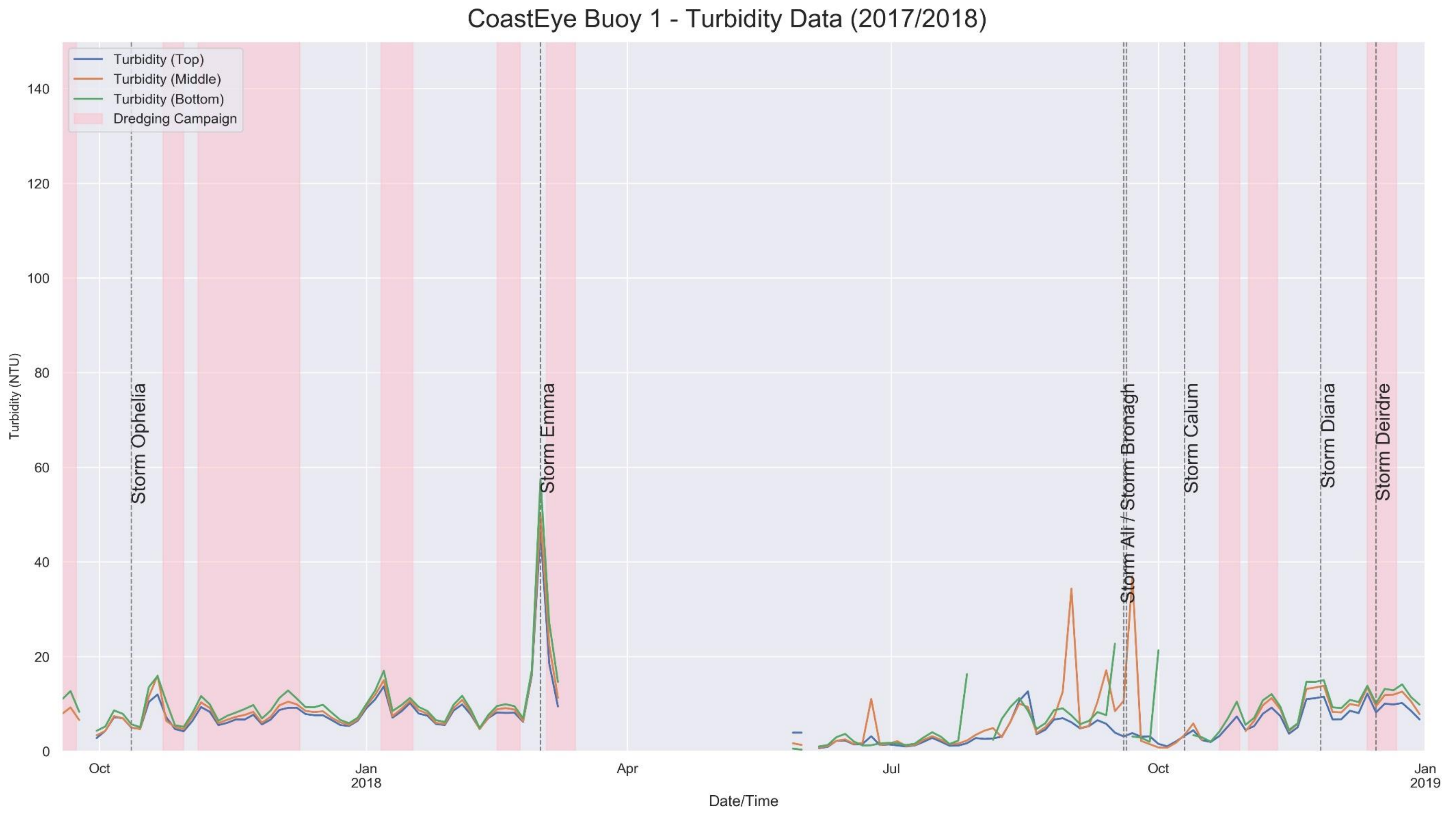


Figure 9-19: Plots of 24-Hour Averages for Turbidity measurements made at Coasteye Buoy 1 Monitoring Station (2017-2018) -Dredging Periods shown by Pink Bars.

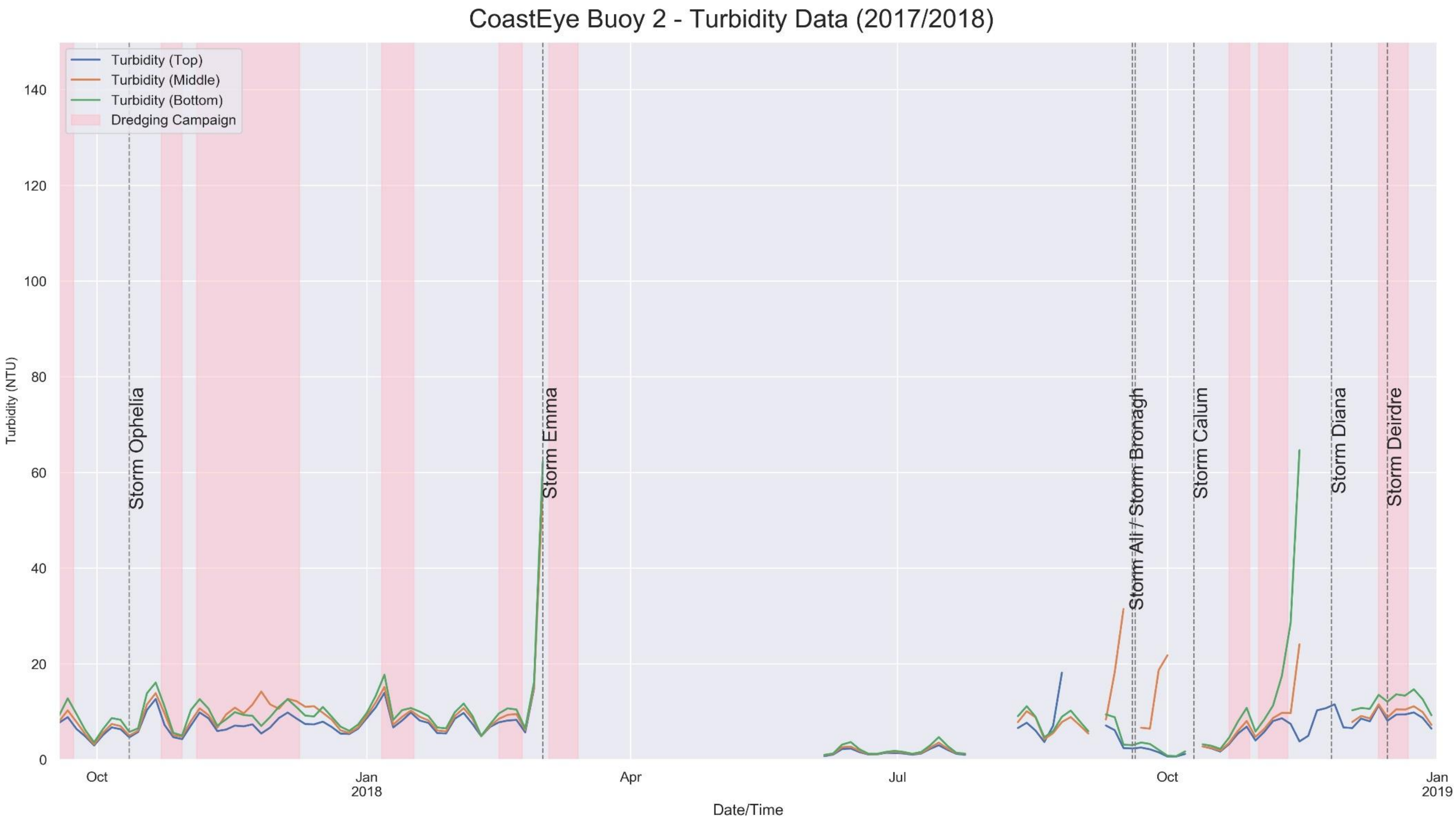


Figure 9-20: Plots of 24-Hour Averages for Turbidity measurements made at Coasteye Buoy 2 Monitoring Station (2017-2018) -Dredging Periods shown by Pink Bars.

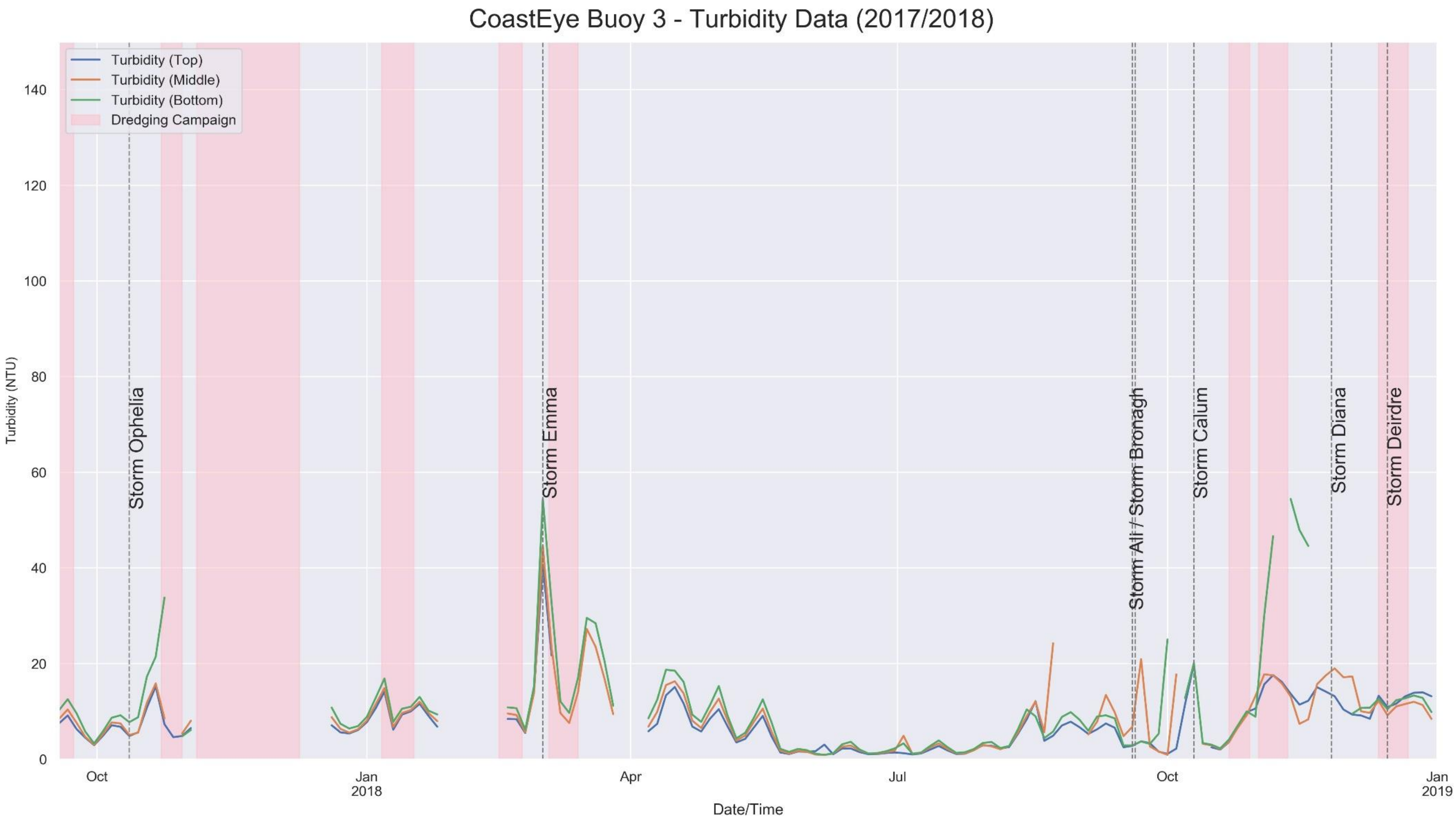


Figure 9-21: Plots of 24-Hour Averages for Turbidity measurements made at Coasteye Buoy 3 Monitoring Station (2017-2018) -Dredging Periods shown by Pink Bars.

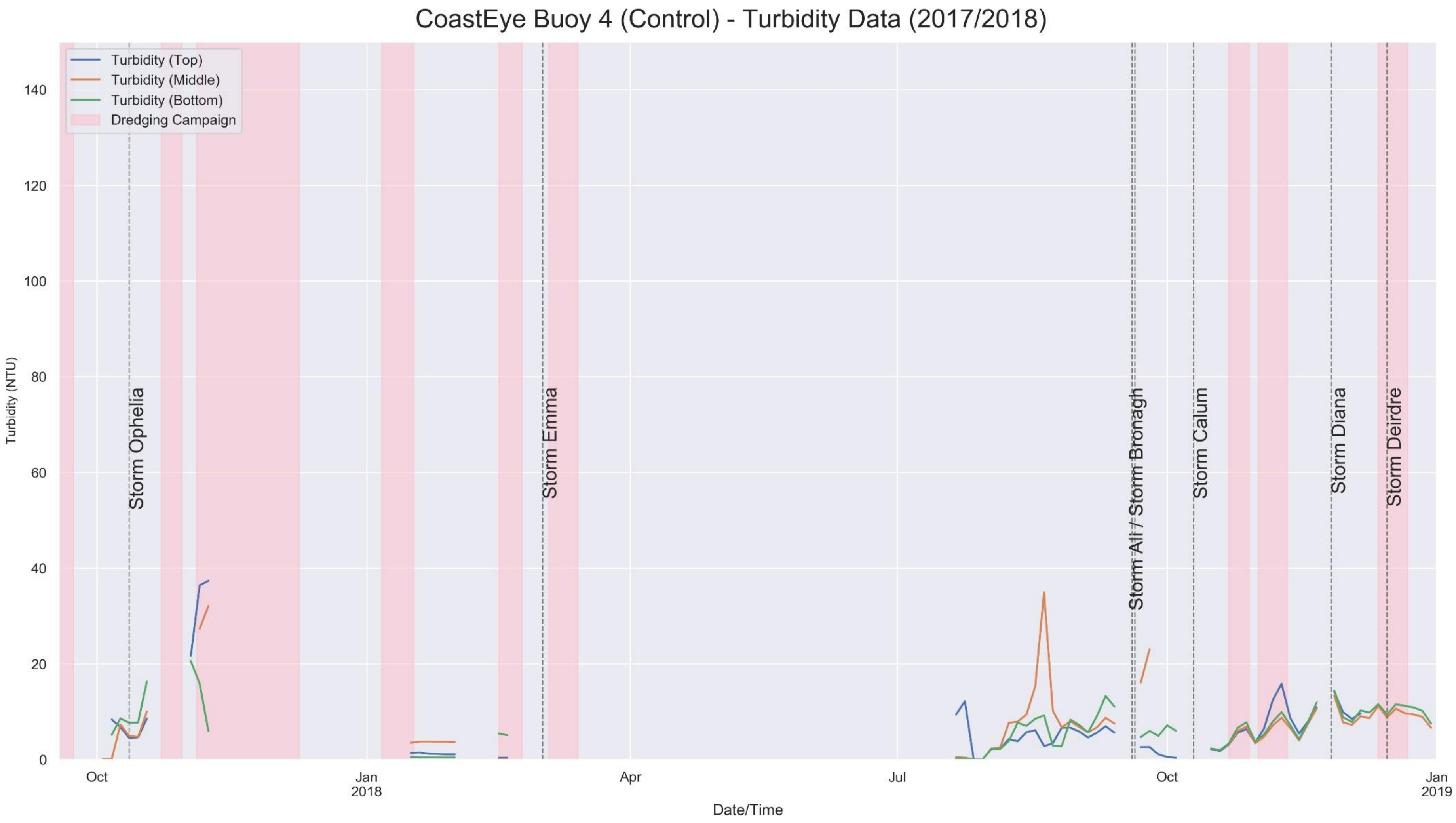


Figure 9-22: Plots of 24-Hour Averages for Turbidity measurements made at Coasteye Buoy 4 Monitoring Station (2017-2018) -Dredging Periods shown by Pink Bars.

Table 9-14 Summary Statistics for CoastBuoy 1 between Sept 2017 to Dec 2018 based on 24-hour average values

	Turbidity (NTU) - Top	Turbidity (NTU) - Middle	Turbidity (NTU) - Bottom
Mean	6.5	8.6	9.0
Max	59.8	115.2	74.2
Min	0.6	0.5	0.3
5%-ile	1.2	1.3	1.4
95 %-ile	12.1	18.3	15.5
n	372	359	349

Table 9-15: Summary Statistics for CoastBuoy 2 between Sept 2017 to Dec 2018 based on 24-hour average values

	Turbidity (NTU) - Top	Turbidity (NTU) - Middle	Turbidity (NTU) - Bottom
Mean	6.6	8.3	8.9
Max	66.6	59.7	92.1
Min	0.5	0.9	0.5
5%-ile	1.1	1.3	1.3
95 %-ile	11.5	16.4	16.2
n	337	318	330

Table 9-16: Summary Statistics for CoastBuoy 3 between Sept 2017 to Dec 2018 based on 24-hour average values

	Turbidity (NTU) - Top	Turbidity (NTU) - Middle	Turbidity (NTU) - Bottom
Mean	7.4	8.9	10.3
Max	52.6	53.4	61.1
Min	0.8	0.8	0.9
5%-ile	1.1	1.2	1.3
95 %-ile	15.7	20.4	30.9
n	357	359	349

Table 9-17: Summary Statistics for CoastBuoy 4 between Sept 2017 to Dec 2018 based on 24-hour average values

	Turbidity (NTU) - Top	Turbidity (NTU) - Middle	Turbidity (NTU) - Bottom
Mean	7.3	8.3	6.6
Max	47.0	58.6	21.5
Min	0.0	0.0	0.0
5%-ile	0.4	0.1	0.1
95 %-ile	24.2	26.2	14.3
n	153	170	180

It is apparent that mean daily turbidity is low at all sites, mean turbidity at the top and middle buoy is typically between 6 and 14 NTU. The average turbidity increases slightly with depth at all monitoring sites within the disposal site. As noted above the maximum turbidity values are heavily influenced by short transient episodes often during stormy weather that are of no environmental significance and are of limited diagnostic value in assessing water quality. By comparison the 95 percentile values show that turbidity is rarely above 50 NTU at any of the sites. Using the relationship established above between turbidity and total suspended solids from the Bay area, this is equivalent to a TSS of less than 100mg/l.

There is no obvious relationship between turbidity in Dublin Bay and dredging periods. A statistical analysis of the turbidity monitoring results is presented in the Dumping at Sea Permit S0024-01 Annual Environmental Reports for 2017 and 2018. The results show no marked difference between turbidity at the dump site (Buoys 1, 2 and 3) and the control site (Buoy 4). The highest turbidity reading was in fact recorded at the control site. The results show that the dominant influence on turbidity levels is in fact the natural spring–neap–spring tidal cycles with the highest turbidity levels recorded close to the seabed.

In conclusion, the measured turbidity results demonstrate that both the dredging campaigns during 2017 and 2018 did not cause any discernible increase in turbidity above background levels. These site-specific detailed monitoring data have provided further understanding of existing turbidity levels and variations to provide added context for the assessment of potential significant effects of the construction and operational activities of the MP2 Project.

9.1.2.8 Water Quality Model Simulations

Chapter 12 Coastal Processes details the extensive numerical modelling programme that has been used to assess the MP2 Project and determine the likelihood of significant impacts on the coastal processes within Dublin Port and Dublin Bay. The assessment includes the dispersion and fate of suspended solids arising from the loading and dumping of dredge spoil. The results of the computational modelling has informed the water quality assessment presented in this Chapter.

9.1.2.9 Summary of Existing Water Quality

A review of available national monitoring information for the water bodies in the immediate vicinity of the MP2 application boundary, in combination with real time monitoring results from the ABR Project and supported by water quality model simulations has concluded:

- The overall WFD Surface Water Quality status between 2010-2015 is:
  - Liffey Estuary Lower - Moderate
  - Liffey Estuary Upper - Moderate
  - Tolka Estuary - Moderate
  - Dublin Bay – Good
- The overall WFD Groundwater Quality status between 2007-2012 is:
  - Dublin Urban groundwater body (EA-G-008) - Good

- Within the immediate vicinity of the MP2 Project area, there are a number of protected areas under Article 6 of the WFD Directive including areas of Bathing and Recreational Water, Nutrient Sensitive Areas and Water Dependant Natura 2000 sites
  - The bathing areas in the immediate vicinity of the MP2 Project have been classified as Dollymount Strand - Good; Sandymount and Merrion Strands - Poor; Seapoint – Excellent in the 2017 Monitoring period. Sandymount and Merrion bathing waters are considered vulnerable to pollution due largely to surface water inflows, and faecal pollution by birds. Bathing water monitoring in the 2018 season has indicated excellent quality in most sampling instances to date.
  - The Liffey Estuary from Islandbridge weir to Poolbeg Lighthouse, including the River Tolka basin and South Bull Lagoon has been designated as a nutrient sensitive area.
  - The licensed dumping area lies within the Rockabill to Dalkey SAC which is designated for Annex I qualifying interest Reef and Annex II species *Phocoea phocoena* (harbour porpoise).
- To date, the extent of achievement of GES under the MSFD has not been established for individual water bodies, consequently no further conclusions can be drawn currently in relation to the MSFD and the WFD water quality assessment is relied on until specific standards are identified.
- The EPA Water Quality in 2016: An indicators Report has stated the following trophic status:
  - Liffey Estuary Lower - Intermediate
  - Tolka Estuary - Eutrophic
  - Dublin Bay - Unpolluted
  - It is also stated that levels of Winter Dissolved Inorganic Nitrogen (DIN) concentration trends have remained stable between 2007 and 2016. In addition, Winter Molybdate Reactive Phosphorus (MRP) concentration trends have remained stable for the Liffey Estuary Lower between 2007 and 2016 and the Tolka Estuary while the concentration of Dublin Bay has shown a significant decrease over this period.
- Marine Institute monitoring provides turbidity, temperature and dissolved oxygen datasets for the estuary and Dublin Bay which are comparable with the ABR Project monitoring datasets.
- Dublin Port Company is carrying out extensive monitoring of water quality in Dublin Port and Dublin Bay as part of theABR Project. Monitoring stations have been established in the Dublin Port and Dublin Bay to provide detailed information on relevant water quality parameters. Monitoring carried out by the Marine Institute shows similar turbidity and dissolved oxygen levels recorded to that of the ABR Project monitoring programme.
  - High frequency water quality monitoring as part of the ABR Project at various locations in the port has shown that average daily turbidity remains generally low and less than 10 NTU (equivalent to about 25mg/l Total Suspended Solids) but may be elevated during storms. The mean dissolved oxygen monitoring data also shows that oxygen levels are consistently close to saturation levels.

  - High frequency measurements of turbidity in Dublin Bay gives a 3-dimensional record of water clarity and shows that mean daily turbidity is low at all sites, typically around 10 NTU (equivalent to about 16mg/l Total Suspended Solids), and increases slightly with depth. There is no obvious relationship between turbidity and dredging periods.
  - Water quality has been satisfactory during the monitoring programme 2017 - 2018 and has not been impacted by loading or dumping during dredging operations. Measured turbidity results demonstrate that the dredging campaigns during 2017 and 2018 did not cause any discernible increase in turbidity above background levels.

- Water quality model simulations, undertaken to assess the likely water quality impact of dredging and disposal operations on general water quality and for protected areas, have concluded that there will be no significant elevation in suspended solids **outside the immediate zone of the operations**. To further support these predictions, it is noted that ongoing water quality monitoring undertaken as part of the ABR Capital dredging and disposal campaign have demonstrated that these disposal operations did not cause any discernible increase in turbidity above background levels. In addition, the potential impact on the dispersion of the plume (or associated nutrient concentrations or other water quality indicators) in the vicinity of the Ringsend WWTW Outfall was also examined with no change predicted in the water quality of these receiving waters. Water Quality model simulations carried out as part of this study have demonstrated that alterations to the seabed morphology as a result of the MP2 project will not alter the dispersion of the treated effluent plume (or associated bacterial and nutrient concentrations or other water quality indicators) in the vicinity of the Ringsend WWTW Outfall.

9.1.3 Likelihood of Impacts

The likelihood of environmental impacts arising due to the MP2 Project is assessed in relation to the construction and operational phases. The elements of construction and operation and the potential impacts on water quality have been identified for assessment.

The assessment has been informed by consultation with a wide range of stakeholders. Consultees included Dublin City Council, Inland Fisheries Ireland, Marine Institute, EPA, National Parks and Wildlife Service. The consultation process is described in detail in Chapter 5 of this EIAR.

The significance of any environmental effect is rated based on the magnitude of the impact and the importance of the attribute as detailed in Section 9.1.1. Based on the criteria detailed in NRA Guidelines the Dublin Bay coastal water body, the Liffey Estuary Lower and Tolka Estuary water bodies are considered to be of "extremely high" importance due to its designation under the Urban Waste Water Treatment Directive (91/271/EEC) and proximity to the South Dublin Bay and Tolka Estuary SPA designated under EU Birds Directive (79/409/EEC). The Liffey Estuary Upper is considered to be of "very high" importance due to its quality and value on a regional scale.

The MP2 Project at Dublin Port has the potential to directly impact upon the ‘Liffey Estuary Lower’ transitional water body (EA_090_0300) and ‘Dublin Bay’ coastal water body (EA_090_0000) given the location of the works. The potential to indirectly impact upon the adjacent 'Tolka Estuary' (EA_090_0200) ‘and Liffey Estuary Upper’ river water body (EA_090_0400), transitional water bodies has also been considered.

9.1.3.1 Potential Construction Phase Impacts

The major elements of the construction programme are outlined in Chapter 3 of this EIAR. In summary and for the purposes of this assessment they have been considered as the following four types of works:

- Demolition of existing building & structures
- Berth Construction:
  - A new Berth 53,
  - Realignment of the previously consented Berth 52 and works to create a closed berthing face at the eastern end of Berth 49
  - Berth 50A extension
  - The redevelopment of Oil Berth 3
  - Infilling Oil Berth 4.
- Capital Dredging and Disposal
  - Dredging of berthing pockets and localised widening of the navigation channel
  - Disposal of dredge spoil at the offshore disposal site
- Landside ancillary works required to serve the marine side operations.

Temporary impacts on water quality have the potential to occur during the construction phase of the works. Mobilised suspended sediment and cement release through construction activities are the principal potential sources of water quality impact. The following have been considered in this assessment:

- Increased suspended sediment levels due to the accidental release of sediment to the water column during:
  - Demolition of buildings & structures;
  - Berth Construction including the construction of waterside berths, quay walls, jetties, open piled structures.
  - Capital Dredging and Sediment disposal operations;
  - Landside ancillary works to serve the marine operations including the construction of ramps and deck structures to access linkspans, services and drainage installation, and installation of jetty furniture and fender systems etc;
- Accidental release of highly alkaline contaminants from concrete and cement during the demolition of buildings and structures and the construction of hardstand areas, waterside berths, quay walls, jetties, bridging structures, etc.; and
- General water quality impacts associated with works machinery, infrastructure and on-land operations including the temporary storage of construction materials, oils, fuels and chemicals.

The impacts in relation to the construction of each component of works are assessed in Section 9.1.4 in sequence.

9.1.3.2 Potential Operational Phase Impacts

The operational phase impacts associated with the MP2 Project (buildings/structures, berths and associated marine berthing and landside works areas) represents an increase in the current normal day to day port activities. These associated impacts are currently well understood and managed within the Port's operational and maintenance procedures. The principal potential sources of water quality impact are:

- Increased suspended sediment levels due to port operations including the ongoing maintenance dredging of the new berths.
- General water quality impacts associated with works machinery, infrastructure and on-land operations including the temporary storage of construction materials, oils, fuels and chemicals and releases associated with the operation and maintenance of surface water drainage systems.

In addition to normal day-to-day port activities resulting in potential water quality concern, any hydromorphological impacts, associated with the operation of coastal and bankside structures, have been addressed within Chapter 12 of this EIAR.

9.1.3.3 Impact Matrix (Absence of Mitigation)

The potential impacts outlined in sections 9.1.3.1 and 9.1.3.2 above are rated based on the impact level criteria in Section 9.1.1 to indicate their potential severity (profound, significant, moderate, slight and imperceptible) in the absence of any mitigation. The assessment reflects the activities and pollutants listed above and the different considerations for construction and operational phases of the MP2 Project.

Table 9-18 Potential Impact Rating Matrix (in the absence of mitigation)

	Significance of Environmental Impact			
CONSTRUCTION PHASE	**Demolition of Existing Buildings & Structures**	**Berth Construction**	**Capital Dredging**	**Landside Works**
Suspended sediments / sedimentation	Significant	Imperceptible	Profound	Significant
Concrete and cement pollution	Significant	Significant	No Impact	Significant
Impacts associated with general construction works	Significant / Moderate			
OPERATIONAL PHASE	**Buildings & structures**	**Berth Operation**	**Maintenance Dredging**	**Landside Works**
Suspended sediments / sedimentation	Imperceptible	Imperceptible	Significant	Imperceptible
Impacts associated with general port operation activities	Significant			

9.1.4 Description of Likely Significant Impacts

9.1.4.1 Construction Phase Impacts

9.1.4.1.1 Suspended Sediment and Sedimentation

Demolition of existing buildings & structures

As described in Chapter 3, decommissioning and demolition of existing structures and buildings such as the Port Operations Building, the "Pier Head" of the 19th Century Eastern Breakwater and the southern end of the Eastern Oil Jetty is required to facilitate the construction of the new Berth 50A and Oil Berth 3.

Surface water quality can be affected during demolition works through the generation of fine materials eroded as a result through clearing surfaces and exposing soils/rubble to rainwater and drainage water. These sediments may be deposited in watercourses and could potentially result in an increase in suspended sediments concentrations in run-off from the site.

Suspended sediment due to run off from these activities can have a negative impact on water quality, water dependant habitats and aquatic ecology particularly in areas immediately adjacent to the River Liffey Lower and River Tolka Estuary.

Whilst there are currently no direct flow pathways leading to receiving waters from the existing site configuration, during construction there is potential for silt laden water to discharge directly or via overland flow.

The magnitude of the potential impacts arising from sediment from demolition works entering the aquatic environment and the localised disturbance to the eastern breakwater are considered to be *minor adverse* with regard to localised water quality. The significance of the environmental effect is therefore *significant*, in the absence of mitigation, based on the extremely high sensitivity of the receiving environment over the short term.

Berth Construction

As described in Chapter 3, the MP2 Project involves the construction of a new Berth 53 along the north side of the navigation channel at the eastern extreme of the Port, the realignment of Berth 52, and an extension of Berth 50A. The works will also include the removal of Oil Berth 4 and consolidating operations to Oil Berth 3. The berth will be used as a multi-purpose structure, initially for oil tanker berthing, with a future potential use for container vessel berthing. Oil Berth 4 will be infilled and Oil Berth 3 redeveloped. The installation of sheet piles and tubular piles is required to facilitate infilling operations and berth construction. Pile installation operations have the potential to cause a temporary increase in suspended sediment due to disturbance of the riverbed materials causing the resuspension of sediments in the water column leading to the localised reduction in water quality.

The magnitude of the potential impacts arising from pile installation is considered to be *negligible* with regard to water quality. The significance of the environmental effect is therefore *Imperceptible* in the absence of mitigation based on the extremely high sensitivity of the receiving environment over the short term.

Capital Dredging and Disposal

Dredging is required to facilitate creation of a sufficiently large manoeuvring area, and to provide sufficient water depth at each berth for the design vessels as described in Chapter 3. Dredged depths will range from -10m CD to -13m CD.

Dredging operations will cause temporary suspension and release of sediments at the loading sites. Dumping operations will also give rise to temporary sediment plumes at the licensed disposal site at the approaches to Dublin Bay. Dredging loading operations have been designed to minimise the disturbance and escape of material at the seabed and during removal through the water column. Individual loading operations are of relatively short duration and intermittent in nature and the works area is limited. It is envisaged that disposal operations occur at the licensed disposal site at the approaches to Dublin Bay which is naturally dispersive for fine sediments. Nevertheless, significant amounts of dredge material will be removed and deposited at the disposal site over a relatively extended period.

The magnitude of the potential impact from suspended sediment due to dredging and disposal is considered to have a moderate adverse risk to water quality. The localised significance of the environmental effect is therefore profound adverse in the absence of mitigation based on the extremely high sensitivity of the receiving environment.

Landside ancillary works

Landside construction works are ancillary works required to serve the marine side works. They consist of construction of ramps and deck structures to access linkspans, services and drainage installation, and installation of jetty furniture and fender systems. Other relatively minor boundary and access works are also included (Chapter 3).

Construction works can give rise to mobilisation and release of sediments during excavation and exposure of unprotected soils, stockpiling and the construction of road infrastructure. This could potentially result in an increase in suspended sediments concentrations in run-off from the site.

Based on the relatively small extent and area of works the magnitude of the potential impacts arising due to sediment from construction is assessed to have a *minor adverse* risk to water quality. The significance of the potential environmental effect is therefore *significant* adverse in the absence of mitigation based on the extremely high sensitivity of the receiving environment over the short term.

9.1.4.1.2 Concrete and Cement Pollution

Demolition of existing buildings & structures

Some demolition works will be required and it is likely that this will consist of localised breaking out of concrete using a rock breaker mounted on an excavator. This has the potential to create highly alkaline dust in the absence of mitigation, which in turn could find its way into the water column and pose a threat of pollution.

Given the proximity of works to the aquatic environment and the scale of the works, the magnitude of the potential impacts arising from demolition dust entering waters are considered to be *minor adverse.* The significance of the environmental effect is therefore *significant adverse* in the absence of mitigation based on the high sensitivity of the receiving environment.

Berth Construction

Fresh concrete and cement is highly alkaline and therefore will affect water quality (particularly in terms of pH) if washed into the water body. The impacts in relation to cement and concrete for the berth construction relate to several elements of work. Concrete will be poured in-situ during construction of jetty concrete decks, bank-seats and access ramps. Precast structures on dolphins and bridge beams will be filled with reinforced concrete. Steel combi-walls will have concrete capping beams and cofferdam voids will be filled with reinforced concrete.

Given the proximity of works to the aquatic environment and the scale of the works, the magnitude of the potential impacts arising from concrete/cement entering waters are considered to be *minor adverse.* The significance of the environmental effect is therefore *significant adverse* in the absence of mitigation based on the high sensitivity of the receiving environment.

Capital Dredging and Disposal

Capital dredging does not entail any concrete or cement works. Therefore, there are no potential effects on water quality arising from concrete/cement pollution associated with dredging. The significance rating of the environmental effect is therefore *imperceptible*.

Landside ancillary works

Landside construction works required to serve the marine side works are described in Chapter 3. The impacts in relation to cement and concrete for the landside works relate to a range of activities mainly including construction and upgrade of access routes, and installation of underground services and drainage systems. The works will also include the demolition of the Port Operations Building and ancillary structures.

Landside works are relatively small scale and are largely separated from aquatic systems by buffer areas. Demolition of concrete structures has the potential to create highly alkaline dust in the absence of mitigation, which could find its way into the aquatic system and pose a threat of pollution. The scale of demolition required is small and some of the structures for removal are prefabricated units.

Based on the relatively small scale of works the magnitude of the potential impacts arising due to cement and concrete from landside construction is assessed to have a *minor adverse* risk to localised water quality. The significance rating of the potential environmental effect over the short term is *significant adverse* in the absence of mitigation based on the extremely high sensitivity of the receiving environment.

9.1.4.1.3 General Construction Works

The construction works will involve the use of plant and machinery, as well as the associated temporary storage of construction materials, oils, fuels and chemicals. During the construction phase there is the potential for accidental spillage or release of construction materials (e.g. diesel, oil, chemicals), and although the potential site compounds will not be sited immediately adjacent to the water body there is the potential for contaminants to drain into the harbour and estuary in the absence of mitigation. It is also possible that residual contaminants may be mobilised during the demolition of the southern end of the eastern oil jetty, removal of Oil Berth 4 and the reconfiguration of oil pipeline infrastructure and washed into the harbour resulting in a localised deterioration in water quality within the port area.

Given the scale and nature of the works, the magnitude of the impact associated with general construction is considered to be *minor adverse*. The significance of the environmental effect is therefore *significant adverse* in the absence of mitigation based on the high sensitivity of the receiving environment.

9.1.4.2 Operational Phase Impacts

9.1.4.2.1 Suspended Sediment and Sedimentation

The new facilities will allow larger vessels to use Dublin Port. Dredging is required to maintain the established charted depth of navigation channels and manoeuvring areas, and the operational depths of berthing pockets. The annual sediment load entering the port from the upstream Liffey catchment, leading to deposition in the port, will not change significantly due to the MP2 Project. Therefore, maintenance dredging requirements to maintain the new channels and pockets should not differ substantially from the current operational conditions.

There are no perceptible changes in suspended sediments associated with the operation of the new structures, berths or landside works. Any increase in suspended sediments and sedimentation due to maintenance dredging as a result of the MP2 Project is likely to be low and is assessed to have a localised *minor adverse* impact to water quality. The significance of the effect is therefore *significant* in the absence of mitigation based on the extremely high sensitivity of the receiving environment.

9.1.4.2.2 General Operational Activities

Surface water drains installed in new hardstand areas have the potential to provide pathways for a wide range of contaminants arising from general port operations to the aquatic environment. Direct pathways also exist within the immediate landside hinterland of facilities. Such pollutants may derive from spillages, vehicle operation, atmospheric deposition, erosional losses and leakages. The main potential pollutants from surface water drainage or direct run-off are sediment, hydrocarbons, and trace contaminants including metals and organics.

The magnitude of the potential impacts arising from contaminated surface water run-off from the new berthing and hardstanding areas entering the aquatic environment directly or via the surface water drainage system would potentially have *minor adverse* impacts on water quality in the area depending on the volumes released. The significance of the environmental effect is therefore *significant* in the absence of mitigation based on the high sensitivity of the receiving environment over the short term.

9.1.5 Mitigation Measures

In the absence of mitigation, the construction of some elements of the MP2 Project has the potential to have *Significant or Profound* negative impacts on the aquatic environment.

Similarly, with no mitigation the MP2 Project has the potential to have *Significant adverse* impacts on the aquatic environment during the operation stage, mainly as a result of maintenance dredging operations and contaminated run off entering the aquatic environment.

With these considerations in mind, detailed mitigation has been incorporated into the engineering design of the MP2 Project to minimise its potential impact on the water environment. Indeed, most potential impacts to water quality posed by this project during construction and operation will be dependent on the quality of drainage and treatment of site run-off before discharge to the Estuary. Therefore, it is pertinent to ensure that procedures are put in place for the control and minimisation of surface water and suspended solids movement, it is also important that measures are taken to ensure existing drainage pathways are kept free from construction sediment and pollutants through the use of effective barriers to pollutant export and best practice techniques to control these pressures at source. Section 9.1.5.1 and Section 9.1.5.2 details the mitigation measure that will be employed on site during the MP2 Project construction and operational phases.

9.1.5.1 Construction Phase Mitigation Measures

9.1.5.1.1 Construction Phase Best Practice Measures

Mitigation measures will be implemented by the contractor and will include the requirements for best practice and adherence to the following relevant Irish guidelines and recognised international guidelines:

- Good practice guidelines on the control of water pollution from construction sites developed by the Construction Industry Research and Information Association (CIRIA, 2001);
- Netregs Guidance for Pollution Prevention series (GPP), Pollution prevention guidelines (PPGs) 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);
  - GPP2: Above Ground oil storage tanks
  - PPG3: use and design of oil separators in surface water drainage
  - GPP5: Works and maintenance in or near water
  - PPG6: Working at construction and demolition sites
  - GPP8: Safe Storage and disposal of used oils
  - GPP13: Vehicle washing and cleaning
  - PPG20: Dewatering underground ducts and chambers
  - GPP21: Pollution incident response planning
  - GPP22: Dealing with spills

- 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.

9.1.5.1.2 Suspended Sediment and Sedimentation

Suspended sediment, including all soils, sands and rubble is the single main pollutant to the aquatic environment generated at construction sites and largely arises from the erosion of exposed soils and sediments by surface water runoff. The adoption of appropriate erosion and sediment controls during construction is essential to prevent sediment pollution.

<u>Demolition of existing buildings and structures, berth construction and construction of landside ancillary works</u>

As indicated above these demolition and construction works have the potential to result in a localised impact on water quality.

The mitigation and control measures to address the impact from suspended sediments associated with these activities will follow sound design principals and good working practices as listed in the Netregs Pollution Prevention Guidelines. In addition to the requirements of best practice and relevant guidelines, the following mitigation measures will be implemented by the contractor during the construction phase.

In addition to the mitigation measures referenced in the documents listed above, the following sediment control measures will be installed where necessary;

- Where preferential surface flow paths occur, silt fencing or other suitable barriers will be used to ensure silt laden or contaminated surface runoff from the site does not discharge directly to a water body or surface water drain.
- In the event that dewatering of foundations or drainage trenches is required during construction and/or discharge of surface water from sumps, a treatment system prior to the discharge will be used; silt traps, settlement skips etc. This measure will allow additional settlement of any suspended solids within storm water arising from the construction areas.

Assuming the above mitigation measures are employed during demolition, clearing and berth construction activities, the potential impact to receiving water environment will be reduced to negligible thus reducing the significance of environmental effect to *Imperceptible.*

<u>Capital Dredging and Disposal</u>

Dublin Port Company completed its first winter capital dredging season (October 2017 – March 2018) as part of the ABR Project. This dredging campaign was fully compliant with the requirements of all the development consents, as confirmed by high resolution environmental monitoring results reported in the Annual

Environmental Report submitted to the Office of Environmental Enforcement (OEE) in March 2018. The monitoring included year-round real-time measurement of water quality parameters in the Liffey Channel and in Dublin Bay at eight monitoring stations and at various water depths. This was supplemented by sediment plume and hydrographic monitoring that validated Plume Dispersal Modelling. Summary results are presented in Chapter 12 (Section 12.4.1).

A Dredging Management Plan was developed for the ABR Project and is set out in *Alexandra Basin Redevelopment Project Construction Environmental Management Plan (CEMP) Rev. F August 2018*. The mitigation for dredging operations in the MP2 Project has been informed by ABR Project monitoring and experience working in the same locations. The following key relevant mitigation measures will apply to each dredging campaign in the MP2 Project:

- Loading will be carried out by a backhoe dredger or trailing suction hopper dredger (TSHD).
- The capital dredging activity will be carried out during the winter months (October – March) to negate any potential impact on salmonid migration (particularly smolts) and summer bird feeding, notably terns, in the vicinity of the dredging operations.
- No over-spilling from the vessel will be permitted while the dredging activity is being carried out within the inner Liffey Channel.
- The TSHD pumps will be switched off while the drag head is being lifted and returned to the bottom as the dredger turns between successive lines of dredging to minimise the risk of fish entrainment.
- The dredger's hopper will be filled to a maximum of 4,100 cubic metres (including entrained water) to control suspended solids released at the dumping site. This is equivalent to a maximum quantity per trip of 2,030 tonnes (wet weight).
- Full time monitoring of Marine Mammals within 500m of loading and dumping operations will be undertaken in accordance with the measures contained in the Guidance to Manage the Risk to Marine Mammals from Man-Made Sound Sources in Irish Waters (NPWS 2014).
- A documented Accident Prevention Procedure will be put in place prior to commencement
- A documented Emergency Response Procedure will be put in place prior to commencement
- A full record of loading and dumping tracks and record of the material being dumped will be maintained for each trip.
- Dumping will be carried out through the vessel's hull.
- The dredger will work on one half of the channel at a time within the inner Liffey channel to prevent the formation of a silt curtain across the River Liffey.
- When any dredging is scheduled to take place within a 500m radius of power station intakes, the relevant stakeholders will be notified so that precautionary measures can be taken if deemed necessary.

In circumstances where the above mitigation measures are employed during capital dredging and disposal operations, the potential impact to receiving water environment will be negligible thus reducing the significance of environmental effect to *Imperceptible.*

9.1.5.1.3 Concrete and Cement Pollution

Demolition of existing buildings and structures, berth construction and construction of landside ancillary works

The impacts in relation to cement and concrete for the MP2 Project are, for the most part (but not limited to); demolition of buildings and structures, construction of piles and foundations for the berthing areas, quay walls etc., the installation of the concrete berthing area areas (to be poured in-situ) and construction of landside ancillary works.

The principal risks and related mitigation measures are:

- Breaking of concrete (associated with structure demolition) has the potential to emit alkaline dust into the receiving environment. A barrier between the dust source and the sensitive receptor (the water body in this case) will be erected to limit the possibility of dust contacting the receptor.
- Concrete use and production shall adhere to control measures outlined in Guidance for Pollution Prevention (GPP5): Works and maintenance in or near water (2017). Any on-site concrete production will have the following mitigation measures: bunded designated concrete washout area; closed circuit wheel wash etc.; and initial siting of any concrete mixing facilities such that there is no production within a minimum of 10 metres from the aquatic zone.
- The use of concrete in close proximity to water bodies requires a great deal of care. Fresh concrete and cement are very alkaline and corrosive and can cause serious pollution in water bodies. It is essential to ensure that the use of wet concrete and cement in or close to any water body is carefully controlled so as to minimise the risk of any material entering the water, particularly from shuttered structures or the washing of equipment.
- Where concrete is to be placed under water or in tidal conditions, specific fast-setting mix is required to limit segregation and washout of fine material / cement. This will normally be achieved by having either a higher than normal fines content, a higher cement content or the use of chemical admixtures.

In circumstances where the above mitigation measures are employed during demolition, clearing and berth construction operations, the potential impact to receiving water environment will be reduced to negligible thus reducing the significance of environmental effect will be reduced to *Imperceptible.*

Capital Dredging and Disposal

Capital dredging does not entail any concrete or cement works, therefore, no construction phase mitigation measures have been proposed.

9.1.5.1.4 General Construction Works

The risk of water quality impacts associated with works machinery, infrastructure and on-land operations (for example leakages/spillages of fuels, oils, other chemicals and waste water) will be controlled through good site management and the adherence to codes and practices which limit the risk to within acceptable levels. The following measures will be implemented during construction:

- A detailed works specific Construction Environmental Management Plan (CEMP) will be prepared by the contractor which will meet the minimum requirements of the draft CEMP (under separate cover) and will include detail in respect of every aspect of the works in order to minimise potential impacts and maximise potential benefits associated with the works;

- Management and auditing procedures, including tool box talks to personnel, will be put in place to ensure that any works which have the potential to impact on the aquatic environment are being carried out in accordance with required permits, licences, certificates and planning permissions;
- Existing and proposed surface water drainage and discharge points will be mapped on the Drainage layout. These will be noted on construction site plans and protected accordingly to ensure water bodies are not impacted from sediment and other pollutants using measures to intercept the pathway for such pollutants;
- The use of oils and chemicals on-site requires significant care and attention. The following procedures will be followed to reduce the potential risk from oils and chemicals:
  - Fuel, oil and chemical storage will be sited on an impervious base within a bund and secured. The base and bund walls must be impermeable to the material stored and of adequate capacity. The control measures in GPP2: Above Ground Oil Storage Tanks and PPG 26 “Safe storage – drums and intermediate bulk containers” (Environment Agency, 2011) will be implemented to ensure safe storage of oils and chemical.
  - The safe operation of refuelling activities shall be in accordance with PPG 7 “Safe Storage – The safe operation of refuelling facilities” (Environment Agency, 2011).
- Contingency Planning: A project specific Pollution Incident Response Plan will be prepared by the contractor consistent with DPC's Environmental Emergency Plan and will be in accordance with PPG 21 Pollution Incident Response Planning. Whilst a major incident is highly unlikely to occur in circumstances where the mitigation measures are implemented, the finalisation of the draft CEMP is considered to be best practice. The contractor's Environmental Manager and DPC will be notified in a timely manner of all incidents where there has been a breach in agreed environmental management procedures. Suitable training will be provided by the contractor to relevant personnel detailed within the Pollution Incident Response Plan to ensure that appropriate and timely actions is taken.

In circumstances where the above mitigation measures are employed during construction the significance of environmental effect to the receiving water environment will be reduced to *Imperceptible.*

9.1.5.2 Operational Phase Mitigation Measures

9.1.5.2.1 Channel Maintenance Dredging Works

Maintenance dredging is an ongoing requirement in the port and new licences will be required to cover maintenance of the areas newly dredged in capital dredging works under the MP2 Project. Conditions set in the Foreshore Licence and Dumping at Sea Permit will prescribe strict environmental protection measures. Maintenance dredging will implement comprehensive mitigation measures as set out below:

- Loading will be carried out by a backhoe dredger or trailing suction hopper dredger (TSHD).
- No over-spilling from the vessel will be permitted while the dredging activity is being carried out within the inner Liffey Channel.

- The TSHD pumps will be switched off while the drag head is being lifted and returned to the bottom as the dredger turns between successive lines of dredging to minimise the risk of fish entrainment.
- The dredger's hopper will be filled to a maximum of 4,100 cubic metres (including entrained water) to control suspended solids released at the dumping site. This is equivalent to a maximum quantity per trip of 2,030 tonnes (wet weight).
- Full time monitoring of Marine Mammals within 500m of loading and dumping operations will be undertaken in accordance with the measures contained in the Guidance to Manage the Risk to Marine Mammals from Man-Made Sound Sources in Irish Waters (NPWS 2014).
- A documented Accident Prevention Procedure will be put in place prior to commencement
- A documented Emergency Response Procedure will be put in place prior to commencement
- A full record of loading and dumping tracks and record of the material being dumped will be maintained for each trip.
- Dumping will be carried out through the vessel's hull.
- The dredger will work on one half of the channel at a time within the inner Liffey channel to prevent the formation of a silt curtain across the River Liffey.
- When any dredging is scheduled to take place within a 500m radius of power station intakes, the relevant stakeholders will be notified so that precautionary measures can be taken if deemed necessary.

Assuming the above mitigation measures are employed during maintenance dredging and disposal operations, the potential impact to receiving water environment will be reduced to *negligible* thus reducing the significance of environmental effect will be reduced to *Imperceptible.*

9.1.5.2.2 General Operational Activities

Storm water runoff will be collected in a dedicated storm water drainage system and will not be permitted to discharge directly to the marine environment from new jetties, and hardstand areas. The surface water drainage system will consist, *inter alia*, of heavy-duty gullies cast into the reinforced concrete deck, with concrete pipes cast into the in-situ concrete deck structure. These pipes will carry the storm water to an appropriate full retention oil separator which will trap oils and silt prior to being discharged into the harbour waters through a non-return flap valve. A readily and safely accessible monitoring chamber will be provided on the storm water pipeline as appropriate to allow for inspection and sampling of the storm water being discharged.

The oil interceptors on the surface water drainage network will be selected and sized based on the pollution prevention guideline: “Use and design of oil separators in surface water drainage systems: PPG 3” (Environment Agency, 2006) and BS EN 858 which is the European Standard for the design, performance, testing, marking and quality control of separators within the EU. All separators must comply with this standard. In accordance with PPG3 a class 1 bypass separator will be required for general and car parking areas of the site whilst a class 1 full retention separator will be required for the HGV parking and loading areas. Notwithstanding this, full retention separators are proposed for each phase of the development and will be sized in accordance with the design flow as presented in Chapter 3 (590 l/s for a six-hour duration storm) and the drainage area to be serviced.

The MP2 Project, when complete, will be subject to the Port's existing Environmental Management System (EMS) which is accredited to ISO 14001 standard and the Port Environmental Review System (PERS) which has gained Dublin Port designation as an 'Ecoport' at European level.

The EMS comprehensively identifies environmental aspects and impacts relating to Dublin Port including Tenant operations. Regular review of environmental aspects is required and will facilitate incorporation of MP2 Project-specific issues that arise to implement mitigation as necessary. The EMS is supported by a comprehensive suite of Standard Operating Procedures (SOP) providing mitigation of all environmental aspects identified and mechanisms to ensure effective implementation. SOPs have been prepared for oil and chemical spill responses, mineral oil handling, waste handling, monitoring and maintenance of surface water interceptors and handling of drain cleaning waste. Controls are in place for transport, handling and storage of hazardous materials, ship cargo, dry bulk material, surface water runoff, fuelling and bunkering of vessels and ship discharges. Site audits promote best practice and ensure compliance with the EMS requirements.

In circumstances where the above mitigation measures listed are employed, the potential impact to receiving water environment will be reduced to *negligible* thus reducing the significance of environmental effect will be reduced to *Imperceptible.*

9.1.6 Residual Impacts

In circumstances where the appropriate mitigation measures are fully implemented during the construction and operational phases as outlined in the previous section, the impact of the MP2 Project on the water quality in the area will be imperceptible as indicated in Table 9-19

Accordingly, the MP2 Project will not have a significant effect on the water quality of the receiving waters or make a significant change to the existing morphology.

In all the circumstances as outlined, it can therefore be concluded that the proposed works are compliant with the requirements and environmental objectives of the EU Water Framework Directive and the other relevant water quality objectives for these water bodies.

Table 9-19 Residual Impacts (with mitigation)

Significance of Environmental Impact				
CONSTRUCTION PHASE	**Demolition of existing buildings & structures**	**Berth Construction**	**Capital Dredging**	**Landside Works**
Suspended sediments / sedimentation	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Concrete and cement pollution	Imperceptible	Imperceptible	No Impact	Imperceptible
Impacts associated with general construction works	Imperceptible			
OPERATIONAL PHASE	**Buildings & structures**	**Berth Operation**	**Maintenance Dredging**	**Landside Works**
Suspended sediments / sedimentation	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Impacts associated with general port operation activities	Imperceptible			

9.1.7 Potential Cumulative Impacts

Potential cumulative impacts may arise from the MP2 Project when combined with other existing and/or approved projects. In accordance with the European Commission (2017) and EPA Draft Guidelines (2017), existing and/or approved projects with the potential for cumulative impacts have been identified. Cumulative impact assessments have been undertaken in this section for relevant pressures that could potentially give rise to cumulative impact. Each development with the potential to impact on the water environment has been considered through a review of the environmental supporting information (where available) for the existing or approved developments.

9.1.7.1 Poolbeg West SDZ

Poolbeg West is designated as a Strategic Development Zone (SDZ). Planning permission for this development was approved by An Bord Pleanála in April 2019. In addition to 3,500 residential units, its uses will include leisure, community, educational and commercial facilities. In relation to potential water quality issues and cumulative impact, the primary consideration is wastewater discharges from the SDZ. Wastewater discharges will be treated at Ringsend WwTP which is considered under Section 9.1.7.3 and captures any potential cumulative effects arising from the SDZ.

9.1.7.2 Dublin Port Company ABR Project

The Alexandra Basin Redevelopment (ABR) Project is the first major infrastructure project to be brought forward for planning and other consents from Dublin Port Company's (DPC) Masterplan 2012 to 2040. An Bord Pleanála granted permission for the ABR Project on 8th July 2015 (29N.PA0034).

The ABR Project comprises a number of engineering works set out in DPC's Masterplan document, mainly:

- 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.
- Infilling of the Basin at Berths 52 & 53 and construction of a new river berth with a double tiered Ro-Ro ramp.
- Deepening of the fairway and approach to Dublin Port to increase the ruling depth from -7.8m CD to -10.0m CD.

Both the ABR Project and MP2 Project are part of Dublin Port Company's Masterplan and have been planned and designed as part of a structured and integrated development programme that considers environmental impact and cumulative effects. The most relevant element of the ABR Project in considering potential cumulative impacts on water quality is the capital dredging elements. Dredging in both the ABR Project and MP2 Project will occur in the same water body (Liffey Estuary Lower) and the disposal of dredge spoil will use the same licensed dump site at the approaches to Dublin Bay. Dublin Port Company will implement mitigation through scheduling for avoidance of overlap of dredging activity in both of these projects. This temporal separation will mitigate cumulative effects. Extensive mitigation measures as described above will be implemented during the dredging campaigns in both projects.

On the basis of scheduling of works and comprehensive mitigation measures applied it can be concluded that there will be no cumulative effects.

9.1.7.3 Irish Water – Ringsend Wastewater Treatment Plant (WwTP) Upgrade Project

The need for additional wastewater treatment capacity has previously been identified to meet increased commercial, domestic and industrial demand together with a requirement to meet higher environmental standards in the Lower Liffey Estuary which is designated as a “sensitive” water body requiring higher treatment standards. As a result, Irish Water propose to expand the existing wastewater treatment plant to 2.4 million population equivalent (PE) capacity and to upgrade the Ringsend WwTP using enhanced Nereda© treatment technology to allow for improved environmental outcomes.

Estimates of the potential reduction of pollutants due to the upgrade are provided in the *Ringsend Wastewater Treatment Plant Upgrade Project EIAR* (June 2018). These are reproduced here in Table 9-20. It has been estimated in process proving trials that the proposed upgrade and enhanced treatment process will result in a substantial reduction in Biochemical Oxygen Demand (BOD), suspended solids and nutrient loads with significant positive environmental benefits.

The Ringsend Wastewater Treatment Plant Upgrade EIAR (June 2018) finds that there is potential for a temporary negative but not significant effect in the Tolka Estuary during the upgrade due to a number of secondary treatment tanks being temporarily out of operation. However, it concludes that the benefit of the permanent positive impact after the completion of construction outweighs the insignificant, temporary negative impact observed during the construction phase. Therefore, given the positive impact of the WwTP upgrade on receiving water quality it is unlikely that there will be any cumulative adverse effects when considered in combination with the MP2 Project.

Table 9-20 Ringsend Wastewater Treatment Plant, Final Effluent Discharge – Load Reduction Summary

Parameter	Current Average	Future Average	% Reduction
BOD (Biochemical Oxygen Demand)	8,739 kg/day	7,206 kg/day	17.5%
Suspended Solids	16,205 kg/day	10,508 kg/day	35.2%
Ammonia	4,370 kg/day	600 kg/day	86.3%
DIN (Dissolved Inorganic Nitrogen)	5,939 kg/day	4,804 kg/day	19.1%
MRP (Molybdate Reactive Phosphate)	1,056 kg/day	420 kg/day	60.2%

9.1.7.4 Howth Yacht Club Project

Howth Yacht Club are holders of a Dumping at Sea Permit (Ref. No. S0010-01) granted in August 2011 for capital works at the inner marina basin at Howth Harbour to extend the existing marina to provide additional berths. Loading and dumping activities must be completed within one year of the date of commencement of activities. Dumping of the uncontaminated dredged material is to be at the licensed disposal site at the approaches to Dublin Bay, west of the Burford Bank.

The disposal site is an established spoil ground which has been used previously by Howth Yacht Club for the disposal of dredged material and is also currently permitted for use by Dublin Port Company (Dumping at Sea Permit S0024-01). Under permit S0010-01, Howth Yacht Club are permitted to load and dump a maximum of 120,000 tonnes of dredged material over a one year period. In its application for a Dumping at Sea Permit Howth Yacht Club estimated a maximum daily quantity for dumping of 1,200 tonnes and 800 tonnes in each load. It also suggested a spring or winter commencement and campaign duration of six months.

The annual load is equivalent to approximately 6% of the annual permitted quantity of material that may be dumped at this site by Dublin Port Company under Dumping at Sea Permit S0024-01. While dumping by Dublin Port Company is restricted to the winter months (October to March), no such restriction applies to Howth Yacht Club activities. Given the possibility of a spring commencement to dredging in Howth it is possible, therefore, that there could be temporal overlap of some if not all dredging activities under these two permits.

Only Howth Yacht Club and Dublin Port Company currently hold Dumping at Sea Permits for use of the Dublin Bay dumping site and the Howth permit has been in place since 2011 without commencement. The dumping site has been used by a number of users over many years without significant environmental effect. A *Marine Benthic Survey of the Dredge Spoil Disposal Area at the Burford Bank (June 2016),* ABR Dublin Port Company concluded that the biological communities identified at the disposal site and the adjacent areas were similar to those recorded by Walker and Rees (1980), who had identified communities present in Dublin Bay dominated by similar fauna over 20 years earlier. This indicates the stable nature of the benthos (which water quality elements support) within Dublin Bay and around the area of the dumpsite. Results from the above survey generally concur with the findings of previous surveys of the area and indicate stable benthic communities at high biological status in the area of the disposal site.

Therefore, it is unlikely that any significant cumulative effects will occur due to the Howth Yacht Club proposed project.

9.1.7.5 Dublin Bay Power Plant

Synergen Power Limited operates the Dublin Bay Power Plant at Pigeon House Road in Poolbeg peninsula. The plant is a primarily natural gas-powered electricity generation plant in tandem with a heat recovery steam generator (IED Licence PO486-02).

The most significant discharge from the plant is the condenser cooling water discharge. The cooling water is abstracted from the Liffey Estuary Lower and returned via a channel downstream. The maximum volume of cooling water discharge permitted in any one day is 726,000 cubic metres and the maximum permitted rate per hour is 30,250 cubic metres. The cooling water stream also receives emissions from the boiler blowdown emission point (maximum 100 cubic metres per day) and the plant's water treatment neutralisation tank emission point (maximum 200 cubic metres per day).

The IED licence sets emission limit values (ELVs) for a range of parameters including thermal limits for the cooling water discharge which are not relevant to MP2 Project activities. The most relevant parameter in terms of potential cumulative effects with the MP2 Project is suspended solids where an ELV of 30mg/l applies to the Synergen water neutralisation treatment tank emission point. The 2017 AER reports a value of 5.25mg/l. This compares with an average turbidity measured at Poolbeg (Table 9.6) of 15.4 NTU which is equivalent to a total suspended solids of 38.5mg/l based on the relationship established in Figure 9.8. Compliance with the ELV for suspended solids means it is highly unlikely that any significant cumulative effect would occur.

Therefore, given the nature and composition of the Dublin Bay Power Plant discharge there will be no additive contribution to pollutant loads and no cumulative effects are likely.

9.1.7.6 Poolbeg Generating Station

The ESB operates the Poolbeg Generating Station, Pigeon House Road in accordance with IED Licence P0577-03. Poolbeg Generating Station has a total electricity generating capacity of 470MWe from a combined cycle gas turbine (CCGT) generating unit firing on natural gas from the national gas network.

Emissions to water include discharge of condenser cooling waters to the Liffey Estuary Lower. The maximum permitted volume to be discharged in any one day is 1,036,800 cubic metres and the maximum permitted rate per hour is 43,200 cubic metres. The cooling water stream also receives emissions from the water treatment neutralisation tank emission point (maximum 200 cubic metres per day), and boiler blowdown emission points (combined maximum 200 cubic metres per day). Screen wash water at the upstream abstraction point is returned locally to the Liffey Estuary Lower (combined maximum 480 cubic metres per day).

The IED licence sets emission limit values (ELVs) for a range of parameters including temperature, thermal load and chlorine in the cooling water discharge. These and the other parameters specified are of little relevance to MP2 Project activities. No limits have been specified in relation to suspended solids at the point of discharge.

Therefore, given the nature and composition of the Poolbeg Generating Station discharge there will be no additive contribution to pollutant loads and no cumulative effects are likely.

9.1.7.7 Waste Incinerator / Waste to Energy Facility

Dublin City Council operates a waste incinerator/waste to energy facility at Pigeon House Road in Poolbeg peninsula in accordance with Waste Licence W0232-01. The facility is currently operated by Covanta on behalf of Dublin City Council. Up to 600,000 tonnes of waste per annum may be processed at the facility.

Cooling water is discharged to the Liffey Estuary Lower via the same channel as the Dublin Bay Power Plant above. The maximum volume of cooling water discharge permitted in any one day is 570,000 cubic metres and the maximum permitted rate per hour is 14,040 cubic metres.

The IED licence requires monitoring of flow, temperature and residual chlorine in the cooling water emissions and sets ELVs for temperature and total residual chlorine. It also requires toxicity testing and upstream and downstream biological surveys (including fish diversity).

As above for the Dublin Bay Power Plant and Poolbeg Generating Station, the nature and composition of the discharge is such that there will be no additive contribution to pollutant loads and no cumulative effects are likely.

9.1.8 Monitoring

9.1.8.1 Water Quality Monitoring within the inner Liffey channel

The construction works associated with the MP2 Project are confined to the eastern end of the Dublin Port Estate.

A water quality monitoring system has been designed to ensure robust protection of the marine environment and for users of the inner Liffey channel during the construction phase of the MP2 Project.

It is proposed to maintain the four water quality monitoring stations already in position for the ABR Project. The location of the monitoring stations are shown in Figure 9-23 Location of Monitoring StationsFigure 9-23.

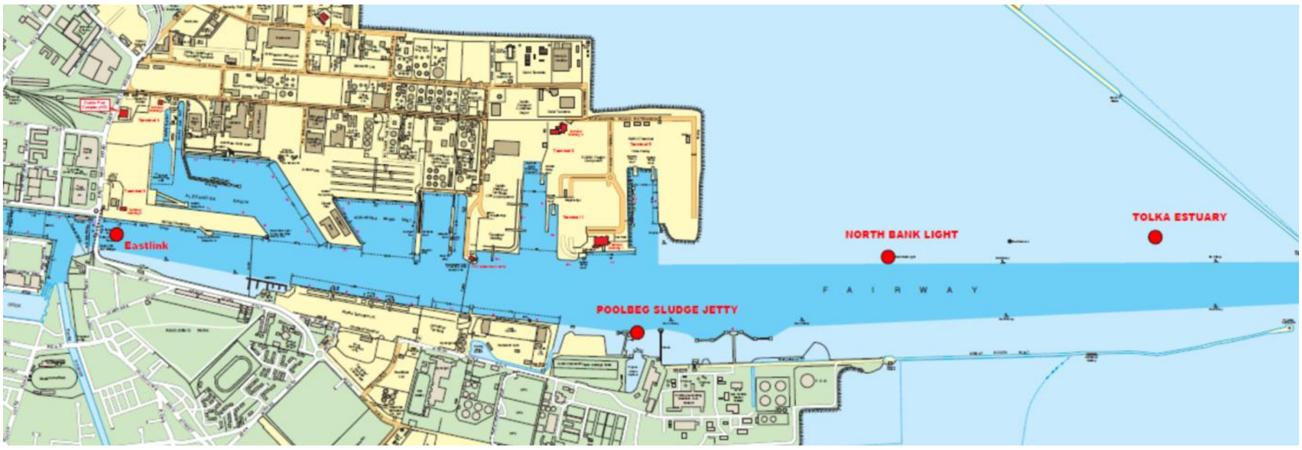


Figure 9-23 Location of Monitoring Stations

Monitoring Station 1 (Eastlink)

This monitoring station is sited in the River Liffey Channel upstream of the works at East Link Bridge.

Monitoring Station 2 (Poolbeg Sludge Jetty)

This monitoring station is sited along the southern edge of the River Liffey Channel at the Poolbeg Sludge Jetty in close proximity to a power station intake.

Monitoring Station 3 (North Bank Light)

This monitoring station is sited along the northern edge of the River Liffey Channel at the North Bank Light outside, but in close proximity to, the South Dublin Bay and River Tolka SPA.

Monitoring Station 4 (Tolka Estuary)

This monitoring station will be sited in the Tolka Estuary near the northern edge of the River Liffey Channel inside the South Dublin Bay and River Tolka SPA.

Monitoring System Specification

The specification is based on state of the art 24/7 real time monitoring. Water quality monitoring sensors, giving high resolution data with respect to the following parameters are being used at each of the four monitoring locations

- Turbidity
- Dissolved Oxygen
- Temperature
- Salinity

Water level is also measured at one monitoring station to provide information on tidal state. Turbidity is measured as a surrogate for suspended solids. Site specific tests have previously been undertaken by the ABR Project to define the relationship between Turbidity and suspended solids.

Apparatus housing and moorings used are robust and designed for the marine conditions at the monitoring locations. An ongoing calibration and maintenance programme is in place comprising:

- Regular calibration of sensors
- Regular maintenance of sensors (including cleaning)
- Maintain Data Quality Control
- Provision of replacements if required

A data acquisition and transfer system is being used to enable the transmission of high resolution data at approximately 15 minute intervals.

A data storage, interrogation system is in place comprising

- Provision of Data Server
- Web site for access to data

– Suitable Software to interrogate and display data

The following trigger levels that will prompt investigation are proposed:

– Dissolved Oxygen level falling below 6 mg/l

– Peak Suspended Solids level rising more than 100mg/l above background (Based on the Turbidity v Suspended Solids relationship previously established this is equivalent to an Turbidity increase of 40 NTU above background)

The Dissolved Oxygen trigger level has been selected to safeguard fish-life.

Duration of Monitoring Programme

The monitoring network infrastructure has been in place since 2016 and will continue for the duration of the construction phase of the MP2 Project.

This monitoring system has already generated a robust water quality baseline within the inner Liffey channel with the ability to identify water quality trends. The continuation of the monitoring system will serve to further strengthen the knowledge of water quality trends, a key indicator of the health of the marine environment.

The water quality data currently being collected is circulated to Dublin City Council on a monthly basis. This transfer of information continues for the duration of the construction phase of the MP2 Project

The data collected is also being shared with research organisations (Dublin City University, Maynooth University and University College Cork).

Incident Response / General Observations

In the event of possible environmental incidents, the on-site environmental facilities manager will initiate additional investigative sampling as required to seek to identify the possible source and nature of any pollutants present. A record will be made of any general observations relevant to the event which may inform the investigation including: weather conditions; any unusual water attributes (e.g. unusual colour or smell of sample, foam, scum); any other observations including works within or surrounding the site; any other general observations including written and photographic records will be made as appropriate.

Reporting

Data from ongoing monitoring programmes will be collated at regular intervals (usually calendar months) and summarised in synoptic reports by the Environmental Facilities Manager. Any breaches of emission, trigger levels or compliance values will be indicated in the report along with the findings of any relevant investigation. In addition to interim synoptic reports an annual environmental report will be prepared.

9.1.8.2 Water Quality Monitoring within Dublin Bay

It is proposed that dredge spoil arising from the MP2 Project will be disposed of at the licenced offshore disposal site located at the entrance to Dublin Bay, to the west of the Burford Bank.

DPC has established four water quality monitoring stations within Dublin Bay which have been operational since September 2017 and will continue to operate until April 2021. The monitoring buoys are scheduled to be removed in April 2021 following completion of the monitoring under Dumping at Sea Permit S0024-01. During this period capital dredging will have taken place over four winter seasons and maintenance dredging will have taken place during 2017, 2018 and 2020 (subject to consent).

This monitoring effort will provide sufficient results to validate computational models developed to predict the impact of the MP2 Project capital dredging campaign. The monitoring requirements at the dump site will be subject to the conditions of a separate Dumping at Sea Permit, if granted by the EPA.

9.1.9 Conclusions

Baseline water quality within the receiving environment was established through review of national monitoring data used to establish water quality status in the context of the EU Water Framework Directive (WFD) and supporting environmental standards. Recent high-frequency monitoring data collected during Dublin Port Company's ABR Project was also reviewed.

Using baseline water quality data and site specific water quality model simulation outputs, an assessment of the MP2 Project was conducted to determine the likelihood of significant impacts on water quality using the criteria for rating significance and magnitude as set out in the National Roads Authority (NRA) publication "*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*" (NRA, 2008) and appropriate mitigation measures to reduce impacts were proposed, where necessary.

In circumstances where the appropriate mitigations measures are fully implemented during the construction and operational phases, the impact of the MP2 Project on the water quality in the area will be imperceptible. The MP2 Project is therefore not expected to have a significant effect on the water quality of the receiving waters.

It can therefore be concluded that the MP2 Project works are compliant with the requirements and environmental objectives of the EU Water Framework Directive and the other relevant water quality objectives for these water bodies.

9.2 Flood Risk Assessment

This section of the EIAR addresses the potential for flooding to the MP2 Project site. It identifies possible sources of flooding, establishes the impact of the development and proposes mitigation measures to minimise the flood risk. The risk of flooding to the MP2 Project is assessed in accordance with the methodologies set out in the Planning System and Flood Risk Management Guidelines (November 2009).

The potential impact of the MP2 Project on flooding adjoining receptors is also considered as part of this assessment.

9.2.1 Assessment Methodology

The risk of flooding to the MP2 Project has been assessed in accordance with the methodologies set out in the Planning System and Flood Risk Management Guidelines (November 2009). The assessment comprises the following stages:

- consideration of Dublin Port Masterplan 2040 Strategic Flood Risk Assessment (SFRA);
- identification of potential sources of flooding; determination of Flood Zones and consideration of how the MP2 Project complies with Planning System and Flood Risk Management Guidelines (November 2009) using the sequential approach; and
- Impact assessment of the MP2 Project based on the Flood Zones and the development vulnerability classifications is carried out and mitigation measures proposed where applicable.

9.2.1.1 Dublin Port Masterplan 2040 Strategic Flood Risk Assessment

RPS have previously carried out a Strategic Flood Risk Assessment (SFRA) in support of the Masterplan 2040 (review in 2018), for the redevelopment of Dublin Port. The main purpose of the SFRA was to appraise the adequacy of existing information, prepare flood zone maps, and to highlight potential development areas that require more detailed assessment on a site-specific level. The SFRA also provides guidance for appropriate types of development within areas at potential risk of flooding and suitable mitigation measures to ensure resilience to the predicted effects of climate change.

The SFRA provided the framework as to how all subsequent developments within the port should manage flood risk and identified the need to undertake a site-specific flood risk assessment for all sites identified as being at risk from flooding. This section of this EIAR is equivalent to a site-specific flood risk assessment and has been prepared in accordance with ‘Planning System and Flood Risk Management Guidelines for Planning Authorities’ first published by the Department of the Environment, Heritage and Local Government and the OPW in November 2009, referred to hereafter as ‘The Guidelines’.

9.2.1.2 Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning. There are three types or levels of flood zones defined for the purposes of the Guidelines:

- **Flood Zone A** - where the probability of flooding from rivers and the sea is highest (greater than 1% for river flooding, or 0.5% for coastal flooding);
- **Flood Zone B -** where the probability of flooding from rivers and the sea is moderate (between 0.1% and 1% for river flooding, or between 0.1% and 0.5% for coastal flooding);
- **Flood Zone C** - where the probability of flooding from rivers and the sea is low (less than 0.1% for both river and coastal flooding). None of the MP2 Project is considered to be Flood Zone C.

The flood zones are based on the current (present-day) assessment of events without the inclusion of climate change factors. The presence of flood protection structures should be ignored in determining flood zones. This is because areas protected by flood defences still carry a residual risk of flooding from overtopping or breach of defences and the fact that there may be no guarantee that the defences will be maintained in perpetuity. The flood zones described above are indicative of river and coastal flooding only. They should not be used to suggest that any areas are free from flood risk, since they do not include the effects of other forms of flooding such as groundwater or artificial drainage systems.

9.2.1.3 Sequential Approach

A sequential approach to planning is a key tool in ensuring that development, particularly new developments, is first and foremost directed towards land that is at low risk of flooding. The sequential approach (as described in Figure 3.1 of the Planning System and Flood Risk Management Guidelines (reproduced in Figure 9-24) should be applied to all stages of the planning and development management process. It is of particular importance at the plan-making stage but is also applicable in the layout and design of development within a specific site at the development management stage.

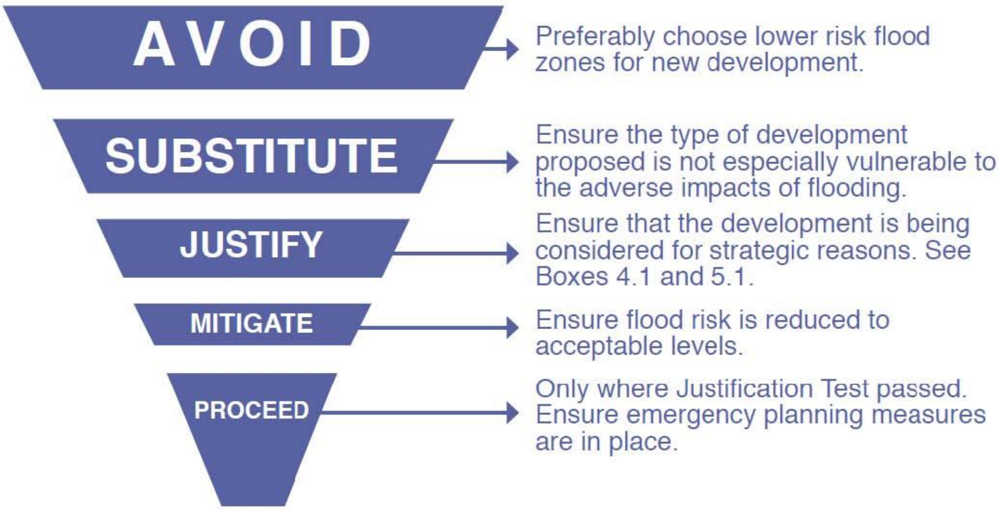


Figure 9-24: Sequential Approach Principles in Flood Risk Management (DEHLG, 2009)

The sequential approach (Figure 9-25) makes use of flood risk assessment and of prior identification of flood zones for river and coastal flooding and classification of the vulnerability to flooding of different types of development.

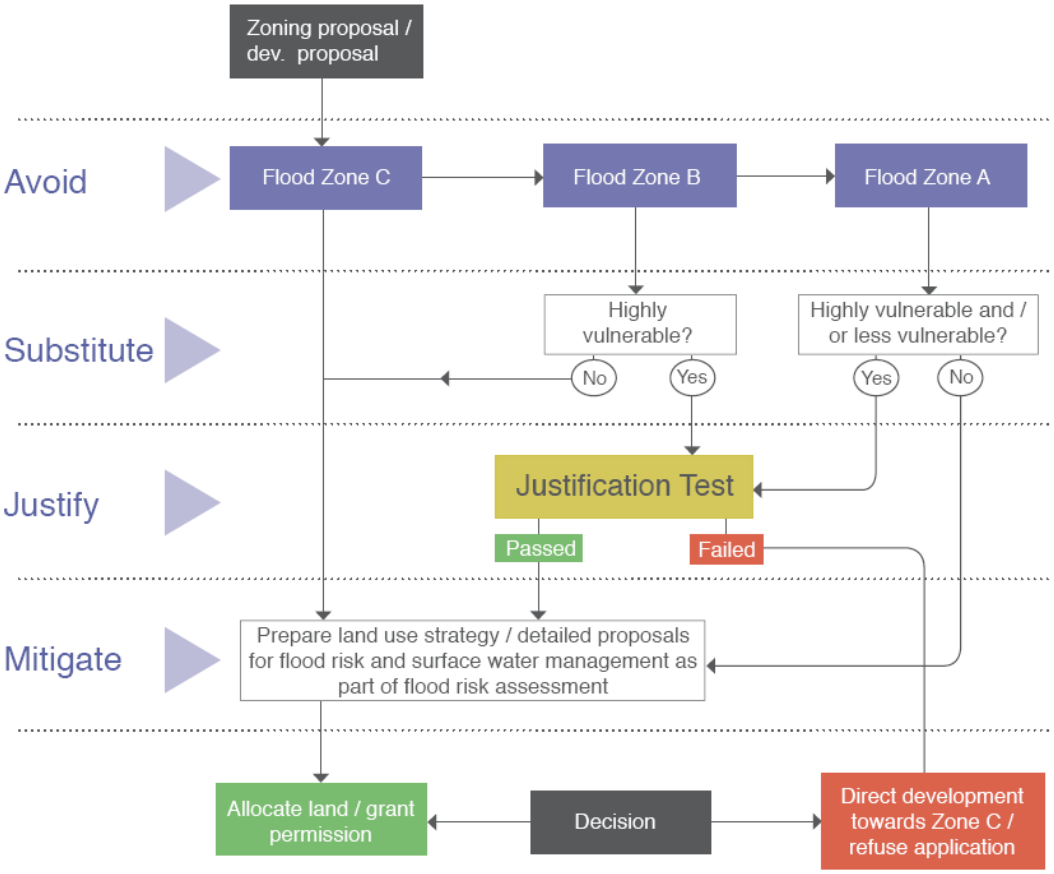


Figure 9-25: Sequential Approach to Mechanism in the Planning Process (DEHLG, 2009)

9.2.1.3.1 Classification of Vulnerability

The guidelines also classify different types of development in terms of their vulnerability class as shown in Table 9-21 Note: this table is not a definitive list of development type and uses not listed should be considered on their own merits. Table 9-22

Table 9-22 illustrates the types of development that would be appropriate to each flood zone and those that would be required to meet the Justification Test.

Table 9-21 : Classification of Vulnerable of different types of development

Vulnerability Class	Land use and types of development include:
Highly Vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations, hospitals and schools, dwelling houses, student halls of residence and hostels, essential infrastructure such as primary transport and utility distribution including: electricity generating power stations and substations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc) in the event of flooding
Less Vulnerable development	Buildings used for retail, leisure, warehousing, commercial, industrial and non-residential institutions; land and building used for agriculture and forestry; local transport infrastructure.
Water-compatible development	Flood control infrastructure; docks marina and wharves; navigation facilities, ship building, repairing and dismantling; amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; lifeguard and coastguard stations etc.

Table 9-22 : Matrix of Vulnerability Vs. Flood Zone

Vulnerability	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable	Justification Test	Justification Test	Appropriate
Less Vulnerable	Justification Test	Appropriate	Appropriate
Water Compatible	Appropriate	Appropriate	Appropriate

9.2.2 Existing Environment

9.2.2.1 Dublin Port Masterplan 2040 Strategic Flood Risk Assessment

A Strategic Flood Risk Assessment (SFRA) was prepared for the Dublin Port Masterplan 2040, in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities (DEHLG, 2009). The conclusion of the SFRA was that an appropriately detailed site-specific FRA will be required in support of any planning application for individual developments within the Masterplan area. The SFRA identified that:

- The level of detail will vary depending on the risks identified and the proposed land use.
- For sites within Flood Zone A or B, a site-specific 'Stage 2- Initial FRA' will be required, which may need to be developed into a 'Stage 3- Detailed FRA'.
- The extents of Flood Zone A and B were delineated in the SFRA based on the Eastern CFRAM study maps. However, future studies may refine the extents so a comprehensive review of available data should be undertaken for any FRA.
- A more detailed, site-specific Flood Risk Assessment may produce locally varying flood outlines. This has been done for the MP2 Project site as described later in this chapter.

Any proposal must demonstrate the use of the sequential approach in terms of site layout and design and must satisfy the Justification Test (if required). It is therefore necessary to consider the flood risk to the MP2 Project site in detail to determine the type of assessment required. The proposal has demonstrated appropriate mitigation and management measures have been put in place as described later in this chapter.

9.2.2.2 Sources of Flooding

The River Liffey flows through the MP2 Project site. At this location, the River Liffey can be considered as tidal, therefore, extreme flood events are likely to be dominated by coastal flooding and extreme fluvial events will not further increase the extreme levels predicted during extreme tidal and storm events. Fluvial flood risk has not been considered further on the basis that coastal flood risk is the predominant source of flood risk at this location.

An analysis of the extreme water levels at Dublin Port was undertaken to determine the most up to date predicted tidal flood levels at the site. This is fully described in Appendix 9-1. The predicted tidal water levels of this analysis are as shown in Table 9-23.

Table 9-23 Predicted Tidal Water Levels

Annual Exceedance Probability (AEP)	Return Period	Water level to OD (Malin)
0.5%	200 yr	3.325
0.1%	1000 yr	3.584

9.2.2.3 Flood Zones

The flood zones for the MP2 Project have been derived based on the predicted tidal water levels indicated in Table 9-23 without the inclusion of climate change factors. These flood levels are indicative of coastal flooding and should not be used to suggest that any areas are free from flood risk, since they do not include the effects of other forms of flooding such as groundwater or artificial drainage systems.

LiDAR data for the area was used to map the extent flood zones within the site based on the levels shown in Table 9-24. Figure 9-26 shows the extent of these present day (PD) flood zones in relation to the MP2 Project site. As illustrated a significant portion of the MP2 Project site is within the PD Flood Zones A & B with the remaining areas in Flood Zone C.

Table 9-24 Flood Zone Predicted Flood Levels

Flood Zone	Water level to mOD (Malin)
A	<3.325
B	3.325 - 3.584
C	>3.584

Figure 9-26: Extent of Flood Zones (Present Day)

9.2.2.3.1 Alexandra Basin Redevelopment Project

The Alexandra Basin Redevelopment (ABR) project received planning permission in 2015 and works are currently ongoing. As part of the ABR Project works, a number of areas of the MP2 Project site are to be infilled and raised from original ground levels to a level of 4.58mOD, which is above the MP2 Project site specific analysis of predicted tidal flood levels. This will have the effect of altering the Flood Zones as shown in Figure 9-27. Therefore, post ABR Project Flood Zones are used as the basis for this MP2 Project assessment.

Figure 9-27: Extent of Flood Zones (Post ABR Project)

9.2.3 Impact Assessment

As highlighted in Section 9.2.1.3.1, the Planning Guidelines classify different types of development in terms of their vulnerability class (Table 3.1 of the guidelines has been reproduced in Table 9-21). Table 3.2 of the Guidelines (reproduced as Table 9-22) illustrates the types of development that would be appropriate to each flood zone and those that would be required to meet the Justification Test. Appropriate development is development whose vulnerability to flooding is such that it is generally acceptable within a particular flood zone. The flood zones have been mapped onto the current proposals for the MP2 Project site. This is shown in Figure 9-28.

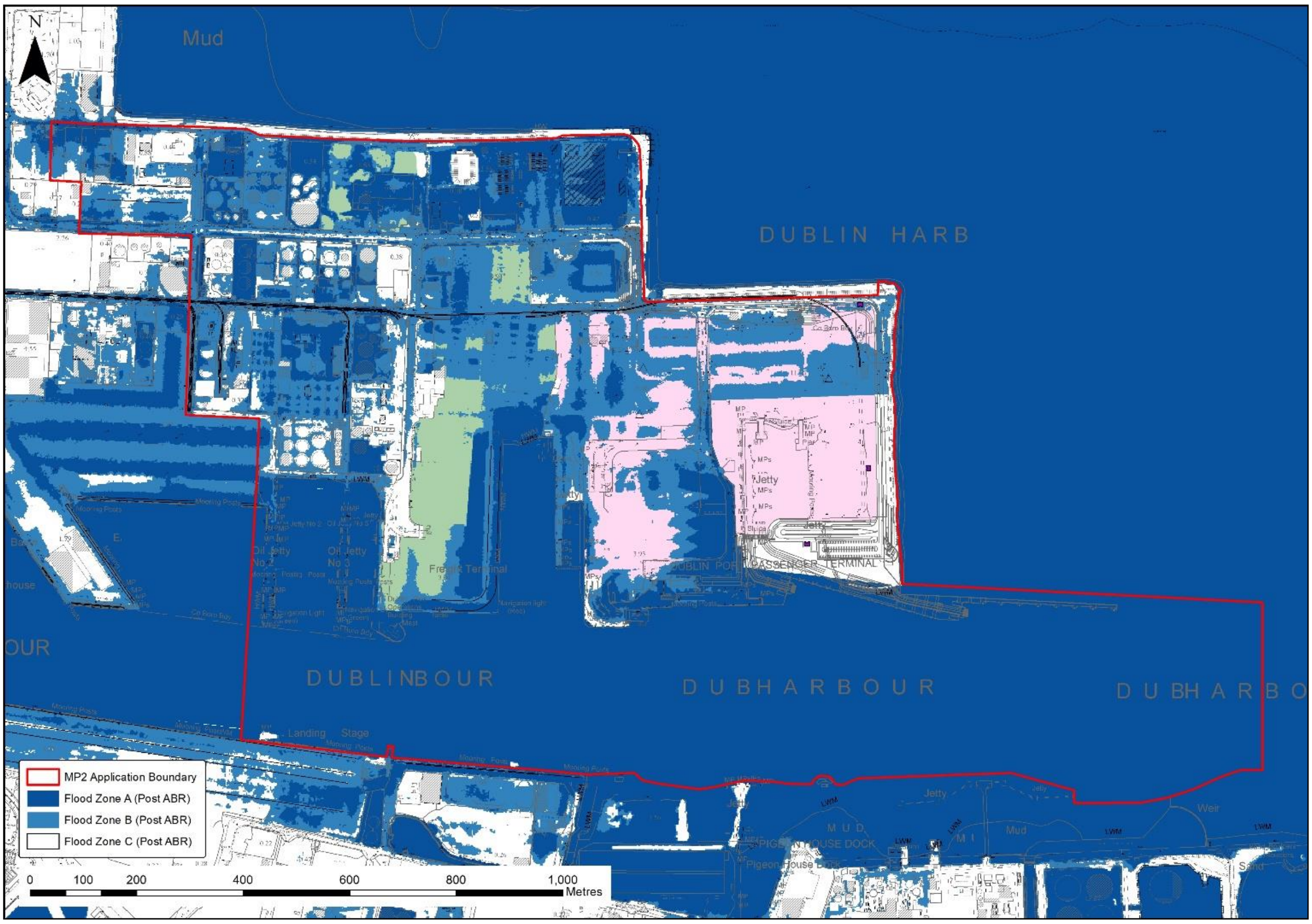


Figure 9-28 Extent of Flood Zones (including MP2 Project layout)

The MP2 Project has a range of uses with varying degrees of vulnerability. This has been considered in detail in the following section. The land-based elements of the proposal have been considered in accordance with the Guidelines with the manoeuvring and dredging areas located within the existing marine environment.

Berth 52 / 49

The MP2 Project includes the reorientation of the already consented Berth 49 & Berth 52. Berth 52/49 will be used predominantly for the berthing of Roll On/Roll Off ferries. Berths will remain at a level of 4.6m OD as per the ABR Project, and is therefore located in Flood Zone C. Therefore, no further assessment is required of this facility, however, it is noted as a water-compatible usage in terms of the docks, marina and wharves category.

Berth 53

Berth 53 will be used predominantly for the berthing of Roll On/Roll Off ferries. This is located in Flood Zone A. This use again can be considered as ‘Water-compatible’ and is therefore appropriate in all flood zones.

Berth 50A

The works at Berth 50A will lengthen the existing river berth 50A to provide a multipurpose predominately Lo-Lo container vessel berth. This is located in Flood Zone A. This use also can be considered as ‘Water-compatible’ and is, therefore, appropriate in all flood zones.

Oil Berth 3

The Eastern Oil Jetty comprises Oil Berth 3 to the west and Oil Berth 4 to the east. The works at Oil Berth 3 will involve the removal of Oil Berth 4 and consolidating operations to Oil Berth 3. The berth will be used as a multi-purpose structure, initially for oil tanker berthing, with a future potential use as a container vessel. This is located in Flood Zone A. This use again can be considered as 'Water-compatible' and is therefore appropriate in all flood zones.

New Quay Wall at Jetty Road

The dredging at Oil Berth 3 will require stabilisation of the existing Jetty Road. It is not proposed to use this quay wall for the berthing of vessels. This is located in Flood Zone A. This use can be considered as 'Water-compatible' and is therefore appropriate in all flood zones.

Unified Ferry Terminal (UFT) Area

The area to the eastern end of the port is currently occupied by four main ferry operators. It is proposed to use the existing Terminal 1 building to facilitate all operators. It is proposed to relocate all public access to the perimeter of the site, leaving the internal area free for unified port operations. The configuration of the area will be flexible as the usage of the port evolves and will generally be split into stacking areas for accompanied HGVs, accompanied and unaccompanied cars and trailers, with circulation routes indicated to route vehicles to each zone and to and from the berths. Parts of the UFT are located in Flood Zones A, B and C. The ferry terminal can be considered as a dockside activity that requires a waterside location. This makes it a 'Water-compatible development', which is appropriate in all flood zones.

9.2.3.1 Summary of Impacts

All of the uses within the MP2 Project site can be considered as 'Water-compatible development'. This type of development is considered appropriate in all flood zones, and therefore a Justification Test is not required. While the combination of risk and vulnerability is such that the development is generally acceptable, the risk remains and it may change during the lifetime of the development. Therefore, mitigation measures have been considered in the following section that will reduce that risk.

9.2.3.2 Potential impact of flooding adjoining receptors

An assessment of the change in wave climate resulting from the port marine works was undertaken to determine any potential flooding impact on the landside port and adjoining receptors due to the development. As presented in Chapter 12 (Section 12.4.2) changes to the wave climate due to the MP2 Project show no noticeable change in relevant proximate areas such as Clontarf, Fairview and Ballybough bordering the Tolka Estuary. Changes in wave height within the Port are not significant. Therefore the risk of potential coastal flooding due to the MP2 Project in these areas is determined to be negligible. No further mitigation is therefore considered in respect of the change in wave climate.

9.2.4 Mitigation Measures

The risk to the MP2 Project site is from tidal flooding from the River Liffey. Tidal levels around the coast of Ireland are currently monitored by OPW who issue high tide advisories so there will be sufficient warning of any extreme tidal events that are likely to impact on Dublin Port. In addition, there is a Dublin Bay tidal warning system (TRITAN) in operation by Dublin City Council. Tidal warning will be the key mitigation measure for the MP2 Project site. If an extreme event is forecast, any sailings from the port are likely to be cancelled. The entire port area will be at risk of flooding so it likely to have been closed and evacuated in accordance with existing emergency plans.

In accordance with the SFRA, the design and assessment of development should be at the present day 0.5% tidal event, with a suitable allowance for climate change and a suitable freeboard, taking account of the site-specific wave climate.

Each of the areas described in Section 9.2.3, with the exception of Berth 52 which requires no mitigation, is considered as follows:

Berth 53

The level of Berth 53 will be set at 4.6m OD to tie into Berth 52. This is in excess of the 0.5% AEP tidal level of 3.33m, and provides some 1.25m for climate change and freeboard with wave regime. No further mitigation measures are proposed.

Berth 50A

The existing quay edge level of Berth 50A is 3.47m OD, and this will be matched in the extension. This is just above the 0.5% AEP tidal level of 3.33m, and provides 0.14m of freeboard. However, there will be no permanent damage caused due to the flooding, and therefore no further mitigation measures are proposed.

Oil Berth 3

The level of Oil Berth 3 will be set at 3.41m OD to match the existing level and to tie into the crane rails at Berth 50A in the future. This is just above the 0.5% AEP tidal level of 3.33m, and provides 0.08m of freeboard. However, there will be no permanent damage caused due to the flooding, and therefore no further mitigation measures are proposed.

New Quay Wall at Jetty Road

The quay wall will flood during a 0.5% tidal event; however, there will be no permanent damage caused due to the flooding. No mitigation measures are proposed.

Unified Ferry Terminal (UFT) Area

Within the UFT area there are a number of different elements that require different mitigation measures, so these are considered separately. If a high tide advisory is issued then there is unlikely to be any ferry sailings from the Port, and the UFT area can be evacuated (excepting for unaccompanied cars associated with foot passenger usage). It should be noted that if an extreme tidal event occurs, there would be widespread flooding across Dublin, including many of the roads into and within the port with flood warning and management actions in place by the competent authorities.

Vehicle Parking:

The majority of the UFT area site is taken up by parking areas for HGVs and cars, and parts of these areas are at risk of flooding in a 0.5% AEP event.

The accompanied stacking areas for HGVs and cars will be operational only if the terminal open so there is unlikely to be any vehicles in these areas during a flood as the port will be closed. There is no damage if these areas are flooded and they can be readily be cleaned up as necessary following any flooding.

There will be a stacking area for unaccompanied HGV trailers. These trailers will be in this area for a short time before loading/unloading to the ferries or onward journeys. This area can be evacuated if required to prevent the elevated trailers being damaged. Again, if these areas are flooded and they can be readily be cleaned up as necessary following any flooding.

Parking facilities are provided outside of the south-east corner of the UFT, where foot passengers can leave their cars before boarding the ferries. There is therefore the possibility that cars could be parked here before an extreme coastal event is forecast and would therefore be unaccompanied and not able to be evacuated. This usage is contained within the car park located within the raised ABR Project area which is therefore at least risk of flooding during an extreme event.

Existing Passenger Terminal Building:

The existing Passenger Terminal 1 will be utilised as the Unified Ferry Terminal Building to facilitate foot passenger check in and provide facilities for those in accompanied units awaiting departure, meaning that the numbers of people using this existing building will increase.

The finished floor level of the existing passenger terminal building is 3.39m OD. This is above the predicted 0.5% AEP flood level of 3.33m OD, with little allowance for climate change or freeboard with wave climate.

Flood proofing measures can be used to prevent flood water from entering the building and reducing the damage. This could include the use of demountable flood barriers on all external doors. A commonly used product called “Floodgate”, as shown in Figure 9-29, is a demountable barrier which can be quickly erected in approximately two minutes across any doorway without the need for recesses or any other modification to the doorframe. It comprises of a 25mm thick, steel boxed frame which expands telescopically on the horizontal and vertical plane. The steel frame is enveloped by a 7mm thick neoprene jacket which, when expanded, forms a waterproof seal between it and the aperture it is expanded into. It is designed to be readily manually handled and is easy to install. Staff will be trained to erect any barriers. The barrier would offer protection to 680mm above finished floor level, to provide protection to a level of 4.05m OD thus increasing the allowance for climate change, freeboard and wave climate to 0.72m

Figure 9-29: A Type of Demountable Flood Barrier

Toilet Facilities:

It is proposed to provide toilet facilities for people in the pre-departure accompanied stacking area. These will consist of simple structures with separate facilities provided for HGV drivers and car passengers. These should be located outside of Flood Zone A where is possible and incorporate flood resilient considerations within their detailed design.

Pedestrian Underpass:

A pedestrian underpass is proposed to facilitate pedestrian links to the Terminal Building. The entrance and exit to the underpass are located within the raised ABR Project area and are therefore not at risk of flooding during an extreme event. The underpass itself will need to be 'tanked' to prevent the ingress of water.

Passenger Walkway Structures:

It is proposed to install passenger walkway structures to access Berth 51A and Berth 52. Each structure will include an ambulant disabled stairway, a lift and an enclosed high-level walkway to facilitate access to the ships. These walkways are located within the raised ABR Project area and are therefore not at risk of flooding during an extreme event.

Storm Drainage

The hard-standing areas in the UFT are as existing or as consented under the ABR Project and therefore no significant upgrade to the storm drainage is proposed.

9.2.5 Residual Impacts

Residual risk is the risk that remains after all mitigation measures have been taken to reduce the frequency of flooding. For some areas of the site, coastal flood risk will remain following completion of the development. However, it is assumed that, given the severity of the design event, sufficient warning will be given to evacuate the area. This means that there is a low likelihood of any of the potential flood risk areas being occupied. These areas are resilient to flooding in that no damage will be caused by the flooding. The areas where unaccompanied cars may be present before an event is predicted are located on the elevated areas of lowest risk.

As with any development within a coastal floodplain there is always a residual risk linked with a more extreme event, greater than the design event, occurring. It should be noted that the existing terminal building remains at risk if the flood proofing measures are not erected or if a more extreme event were to occur. The mitigation measures will provide a level of protection to reduce the impact from an extreme event as far as reasonably possible. The overall residual risk is therefore considered to be low.

9.2.6 Conclusions

The flood risk to the MP2 application area has been assessed and the predominant source of flood risk emanates from tidal flooding.

Under the Planning System and Flood Risk Management Planning Guidelines (2009), the MP2 Project site consists of areas located within Flood Zones A, B and C. The proposed land uses, and the types of developments within the MP2 Project site involves docks or dockside activities that require a waterside location, and so can be classed as 'Water-compatible development'. This means that the development is appropriate for all flood zones and a Justification Test is not required to be completed.

Mitigation measures have been proposed where appropriate to prevent vehicles and people remaining in the areas if an extreme tidal event is predicted. Whilst there will be no damage to the majority of the site if a flood were to occur, mitigation measures have been proposed for the existing terminal building.

The MP2 Project is compliant with The Planning System and Flood Risk Management Planning Guidelines (2009).

10 AIR QUALITY & CLIMATE

10.1 Introduction

This chapter of the EIAR assesses the potential impacts to air quality arising from or associated with the MP2 Project. It should be read in conjunction with the site layout plans and project description (Chapter 2).

Potential effects to air quality may arise during the construction phase, such as from the generation of construction dusts and construction traffic. The construction activities have been examined to identify those that have the potential for air emissions. The operational development will give rise to potential emissions from road traffic and shipping, similar to the existing operation. Each of these potential sources has been identified and emissions have been evaluated using standard procedures. Considerations extend beyond construction and operational activities and included in this section are factors that are vulnerable to unplanned events that have the potential to cause significant sudden environmental effects. The measures to reduce, avoid and prevent these likely significant effects are proposed, where they are necessary. Thereafter, the likely significant residual effects of the project on air quality are predicted.

This chapter has also considered the requirements of the EIA Directive in relation to climate change and has provided:

- A description of the factors in relation to climate (for example greenhouse gas emissions, impacts relevant to adaptation) likely to be significantly affected by the project;
- A description of the likely significant effects of the project on the environment resulting from, inter alia, the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.

Annex IV to the 2014 EIA Directive includes direct reference to climate and climate change in two provisions. The emphasis is placed on two distinct aspects of the climate change issue:

- **Climate change mitigation**: this considers the impact the Project will have on climate change, through greenhouse gas emissions primarily; and
- **Climate change adaptation:** this considers the vulnerability of the Project to future changes in the climate, and its capacity to adapt to the impacts of climate change, which may be uncertain.

This chapter has been prepared in accordance with the following guidance documents:

- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.
- The European Commission *Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report* (2017).

- The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018).
- The EPA *Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)* (2017).
- The DHPLG published the revised *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment* (August 2018).

10.2 Assessment Methodology

10.1.1 Baseline Air Quality

The current state of the environment in terms of baseline air quality has been determined from the data from the EPA monitoring Zone A (Dublin) network to determine compliance with relevant ambient air legislation. In addition to the EPA monitoring, DPC carry out a series of ambient air quality monitoring tests within the environs of the port. The monitoring was undertaken in the period 2014 - 2018 at a series of 18 locations (as shown in

Figure 10-1) in the environs of the port. This monitoring is employed in this assessment to demonstrate the spatial variation in the Port and in the wider Dublin area in conjunction with the data from the EPA network.

The likely evolution of this baseline in future years without the proposed development (i.e. the "Do-Nothing" scenario is also presented.

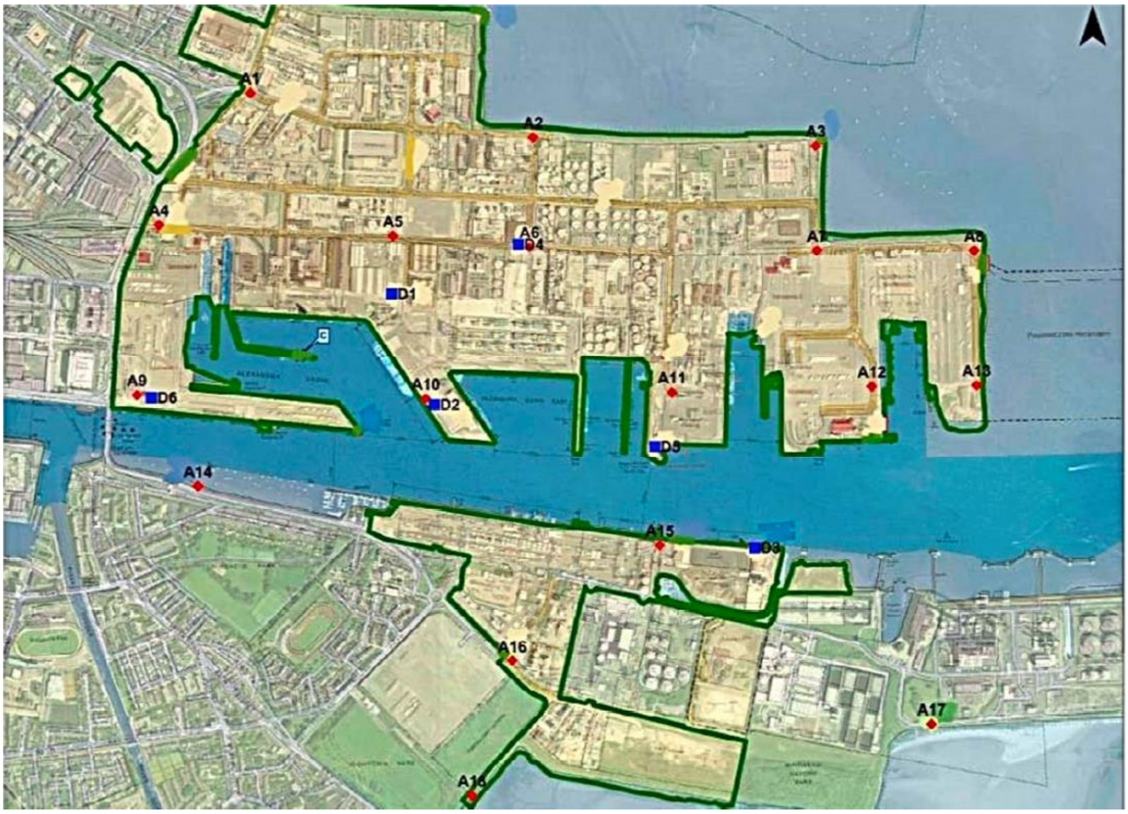


Figure 10-1 DPC Air Monitoring Locations

10.1.2 Baseline Climate

Existing climatic data for the study area has been derived from the Met Éireann historical database (https://www.met.ie/climate-ireland/1981-2010/dublin.html). The nearest meteorological station to the port is the Met Éireann Station in Dublin Airport which lies approximately 9km to the north. The 30-year averages from the station at Dublin Airport from 1981 to 2010 are employed to determine the existing baseline.

The description of the evolving baseline climate on a national level is derived from the EPA Report '*A Summary of the State of Knowledge on Climate Change Impacts for Ireland*' (2017) and the '*Ensemble of regional climate model projections for Ireland*', (EPA 2015).

The existing carbon foot-printing of Dublin Port is derived from the annual Sustainability Report prepared by DPC on its operations. DPC publishes an annual Sustainability Report to track and record progress on the ports environmental responsibilities. As part of the 2015 Sustainability Report, DPC commenced a carbon footprint inventory of all port emission sources. This is to generate awareness in the maritime community for the need for action regarding greenhouse gas emissions and to make available information on the effects on climate change. This information allows DPC to establish initiatives and set ambitious targets to reduce emissions. The latest published report is the Sustainability Report 2017 and this is employed to present the current baseline GHG emissions from the port.

The likely evolution of this baseline in future years without the proposed development (i.e. the "Do-Nothing" scenario is also presented.

10.1.3 Construction Stage Impacts

There are four potential impacts to atmosphere from the construction stage of the proposed development:

- Generation and dispersion of construction dusts during the proposed works (demolition, dredging and general construction);
- Emissions associated with construction traffic;
- Potential odours (such as during dredging); and
- Greenhouse gas emissions from the construction phase of the proposed development.

The methodologies employed for each of these impacts is summarised as follows:

Dust Dispersion

Construction dust has the potential to cause local impacts through dust nuisance at the nearest sensitive receptors and also to sensitive ecosystems. The potential for dust generation from the construction activities associated with the proposed development will be assessed on the basis of a review of the proposed methodologies and the proximity of these activities to sensitive receptors.

Construction activities such as stone importation, excavation, earth moving, dredging and backfilling may generate quantities of dust, particularly in dry weather conditions. The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction.

The potential for dust emissions from the construction phase of the project is addressed qualitatively in accordance with the NRA Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (Rev. 1) (NRA 2011; referred to hereafter as the NRA Guidelines).

Construction Traffic

The proposed construction operation will involve the movement of materials and reconfiguration of existing roadways, buildings and lands to create an additional three hectares of usable terminal. Additional infill material may be sourced offsite and transported via the newly configured access to the Port. All dredged material will be barged to the dump site and will not travel by road. An analysis of construction traffic will be undertaken in accordance with the NRA Guidelines.

Odour

The main potential odour from the construction stage relates to the potential for fugitive odours from the dredging operation, particularly hydrogen sulphide, which can be particularly offensive.

- DPC undertook maintenance dredging campaigns within the port's navigation channel and berthing pockets in 2012, 2016, 2017 and 2018. Hydrogen sulphide was not encountered in the port during any of these dredging campaigns.
- During the 2003 dredging of Berths 32 and 33 within Alexandra Basin West, a long reach excavator on a pontoon was used and the dredge material was brought onto the quay wall and processed for shipment to Germany. Again, hydrogen sulphide was not encountered.

Despite the low risk of encountering odours, a series of odour mitigation measures have been presented to minimise the impact of this operation and to prevent any nuisance in the unlikely event that they are encountered.

Greenhouse Gas Emissions

The construction phase climate assessment was carried out to identify sources and quantify total Greenhouse Gas (GHG) emissions generated from the construction activities associated with the proposed development. This assessment was carried out using the carbon calculator for construction activities developed by the Environment Agency (EA) in the UK. The carbon calculator calculates the embodied carbon dioxide (CO_2) of materials plus CO_2 associated with their transportation. The tool also considers personal travel, site energy use and waste management.

10.1.4 Operation Stage

Road Traffic Emissions

A prediction of the local impact of traffic-derived pollution during the operation phase was carried out using the Local Assessment model in the Design Manual for Road and Bridges (DMRB), Volume 11, Section 3, Part 1 in accordance with the NRA guidelines for assessment of impacts to air from road transport. Traffic data was provided in the form of Annual Average Daily Traffic (AADT) for the existing scenario and a series of future scenario years accounting for growth based on the Dublin Port Masterplan 2040, reviewed 2018.

Shipping Emissions

Shipping emissions associated with the proposed development have been quantified using the emission factors presented in the EMEP/EEA Emission Inventory Guidebook 2016, Section 1.A.3.d.i Navigation (shipping).

Operational Emissions

Greenhouse gas emissions from energy use at the port, as documented in the carbon footprint, are assessed through a review of the proposed changes to operations at the site to determine the potential for significant impact.

Climate Change Adaption

In addition to emissions generation described above, the adaptability of the proposed development to climate change has also been assessed. In particular, the impacts of flooding in the Dublin Port area has been addressed through consultation with the CFRAM mapping for the area and interaction with the drainage specialist on the MP2 Project.

10.1.5 Assessment Criteria

10.1.5.1 Construction Dust

During the construction phase, dust is considered the principal risk of pollution to the atmosphere. However, there is no legislative limit for total suspended particles, so the guidelines presented by the German Government TA Luft guidance are employed. Under this guidance the it is a requirement to maintain monthly dust levels below the guideline of 350mg/m^2/day as an annual average at sensitive receptors.

10.1.5.2 Odours

Like construction dusts there is no legislative limit for odours in Ireland and standard industry guidelines are typically applied. The Odour Impact Assessment Guidance for EPA Licensed Sites (AG5) is a procedure offers a consistent and systematic approach to the assessment of odours on and in the local area of facilities and installations licenced by the EPA. This sensory assessment is used to determine if an odour has potential to cause nuisance.

This will be supplemented with chemical testing as required. In this case, an odour marker compound such as hydrogen sulphide will be used to determine odour nuisance during the dredging works. Hydrogen sulphide (H_2S) is one of the key odour compounds that can cause odour nuisance impacts. H_2S is a colourless, flammable, extremely hazardous gas with a “rotten egg” odour. It occurs naturally in crude petroleum and natural gas. In addition, H_2S is produced by bacterial breakdown of organic materials and may be released during dredging works if there is organic material disturbed in the bed of the inner Liffey channel.

There are no statutory limits for the protection of human health for H2S so guidelines are applied. Two thresholds are employed in this assessment – the threshold for odour nuisance and the threshold for health impacts as presented in Table 10-1 (source WHO “Air Quality Guidelines for Europe”, 2000).

Table 10-1 Health and Odour Guidelines H_2S

Parameter	Averaging Period	Guideline	Source
Health Effects	24 hours	150 µg/m^3	World Health Organisation
Odour Annoyance	30 minutes	7 µg/m^3	World Health Organisation

10.1.5.3 Combustion Gases/Particulates (such as from road traffic)

In May 2008, all previous European Directives on air quality were replaced with a revised Directive on ambient air quality and cleaner air for Europe (2008/50/EC) which has been transposed into Irish legislation as the Air Quality Standards Regulations 2011 (S.I. 180 of 2011), as amended. These limits as specified in these Regulations are presented in Table 10-2 and represent the main assessment criteria for the operation phase of the MP2 Project.

The 2011 Regulations specify limit values in ambient air for sulphur dioxide (SO_2), lead, benzene, particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2) and oxides of nitrogen (NO_x). These limits are mainly for the protection of human health and are largely based on review of epidemiological studies on the health impacts of these pollutants. In addition, there are limits that apply to the protection of the wider environment (ecosystems and vegetation). All predicted concentrations from the operation of the MP2 Project are compared to the air quality limits to determine the extent of any impact on residential or ecological receptors.

The NRA Guidelines specifies the significance criteria for determining air quality impacts. The predicted increases or decreases from road traffic pollution may been utilised to determine the significance of any impact in relation to the NRA criteria as presented in Table 10-3, Table10-4 and Table 10-5.

Table 10-2 Limits as Specified in Air Quality Standards Regulations 2011 (S.I. 180 of 2011)

Pollutant	Criteria	Value
Nitrogen Dioxide	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m^3 NO_2
	Annual limit for protection of human health	40 µg/m^3 NO_2
	Annual limit for protection of vegetation	30 µg/m^3 $NO + NO_2$
Benzene	Annual limit for protection of human health	5 µg/m^3
Carbon Monoxide	Maximum daily 8-hour running mean	10 mg/m^3
Lead	Annual limit for protection of human health	0.5 µg/m^3
Sulphur Dioxide	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	350 µg/m^3
	Daily limit for protection of human health - not to be exceeded more than 3 times/year	125 µg/m^3
	Annual limit for protection of vegetation	20 µg/m^3
Particulate Matter PM_{10}	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3 PM_{10}
	Annual limit for protection of human health	40 µg/m^3 PM_{10}
Particulate Matter $PM_{2.5}$	Annual target value for the protection of human health	20 µg/m^3 $PM_{2.5}$

Table 10-3 Definition of Impact Magnitude for Changes in Ambient Air Pollutant Concentrations (Source: NRA, 2011)

Magnitude of Change	Annual Mean NO_2 / PM_{10}	No of Days with PM_{10} Conc greater than 50µg/m^3	Annual Mean PM
Large	Increase/decrease ≥4µg/m^3	Increase/decrease >4 days	Increase/decrease ≥2.5µg/m^3
Medium	Increase/decrease 2 - <4µg/m^3	Increase/decrease 3 of 4 days	Increase/decrease 1.25 - <2.5µg/m^3
Small	Increase/decrease 0.4 - <2µg/m^3	Increase/decrease 1 or 2 days	Increase/decrease 0.25 - <1.25µg/m^3
Imperceptible	Increase/decrease <0.4µg/m^3	Increase/decrease <1 day	Increase/decrease <0.25µg/m^3

Table 10-4 Air Quality Impact Descriptors for Changes in Annual Mean Nitrogen Dioxide Concentrations at a Receptor (Source: NRA, 2011)

Absolute Concentration in Relation to Objective/Limit	Changes in Concentration		
	Small	Medium	Large
Increase with Proposed Project			
Above Objective/Limit Value with development (≥40μg/m^3 of NO_2 or PM_{10}) (≥25μg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value with development (36-<40μg/m^3 of NO_2 or PM_{10}) (22.5-<25μg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value with development (30-<36μg/m^3 of NO_2 or PM_{10}) (18.75-<22.5μg/m^3 of $PM_{2.5}$)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value with development (<30μg/m^3 of NO_2 or PM_{10}) (<18.75μg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Adverse
Decrease with Proposed Project			
Above Objective/Limit Value with development (≥40μg/m^3 of NO_2 or PM_{10}) (≥25μg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value with development (36-<40μg/m^3 of NO_2 or PM_{10}) (22.5-<25μg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value with development (30-<36μg/m^3 of NO_2 or PM_{10}) (18.75-<22.5μg/m^3 of $PM_{2.5}$)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value with development (<30μg/m^3 of NO_2 or PM_{10}) (<18.75μg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Beneficial

Table 10-5 Air Quality Impact Descriptors for Changes in Number of Days with PM10 Concentrations Greater than 50µg/m^3 at a Receptor (Source: NRA, 2011)

Absolute Concentration in Relation to Objective/Limit	Changes in Concentration		
	Small	Medium	Large
Increase with Proposed Project			
Above Objective/Limit Value with development (≥35days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value with development (32-<35days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value with development (26-<32days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value with development (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Proposed Project			
Above Objective/Limit Value with development (≥35days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value with development (32-<35days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value with development (26-<32days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value with development (<26 days)	Negligible	Negligible	Slight Beneficial

In addition to the statutory limits for the protection of human health listed in Air Quality Standards Regulations (S.I. 180 of 2011), the World Health Organisation (WHO) has published a set of air quality guidelines for the protection of human health. The key publication is the "*WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide, Global update 2005 Summary of risk assessment*". The WHO guidelines are based on reducing the risk to human health and in some cases the levels differ from the EU statutory limits as these limits are based on balancing health risks with technological feasibility, economic considerations and various other political and social factors in the EU.

The 2005 WHO guidelines are presented in Table 10-6 and illustrate that while the NO_2 levels are analogous to those in S.I. 180 of 2011 (excluding the tolerance levels for the 1-hour averages), the annual average PM_{10} and $PM_{2.5}$ levels specified by the WHO are half those specified in the legislation. The WHO note that these are the lowest levels at which total, cardiopulmonary and lung cancer mortality have been shown to increase with more than 95% confidence in response to long-term exposure to $PM_{2.5}$. The EPA has called for movement towards the adoption of these stricter WHO guidelines as the legal standards across Europe and in Ireland.

Table 10-6 WHO 2005 Air Quality Guidelines

Pollutant	Criteria	Value
Nitrogen Dioxide (NO_2)	Hourly level for protection of human health	200 µg/m^3 NO_2
	Annual level for protection of human health	40 µg/m^3 NO_2
Sulphur Dioxide (SO_2)	10 minute level for protection of human health	500 µg/m^3
	Daily level for protection of human health	20 µg/m^3
Particulate Matter (PM_{10})	24-hour level for protection of human health	50 µg/m^3 PM_{10}
	Annual level for protection of human health	20 µg/m^3 PM_{10}
Particulate Matter ($PM_{2.5}$)	24-hour level for protection of human health	25 µg/m^3 $PM_{2.5}$
	Annual level for protection of human health	10 µg/m^3 $PM_{2.5}$

National Climate Change Policy and Targets

CO_2 emissions have a climate warming effect which is global. This is regardless of their rate of release, location or the weather when they are released into the atmosphere. This is unlike pollutants that affect local air quality where the rate of release, location and prevailing weather, as well as the amount of pollutant, determines the local concentrations and the impact. Local ambient concentrations of CO_2 are not relevant and there are no limits or thresholds that can be applied to particular sources of carbon emissions – any amount of CO_2 released into the atmosphere will contribute to climate warming, the extent of which is determined by the magnitude of the release. Although CO_2 emissions are typically expressed as kilogrammes or tonnes per year, there is a cumulative effect of these emissions because CO_2 emissions have a warming effect which lasts for 100 years or more.

The National Policy Position on Climate Action and Low Carbon Development was published on 23 April 2014. The policy sets a fundamental national objective to achieve transition to a competitive, low-carbon, climate-resilient and environmentally sustainable economy by 2050. The policy states that GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national strategies – respectively through a series of National Mitigation Plans and a series of National Climate Change Adaptation Frameworks.

The National Policy Position envisages that development of National Mitigation Plans will be guided by a long-term vision of low carbon transition based on the following:

- An aggregate reduction in carbon dioxide (CO_2) emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors; and
- In parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

The relevant policy to the MP2 Project is the aggregate reduction emissions of at least 80% from the electricity generation, built environment and transport sector by 2050.

Further to the National Policy Position, the Climate Action and Low Carbon Development Act 2015 was enacted on 10 December 2015. The Climate Action Act sets out the proposed national objective to transition to a low carbon, climate resilient and environmentally sustainable economy by the end of 2050.

On 14 May 2018, the European Council adopted a regulation on greenhouse gas emission reductions - EU effort Sharing Regulation sets out 2030 targets for member states. The starting point is an average of 2016-2018 emissions with binding emission reduction targets of 30% compared to 2005 levels.

Ireland reported total GHG emissions of 61.545 million tonnes CO_{2eq} in 2016, up 2.12 million tonnes CO_{2eq}. When compared to the 1990 baseline, Ireland has increased GHG emissions by 3.6% compared to the 20% reduction target set for Ireland under the EU 2020 strategy.

Transport (which predominately consists of road transport) is currently the second largest contributor of GHG emissions in Ireland (after agriculture) at 19.5%. Greenhouse gas emissions are projected to increase from most sectors. Further growth in emissions from the transport sector is projected in line with a growth in fuel consumption in diesel cars and freight up to 2025. Between 1990 and 2016, the transport sector showed the greatest overall sectoral increase of 139% and increases are linked to economic prosperity with year on year increases observed up to 2007 followed by five years of year on year decrease during the economic downturn. Emissions in the transport sector started to show a year on year increase again in 2014 when compared to the 2013 annual emissions.

10.1.5.4 Potential for Cumulative Impacts

There are a number of other projects within Dublin Port and the general Dublin area that have potential for cumulative and in-combination effects associated with the construction or operation phases of the MP2 Project. These are described in the following paragraphs along with a description of the related developments.

Alexandra Basin Redevelopment (ABR) Project

Works at the ABR Project have been permitted under planning permission (reference 29N.PA0034) and the construction phase of this development are ongoing. The phasing of the works at the ABR Project has been considered as part of the MP2 Project, and elements of the works at the ABR Project fall within the site boundary of the MP2 Project and works will run concurrently. The principal construction activities with potential for cumulative air quality impact taking place in the ongoing construction at the ABR Project include:

- Dredging of contaminated sediment from Alexandra Basin West and the subsequent treatment of same and its recovery through infill in two locations: the disused Graving Dock #2 adjacent to Alexandra Basin West, and Berth 52/53 at the eastern edge of the port area. This will be carried out under an Industrial Emissions Licence from the EPA (Ref. P1022-02). Contaminants in the sediment include heavy metals, TBT, DBT, hydrocarbons, PAHs and PCBs. The treatment which will comprise stabilisation and solidification of the contaminated sediment is proposed to be undertaken on land adjacent to Berth 52/53.
- Dredging of sediments from the navigation channel which will be disposed of at sea under permit from the EPA (Under Dumping at Sea permit S0024-01);

These concurrent construction activities have potential for dust dispersion (including hazardous dusts). A refined dust dispersion model for construction activity has been carried out for the ABR Project and presented in the planning and licence consent applications for this project. The model indicates that there will be no significant impact on human health and the environment from the proposed operations. This is largely as a result of the high moisture content of the dredged material which will naturally mitigate the potential for dust generation. The potential for cumulative dust impact from both projects is considered in this assessment.

Dublin Inland Port

DPC has acquired 44 hectares of land 14 km from Dublin Port to provide facilities for non-core but port related activities. The lands are located within the administrative area of Fingal County Council and are explicitly zoned to include the activities envisaged by DPC, including road transport depots and transport logistics facilities.

10.3 Existing Environment

10.1.6 Receiving Environment

The site of the MP2 Project is approximately 2km east of Dublin City Centre within the Northern Lands of Dublin Port.

There are sensitive receptors (houses, commercial operations) located in the area and these receptors vary in distance from the proposed development. There is a potential that receptors may experience a change in air quality and the extent of these changes in air quality is identified in this assessment.

The nearest sensitive residential receptors to the south of the proposed development are the residential dwellings on York Road, Pigeon House Road, Ringsend Park and Pembroke Cottages circa 400 metres to the south of the MP2 application boundary.

To the north of the development site there is the extensive residential area of Clontarf with the properties along Clontarf Road closest to the MP2 application boundary of the development at circa 450 metres.

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 3 Arena Theatre and the Gibson Hotel are the closest receptors 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).

10.1.7 Existing Sources in the Area

The main existing sources of pollution to air quality in the area around Dublin Port are from road traffic, rail traffic, shipping traffic, space heating, industrial emissions and fugitive emissions from fuel/gas storage.

The road network around Dublin Port is centred on the East Wall Road (R131) which connects the East Link Toll Bridge to the south with the Dublin Port Tunnel to the north and forms the western boundary of the port. This road is heavily trafficked, especially at peak times. In addition to this regional road there is a network of internal roads within Dublin Port Estate including the Alexandra Road, the Tolka Quay Road and the Promenade Road which mainly serve HGVs entering and leaving the port.

Irish Rail operates the rail line which runs along Alexandra Road with a number of spurs off this main line. Trains are diesel fired with some localised emissions.

Port operations including shipping emissions (both docked emissions and at sea emissions) and land operations (cranes, trucks, etc.) also give rise to combustion emissions. These emissions are dependent on the fuel employed, the size of the vessel and the duration of the operations.

There are four facilities located in Dublin Port that are licensed by the EPA:

- ESB North Wall Generating Station (IE Licence P0579-03). North Wall generating station has one operating generating unit, an open cycle gas turbine CT5, with a total maximum electricity generating capacity of 115 MW. CT5 is normally fired on natural gas supplied from the national gas network with distillate oil used as a secondary fuel. In 2017 the plant operated for 988 hours only. The plant discharges to atmosphere via one combustion stack (A1-2) and in 2017 the plant discharged a total of 53.707 tonnes of NO_x/NO_2.
- Indaver Waste Transfer Station (Waste Licence W0036-02) which accepts and exports hazardous waste from Ireland to Britain and other European countries for recovery, disposal or treatment. This facility also houses a solvent blending facility which allows for the specific blending of solvents to derive a fuel from this waste. There are no major emissions to atmosphere from this facility.
- Irish Tar & Bitumen Suppliers (IPC Licence P0086-01) who carry out the chemical manufacture of glues, bonding agents and adhesive. The plant has two main emissions to atmosphere each of which discharge NO_x, SO_x and CO.
- Dublin Waste to Energy Limited (IE Licence Register W0232-01) who hold a licence to burn up to 600,000 tonnes of non-hazardous waste and to recover energy in the form of steam and electricity for export to the national grid. There are two main emission points from this facility, one for each incinerator line that both discharge a series of gaseous and particulate combustion emissions through twin stacks at a height of 105 metres. In 2017 this facility reported the following total emissions:

Arsenic	0.0 kg
Cadmium	2.0 kg
Mercury	2.0 kg
Zinc	2.0 kg
Dioxins and Furans	0.002 kg
Chlorine	67 kg
Fluorine	121 kg
Particulates	315 kg
Carbon Monoxide	10,595 kg
Non-methane VOCs	1294 kg
NOx	230,785 kg
SOx	2,467 kg

As the Dublin conurbation is subject to a ban on smoky coal under the Air Pollution Act, 1987 (Marketing, Sale and Distribution of Fuels) Regulations (1998-2011), the space heating in the area (both residential and commercial) will be based on gas, oil, biomass and non-bituminous coals. Consequently the levels from space heating in the area are not elevated.

10.1.8 Seveso (COMAH) Sites

In addition to the EPA licensed facilities, there are a number Seveso sites located in this part of Dublin Port as regulated under the *Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015)*. These Seveso sites store large volumes of solvent, fuel or gas and hence have the potential to have impacts to atmosphere through fugitive emissions as opposed to scheduled emissions through a stack. The Seveso sites located in this area of Dublin Port are listed in Table 10-7.

Table 10-7 Seveso Sites at Dublin Port

Site	Seveso Tier	Site Nature
Topaz Energy Limited Terminal 1, Alexandra Road, Dublin Port, Dublin 1	Lower	Fuel Storage
Topaz Energy Limited (Yard 3)	Lower	Fuel Storage
Calor Teoranta	Upper	Gas Storage
Fareplay Energy Ltd (Fareplay Terminal Dublin, Promenade Road, Dublin Port, Dublin 3)	Upper	Fuel Storage
Indaver	Upper	Solvent Storage
Tedcastles Oil Products (Yard 2)	Upper	Fuel Storage
Valero Energy (Ireland) Ltd. (Dublin Joint Fuels Terminal, Alexandra Road, Dublin Port, Dublin 1)	Upper	Fuel Storage

10.1.9 Baseline Air Quality

Air quality legislation in Ireland deals with air quality by means of "zones" based on population. For Ireland, four zones are defined and the main areas defined in each zone are:

- Zone A: Dublin Conurbation.
- Zone B: Cork Conurbation.
- Zone C: Other cities and large towns comprising Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Dundalk, Navan, Letterkenny, Celbridge, Newbridge, Mullingar, Balbriggan, Greystones, Leixlip and Portlaoise.
- Zone D: Rural Ireland, i.e. the remainder of the State excluding Zones A, B and C.

The MP2 Project is located in Dublin 1 in the jurisdiction of Dublin City Council therefore the site lies within EPA Air Quality Zone A (Dublin Conurbation). The EPA air quality monitoring network for Zone A has been reviewed and suitable representative data is presented to identify the background air quality in the area of the MP2 Project.

A summary of the EPA monitoring carried out in Zone A (Dublin Conurbation) is presented in the following sections. The EPA monitoring network in Dublin, includes the local authority networks, a number of city centre locations (e.g. Coleraine Street, Winetavern Street, etc.) as well as suburban stations (e.g. Rathmines, Blanchardstown, etc.).

There are a wide number of stations in the Dublin area tested for various pollutants and there is variation each year regarding the locations and pollutants monitored at these locations. Presented in this section are the annual averages of all stations in Zone A. The averages are considered representative of the wider Dublin area and the site of the MP2 Project.

10.1.9.1 Nitrogen Dioxide (NO_2)

Nitrogen Dioxide (NO2) is classed as both a primary and a secondary pollutant. As a primary pollutant NO2 is emitted from all combustion processes (such as a gas/oil fired boiler or a car engine). As a secondary pollutant NO2 is derived from atmospheric reactions of pollutants that are themselves, derived mainly from traffic sources. The results of the EPA Dublin network monitoring for the period 2002 to 2017 are presented in Table 10-8. The average results indicate compliance with the limits for the protection of human health (Table 10-2) with the trend indicating a generally reducing ambient level over the fifteen year period in Dublin. This compliance level is to some extent a result of Ireland's location in Western Europe where there is a strong prevailing westerly wind, high rainfall levels and low sunshine levels that allows for the rapid dispersion of pollutants and generally good air quality. In addition, at EU level there is legislation driven improvements to vehicles in terms of both engine performance and fuel specification (known as the Auto Oil Program) which has also helped in the reduction in pollutants over the past fifteen years.

Table 10-8 Results of NO2 monitoring carried out by the EPA in Zone A

Year	Annual Mean NO2 ($\mu g/m^3$)	Annual No. of NO_2 Values Exceeding Hourly Limit for Protection of Human Health >200$\mu g/m^3$	Annual Mean NOx ($\mu g/m^3$)
2002	29	4	-
2003	34	2	-
2004	28	0	-
2005	28	1	-
2006	28	0	-
2007	28	0	-
2008	25	1	51
2009	28	2	55
2010	26	0	46
2011	25	1	46
2012	23	1	42
2013	19	1	33
2014	19	6	33
2015	20	0	34
2016	24	1	43
2017	21	1	38
Limit	40 Annual Limit for Protection of Human Health	18 No of samples not to exceed the year)	30 (Annual limit for protection of vegetation)
WHO Guideline	40	-	-

In addition to the EPA monitoring, DPC carries out a series of ambient air quality monitoring tests within the environs of the port to monitor ongoing trends and issues related to the port operation. The results of the monitoring of nitrogen dioxide (NO2) in the period 2014 to 2018 are presented in Table 10-9. Monitoring was undertaken using diffusion tubes at a series of 18 monitoring locations as shown in Table 10-1.

The table illustrates that there were a number of breaches in the EU annual average limit value at a number of monitoring stations (noted in yellow) in all years monitored. With the exception of one of these (A14 at the R131), all others where elevated levels were detected were within the footprint of the Dublin Port operation north of the Liffey and all are located in close proximity to the main port road network. The predominant source of this NO_2 in the port is road traffic and in particular the high volume of HGVs. It is noted that the ESB Generating plant is also a potentially significant source of NO_x with circa 54 tonnes emitted in 2017.

The elevated levels at A14, which is close to the residential areas of York Road and Pigeon House Road, are likely to be related to road traffic on the R131 and East Link Toll Bridge. Road traffic at lower speeds in proximity to the toll barrier will generate higher emissions that traffic operating at more efficient speeds.

At the other four locations south of the Liffey (A15 to A18) the annual averages are more in line with the levels reported by the EPA in Dublin City Centre (Winetavern Street and Coleraine Street). These locations are more representative of background Dublin air as these are not directly adjacent to major roads within the port.

Table 10-9 Results of ambient NO_2 monitoring undertaken in Dublin Port

Ref.	Location	Average NO_2 (µg/m^3)			
		2014/2015	2016	2017	2018
A1	Junction of Promenade Road and Bond Road	50.28	38.85	47.84	40.21
A2	Junction of Promenade Road and 1 Branch Road South	48.44	30.97	30.54	29.85
A3	North east perimeter of the Port	41.11	27.23	42.83	28.68
A4	Alexandra Road (Port entrance)	52.29	45.55	42.67	46.09
A5	Junction of Alexandra Road and 3 Branch Road South	52.95	38.24	38.26	42.06
A6	Junction of Alexandra Road and 2 Branch Road North	43.63	37.93	41.23	37.39
A7	Junction of Alexandra Road and Terminal Road North	55.38	32.99	47.45	35.60
A8	Alexandra Road Extension (eastern boundary of Port)	47.05	31.35	47.74	31.77
A9	Port lands adjacent to Tom Clarke Bridge	47.28	44.40	53.18	39.45
A10	Ocean Pier	45.17	36.03	41.22	31.07
A11	Breakwater Road South	44.11	37.20	40.96	35.66
A12	Adjacent to Berth 52	41.55	25.20	44.27	31.33
A13	Alexandra Road Extension (eastern boundary of Port)	48.72	30.30	43.63	31.43
A14	R131 (East Link Toll Booth)	48.26	36.85	44.08	41.41
A15	Southern shore of Estuary (adjacent to Hammond Lane)	35.12	29.05	27.66	29.73
A16	South Bank Road	30.65	25.58	30.70	28.49
A17	Coast road at Poolbeg Beach	30.16	20.17	28.02	19.79
A18	Coast road at Sean O'Casey Park	22.36	20.22	19.45	17.94
Annual Average Limit for the Protection of Human Health		**40**			
WHO Guideline		**40**			

10.1.9.2 Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate Matter (PM_{10} and $PM_{2.5}$) may be emitted as a primary pollutant from road vehicle exhausts, which is the main source in urban areas. In rural areas, sources will include traffic, agricultural activities and natural processes such as sea salt aerosol. Also point sources such as combustion, i.e. domestic fires, industrial boilers etc. are primary sources of PM_{10}. PM_{10} may also be formed as secondary pollutants from the condensation or reaction of chemical vapours in the atmosphere. Particulate Matter ($PM_{2.5}$) has similar effects on health as PM_{10}, however, $PM_{2.5}$ is a better indicator of anthropogenic (man-made) emissions. The results of the EPA network for the period 2002 to 2017 are presented in Table 10-10. As with NO_x, the PM_{10} and $PM_{2.5}$ data for Zone A shows compliance with the human health limits presented in Table 10-2. All sites in the Dublin area have been in full compliance with the human health limits for the past fifteen years and show a slight gradual decrease in annual emissions which is due to the legislation driven improvements in fuel and engine technology. It is also noted that since 2012 the aggregated Zone A data also shows levels below the WHO guidelines for air quality (Table 10-6) which are significantly lower than the statutory limits.

Table 10-10 Results of PM_{10} and $PM_{2.5}$ monitoring carried out by the EPA in Zone A

Year	Annual Mean PM_{10} (µg/m^3)	Annual no. of PM_{10} Values Exceeding 24 Hour Limit for Protection of Human Health >50µg/m^3	Annual Mean PM2.5 (µg/m^3)
2002	23	17	-
2003	23	25	-
2004	18	16	-
2005	16	5	-
2006	18	9	-
2007	15	5	-
2008	16	3	16
2009	16	3	10
2010	16	4	11
2011	15	9	11
2012	14	2	10
2013	17	56	10
2014	15	22	8
2015	14	39	6
2016	14	9	9
2017	12	20	8
Limit	**40 (Annual Limit for protection of human health)**	**35 (No of Samples not to exceed per year)**	**25 (Annual target value for the protection of human health)**
WHO Guideline	**20**	**-**	**10**

Monitoring for fine particulate matter (PM_{10} and $PM_{2.5}$) was undertaken by DPC at two locations within the port since 2014 and the annual average results of this monitoring are shown in Table 10-11. The results show that the levels of both pollutants within the port are below the limits for the protection of human health (refer Table 10-2) but are typically above the corresponding WHO guidelines (refer Table 10-6). However, the levels within the port are markedly higher that the EPA recorded levels in the greater Dublin area (Zone A) as shown in Table 10-10. This is likely as a direct result of the high volumes of diesel powered vehicles and HGVs operating within the port that are known to be higher emissions of particulate matter than the wider vehicle fleet in the public roads across Dublin. Sea salt aerosol would also be significant at coastal areas such as at the port. The ESB generating station would not be a significant source as particulate emissions from natural gas combustion are negligible.

Table 10-11 Results of ambient PM_{10} and $PM_{2.5}$ monitoring undertaken in Dublin Port

Ref.	Location	Average PM_{10} (µg/m^3)				Average $PM_{2.5}$ (µg/m^3)			
		2014/15	2016	2017	2018	2014/15	2016	2017	2018
D5	Breakwater Road South	26.4	26.4	24.8	27.9	17.4	14.0	6.8	12.2
D6	Port lands adjacent to Tom Clarke Bridge	28.2	31.4	34.6	29.8	16.9	18.3	11.0	11.4
Annual Average Limit for the Protection of Human Health		40				20			
WHO Guideline		20				10			

10.1.9.3 Sulphur Dioxide (SO_2)

The largest sources of SO_2 emissions are as a primary pollutant from fossil fuel combustion at power plants and other industrial facilities. Smaller sources of SO_2 emissions include industrial processes such as extracting metal from ore, and the burning of high sulphur containing fuels by locomotives, large ships, and non-road equipment. SO_2 is linked with a number of adverse effects on the respiratory system.

The levels in SO_2 in Dublin over the period 2002 to 2017 are presented in Table 10-12. The levels are low and less than 20% of the limit for the protection of human health (refer Table 10-2). These levels are decreasing annually and are low largely as a result of the ban on smoky coal under the Air Pollution Act, 1987 (Marketing, Sale and Distribution of Fuels) Regulations (1998-2011).

In addition, the sulphur content of fuels for road, non-road and marine fuels are heavily regulated through the following:

- SI 155 of 2011 - European Communities Act, 1972 (Environmental Specifications for Petrol, Diesel Fuels and Gas Oils for use by non-road mobile machinery, including inland waterway vessels, agricultural and forestry tractors, and recreational craft) Regulations 2011.
- SI No.119 of 2008 - Sulphur Content of Heavy Fuel Oil, Gas Oil and Marine Fuels.
- SI 156 of 2011 - European Communities Act 1972 (Sulphur Content of Heavy Fuel Oil, Gas Oil, and Marine Fuels) (Amendment) Regulations 2011.

Table 10-12 Results of SO_2 monitoring carried out by the EPA in Zone A

Year	Annual Mean SO_2 ($\mu g/m^3$)	Annual no. of SO_2 Values Exceeding 24 Hour Limit for Protection of Human Health >125µg/m^3	Annual no. of SO_2 Values Exceeding 1 Hour Limit for Protection of Human Health >350µg/m^3
2002	6.7	0	0
2003	7.4	0	0
2004	3.3	0	0
2005	3.2	0	0
2006	3.2	0	0
2007	2.5	0	0
2008	2.0	0	0
2009	2.7	0	0
2010	2.5	0	0
2011	2.4	0	0
2012	2.0	0	0
2013	2.4	0	0
2014	3.6	0	0
2015	1.6	0	0
2016	1.2	0	0
2017	1.7	0	0
Limit	20 (Annual limit for the protection of vegetation)	3 (No of samples not to exceed per year)	24 (No of samples not to exceed per year)

The results of the DPC monitoring of sulphur dioxide (SO_2) in the period 2014 to 2018 are presented in Table 10-13. Monitoring was undertaken using diffusion tubes at a series of 18 monitoring locations as shown in Figure 10-1. Unlike the NO_2 data, the SO_2 data around the port shows that all levels are well below the EU limit for the protection of ecosystems (refer Table 10-2). This is largely as a result of recent statutory driven reductions in the sulphur content of road fuels, shipping fuels and some home heating fuels. As such, there is a general downward trend in ambient SO_2 in recent years.

There is also less spatial variation in the data with a largely uniform dataset. The stations at the coast along the mouth of the estuary (A11, A12, A13, A15 and A17) show slightly higher levels than the others indicating a potential source of SO_2 within this area.

There are no major sources of SO_2 associated with the port given the above restrictions on fuel specification and type. While there is a generating station adjacent to the site, this is powered by natural gas with low sulphur emissions.

It is notable that the levels in the port area are generally higher than those recorded by the EPA in Dublin City Centre as shown in Table 10-12.

Table 10-13 Results of ambient SO_2 monitoring undertaken in Dublin Port

Ref.	Location	Average SO_2 ($\mu g/m^3$)			
		2014/2015	2016	2017	2018
A1	Junction of Promenade Road and Bond Road	1.85	0.98	1.07	1.62
A2	Junction of Promenade Road and 1 Branch Road South	1.78	1.84	4.34	2.42
A3	North east perimeter of the Port	2.56	2.41	2.55	2.59
A4	Alexandra Road (Port entrance)	1.69	2.26	1.17	2.30
A5	Junction of Alexandra Road and 3 Branch Road South	2.66	3.07	1.56	3.82
A6	Junction of Alexandra Road and 2 Branch Road North	3.78	4.04	4.03	6.52
A7	Junction of Alexandra Road and Terminal Road North	4.33	3.18	3.55	4.17
A8	Alexandra Road Extension (eastern boundary of Port)	2.40	2.52	3.29	2.85
A9	Port lands adjacent to Tom Clarke Bridge	1.46	2.34	1.10	2.24
A10	Ocean Pier	3.28	2.59	2.07	3.32
A11	Breakwater Road South	5.19	3.45	3.19	5.55
A12	Adjacent to Berth 52	5.07	3.34	1.53	1.74
A13	Alexandra Road Extension (eastern boundary of Port)	5.87	2.00	2.64	3.19
2.08A14 2.34	R131 (East Link Toll Booth)	1.81	1.77	1.17	2.12
A151.77	Southern shore of Estuary (adjacent to Hammond Lane)	3.59	2.34	1.32	2.68
A16	South Bank Road	1.31	1.77	1.06	2.54
A17	Coast road at Poolbeg Beach	4.84	2.08	4.27	3.19
A18	Coast road at Sean O'Casey Park	1.25	1.34	1.19	1.67
Annual Average Limit for the Protection of Human Health		**20**			

10.1.9.4 Carbon Monoxide (CO)

Carbon monoxide is produced from the partial oxidation of carbon-containing compounds (i.e. organic fuels such as coal, oil, petrol, diesel, wood, etc.) during the combustion process. CO forms when there is not enough oxygen to produce carbon dioxide (CO_2). As such, CO is a primary pollutant from all combustion process including vehicle exhausts, shipping exhausts, domestic heating, etc. The extent of CO emissions depends on the fuel type and the combustion conditions. Once inhaled. CO is quickly absorbed into the bloodstream from the lungs. Then it combines with haemoglobin in the blood to form carboxyhaemoglobin. This reduces the ability of the blood to carry oxygen around the body and it robs the heart, brain and other vital organs of oxygen.

Annual average levels of CO in Dublin are presented in Table 10-14. Recent levels are less than 10% of the limit value (refer Table 10-2) and show a gradual decrease annually. CO will be emitted by the natural gas generating station in Dublin Port as well as from the road/rail/shipping activities.

Table 10-14 Results of CO monitoring carried out by the EPA in Zone A

Year	Annual Mean CO (mg/m^3)	Annual no. of CO Values Exceeding Hourly Limit for Protection of Human Health >10mg/m^3
2002	0.7	0
2003	0.4	0
2004	0.6	0
2005	0.6	0
2006	0.5	0
2007	0.3	0
2008	0.4	0
2009	0.3	0
2010	0.3	0
2011	0.3	0
2012	0.4	0
2013	0.3	0
2014	0.3	0
2015	0.2	0
2016	0.3	0
2017	0.3	0
Limit	10 (8-hour limit for protection of human health)	No of Samples not to exceed per year

10.1.9.5 Volatile Organic Compounds (VOCs)

VOCs such as benzene (a known human carcinogen) are emitted directly from petrol fuelled vehicles. Other VOCs are also emitted from petrol exhausts (toluene, ethylbenzene, xylenes). VOCs have varying sources and properties and only benzene has a limit for the protection of human health in the legislation (Table 10-2). The EPA monitor for benzene and other VOCs in Rathmines and these results are presented in Table 10-15. Benzene levels in Dublin are low and well below the limit for the protection of human health (refer Table 10-2) and have remained low for the last ten years. Levels of the other VOCs in Dublin have also remained stable in the last seven years but there is no limit designated as the standard for the protection of human health.

Existing sources of VOCs from the current operations at Dublin Port include road/rail and shipping traffic as well as fuel/solvent handling and storage from the adjoining Seveso sites.

Table 10-15 Results of VOC monitoring carried out by the EPA in Zone A

Year	Annual Mean Benzene (μg/m^3)	Annual Mean Toluene (μg/m^3)	Annual Mean Ethylbenzene (μg/m^3)	Annual Mean m/p-Xylene (μg/m^3)	Annual Mean o-Xylene (μg/m^3)
2002	2.5	-	-	-	-
2003	1.1	-	-	-	-
2004	1.3	-	-	-	-
2005	0.5	1.2	0.1	0.4	0.1
2006	2.7	6.5	0.8	2.6	0.7
2007	2.8	5.1	0.5	1.4	0.4
2008	0.9	6.1	0.3	0.5	0.2
2009	0.8	2.7	-	3.0	0.4
2010	0.8	2.3	0.3	0.5	0.1
2011	1.6	3.6	0.4	1.5	0.5
2012	1.2	3.5	0.5	1.8	0.4
2013	0.94	1.9	0.31	1.48	0.35
2014	0.94	2.07	0.28	1.61	0.41
2015	0.92	1.88	0.16	0.8	0.22
2016	1.01	2.07	0.20	0.93	0.22
2017	0.92	2.30	0.22	1.29	0.29
Limit	5 (Annual limit for protection of human health)	NA	NA	NA	NA

10.1.9.6 General Dusts

Monitoring for dusts (general particulate matter) was undertaken by DPC at four locations within the port between 2014 and 2018 and the results of this monitoring are shown in Table 10-16. The results of the monitoring in the port area north of the Liffey (D1, D2 and D4) show levels below the TA Luft Guideline for dust nuisance which would indicate that dust levels within the port are not currently causing an adverse impact.

The location on the south of the estuary (D3) shows a level considerably higher than the guideline in 2014/2015 indicating a potential adverse dust impact in this area. It is noted that the Hammond Lane and Ecocem sites are in close proximity to this monitoring station and these operations may contribute to the dust levels recorded. It is noted that these levels have reduced significantly through the monitoring period and show compliance in 2018.

Table 10-16 Results of dust deposition monitoring undertaken in Dublin Port from 2014 to 2018

Ref.	Location	Annual Average Dust Deposition Rate (mg/m²/day)			
		2014/2015	2016	2017	2018
D1	3 Branch Road South	221	241	266	176
D2	Ocean Pier	220	280	287	286
D3	Southern shore of Estuary	528	483	404	325
D4	Junction of Alexandra Road and 2 Branch Road North	292	301	300	257
TA Luft Guideline for non-hazardous dusts		350			

10.1.10 Baseline Climate

10.1.10.1 National Baseline

The weather in Ireland is influenced by the Atlantic Ocean, resulting in mild, moist weather dominated by maritime air masses. The prevailing wind direction is from a quadrant centred on west-southwest. These are relatively warm winds from the Atlantic and frequently bring rain.

Easterly winds are weaker and less frequent and tend to bring cooler weather from the northeast in spring and warmer weather from the southeast in summer. The site of the MP2 Project on the east coast would experience a higher frequency of easterly winds than more inland locations or those on the west coast.

The nearest meteorological station to the area is the Met Éireann Station in Dublin Airport which lies approximately 9km north of the subject site. The 30-year averages from the station at Dublin Airport are presented in Table 10-17.

Table 10-17 30-year Average Meteorological Data from Dublin Airport (Annual Values from 1981-2010, source: www.met.ie)

Parameter	30-year Average
Mean Temperature (0C)	9.8
Mean Relative Humidity at 0900 UTC (%)	83.0
Mean Daily Sunshine Duration (hours)	3.9
Mean Annual Total Rainfall (mm)	758.0
Mean Wind Speed (knots)	10.3

The prevailing wind direction for the area is between west and southwest as presented in the windrose for Dublin Airport Met Station for 1942 to 2010 in Figure 10-2. Northerly winds tend to be very infrequent (less than 5%) with easterly winds marginally more frequently (5-10%).

Wind characteristics are typically moderate with relatively infrequent gales (average only 8.2 days with gales per annum).

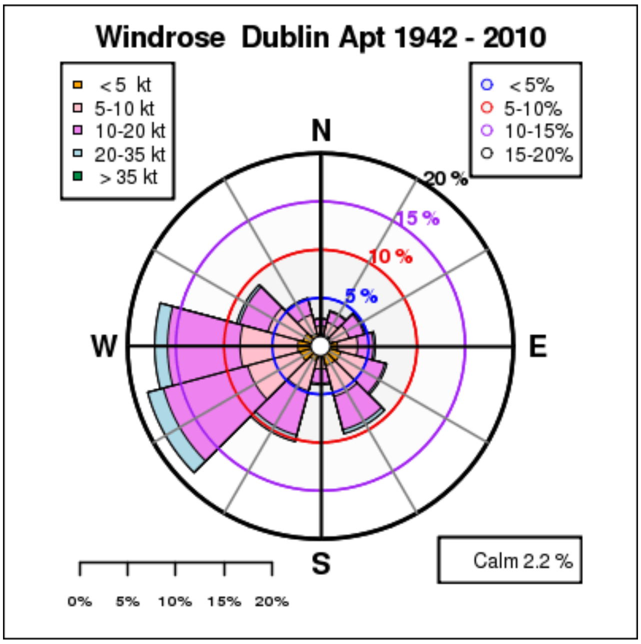


Figure 10-2 Windrose for the Dublin Airport Met Station 1942 to 2010 (source:www.met.ie)

As a direct result of global climate change the baseline climate in Irelands is predicted to undergo some change with observed and projected physical climate changes predicted including the following:

- Increase in average temperature (surface air temperature, sea surface temperature);
  - Projections for mid-century indicate an increase of 1–1.6°C in mean annual temperatures
  - The largest increases will be seen in the east of the country.

  - Warming is enhanced for the extremes (i.e. hot or cold days), with the warmest 5% of daily maximum summer temperatures projected to increase by 0.7–2.6°C.
  - The coldest 5% of night-time temperatures in winter are projected to rise by 1.1–3.1°C.
  - The number of frost days is projected to decrease by over 50%.
- Changes in precipitation patterns;
  - Significant decreases in average precipitation amounts are projected for the spring and summer months as well as over the full year.
  - These drier conditions are projected to be more pronounced in the summer, with "likely" reductions in rainfall ranging from 0% to 20%
  - The frequencies of heavy precipitation events show notable increases (approximately 20%) over the year as a whole, and in the winter and autumn months.
  - The number of extended dry periods (is also projected to increase substantially by mid-century. The projected increases in dry periods are largest for summer, with "likely" values ranging from 12% to 40%.
- Ongoing mean sea level rise;
- Changes in the character of weather extremes such as storms, flooding, sea surges and flash floods.
  - The overall number of North Atlantic cyclones is projected to decrease by approximately 10%. The projected decrease in overall cyclone activity is consistent with a projected increase in average mean sea-level pressure of approximately 1.5 hPa for all seasons by mid-century.

10.1.10.2 Dublin Port Carbon Footprint

DPC publishes an annual Sustainability Report to track and record progress on the ports environmental responsibilities. As part of the 2017 Sustainability Report, DPC commenced a carbon footprint inventory of all port emission sources. This is to generate awareness in the maritime community for the need for action regarding greenhouse gas emissions and to make available information on the effects on climate change. This information allows DPC to establish initiatives and set ambitious targets to reduce emissions. The calculated footprint for the period 2009 to 2017 is presented in Table 10-18.

The 2017 results indicate that the main emission sources are electricity use (at 36% of the total) and transport fuels (at 51% of the total) followed by space heating (at 13%). Emissions associated with electricity use are largely stable in the period from 2009 to 2015 with reductions in 2016 and 2017 which is very positive relative to the growing throughput in the port indicating some decoupling of the emissions. However, the emissions from transport fuels are generally increasing in line in this period with the increased throughput at the port and the contribution of transport related GHG to the port's footprint is increasing.

The trend in the period 2009 to 2017 shows a significant degree of fluctuation with annual emissions within the range 3,800 to 4,600 tonnes of CO_2 per annum. The overall trend shows a downward trajectory as a result of the reduced electricity and gasoil emissions which offset the observed increases in transport emissions.

Table 10-18 Dublin Port Company Carbon Footprint 2009-2017

Category	Energy Type	Unit	2009	2010	2011	2012	2013	2014	2015	2016	2017
Electricity	Net Electricity Imports	Tonne CO_2	2,103	2,307	2,044	2,240	2,054	1,845	1,873	1,795	1,398
Gas	Natural Gas	Tonne CO_2	59	73	60	79	167	139	149	155	130
Heating Oils	Kerosene	Tonne CO_2	20	21	20	10	20	20	21	32	37
	Gasoil	Tonne CO_2	614	573	687	626	434	361	395	360	340
Transport Fuels (Mineral Oil Fuels)		Tonne CO_2	1,165	1,598	1,205	1,253	1,541	1,648	1,899	1,848	1,981
Transport Biofuels		Tonne CO_2	0	0	0	0	0	0	0	0	0
Total Tonnes CO_2 Emissions		Tonne CO_2	3,962	4,573	4,015	4,209	4,216	4,013	4,337	4,189	3,886
Throughput		`000 Tonne`s	26,50	28,11	28,11	27,98	28,84	30,85	32,83	-	36.42

DPC and Sustainable Energy Authority of Ireland (SEAI) signed a joint energy efficiency agreement in 2012. As a member of the Public Sector Energy Partnership Programme, the agreement means that DPC and SEAI will work in partnership to achieve a target of 33% energy efficiency improvements by 2020 relative to its baseline year of 2009. As of December 2017, DPC has achieved a 24.3% improvement in energy performance. In order to meet the 2020 target of a 33% energy efficiency improvement DPC needs to achieve a 4.3% improvement each year, between 2018 and 2020 across its major energy consumers.

10.1.11 'Do-Nothing' Scenario

The EIA Regulations require a description of the relevant aspects of the current state of the environment (baseline scenario) as well as and an outline of the likely evolution thereof without the development. In this EIAR this scenario is referred to as the 'Do-Nothing' Scenario and the evolution of the air quality and climate baseline in the absence of the proposed development is presented within this section.

The baseline air quality trends shown for the Dublin area from 2002 to 2017 presented in Section 10.3.4 show a gradual decline for all pollutants on an annual basis. These gradual decreases are based on the implementation of a series of national and EU driven policies and legislation on emissions from road traffic, industrial emissions and space heating. The EPA reports do highlight the main challenges of reducing air pollution from key sources such as particulate matter emissions from solid fuel burning (e.g. peat, coal and wood) in the residential sector and NOx emissions from vehicles in the transport sector.

In the future, the Government's proposed 'National Clean Air Strategy' for Ireland is expected to propose further policy solutions to address the major public health and environmental challenges posed by air pollution to Ireland which is anticipated to enable the further improvements in ambient air quality with the objective of achieving compliance with the WHO Guidelines.

Ongoing reductions is tailpipe emissions from the Auto Oil program will lead to a continual reduction in emissions per fleet vehicle in Ireland as newer Euro 6/VI vehicle, hybrids and electric vehicles replace older vehicles. This decrease may be offset by the increased number of vehicles in the fleet and/or a reduction on the efficiency on the road network.

Industrial, energy and space heating emissions are expected to show a gradual decrease through greater regulation from a range of EU and national policies, targets and strategies on emissions reductions and demand management.

Within the Dublin Port area, the ambient air quality levels presented for the period 2015 to 2018 show a trend of a largely stable baseline with little or no significant increase/decrease in ambient air quality levels monitored. It is noted that DPC has been granted planning permission for works to the port's private internal road network which includes works on public roads at East Wall Road, Bond Road and Alfie Byrne Road consisting of construction of new roads and enhancements to existing roads within the Dublin Port estate north of River Liffey. This development is currently being implemented by DPC and has been designed to improve efficiencies in traffic movement within the port and therefore reduce congestion. This increased efficiency and reduced congestion may result in a potential reduction in emissions from road traffic within the port in future years.

In addition, DPC is currently developing an initiative with the haulier companies operating in the port to provide the necessary Compressed Natural Gas (CNG) fuelling infrastructure across the port to facilitate the future trend for HGVs to change fuel from diesel to CNG. CNG emissions are significantly lower than the corresponding diesel fuelled vehicles and this represents a potential significant emissions reduction strategy. The European Environment Agency 'EMEP/EEA air pollutant emission inventory guidebook 2016' (Update Jul. 2018), published a series of default emission factors for various sources and Table 10-19 shows the published emission factors of key pollutants from diesel and CNG fuelled heavy vehicles. The table illustrates the significant reduction in emission per kg of fuel used with CNG relative to diesel with a 61% reduction in NOx, a 98% reduction in PM and a more modest reduction in greenhouse gases (CO_2) at 13%.

Table 10-19 Tier 1 Emission Factors for Diesel and CNG from HGVs

Pollutant	Diesel	CNG
NO_x (g/kg fuel)	33.37	13.00
PM (g/kg fuel)	0.94	0.02
CO_2 (kg/kg fuel)	3.169	2.743

In the event that this scheme is a success with a significant uptake of the CNG fuel by hauliers, then the existing port baseline air quality will likely result in a significant decrease in NO_X and PM levels measured at the port.

In the absence of the proposed development, the evolving baseline DPC carbon footprint presented in Section 10.3.5 is predicted to continue the trends presented in Table 10-18 with a general increase on transport related emissions as a result of increased throughput associated with the port Masterplan. As shown in Table 10-19, the use of CNG in haulage vehicles can result in a slight reduction in CO_2 emissions per vehicle the resultant impact of this measure will depend on the uptake of hauliers for this fuel.

DPC has proposed port specific mitigation with a view to reducing emissions while vessels are berthed at the port. DPC propose to provide shore to ship power (SSP) on berths 52 and 53 for vessels at these berths. This will facilitate powering of the berthed vessels by the national grid which will allow the vessel to turn off their main and auxiliary engines for the duration of berthing. This reduces direct GHG emissions from the ships while in port. These emissions are not currently accounted for in the carbon footprint presented in Table 10-18. As a result of this measure, the electricity use at the port will increase resulting in a net increase in the electricity generation emissions recorded in the footprint. However, it is important to note that the net impact will be positive in terms of climate whereby existing shipping emission in port will be offset through the use of electricity. Under the EU Renewable Energy Directive (2009/28/EC), Ireland has committed to meet a national target through 40% renewable electricity by 2010 (with 2030 and 2050 targets to be agreed). With the decarbonisation of the electricity generation market, the use of electrical SSP will present a net positive relative to the use of ship engines. While this measure will lead to an increase in the baseline footprint presented in Table 10-18, there would be a slight net reduction in emissions on a national level.

In terms of the evolving national baseline, the EPA estimate emissions to 2035 using two scenarios as follows:-

- "With Existing Measures" - scenario assumes that no additional policies and measures, beyond those already in place by the end of 2016 (latest national greenhouse gas emission inventory), are implemented.
- "With Additional Measures" –scenario assumes implementation of the With Measures scenario in addition to progressing of renewable and energy efficiency targets for 2020.

The latest EPA projections (May 2018) indicate that under the "With Measures" scenario, transport emissions are projected to increase by 18% in the period 2017 to 2020 to 14.55 Mt CO_{2eq} and 20% over the period 2017-2030 to 14.75 Mt CO_{2eq}.

Under the "With Additional Measures" scenario, transport emissions are projected to increase by 17% over the period 2017 – 2020 to 14.39 Mt CO_{2eq} and a similar increase over the period 2017-2030 to 14.32 Mt CO_{2eq}

Based on these trends, the transport sector is the one facing the greatest challenge in achieving the emissions reductions set out in the National Policy Position.

10.4 Impact Assessment

10.1.12 Construction Stage

10.1.12.1 Construction Dust

In accordance with the NRA Guidelines, where there are construction activities at a development site, there is a risk that dust may cause an impact at sensitive receptors in close proximity to the source of the dust generated. These distances are presented in Table 10-20 (source NRA Guidelines, May 2011 Revision).

Table 10-20 NRA Assessment Criteria for the Impact of Dust Emissions from Construction Activities, (with standard mitigation in place)

Source		Potential Distance for Significant Effects (Distance from Source)		
Scale	Description	Soiling	PM_{10}	Vegetation Effects
Major	Large Construction sites, with high use of haul routes.	100m	25m	25m
Moderate	Moderate Construction sites, with moderate use of haul routes.	50m	15m	15m
Minor	Minor Construction sites, with minor use of haul routes.	25m	10m	10m

It is important to note at the outset that one of the principal factors affecting dust generation and dust deposition relates to moisture content. Moisture increases the mass of a dust particle meaning particles are less friable and hence, less prone to dust dispersion. In most construction projects, the principal means of dust suppression is through maintaining a high moisture level on dust particles. In the case of the proposed works at Dublin Port, all dredged material will inherently have high moisture content and hence a lower risk of dust impact.

The proposed construction phase is a presented in Chapter 2 of this EIAR and includes details of the main tasks and durations. In summary, the following are the main activities with relevance to air quality and dust impact:

- Demolition of Terminal 2 building, Terminal 5 building, Terminal 5 Check-in, Terminal 5 Sheds (3 no.), Terminal 1 Car Check in booths.
- Dredging of sediments from the navigation channel which will be disposed of at sea under permit from the EPA.

The dredging operations are considered very low risk for dust impacts given that this material will have very high moisture content (circa 50% by weight). This is also the case for the transport of this material. As such, these operations are considered to have negligible dust impacts and are not considered further in this assessment.

The area of the construction site of the MP2 Project is categorised as “major” and hence, as per the NRA Guidelines, any receptor within 100 metres of the site has the potential for adverse effects from construction dusts. Given the nature of the port and the distance to and sensitive receptors, there are no properties located within this impact zone. As a consequence, construction dust from the MP2 Project will be "**negligible**" for the duration of the works.

The dispersion model presented in the EIS for the ABR Project illustrated that the operation of the dredge spoil treatment facility, coupled with infilling and general site construction for that project will not have an adverse impact on sensitive receptors in the area around Dublin Port. All concentrations of dust and metals will remain within the relevant limits and guidelines for the protection of human health. In all cases the results showed only a marginal increase on the existing background levels in the area as a result of these works.

Both of the construction phases of the MP2 Project and ABR Project will run concurrently and hence there is potential for cumulative impact relating to construction dust. However, given the marginal to negligible impacts presented in both analyses, the cumulative impact of construction dust is considered "**negligible**". Furthermore, DPC are required to carry out dust deposition monitoring within the port to demonstrate compliance with the TA Luft Guideline (350mg/m^2/day) under Schedule B.3 of the IE Licence (P1022-01).

10.1.12.2 Construction Odour

There is a relatively low potential for odour generation and nuisance to occur during the construction phase. The potential exists where decayed organic material has the potential to release sulphurous compounds (such as H_2S) or where solvent contamination is uncovered.

Both of these sources will potentially be released under water during the dredging operations. Low levels or organic solvents are predicted in the dredged material and any vapour released 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). In both cases the impact to air quality and climate is considered **"negligible".**

10.1.12.3 Construction Traffic

Construction traffic will arrive and depart the port via the national road network (M1, East Wall Road, etc.). All HGV movements will be in compliance with the Dublin City Council HGV Management Strategy. Within the North Port Estate, traffic will be routed through the existing road network to reach the MP2 Project application boundary. Traffic within the proposed site will be diverted in a phased manner to ensure the existing facilities at Terminal 1 and Terminal 2 remain operational with minimal impact.

An indicative Construction Programme for the MP2 Project (as shown in Chapter 3) has been used to determine the anticipated construction traffic on the road network. The peak HGV traffic volume will occur Q3 2030. There will be an average daily traffic over this period of 57 HGV movements per day, based on a 5-day working week. The peak week within the proposed construction stage will be Q4 2030 where on average there will be 81 HGV movements per day. This would incorporate a peak of 17 HGV movements each way per hour between 7am and 8 am. Both the DMRB and the NRA Guidelines state that air quality impacts from changes in road traffic volumes may be significant and should be assessed where the traffic volumes show an increase or decrease in traffic emissions of 5-10% or more. The traffic analysis indicates that current traffic volumes on the East Wall Road are 15,622 AADT and hence the 81 traffic movements equates to circa 1% of the East Wall Road volumes. In this regard, employing the DMRB/NRA criteria the construction traffic volumes will not be significant and the resultant air quality impact from construction traffic is **"negligible".**

10.1.12.4 Construction Greenhouse Gases

Emissions of construction generated GHG will arise from embodied emissions in site materials, direct emissions from plant machinery/equipment as well as emissions vehicles delivering material and personnel to the construction site. These emissions have been estimated using the Environment Agency (EA) *Carbon Calculator for Construction Sites* and the results are presented in Table 10-21.

Table 10-21 Summary of Greenhouse Emissions for Construction Phase

Item	Estimated GHG Emissions (tCO_2eq)
Quarried Material	1,250
Concretes	10,561
Metals	15,400
Plant Emissions	3,176
Site Accommodation	594
Material Transport	6,034
Personnel Transport	1075
TOTAL	**38,090**

The total estimated greenhouse gas emissions associated with the proposed construction of the development is calculated at 38,090 tonnes of CO_{2eq}. The construction of the MP2 Project will result in a "**permanent slight adverse impact**" for climate.

The management of GHG emissions through the construction stage will be carried out in accordance with the principles of PAS 2080 *Carbon Management in Infrastructure* (2016) through the following stages:

- Quantification of GHG Emissions;
- Target setting, baseline setting and monitoring;
- Reporting; and
- Continual Improvement.

Using this management tool will help to manage the potential for emissions.

10.1.13 Operation Phase

10.1.13.1 Operation Phase Road Traffic

Road traffic from the MP2 Project can impact directly on local air quality and any sensitive receptors that are located adjacent to the local road network may experience the impacts to local air quality. Traffic on the road network is predicted to increase during the operation stage in line with the increased throughput of cargo and passengers as predicted under the Masterplan. Given the main traffic routes on the existing network and the locations of residential areas along these routes, the following links have been assessed using the DMRB local model:

- R1: Residential Properties along Royal Oak Housing, Santry to quantify the impacts for properties along the M1 exiting the Dublin Port Tunnel.
- R2: Residential Properties along East Wall Road close to the port entrance
- R3: Residential Properties along Sherriff Street Upper
- R4: Residential Properties along Pigeon House Road to quantify the impacts from traffic on the East Link toll road

The results of the analysis for all four receptors are presented in Table 10-22.

Table 10-22 Local Impact to Air Quality as a result of Operational Traffic

Property Group	Scenarios	Nitrogen Dioxide ($\mu g/m^3$)	Particulate Matter (PM10) $\mu g/m^3$	
		Annual Average NO2	Annual Average PM10	No. of Days >50 $\mu g/m^3$
R1 Royal Oak Housing (Santry)	2018 Existing	24.70	15.19	0.14
	2026 Do-Minimum	24.85	15.22	0.15
	2026 Do-Something	25.07	15.28	0.15
	2040 Do-Minimum	25.05	15.27	0.15
	2040 Do-Something	25.89	15.51	0.19
R2 Residential Housing on East Wall Road	2018 Existing	23.26	15.36	0.17
	2026 Do-Minimum	23.29	15.4	0.17
	2026 Do-Something	23.45	15.47	0.18
	2040 Do-Minimum	23.43	15.49	0.19
	2040 Do-Something	24.03	15.77	0.25
R3 Apartments on Sheriff Street Upper	2018	21.76	14.61	0
	2026 Do-Minimum	21.90	14.68	0
	2026 Do-Something	22.15	14.77	0
	2040 Do-Minimum	22.15	14.79	0
	2040 Do-Something	23.24	15.22	0.15
R4 Residential Houses on Pigeon House Road	2018	24.80	15.76	0.25
	2026 Do-Minimum	24.81	15.80	0.26
	2026 Do-Something	25.04	15.89	0.28
	2040 Do-Minimum	24.98	15.91	0.29
	2040 Do-Something	25.82	16.27	0.41
Statutory Limits		40	40	25

The results indicate that all levels of pollutants are predicted to remain within the limits for the protection of human health along each of these routes even with the full predicted growth in traffic by 2040. Using the NRA significance criteria (as outlined in Table 10-3) the predicted increases associated with the MP2 Project relative to the "do-minimum" scenario are classed as "imperceptible" to "small". While the levels remain below the relevant limits these increases and air quality impact from this traffic are classed as "**negligible**". This includes for the wider masterplan traffic and hence the cumulative traffic impact on air quality is also considered "**negligible**".

In accordance with the UK DMRB, the regional impact of the proposed operational road traffic has been assessed in terms of the total mass of CO_2 emitted and the results are presented in Table 10-23. This assessment covers the wider road network employed by the traffic and not simply the roads within the port.

Table 10-23 Total Emissions from the Operational Road Traffic

Scenario	Carbon Dioxide (CO_2) (tonnes)
2026 Do-Minimum	37,796
2026 Do-Something	42,904

The results of the assessment indicate that the total GHG emissions as CO_2 from the 2026 Do-Something Scenario will increase with the proposed development in operation. This approximate 13% increase equates to 5,108 tonnes of carbon dioxide per annum in 2026 compared to the Do-Nothing scenario. These impacts are considered as "**permanent slight adverse impact**".

10.1.13.2 Operation Phase - Shipping Emissions

The long term development of the Port was established by the Dublin Port Masterplan 2012-2040 which was published in February 2012 and then reviewed and updated in June 2018. Under the Masterplan shipping volumes at the port are predicted to increase annually at an average annual growth rate of 3.3% from 2010 to 2040 .

Specifically, the MP2 Project will deliver additional capacity for both the Ro-Ro and Lo-Lo modes through the following:

- Construction of a new Ro-Ro jetty (Berth 53).
- A reorientation of the already consented Berth 52.
- A lengthening of an existing river berth (50A) to provide the DFT Container Terminal with additional capacity to handle larger container ships.
- Redevelop Oil Berth 3 as a future deep water container berth (-13.0m CD) for the DFT Container Terminal.

The total cargo shipping volumes from 2010 and projected for the MP2 Project in 2040 and the overall Masterplan in 2040 are presented in Table 10-24. The total predicted increase in capacity over the 30 years under the 2040 Masterplan is 77.2 million tonnes by 2040 relative to the 28.9 million tonnes in 2010. The MP2

Project will provide 32.1% of the increase in capacity required with a projected capacity of an addition 15.5 million tonnes by 2040.

Table 10-24 Total Shipping Volumes 2010 (Baseline), 2014 (MP2 Project) and 2040 (Masterplan)

Cargo Type	2010 Actual Volumes	MP2 Project 2040 Projected Volumes	Masterplan 2040 Projected Volumes
Ro-Ro ('000 units)	701	1,165	2,249
Ro-Ro Sailings per day	13.0	14.6	18.0
Lo-Lo ('000 TEU)	641	1,091	1,574
Lo-Lo Sailings per week	7.4	8.6	11.0
Total tonnes	**28,879,000**	**44,379,000**	**77,157,000**
Total Sailings per annum	**5,130**	**5,776**	**7,142**

This change in shipping capacity will have a potential to impact the existing shipping emissions and due to the nature of shipping this will be a direct transboundary impact. However, it is important to note that the proposed increased tonnages to 2040 will be accommodated on larger vessels whereby an increased number of units can be accommodated on any vessel. As shown in Table 10-24, while the tonnages handled at the port are projected to increase by 167% with the Masterplan, the number of sailings will only increase by 39% illustrating the projected efficiency.

The projected changes in shipping numbers associated with the MP2 Project and cumulatively with the overall Masterplan to 2040 are presented in Table 10-25. The results indicate an increase in shipping emissions associated with the MP2 Project as a result of the increased Ro-Ro and Lo-Lo shipping numbers and cumulatively, a further associated increase with the shipping predicted under Masterplan 2040.

These predictions conservatively assume no future reductions in emissions through improved fuel or engine technology (e.g. such as shore side power to vessels). The results indicate that by 2040, the 2010 emissions will have increased by a factor of 13% as a result of the MP2 Project and 39% as a result of the wider Masterplan shipping traffic. This is considered to be a "long term and permanent slight adverse impact" and transboundary in nature.

Table 10-25 Total Shipping Emissions 2010 (Baseline), 2014 (MP2 Project) and 2040 (Masterplan)

Scenario	Total NO_x per annum (tonnes)	Total VOCs per annum (tonnes)	Total TSP per annum (tonnes)
2010	19,818	707	379
MP2 Project 2040	22,314	796	426
Masterplan 2040	27,593	984	527

Note: Emissions based on Tier 1 emission factors for ships using marine diesel oil/marine gas oil.

EU Directives are in force which relate to the content of sulphur in marine gas oil (EU Directive 93/12 and EU Directive 1999/32) and the content of sulphur in heavy fuel oil used in SECA (EU-Directive 2005/33).

The Marine Environment Protection Committee (MEPC) of IMO has approved amendments to Marpol Annex VI in October 2008 in order to strengthen the emission standards for NO_x and the sulphur contents of heavy fuel oil used by ship engines.

The current Marpol 73/78 Annex VI legislation on NO_x emissions, formulated by IMO (International Maritime Organisation) is relevant for diesel engines with a power output higher than 130 kW, which are installed on a ship constructed on or after 1 January 2000 and diesel engines with a power output higher than 130 kW which undergo major conversion on or after 1 January 2000.

The Marpol Annex VI, as amended by IMO in October 2008, considers a three tiered approach as follows:

- Tier I: diesel engines (> 130 kW) installed on a ship constructed on or after 1 January 2000 and prior to 1 January 2011;
- Tier II: diesel engines (> 130 kW) installed on a ship constructed on or after 1 January 2011;
- Tier III (1): diesel engines (> 130 kW) installed on a ship constructed on or after 1 January 2016.

Given the existing legal requirements around fuel and emissions for shipping, the extent of emissions per vessel are gradually reducing and will continue to reduce in future years. As such, the analysis presented in Table 10-19 should be considered a conservative worst case estimate.

10.1.13.3 Climate Change Adaption

In terms of the risk of major disasters which are relevant to the project, given the coastal nature of the port, the main potential risks include climate induced sea level rise and flooding. The first climate adaptation plan for the transport sector, *Developing Resilience to Climate Change in the Irish Transport Sector*, was published in November 2017 by the Department of Transport, Tourism and Sport (DTTAS). The plan outlines climate research and analysis on the likely impacts of climate change for transport – including more frequent storm events, rising sea levels and increased incidents of flooding. In particular for ports, the plan notes the following potential impacts:

- Sea level rise and increased occurrence of coastal storms will put port infrastructure at risk;
- Damages to port infrastructure from freezing weather events;
- Service disruption; and
- Changing patterns of siltation.

A flood risk assessment of the proposed development is presented in Chapter 9 of this EIAR which states that the risk to the MP2 Project site is from tidal flooding from the River Liffey. The analysis determines that all of the proposed land uses within the MP2 Project site can be considered as 'Water-compatible development' and this type of development is considered appropriate in all flood zones. While the combination of risk and vulnerability is such that the development is generally acceptable, the risk remains and it may change during the lifetime of the development. Therefore mitigation measures have been considered that will reduce this risk and allow for adaptation of the development to future climate change. The relevant mitigation includes the following:

- Berth 53, Berth 50A and Oil Berth 3 are proposed at levels in excess of the 0.5% AEP tidal level of 3.33m, and provides some 1.25m for climate change and freeboard with wave regime. As such, no further mitigation measures are proposed for these structures.
- The New Quay Wall at Jetty Road will flood during a 0.5% tidal event; however there will be no permanent damage caused due to the flooding and as such, no mitigation measures are proposed.
- Sections of the vehicle parking area at the Unified Ferry Terminal (UFT) Area are at risk of flooding in a 0.5% AEP event. A series of management measures have been proposed to mitigate the potential for flood impact in this area.
- The finished floor level of the Existing Passenger Terminal 1 Building is 3.37m OD. This is above the predicted 0.5% AEP flood level of 3.33m OD, with little allowance for climate change or freeboard with wave climate. Flood proofing measures such as the use of demountable flood barriers on all external doors are proposed.

10.1.14 Mitigation Measures

10.1.14.1 Construction Dust

A Construction Environmental Management Plan (CEMP) has been prepared and contains measures to mitigate construction dust emissions during the construction phase. The dust mitigation measures will be based upon the industry guidelines in the Building Research Establishment document entitled ‘Control of Dust from Construction and Demolition Activities’. The CEMP provides additional safeguards to the receiving environment and appraises the efficacy of the mitigation measures implemented to address any potential environmental effects 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 potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations.

The Construction Environmental Monitoring Programme includes the following elements related to air quality and climate control:

- 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 HGVs and other site vehicles exiting the site will make use of a wheel wash facility prior to entering onto Dublin Port estate roads and public roads, to ensure mud and other wastes are not tracked onto the roads. Wheel washes will be self-contained systems that do not require discharge of the wastewater to water bodies;

- 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;
- 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;
- It will be required that all vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum; and
- Monthly monitoring of dust deposition levels each month for the duration of construction for comparison with the guideline of 350mg/m^2/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.

In the event that the mitigation measures as outlined are implemented in the construction phase as set out in the application documentation, the levels of dust generated are assessed to be minimal and are unlikely to cause an environmental nuisance.

10.1.14.2 Construction Phase - Odour

In addition to construction dusts the CEMP also includes a draft odour management plan (OMP) to mitigate the potential for odours from dredging operations. The draft OMP follows 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 follows the EPA "*Odour Impact Assessment Guidance for EPA Licensed Sites*" (Guidance Note AG5, 2010). The OMP includes measures 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.

The plan considers sources, releases and impacts of odour and use these to identify opportunities for odour management. The OMP 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. In addition, the plan includes a procedure for complaint recording and investigation to ensure that all complaints received at the site are suitably addressed.

10.1.14.3 Construction Phase – Greenhouse Gases

Mitigation measures to minimise CO_2 emissions from the construction phase include the following:

- Consultation with a wider variety of internal and external stakeholders to ensure all relevant information is included in the development of the plans.
- Implementation of a Traffic Management Plan which will be prepared in advance of the construction works and which will form part of the specification for the construction works. This will outline measures to minimise congestion and queuing, reduce distances of deliveries and eliminate unnecessary loads;
- Reducing the idle times by providing an efficient material handling plan that minimizes the waiting time for loads and unloads. Reducing idle times could save up to 10% of total emissions during construction phase;
- Turning off vehicular engines when not in use for more than five minutes. This restriction will be enforced strictly unless the idle function is necessary for security or functionality reasons; and
- Regular maintenance of plant and equipment. Technical inspection of vehicles to ensure they will perform the most efficiently.
- Materials with a reduced environmental impact will be incorporated into the construction design through re-use of materials or incorporation of recycled materials in place of conventional building materials. The following materials will be considered for the construction phase:-
  - Ground Granulated Blast Furnace Slag (GGBS) & Pulverised Fuel Ash - Used as replacements for Portland cements to increase sustainability and carbon footprint of civil and structural works; and
  - Steel - The recovery rates associated with using recycled steel are high and research exists which shows that 99% of structural steel arising from demolition sites is recycled or re-used. The carbon emissions emitted during the production of virgin steel can be higher than some other structural materials on a tonne by tonne basis, and recycled steel will be used where possible.
- An Energy Management system will be implemented for the duration of the works. This will include the following measures:-
  - The use of thermostatic controls on all space heating systems in site buildings to maintain optimum comfort at minimum energy use;
  - The use of sensors on light fittings in all site buildings and low energy lighting systems;
  - The use of adequately insulated temporary building structures for the construction compound fitted with suitable vents;
  - The use of low energy equipment and “power saving” functions on all PCs and monitors in the site offices;
  - The use of low flow showers and tap fittings; and
  - The use of solar/thermal power to heat water for the on-site welfare facilities and contamination unit (sinks and showers).

10.1.14.4 Operational Phase – Road Traffic

Mitigation of road traffic emissions are mainly achieved through EU legislation driven improvements in fuel and engine technology resulting is a gradually reducing emissions per vehicle profile. The collection of EU Directives, known as the Auto Oil Programme, have outlined improved emission criteria which manufacturers are required to achieve from vehicles produced in the past and in future years. This is a trend which has been in operation for many years and is destined to continue in future years for both cars and heavy goods vehicles. The introduction of the National Car Test (NCT) has also helped to reduce transport emissions by ensuring that all vehicles on Irish roads over four years old undergo an emissions test.

In addition to the broader EU mitigation, the following port specific mitigation is relevant for the development:

DPC has been granted planning permission for works to the port's private internal road network which includes works on public roads at East Wall Road, Bond Road and Alfie Byrne Road consisting of construction of new roads and enhancements to existing roads within the Dublin Port estate north of River Liffey. This development is currently being implemented by DPC and has been designed to improve efficiencies in traffic movement within the port and therefore reduce congestion. This increased efficiency and reduced congestion will result in a reduction in emissions from road traffic within the port.

Secondly, DPC is currently developing an initiative with the haulier companies operating in the port to provide the necessary Compressed Natural Gas (CNG) fuelling infrastructure across the port to facilitate the future trend for HGVs to change fuel from diesel to CNG. The EMEP/EEA 2016 Tier 1 emission factors for both fuel types are shown for a range of pollutants in Table 10-26. The table illustrates significant reductions in pollutants generated when using CNG relative to diesel highlighting the potential value of this DPC mitigation to local air quality.

Table 10-26 EMEP/EEA Tier 1 Emission Factors for Diesel and CNG

Fuel	CO (g/kg fuel)	VOC (g/kg fuel)	NOx (g/kg fuel)	PM (g/kg fuel)
Diesel	7.58	1.92	33.37	0.94
CNG	5.70	0.26	13.00	0.02
Fraction	**75%**	**14%**	**39%**	**2%**

As outlined in the prediction model findings, when the development becomes operational, compliance with all the relevant limit values will be achieved at the nearest sensitive receptors regardless of the above local mitigation.

10.1.14.5 Operation Phase - Shipping Emissions

As outlined in Section 10.1.5.2, a number of EU Directives and the requirements of the Marpol Convention regulate the fuels and emissions employed in the shipping industry. These requirements will remain in practice throughout the operation of the MP2 Project and may be replaced with more stringent emission limits.

In addition to the international mitigation implemented by Marpol, DPC has proposed port specific mitigation with a view to reducing emissions while vessels are berthed at the port. DPC propose to provide shore to ship power (SSP) on berths 52 and 53 for vessels at these berths. This will facilitate powering of the berthed vessels by the national grid which will allow the vessel to turn off their main and auxiliary engines for the duration of berthing. This reduces direct emissions from the ships while in port and at the closest point to the sensitive human receptors in the area.

10.1.14.6 Climate Adaption Plan

DPC is committed to formulating a Climate Adaption Plan that is cognisant of the DTTAS plan and the *Sectoral Planning Guidelines for Climate Change Adaption* published by the Department of Communications, Climate Action & Environment. The mitigation plan will be reviewed in line with the Climate Action and Low Carbon Development Act 2015. This will ensure that an iterative approach to adaptation planning is informed by the latest scientific evidence thus enabling DPC to modify or escalate adaptation actions as appropriate.

10.1.15 Residual Impacts

10.1.15.1 Construction Phase

On implementation of the dust minimisation plan and ongoing monitoring the impact of construction dust from the proposed MP2 Project on the community is considered "**negligible**".

The residual odour impact of the prosed the dredging operations is considered **"negligible**". Once the measures proposed in the Odour Management plan are implemented during this operation.

As the construction traffic volumes predicted with the MP2 Project are not considered significant, the resultant air quality impact from construction traffic is **"negligible".**

The total estimated greenhouse gas emissions associated with the proposed construction of the development is calculated at 38,090 tonnes of CO_{2eq}. The construction of the MP2 Project will result in a "**permanent slight adverse impact"**

10.1.15.2 Operation Phase

The results of the analysis of the predicted changes in road traffic patterns as a result of the MP2 Project and wider Masterplan indicates that all levels of pollutants are predicted to remain within the limits for the protection of human health at residential areas along transport routes even with the full predicted growth in traffic by 2040. While the levels remain below the relevant limits these increases and air quality impact from this traffic are classed as "**negligible**". This includes for the wider masterplan traffic and hence the cumulative traffic impact on air quality is also considered "**negligible**".

The results of the assessment indicate that the total GHG emissions as CO_2 from the 2026 Do-Something Scenario will increase with the proposed development in operation. This approximate 13% increase equates to 5,108 tonnes of carbon dioxide per annum in 2026 compared to the Do-Nothing scenario. These impacts are considered as "**permanent slight adverse impact**".

Future shipping emissions have been estimated based on the projected increases in shipping numbers at the port in 2040 both as a result of the MP2 Project and cumulatively for the Masterplan. The results indicate that by 2040, the 2010 shipping emissions will have increased by a factor of 13% as a result of the MP2 Project and

39% as a result of the wider Masterplan shipping traffic. This conservatively assumes no future reductions in emissions or increased efficiency of vessels or movements. This is considered to be a "**long term and permanent slight adverse impact**".

10.5 Conclusions

The current state of the environment in terms of baseline air quality has been determined from the data from the EPA monitoring Zone A (Dublin) network to determine compliance with relevant ambient air legislation. In addition to the EPA monitoring, DPC carry out a series of ambient air quality monitoring tests within the environs of the port. This monitoring is employed in this assessment to demonstrate the spatial variation in the Port and in the wider Dublin area in conjunction with the data from the EPA network.

Results of the baseline monitoring indicates that recent levels in the Greater Dublin Area are well below the statutory limits for the protection of human health and also below the WHO guidelines for the protection of human health. It is noted that monitoring undertaken by DPC within the Port footprint show levels that are higher than the Greater Dublin Area average and, in some cases, levels exceed both the statutory limits and the WHO guidelines.

There are sensitive receptors (houses, commercial operations) located in the area and these receptors vary in distance from the proposed development. There is a potential that receptors may experience a change in air quality and the extent of these changes in air quality is identified in the air quality assessment. The nearest sensitive residential receptors to the south of the proposed development are the residential dwellings on York Road, Pigeon House Road, Ringsend Park and Pembroke Cottages circa 400 metres to the south of the MP2 Project application boundary. To the north of the application boundary there is the extensive residential area of Clontarf with the properties along Clontarf Road, closest to the MP2 application boundary at circa 450 metres.

DPC publishes an annual Sustainability Report to track and record progress on the ports environmental responsibilities. As part of the report a carbon footprint inventory of all port emission sources has been developed to track emissions and set ambitious targets to reduce emissions.

Construction dust has the potential to cause local impacts through dust nuisance at the nearest sensitive receptors and also to sensitive ecosystems. Given the nature of the port and the distance to sensitive receptors, there are no properties located within the dust risk impact zone and it is concluded that construction dust from the MP2 Project will be negligible for the duration of the works.

The proposed construction operation will involve the movement of materials and reconfiguration of existing roadways, buildings and lands to create an additional three hectares of usable terminal. Additional infill material may be sourced offsite and transported via the newly configured access to the Port. All dredged material will be barged to the dump site and will not travel by road. As the construction traffic volumes predicted with the MP2 Project are not considered significant relative to existing volumes, the resultant air quality impact from construction traffic is negligible.

The main potential odour from the construction stage relates to the potential for fugitive odours from the dredging operation. Despite the low risk of encountering odours, a series of odour mitigation measures have been presented to minimise the impact of this operation and to prevent any nuisance in the unlikely event that odours are encountered. The residual odour impact of the prosed the dredging operations is considered negligible.

The construction phase climate assessment was carried out to identify sources and quantify total greenhouse gas emissions generated from the construction activities associated with the proposed development. The total estimated greenhouse gas emissions associated with the proposed construction of the development will result in a permanent slight adverse impact.

A prediction of the local impact of traffic-derived pollution during the operation phase was carried out and the results of the analysis of the proposed development and wider Masterplan traffic indicates that all levels of pollutants are predicted to remain within the limits for the protection of human health at residential areas along transport routes even with the full predicted growth in traffic by 2040. While the levels remain below the relevant limits these increases and air quality impact from this traffic are classed as negligible. This includes for the wider masterplan traffic and hence the cumulative traffic impact on air quality is also considered negligible.

Shipping emissions associated with the proposed development have been quantified based on the projected increases in shipping numbers at the port in 2040 both as a result of the MP2 Project and cumulatively for the Masterplan. Shipping emissions are predicted to generate a long term and permanent slight adverse impact for climate and air quality.

Greenhouse gas emissions from energy use at the port, as documented in the carbon footprint, are assessed through a review of the proposed changes to operations at the site to determine the potential for significant impact. The results of the assessment indicate that the total carbon emissions will increase with the proposed development in operation. These impacts are considered as permanent slight adverse impact.

11 NOISE & VIBRATION

This chapter of the EIAR assesses the potential impact of the MP2 Project on Noise and Vibration in the receiving environment. The likely significant effects of the project caused by noise and vibration are examined and measures to reduce, avoid and prevent these likely significant effects are proposed, where they are necessary. The assessment on terrestrial noise and vibration is presented in Section 11.1 and the assessment on underwater noise is presented in Section 11.2.

11.1 Terrestrial Noise and Vibration

11.1.1 Introduction

This section presents an appraisal of the likely terrestrial noise and vibration impacts associated with the MP2 Project during the construction and operational phases of the project.

During the construction phase, there is potential for noise impacts at the nearest noise sensitive properties from the use of noisy plant and equipment, from construction traffic and vibration impacts from the use a certain construction phase activities (e.g. piling).

The assessment of operational phase noise includes an assessment of the noise impact from new plant/equipment to be used within the MP2 Project area and the assessment of road traffic changes in the vicinity of the port as a result of the MP2 Project.

The proposed development will result in the development of the following areas within Dublin Port:

- Works at Berth 53 (including a new Ro-Ro jetty structure, 8 new reinforced concrete mooring dolphins, a new linkspan structure with associated bank seat, a new ramp structure, a new deck structure, a new maintenance route, provision of thruster screens, dredging of the berth pocket, installation of concrete mattresses for slope stabilisation and the installation of various jetty furniture);
- Works at Berth 52 (including a new Ro-Ro quay structure, a new sheet pile combi-wall structure at the east end of Berth 49, a new sheet pile combi-wall structure to accommodate a new linkspan, a new ramp structure, a new bankseat, 3no. new mooring dolphins to the east of Berth 53 and the installation of new jetty furniture);
- Works at Berth 50A (including demolition of the Port Operations Building and associated structures, demolition of the Pier Head at Eastern Breakwater, demolition of the southern end of the Eastern Oil Jetty, a new sheet pile combi-wall, a new sheet pile anchor wall, a new bridging structure to facilitate the existing 220kV high voltage ESB cables, backfilling in the Oil Berth 4 area, a new tubular steel pile support for existing crane rails, a new reinforced concrete deck, dredging of the berth pocket and the installation of new jetty furniture);
- Works at Oil Berth 3 (including demolition of the southern end of the Western Oil Jetty, a new steel sheet pile combi-wall, filling of the void between Oil Berth 4 and the revetment, a new sheet pile anchor wall, new tubular steel piles to support future extension of the crane rails, a new reinforced concrete deck, dredging of the berth pocket and installation of jetty furniture);

- Works on a new quay wall at Jetty Road (including a new steel sheet pile combi-wall, the installation of ground anchors, a new reinforced concrete capping beam, re-decking the existing Jetty Road and installation of furniture);
- There are three ferry terminal buildings located within the MP2 Project application boundary. Terminal 2 is used by Stena Line, Terminal 5 is used by Seatruck and Terminal 1 is used by Irish Ferries, with seasonal use by Isle of Man Steam Packet Company. Terminal 2 and Terminal 5 will be demolished as part of the works, with the existing Terminal 1 Building being used as a unified terminal building thereafter.

A full description of the proposed development is included in Chapter 3 of this EIAR.

This chapter should be read in conjunction with Figure 11-1, which illustrates the noise monitoring locations and the noise prediction locations.

Figure 11-1 Location of noise monitoring locations and noise prediction locations

11.1.2 Assessment Methodology

11.1.2.1 Relevant Noise Guidance Documents

Environmental Protection Agency (EPA) Office of Environmental Enforcement (OEE) - Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (2016)

NG4 is the most recent Irish guidance document in relation to noise survey and assessment and therefore the most relevant Irish guidance document for the purposes of this assessment. The document relates primarily to noise surveys and assessments for EPA licensed facilities but in the absence of any other directly applicable guidance documents, it provides reference material for the purposes of completing the noise assessment for the proposed development.

NG4 provides detailed consideration of a range of noise related issues including basic background to noise criteria, various noise assessment criteria and procedures, noise reduction measures, Best Available Techniques (BAT) and the detailed requirements for noise surveys.

This guidance sets out typical limit values for noise from licensed sites, namely:

- Daytime (07:00 – 19:00) – 55dB $L_{Ar,T}$;
- Evening (19:00 – 23:00) – 50dB $L_{Ar,T}$;
- Night-time (23:00 – 07:00) – 45dB $L_{Aeq,T}$

Where a proposed development occurs in a low background noise area, the above limits can be reduced by 10dB(A). Low background noise levels are defined in the document as < 40dB(A) during daytime, <35dB(A) during evening and <30dB(A) during night-time.

This guidance document has been used in particular for the assessment for operational phase noise from the MP2 Project.

NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004)

This guidance document is primarily concerned with setting out the design criteria in relation to noise from new road schemes in Ireland, however, it also provides reference material in terms of suitable noise and vibration threshold limits for construction activities.

The NRA Guidelines indicate noise levels typically deemed to be acceptable for the construction phase of road schemes (See Table 11-1). These values are indicative only and more stringent limits may be applied where pre-existing noise levels are low.

Table 11-1 Maximum Permissible Noise Levels at the Façade of Dwellings during Construction

Days & Times	$L_{Aeq\ (1\ hr)}$ dB	$L_{pA(max)slow}$ dB
Monday to Friday (07:00 – 19:00hrs)	70	80
Monday to Friday (19:00 – 22:00hrs)	60*	65*
Saturday (08:00 – 16:30hrs)	65	75
Sunday Bank Holidays (08:00 – 16:30hrs)	60*	65*

* Construction activity at these times. Other than that required in respect of emergency works, will normally require explicit permission of the relevant local authority.

This guidance has been used for the assessment for construction phase noise from the MP2 Project.

NRA Good Practise Guidance for the Treatment of Noise during the Planning of National Road Schemes (2014)

The purpose of this good practice guidance is to expand and supplement the advice already provided in the NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004).

The good practice guidance is based on two studies completed by Atkins and Trinity College Dublin, which evaluated the effectiveness of the NRA Guidelines (2004). The studies included consideration of the Constraints Studies, Route Selection Studies, present practice in other countries both in Europe and beyond, recently published revisions to the UK DMRB and noise research on the design and effectiveness of noise barriers.

The good practice guidance has been used in tandem with the NRA Guidelines (2004) to inform portions of the assessment of the MP2 Project that are covered within these guidance documents.

British Standard BS5228:2009+A1:2014 Noise and Vibration Control on Construction and Open Sites

This British standard consists of two parts and covers the need for protection against noise and vibration of persons living and working in the vicinity of construction and open sites. The standard recommends procedures for noise and vibration control during construction operations and aims to assist architects, contractors and site operatives, designers, developers, engineers, local authority environmental health officers and planners.

Part 1 of the standard provides a method of calculating noise from construction plant, including:

- Tables of source noise levels;
- Methods for summing up contributions from intermittently operating plant;
- A procedure for calculating noise propagation;
- A method for calculating noise screening effects; and
- A way of predicting noise from mobile plant, such as haul roads.

The standard also provides guidance on legislative background, community relations, training, nuisance, project supervision and control of noise and vibration.

The ABC method outlined in Section E3.2 has been used for the purposes of determining whether the predicted noise levels from the construction activities will result in any significant noise impact at the nearest noise sensitive properties.

Table 11-2 outlines the applicable noise threshold limits that apply at the nearest noise sensitive receptors. The determination of what category to apply is dependent on the existing baseline ambient (LAeq) noise level (rounded to the nearest 5dB) at the nearest noise sensitive property. For weekday daytime, if the ambient noise level is less than the Category A threshold limit, the Category A threshold limit (i.e. 65dB) applies. If the ambient noise level is the same as the Category A threshold limit, the Category B threshold limit (i.e. 70dB) applies. If the ambient noise level is more than the Category A threshold limit, the Category C threshold limit (i.e. 75dB) applies. The applicable limits that apply at each of the sensitive receptors included in the construction phase noise model are presented and discussed in Section 11.1.4.

Table 11-2 Noise Threshold Limits at Nearest Sensitive Receptors

	Threshold Limits [dB(A)]		
	Category A	**Category B**	**Category C**
Night-time (23:00 - 07:00)	45	50	55
Evening and Weekends (19:00 - 23:00 Weekdays, 13:00-23:00 Saturdays, 07:00-23:00 Sundays)	55	60	65
Weekday daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75

This guidance document has been used for the assessment of construction and operational phase noise from the MP2 Project.

British Standard 8233:2014 Sound Insulation and Noise Reduction for Buildings – Code of Practise

BS8233:2014 provides guidance values for a range of ambient noise levels within residential and commercial/industrial properties as shown in Table 11-3.

Table 11-3 Internal Ambient Noise Levels for Living Spaces

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq, 8hr}$

The standard allows for a further relaxation in standards of up to 5dB where "development is considered necessary or desirable". In relation to external amenity areas such as gardens and patios, the standard states that it is desirable that external noise does not exceed 50 dB LAeq,T with an upper guideline value of 55 dB LAeq,T.

This guidance document has been used as reference for the internal standard ambient noise levels to be achieved inside residential properties.

World Health Organisation (WHO) – Guidelines for Community Noise

In 1999, the World Health Organisation (WHO) proposed guidelines for community noise. In this guidance, a LAeq threshold daytime noise limit of 55 dB is suggested for outdoor living areas in order to protect the majority of people from being seriously annoyed. A second daytime limit of 50 dB is also given as a threshold limit for moderate annoyance.

The guidelines suggest that an internal LAeq not greater than 30 dB for continuous noise is needed to prevent negative effects on sleep. This is equivalent to a façade level of 45 dB LAeq, assuming open windows or a free-field level of about 42 dB LAeq. If the noise is not continuous, then the internal level required to prevent negative effects on sleep is a LAmax,fast of 45 dB. Therefore, for sleep disturbance, the continuous level as well as the number of noisy events should be considered.

The Night Noise Guidelines for Europe was published in 2009 on the back of extensive research completed by a WHO working group. Considering the scientific evidence on the threshold of night noise exposure indicated by Lnight,outside as defined in the Environmental Noise Directive (2002/49/EC), an Lnight,outside of 40dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. An interim target of 55dB is recommended where the NNG cannot be achieved. These guidelines are applicable to Member States of the European Region and may be considered as an extension to the previous WHO Guidelines for Community Noise (1999).

In 2012, the WHO published the Methodological Guidance for Estimating the Burden of Disease from Environmental Noise. This document outlines the principles of quantitative assessment of the burden of disease from environmental noise, describes the status in terms of the implementation of the European Noise Directive and reviews evidence on exposure-response relationships between noise and cardiovascular diseases.

This guidance document has been used as reference for the standard internal/external ambient noise levels to be achieved for residential properties.

UK Department of Transport (Welsh Office) – Calculation of Road Traffic Noise (CRTN)

This Calculation of Road Traffic Noise (CRTN) guidance document outlines the procedures to be applied for calculating noise from road traffic. These procedures are necessary to enable entitlement under the Noise Insulation Regulations (NI) 1995 to be determined but they also provide guidance appropriate to the calculation of traffic noise for more general applications e.g. environmental appraisal of road schemes, highway design and land use planning.

The document consists of three different sections, covering a general method for predicting noise levels at a distance from a highway, additional procedures for more specific situations and a measurement method for situations where the prediction method is not suitable. The prediction method constitutes the preferred calculation technique but in a small number of cases, traffic conditions may fall outside the scope of the prediction method and it will then be necessary to resort to measurement. The prediction method has been used in this instance to determine the likely noise impact from traffic flow increases as a result of the MP2 Project.

This guidance document has been referenced as it provides the prediction methods for determining road traffic noise.

11.1.2.2 Relevant Vibration Guidance

Limits of transient vibration, above which cosmetic damage could occur, are given numerically in Table 11-4 (Ref: BS5228-2:2009+A1:2014, Annex B, Table B2, Page 38). Minor damage is possible at vibration magnitudes which are greater than twice those given in Table 11-4, and major damage to a building structure can occur at values greater than four times the tabulated values (definitions of the damage categories are presented in BS7385-1:1990, 9.9).

Table 11-4 Transient Vibration Guide Values for Cosmetic Damage (Ref BS5228-2:2009+A1:2014)

Type of Building	Peak Particle Velocity (PPV) (mm/s) in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings.	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
Unreinforced or light framed structures. Residential or light commercial buildings.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above.

British Standard BS 7385 (1993) Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration indicates that cosmetic damage should not occur to property if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz. These guidelines refer to relatively modern buildings and therefore, these values should be reduced to 50% or less for more sensitive buildings.

The NRA Guidelines for the Treatment of Noise & Vibration in National Road Schemes recommends that vibration is limited to the values set out in Table 11-5 in order to ensure that there is little or no risk of even cosmetic damage to buildings. These values and the values indicated in Table 11-4 are used as guidance for monitoring vibration levels from the construction phase of the MP2 Project.

Table 11-5 Recommended Vibration Level Thresholds for NRA Schemes

Allowable Vibration Velocity (Peak Particle Velocity) at the Closest Part of Any Sensitive Property to the Source of Vibration, at a Frequency of:		
Less than 10Hz	10 to 50 Hz	50 to 100 Hz (and above)
8mm/s	12.5mm/s	20mm/s

11.1.2.3 Assessment Methodology for Determining Noise Impacts

General Significance Criteria

Table 11-6 contains the general significance criteria that have been used for determining the level of impact associated with the MP2 Project. Different aspects of noise from the MP2 Project (e.g. construction, plant/equipment, traffic etc.) are assessed using the different methodologies as described in the relevant guidance document. Where feasible, the significance criteria have been used in the various assessments included in this chapter having regard to the sensitivity of receptors.

Table 11-6 Criteria to Define the Sensitivity of Receptors

Sensitivity	Description	Examples of receptors
High	Receptors where occupants or activities are particularly susceptible to noise	Residential Quiet areas for outdoor recreation Religious institutions (e.g. churches and cemeteries) Schools during the daytime
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance	Offices Restaurants Sports grounds where noise is not a normal part of the event (e.g. golf courses and tennis courts)
Low	Receptors where distraction or disturbance from noise will have minimal effect	Commercial buildings not occupied during operational hours Factories and working environments with existing high noise levels Sports grounds and facilities where noise levels are a normal part of activity

The majority of receptors which have the potential to be affected by noise and vibration impacts arising due to the MP2 Project are the residents of dwellings in the vicinity of the existing port. Residents are deemed to be highly sensitive. The significance of the effect is determined as a function of the sensitivity of the receptor and the magnitude of impact it is exposed to. This is set out in Table 11-7.

Table 11-7 Matrix for Determining Significance of Effect for Receptors of High Sensitivity

Magnitude of Impact (beneficial or adverse)	Significance of effect for receptors of high sensitivity
Major	Large or very large
Moderate	Moderate or large
Minor	Slight
Negligible	Slight
No impact	Neutral

Effects are considered to be significant when identified as likely to have Moderate, Large or Very Large effect.

Construction Noise

The NRA Guidelines for the Treatment of Noise & Vibration on National Road Schemes (2004) British Standard BS 5228:2009+A1:2014 Noise and Vibration Control on Construction and Open Sites are the standard noise guidance documents for assessing construction phase noise impacts. Section 11.1.2.2 contains a brief description of these guidance documents.

Due to the temporary nature of construction activities, higher noise threshold limits apply to construction phase activities than to permanent operational phase activities. The appropriate noise threshold limits for construction phase activities are outlined in Table 11-1 and Table 11-2. These guidance documents do not apply significance criteria for noise impacts other than outlining permissible threshold limits for noise as outlined in these tables.

Traffic Noise

As outlined in Section 11.1.2.2, the CRTN is the standard noise guidance document for predicting traffic noise levels from traffic flow information and other relevant road topographical information. While the CRTN provides a methodology for predicting traffic noise levels, it does not provide significance criteria for assessing changes in traffic noise levels.

The Design Manual for Roads and Bridges (DMRB) is a guidance document which was created for the purpose of assessing noise and vibration impacts from road projects. While the MP2 Project is not a road project, the classification of magnitude of noise impact tables included in Section 3, Part 7 of DMRB Volume 11 are applicable to the assessment of road traffic changes associated with the MP2 Project.

Table 11-8 and Table 11-9 present the magnitude of noise impacts for both short-term and long-term changes in traffic noise levels. The short-term criteria is used for the purposes of assessing the construction phase noise levels and the commencement of operational phase in the year of opening, while the long term criteria has been used for the purposes of assessing long term operational phase traffic noise levels 10 years after the year of opening. An additional column has been included in Table 11-8 and Table 11-9 to link the magnitude level defined in the DMRB with the significance criteria outlined in Table 11-7.

Table 11-8 Classification of Magnitude of Noise Impacts in the Short Term

Noise Change $L_{A10,18hr}$	Magnitude of Impact	Equivalent Significance Criteria (See Table 11-7)
0	No Change	Neutral
0.1 - 0.9	Negligible	Neutral
1.0 - 2.9	Minor	Minor Adverse/Beneficial Effect
3.0 - 4.9	Moderate	Moderate Adverse/Beneficial Effect
5.0 +	Major	Major Adverse/Beneficial Effect

Table 11-9 Classification of Magnitude of Noise Impacts in the Long Term

Noise Change $L_{A10,18hr}$	Magnitude of Impact	Equivalent Significance Criteria (See Table 11-7)
0	No Change	Neutral
0.1 - 2.9	Negligible	Neutral
3.0 - 4.9	Minor	Minor Adverse/Beneficial Effect
5.0 - 9.9	Moderate	Moderate Adverse/Beneficial Effect
10.0 +	Major	Major Adverse/Beneficial Effect

Vibration

In terms of significance criteria, British Standard BS 5228:2009+A1:2014 provides guidance on the effects of vibration levels on residential receptors. Table B1 of Annex B provides an outline of vibration levels and associated effects; this is reproduced in Table 11-10 below. An additional column has been added to the Table to link these vibration levels to the equivalent significance criteria as outlined in Table 11-7.

Table 11-10 Guidance on Effects of Vibration Levels on Sensitive Receptors

Vibration Level	Effect	Significance Criteria (See Table 11-7)
0.14 - 0.3 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Neutral
0.3 - 1.0 mm/s	Vibration might be just perceptible in residential environments	Minor Adverse Effect
1.0 - 10.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.	Moderate Adverse Effect
>10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	Major Adverse Effect

11.1.2.4 Methodology for Noise Monitoring

Three monitoring locations were used for the baseline noise survey, all of which were unattended. All noise monitoring locations are presented in Figure 11-1. Monitoring was undertaken continuously in 15-minute logging periods over a period of approximately 10-14 days.

The unattended noise measurements were completed using A Rion NL-32 Class 1 Sound Level Meter with associated outdoor kit (outdoor casing, Rion WS-03SO1 Windscreen head assembly, Rion EC-04 2m Extension Cable & Rion NC-74 Class 1 Acoustic Calibrator). This instrumentation conforms to the requirements for integrating averaging sound level meters (Type 1) as specified in BS EN 60804:2001 Integrating-averaging sound level meters (Class 1 in BS EN 61672:2003 Electroacoustics. Sound Level Meters. Specifications). These standards define a wide range of performance criteria which are technically complex and detailed but simply define the highest standard of noise meter that should be used for the purposes of environmental noise monitoring. The sound level meter was accurately calibrated before use.

Measurements were made at a height of 1.2 – 1.5m above ground level. The weather conditions were in accordance with the requirements of BS7445: Description and Measurement of Environmental Noise and ISO 1996: Acoustics - Description, Measurement and Assessment of Environmental Noise.

The following parameters were recorded during each monitoring period:

L_{Aeq}	The continuous equivalent A-weighted sound pressure level. This is an “average” of the sound pressure level.
L_{Amax}	This is the maximum A-weighed sound level measured during the sample period.
L_{Amin}	This is the minimum A-weighted sound level measured during the sample period.
L_{A10}	This is the A-weighted sound level that is exceeded for noise for 10% of the sample period.
L_{A90}	This is the A-weighted sound level that is exceeded for 90% of the sample period.

11.1.3 Receiving Environment

Noise Survey at Nearest Sensitive Receptors

Baseline noise monitoring was undertaken at three locations to determine the existing noise environment in the vicinity of the MP2 Project. The noise monitoring locations are illustrated in Figure 11.1. The locations are summarised below:

- Location 1: Adjacent Marina – Representative of the nearest properties to the south of the Port (i.e. Pigeon House Road, Coastguard Cottages);
- Location 2: Western Boundary of the Port– Representative of the nearest properties to the west of the Port; and
- Location 3: 108 Kincora Road – Representative of properties in Clontarf.

The existing noise environment in the vicinity of the port is dominated by road traffic noise, with contributions from various other industrial and human noise sources including the existing port activities.

Table 11-11 to Table 11-19 present the noise monitoring data for the three unattended survey locations, which is representative to the nearest noise sensitive properties to the south, west and north of the port (Pigeon House Road / Coastguard Cottages, Gibson Hotel and adjacent residential properties and Clontarf). The tables present the average ambient (LAeq) and background (LA90) noise levels for day (07:00 – 19:00), evening (19:00 – 23:00) and night-time periods (23:00 – 07:00).

Table 11-11 Location 1 (Marina) – Daytime Baseline Noise Levels (01/03/19 – 14/03/19)

Date	Measured L_{Aeq} dB(A)	Measured L_{A90} dB(A)
01/03/19	58.7	55.3
02/03/19	58.9	55.7
03/03/19	58.1	54.5
04/03/19	59.5	57.1
05/03/19	59.3	56.0
06/03/19	59.1	56.6
07/03/19	62.7	59.8
08/03/19	59.3	56.2
09/03/19	60.7	56.3
10/03/19	62.5	58.6
11/03/19	59.4	55.7
12/03/19	63.4	58.9
13/03/19	63.3	59.0
14/03/19	61.8	58.8
Combined	**60.9**	**57.0**

Table 11-12 Location 1 (Marina) – Evening Baseline Noise Levels (01/03/19 – 14/03/19)

Date	Measured L_{Aeq} dB(A)	Measured L_{A90} dB(A)
01/03/19	59.8	59.3
02/03/19	60.3	57.3
03/03/19	60.0	56.7
04/03/19	59.7	55.1
05/03/19	59.0	55.7
06/03/19	61.1	58.5
07/03/19	60.2	55.7
08/03/19	60.7	56.2
09/03/19	60.1	55.9
10/03/19	59.9	56.5
11/03/19	57.6	52.5
12/03/19	64.1	58.5
13/03/19	58.3	54.5
14/03/19	56.7	53.8
Combined	**60.2**	**56.2**

Table 11-13 Location 1 (Marina) – Night-time Baseline Noise Levels (01/03/19 – 14/03/19)

Date	Measured L_{Aeq} dB(A)	Measured L_{A90} dB(A)
01/03/19	56.9	51.7
02/03/19	56.3	51.1
03/03/19	54.5	48.2
04/03/19	54.3	47.9
05/03/19	56.7	50.2
06/03/19	55.7	50.1
07/03/19	59.3	52.0
08/03/19	55.6	47.2
09/03/19	56.6	48.0
10/03/19	57.0	47.2
11/03/19	57.0	49.4
12/03/19	59.5	52.2
13/03/19	64.5	57.4
14/03/19	61.7	57.4
Combined	**58.6**	**50.7**

Table 11-14 Location 2 (Gibson Hotel) – Daytime Baseline Noise Levels (01/03/19 – 14/03/19)

Date	Measured L_{Aeq} dB(A)	Measured L_{A90} dB(A)
01/03/19	61.6	57.7
02/03/19	61.7	58.4
03/03/19	60.7	56.8
04/03/19	62.6	59.6
05/03/19	62.5	59.0
06/03/19	62.3	58.8
07/03/19	62.1	59.6
08/03/19	62.4	59.1
09/03/19	61.7	56.6
10/03/19	59.0	55.6
11/03/19	61.5	58.5
12/03/19	63.4	59.7
13/03/19	61.5	58.6
14/03/19	61.7	58.5
Combined	**61.9**	**58.3**

Table 11-15 Location 2 (Gibson Hotel) – Evening Baseline Noise Levels (01/03/19 – 14/03/19)

Date	Measured L_{Aeq} dB(A)	Measured L_{A90} dB(A)
01/03/19	57.4	53.9
02/03/19	58.5	55.3
03/03/19	57.7	52.3
04/03/19	58.0	53.2
05/03/19	58.9	56.0
06/03/19	58.8	53.8
07/03/19	58.1	53.6
08/03/19	59.7	54.5
09/03/19	56.1	52.3
10/03/19	57.7	53.9
11/03/19	58.4	54.1
12/03/19	60.2	56.7
13/03/19	58.6	54.8
14/03/19	58.9	55.4
Combined	**58.5**	**54.3**

Table 11-16 Location 2 (Gibson Hotel) – Night-time Baseline Noise Levels (01/03/19 – 14/03/19)

Date	Measured L_{Aeq} dB(A)	Measured L_{A90} dB(A)
01/03/19	57.3	47.1
02/03/19	55.6	46.6
03/03/19	54.1	45.1
04/03/19	57.5	47.2
05/03/19	58.8	50.4
06/03/19	57.1	48.0
07/03/19	57.2	49.2
08/03/19	56.5	45.2
09/03/19	57.2	48.1
10/03/19	54.3	44.2
11/03/19	57.0	47.8
12/03/19	58.1	50.4
13/03/19	58.0	52.2
14/03/19	59.1	53.2
Combined	**57.2**	**48.2**

Table 11-17 Location 3 (Clontarf) – Daytime Baseline Noise Levels (26/02/19 – 06/03/19)

Date	Measured L_{Aeq} dB(A)	Measured L_{A90} dB(A)
26/02/19	49.5	46.6
27/02/19	46.7	40.0
28/02/19	48.4	40.5
01/03/19	48.3	42.1
02/03/19	50.1	46.3
03/03/19	45.8	40.4
04/03/19	50.8	45.8
05/03/19	59.1	48.2
06/03/19	50.4	45.3
Combined	***52.1***	***43.9***

Table 11-18 Location 3 (Clontarf) – Evening Baseline Noise Levels (26/02/19 – 06/03/19)

Date	Measured L_{Aeq} dB(A)	Measured L_{A90} dB(A)
26/02/19	44.7	42.0
27/02/19	37.7	31.9
28/02/19	40.2	35.8
01/03/19	44.8	41.1
02/03/19	47.5	44.0
03/03/19	44.0	41.7
04/03/19	47.2	42.9
05/03/19	48.7	45.7
06/03/19	44.8	42.6
Combined	***45.4***	***40.9***

Table 11-19 Location 3 (Clontarf) – Night-time Baseline Noise Levels (26/02/19 – 06/03/19)

Date	Measured L_{Aeq} dB(A)	Measured L_{A90} dB(A)
26/02/19	44.5	40.3
27/02/19	39.0	31.8
28/02/19	42.8	36.9
01/03/19	40.9	37.1
02/03/19	43.8	39.4
03/03/19	42.5	39.1
04/03/19	48.3	43.8
05/03/19	48.0	42.8
06/03/19	46.6	42.3
Combined	***45.0***	***39.3***

11.1.4 Likelihood of Impacts

11.1.4.1 Construction Phase

Construction Noise – General

A detailed noise model was created of the Port and surrounding noise sensitive receptors in order to predict the cumulative noise level associated with construction phase activities at the nearest noise sensitive properties. In order to predict worst-case construction noise impacts, it was necessary to define the various typical plant and equipment to be used as part of the construction phase activities. Table 11-20 includes a list of the most significant plant/equipment likely to be used during the construction phase of the MP2 Project.

Table 11-20 Typical Plant and Equipment to be used During Construction Phase

(Ref: BS5228:2009+A1:2014)

Activity / Plant (Reference from Annex C & D, BS5228:2009+A1:2014)	Power Rating (kW)	Equipment Size, Weight (Mass), Capacity	Sound Power Level (dB)
Demolition: Breaking up concrete - Breaker mounted on wheeled backhoe (C1 - Ref 1)	59	7.4t, 1799mm tool, 125 bar	120
Demolition: Dumping brick rubble - tracked excavator loading dump truck (C1 - Ref10)	228	44t	113
Demolition: Tracked excavator (C2 - Ref 3)	2102	22t	106
Clearing Site: Dozer (C2 - Ref 1)	142	20t	103
Clearing Site: Tracked excavator (C2 - Ref 3)	102	22t	106
Clearing Site: Wheeled backhoe loader (C2 - Ref 8)	62	8t	96
Ground Excavation: Dozer (C2 - Ref 12)	142	20t	109
Ground Excavation: Tracked excavator (C2 - Ref 14)	226	40t	107
Ground Excavation: Wheeled loader (C2 - Ref 27)	193	-	108
Distribution of Material: Tipper Lorry (C8 - Ref 20)			107
Rolling & Compaction: Roller (C2 - Ref 38)	145	18t	101
Piling: Tubular Steel Piling - hydraulic hammer - (C3 - Ref 3)		240mm diameter	116
Pumping Water: Water pump (C2 - Ref 45)	20	6 in	93
Dredging: Ship Chain Bucket (D12 - Ref 1)		35m long	124
Dredging: Loading dredged aggregates [Wheeled Loader] (D12 - Ref 5)	93		112

Potential Impacts of Construction Phase Noise

Where construction activity takes place for a development in the vicinity of residential properties, it is standard practice that the activities would 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.

In order to assess a worst-case construction noise scenario, a noise modelling exercise was undertaken using CadnaA noise modelling software. A model was prepared which includes items of plant/equipment listed in Table 11-15. The model was prepared on the basis that all areas of construction activity will be taking place at the same time, which will not be the case in practice. The noise model is worst-case on the basis that it assumes a quantity of plant/equipment that will all be active at the same time and continuously, which is an over-estimation of the likely number of items of plant/equipment that will be active at any one time.

Based on the plant included in Table 11-15 the plant/equipment included in the noise model for each area is detailed below. The location of each piece of plant/equipment has been included in the model to reflect the nearest location to the nearest noise sensitive properties in the study area.

<u>Worst-Case Noise Model Scenario</u>

Berth 53: piling rig x 1, mobile crane x 1, rock breaking plant x 1, tracked excavator x 1, dozer x 1, loader x 1, breaker.

Berth 52: piling rig x 1, mobile crane x 1, rock breaking plant x 1, tracked excavator x 2, dozer x 2, loader x 2, breaker mounted on wheeled backhoe and tipper.

Berth 50A: piling rig x 1, mobile crane x 1, rock breaking plant x 1, tracked excavator x 2, dozer x 2, loader x 2, breaker mounted on wheeled backhoe and tipper.

Eastern Oil Jetty: piling rig x 1, mobile crane x 1, rock breaking plant x 1, tracked excavator x 1, dozer x 1, loader x 1, breaker mounted on wheeled backhoe and tipper.

New Quay Wall at Jetty Road; piling rig x 1, mobile crane x 1, tracked excavator x 1, dozer x 1, loader x 1.

Demolition of Terminal 2 and 5: breaker mounted on wheeled backhoe and tipper.

While there are a significant number of sensitive receptors in the vicinity of the proposed activities that have the potential to be impacted by construction phase noise associated with the proposed development, they are generally grouped together in three approximate areas in relation to the Port, namely:

- South of the Port, centre on Pigeon House Road and York Road;
- West of the Port in the approximate area of the 3 Arena; and
- North of the Port in the areas of Clontarf closest to the Port.

There are hundreds of receptors in each of these general areas and, accordingly, a representative sample of receptors have been selected and included in the noise model. These are illustrated in Figure 11-1. This select number of receptors is representative of those properties that are nearest to the proposed works and most likely to be impacted by the proposed construction phase activities. These properties are also representative of the properties adjacent to them but not included in the noise model. Table 11-21 includes the worst-case predicted noise levels from the noise model at the nearest noise sensitive properties.

Table 11-21 Worst-Case Predicted Construction Noise Levels at Nearest Noise Sensitive Properties from Construction Phase

Property Reference	Nearest Property (See Figure 11.1)	Predicted Worst-Case Construction Noise (dBA)
1	55 Strand Road	37.0
2	27 Strand road	41.3
3	20 Strand Road	42.7
4	48 Beach Road	43.2
5	11 Poolbeg Quay	47.8
6	79 Pigeon House Road	40.1
7	64 Pigeon House Road	33.9
8	49 Pigeon House Road	32.5
9	29 Pigeon House Road	42.8
10	115 Ringsend Park	38.5
11	57-88 O'Rahilly House	39.5
12	Gibson Hotel	41.1
13	16 Shalmalier Road	40.5
14	16 Forth Road	34.3
15	92 Danesfort	36.7
16	130 Clontarf Road	43.7
17	167 Victoria Terrace	45.3
18	190 Clontarf Road	46.5
19	218 Clontarf Road	47.7
20	259 Clontarf Road	44.0

Table 11-21 illustrates the worst-case predicted cumulative construction noise levels at the nearest noise sensitive receptors during the construction process. These worst-case predicted noise levels have been calculated on the basis that, at all times, all items of plant/equipment are at the nearest point of their usage to the respective noise sensitive property.

In order to determine the noise impact associated with the worst-case predicted construction noise levels included in Table 11-21, the predicted noise levels have been compared to the permissible construction noise levels included in the NRA Guidelines (see Table 11-1) and the derived threshold noise limits using the ABC Method from British Standard BS5228:2009+A1:2014 (see Table 11-2). Table 11-22 illustrates whether the worst-case predicted construction noise levels are within the respective noise threshold limits outlined in the NRA Guidelines and BS5228:2009+A1:2014.

Table 11-22 Comparison of Worst-Case Predicted Construction Noise Levels with Noise Threshold Limits in NRA Guidelines (2004) and BS5229:2009+A1:2014

Property Ref	Nearest Property (See Figure 11.1)	Predicted Worst-Case Construction Noise (dBA)	Noise Threshold Limit (LAeq) (dBA)	
			NRA Guidelines	BS5228:2009: +A1:2014 ABC Method
1	55 Strand Road	37.0	70	65
2	27 Strand road	41.3	70	65
3	20 Strand Road	42.7	70	65
4	48 Beach Road	43.2	70	65
5	11 Poolbeg Quay	47.8	70	65
6	79 Pigeon House Road	40.1	70	65
7	64 Pigeon House Road	33.9	70	65
8	49 Pigeon House Road	32.5	70	65
9	29 Pigeon House Road	42.8	70	65
10	115 Ringsend Park	38.5	70	65
11	57-88 O'Rahilly House	39.5	70	65
12	Gibson Hotel	41.1	70	65
13	16 Shalmalier Road	40.5	70	65
14	16 Forth Road	34.3	70	65
15	92 Danesfort	36.7	70	65
16	130 Clontarf Road	43.7	70	65
17	167 Victoria Terrace	45.3	70	65
18	190 Clontarf Road	46.5	70	65
19	218 Clontarf Road	47.7	70	65
20	259 Clontarf Road	44.0	70	65

Table 11-22 illustrates that worst-case predicted noise from construction activities associated with the proposed development are well within the guideline threshold limits included in the NRA Guidelines (2004) and British Standard BS5228:2009+A1:2014. These worst-case predicted noise levels assume a level of simultaneous activity of plant/equipment which will not occur in reality and hence is an over-estimation of the likely worst-case noise levels that will actually occur during the construction phase. The average noise levels from construction activities at the nearest receptors throughout the majority of the construction period are likely to be significantly lower than the worst-case predicted noise levels included in Table 11-22.

While the predicted worst-case construction noise levels from the MP2 Project are within the required threshold limits, it is standard practice to recommend for mitigation measures to be put in place in order to ensure that construction noise levels are reduced to the lowest possible levels where practicable. Noise mitigation measures for construction activities are outlined in Section 11.1.6.

Construction Phase Traffic Impacts

During the construction phase, there will be an increase in traffic flows primarily on the Dublin Port Tunnel as plant/equipment and materials are delivered to the Port.

The changes to traffic flow levels on the local road network, construction phase traffic movements will be less than 25% on the Dublin Port Tunnel at all stages of the construction phase and considerably less than this on all other routes. The UK Design Manual for Roads and Bridges (DMRB, Volume 11, Section 3, Part 7) states that it takes a 25% increase or a 20% decrease in traffic flows in order to get a 1dB(A) change in traffic noise levels. On this basis, traffic noise levels associated with the construction phase of the MP2 Project will be significantly less than 1dB(A).

It is generally accepted that it takes an approximate 3dB(A) increase in noise levels to be perceptible to the average person (Ref: NRA Guidelines for the Treatment of Noise and Vibration in National Road Scheme, 2004). Based on this reference, the likely effect of traffic noise increases on the local road network will be imperceptible.

Construction Phase Vibration Impacts

Some construction phase activities associated with the proposed development have the potential to result in vibration impacts at sensitive receptors if sufficiently close to the respective receptor. Activities included in the proposed construction phase that have the potential to result in vibration impacts include piling and to a lesser extent demolition activities and dredging.

BS5228:2009 Code of Practice for Noise and Vibration Control on Construction and open Sites - Part 2: Vibration provides reference data relating to measured vibration levels associated with different types of piling activities in different ground strata. BS5228:2009 references vibration levels measured for various types of bored piling / cast-in-situ piling (using hammer), a technique which reflects the type of piling that will be conducted as part of the MP2 Project.

Reference 11 from Table D1 of British Standard BS5228:2009+A1:2014 indicates that bored piling on loose rock over weathered rock over rock, gives a measured PPV of 1.2mm/s at 30m. The nearest piling activity will be over 500m away from the nearest sensitive properties. Therefore, the worst-case vibration levels from the proposed construction works will be significantly less than 1mm/s, which is substantially below the vibration threshold limits outlined in Table 11-4 and Table 11-5.

On the basis of the criteria outlined in Table 11-4, it is anticipated that the proposed development will have a neutral impact at the nearest sensitive properties.

11.1.4.2 Operational Phase

The proposed development will result in changes to the existing port layout and berths to facilitate a more efficient functioning of the port by reducing dwell time and increasing throughput to achieve an Annual Average Growth Rate (AAGR) of 3.3% per annum to 2040. Whilst the traffic is expected to grow in line with the throughput of cargo, it is not proposed that there will be a significant increase in the numbers of various items of plant/equipment as a result of the MP2 Project over and above what is currently in operation within the Port.

Any changes to port plant/equipment will be substantially less than the numbers of plant/equipment included in the construction phase noise assessment included in Section 11.1.4.1. Table 11-21 contains worst-case construction noise predictions at the nearest noise sensitive receptors and it is anticipated that operational phase noise levels resulting from changes to operational phase plant/equipment will be substantially less than the predicted noise levels included in this table. Any change to operational phase plant/equipment will result in noise levels that are below existing ambient (LAeq) and background (LA90) noise levels at the nearest noise sensitive properties (as illustrated in Table 11-11 – Table 11-19).

Operational Phase Traffic Impacts

The purpose of the MP2 Project is to rationalise port activities with a view to maximising the use of the existing port area so that it can facilitate the port's expected growth rates. Traffic flows were prepared by the traffic consultants for operational phase scenarios with and without the proposed development in place for opening year (2026) and a future year scenario (2040). The Do something scenario is based on port growth rates as currently projected, whereas the Do Minimum scenario is reflective of a far lower growth significantly less than the port projected growth rates. Table 11-23 shows traffic flow changes and traffic noise changes as a result of the MP2 Project.

Table 11-23 Traffic Noise Changes as a Result of the MP2 Project

Road Link	Percentage Increase in Traffic Flows	Increase in Traffic Noise dB(A)
2026		
Dublin Port Tunnel	14%	<1 dB(A)
East Wall Road	14%	<1 dB(A)
Sherrif Street Upper	14%	<1 dB(A)
North Wall Quay	14%	<1 dB(A)
Tom Clarke Bridge	14%	<1 dB(A)
2040		
Dublin Port Tunnel	54%	1.9 dB(A)
East Wall Road	54%	1.9 dB(A)
Sherrif Street Upper	54%	1.9 dB(A)
North Wall Quay	54%	1.9 dB(A)
Tom Clarke Bridge	54%	1.9 dB(A)

Section 11.1.5 contains a discussion on the significance of operational phase traffic noise increases associated with the MP2 Project.

11.1.4.3 Potential Cumulative Impacts

The assessment included in this chapter concludes that there will be a negligible construction or operational phase noise or vibration impact as a result of the MP2 Project. On this basis, there is no potential for significant cumulative noise/vibration impacts from the MP2 Project in tandem with other planned developments in the study area as the proposed development will not increase any combined predicted noise levels from any other developments that may be closer to the nearest noise sensitive receptors.

11.1.5 Description of likely significant impacts

Section 11.1.4 contains a description of the noise and vibration impact assessment for the MP2 Project. This section contains an evaluation of the likely significance of impacts associated with the MP2 Project using the criteria of significance as described in Section 11.1.2.

11.1.5.1 Construction Phase Plant/Equipment

Table 11-21 and Table 11-22 present the worst-case construction noise levels associated with MP2 Project. The worst-case predicted construction noise levels are substantially below the noise threshold limits for construction noise as presented in the NRA Guidelines and BS5228:2009+A1:2014. There are also below existing ambient (LAeq) noise levels in all areas. On this basis, the magnitude of the potential impact is negligible and neutral in accordance with the significance criteria outlined in Table 11-7. The significance of the impact, in the absence of mitigations measures, is therefore neutral.

11.1.5.2 Construction Phase Traffic Movements

Construction phase traffic noise will be less than 1dB(A) on all relevant road links, which equates to a negligible magnitude of impact as presented in Table 11-8. This equates to a neutral significance in accordance with the criteria set out in Table 11-7.

11.1.5.3 Construction Phase Vibration

Construction phase vibration levels will be neutral in accordance with the magnitude levels and significance criteria outlined in Table 11-10.

11.1.5.4 Operational Phase Plant/Equipment

Operational phase plant/equipment noise will be neutral in accordance with the significance criteria set out in Table 11-7.

11.1.5.5 Operational Phase Traffic Movements

Table 11-23 presented road traffic noise changes as a result of the proposed development for opening year (2026) and a future year scenario (2040). These traffic noise changes are negligible on the basis of the impact magnitudes listed in Table 11-8 and Table 11-9 for short and long terms changes. This equates to a significance level of neutral in accordance with the criteria outlined in Table 11-7.

11.1.6 Remedial and Mitigation Measures

In the absence of mitigation measures the construction and operation of the MP2 Project do not have the potential to have significant noise and vibration effects on the environment. Notwithstanding that there is no likely predicted impacts, the following measures are proposed to be incorporated in line with industry best practice and for added protection to the nearest noise sensitive properties.

11.1.6.1 Construction Phase

Section 11.1.4 contains an assessment of the noise impact associated with the construction phase of the MP2 Project at the nearest noise sensitive properties. The assessment of the worst-case predicted construction noise levels using the ABC Method (BS5228:2009+A1:2014) and the NRA Guidelines (2004) indicates that worst-case construction noise levels will be well within the required threshold limits included in these guidance documents.

British Standard BS5228:2009+A1:2014 – 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 during the construction phase of the proposed development. The proposed best practice measures include:

- 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 will 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.
- 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 be operated throughout the construction phase and all efforts will be made to address any noise issues that may arise at the nearest noise sensitive properties.

Dublin City Council's Air Quality Monitoring and Noise Control Unit have developed a 'Good Practice Guide for Construction and Demolition'. This document is consistent with the construction phase guidance documents referenced in this chapter and will be adhered to in addition to the mitigation measures outlined in this section.

A Draft Construction Environmental Management Plan (CEMP) including a Draft Noise Management Plan (NMP) has been prepared (included with the application for consent submission) and provides additional detail in respect of the works in order to minimise potential impacts and maximise potential benefits associated with the works.

11.1.6.2 Operational Phase

The change in location of various plant/equipment as a result of the MP2 Project will not result in any significant change to operational phase noise levels from the Port. Any change to operational phase plant/equipment noise levels from the MP2 Project will be substantially less than those from the construction phase, which are lower than the existing daytime ambient noise levels (i.e. LAeq) at all of the nearest noise sensitive properties. Existing night-time activities in the port will not be significantly increased as a result of the MP2 Project.

In order to ensure that there is no increase in noise impact from changes to vessel movements during the night-time period, Dublin Port will implement a Noise Management Plan in relation to the ongoing management of noise issues associated with changes to Port activities. This plan will include the following elements as a minimum:

- the provision for noise management to be included as a key consideration for all significant changes made to Port operations by senior management within Dublin Port;
- the prior assessment of potential noise impacts associated with any alteration to Port activities that may be likely to result in a significant noise impact at the nearest noise sensitive properties;
- a range of procedures to mitigate noise during the night-time period, including measures to control tonal/impulsive noise sources (e.g. foghorn, tannoy announcements etc.) before 07:00 hours.

Vibration

As outlined in Section 11.1.4, the construction phase of the proposed development is not likely to result in any significant vibration effects as a result of the MP2 Project.

British Standard BS5228:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and open Sites - Part 2: Vibration includes a range of measures for the reduction of vibration associated with piling activities and for general surface based activities. The mitigation measures included in British Standard BS5228:2009+A1:2014, will be implemented to reduce vibration levels from general and piling activities to the lowest possible levels.

11.1.7 Residual Impacts

Worst-case construction noise levels are substantially below the required thresholds outlined in the relevant noise guidance documents and existing ambient noise levels at the nearest noise sensitive properties.

There will be a neutral noise impact associated with traffic flow changes as a result of the construction or operational phase of the proposed development. Any traffic flow changes associated with the MP2 Project will not be in the range whereby they would be audible at the nearest noise sensitive properties.

There will be no significant operational phase plant/equipment noise impacts from the MP2 Project at the nearest noise sensitive properties.

There will be no significant vibration residual effects associated with the MP2 Project.

11.1.8 Monitoring

Noise surveys will be conducted during the construction phase in accordance with BS7445: Description and Measurement of Environmental Noise. It is proposed that continuous noise measurements will be recorded at two locations for the duration of the construction works. All measurements will be made using Type 1 precision digital sound levels meters and associated hardware. The following parameters will be recorded as a minimum: L_{Aeq}, L_{Amax}, L_{Amin}, L_{A10} & L_{A90}. The location and specification of the noise surveys will be agreed with Dublin City Council in advance of any construction works taking place.

This monitoring programme will ensure that noise from construction activities will be within the noise threshold limits as outlined in Table 11-1 and table 11-2 throughout the construction phase.

All data will be collected and analysed on a weekly basis and the analysed data will be fed back to DPC and the Contractors on a weekly basis with a view to reviewing the compliance of construction phase activities.

Any noise nuisance issues associated with the construction phase activities will be immediately assessed and analysed in relation to the recorded noise levels and all correspondence with DPC, the Contractor, Dublin City Council and residents will be conducted with the appropriate level of urgency. This will include the appropriate liaison with DPC and the Contractor to control activities to ensure that the construction phase activities are in line with any relevant planning conditions and the Draft CEMP (included with the application for consent submission).

In order to ensure that there is no increase in noise impact from changes to vessel movements during the night-time period, Dublin Port will implement the Noise Management Plan in relation to the ongoing management of noise issues associated with changes to Port activities.

11.1.9 Conclusions

A detailed baseline noise monitoring survey was completed at a representative number of properties to determine the noise environment in the vicinity of the proposed redevelopment. This baseline noise monitoring survey was used as a basis for determining the likely noise impact associated with the MP2 Project

The Noise and Vibration Assessment was completed with reference to a range of relevant Irish and international noise and vibration guidance documents.

Worst-case construction noise levels from the proposed redevelopment will be well below the standard noise threshold limits outlined in the relevant noise guidance documents and are below the existing ambient noise levels at all of the nearest noise sensitive properties to the MP2 Project. Noise mitigation measures are included in the EIAR to ensure that construction noise impacts are reduced to the lowest possible levels.

There will be no significant noise impacts associated with traffic flow changes as a result of the construction or operational phases of the MP2 Project. The traffic flow increases associated with the MP2 Project will result in neutral change to traffic noise levels.

There will be construction phase activities associated with the MP2 Project that have the potential to generate vibration impacts, most prominently the piling works required as part of the construction phase. The distance of the piling activities from the nearest sensitive properties will ensure that there is no significant vibration impact at these properties.

During the operational phase, there will be no significant operational phase plant/equipment noise impacts from the MP2 Project at the nearest noise sensitive properties.

11.2 Underwater Noise

11.2.1 Introduction

This section presents an assessment of the likely underwater noise impacts associated with the MP2 Project in the port area including the River Liffey and Dublin Bay.

A detailed description of the MP2 Project is provided in Chapter 3. The potential effect of underwater noise on Biodiversity is addressed in Chapter 7. Reference will be made throughout this Section to these linked elements of the EIAR. This section also provides information to support the NIS.

11.2.1.1 Underwater Noise Overview

Noise is defined as unwanted sound. Underwater noise arising during the construction and operation phases of the MP2 Project has the potential to impact human activities such as diving and has the potential to impact on marine mammals and fish which are listed for protection under the EU Habitats Directive and Council Regulation. There are no significant effects on diving birds as the probability of interaction is extremely unlikely. Based on comparisons to human hearing underwater and an understanding of avian hearing physiology, hearing is not a useful mechanism for birds underwater (Dooling & Therrien, 2012). An assessment of the effect of underwater noise on diving birds has been screened out for these reasons.

Underwater noise is quantified in frequency (Hertz) and intensity (decibels). The decibel (symbol: dB) is a unit of measurement used to express the ratio of one value of a physical property to another on a logarithmic scale. It can be used to express a change in value (e.g., +1 dB or −1 dB) or an absolute value. In the case of underwater noise absolute values, it expresses the ratio of an underwater sound pressure to a reference value of 1 micropascal (μPa).

When used in this way, the decibel symbol is appended to indicate the reference value, for example, 180 dB re 1 μPa. The level in decibels is entirely dependent on the reference level. It is important to note that the reference level for airborne noise (Section 11.1) is different and the acoustic impedance of air and water are also different. This leads to a significant difference in decibel levels for the same sound pressure level. Decibel levels in water are significantly higher and cannot be compared directly to decibel levels in air.

Another important consideration in relation to noise is that it is not a persistent pollutant, once the noise source ceases noise levels drop very quickly to pre-existing levels. The natural underwater soundscape is not silent, biological sounds from fish and marine mammals are mixed with sounds from waves and surface noise, current flow and turbulence and rain and storm noise. The ambient noise levels in coastal water, bays and harbours are subject to wide variations, particularly with breaking waves. Wind speed determines wave activity and underwater noise levels significantly. An increase of 7.2 dB in underwater noise levels was found by Piggott (1965) to result from the doubling of wind speed.

11.2.1.2 Activities giving rise to Underwater Noise Levels

The MP2 Project is described in detail in Chapter 3. The principal underwater noise impacts will arise from the following activities:

- Ground investigation works to assess the nature of the bedrock and overburden materials. The works will be carried out by cable percussion boring, rotary coring, and penetration testing;
- Excavation of maritime infrastructure close to the Liffey channel;
- Piling during installation of quay walls and jetties;
- Dredging of berthing pockets and localised channel widening;
- Disposal of the dredged material at the licensed dump site at the entrance to Dublin Bay located to the west of the Burford Bank;
- Increased vessel traffic following construction and operation of new port facilities.

11.2.2 Assessment Methodology

This underwater noise assessment comprises of a description of the receiving environment, a description of likely significant impacts, recommendations for remedial measures, a statement of residual impacts and monitoring proposals for the MP2 Project. The methodology used for this assessment is consistent with best practice for underwater noise assessments and includes interaction with the benthic & fisheries and marine mammal specialists.

Dublin Bay has been monitored and underwater noise levels reported on several occasions. The shipping traffic noise levels are determined by the proximity to passing vessels. Construction and dredging noise occurs sporadically from maintenance activities and in recent years from the construction of the ABR Project. This assessment is based on reporting of a number of measurements which describe the receiving environment, followed by a description of the activities likely to give rise to underwater noise. The potential impacts are described and evaluated. Mitigation measures are recommended along with monitoring requirements.

11.2.3 Receiving Environment

Underwater noise levels can be divided into three typical categories:

1. Background noise level (no dominant sound, low noise level);
2. Biological noise level (louder sounds not attributable to anthropogenic sources); and
3. Shipping noise (louder sounds attributable to shipping traffic).

Dublin Bay is home to Dublin Port and Dun Laoghaire Harbour along with a number of smaller harbours and marinas. Marine traffic includes: large cargo ships, passenger cruise ships, large ferry vessels, fast ferries, trawlers and leisure traffic. The main shipping channels from the Irish Sea are north and south of the Burford Bank towards the Great South Wall light and into the dredged shipping channel on the eastern approaches to the port up the River Liffey as far as the East-Link/Tom Clarke Bridge.

The central port area from Berth 53 to the Alexandra Basin West is heavily trafficked on a daily basis. This working area in Dublin Port is relatively noisy in comparison to the greater Dublin Bay area. Noise in the port area comes from shipping and a multitude of industrial sources. The port is accessed via the dredged channel which extends some 2.5 km from the Great South Wall light to Berth 53. The channel is approximately 200 m wide and is currently 8 m deep. This narrow shallow channel has the effect of confining noise from the port within that area and a short section of the channel and the River Liffey upstream.

All traffic to and from port uses the dredged navigation channel to the eastern end of the Great South Wall and then heads either north or south of the Burford Bank. West of the Great South Wall light in the dredged channel, noise levels are elevated in the navigation channel as a vessel passes but again fade quickly. The outer Dublin Bay area is also a shallow water area (<30 m deep) and underwater sound does not propagate efficiently, resulting in short elevations in noise levels while a vessel is passing by.

11.2.3.1 Sensitivity of the Receiving Environment

The receiving environment during the construction phase is an enclosed section of a busy port. Existing underwater noise levels in the area are elevated in the presence of shipping traffic but noise attenuates quickly due to absorption by the mud on the seabed. From an underwater noise perspective any sources of additional noise will be confined to an area close to the source and attenuate rapidly.

The site is noise sensitive due to the proximity of marine species including fish; Salmon, River Lamprey, Sea Lamprey, Eel, Smelt and Shad, and marine mammals, primarily the resident seal population and Harbour Porpoise associated with the nearby Special Area of Conservation. The underwater noise impact thresholds used in this chapter are set out generally in Popper et al. (2014), NPWS (2014), NOAA (2013) and Finneran & Jenkins (2012).

The outer part of Dublin Bay is a popular recreational diving location, with scenic dives at Scotsman's Bay, Sandycove, Muglins Rock, Dalkey Island and Irelands Eye. Popular wreck sites include the Queen Victoria and other wreck sites further out. The closest of these sites (Scotsman's Bay) is located some 6 km from the end of the Great South Wall, which is in turn over 2 km from the nearest piling activity.

Noise levels from construction in the port will be contained in the dredged channel close to the source and will not propagate out to the wider bay area. Shipping entering or leaving the port will result in localised increases in noise levels in the outer bay.

11.2.3.2 Strive Report (2011)

Underwater noise levels were measured at locations around Ireland, including Dublin Bay and reported for the EPA by Beck et al. (2011).

For Dublin Bay, the noise monitoring equipment was located on the -10m CD contour line on two sites, north and south of the main shipping channel. Weather conditions at each location during the measurements were fair weather with winds of less than 10 knots. Background Noise levels are expected to be higher in adverse weather conditions.

The results were reported as broadband (5 Hz to 20 kHz) RMS values. At the northern side of Dublin Bay, noise levels were between 125 dB and 135 dB re 1 μPa across all frequency bands whereas at the southern site the noise levels were marginally higher, while still remaining below 140 dB re 1 μPa. At the northern site, the low-frequency components (below 100 Hz) were about equal for all noise whereas at the southern end the biological and background noise levels do not appear to have these low-level frequency components. There were significant temporal variations, related to shipping activity and what appears to be an elevated noise level during night hours when compared with daytime.

Shipping noise is dependent on the level of shipping traffic. It is similar to road traffic in the sense that a busy international shipping channel is like a motorway, i.e. has a constantly high level. For the majority of Irish waters shipping noise is like road traffic noise on a rural road. As a car/ship goes by there is an elevated level and the noise returns to background levels quickly thereafter.

11.2.3.3 ABR Project

The Alexandra Basin Redevelopment (ABR) Project (29N.PA0034) is currently underway in the port. During the course of construction underwater noise levels were measured and reported in Table 11-24. The background noise levels are higher than those reported for the outer Dublin Bay area in Section 11.2.3.2. Elevated levels due to shipping were similar to the outer bay area in that the levels rose for the short period when the ship was passing.

Table 11-24 Underwater noise levels measured in the port area 2017

Source	North Wall Light		ESB Pontoon	
	SPL dBre: 1µPa @ 1m	SEL dBre: 1µPa^2-s	SPL dBre: 1µPa @ 1m	SEL dBre: 1µPa^2-s
Natural Background	150	<132	130-140	110-120
Shipping	165	150	165	150
Piling	180	140	-	-

11.2.3.4 2017 Piling Noise Monitoring Report

Piling noise in Alexandra Basin West was monitored on 23 November 2017 while piling was taking place on the Ocean Pier quay wall. A notable feature of the piling noise was the intermittent nature of the noise source. While piling is underway ‘all day’, the actual piling strikes occur for one third of actual time. This is due to the need to ensure the piles are properly aligned, piling depth checks, changes in piling settings, meal breaks and equipment. The average ‘striking period’ duration was under 12 minutes with varying breaks in between.

Measurements were carried out at two locations 200m from the source (Alexandra Basin/North Wall Quay) and 1,200m from the source (ESB Pontoon/Tern Nesting Site) down river during piling. Background underwater noise measurements were also carried out in the period between piling and reported in Table 11-24

A typical pile strike is shown in Figure 11-2. The metrics of this pile strike are used in Section 11.2.8.1 to predict potential noise impacts from the MP2 Project.

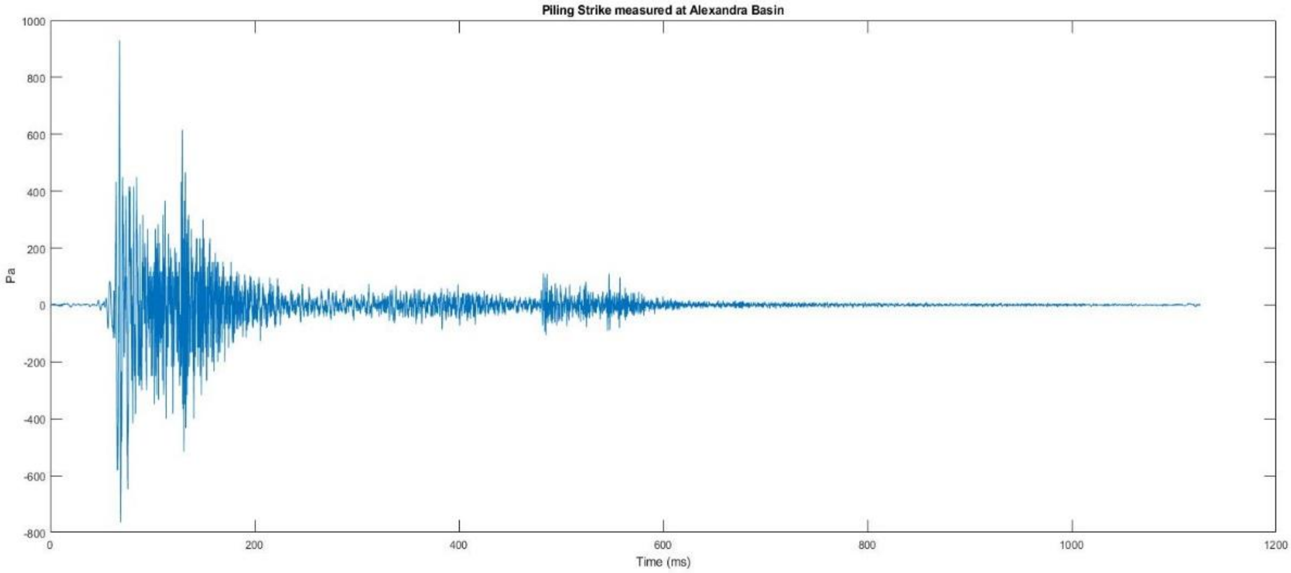


Figure 11-2 Pile Strike at Alexandra Basin West

11.2.4 Likelihood of Impacts

Dublin Port has been in operation for over 300 years with motorised vessels for over 100 years. While the level of traffic has increased, the North Quay Wall was constructed 150 years ago and the port area has centred on the two Alexandra Basins throughout this time. Underwater noise levels related to the MP2 Project will increase temporarily during construction and revert to shipping traffic related noise once constructed.

Sound transmission in shallow water is highly variable and site specific because it is strongly influenced by the acoustic properties of the bottom and surface as well as by variations in sound speed within the water column (Richardson et. al., 1995). With shallow water sound transmission, the combination of environmental factors makes it difficult to develop accurate theoretical models. The theory must be combined with site-specific empirical data to obtain reliable propagation predictions.

There are two main impacts to be assessed; construction of the MP2 Project, during which the worst case noise will relate to piling activity, and the normal port operation during construction and when construction is complete. This assessment is based on the piling and construction activity being carried out while the port is in normal operation.

11.2.4.1 Dredging and Piling Activity

The extent of piling operations required for this development is set out in Table 11-25 below.

Table 11-25 Extent of Dredging and Piling Activity

Location	Piling Required
Berth 53	1.0 m dia. to 1.2m dia. x 22mm to 25mm thick tubular steel piles (raking and vertical)
Berth 52	AZ- 28-700 Sheet Pile with 1.6m dia. x 22mm-25mm thickness King Piles (as per ABR Project Drawings). AZ- 28-700 Sheet Pile deadman. AZ- 28-700 Sheet Pile for cellular walls.
Berth 50A	AZ- 28-700 Sheet Pile with 1.4m dia. x 22mm-25mm thickness King Piles (similar to that under construction for the ABR Project) AZ- 28-700 Sheet Pile deadman.
Oil Berth 3	AZ- 28-700 Sheet Pile with 1.4m dia. x 22mm-25mm thickness King Piles (similar to that under construction for the ABR Project) AZ- 28-700 Sheet Pile deadman.
Jetty Road	AZ- 28-700 Sheet Pile with 1.4m dia. x 22mm-25mm thickness King Piles (similar to that under construction for the ABR Project) AZ- 28-700 Sheet Pile deadman.
Berth 53 Dredging	Dredging works at Berth 53. The standard depth of the channel will be -10.0m CD
Channel Dredging	Channel dredging works to the south of the existing navigation channel. The standard depth of the channel will be -10.0m CD
Other Dredging	Dredging works are also required at Oil Berth 3 where the standard depth of the berthing pocket will be -13.0m and Berth 50A the standard depth of the berthing pocket will be -11.0m CD

11.2.4.2 Underwater Noise Sources

Quoted (peak) source levels for underwater noise sources are quoted in dB re μPa at 1 metre. This is a 'notional' figure extrapolated from far field measurements as it is not practicable to measure sound levels at 1m from an active source such as a ship or a pile-driver. Measurements are taken in what is known as the far field and extrapolated back to a notional 1 m from the idealised point source. It is usual to take measurements at several hundred metres or kilometres in deep water and extrapolate the measured levels to what has become known as a 1 m source level. This is illustrated in Figure 11-3.

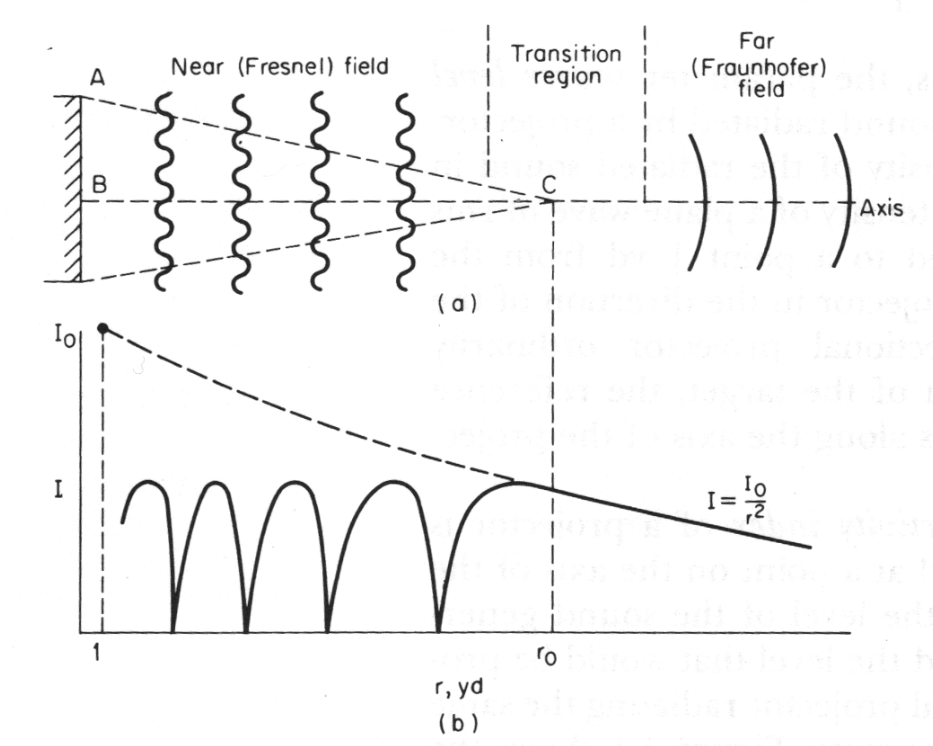


Figure 11-3 Underwater Noise source level fields (Urich 1983, fig. 4)

The actual propagation of sound in the near (Fresnel) field produces an undulating curve, but the extrapolated (dashed) line indicates a much higher theoretical source level.

This extrapolation leads to apparently high values for the source level and can lead to erroneous conclusions about the impact on marine mammals and fish for the following reasons:

- Far field source levels do not apply in the near field of the array where the sources do not add coherently; sound levels in the near field are, in fact, lower than would be expected from far field estimates.
- Source level calculations are generally based on theoretical point sources with sound propagating equally in all directions. This is not easily replicated in real world conditions.
- The majority of published data for underwater sources is based on deep water measurements. Sound propagation in shallow water is significantly more complex and sound does not propagate as efficiently as it would in deep water.

A table of typical underwater noise levels is set out below in Table 11-26.

Table 11-26 Table of typical underwater noise levels

Source	SPL dB re:1µPa @ 1m	SEL dB re: 1µPa²-s	Sound Duration seconds	Peak Frequency Hertz	Bandwidth Hertz
Super Tanker 337m long @ 18 knots	185	-	constant	23	5-100
Dredging (Suction/Hopper dredge)	177	-	constant	80-200	20-8,000
Tug vessel (while towing)	145-170	-	constant	-	37-5,000
Fishing vessel (12m long @ 7 knots)	150	-	constant	300	250-1000

The operation of dredgers on silty material results in underwater noise levels in the same range as shipping traffic. While the dredger is operating suction equipment, it is travelling at slow speed. Shipping traffic in the area is usually larger vessels, generally travelling at higher speeds or manoeuvring using thruster engines. The impact of dredging noise is therefore not regarded as likely to have a significant effect in the overall context and as outlined in Section 11.2.8, the worst case underwater noise level will arise from impact piling and this assessment is carried out on that basis.

11.2.5 Description of likely significant impacts

The criteria used to assess the significance of the underwater noise impacts is presented in Table 11-27. Underwater noise criteria are the subject of ongoing research. In many cases, species specific data is sparse or does not currently exist and has to be extrapolated from similar species. The criteria are selected from best international practise and publications. The thresholds for mustelids is taken from the only available guideline which provides a threshold for sea otters because there is no published threshold for the Eurasian otter.

Table 11-27 Underwater Noise Impact Criteria

Organism	Impact Type	Threshold dB	Criteria	Data Source
Human Diver	Annoying but not harmful	160 dB re: 1µPa SPLPeak	Peak	Norro et al (2010)
	Just audible	145 dB re: 1µPa SPLRMS	RMS	Parvin et al. (2002)
Fish	Mortality of fish eggs and larvae	210 dB re 1µPa2s	SELcum	Popper *et al.*, (2014)
		207 dB re: 1µPa SPLPeak	Peak	Popper *et al.*, (2014)
	Mortality/ PTS in adult fish*	207 – 219 dB re 1µPa2s	SELcum	Popper *et al.*, (2014)
		207 – 213 dB re: 1µPa SPLPeak	Peak	Popper *et al.*, (2014)
	Recoverable injury in adult fish*	203 – 216 dB re 1µPa2s	SELcum	Popper *et al.*, (2014)
		207 – 213 dB re: 1µPa SPLPeak	Peak	Popper *et al.*, (2014)
	Temporary Threshold Shift (TTS)	186 dB re 1µPa2s	SELcum	Popper *et al.*, (2014)
Cetaceans	Permanent Threshold Shift (PTS) [SPLPeak]	230 dB re: 1µPa SPLPeak	Peak	NPWS (2014)
		198 dB re 1µPa2s	SEL	NPWS (2014)
	Behaviour effects	160 dB re: 1µPa SPLRMS	RMS	NOAA (2013)
Pinnipeds	Permanent Threshold Shift (PTS) [SPLPeak]	218 dB re: 1µPa SPLPeak	Peak	NPWS (2014)
		186 dB re 1µPa2s	SEL	NPWS (2014)
Mustelids (Sea Otters)	Permanent Threshold Shift (PTS)	220 dB re 1µPa2s	SEL	Finneran & Jenkins (2012)

11.2.5.1 Underwater Noise Impacts

The scale of this development in the context of the existing harbour is described in Chapter 3: Project Description of this EIAR.

The construction of the quay walls and berths will involve some marine traffic transporting materials but the most significant underwater noise element of the construction phase will be the piling requirement. The piling specification is similar to that being used in the ABR Project. The majority of the piles are the AZ sheet piles which will be driven using a vibratory pile driver. The heavy tubular piles will be 1.0 to 1.6 m in diameter. Experience at Dublin Port has shown that heavy tubular piles greater than 1.0m in diameter sink several metres vertically into the seabed when initially lowered. It is likely however that at least half of the tubular pile driving will require an impact hammer to drive the piles to the required depth. No riverside impact piling to take place between March and May along the River Liffey. The piling operation is described in detail in Chapter 3.

Driving heavy tubular piles such as those proposed is an intermittent activity. The pile is lifted into place, aligned and lowered slowly into position. Initially there will be multiple stops for alignment checks, each lasting as long as the preceding pile driving period. Gradually the pile is driven for longer periods. As this occurs frequent checks on alignment are again required. Due to the length of the piles it is likely that the piles will be installed in sections so further time is required to weld extension sections to the pile.

An examination of piling log sheets for a typical days piling activity during the ABR project (23rd November 2017) shows that piling started at 09:17 and was carried out in eight ‘sessions’ taking 12.6 minutes on average. Break periods between piling averaged seven minutes for short breaks, for example a quick alignment check. Longer breaks of 50 minutes were required for setup changes. The piling finished at 13:58 to facilitate welding and setup for the following day. Total piling strikes during this period was 3,796 with an average of 475 strikes per period. The average striking rate was one strike every 1.6 seconds.

As can be seen from this description, the impact piling is not a continuous activity, the likelihood is that even at peak requirement, the impact hammer will only be used for 30% to 50% of the day. Support activities will involve relocating the three barges and operating hydraulic power packs to power the piling rig. A crane will be required to lift the piles into place.

11.2.5.2 Underwater Noise Sources

The underwater noise impacts will occur in two phases, the construction phase and the operations phase. During the operations phase, the impact will be confined to vessel traffic at the port. Underwater noise levels will remain as they are currently, i.e. elevated levels for a short period in the outer bay as a vessel navigates the channel and elevated levels for short periods (10 to 30 minutes) while the vessel berths in the port. The noise levels associated with shipping traffic are outlined in Table 11-26. Noise levels during construction will be significantly higher than those arising from port operations. The main activities required during construction with potential underwater noise impacts are outlined in Table 11-28.. Noise from impact piling described will represent the worst case noise event during construction.

The assessment of underwater noise impacts will be carried out on the basis of the impact piling noise during construction as all other activities will have lower impacts. The cumulative impact of all activities is addressed in Section 11.2.2.

Table 11-28 Construction Tasks with potential underwater noise impacts

Construction Activity	Details	Extent/Duration	RMS Noise Levels dB re: 1μPa @ 1m
Delivery of piles (by sea if required)	Vessel traffic, similar to existing	Cargo vessel deliveries to port similar to existing shipping traffic	170
Delivery and assembly of the barges	Described in Section 2.3.3.4	Mobilisation and Demobilisation will take 2-3 days on each occasion	170
Relocation of jack up barge	Described in Section 2.3.3.4	Estimated every 3 days over the piling period	170
Support vessel	Safety requirement	Full piling period	150
Operation of jack up barge	Support equipment (hydraulics, crane, etc.)	Full piling period	150
Vibratory Piling	Required for all sheet piles	Full piling period	170
Impact Piling	Required for all circular piles and some sheet piles	Full piling period	222 (worst case)

It is clear from Table 11-28 that impact piling will cause the worst case underwater noise impacts. Each of the other activities is at least 30 dB quieter than the impact piling activity. The choice of piling method is a complex issue involving the need to drive the pile fully to ensure long term stability, a parameter which varies with site-specific soil conditions. While the noise level arising during vibratory pile driving is lower, the available pile driving energy is also significantly lower. Vibratory pile driving is also not very effective in firm clays and cannot drive piles deeply into stiff clays (Tomlinson & Woodward (2008). The impact driving hammer is however suitable for driving all types of pile in stiff to hard clays,

With lower energy pile driving the time taken to drive a pile is longer. This has a significant effect on the acoustic impact of the activity as the Sound Exposure Level (SEL) and Cumulative Sound Exposure Level (SEL_{cum}) are key criteria which are time based. The longer the duration of the event the higher the SEL or SEL_{cum} level. Impact pile driving results in a shorter duration of piling noise. Vibratory piling will be utilised for a significant portion of the work at Dublin Port, i.e. the sheet piling. The ground conditions however require impact piling is utilised for the heavy tubular piles.

Based on previous experience at Dublin Port, where extensive piling was being carried out, piling will probably occur about 30-50% of the working time during the day. The balance of the time being taken up with alignment checks, welding and other support activities and meal breaks. This utilisation factor is consistent with Bailey et al. (2010). The total duration of impact piling will therefore be a small proportion of the overall construction period.

Due to the proximity of sensitive protected species and the potential for high levels of underwater noise from impact piling in particular, this EIAR includes this specific assessment of underwater noise levels.

The context for this assessment includes the enclosed shallow water area in which the activity takes place along with the scale of the development. These factors in particular indicate that potential underwater noise impacts will be significant at close range but not in the wider bay area.

11.2.5.3 Underwater Noise Prediction

As outlined in Table 11-28, the worst case underwater noise impact is during impact pile driving. Impact pile driving is the subject of considerable interest due to the noise levels arising from driving large (4-5 m diameter) piles for offshore wind farms in open water. It is important to distinguish that type of piling from the activity proposed in an enclosed area at Dublin Port.

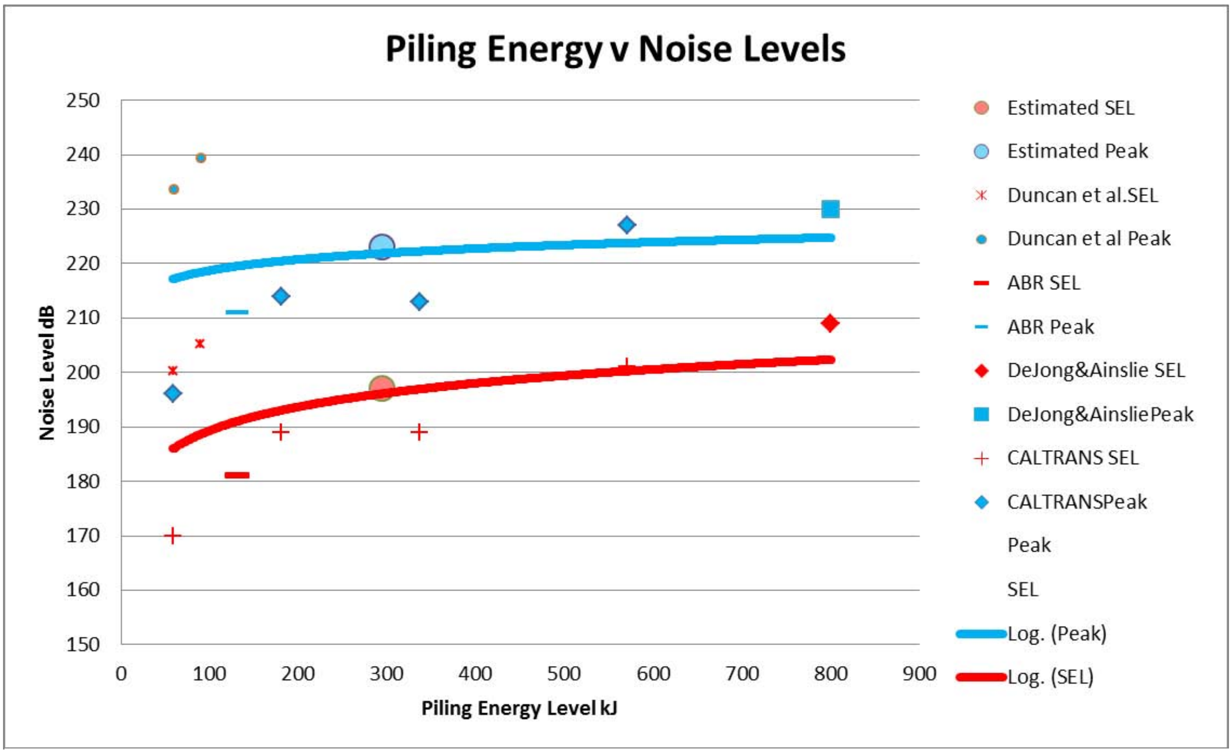


Figure 11-4 Sound Source levels from a range of piling activities

Piling intensity can be determined by the energy input per strike. De Jong and Ainslie (2008) relate impact piling energy to sound output and provide underwater noise source level data for an 800 kJ piling operation. The California Department of Transport has provided a compendium of pile driving sound data, Caltrans (2007), which has a large database of pile types and diameters.

Four appropriate examples of piling activity across a range of piling energies were taken from this compendium and plotted in Figure 11-4. Measured data, collected by RPS in Dublin Port as part of the ABR Project are also included on the figure. The plot is completed with data taken from Duncan et al (2010) from two projects in Australia.

Trend-line plots are provided for all the data. It should be noted however that the Duncan et al (2010) data appears to be significantly higher than data from the other sources. If this data were excluded, the trend-line fit for the remaining data (comprising 6 different independent projects) would be much better. There may be site specific factors that gave rise to higher levels, in particular the calcarenite seabed in Australia.

The estimated maximum strike energy required at Dublin Port has been estimated to be 294 kJ, which is considerably higher than that used in Alexandra Basin West in 2017. Including the Duncan et al (2010) data on a trend-line curve in Figure 11-4 this provides source level estimates for pile driving noise, presented in Table 11.29.. SEL_{cum} is based on 1,000 strikes.

Table 11-29 Estimated impact piling sound source levels for Dublin Port

Metric	Noise Levels
Peak Sound Level	223 dB re 1µPa @ 1m
Sound Exposure Level SEL	197 dB re 1µPa^2-s @ 1m
SEL_{cum}	227 dB re 1µPa2-s @ 1m
RMS Sound Pressure Level	206 dB re 1µPa @ 1m

11.2.5.4 Underwater Noise Model

There are several methods available for modelling the propagation of sound between a source and receiver ranging from very simple models which simply assume spreading according to a 10 log (r) or 20 log (r) relationship (as discussed above) to full acoustic models (e.g. ray tracing, normal mode, parabolic equation, wavenumber integration and energy flux models). In addition, semi-empirical models are available which lie somewhere in between these two extremes in terms of complexity.

When the water is very shallow (as is the case at Dublin Port) sound propagation theory predicts that, if the effective water depth is less than λ/4, (where λ = wavelength of the sound) waves are not matched to the duct and very large propagation losses occur (this means that frequencies lower than 30 Hz will not propagate effectively in the area). The situation at Dublin Port is further complicated by the bathymetry and the confined nature of the navigation channel and the port.

As a pressure pulse from an impulsive source propagates towards the receiver, the duration of the pulse increases. Thus the relationship between the peak sound pressure level and the SEL changes with distance. The SEL level was calculated based on the rms (90% energy) sound pressure level normalised to a one second time interval. The single pulse SEL values have been combined for each pulse as part of the various cumulative SEL modelling scenarios.

It is important to note that the rms sound pressure level will depend upon the integration window used or, in other words, the measurement time for the rms. Using a longer duration measurement would result in a lower rms sound pressure level than using a shorter one. Therefore the rms sound pressure source level, determined the interval which contains 90% of the sound energy, has been calculated based on a digitisation of the time history plot of the waveform. This integration procedure gives a more relevant and consistent value for comparison between various studies and is the suggested metric in Southall et al. (2007).

In open water, increasing the distance from the sound source usually results in the level of sound becoming lower, due primarily to the spreading of the sound energy with distance, The way that the sound spreads (geometrical divergence) will depend upon several factors such as water column depth, pressure, temperature gradients, salinity as well as water surface and bottom (i.e. seabed) conditions. Thus, even for a given locality, there are temporal variations to the way that sound will propagate. However, in simple terms, the sound energy may spread out in a spherical pattern (close to the source) or a cylindrical pattern (much further from the source), although other factors mean that decay in sound energy may be somewhere between these two simplistic cases. The issue is further complicated in the confined space at Dublin Port. Reflections from the quay walls, interference patterns at the basin openings and absorption by the navigation channel sides all impact on underwater noise propagation.

In acoustically shallow waters such as Dublin Bay, the propagation mechanism is determined by multiple interactions with the seabed and the water surface (Lurton 2002; Etter 2013; Urick 1983; Kinsler et al. 1999). Whereas in deeper waters the sound will propagate further without encountering the surface or bottom of the sea, in shallower waters the sound may be reflected and absorbed at either or both boundaries.

With a shallow source, the source and its reflected image become a dipole source with a vertical directionality (Urich 1983). In deep water with both a shallow source and a shallow receiver, spreading loss may be as much as 40 log R, versus the 20 log R expected from spherical spreading. In shallow water, the shallow source dipole effect introduces an additional 10 log R spreading loss (Grachev 1983, quoted in Richardson et. al. (1985)), increasing the loss from ~15 log R to ~25 log R. A similar interference effect occurs when the receiving location is within ¼ wavelength of the surface, (At 15 metres depth this impacts all frequencies under 25 Hz).

At the sea surface, the majority of sound is reflected back in to the water due to the difference in acoustic impedance (i.e. sound speed and density) between air and water. Scattering of sound at the surface of the sea can be an important factor with respect to the propagation of sound. In an ideal case (i.e. for a perfectly smooth sea surface), the majority of sound wave energy will be reflected back into the sea. For rough seas, however, much of the sound energy is scattered (e.g. Eckart 1953; Fortuin 1970; Marsh, Schulkin, and Kneale 1961; Urick and Hoover 1956). Scattering can also occur due to bubbles near the surface such as those generated by wind or fish. Scattering my also result from the presence of suspended solids in the water such as particulates and marine life. Scattering is more pronounced for higher frequencies than for low frequencies and is dependent on the sea state (i.e. wave height).

Because surface scattering results in differences in reflected sound, its effect will be more important at longer ranges from the source sound and in acoustically shallow water (i.e. where there are multiple reflections between the source and receiver). The degree of scattering will depend upon the sea state/wind speed, water depth, frequency of the sound, temperature gradient, angle of incidence and range from source. It should be noted that variations in propagation due to scattering will vary temporally within an area primarily due to different sea-states / wind speeds at different times. However, over shorter ranges (e.g. several hundred meters or less) the sound will experience fewer reflections and so the effect of scattering should not be significant.

When sound waves encounter the bottom, the amount of sound reflected will depend on the geo-acoustic properties of the bottom (e.g. grain size, porosity, density, sound speed, absorption coefficient and roughness) as well as the angle of incidence and frequency of the sound (Cole 1965; Hamilton 1970; Mackenzie 1960; McKinney and Anderson 1964; Etter 2013; Lurton 2002; Urick 1983). At Dublin Port the bottom is comprised primarily of mud or other acoustically soft sediment and will reflect less sound than acoustically harder bottoms such as rock or sand. This effect will also depend on the profile of the bottom (e.g. the depth of the sediment layer and how the geo-acoustic properties vary with depth below the sea floor). The effect is less pronounced at low frequencies (a few kHz and below). A scattering effect (similar to that which occurs at the surface) also occurs at the bottom (Essen 1994; Greaves and Stephen 2003; McKinney and Anderson 1964; Kuo 1992).

Another important factor is the sound speed gradient. Changes in temperature, salinity and pressure with depth mean that the speed of sound varies throughout the water column. This can lead to significant variations in sound propagation and can also lead to sound channels, particularly for high frequency sound. Sound can propagate in a duct-like manner within these channels, effectively focussing the sound, and conversely they can also lead to shadow zones. The frequency at which this occurs depends on the characteristics of the sound channel but, for example, a 25 m thick layer would not act as a duct for frequencies below 1.5 kHz. The temperature gradient can vary throughout the year and thus there will be potential variation in sound propagation depending on the season.

In choosing which propagation model to employ, it is important to ensure that it is fit for purpose and produces results with a suitable degree of accuracy for the application in question, taking into account the context Thus, in some situations (e.g. low risk due to underwater noise, range dependent bathymetry is not an issue, non-impulsive sound) a simple (N log R) model will be sufficient, particularly where other uncertainties outweigh the uncertainties due to modelling. On the other hand, some situations (e.g. very high source levels, impulsive sound, complex source and propagation path characteristics, highly sensitive receivers and low uncertainties in assessment criteria) warrant a more complex modelling methodology.

The first step in choosing a propagation model is therefore to examine these various factors, such as set out below:

- balancing of errors / uncertainties;
- range dependant bathymetry;
- frequency dependence; and
- source characteristics.

For impulsive sound, such as that produced by a piling source, the sound propagation is rather more complex than can be modelled using a simple N log (R) relationship. For example, as discussed previously, the rms sound pressure level of an impulsive sound wave will depend upon the integration window used. An additional phenomenon occurs where the pulse waveform elongates with distance from the source due to a combination of dispersion and multiple reflections. This temporal “smearing” can significantly affect the peak pressure level and reduces the rms amplitude with distance (because the rms window is longer).

Sound propagation modelling for this assessment was therefore based on an established, peer reviewed, range dependent sound propagation model which utilises the semi-empirical model developed by Rogers (1981). The model provides a robust balance between complexity and technical rigour over a wide range of frequencies, has been validated by numerous field studies and has been benchmarked against a range of other models. The following inputs are required for the model:

- third-octave band source sound level data;
- range (distance from source to receiver);
- water column depth (input as bathymetry data grid);
- sediment type;
- sediment and water sound speed profiles and densities;
- sediment attenuation coefficient; and
- source directivity characteristics.

The propagation loss is calculated using the formula:

$$TL = 15log_{10}R + 5\log_{10}(H\beta) + \frac{\beta R \theta_L^2}{4H} - 7.18 + \alpha_w R$$

Where R is the range, H the water depth, β the bottom loss, θ_L the limiting angle and α_w the absorption coefficient of sea water (α_w is a frequency dependant term which is calculated based on Ainslie and McColm, 1998).

The limiting angle, θ_L is the larger of θ_g and θ_c where θ_g is the maximum grazing angle for a skip distance and θ_c is the effective plane wave angle corresponding to the lowest propagating mode.

$$\theta_g = \sqrt{\frac{2Hg}{c_w}} \qquad \theta_c = \frac{c_w}{2fH}$$

Where g is the sound speed gradient in water and f is the frequency.

The bottom loss β is approximated as:

$$\beta \approx \frac{0.477(\rho_s/\rho_w)(c_w/c_s)K_s}{[1-(c_w/c_s)^2]^{3/2}}$$

Where ρ_s is the density of sediment, ρ_w the density of water, c_s the sound speed in the sediment, c_w the sound speed in water and K_s is the sediment attenuation coefficient.

The propagation model also takes into account the depth dependent cut-off frequency for propagation of sound (i.e. the frequency below which sound does not propagate):

$$f_{cut-off} = \frac{c_w}{4h\sqrt{1 - \frac{c_w^2}{c_s^2}}}$$

Where c_s and c_w are the sound propagation speeds in the substrate and water.

The propagation and sound exposure calculations were conducted a water column depths of 12m in order to determine the likely range for injury and disturbance. It should be noted that the effect of directivity has a strong bearing on the calculated zones for injury and disturbance because a marine mammal with direct line of sight to the source will be exposed to greater noise levels than an animal in the outer navigation channel or the greater bay area.

Using the measurement of piling noise carried out at Alexandra Basin West as a source for the Rodgers model, the Peak and SEL underwater noise levels have been predicted out to a range of 1,400m and shown in Figure 11-5.

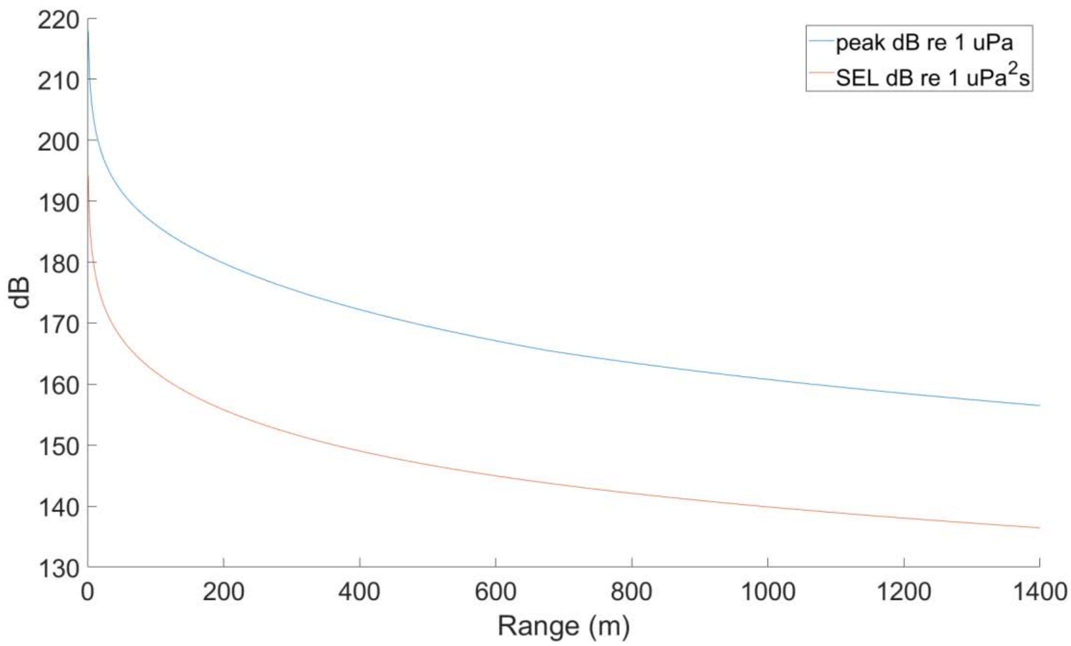


Figure 11-5 Predicted underwater noise levels

Due to the confined shallow space and the narrow channel width, the worst case impact zone is quite small in extent. The potential injury zones are summarised as follows:

- Potential discomfort to recreational divers limited to 1km with clear line of sight;
- Potential injury to fish species is limited to 12m from the source;
- Permanent Threshold Shift injury to marine mammals is limited to 1m from the source; and
- Disturbance to marine mammals is limited to 120m from the source.

As outlined in Section 11.2.3 the site location is a confined area close to the port. The underwater noise impact zone will be limited to the navigation channel and the River Liffey for the impact zones set out in Table 11-30.

Table 11-30 Underwater noise impact zones

Organism	Impact Type	Threshold dB	Criteria	Range
Human Diver[1]	Annoying but not harmful	160 dB re: 1µPa SPLPeak	Peak	1065m
	Just audible	145 dB re: 1µPa SPLRMS	RMS	625m
Fish	Mortality of fish eggs and larvae	210 dB re 1µPa2s	SELcum	n/a
		207 dB re: 1µPa SPLPeak	Peak	10m
	Mortality/ PTS in adult fish*	207 – 219 dB re 1µPa2s	SELcum	n/a
		207 – 213 dB re: 1µPa SPLPeak	Peak	10m
	Recoverable injury in adult fish*	203 – 216 dB re 1µPa2s	SELcum	12m
		207 – 213 dB re: 1µPa SPLPeak	Peak	10m
	Temporary Threshold Shift (TTS)	186 dB re 1µPa2s	SELcum	5m
Cetaceans	Permanent Threshold Shift (PTS) [SPLPeak]	230 dB re: 1µPa SPLPeak	Peak	n/a
		198 dB re 1µPa2s	SEL	n/a
	Behaviour effects	160 dB re: 1µPa SPLRMS	RMS	120m
Pinnipeds	Permanent Threshold Shift (PTS) [SPLPeak]	218 dB re: 1µPa SPLPeak	Peak	1m
		186 dB re 1µPa2s	SEL	1m
Mustelids (Sea Otters)	Permanent Threshold Shift (PTS)	220 dB re 1µPa2s	SEL	n/a

The potential impact of these underwater noise levels on marine species are addressed in Chapter 7 of this EIAR. There will be no underwater noise impact at recreational diving sites in Dublin Bay.

The impact radius as shown in Table 11-30 is localised, as set out in Section 11.2.5.2 when piling takes place it is an intermittent activity during the day. No piling is carried out within the main Liffey Channel during the March to May period as set out in Chapter 7. Any increase in underwater noise levels during construction will only occur as a not significant short term adverse impact. The long term impact from shipping traffic is likely to be neutral as any change in underwater noise from vessels is localised in shallow water and unlikely to affect the overall underwater noise level.

[1] Based on open water conditions

11.2.6 Potential Cumulative Effects

Construction work is currently underway for the ABR Project which is due to be completed by 2025. There is a potential overlap with the last phase of the ABR Project comprising works to the North Wall Quay Extension / Wave Wall and piling works at Berth 52 under the MP2 Project. There will however be no cumulative impact of piling noise at North Wall Quay Extension / Marina Wall and Berth 52 due to the distance of separation between the works.

The port is carrying on normal operations which includes shipping traffic and port activities.

A desktop planning search indicated a number of larger scale projects at planning stage in the area. These applications included infrastructural upgrades by Dublin Port Company to support the operation of the port and also significant investment by companies with facilities located within the port in the upgrade of facilities. The larger scale developments permitted included:

- Harbour Operations Centre consisting of three storey building with a total floor area of 500m^2, within a footprint of 17.5m x 15m (Reg. Ref. 1506/05).
- Internal road upgrade works throughout an extensive area of Dublin Port land including the subject site (Reg. Ref. 3084/16)
- The upgrade of yard facilities at Tolka Quay Road on a site with an area of 2.8ha (Reg. Ref. 2429/17)
- Construction of 1 no. new oil storage tank, demolition of existing buildings and the construction of 1 no. new oil storage tank, to a total storage capacity of 15,770m^3 at Alexandra Road. This is a Seveso site. (Reg. Ref. 3170/09).
- New oil terminal, Topaz Terminal No.3, Promenade Road, bounded to the South by Tolka Quay Road, to the West by TOP Yard 2 and to the East by an access lane to include demolition of the existing terminal of Topaz Terminal No. 1, Alexandra Road. (Reg. Ref. 3171/12).

None of these developments require underwater construction so are not regarded as having any in-combination effect.

Maintenance dredging is also carried out at Dublin Port. The operation of dredgers on silty material results in underwater noise levels in the same range as shipping traffic. The cumulative impact of maintenance dredging noise and capital dredging noise is not therefore not regarded as likely to have a significant effect in the overall context of the proposed development.

Underwater noise levels arising from any of the activities referred to in this section will not alter underwater noise levels to any significant extent and will therefore have no in combination impact.

As outlined in Table 11-28 the source noise level from impact piling is 50 dB higher than any of the other construction or operation activities. When adding the individual contribution of noise sources, the greatest increase arises from the addition of similar noise levels. Where noise levels differ by more than 10 dB, the cumulative noise level is effectively the level of the louder source. This is due to the nature of logarithmic addition of noise levels. With a 30 dB difference in levels the additional cumulative impact of any or all of the other sources in combination with impact pile driving will be nil.

11.2.7 Remedial and Mitigation Measures

11.2.7.1 Construction Phase

The impact from underwater noise is quite limited, based on the measured underwater noise levels for similar scale works being carried out in Alexandra Basin West. The underwater noise levels is predicated on piling taking place in a similar manner to that work, i.e. impact piling is an intermittent activity with significant breaks for placement of piles, alignment checks, etc.

The primary 'interest' for the purpose of this assessment during the construction phase is the pile driving process. The use of heavy pile sections which have the capacity to sink under their own weight require the use of an impact driver. The use of vibratory piles for a substantial portion of the piling requirements as described in Section 11.2.5.2 is a significant mitigation measure as any reduction in impact driving will be beneficial.

Pile driving activity will be carried out as efficiently as possible, to reduce the duration of the piling activity. Piling will only take place for a portion of each day and will not be carried out at night.

Specific mitigation measures and details of compliance with NPWS (2014) guidelines such as soft start, use of marine mammal observers and exclusionary periods for piling are specified in Chapter 7.

11.2.7.2 Operational Phase

Underwater noise levels during the operation phase of the MP2 Project are not expected to change the underwater noise levels in any measurable way. No mitigation measures are therefore required for the operational phase.

Table 11-31 Table of Proposed Mitigation

Impact	Magnitude	Significance	Proposed Mitigation
Underwater noise while impact piling	Exclusionary period March-May on riverside impact piling works Daytime operation	Slight adverse	Marine Mammal Observer to scan prior to impact pile driving
Operational Phase	No measureable change from existing levels	Imperceptible	None

11.2.8 Monitoring

Monitoring noise during the operational phase will be undertaken. The Dublin Bay area is subject to commercial traffic from Dublin Port, Dun Laoghaire Port, Howth Port and leisure and commercial traffic from numerous marinas around the bay. In order to monitor Dublin Port traffic related noise it is proposed to install a hydrophone at the eastern end of the port linked to a vessel identification system. Monitoring will provide information on background (absence of shipping) and ambient (shipping noise included) noise levels along with linking noise events to specific vessels. This approach ensures that particularly noisy vessels can be identified and appropriate measures outlined in the IMO (2014) guidelines are taken to control noise emissions from those vessels.

11.2.9 Conclusions

Site specific underwater noise levels have been established whilst piling and dredging operations have been taking place.

The principal underwater noise impacts will arise from the following activities: ground investigation works to assess the nature of the seabed, demolition and excavation close to the Liffey channel, piling during installation of quay walls and jetties, dredging works including the disposal of the dredged material to the west of the Burford Bank and increased shipping traffic.

The receiving environment during the construction phase is an enclosed section of a busy port. Existing underwater noise levels in the area are elevated in the presence of shipping traffic but noise attenuates quickly due to absorption by the mud on the seabed. From an underwater noise perspective any sources of additional noise during construction will be confined to an area in the inner port and attenuate rapidly.

The site is noise sensitive due to the proximity of marine species including fish in the Liffey channel. The outer part of Dublin Bay is a popular recreational diving location, with scenic dives at Scotsman's Bay, Sandycove, Muglins Rock, Dalkey Island and Irelands Eye. The closest of these sites (Scotsman's Bay) is located some six kilometres from the end of the Great South Wall, and more than eight kilometres from the nearest piling activity. The outer bay is also home to marine mammals, primarily the resident seal population and Harbour Porpoise associated with the nearby Special Area of Conservation.

The construction of the quay walls and berths will involve some marine traffic transporting materials but the most significant underwater noise element of the construction phase will be the piling requirement.

An underwater noise propagation model was used to predict the potential underwater noise impacts of the MP2 Project. The propagation and sound exposure levels were calculated in order to determine the likely range for injury and disturbance using well established modelling and injury criteria. Due to the confined shallow space and the narrow channel width, the worst case impact zone is quite small in extent. The potential injury zones are summarised as follows:

- Potential discomfort to recreational divers limited to 1 km with clear line of sight;
- Potential injury to fish species is limited to 12 m from the source;
- Permanent Threshold Shift injury to marine mammals is limited to 1m from the source; and
- Disturbance to marine mammals is limited to 120 m from the source.

No recognised dive sites will be impacted by underwater noise from the MP2 Project. No piling will be carried out along the riverside of the Liffey in the March to May period to protect migrating fish. Specific marine mammal mitigation measures will be undertaken including compliance with NPWS (2014) guidelines.

It is proposed that underwater noise levels will be monitored during the construction period at a minimum of two locations upriver and two locations downstream of the works when works are being carried out in the navigation channel. Monitoring will be carried out at the commencement of the piling activity. Any increase in underwater noise levels during construction can be considered as a not significant short-term adverse impact with no residual impact.

Monitoring noise during the operational phase will be undertaken. The Dublin Bay area is subject to commercial traffic from Dublin Port, Dun Laoghaire Port, Howth Port and leisure and commercial traffic from numerous marinas around the bay. In order to monitor Dublin Port traffic related noise it is proposed to install a hydrophone at the eastern end of the port linked to a vessel identification system. Monitoring will provide information on background (absence of shipping) and ambient (shipping noise included) noise levels along with linking noise events to specific vessels. This approach ensures that particularly noisy vessels can be identified and appropriate measures outlined in the IMO (2014) guidelines are taken to control noise emissions from those vessels.

12 MATERIAL ASSETS - COASTAL PROCESSES

12.1 Introduction

This chapter assesses the potential impact of the MP2 Project on the coastal processes in the Dublin Port and Dublin Bay areas and includes information about the tidal regime and the inshore wave climate in order to enable the competent authority to assess the potential impacts on coastal processes.

In addition, this chapter also includes information about sediments in the receiving environment and the inshore wave climate along the Clontarf frontage and will therefore be relevant to the Water Quality and Flood Risk Assessment presented in Chapter 9.

The assessment presented in this Chapter is based on the project description detailed in Chapter 3 of this EIAR.

12.2 Assessment Methodology

12.2.1 Modelling Methodology

RPS used the MIKE 21/3 hydrodynamic numerical modelling software package developed by DHI, to address potential coastal processes issues. This was achieved by developing a range of two dimensional and three dimensional numerical models to represent:

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

These models were used in conjunction with hydrographic survey data and site specific water quality monitoring data to assess the construction and operational impacts of the MP2 Project in the context of the following coastal processes:

- The dispersion and settlement of sediment plumes generated during dredging operations;
- The dispersion of sediment material disposed of at the spoil site;
- The tidal regime;
- Sediment dynamics and the morphological response of the seabed within Dublin Port;
- The inshore wave climate; and
- Flood risk to the surrounding areas.

The impact of the MP2 Project on these coastal processes has been quantified by means of difference plots throughout this chapter, i.e. post-project minus pre-project conditions. As such, the extent and magnitude of potential impacts as a result of the MP2 Project can be clearly identified and compared against baseline conditions. To conclude the assessment, mitigation measures are proposed to reduce impacts, where appropriate. This enables a “with mitigation” assessment to be made of any residual impact as a result of the construction and operational phases of the MP2 Project and/or in combination with other projects in the vicinity of Dublin Port.

12.2.2 Coastal Process Modelling Software

A suite of coastal process models, based on the MIKE software developed by DHI, was used to assess the potential impact of the MP2 Project on the coastal processes within Dublin Port and Bay. The MIKE system is a state of the art, industry standard, modelling system, based on a flexible mesh approach. This software was developed for applications within oceanographic, coastal and estuarine environments.

A brief synopsis of the MIKE system and modules used for this assessment is outlined below:

1. **MIKE 21 & MIKE 3 Flow Model FM system** - Using these flexible mesh modelling systems, it is possible to simulate the mutual interaction between currents, waves and sediment transport by dynamically coupling the relevant modules in both two and three dimensions. Hence, a full feedback of the bed level changes on the waves and flow calculation can be included.

2. **The Hydrodynamic module** –This module is capable of simulating water level variations and flows in response to a variety of forcing functions in lakes, estuaries and coastal regions. The HD Module is the basic computational component of the MIKE 21 and MIKE 3 Flow Model systems providing the hydrodynamic basis for the Sediment Transport and Spectral Wave modules

   The Hydrodynamic module solves the two/three-dimensional incompressible Reynolds averaged Navier-Stokes equations subject to the assumptions of Boussinesq and of hydrostatic pressure. Thus the module consists of continuity, momentum, temperature, salinity and density equations. When being used in three dimensions, the free surface is taken into account using a sigma coordinate transformation approach whereby the vertical layer is divided equally into a discrete number of layers.

3. **The Spectral Wave module** – This module simulates the growth, decay and transformation of wind-generated waves and swell in offshore and coastal areas and accounts for key physical phenomena including wave growth by wave action, dissipation, refraction, shoaling and wave-current interaction.

4. **The Sediment Transport module** - The Sediment Transport Module simulates the erosion, transport, settling and deposition of cohesive sediment in marine and estuarine environments and includes key physical processes such as forcing by waves, flocculation and sliding. The module can be used to assess the impact of marine developments on erosion and sedimentation patterns by including common structures such as jetties, piles or dikes. Point sources can also be introduced to represent localised increases in current flows as a result of outfalls or ship movements etc.

A full description of these systems and modules can be found in Appendix 12-1.

12.2.3 Coastal Process Models and Data Sources

The models used to assess the impact of the MP2 Project on the coastal processes were developed from RPS' present-day Dublin Bay model.

RPS' present-day Dublin Bay Model was created using flexible mesh technology to provide detailed information on the coastal processes around Dublin Port and Dublin Bay. The model uses mesh sizes varying from 250,000

m^2 (equivalent to 500m x 500m squares) at the outer boundary of the model down to a very fine 225 m^2 (equivalent to 15m x 15m squares) along the approach channel and around the harbour channel (as presented in Figure 12-1). The bathymetry of this model was developed using data gathered from a hydrographic survey of the Dublin Port and Tolka estuary undertaken in 2017 and supplemented by data from the Irish National Seabed Survey, INFOMAR and other local surveys collated by RPS for the Irish Coastal Protection Strategy Study (ICPSS, 2003). The extent, mesh structure and bathymetry of this model is illustrated in Figure 12-1.

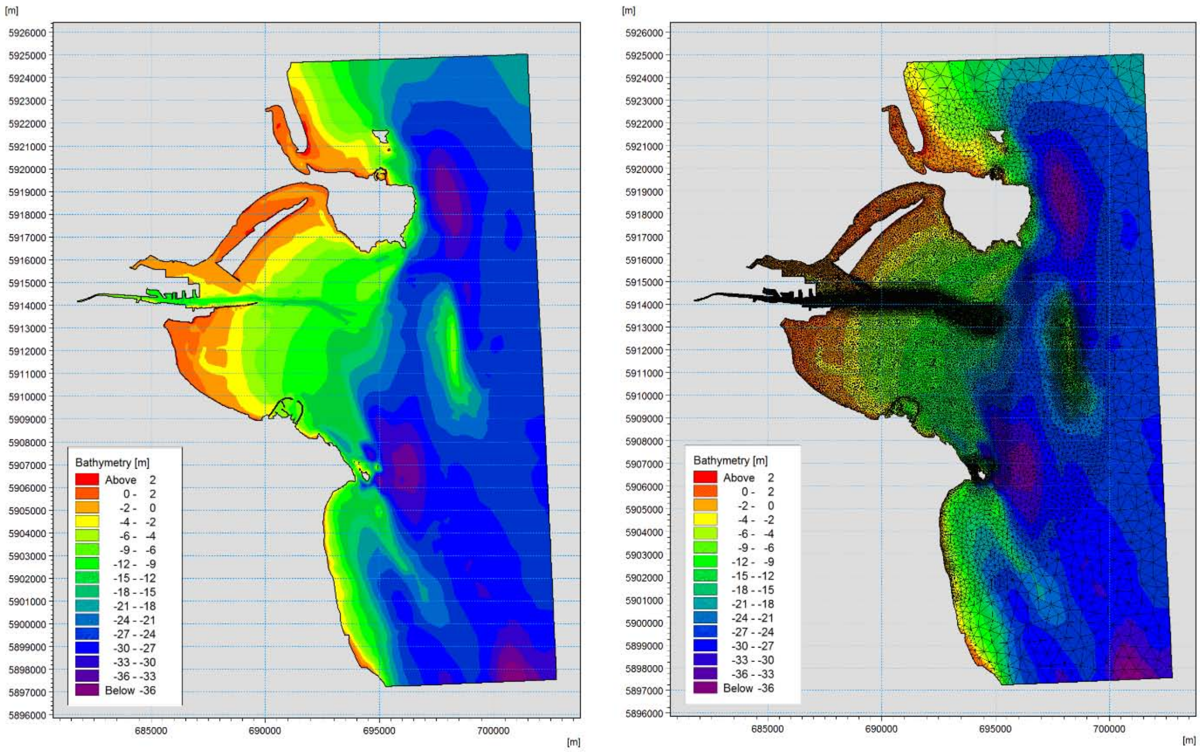


Figure 12-1 Extent and bathymetry of the Dublin Bay model (left) and the mesh structure of the Dublin Bay model (right)

The Dublin Bay model was then updated to produce a 2D version of the model that represented the pre-MP2 Project scenario (in this case, this represents the post-ABR Project layout within Dublin Port). The Dublin Bay model was further updated to produce a second 2D version of the model which represented the Dublin Port post-project scenario with the MP2 Project in place. As such the post-project scenario model had updated bathymetry at Berth 50A/Oil Berth 4, Berth 53 and in the area of the channel dredging works. The constructed elements of the MP2 Project including the new open piled Berth 53, Berth 52 Berth 50A,Oil Berth 3 were also represented in the model.

These two-dimensional models were used to appraise the impact of the MP2 Project on the existing tidal regime, the inshore wave climate and the dumping and dispersion of dredge material at the licensed offshore disposal site. However, as the coastal processes within Dublin Port are highly three-dimensional owing to the fresh water input from the Rivers Liffey, Tolka and Dodder, it was necessary to develop 3D versions of the pre and post-project scenario models.

As illustrated in Figure 12-4, the offshore boundary of the 3D versions of the pre and post-project scenario models extended from the Ben of Howth to Dalkey and includes the Dublin Bay area. These 3D models were comprised of five discrete vertical sigma layers and were used to assess the sediment plumes generated during the various dredging operations within Dublin Port and the operational performance of the MP2 Project.

The bathymetry of the pre and post-project scenario models in the Dublin Port area is illustrated in Figure 12-2 and Figure 12-3 respectively. A Summary of the models that were developed for the MP2 Project assessment and their purpose is summarised in Table 12-1.

Table 12-1 Summary of the numerical models developed for the MP2 Project assessment and their purpose

Numerical Model	2D Version	3D Version
Present day Dublin Bay	• Initial Calibration	n/a
Pre-project scenario (Dublin Port with ABR Project in place)	• Tidal regime • Wave climate • Sediment disposal	• Tidal regime
Post-project scenario (Dublin Port with MP2 Project in place)	• Tidal regime • Wave climate • Sediment disposal	• Tidal regime • Dredging & dispersion • Operational performance of the MP2 Project

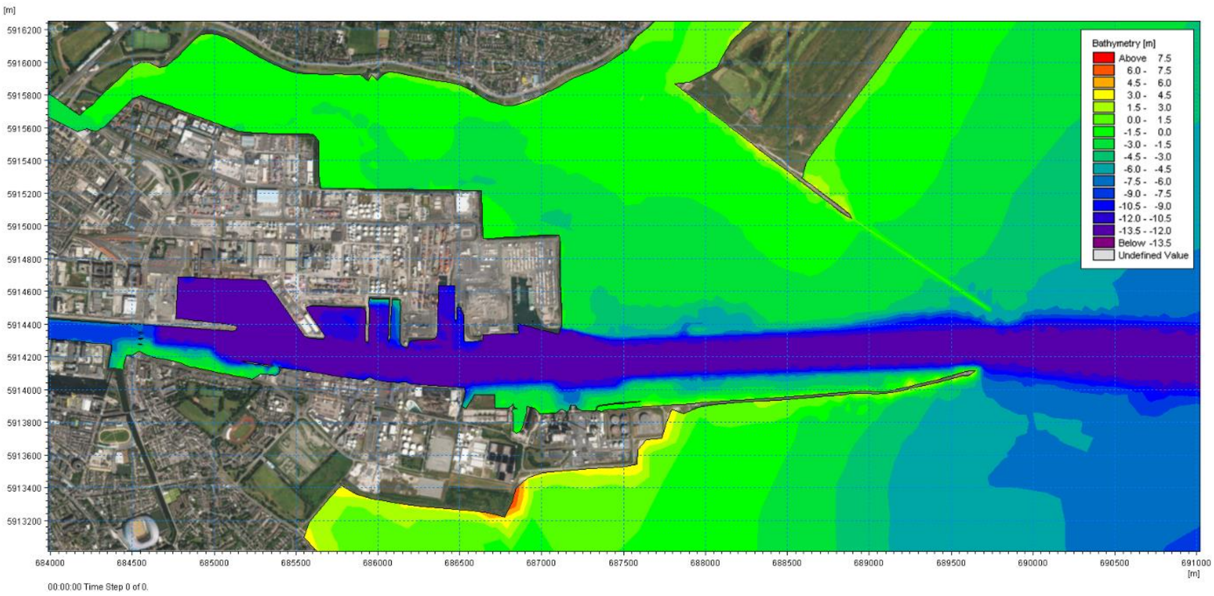


Figure 12-2 Bathymetry of the Dublin Port pre MP2 Project (post ABR Project) model – levels illustrated to Mean Sea Level

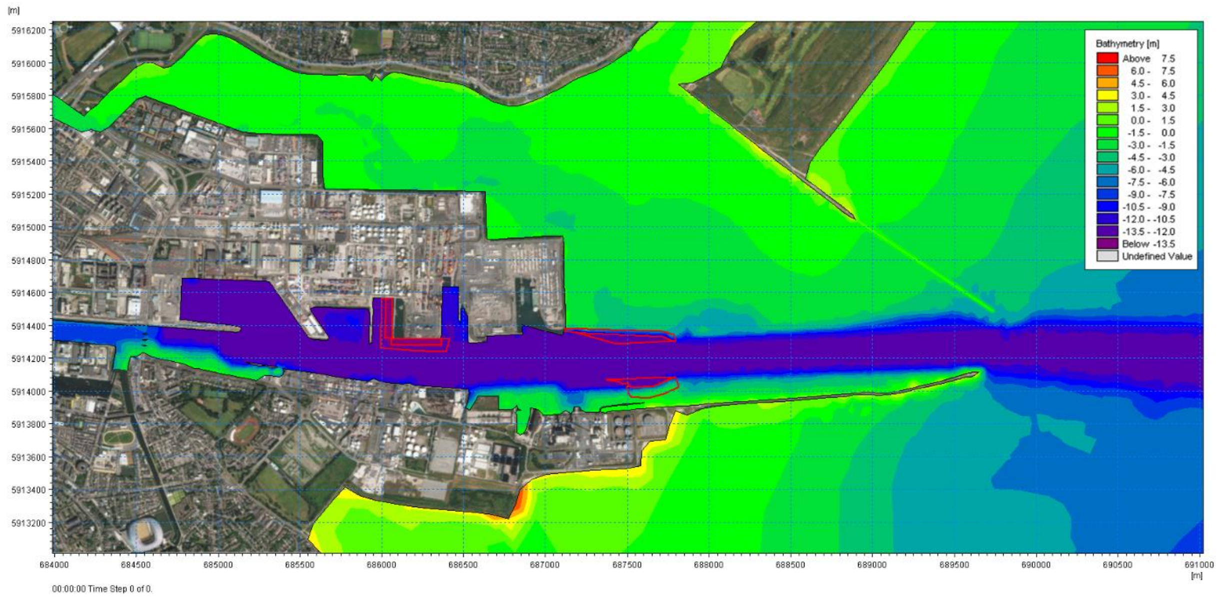


Figure 12-3 Bathymetry of the Dublin Port post MP2 Project model with dredged pockets outlined in red – levels illustrated to Mean Sea Level

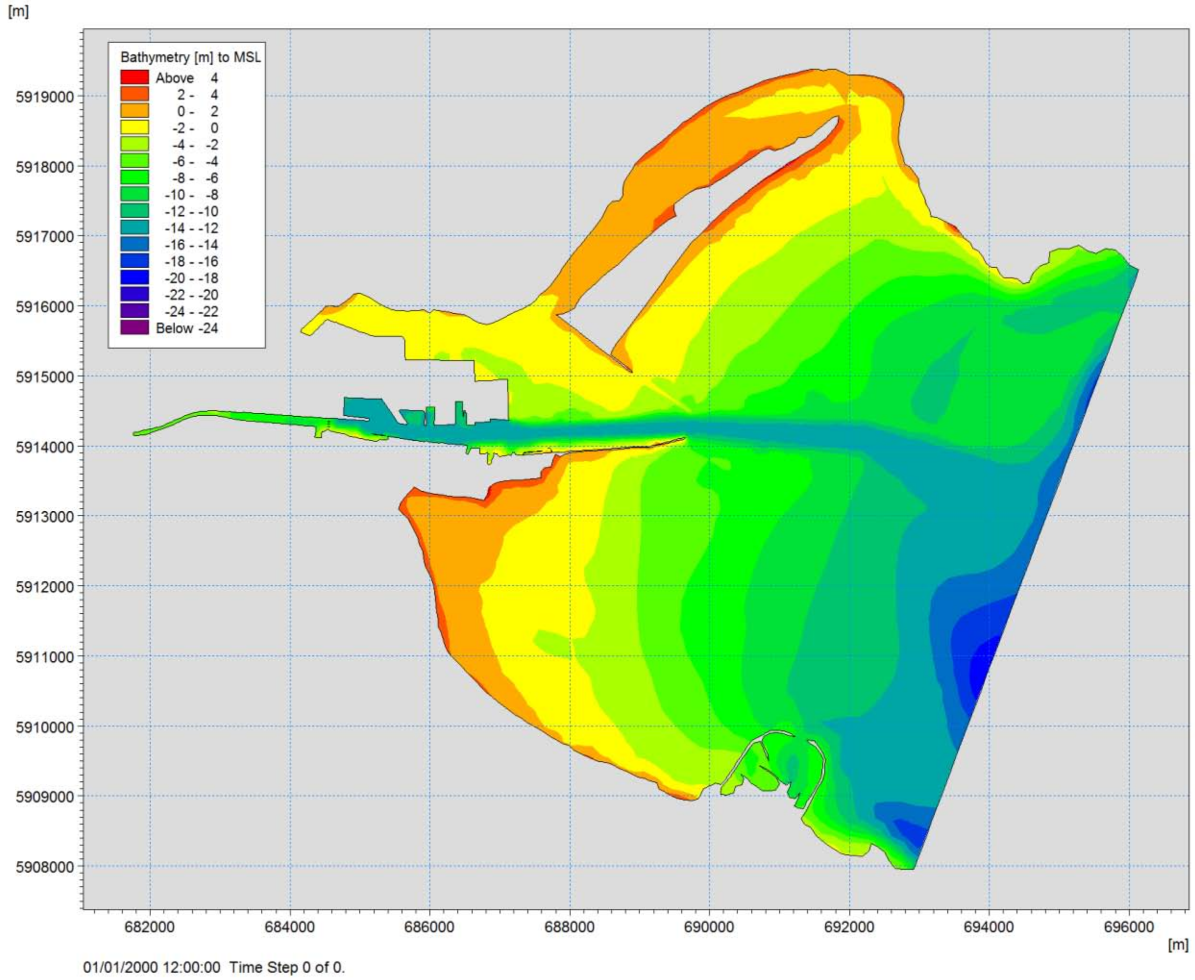


Figure 12-4 Extent and bathymetry of the 3D Dublin Port post MP2 Project model

In addition to the bathymetric survey of Dublin Port and the Tolka estuary area, a comprehensive sediment survey of the Tolka estuary was undertaken by Hydrographic Surveys Ltd in December 2017. This survey comprised sediment sampling at 18 locations for Particle Size Analysis (PSA). The results are presented in Appendix 12-2. Information from this survey was used to inform input parameters for the sediment transport simulations.

The 2017 survey data was complemented by current meter data recorded by two Acoustic Doppler Current Profilers (ADCPs) which were deployed in June 2013 as part of the ABR Project. These devices accurately record current speed, current direction and water depth. One ADCP device was located in the harbour channel in close proximity to buoy 16 and the other device to the north of the approach channel. The devices were deployed for over one month to record full spring and neap tidal cycles. Tidal current meter data recorded by an ADCP device that was deployed 500m west of Burford bank as part of previous study undertaken by DHI was also made available to this study (DHI, 2010).

The extent of the 2017 survey and location of the two ADCP devices that were deployed at part of the ABR Project is illustrated in Figure 12-5. Tidal current meter and surface elevation data from these hydrographic surveys was used to calibrate and validate the present-day Dublin Bay model. This calibration process is described in full detail in Appendix 12-1

Current velocities are also being continuously recorded at the centre of the dump site since September 2017. These recordings have also been used to validate the Dublin Bay model (reported in the Annual Environmental Report (AER) 2017 to the EPA under Dumping at Sea Permit S0024-01.

The model verification process confirmed that the present Dublin Bay model provides a very good representation of the coastal processes in the Dublin Port and Dublin Bay areas.

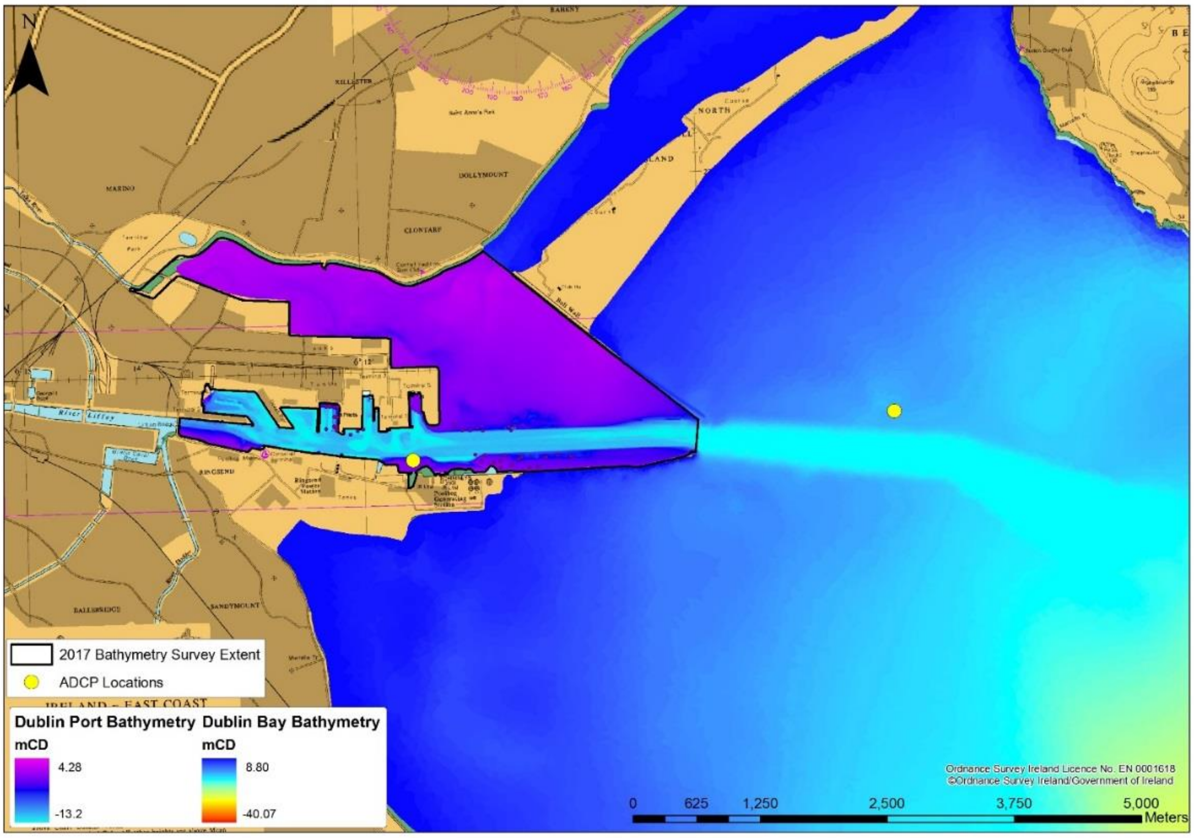


Figure 12-5 Location and coverage of the 2017 Bathymetric Survey

12.2.3.1 Boundary Conditions

The tidal boundary conditions for the 2D pre-project and post-project scenario models were taken from RPS' ICPSS tidal surge model. This model was developed using flexible mesh technology with the mesh size (model resolution) varying from circa 24km along the offshore Atlantic boundary to circa 200m around the Irish coastline. The extent and bathymetry of the ICPSS tidal surge model is presented in Figure 12-6. RPS also utilised their ICPSS east coast wave model to gather wave boundary data for the Dublin Bay model to ensure that the hydrodynamic influence of the offshore Kish and Codling banks were accounted for in the model. The extent and bathymetry of the ICPSS east coast wave model is presented in Figure 12-6.

Tidal boundary condition data for the 3D models were taken from the 2D pre-project and post-project scenario models.

All open sea boundaries were applied to the model as Flather boundaries whereby temporarily and spatially varying water level and current velocities are specified along the boundary. Flather boundaries are one of the most efficient boundary condition methods to downscale coarse model simulations to higher resolution areas as it avoids instabilities commonly associated with water level boundaries.

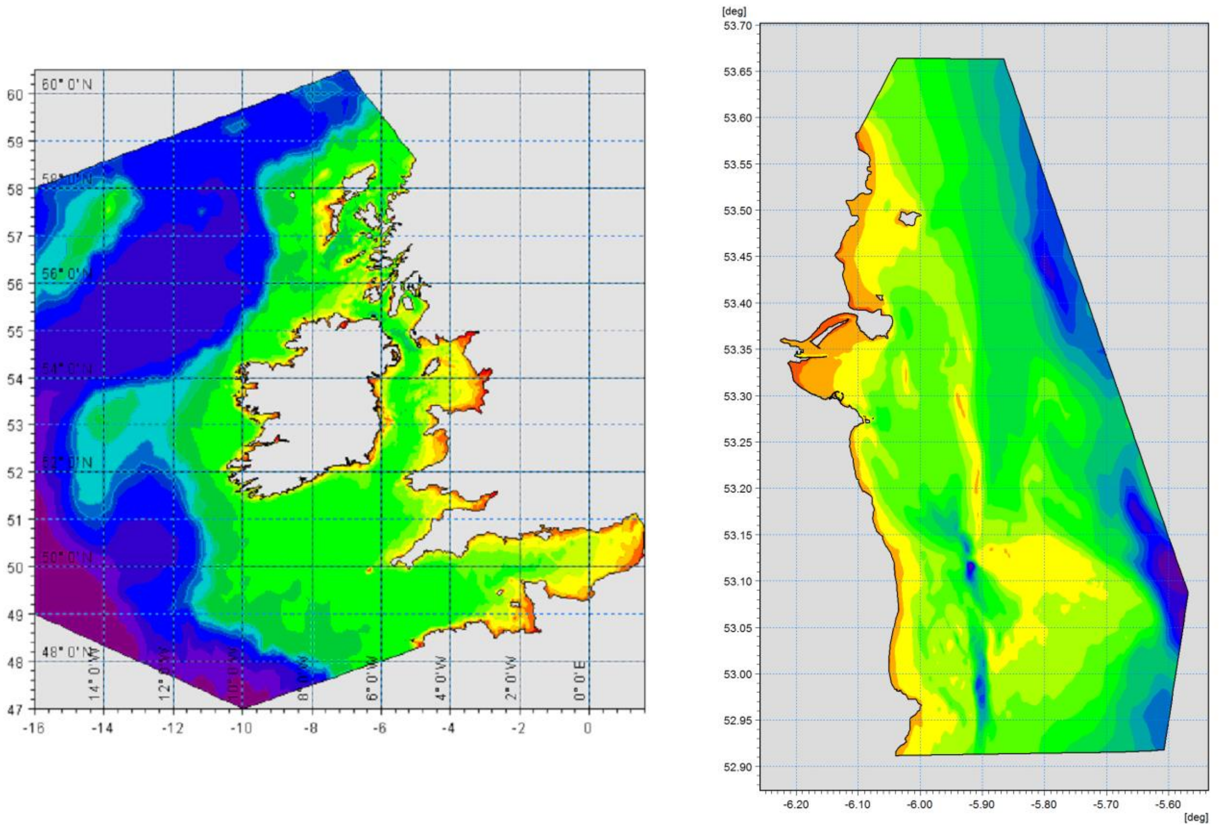


Figure 12-6 Extent and bathymetry of the ICPSS tidal surge model (left) and east coast wave model (right)

12.2.3.2 River Flows

The mean annual river flow values presented Table 12-2 in for the Liffey, Dodder and Tolka were used in the numerical model simulations of the tidal regime. Mean winter river flows were used to model the dispersion and fate of sediment plumes arising from the capital dredging works as dredging works are to be restricted to winter months only. Both the mean winter and annual river flows used for various rivers are presented in Table 12-2.

Table 12-2 Mean annual discharge rates from the Liffey, Dodder and Tolka used in the coastal process models

Source	Mean annual discharge rate (m^3/s)	Mean winter discharge rate (m^3/s)
Liffey	15.6	25.0
Dodder	2.3	2.6
Tolka	1.4	1.6

12.3 Receiving Environment

In this section of the environmental appraisal, the pre-MP2 Project scenario (Dublin Port with ABR Project in place) tidal and wave patterns within Dublin Port and Bay are presented. This is undertaken with reference to both the simulated model data and, where applicable, hydrographic survey data (see Section 12.2.3) and site specific water quality monitoring data made available by Dublin Port Company's Monitoring Programme (ongoing for the ABR Project).

12.3.1 Tidal Regime within Dublin Port (pre-MP2 Project scenario)

The MIKE 21 Hydrodynamic module described in Section 12.2.3 was used in conjunction with the pre-MP2 Project scenario (Dublin Port with ABR Project in place) 2D model to derive baseline tidal regime information within Dublin Port.

Typical tidal flow patterns for a spring ebb and spring flood tide are presented in Figure 12-8. These tidal flow diagrams illustrate that the current speeds in the central navigation channel are marginally higher during mid-ebb conditions relative to mid-flood conditions owing to the contribution of flow from the Liffey, Dodder and Tolka.

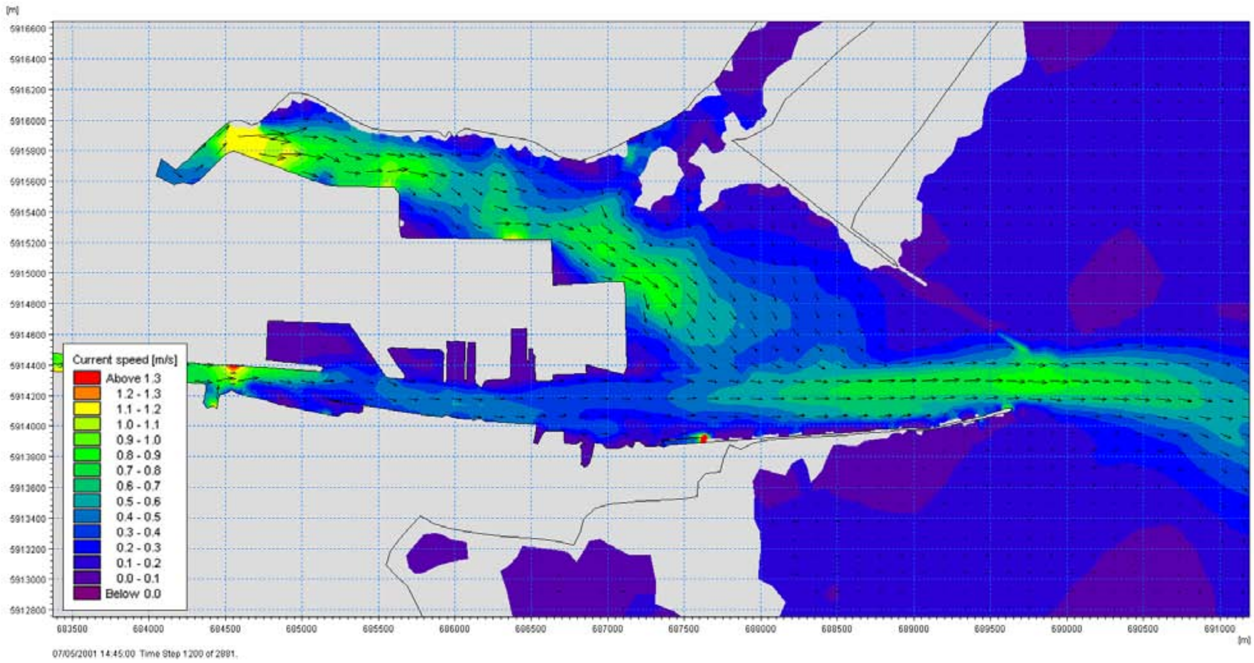


Figure 12-7 Typical spring mid ebb tidal flow patterns – Pre-MP2 Project

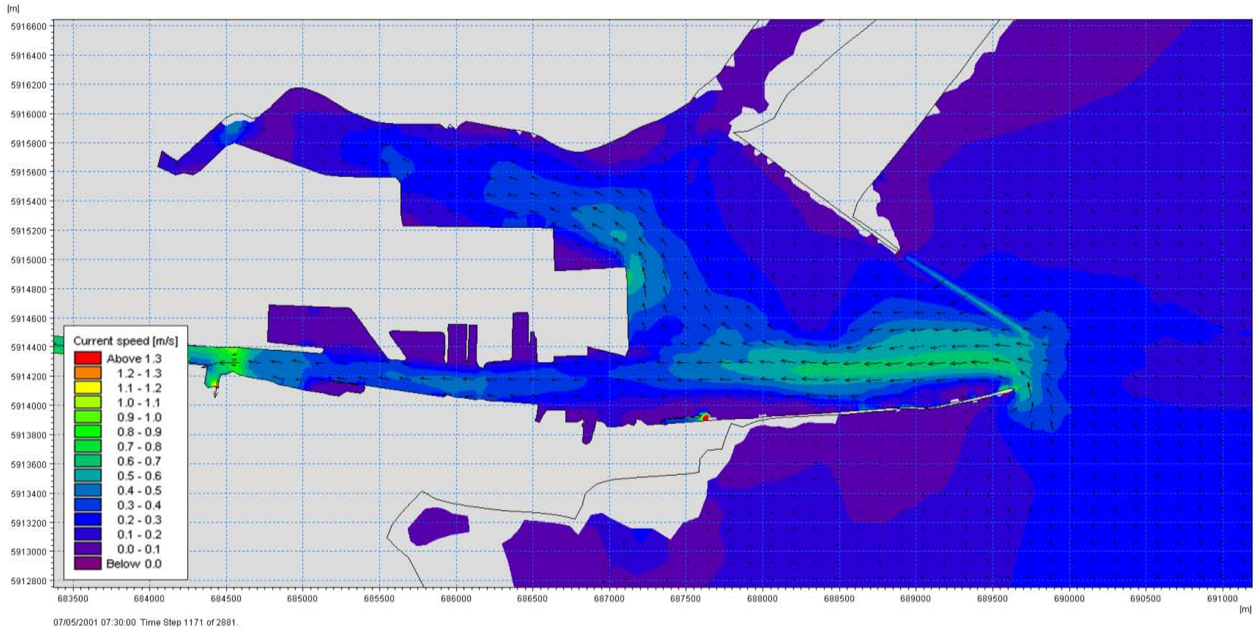


Figure 12-8 Typical spring mid flood tidal flow patterns – Pre-MP2 Project

12.3.2 Wave Climate within Dublin Port (pre-MP2 Project scenario)

Offshore wave data for points at 5.66ºW, 55.50ºN and 5.66ºW, 55.25ºN were taken from the UK Met Office European wave model used as a source to select the largest event for each of the north east, east and south east directions. The three hourly data included wind wave and swell wave components in the form of the significant wave height, mean wave period, peak wave period and mean wave directions. The offshore wave climate data used in the wave transformation simulations are summarised in Table 12-3.

The MIKE 21 Spectral Wave module described in Section 12.2.3 was used in conjunction with the pre-MP2 Project scenario 2D model to transform the offshore wave conditions for the north easterly, easterly and south easterly storm events into the nearshore. These offshore wave conditions are summarised in Table 12-3.

It should be noted that the Spectral Wave module was considered the most appropriate method to assess the inshore wave climate as the alternative Boussinesq wave harbour disturbance model does not account for wind wave generation. This a particularly important factor for areas such as the Clontarf frontage where the wave climate is dominated by wind waves generated over short fetches.

Figure 12-9, Figure 12-10 and Figure 12-11 present the inshore wave heights in Dublin Bay at spring high tide during north easterly, easterly and south easterly storm events respectively. It will be seen from these figures that based on these simulations the largest waves that propagate into Dublin Port occur during easterly storm events at spring high water.

The wave climate is currently being continuously recorded at the centre of the dump site since September 2017. These recordings have also been used to validate the predictions of storm waves entering Dublin Bay (reported in the Annual Environmental Report (AER) 2017 to the EPA under Dumping at Sea Permit S0024-01.

Table 12-3 Offshore wave climate data used to simulate the inshore wave climate

Storm Event	Significant wave height (m)	Peak wave period (s)	Mean wave direction (ºN)
North Easterly	4.6	8.9	29
Easterly	5.5	82	98
South Easterly	5.4	10.4	148

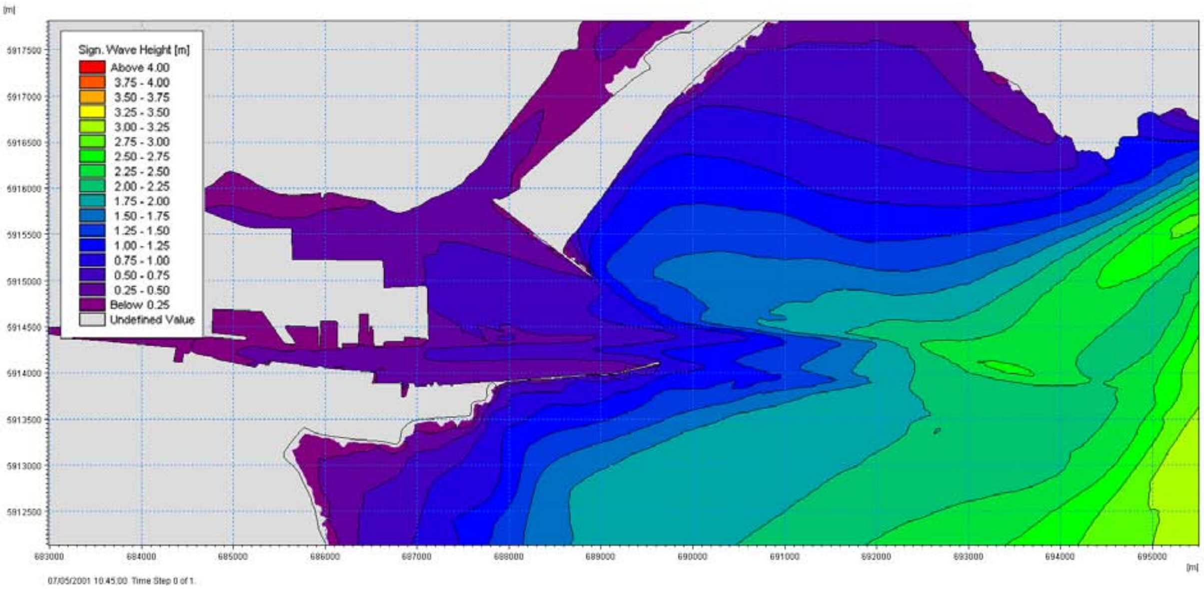


Figure 12-9 North Easterly storm wave heights at spring high water – Pre-MP2 Project

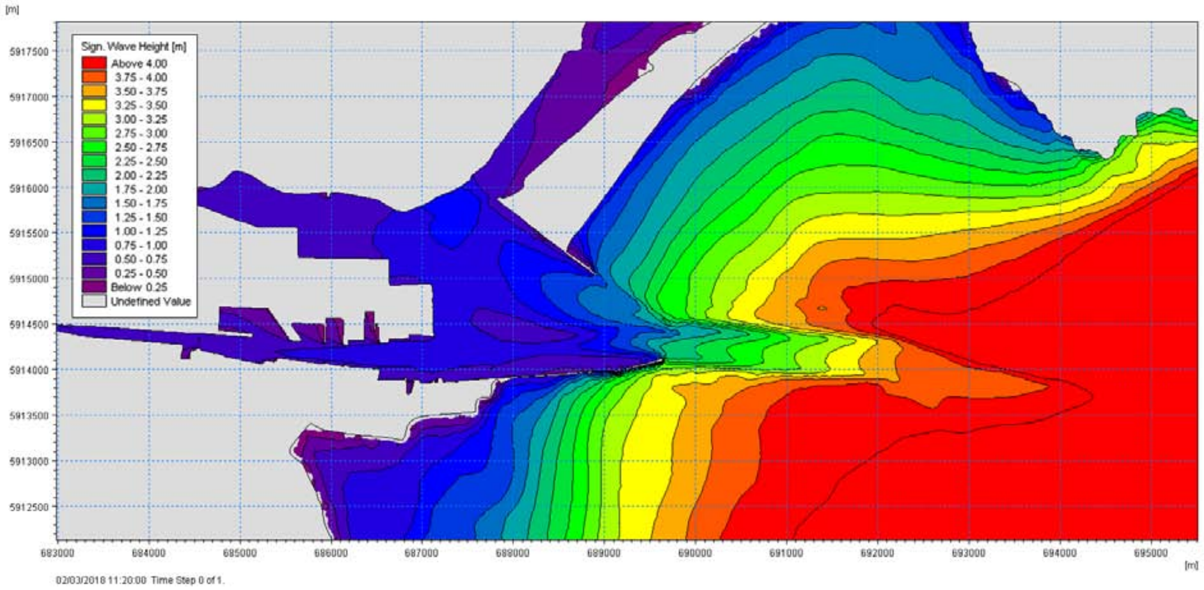


Figure 12-10 Easterly storm wave heights at spring high water – Pre-MP2 Project

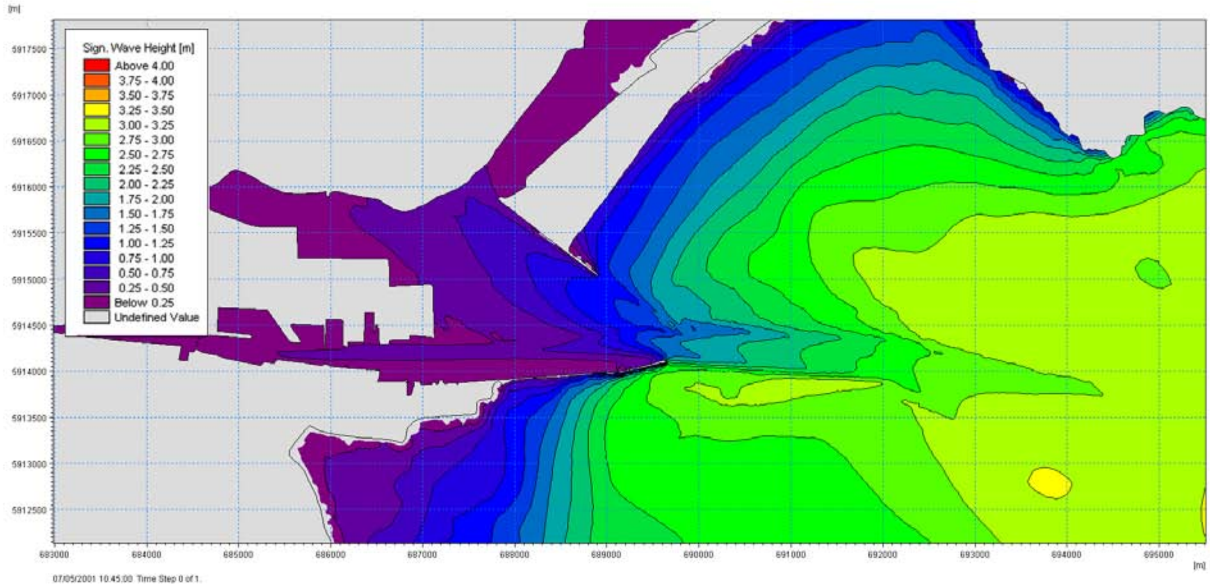


Figure 12-11 South Easterly storm wave heights at spring high water – Pre-MP2 Project

12.4 Likelihood of Impacts

The impact on coastal processes arising from the MP2 Project is assessed in relation to the construction phase of the project and the subsequent operational phase. Various elements of construction and operation and the types of impacts on the tidal, wave and sediment transport regimes that they could potentially result in are identified for assessment in the following sections.

The assessment has been informed by a robust numerical modelling programme and, where applicable, hydrographic survey data (see Section 12.2.3) and site specific water quality monitoring data made available by Dublin Port Company's Monitoring Programme (ongoing for the ABR Project).

12.4.1 Construction Phase Impacts

The major elements of the construction programme are outlined in Chapter 3. In context of coastal process, the elements of the MP2 Project that have the potential to result in construction phase impacts are outlined below:

- Capital Dredging and Disposal:
  - Capital dredging works in the navigation channel and berthing pockets
  - Disposal of dredge spoil at the dumping site

Temporary impacts on water quality have the potential to occur during the construction phase of the works. Mobilised suspended sediment release through capital dredging and disposal activities are the principal potential sources of environmental impact. The potential impacts from the increase in background suspended sedimentation concentrations and deposition levels as a result of the capital dredging and disposal operations during the construction phase are assessed in Section 12.5.1.

12.4.2 Operational Phase Impacts

Port development consisting of the construction of structures and/or changes in the configuration of the seabed bathymetry through capital dredging works has the potential to impact on coastal processes. In context of the MP2 Project, the following elements have the potential to impact on coastal processes:

- New Berth 53
- Re-alignment of the previously consented Berth 52
- Berth 50A extension
- The redevelopment of Oil Berth 3
- Infilling Oil Berth 4

In particular, these elements of work have the potential to impact the following coastal processes during the operational phase of the project:

- Tidal current patterns within Dublin Port and Dublin Bay
- Sedimentation and erosion patterns within Dublin Port and Dublin Bay
- The inshore wave climate within Dublin Port and surrounding area
- Prevailing water levels and the existing flood risk in Dublin Port and the surrounding area

The operational phase impacts in context of these coastal processes are assessed in Section 12.5.2.

12.5 Description of Potential Impacts

12.5.1 Construction Phase Impacts

12.5.1.1 Potential Impacts as a result of capital dredging works

As described in Chapter 3, the MP2 Project will include capital dredging to deepen the berthing pockets at Oil Berth 3/Berth 50A, facilitate construction of Berth 53 and the channel dredging works towards the south of the navigation channel as shown in Figure 12-12. The dredging operations will result in the removal of 424,644 m^3 of marine sediments; a breakdown of the dredging requirements is presented in Table 12-4.

Notwithstanding application of extensive mitigation measures, the process of dredging unavoidably causes disturbance of sediment on the channel bed and dispersal of some material in the water column. Disposal of dredge spoil at the licenced dumping site in Dublin Bay also results in sediment release. These losses may have potential impacts on marine life (Chapter 7) and water quality (Chapter 9) in the form of a suspended sediment plume within the water column. The potential impacts arising from these factors has therefore been assessed in the following sections of the report.

It should be noted that chemical sediment analysis found that the sediments to be dredged from the Port's navigation channel and basins are suitable for conventional dumping at sea (see Chapter 8).

Figure 12-12 MP2 Project Dredging Areas

Table 12-4 Breakdown of dredging requirements for the MP2 Project

Element of Work	Dredge Level	Dredge Requirements (m^3)
Berth 53	-10.0 m CD	159,595
Channel widening area (south of Liffey channel)	-10.0m CD	111,995
Oli Berth 03	-13.0 m CD	83,414
Berth 50A	-11.0 m CD	69,640
Total volume to be dredged		**424,644**

Particle Size Analysis described in Section 12.2.3 indicated that the material to be dredged as part of the MP2 Project is comprised of three discrete fractions with mean diameters of 200µm, 20µm and 3µm, with each fraction constituting approximately 1/3 of the total volume of sediment to be dredged.

Extensive water quality monitoring using real time turbidity measurements during previous dredging campaigns (AER 2017 and AER 2018) has shown that during disposal of dredged fine sands at the licensed disposal site, the fine sand falls rapidly to the bottom and any sediment plume is short lived and is not dispersed widely. However sediments to be dredged in the MP2 Project are finer and contain a substantial silt fraction.

Therefore, plume modelling was undertaken for the silt fractions with silt losses of 1% at the dredger head being introduced as a sediment source in the bottom layer of the model. The other key parameters relating to the dredging simulations presented in the following Sections of this Chapter are set out in Table 12-5.

As the Liffey channel in Dublin Port is influenced by a number of fresh water river inflows and by thermal inputs from three power station cooling water systems, stratification of the water column occurs under certain tidal conditions in the Liffey channel particularly in the central section of the harbour. Therefore, the plume modelling simulations were undertaken using the MIKE 3 Hydrodynamic model described in Section 12.2.3. This model was coupled with the Sediment Transport module and included temperature and salinity effects. The Tolka, Liffey and Dodder river flows were taken as the winter average flows (Table 12-2). The power station flow and temperature characteristics used in the model are shown in Table 12-6.

Three individual simulations were run to simulate the dredging operations at Berth 53, the channel widening area south of the channel, and at Oil Berth 3 and Berth 50A. Each simulation was run for one month to represent the full dredging operation in each area. The output from these simulations is presented in the following Sections of this Chapter.

Table 12-5 Dredging simulation input parameters

Parameter	Value
Trailer Suction Hopper Dredger capacity	4,100 m^3
Ratio of sediment/entrained water during loading	0.3
Average density of material inside hopper	1.65 t/m^3
Average Trip Frequency between Dublin Port and Disposal site	3.0 hours
Average Time to Fill Dredger Hopper	1.5 hours
Time to release load	90 seconds
Overspill Trailer Suction Hopper Dredger head	0%
Sediment loss at Trailer Suction Hopper Dredger head	1% of silts

Table 12-6 Power Station discharge and temperature characteristics, Dublin Harbour

Source	Discharge m^3/s	ΔT degree C	Outlet	Intake
North Wall	3.9	10	Surface layer	Mid depth
Synergen	7.6	6.6	Surface layer	Mid depth
Poolbeg	18.7	7.1	Surface layer	Surface layer

In line with the current Dredging Management Plan developed for the ABR Project and as set out in *Alexandra Basin Redevelopment Project Construction Environmental Management Plan (CEMP) Rev. F August 2018*, no over-spill from the dredger's hopper was included in any of the three model simulations. Other key relevant mitigation measures that will apply to each dredging campaign in the MP2 Project are presented in Section 12.6.1.

Dredging of Berth 53

The dispersion of silts during ongoing dredging is illustrated by a series of plume diagrams that show the suspended sediment concentration of silt in the water column resulting from the dredging operations. Figure 12-13 to Figure 12-16 represent the dispersion of silt material at times of low water, mid flood, high water and mid ebb at a time during the simulated dredging campaign when the suspended sediment concentrations may be expected to be at their highest values (i.e. when the dredger is active at the site).

These figures show that the suspended sediment concentration plumes are confined to the northern half of the navigation channel at all times. The sediment concentrations of the plumes are generally less than 25 mg/l beyond the immediate dredge area. The lateral extent of the 10mg/l plume envelope is generally less than 750m under most tidal conditions.

Monitoring of the Liffey and Tolka Estuaries between East Link Bridge and the entrance to the Port at Poolbeg Lighthouse has been undertaken by the ABR Project (see Chapter 9, Section 9.1.2.7). Measurements of turbidity at the North Bank Light (adjacent to the Tolka Estuary) over the period 2017 – 2018 have ranged from 0 to 39.5 NTU with a mean of 2.6 NTU (n=17,533). This equates to a suspended solids range of 0 to 98 mg/l with a mean of 6.4 mg/l. While there is a relatively small and very local predicted increase in suspended solids due to dredging at Berth 53, this falls within the background range measured close to this location during normal Port operations.

The predicted deposition of the silt fractions lost to the water column during the dredging of Berth 53 at the end of a simulated one-month dredging campaign is presented in Figure 12-17. This Figure shows that the volume of material deposited outside of the dredge area is generally less than 0.40g/m^2 and that the deposition of sediment is generally confined to within the immediate area of the dredging operation. It should be noted that dredging proceeds until the specified design depth is reached and any material deposited within the dredge area will be removed by the dredger until the specification is met.

The estimated natural sediment load from the upstream Liffey catchment is estimated at about 200,000 tonnes per annum (DPC Maintenance Dredge AER 2017, Dumping at Sea Permit S0004-01). If dispersed over the Port area between East Link and Poolbeg Light and the Tolka Estuary this is roughly equivalent to a natural sediment load of 30 kg/m^2 in any year. The small level of deposition predicted as a result of dredging at Berth 53 is therefore highly unlikely to pose any risk through siltation.

It can, therefore, be concluded that the dredging operations required for Berth 53 will not result in any significant impact to either the water quality in terms of suspended sediments, or the nearby environmentally designated areas in terms of sediment deposition.

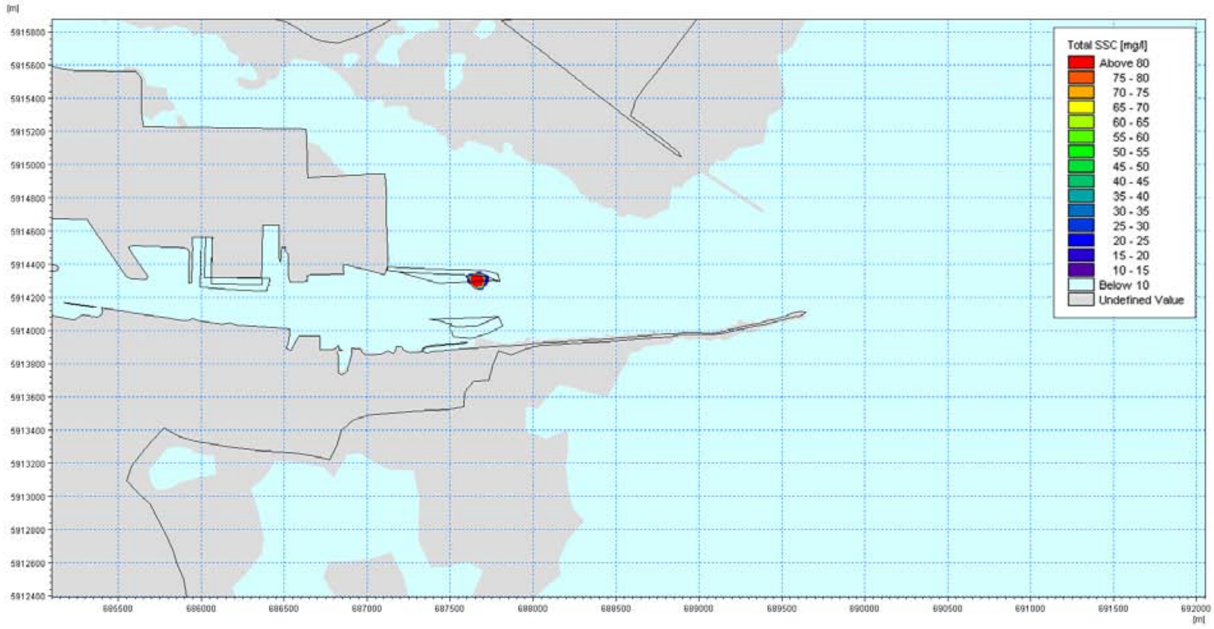


Figure 12-13 Suspended sediment concentration plume in the bottom layer during a typical low water phase of a spring tidal cycle whilst dredging Berth 53

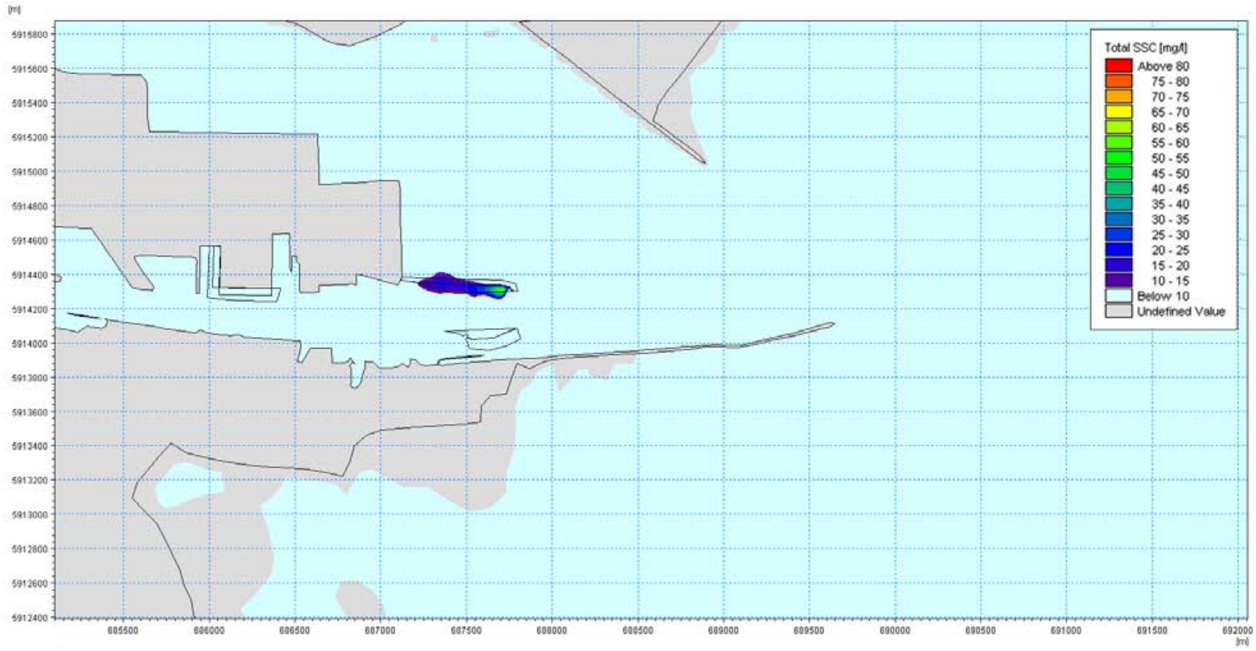


Figure 12-14 Suspended sediment concentration plume in the bottom layer during a typical mid flood phase of a spring tidal cycle whilst dredging Berth 53

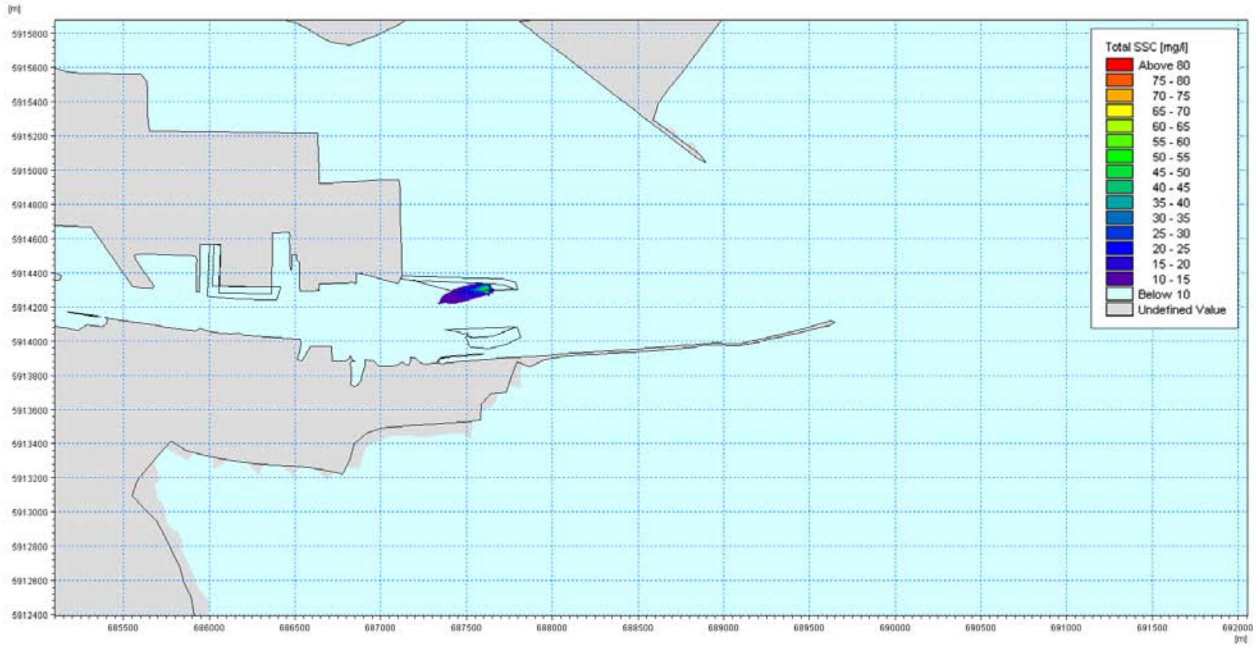


Figure 12-15 Suspended sediment concentration plume in the bottom layer during a typical high water phase of a spring tidal cycle whilst dredging Berth 53

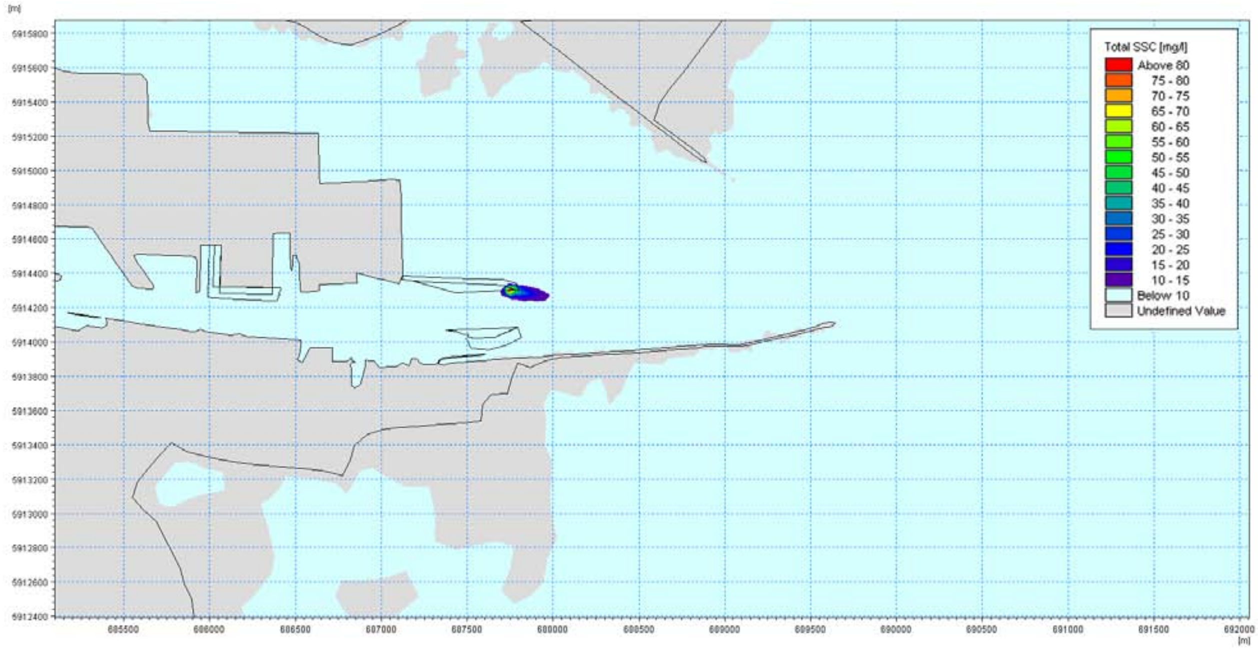


Figure 12-16 Suspended sediment concentration plume in the bottom layer during a typical mid ebb phase of a spring tidal cycle whilst dredging Berth 53

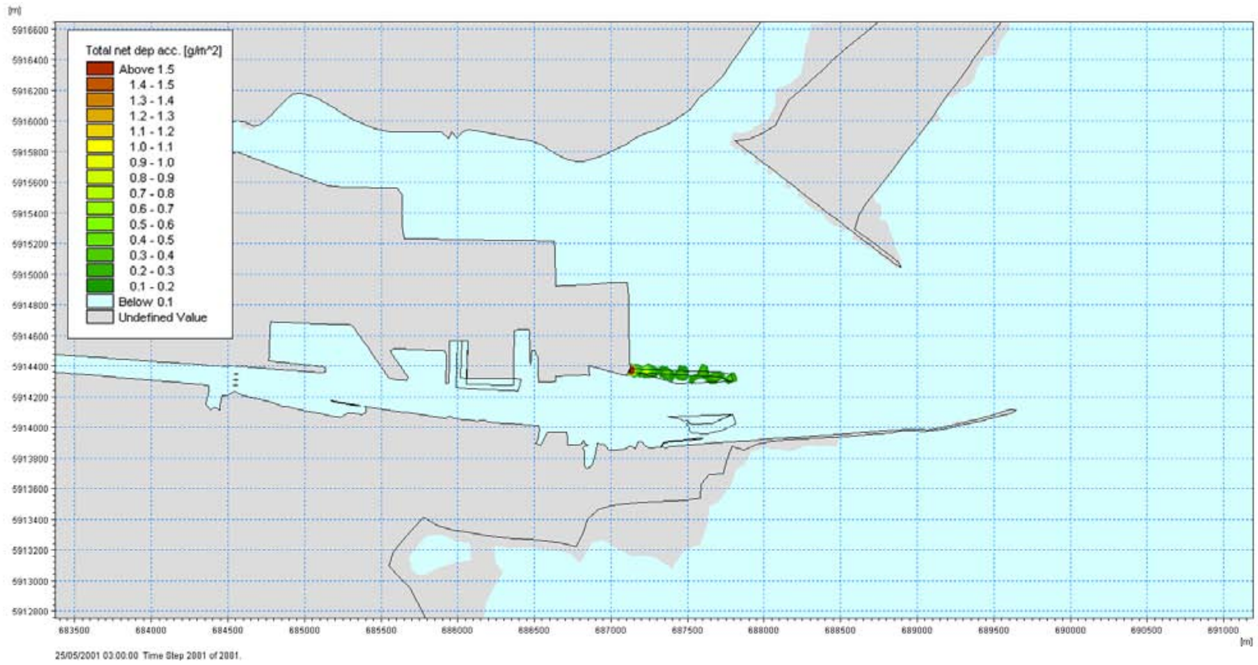


Figure 12-17 Deposition of sediment following the dredging operations at Berth 53

Channel Dredging Works

The impact of the silt dispersion on the suspended sediment concentration is shown by a series of plume diagrams. Figure 12-18 to Figure 12-21 represent the dispersion of silt material at times of low water, mid flood, high water and mid ebb at a time during the dredging operation when the suspended sediment concentrations may be expected to be at their highest values (i.e. when the dredger is active at the site).

It will be seen from these figures the suspended sediment concentration plumes are confined to the southern half of the navigation channel. The sediment concentration of the plumes is generally less than 25 mg/l beyond the immediate dredge area. As set out in the previous section, this is a relatively small and very local predicted increase in suspended solids due to the channel dredging works and is well within the background range experienced at this location during normal Port operations. The lateral extent of the 10mg/l plume envelope is generally less than 600m under most tidal conditions.

The predicted deposition of the silt fractions lost to the water column during the channel dredging works at the end of a simulated one month dredging campaign is presented in Figure 12-22. This Figure shows that the volume of material deposited outside of the dredge area is generally less than 0.30g/m^2 and that the deposition of sediment is generally confined to within the immediate area of the dredging operation. By comparison with natural background sediment loads (previous section) such a small level of deposition is highly unlikely to pose any risk through siltation and no further mitigation is required. Again, any material deposited within the dredge area will be removed by the dredger until the specification is met.

It can, therefore, be concluded that, when considered in terms of background conditions, the dredging operations required for the channel dredging works will not result in any significant impact to either the water quality in terms of suspend sediments, or the nearby environmentally designated areas in terms of sediment deposition. No further mitigation is required.

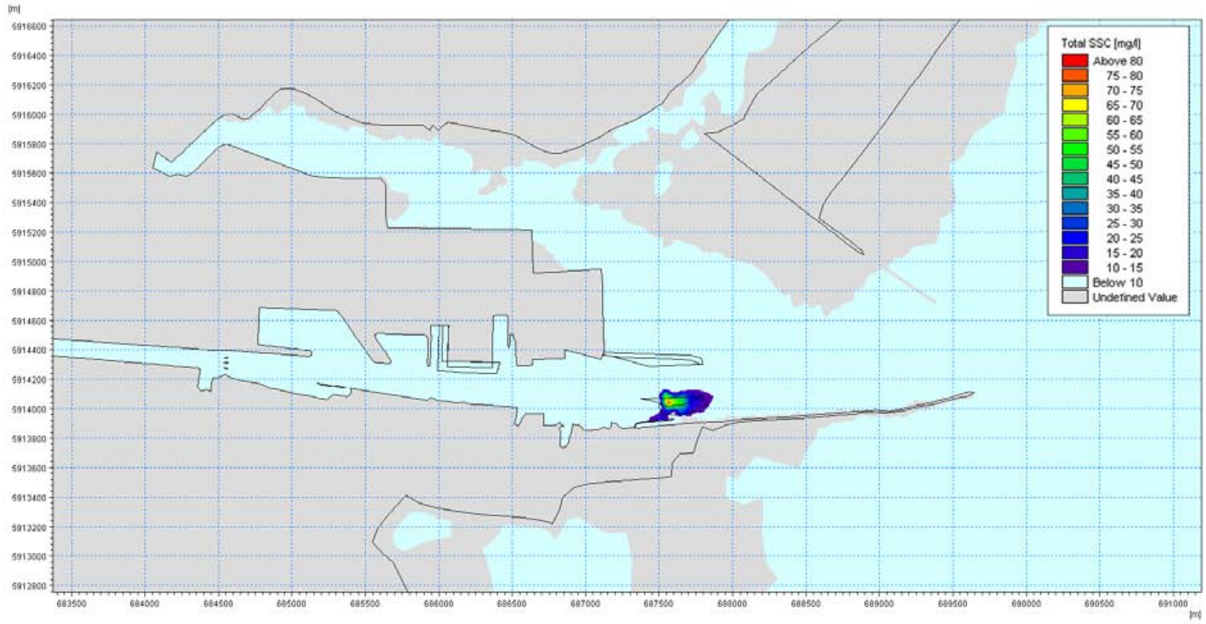


Figure 12-18 Suspended sediment concentration plume in the bottom layer during a typical low water phase of a spring tidal cycle during the Channel Dredging Works

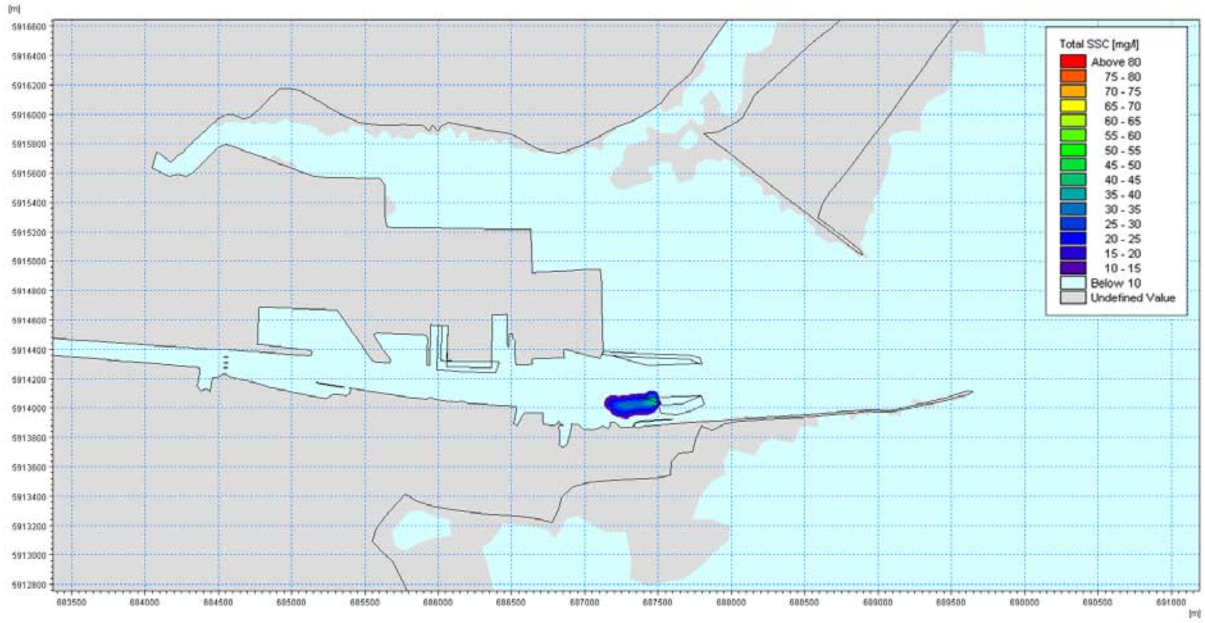


Figure 12-19 Suspended sediment concentration plume in the bottom layer during a typical mid flood phase of a spring tidal cycle during the Channel Dredging Works

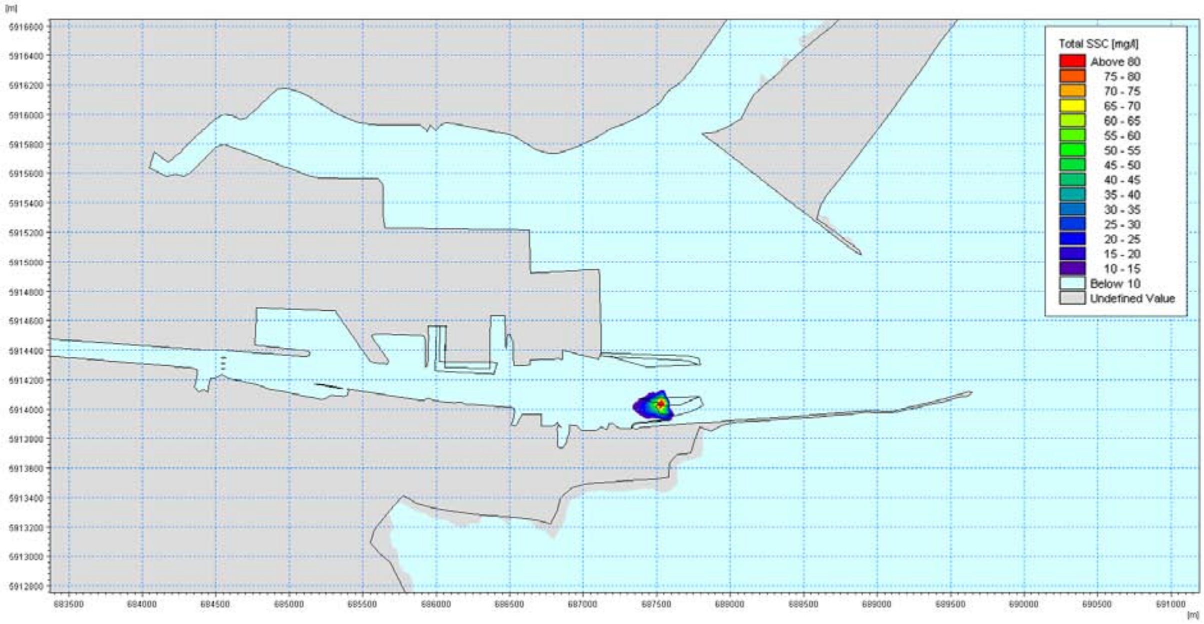


Figure 12-20 Suspended sediment concentration plume in the bottom layer during a typical high water phase of a spring tidal cycle during the Channel Dredging Works

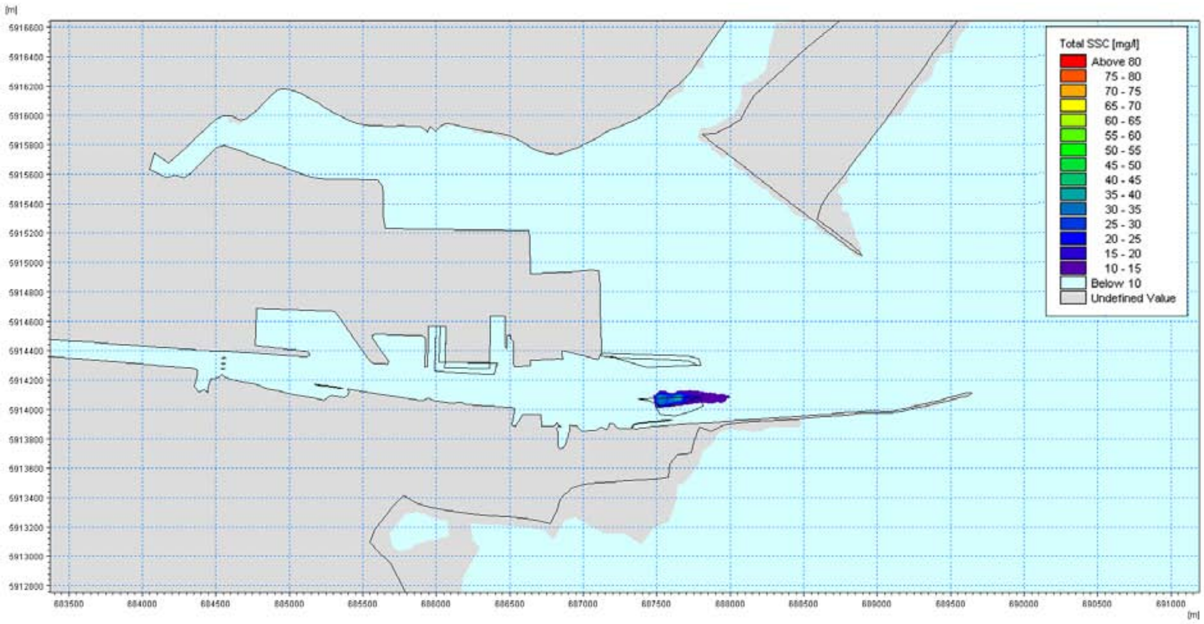


Figure 12-21 Suspended sediment concentration plume in the bottom layer during a typical mid ebb phase of a spring tidal cycle during the Channel Dredging Works

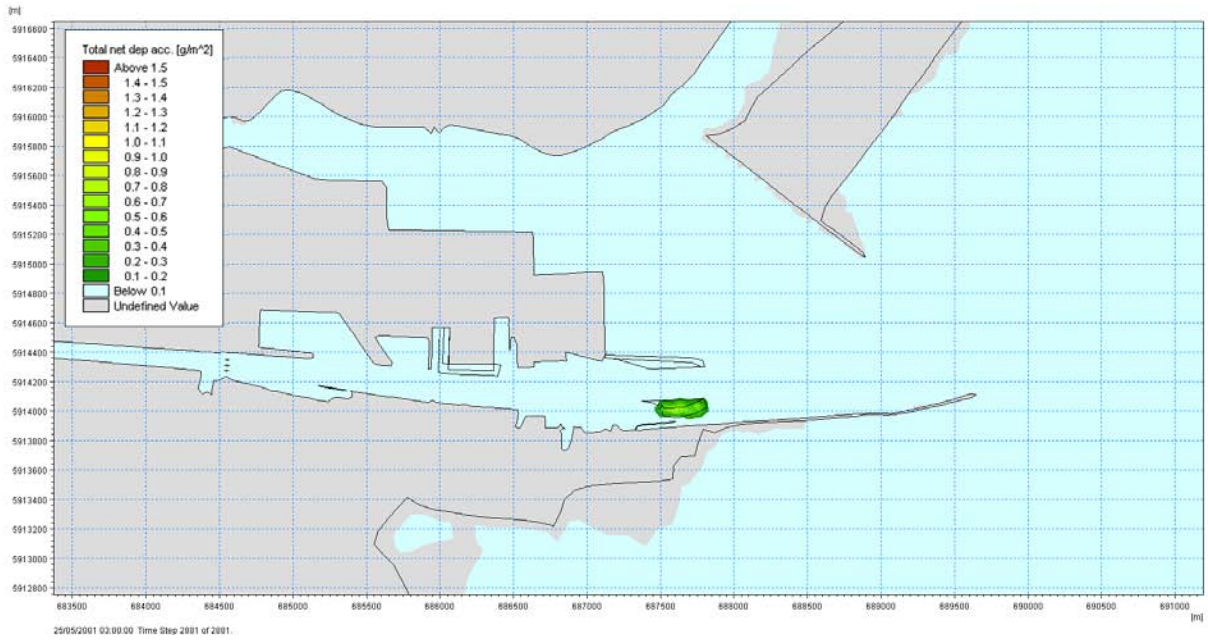


Figure 12-22 Deposition of sediment following the Channel Dredging Works

Dredging of the Oil Berth 3 and Berth 50A

The impact of the silt dispersion on the suspended sediment concentration is shown by a series of plume diagrams. Figure 12-24 to Figure 12-26 represent the dispersion of silt material at times of low water, mid flood, high water and mid ebb at a time during the dredging operation when the suspended sediment concentrations may be expected to be at their highest values (i.e. when the dredger is active at the site).

It will be seen from these figures that the suspended sediment concentration plumes are confined to within Oil Berth 3 and the northern half of the navigation channel. The sediment concentrations of the plumes are generally less than 35 mg/l beyond the immediate source point. While there is a relatively small and very local predicted increase in suspended solids due to dredging at Oil Berth 3 and Berth 50A, this is well within the background range experienced at these locations during normal Port operations.

The predicted deposition of the silt fractions lost to the water column during the dredging of Oil Berth 3 and Berth 50A at the end of the one month dredging campaign simulation is presented in Figure 12-27. This Figure shows that the volume of material deposited outside of the dredge area is generally less than 8g/m^2 and that the deposition of sediment is generally confined to within the immediate area of the dredging operation. As with the previous dredging operations, any material deposited within the dredge area would be removed by the dredger until the final design depth is reached. It can be concluded that the silt material lost to the water column during the dredging of the Oil Berth 3 and Berth 50A will be contained within the Dublin Port.

It can, therefore, be concluded that the dredging operations required for the Oil Berth 3 and Berth 50A will not result in any significant impact to either the water quality in terms of suspended sediments, or the nearby environmentally designated areas in terms of sediment deposition. No further mitigation is required.

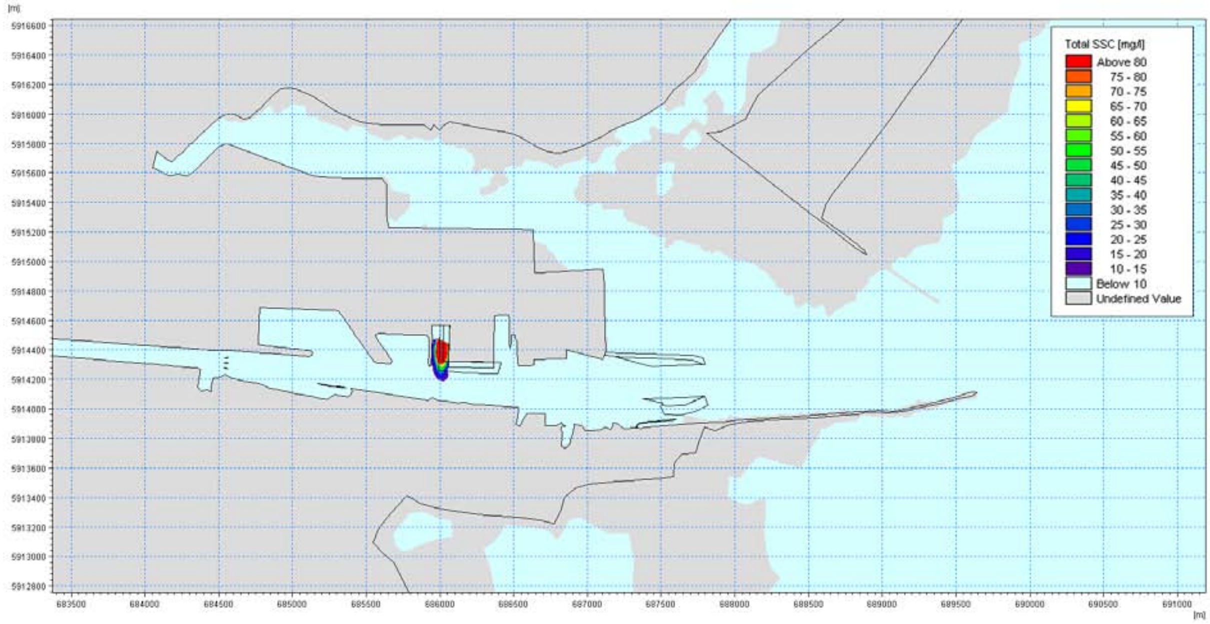


Figure 12-23 Suspended sediment concentration plume in the bottom layer during a typical low water phase of a spring tidal cycle whilst dredging the Oil Berth 3 and Berth 50A

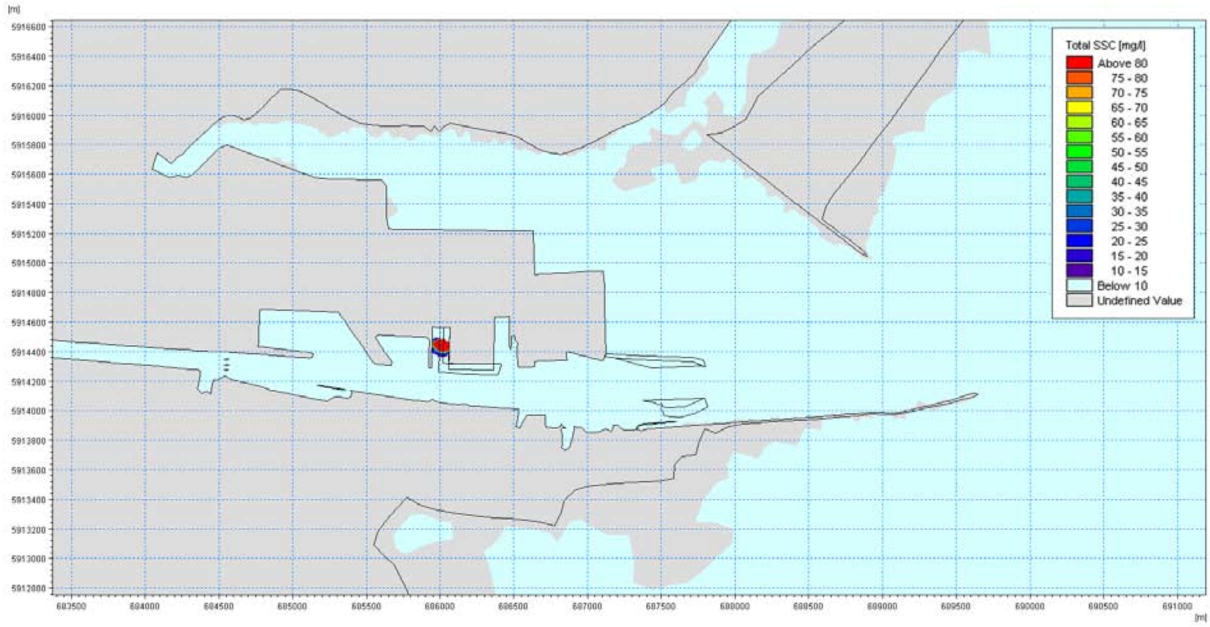


Figure 12-24 Suspended sediment concentration plume in the bottom layer during a mid flood phase of a spring tidal cycle whilst dredging the Oil Berth 3 and Berth 50A

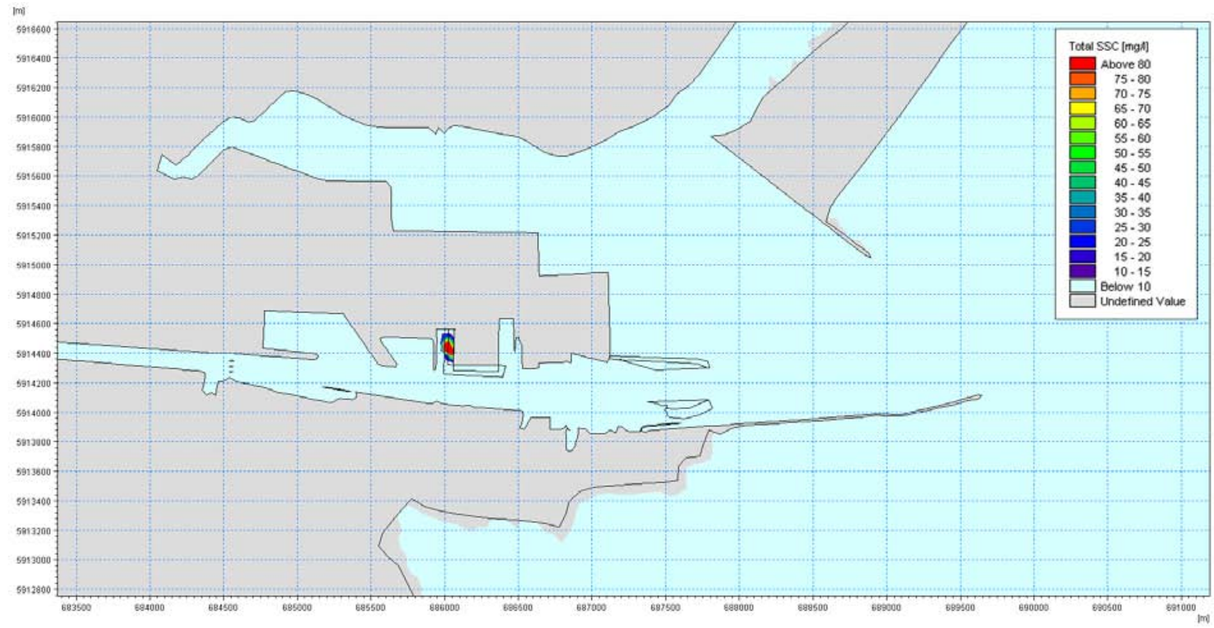


Figure 12-25 Suspended sediment concentration plume in the bottom layer during a typical high water phase of a spring tidal cycle whilst dredging the Oil Berth 3 and Berth 50A

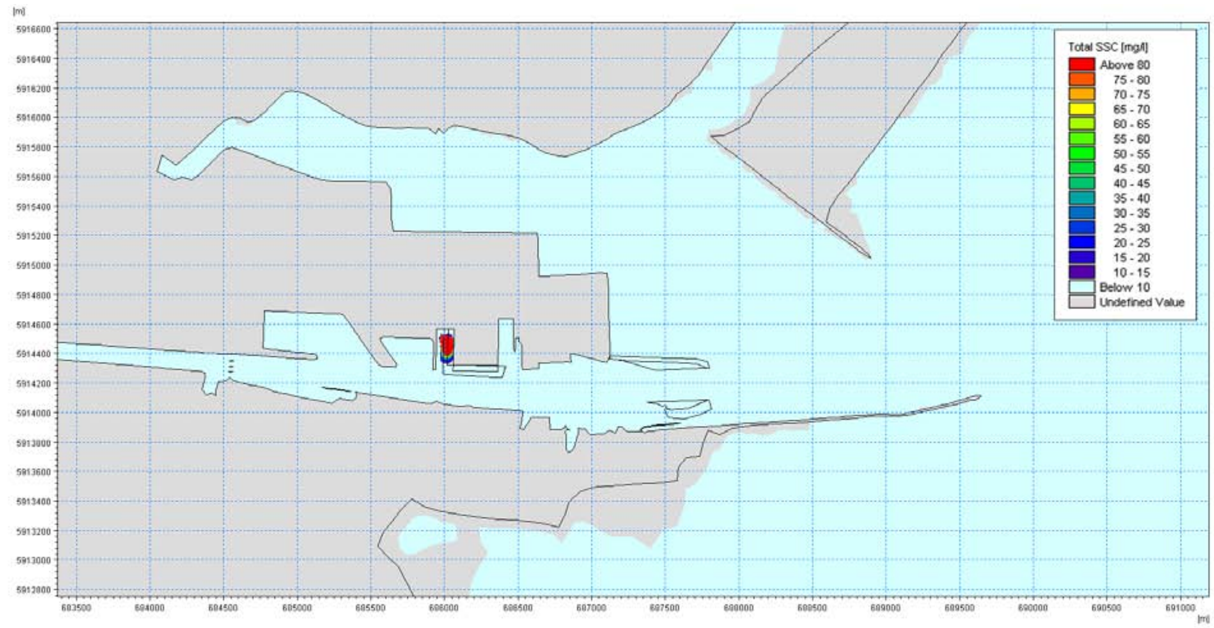


Figure 12-26 Suspended sediment concentration plume in the bottom layer during a typical mid ebb phase of a spring tidal cycle whilst dredging the Oil Berth 3 and Berth 50A

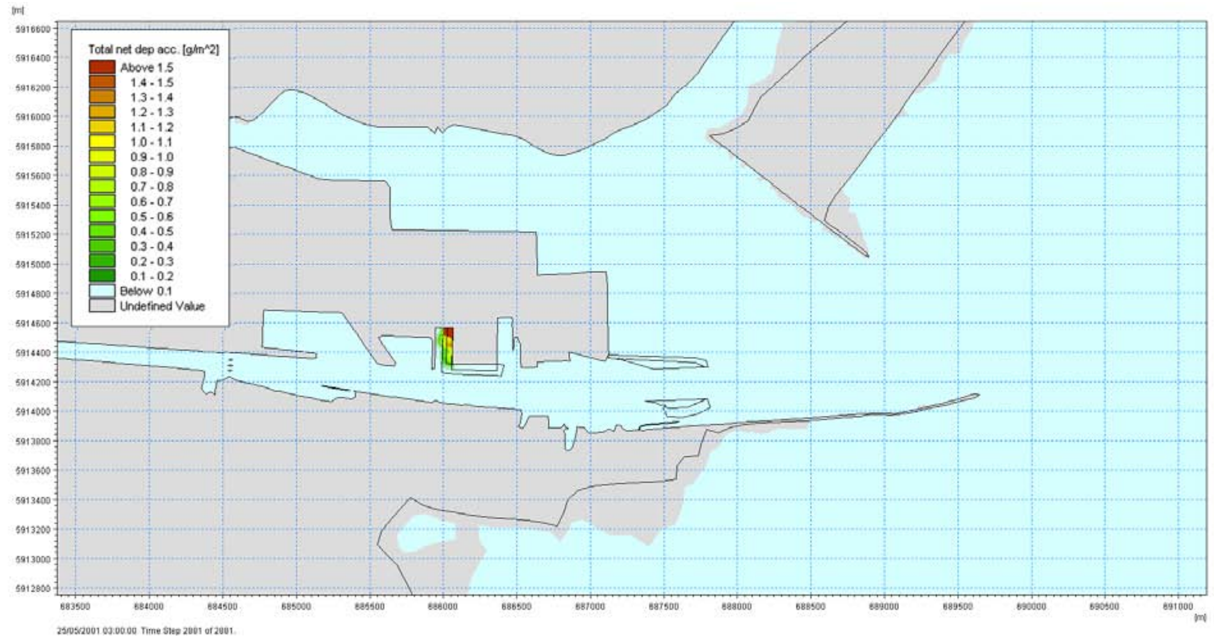


Figure 12-27 Deposition of sediment following the dredging operations at Oil Berth 3 and Berth 50A

Impact of dredging on existing outfalls and power station cooling water systems

Water from the Liffey is abstracted by 4 power plants within the Dublin Port area: the North Wall Station; Synergen – Dublin Bay Power Plant; Covanta Waste to Energy Plant and Poolbeg Power Station. The water is abstracted as part of the electricity generation process and/or for cooling water components. High levels of suspended solids in cooling water has the potential to impact upon the plants cooling system and may result in an increase in operation and maintenance costs.

The Ringsend Waste Water Treatment Plant is also located on the southern bank of the River Liffey. This plant discharges treated effluent into the Liffey Estuary via a cooling water discharge channel to the north east of Poolbeg Generating Station whilst a storm water overflow is located to the north of the storm tanks about 800m upstream. High levels of suspend solids and the ingress of settling material during periods of low flow may have the potential to impact the operational performance of this outfall.

The location of the various power station cooling water intake systems and the Ringsend Waste Water outfall is illustrated in Figure 12-28.

In order to determine whether any of the dredging operations associated with the MP2 Project would impact upon any of these cooling water intake systems or outfall, RPS analysed the modelling results from the dredging simulations described in the previous three sections to calculate the peak and average suspended sediment concentrations due to dredging at each point of interest illustrated in Figure 12-28.These peak and average suspended sediment concentrations due to additional dredging loads are presented in Table 12-7. Also included in the table for comparison are the peak and average background suspended sediments levels based on Dublin City Council and ABR Project monitoring in the interval 2015 to 2017.

The results of the simulations show that the increased levels of suspended sediment concentrations at the power station intakes and Ringsend WwTW outfall are generally very small by comparison with background levels in the Liffey Estuary and are unlikely to have any effect on the quality of intake waters at power stations in terms of suspended solids content. It is customary practice that DPC notifies the power station operators in advance of each dredging campaign. This allows the operations to temporarily stop abstracting water from the Liffey for a short duration in the event that dredging is required within the immediate vicinity of their intake works. The communication between DPC and the power station operators has enabled previous dredging campaigns, where dredging has taken place closer to the intakes, to be undertaken with minimal disruption.

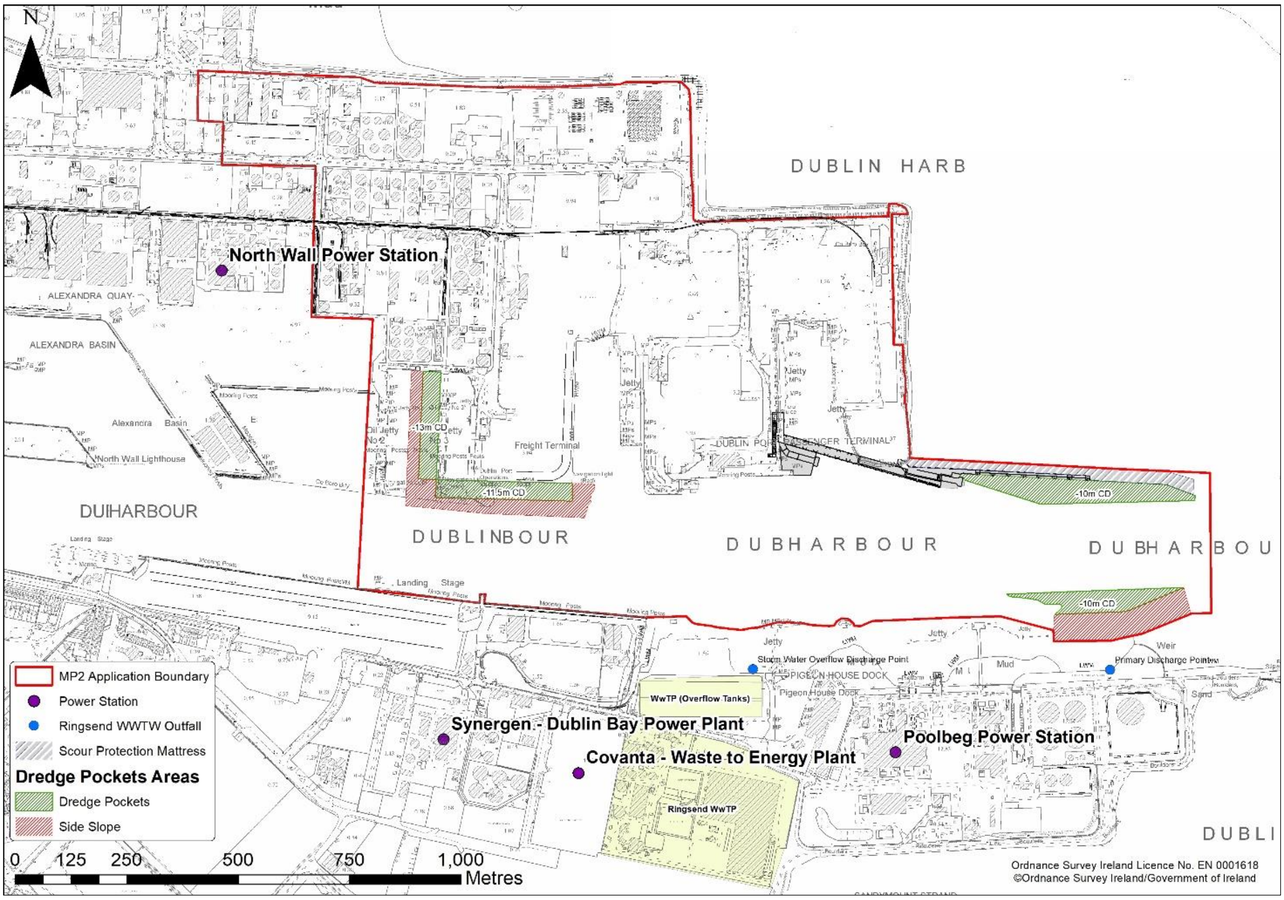


Figure 12-28 Locations of relevant intakes/outfalls within Dublin Port

Table 12-7 Peak and average Suspended Sediment Concentrations at various intakes and outfalls in Dublin Port

Intake	Dredging Location/Scenario	Peak Concentration (mg/litre)	Average Concentration over 1 month (mg/litre)
WwTW	Oil Berth 3/Berth 50A	4.00	1.51
	Berth 53	2.77	0.87
	Channel Dredging Works	24.18	2.07
Poolbeg Power Station	Oil Berth 3/Berth 50A	4.86	1.83
	Berth 53	3.37	1.06
	Channel Dredging Works	29.15	2.51
Synergen – Dublin Bay Power Plant	Oil Berth 3/Berth 50A	6.23	2.30
	Berth 53	4.31	1.23
	Channel Dredging Works	7.10	1.58
North Wall station	Oil Berth 3/Berth 50A	8.11	2.78
	Berth 53	3.54	1.22
	Channel Dredging Works	2.65	1.17
Covanta – Waste to Energy Plant	Oil Berth 3/Berth 50A	6.23	2.30
	Berth 53	4.31	1.23
	Channel Dredging Works	7.10	1.58
SS Monitoring Results (2015 - 2017)	Liffey Estuary (Est Link to Poolbeg Light) Representing Background Levels	150	24.5

12.5.1.2 Potential Impacts as a result of disposing dredge material at sea

A programme of sediment quality sampling and analysis within the Tolka Estuary and Dublin Port area (Chapter 8) has shown that that the sediments to be dredged from the Port's navigation channel and basins are suitable for conventional dumping at sea (subject to the granting of a Dumping at Sea Permit by the EPA). The closest and preferred site is located at the approaches to Dublin Bay to the west of the Burford Bank as presented in Figure 12-29. This disposal option is preferred because it keeps the sand element of the dredge material within the natural Dublin Bay sediment cell.

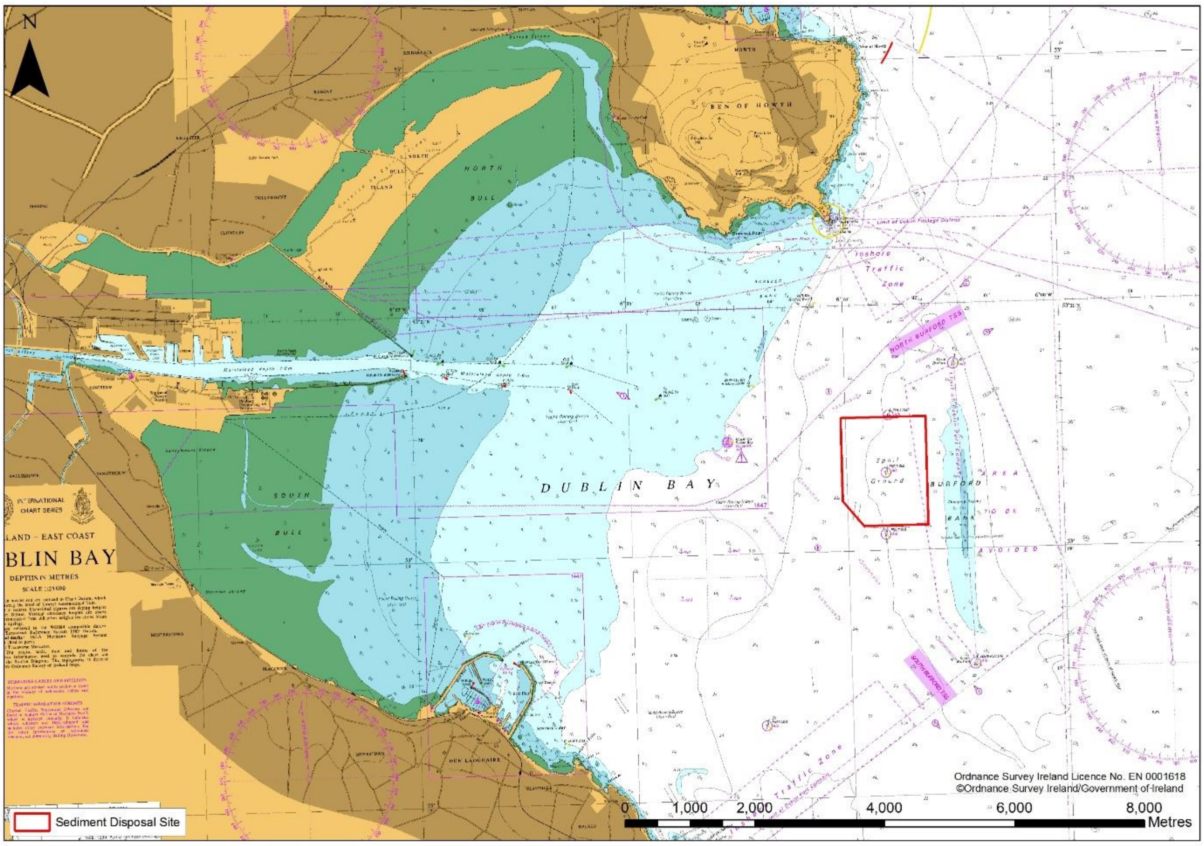


Figure 12-29 Location of the licensed dredged spoil disposal site

The disposal of sediments at sea has the potential to cause a temporary increase in suspended sediments and turbidity levels during the disposal operations and, under certain conditions, could have adverse effects on marine biota (for example, through siltation of benthic communities), changes to sediment structure, or interference with feeding in reduced visibility.

To assess the impact of the MP2 Project disposal operations at the licensed offshore disposal site, a coupled MIKE 21 Hydrodynamic and Sediment Transport model was used to determine the dispersion of the sediment material during the disposal operations.

It was assumed that the Trailer Suction Hopper Dredge would discharge material over the disposal site every *c.* 3 hours and that the equivalent of approximately of 2,030 tonnes (wet weight) would be released per dump. Key parameters relating to the sediment dumping simulations are outlined Table 12-8.

Table 12-8 Disposal simulation input parameters

Parameter	Value
Trailer Suction Hopper Dredger capacity	4,100 m^3
Ratio of sediment/entrained water during loading	0.3
Average density of material inside hopper	1.65 t/m^3
Average Trip Frequency between Dublin Port and Disposal site	3.0 hours
Average Time to Fill Dredger Hopper	1.5 hours
Time to release load	90 seconds

The model simulations were run for the disposal of the dredged material over the course of a complete lunar month, which includes the full range of spring and neap tidal flow conditions. The characteristics of the sediment modelled in this simulation are equivalent to those used in the dredging simulations described in the previous section of this chapter. As such, the sediment material was characterised by three discrete fractions with mean diameters of 200µm, 20µm and 3µm, with each fraction constituting 1/3 of the total volume of silt to be dredged.

The sediment material was introduced into the surface of the model as a point source that moved across the dump site area during the disposal operation. The model then simulated the dispersion, settlement and re-erosion of each fraction of the silt in response to the tidal currents throughout the model area.

The coarser fraction of the sediment, i.e. the sand fraction that had a mean grain size of 200µm, was found to behave differently relative to the two finer silt fractions that had mean grain diameters of 20µm and 3µm. The sand fraction remained on the dump site, whereas the two finer silt fractions were carried away by the tidal currents.

The results of the simulations are given in terms of maximum total suspended sediment concentrations envelope in Figure 12-30, which depicts the maximum level of the suspended sediment concentration which occurs in each cell at any time during the simulation and is thus an envelope covering all the sediment plume excursions. It will be seen from Figure 12-30 that the sediment plume outside the area of the dump site is less than 200mg/l and does not extend further than 750m to the north or south of the dump site.

Based on these results, it can be concluded that the disposal operations associated with the MP2 Project will not result in any significant increases to the background level of suspended sediments and will not, therefore, impact the existing water quality in the greater Dublin Bay area.

NOTE - Mean turbidity measured in Dublin Bay (4 monitoring buoys - 3 at dumpsite and 1 background) is 10.25 NTU. Based on the relationship established for fine sands in Dublin Bay this is equivalent to a Total Suspended Solids (TSS) concentration of 16.5 mg/l or based on finer silts/sands of Liffey Estuary to a TSS concentration of 25.6 mg/l (See Chapter 9, Section 9.1.2). Note that these measurements cover periods of maintenance and capital dredging.

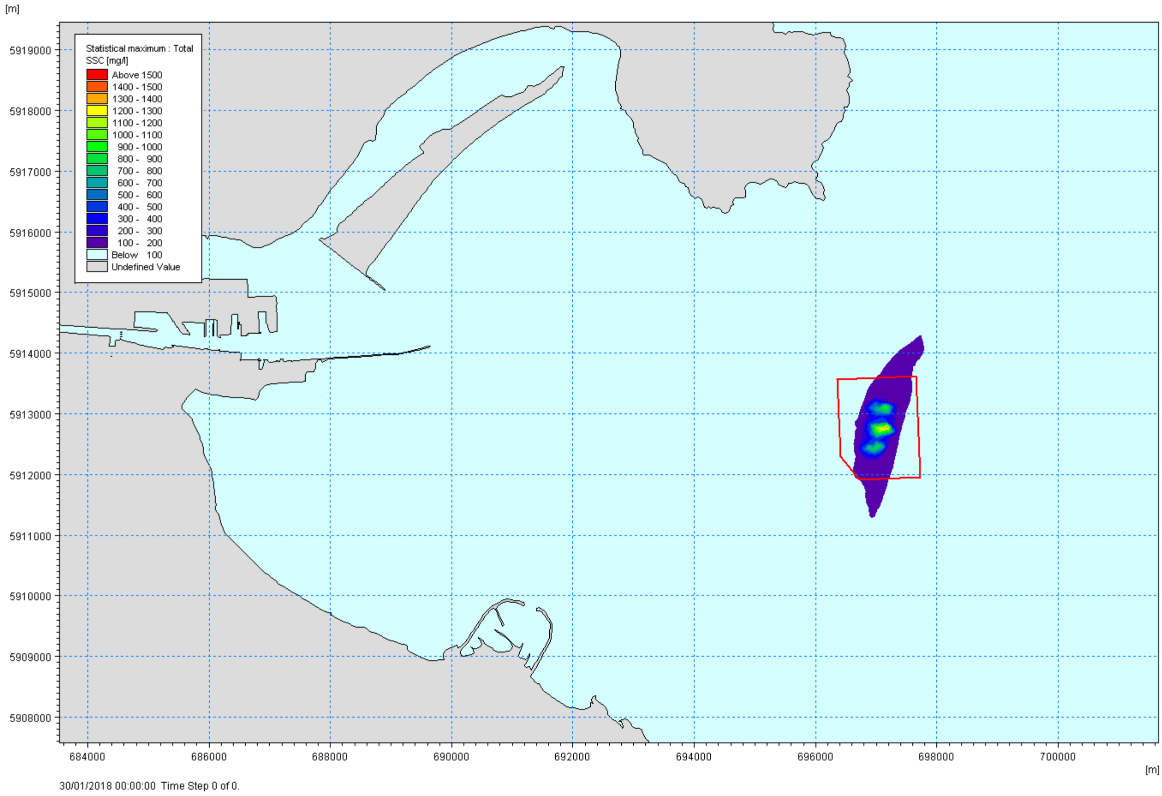


Figure 12-30 Maximum Total Suspended Solids Concentration envelope using a Trailer Suction Dredger dumping circa 2,030 tonnes wet weight at 3 hourly intervals on average within each winter capital dredging season

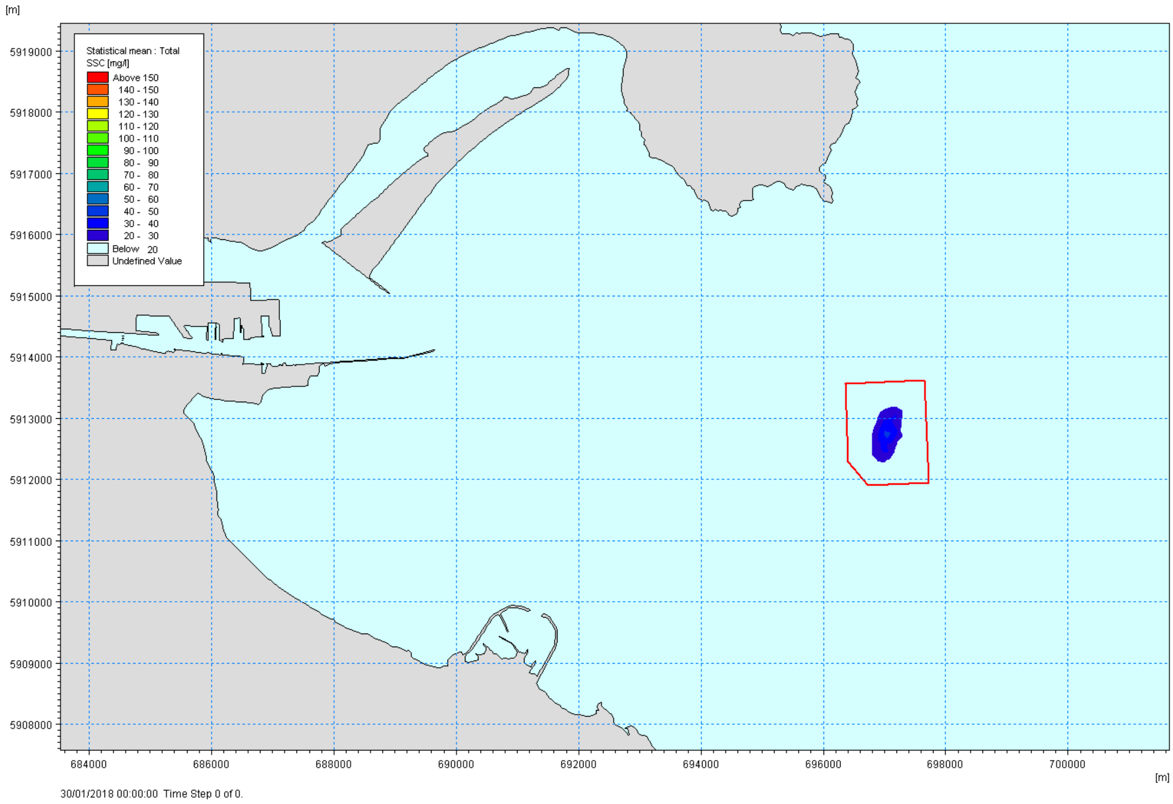


Figure 12-31 Mean Total Suspended Solids Concentration envelope using a Trailer Suction Dredger dumping circa 2,030 tonnes wet weight at 3 hourly intervals on average within each winter capital dredging season

12.5.2 Operational Phase Impacts

12.5.2.1 Potential changes to the existing tidal regime

The potential for changes with the elements of the scheme in place was assessed to consider the potential for operational phase impact. The MIKE 21 Hydrodynamic module described in Section 12.2.3 was used in conjunction with the post-MP2 Project scenario (i.e., Dublin Port, including ABR Project, with MP2 Project in place) 2D model to simulate the tidal regime in the Dublin Port following the implementation of the MP2 Project. Typical tidal flow patterns for a spring ebb and spring flood tide from the post-MP2 Project simulation are presented in Figure 12-32 and Figure 12-33.

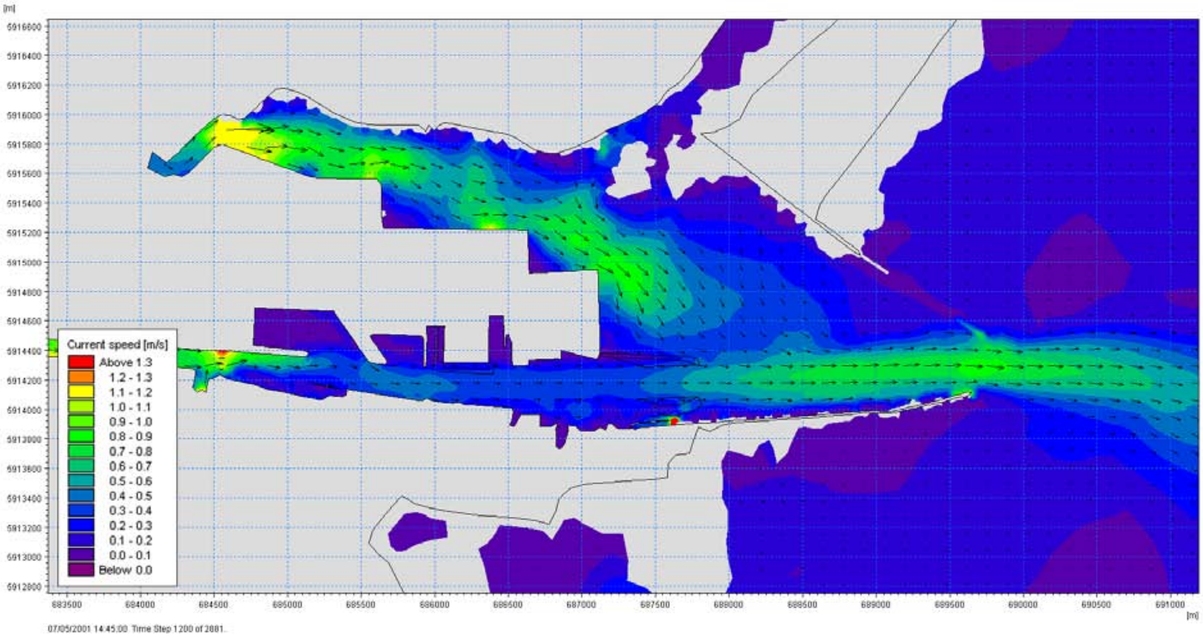


Figure 12-32 Typical spring mid ebb tidal flow patterns – Post MP2 Project

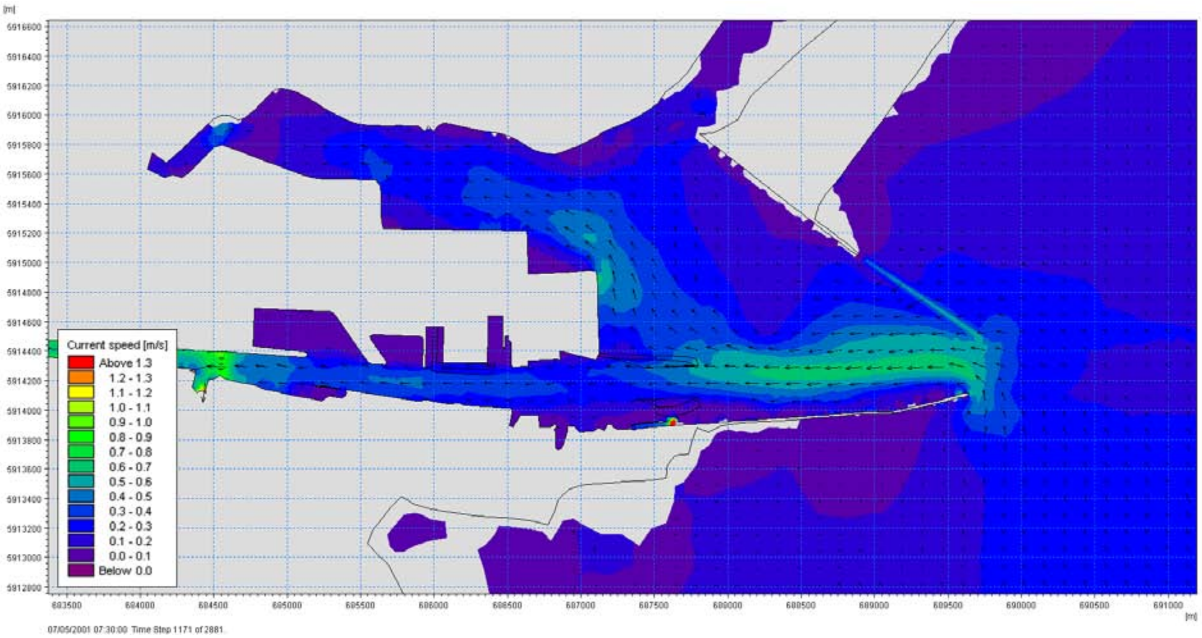


Figure 12-33 Typical spring mid flood tidal flow patterns – Post MP2 Project

The difference in modelled current velocities for the pre and post MP2 Project simulations have been computed for the mid spring ebb and the mid spring flood tides, and are presented in Figure 12-34 and Figure 12-35. Spring tides are periods of greatest current velocities. It shows that current velocity remains substantially unchanged throughout most of the Port area. The maximum predicted change to the mid-ebb or flood current speeds is less than ±0.25m/s. The greatest changes are confined to within the footprint of the works at Berth 50A (velocity increased by 0.20 to 0.25m/s) and Berth 53 (velocity decreased by 0.15 to 0.20m/s) where existing mid-flood and mid ebb currents are approximately 0.40m/s. Predicted changes in current speed reduce rapidly outside the works areas and changes to mid-ebb or mid-flood current speeds are less than ±0.15m/s within 50 - 150m of the works. No notable changes to the tidal regime were detected outside of Dublin Port.

The net difference in the mean current velocity over an entire spring tidal cycle (i.e. *c.*12.44hrs) is presented in Figure 12-36. This figure clearly shows that any predicted changes in current velocity resulting from the MP2 Project will be limited to relatively small areas in the vicinity of works. Net changes of 0.15 to 0.20m/s are only predicted in very small areas within the footprint of the works. There are no predicted net changes to the mean current velocity over an entire spring tidal cycle outside of the footprint of the works.

Therefore, the tidal regime is predicted to remain substantially unchanged post MP2 Project. Given the localised nature and small absolute magnitude of any predicted changes in tidal current velocity it is unlikely that there will be any significant change in net scouring or deposition of sediments within the Liffey Estuary or Dublin Bay resulting from the MP2 Project.

The risk of impact is determined to be negligible and no mitigation is required.

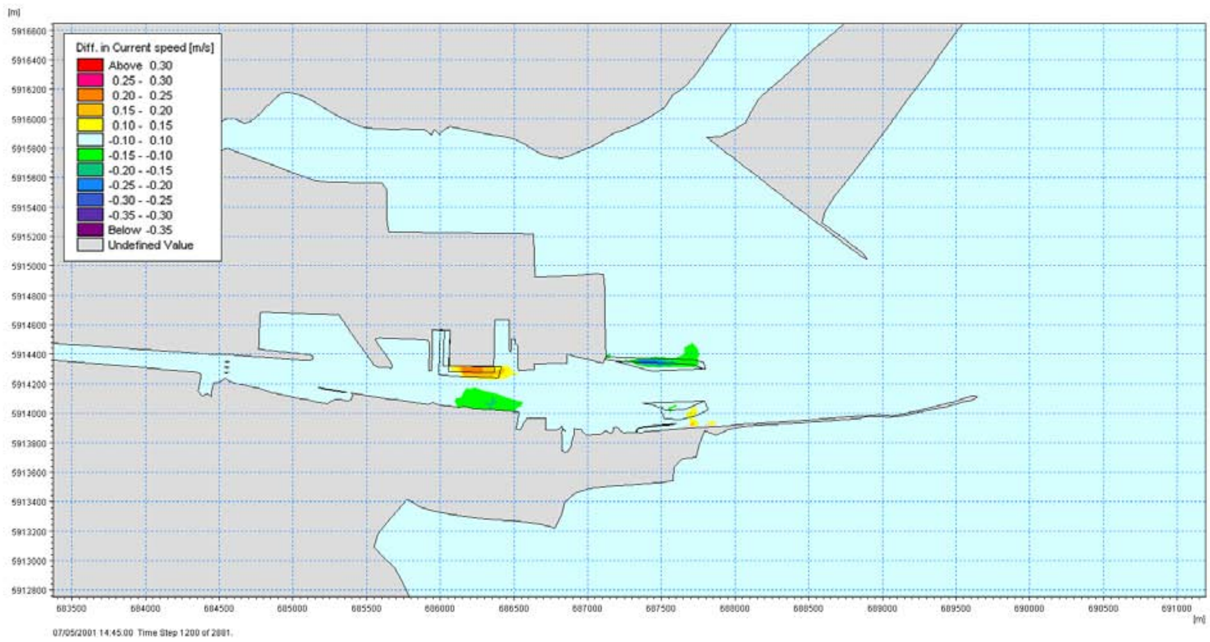


Figure 12-34 Difference in typical spring mid tidal flow patterns as a result of the MP2 Project

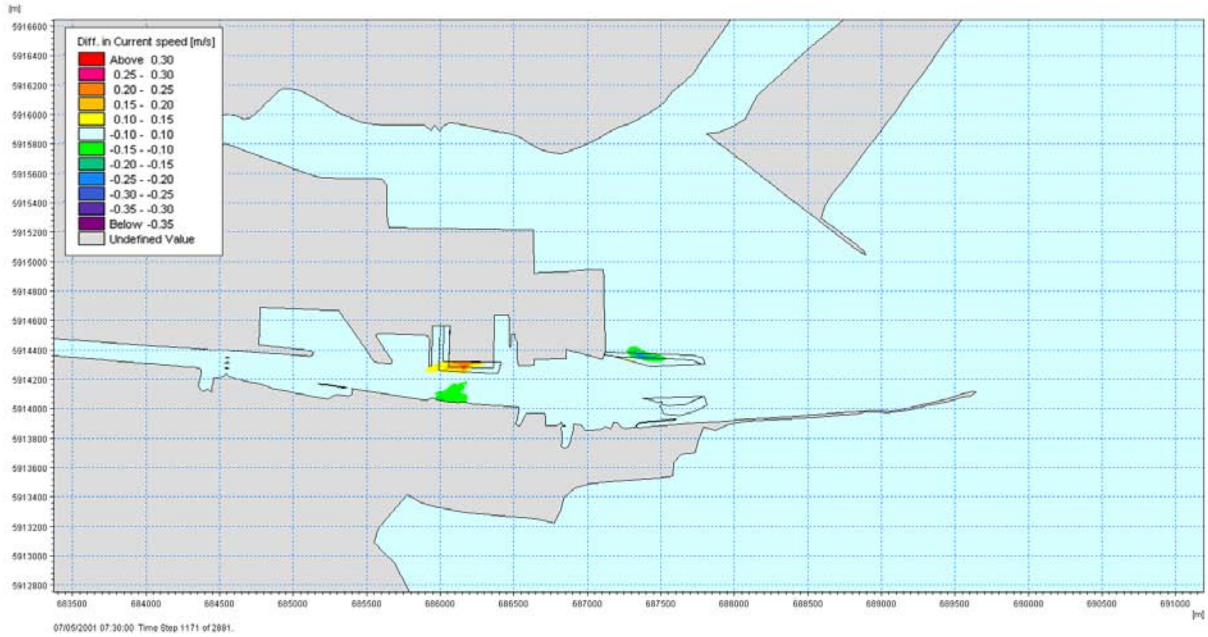


Figure 12-35 Difference in typical spring flood (bottom) tidal flow patterns as a result of the MP2 Project

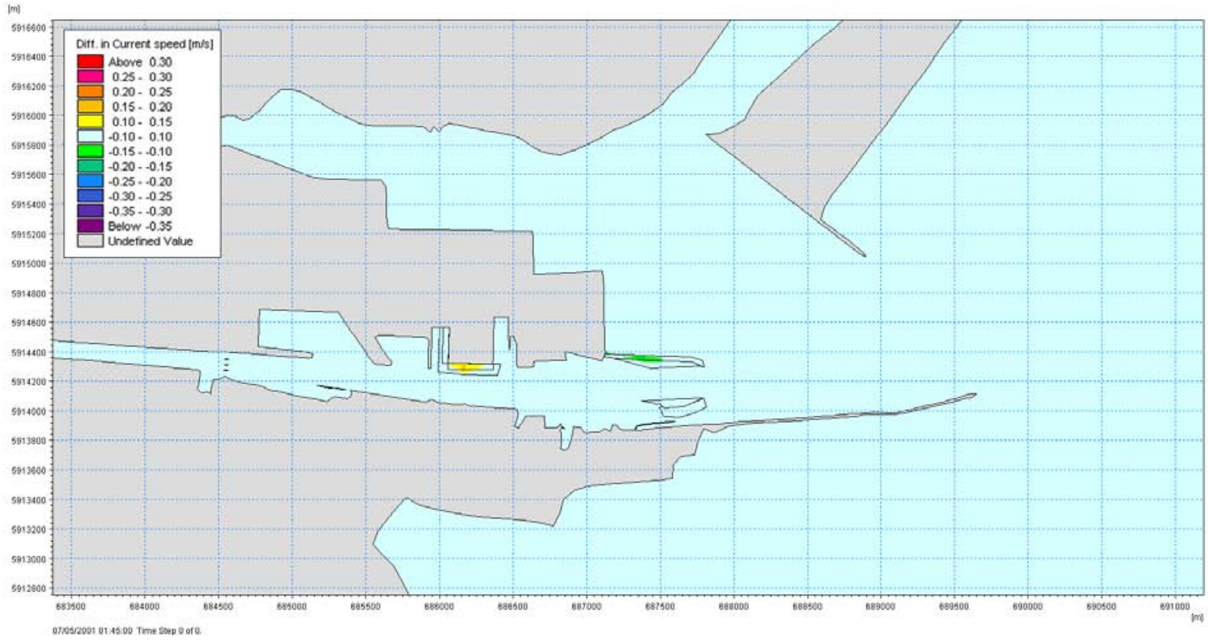


Figure 12-36 Difference in mean spring tidal flow patterns across an entire tidal cycle as a result of the MP2 Project

12.5.2.2 Potential changes to the existing inshore wave climate

Operational phase impacts also considered included potential alteration to wave climate (and its associated possible impact on flood risk). The MIKE 21 Spectral Wave module described in Section 12.2.3 was used in conjunction with the post-MP2 Project scenario 2D model to re-run the offshore wave climate simulations in Dublin Bay based on various wave directions as described in Section 12.3.2.

The simulated inshore wave climate in Dublin Port and the adjacent Dublin coastline post MP2 Project is illustrated in Figure 12-37 to Figure 12-39 for north easterly, easterly and south easterly storm events at spring high tide respectively.

Wave height difference plots are presented for the three storm events in Figure 12-40 to Figure 12-42 to highlight the changes to the inshore wave climate as a result of the MP2 Project. The results show that, during all storm events modelled, only small changes in the wave climate in Dublin Port are predicted and no discernible change in the adjacent coastline areas i.e. Clontarf, Tolka Estuary, Sandymount.

During north easterly storm events, wave heights at Berth 50A are likely to increase by 0.10m or less. During south easterly storm events, similar changes are predicted at Berth 50A but wave height is also predicted to decrease by 0.075m or less at Berth 53 under these storm conditions. During easterly storm events, predicted differences in the wave climate extend further into Dublin Port but are confined to the area adjacent to Alexandra Basin where changes in wave height of less than 0.075m are predicted.

Changes in bathymetry due to dredging activities have the potential to alter the energy with which waves break and could conceivably result in wave overtopping of structures and flood defences. However, consideration of changes to the wave climate due to the MP2 Project presented above show no discernible change in relevant proximate areas such as Clontarf, Fairview and Ballybough bordering the Tolka Estuary. Changes in wave height within the Port beyond the immediate footprint of the MP2 Project works is predicted to be less than ±0.075m during typical storm conditions. These changes are not considered significant and will not impact operations within the Port Therefore the risk of potential coastal flooding due to the MP2 Project in these areas is determined to be negligible and no mitigation is required. An assessment of the impact of the MP2 Project on the existing flood risk can be found in in Chapter 9, Section 9.2.

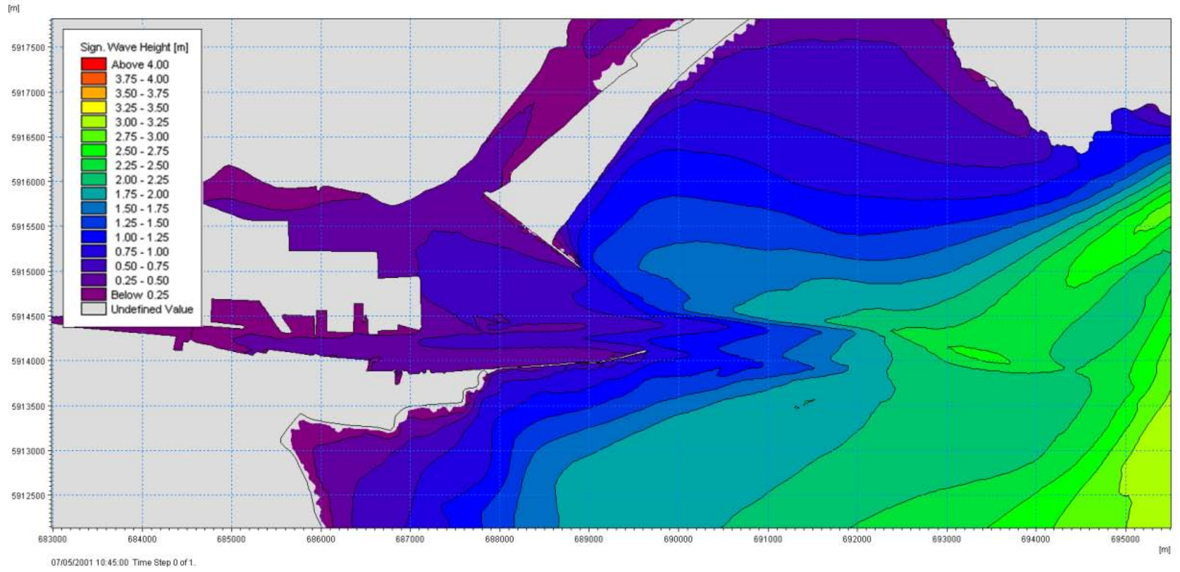


Figure 12-37 North Easterly storm wave heights at spring high water – Post MP2 Project

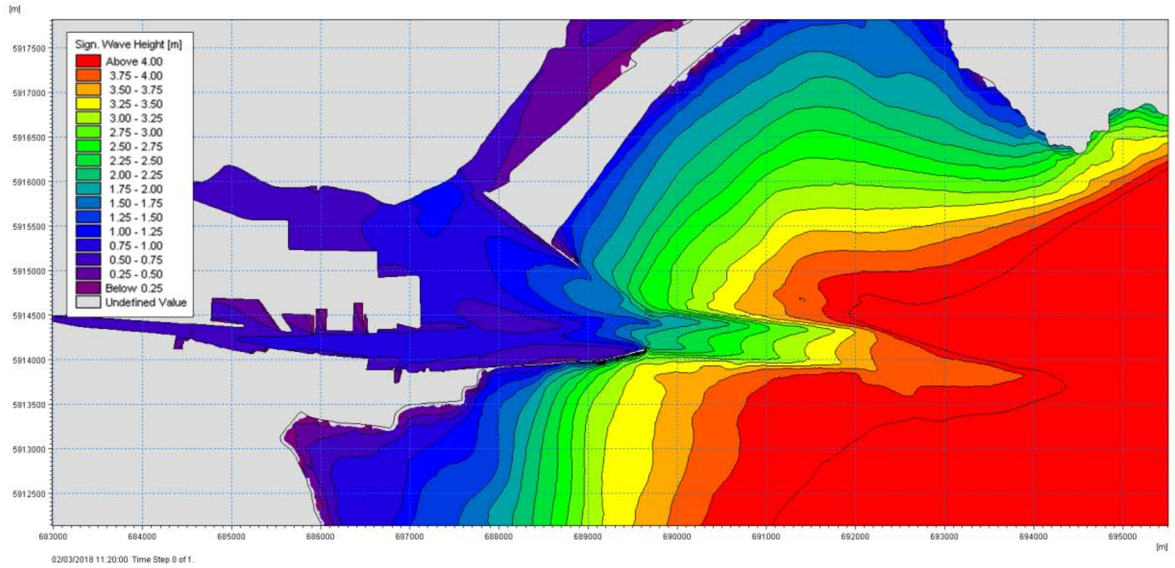


Figure 12-38 Easterly storm wave heights at spring high water – Post MP2 Project

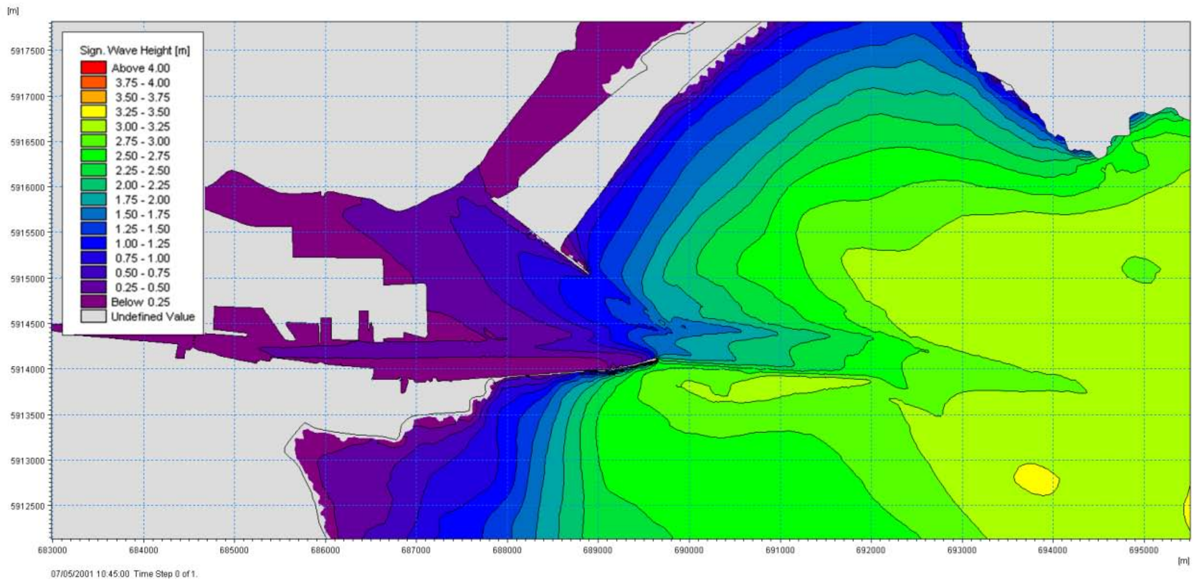


Figure 12-39 Easterly storm wave heights at spring high water – Post MP2 Project

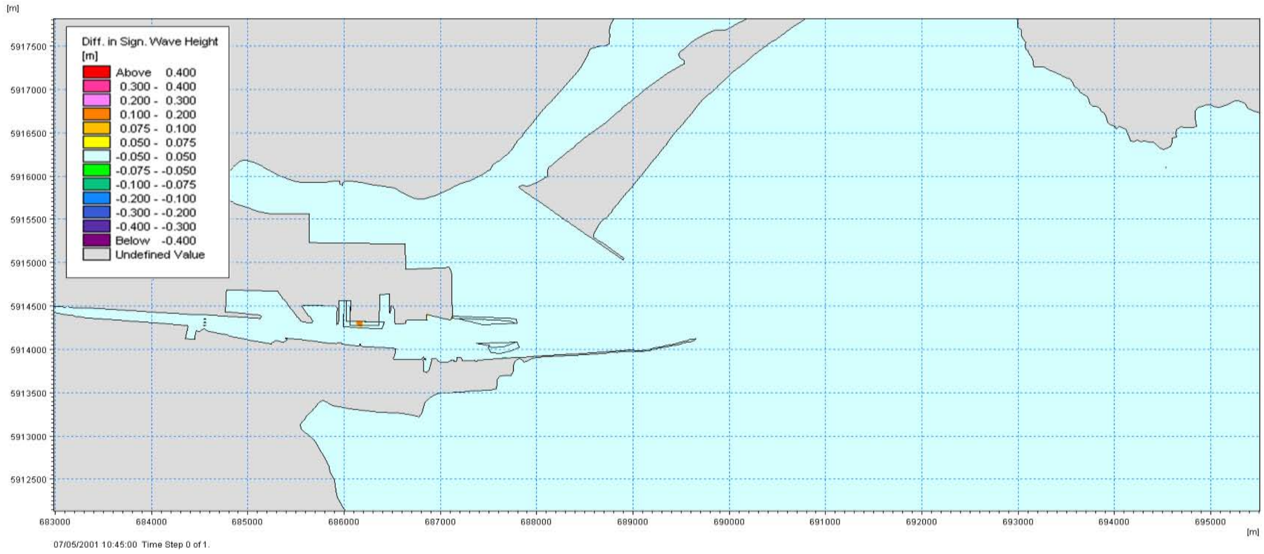


Figure 12-40 Difference in wave heights during a north easterly storm event as a result of the MP2 Project

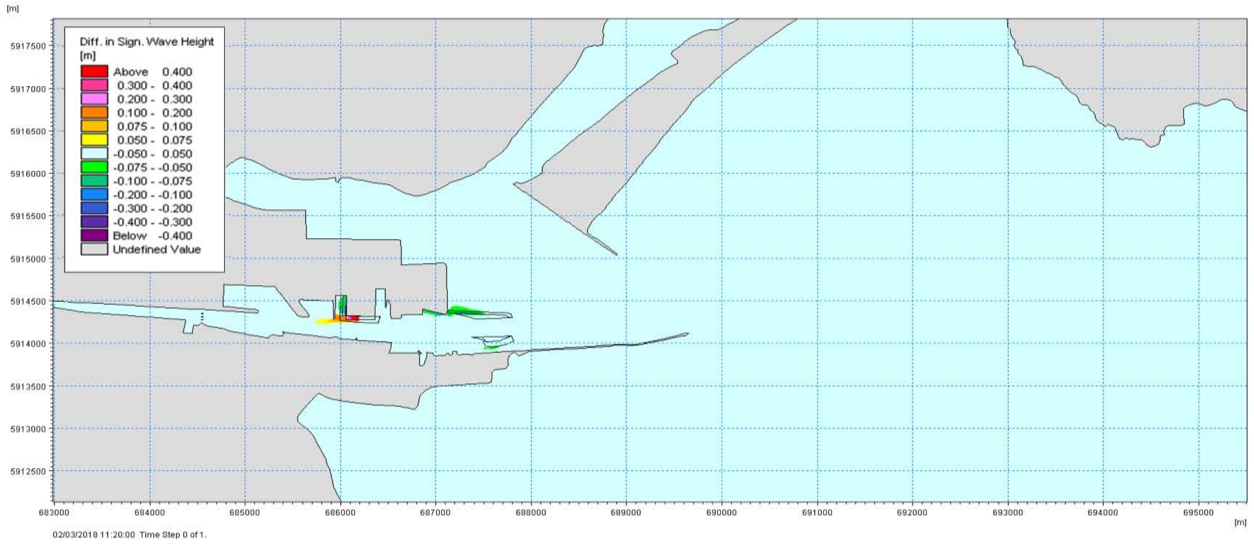


Figure 12-41 Difference in wave heights during a easterly storm event as a result of the MP2 Project

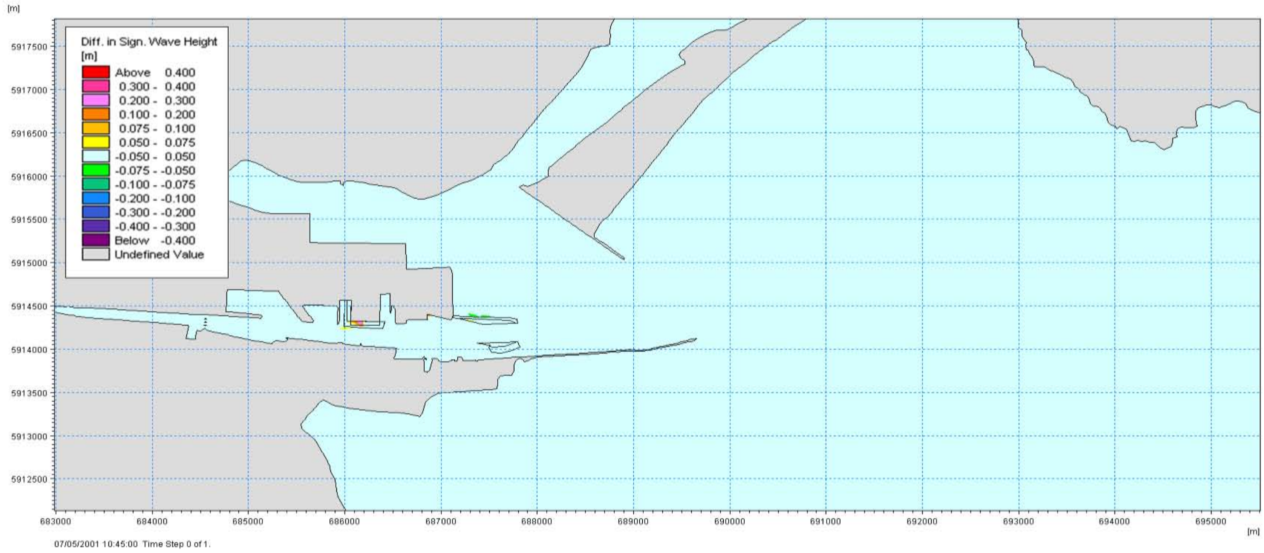


Figure 12-42 Difference in wave heights during a easterly storm event as a result of the MP2 Project

12.5.2.3 Potential changes to the sediment transport regime

As indicated in Chapter 7 (Biodiversity) and shown in Figure 12-43, the MP2 Project site is bounded to the North and East by the South Dublin Bay and Tolka Estuary Special Protection Area (SPA). It was, therefore, important to provide sediment transport regime information for the purposes of the relevant Habitats Directive assessments. Moreover, it is important to consider whether either the Berth 53 structure or subsequent ship movements from this berth would impact the winter foraging areas within the Tolka Estuary during low tide.

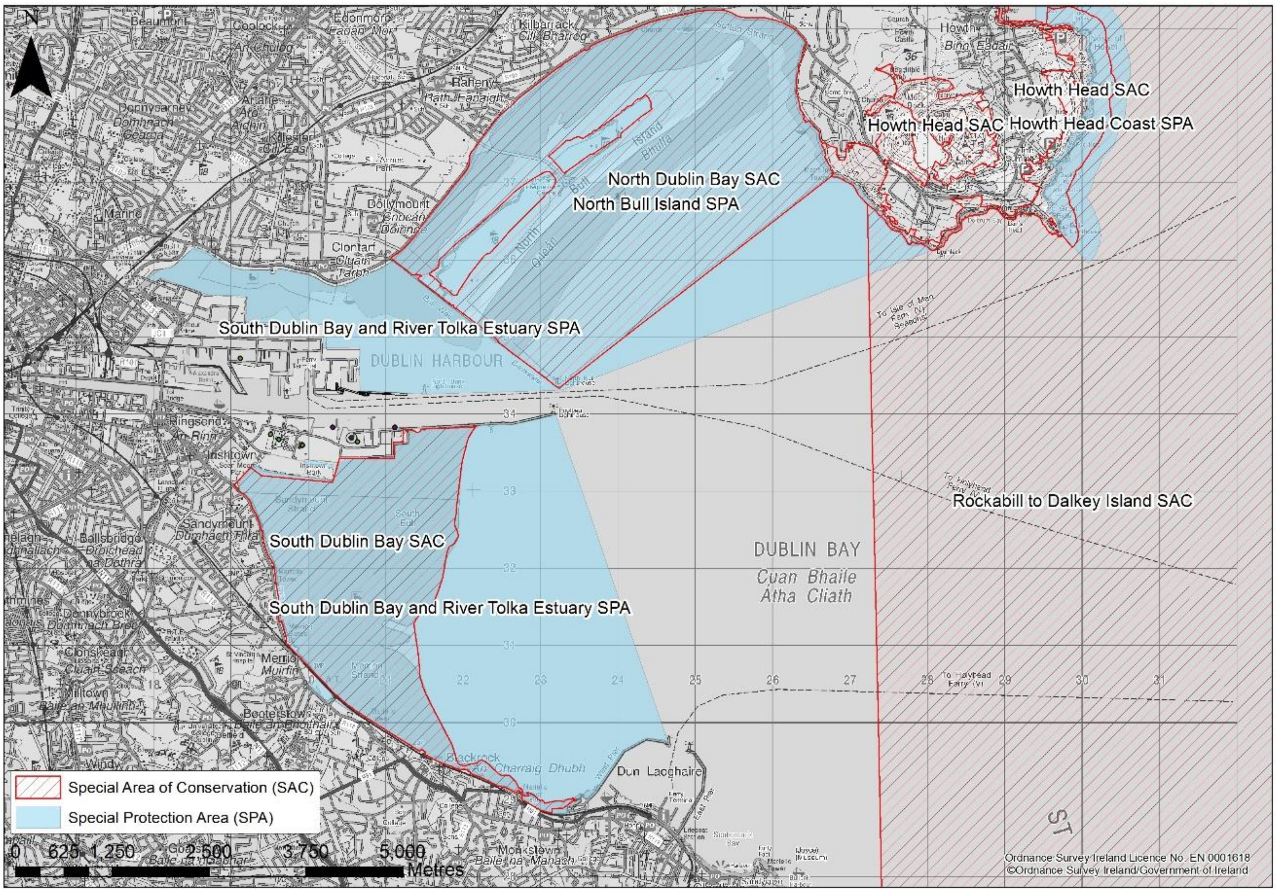


Figure 12-43 Natura 2000 Designated sites surrounding Dublin Port

To assess the potential operational phase impact of ship movements in the area of Berth 53, propeller and thruster jet scour calculations were undertaken for representative ship manoeuvres from navigational simulation studies undertaken by HR Wallingford, 2018 in relation to the MP2 Project. The scour calculations were undertaken in accordance with the following documents: “Guidelines for protecting berthing structures from scour caused by ships” (PIANC, 2015); and the “Principles for the Design of Bank and Bottom Protection for Inland Waterways (BAW, 2010).

This assessment found that, when ship bow thrusters operated at 100%, the resultant peak axial velocity at the boundary of the SPA will be *c.* 4.3m/s and that this velocity would likely result in scour of the neighbouring SPA area. This was considered potentially significant as it could impact the long term stability of the dredged side slope at Berth 53 and thus, in the longer term, potentially affect bed levels and modify the position of the lowest astronomical tide across the winter foraging areas within the Tolka Estuary.

Measures were therefore developed to mitigate this risk which are presented and assessed in Section 12.6.1 of this Chapter.

12.6 Mitigation Measures

12.6.1 Construction Phase Mitigation Measures

As described in Chapter 9 Section 9.1.5.1.1, Dublin Port Company completed its first winter dredging season (October 2017 – March 2018) as part of the ABR Project. This dredging campaign was fully compliant with the requirements of the Dumping at Sea, Foreshore and Planning Consents as confirmed by high resolution environmental monitoring results reported in the Annual Environmental Report submitted to the Office of Environmental Enforcement (OEE) in March 2018.

A Dredging Management Plan was developed for the ABR Project and is set out in *Alexandra Basin Redevelopment Project Construction Environmental Management Plan (CEMP) Rev. F August 2018*. The mitigation for dredging operations in the MP2 Project has been informed by ABR Project monitoring and experience working in the same locations.

The following mitigation measures will apply to each dredging campaign in the MP2 Project:

- Loading will be carried out by a backhoe dredger or trailing suction hopper dredger (TSHD).
- The capital dredging activity will be carried out during the winter months (October – March) to negate any potential impact on salmonid migration (particularly smolts) and summer bird feeding, notably terns, in the vicinity of the dredging operations.
- No over-spilling from the vessel will be permitted while the dredging activity is being carried out within the inner Liffey Channel.
- The TSHD pumps will be switched off while the drag head is being lifted and returned to the bottom as the dredger turns between successive lines of dredging to minimise the risk of fish entrainment.
- The dredger's hopper will be filled to a maximum of 4,100 cubic metres (including entrained water) to control suspended solids released at the dumping site. This is equivalent to a maximum quantity per trip of 2,030 tonnes (wet weight).
- Full time monitoring of Marine Mammals within 500m of loading and dumping operations will be undertaken in accordance with the measures contained in the Guidance to Manage the Risk to Marine Mammals from Man-Made Sound Sources in Irish Waters (NPWS 2014).
- A documented Accident Prevention Procedure will be put in place prior to commencement
- A documented Emergency Response Procedure will be put in place prior to commencement
- A full record of loading and dumping tracks and record of the material being dumped will be maintained for each trip.
- Dumping will be carried out through the vessel's hull.

- The dredger will work on one half of the channel at a time within the inner Liffey channel to prevent the formation of a silt curtain across the River Liffey.
- When any dredging is scheduled to take place within a 500m radius of power station intakes, the relevant stakeholders will be notified so that precautionary measures can be taken if deemed necessary.

Assuming the above mitigation measures are employed during capital dredging and disposal operations, the potential risk to receiving water environment will be negligible thus reducing the significance of environmental impact to Imperceptible.

12.6.2 Operational Phase Mitigation Measures

To mitigate the potential operational impact of the MP2 Project as described in Section 12.5.2.3, a wash protection structure has been designed to reduce scouring associated with manoeuvring vessels within the Berth 53 area. The design and performance of this wash protection structure was assessed and quantified through an extensive numerical modelling programme.

The sediment transport regime was simulated using the 3D coupled MIKE 3 Hydrodynamic and Sediment Transport model described in Section 12.2, in conjunction with the post-project scenario model with the wash protection structure *in situ.* The morphological response of the seabed in the area of Berth 53 was assessed over a typical month of tides. The seabed in this area was represented by gravely sandy silt, sandy gravel and fine sand in the wider Tolka estuary area. This distribution of sediments is illustrated in Figure 12-44 and was based on information derived from the Particle Size Analysis described in Section 12.2.3.

The assessment found the wash protection structure effectively reduced propeller and thruster jet velocities caused by manoeuvring ships and therefore reduced scour in the area of Berth 53.

To determine if the morphological response of the seabed in the area of Berth 53 with the wash protection structure *in situ* would impact on foraging areas within the Tolka Estuary, the position of the LAT mark following one month of typical tides were compared for pre-project scenario and post-project scenario model runs. The predicted change to the position of LAT is presented in Figure 12-45. This figure shows that the change to the position of LAT as a result of the MP2 Project will be negligible.

The only predicted change was localised accretion immediate behind the wash protection structure at levels below LAT.

In circumstances where the above mitigation measure will be implemented, the operational impact of the MP2 Project to the nearby foraging areas within the Tolka Estuary regime will therefore be imperceptible.

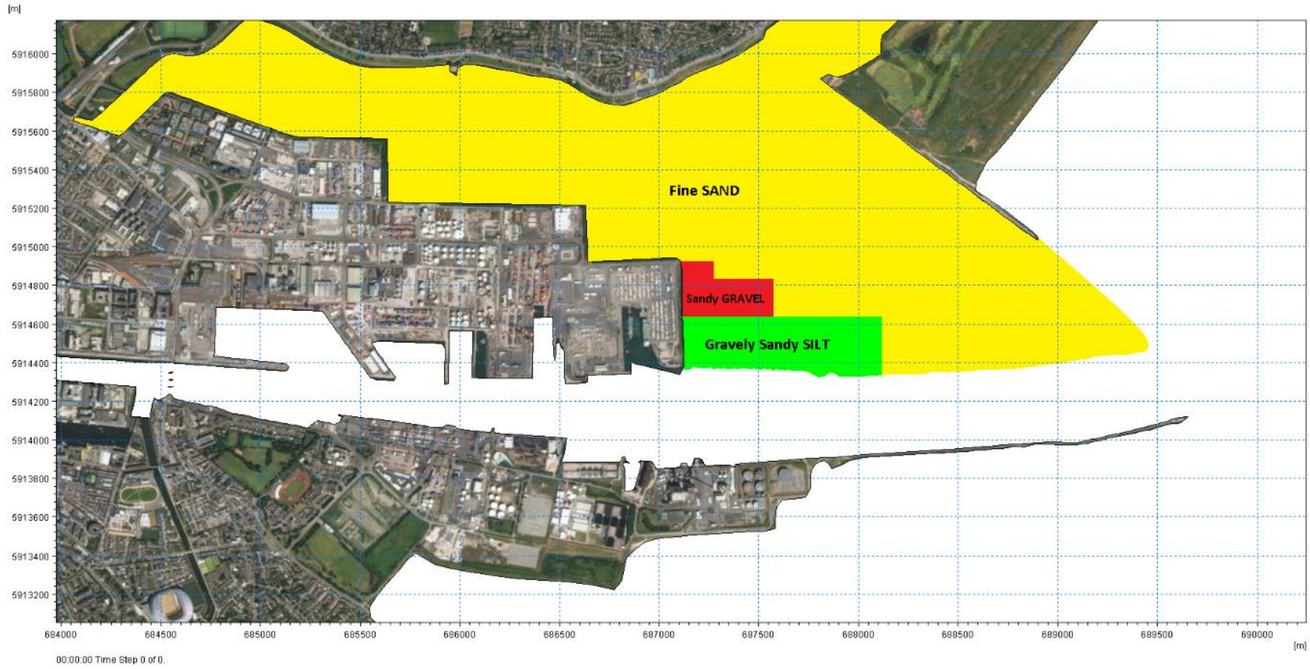


Figure 12-44 Distribution of sediments in the area of Berth 53 based on the 2017 PSA results

Figure 12-45: Position of the Lowest Astronomical Tide mark post ABR (red line) and post MP2 Project with the wash protection structure included (green line)

12.7 Residual Impact

In circumstances where the mitigation measures are fully implemented during the construction and operational phases as outlined in Section 12.6, the impact of the MP2 Project on the coastal processes within Dublin Port and Dublin Bay will consist of small scale, low magnitude changes in the tidal regime and wave climate.

The MP2 Project is therefore not expected to have a significant effect on coastal processes or make a significant change to the existing morphology.

12.8 Monitoring

As described in this Chapter 9, Section 9.1.8, a water quality monitoring programme will provide additional safeguards to the receiving environment and to confirm the effectiveness of the mitigation measures implemented to address any potential environmental impacts to the receiving environment during the construction phase of the works.

Monitoring will continue during construction to confirm the effectiveness of the mitigation measures identified in this EIAR. Regular, confirmatory visual monitoring and environmental audits will also be undertaken during the construction phase of the works.

In addition the Port's existing Environmental Management System (EMS), which is accredited to ISO 14001 standard, will monitor the operational activities to confirm that measures to address operational impacts are effective and provide adequate protection to the sensitive receiving waters.

12.9 Conclusions

The assessment of coastal processes was based on an extensive numerical modelling programme which was undertaken using RPS' in-house suite of MIKE coastal process modelling software developed by the Danish Hydraulic Institute (DHI). Baseline models were calibrated and verified against a range of project specific hydrographic data and subsequently used to assess the construction and operational impacts of the MP2 Project.

The assessment concluded that dredging operations required for the MP2 project will not result in any significant impact to either water quality in terms of suspend sediments, or the nearby environmentally designated areas in terms of sediment deposition with mitigation measures in place.

In respect to the power station intakes and Ringsend WwTW outfall, any increase in the suspended sediment concentrations was generally very small by comparison with background levels in the Liffey Estuary. The dredging operations are therefore unlikely to have any effect on the quality of intake waters in terms of suspended solids content. However, as customary, DPC will continue to notify the power station operators in advance of each dredging campaign. This will allow operators to temporarily stop abstracting water from the Liffey for a short duration in the event that dredging is required within the immediate vicinity of their intake works.

The assessment of disposal of dredge spoil arising from the MP2 Project at the licenced offshore disposal site located to the west of the Burford Bank at the approaches to Dublin Bay concluded that the disposal operations will not result in any significant increases to the background level of suspended sediments and will not, therefore, impact the existing water quality in the greater Dublin Bay area.

The tidal regime is predicted to remain substantially unchanged post MP2 Project. The risk of impact to the existing tidal regime is therefore determined to be negligible and no mitigation is required.

The assessment of potential changes to the inshore wave climate found that the maximum change in wave heights in Dublin Port during storm events from the north east, east and south east did not exceed ±0.10m. These changes were confined primarily to Berth 50A and Berth 50; and there was no discernible change in the wave climate due to the MP2 Project in relevant proximate areas such as Clontarf, Fairview and Ballybough bordering the Tolka Estuary.

These changes to the wave climate are not considered significant and will not impact operations within the Port. Furthermore, the change in risk of potential coastal flooding due to the MP2 Project at neighbouring sites is considered to be negligible and no mitigation is required.

The assessment of potential changes to the morphology of the Tolka Estuary due to the construction and operation of Berth 53 concluded that the open=piled design of the jetty and the incorporation of a wash protection structure to reduce propeller and thruster jet velocities successfully mitigated the potential impact on waterbird foraging areas within the Tolka Estuary. No significant change to the position of the Lowest Astronomical Tide mark would arise as a result of the construction and operation of the MP2 Project.

In circumstances where the mitigation measures are fully implemented during the construction and operational phases, the impact of the MP2 Project on the coastal processes within Dublin Port and Dublin Bay will consist of small scale, low magnitude changes in the tidal regime and wave climate.

On the basis of that the appropriate mitigations measures are fully implemented during the construction and operational phases, the impact of the MP2 Project on coastal processes will be imperceptible.

13 MATERIAL ASSETS - TRAFFIC & TRANSPORTATION

13.1 Introduction

This Chapter assesses the potential impact of the MP2 Project on Traffic and Transportation, referred to as the Traffic and Transportation Assessment (TTA).

The site of the MP2 Project is defined by the application boundary as illustrated on the application drawings. The application boundary, overlain on the existing Port layout is presented in Figure 13-1. The site is located at the eastern end of the Dublin Port Estate and has an area of circa 97 ha.

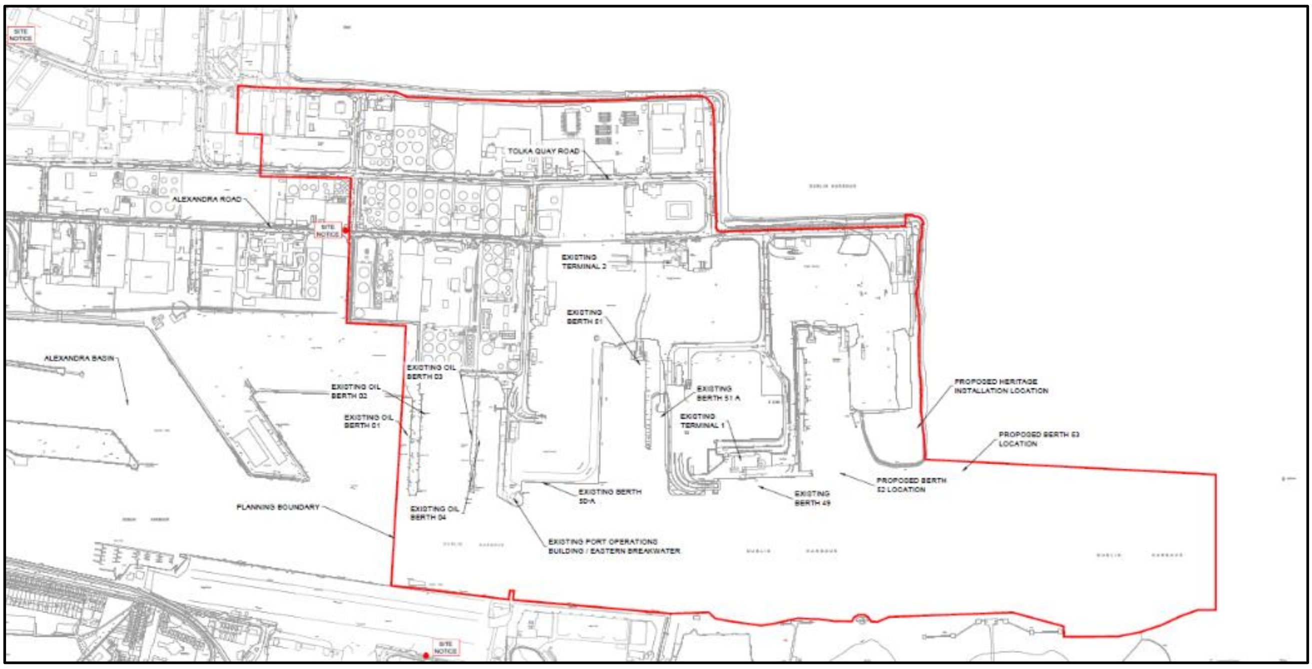


Figure 13-1 Existing Site Location

13.1.1 Definition of Ro-Ro, Lo-Lo and Bulk Liquid

MP2 Project relates to the Ro-Ro, Lo-Lo and Bulk Liquid facilities at the Port. For convenience these terms are explained as follows.

Ro-Ro (Roll-on Roll-off)

Ro-Ro refers to shipping services and activities where vehicles are driven on and off ferries or other specialised ships (such as car carriers). Ro-Ro freight traffic consists of freight vehicles, freight trailers, containers, coaches, passenger cars, trade vehicles and specialist trailers.

Dublin Port handles some of the largest Ro-Ro vessels in the world, such as the Irish Ferries Ulysses and Stena Adventurer. Some services are freight only; others carry a combination of freight and passengers. Ro-Ro freight is transported either “accompanied” or “unaccompanied”.

- "Accompanied" refers to trailer units to which the cab is attached at all times and the driver accompanies the vehicle on the Ro-Ro ferry. The units drive off the vessel and leave the port immediately.
- "Unaccompanied" refers to freight trailers that are delivered and collected from the compound adjacent to the vessel. These trailers are driven on and off ships by dock workers.

Lo-Lo (Lift-On Lift-Off)

Lo-Lo consists of containers carrying all types of goods. Cranes of different types are used to load and unload containers on and off the ship, and secondary handling equipment is used to transport the containers within the Lo-Lo operational area to back areas or within large stacks.

Ro-Ro and Lo-Lo, combined, are jointly referred to as unitised freight.

Bulk Liquid

Bulk Liquid primarily comprises of petroleum imports at Dublin Port, and have minimal traffic movements assosisated with them.

13.2 Existing Environment

The existing terminals, operators, berths, Port accesses and approach roads directly relevant to the transportation assessment for the MP2 Project are highlighted in Figure 13-2.

Existing Terminals, Operators and Berths

Irish Ferries

Figure 13-2 indicates the existing location of Terminal 1 at the eastern side of the Port which currently hosts the Irish Ferries operator. Irish Ferries use an existing double ramp at Berths 49 and a single ramp at Berth 51A. They handle Freight & Passenger Ro-Ro vessels and have 6 vessel arrivals and 6 vessel departures per day. They have accompanied and unaccompanied freight, tourist vehicles and foot passengers. Terminal 1 is accessed via Terminal Road located at the end of Tolka Quay Road.

Stena

The Stena operator is currently located in Terminal 2 and utilises Berth 51 via a double ramp. They handle Freight & Passenger Ro-Ro vessels and have 4 vessel arrivals and 4 vessel departures per day. Stena also have accompanied and unaccompanied freight, tourist vehicles and foot passengers. Terminal 2 is also accessed at the end of the existing Tolka Quay Road.

P&O

P&O currently occupy Terminal 3 at the western side of the Port and utilise a single ramp at Berth 21. They handle Freight & Passenger Ro-Ro vessels and have 3 vessel arrivals and 3 vessel departures per day. Stena handles accompanied and unaccompanied freight and tourist vehicles, but are weighted towards unaccompanied freight. They currently don't have foot passengers on their vessels. Terminal 3 has a dedicated access directly from East Wall Road.

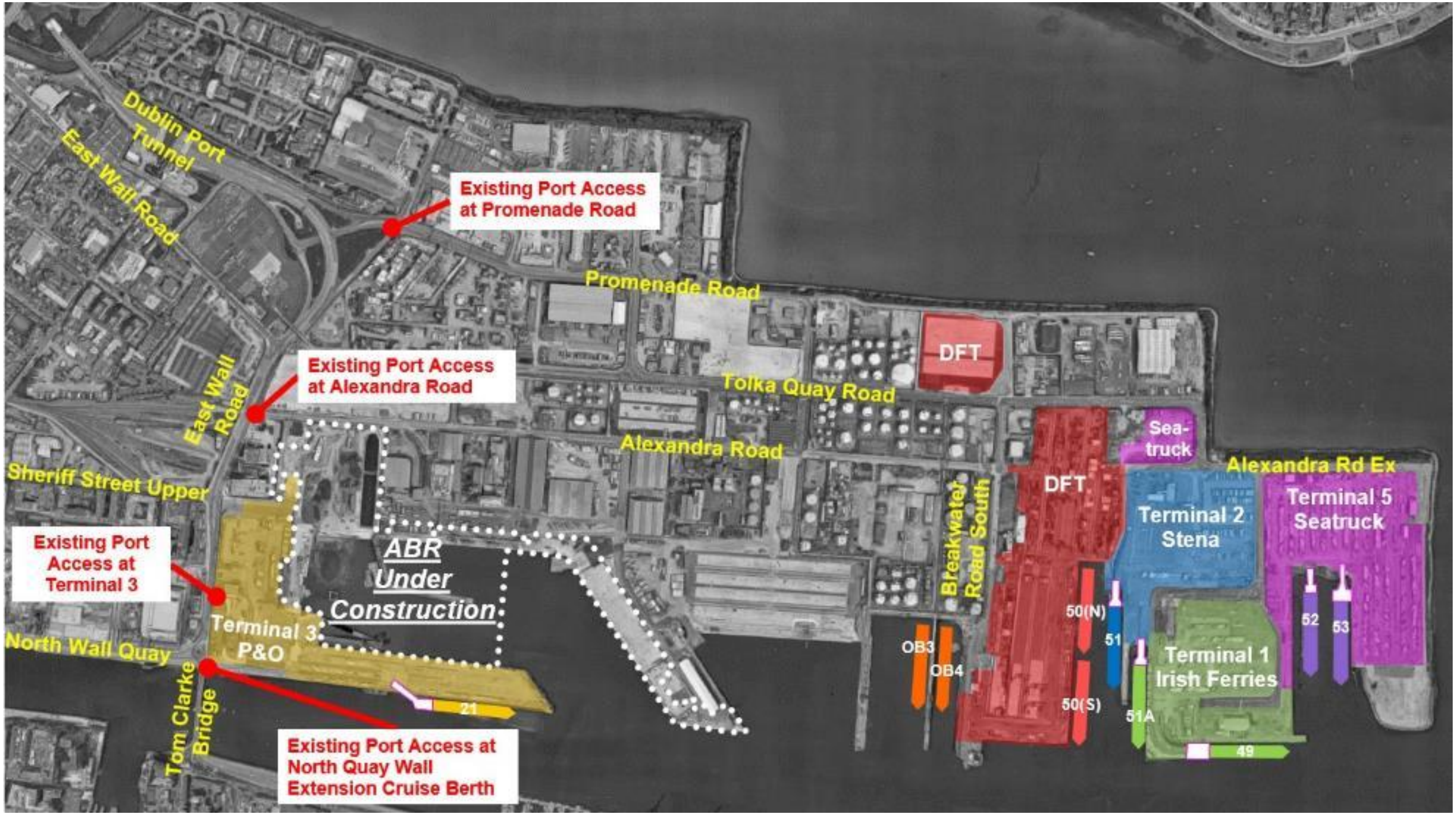


Figure 13-2 Existing Terminals, Operators, Berths, Port Accesses and Approach Roads Most Relevant to the MP2 Project

Seatruck Ferries

The majority of Seatruck's business is unaccompanied freight. They don't handle tourist traffic or foot passengers. Figure 13.2 indicates that they are currently located in Terminal 5 at the eastern side of the Port, and utilise 2 single ramps at Berths 52 and 53. There were 5 vessel arrivals and 5 vessel departures at Seatruck at the time of the traffic surveys. Terminal 5 is accessed via Alexandra Road Extension located at the end of Tolka Quay Road.

Dublin Ferryport Terminals (DFT)

DFT is a Lo-Lo operator located as indicated in Figure 13-2. DFT has two berths, River Berth 50A and Berth 50. Berth 50 can at times accommodate 2 vessels, referred to as being berthed in 50N (for north) and 50S (for south). This report will explain that on the day of the traffic surveys DFT had 1 vessel arrival and 2 vessel departures. Lo-Lo operations by nature generate a lower number of vessels on a less regular schedule compared to Ro-Ro operations. Traffic enters DFT along Breakwater Road South. It has an exit directly onto Tolka Quay Road, and also has some exiting traffic heading north on Breakwater Road South.

Oil Berth 3 and Oil Berth 4

Oil Berth 3 and Oil Berth 4 are included in Figure13-2 and they handle Bulk Liquid at the Port. They generate much less vessel and traffic movements compared to unitised freight. On the day of the traffic survey 1 vessel departed Oil Berth 3. Oil Berth 3 and Oil Berth 4 are accessible via Jetty Road, off Breakwater Road South.

Note that for ease of reference in the report, the current operators' names have sometimes been used rather than the official terminal reference numbers. This is for ease of reading.

Total Vessel Movements

The entities identified above comprise 40 of the 50 vessel movements carried out within the Port on the day of the traffic survey, indicating the extent of influence of the MP2 Project at the Port.

Existing Port Accesses

Figure 13-2 shows the existing Port accesses with East Wall Road currently operational at the Port and reflected in the current existing traffic surveys:

- Promenade Road;
- Alexandra Road;
- Terminal 3, P&O;
- Access to Cruise Berth at North Wall Quay Extension.

Approach Roads

There are 5 main origin / destination routes associated with the Port, as highlighted in Figure13-2:

- The Dublin Port Tunnel;
- East Wall Road;
- Sherriff Street Upper;

- North Wall Quay;
- Tom Clarke Bridge (Previously named the Eastlink Bridge).

13.3 Dublin Port Masterplan and the Strategic Transportation Study

Dublin Port Masterplan 2012 - 2040

The first Dublin Port Masterplan 2012-2040 provided a high level vision as to how Dublin Port could be developed to cater for an anticipated doubling in port volumes over the next 30 years to 60m gross tonnes by 2040, a rate of 2.5% pa, as well as working to enhance the integration of the Port with Dublin City.

Dublin Port Masterplan 2040, reviewed 2018

The Dublin Port Masterplan 2040, reviewed 2018 was adopted in July 2018 and anticipates that throughput will double by 2032 and by 2040 will have grown to 77.2m gross tonnes, resulting in an Average Annual Growth Rate (AAGR) of 3.3% pa.

Strategic Transportation Study

A Strategic Transportation Study was prepared to inform the Strategic Environmental Assessment process associated with the review to the Masterplan. It assessed the increase in growth, proposed modifications to the road network and the suite of sustainable transport measures which were included in the Dublin Port Masterplan, reviewed 2018.

The key features where the AAGR increasing from 2.5% pa to 3.3% pa, and the benefits of the provision of the Southern Port Access Route anticipated for delivery towards the last third of the lifespan of the Masterplan.

The suite of documents can be found here http://www.dublinport.ie/masterplan/masterplan-documents/ and aspects from these documents have been considered in the preparation of the TTA for the MP2 Project where appropriate.

Figure 13-3 Original Masterplan, Reviewed Masterplan and Strategic Transportation Study

13.4 Schemes Relevant to the TTA

There are some schemes and transportation infrastructure improvements, both within the Port Estate and within its environs, which are of particular relevance to the TTA for the MP2 Project.

13.4.1 Consented Road Upgrade on the Dublin Port Estate

DPC has invested significantly in improving the road network within the Dublin Port Estate to facilitate the efficient movement of goods to and from the various terminals and facilities in the Port.

These improvements have been delivered to ensure that the investment in the Dublin Port Tunnel and the expansion of the capacity of the M50 are adequately utilised by freight traffic to and from the Port. In addition to reducing congestion within the Dublin Port Estate and reducing the impact of HGV traffic on the City Centre, the strategic investment in both the Dublin Port Tunnel and the upgrading of the M50 have assisted in reducing the times involved in moving goods to and from the Port.

In the progression of this objective DPC have secured planning permission (Dublin City Council Planning Reg. Ref No. 3084/16) for a major upgrade of the internal road, cycle and pedestrian network within the Dublin Port Estate, which is currently under construction.

This is illustrated in Figure 13-4 and includes:

- A new Promenade Road Extension to connect directly to the Unified Ferry Terminal (UFT) to be located at the eastern side of the Dublin Port Estate. The UTF forms part of the proposals for the MP2 Project;
- A four kilometre long Greenway on the northern fringe of Dublin Port overlooking the Tolka Estuary;

- Gantry signs to assist with traffic management on the internal road network; and
- A landmark grade separated bridge at Promenade Road.

This scheme is of vital importance to the vehicular and sustainable transport connectivity to the MP2 Project. This scheme will be complete and operational prior to the completion of the construction of the MP2 Project.

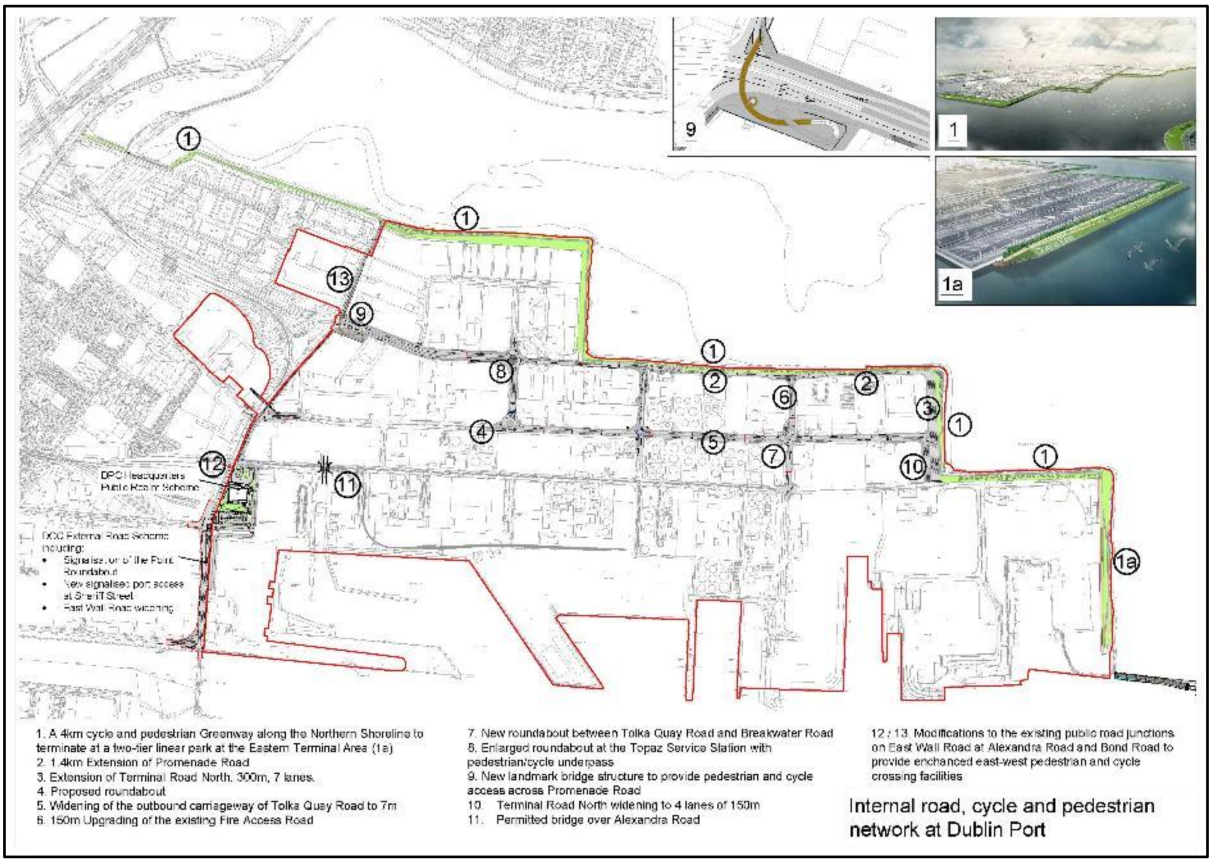


Figure 13-4 Indicative Internal Road, Cycle and Pedestrian Networks at Dublin Port Estate

13.4.2 Permitted ABR Project

Part of the permitted Alexandra Basin Redevelopment Project (ABR Project, PL29N.PA0034) is currently under construction in the approximate location indicated in Figure 13-2.

13.4.3 Closure of the Port Accesses along the East Wall Road

As part of its Masterplan, DPC has committed to closing its existing accesses with East Wall Road. The Terminal 3 and Cruise Berth access close completely. The Alexandra Road access will close to all operational traffic, after which only traffic related to the Port Centre and some cruise related vehicles will be permitted to use the access. These future year access closures have been considered in the TTA.

The rail freight services will continue to use the Alexandra Road access.

Dublin City Council (DCC) are progressing a potential scheme in liaison with DPC to provide widening along East Wall Road and replace the Point Roundabout with a signalised junction, as illustrated in Figure 13-5.

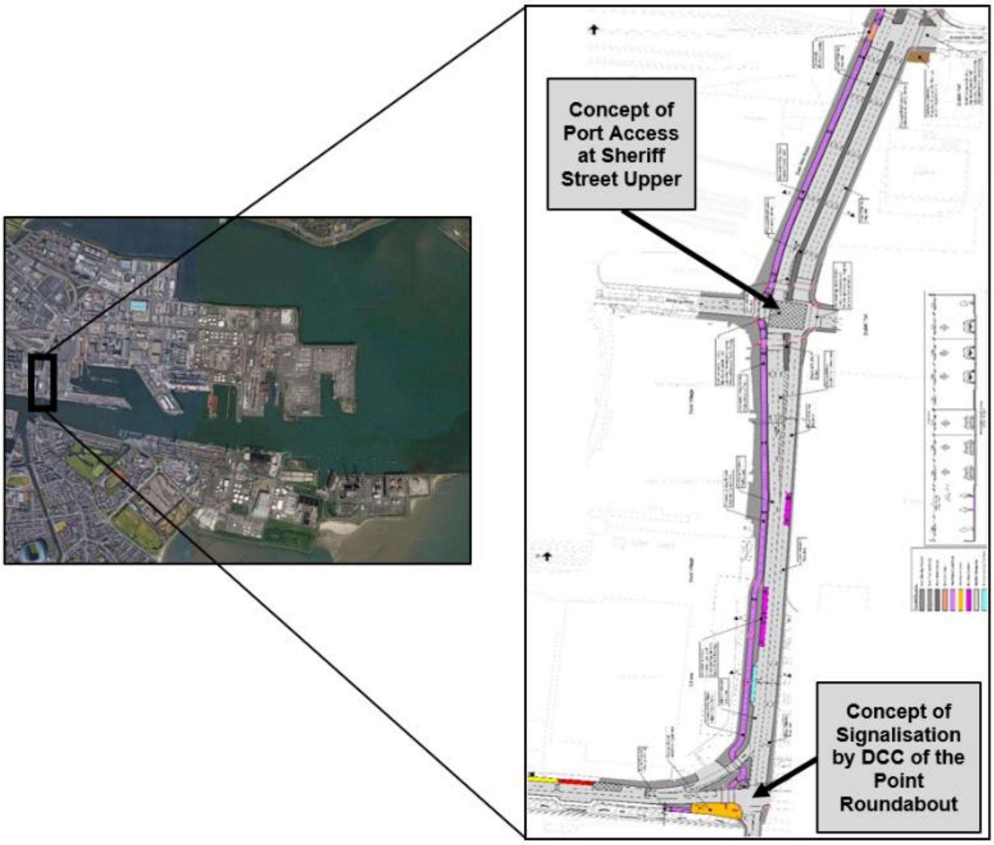


Figure 13-5 Illustration of Concept DCC Scheme along East Wall Road

The future closure of the Dublin Port Estate's accesses along East Wall Road facilitates the delivery of the DCC scheme by removing the requirement for vehicles to U-turn at the roundabout to travel towards the Dublin Port Tunnel and hence remove the roundabout. (U-turning is not permitted at signalised junctions).

Should this scheme be realised, additional controlled walking and cycling crossing facilities could be provided at East Wall Road in the location of the Point Roundabout, and the Alexandra Road access will be relocated to Sheriff Street Upper.

DCC and DPC continue to liaise on the design and implementation of the potential road scheme.

13.4.4 Public Realm Scheme, Opening Up Port Centre

The public realm scheme in the environs of the Port Centre building, as illustrated in Figure 13-6, softened the boundary between the Port and the East Wall Road. This scheme provides cycling, walking and public realm facilities. The cycle parking facilities can be used in conjunction with the surrounding public transport provision to provide multi-modal active travel solutions for users of the MP2 Project.

Figure 13-6 Port Centre Public Realm Scheme

13.5 Development Proposals

A site plan of the land elements of the MP2 Project is presented in Figure 13-7.

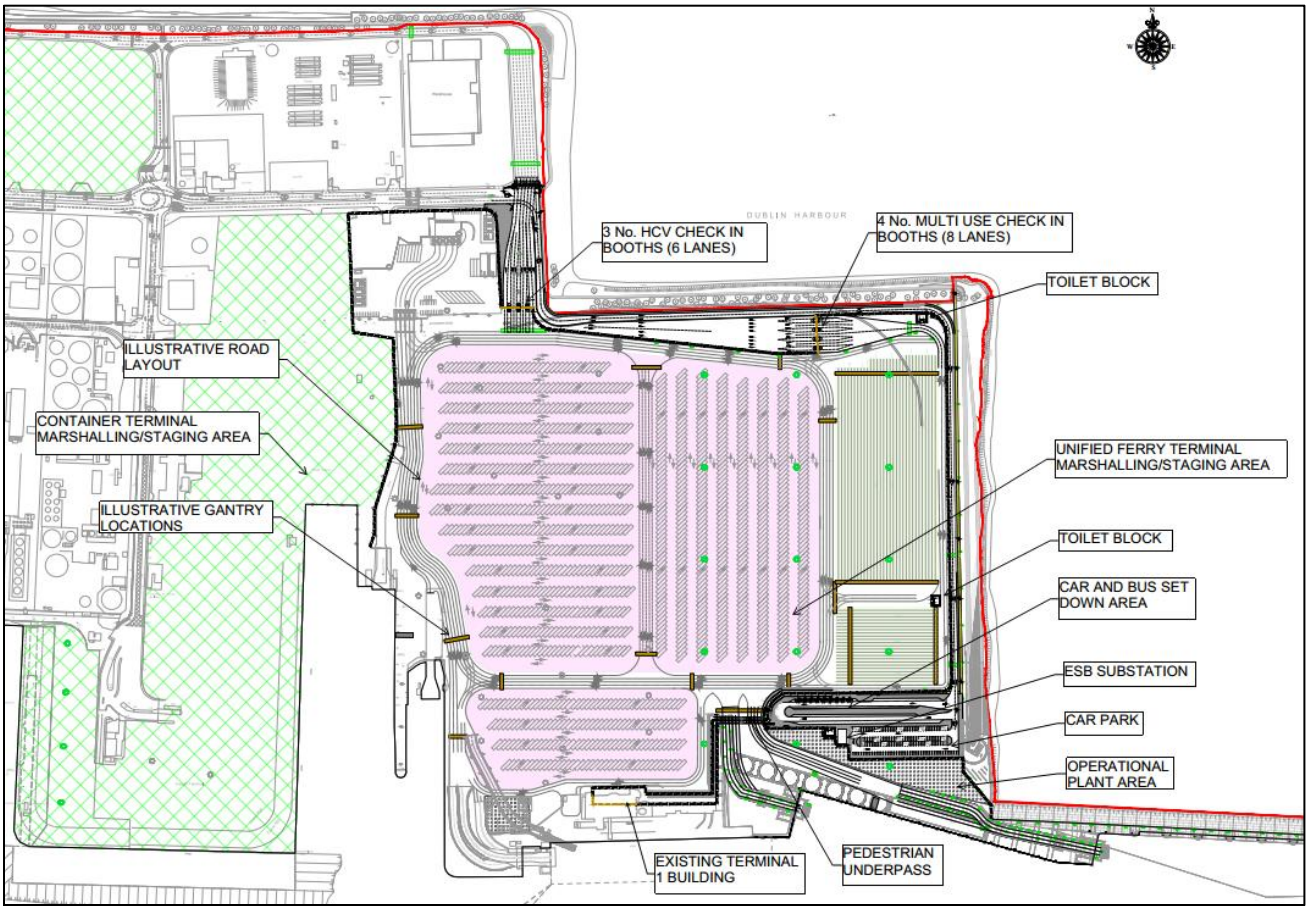


Figure 13-7 Site Plan of the Operational Landside Elements of the MP2 Project

Chapter 3 of the EIAR describes the operation and connectivity of the landside elements of the MP2 Project. The land elements of the MP2 Project will not impede on the existing railway lines present within the MP2 application boundary.

The key aspects of the proposals relevant from a transportation assessment perspective are summarised in Table 13-1.

Table 13-1 Summary of Proposals Most Relevant to the TTA

Operator	Existing Location	Proposed Location	Proposed Vehicular Access
Irish Ferries	Terminal 1 Eastern side of the Port	Within UFT at the eastern side of the Port	Consented upgraded internal road network, with predominantly Promenade Road Extension for direct entry and Tolka Quay Road for direct exit.
Stena	Terminal 2 Eastern side of the Port		
P&O	Terminal 3 Western side of the Port		
Seatruck	Terminal 5 Eastern side of the Port	To a larger footprint at Terminal 4 at the western side of the Port once the ABR Project works are completed	A new access at the western end of Tolka Quay Road, taking advantage of the consented ‘all movements’ roundabout at Bond Drive.
DFT	Eastern side of the Port	To remain in-situ, with additional lands and berthage	As existing, entry and exit via Breakwater Road South with the main exit onto Tolka Quay Road.
Oil Berth 3	Eastern side of the Port	To remain in-situ and reconstructed to be future proofed for potential future uses as a container berth as petroleum volumes decrease.	As existing, via Jetty Road located at the end of Breakwater Road South.
Oil Berth 4	Eastern side of the Port	To be removed to provide extra lands and berthage to DFT.	N/A

13.5.1 Unified Ferry Terminal (UFT)

As referenced in Table 13-1 it is proposed to provide a UFT at the eastern end of the Dublin Port Estate to facilitate Ro-Ro operators such as Irish Ferries, Stena and P&O within a combined space. The transportation assessment considers that the unaccompanied freight operator currently operating on the footprint (Seatruck) will be relocated to the western end of the Dublin Port Estate.

At the conclusion of the MP2 Project this area will comprise approximately 34.4 hectares of hardstanding space (35.8ha inclusive of state services facility).

The landside area within the International Ship and Port Facility Security Code (ISPS) restricted area will be capable of being adapted to the requirements of the trade, and will generally be split into stacking areas for accompanied freight, accompanied tourist vehicles and unaccompanied trailers.

The public access to the perimeter of the site outside the ISPS will lead to the area for staff parking and set/down pick up. Figure 13-8 shows the vehicular access routes for UFT.

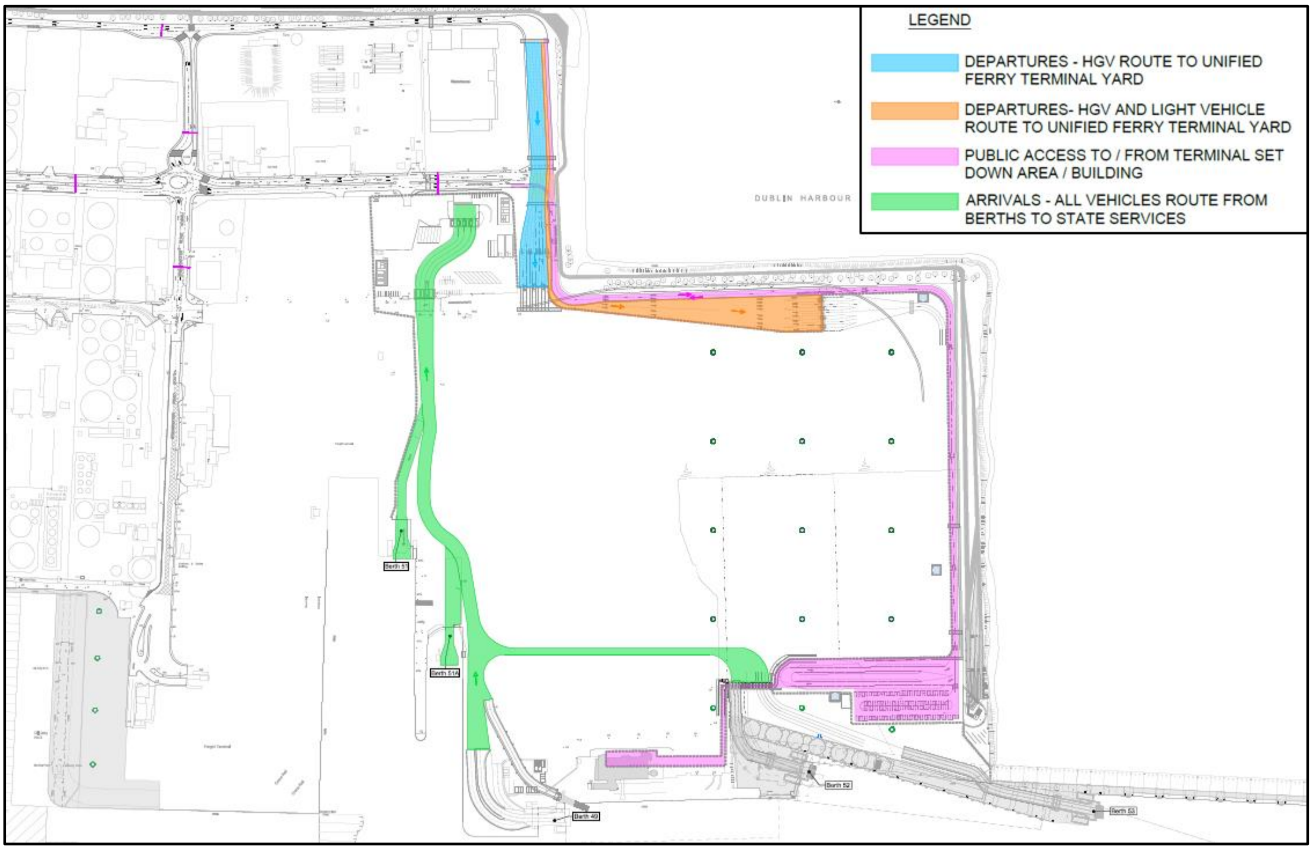


Figure 13-8 Access Arrangements to UFT

Exporting Transportation Movements for UFT

The layout in Figure 13-8 shows vehicles for export will arrive to the UFT via Promenade Road and the Promenade Road Extension to be constructed as part of the consented internal road upgrade.

Note that the access to UFT will be located c1.9km from the adopted road network.

There are seven lanes consented to link the Promenade Road Extension to the entrance to the UFT at Alexandra Road. At the end of Promenade Road Extension seven lanes traffic will be separated through gantry signage with lane designations as indicated below:

- Lane 1 (eastern lane) public access to Terminal 1;
- Lane 2 Access to dual use check-in booths (HGVs / Light Vehicles);
- Lane 3 – 7 HGV access to check-in.

Figures 13-9 to 13-11 confirm the cross sections at the booths.

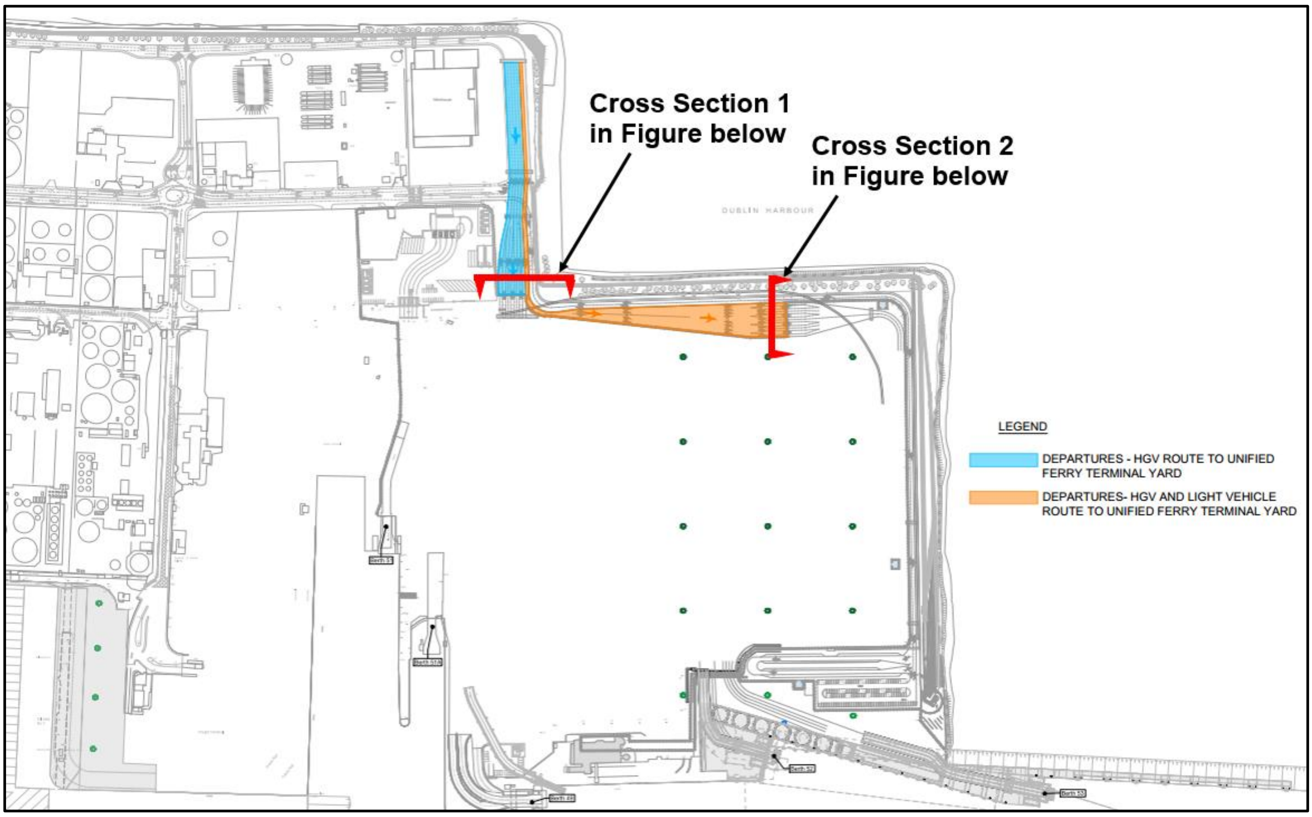


Figure 13-9 Exporting Traffic Movements

Heavy Goods Vehicles (HGV)

HGV check-in will be facilitated at the proposed six lane HGV check-in facility at Alexandra Road and the proposed dual use eight lane check-in facility towards the North East corner of the site. The queue lengths have been estimated based on target check-in times to ensure adequate space is available in advance of the check-in booths to prevent pre-check-in HGV queues from impacting on the public access to the Terminal building or light vehicle access to the dual use check-in booths. This TTA confirms that the queuing will be minimal at the check-in barriers.

In addition, it is anticipated that as the Port traffic increases evolving technology will reduce the target check-in times to further reduce the queue. Additional pre-check-in stacking areas for HGVs can be provided for elsewhere within the Port if required in accordance with the Dublin Port Masterplan 2040, reviewed 2018.

The proposed check-in areas include new double-sided check-in booths with a canopy provided above for cover. It is proposed to provide three new booths to service the six dedicated HGV check-in lanes and an additional four booths to service the eight dual use lanes as illustrated in Figures 13-10 and 13-11.

The check-in booths at the eight dual use lanes will have high and low-level windows to support the dual check-in as illustrated in Figure 13-12.

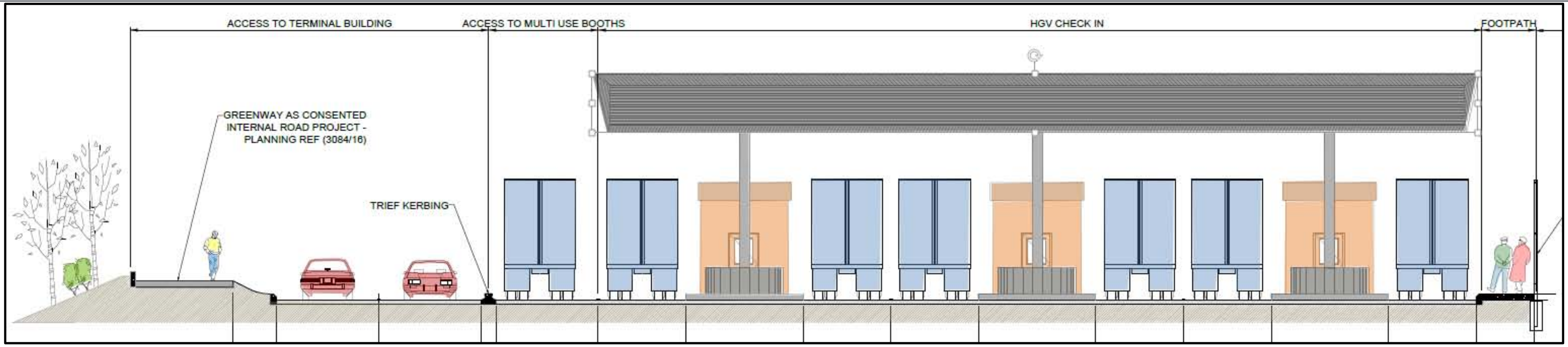


Figure 13-10 Cross Section 1 of HGV Booth Check-in

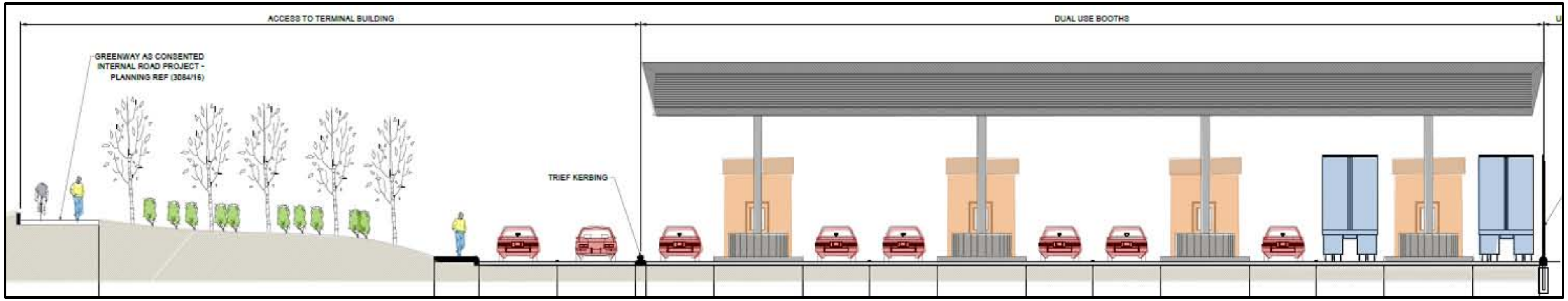


Figure 13-11 Cross Section 2 of Multi-use Booth Check-in

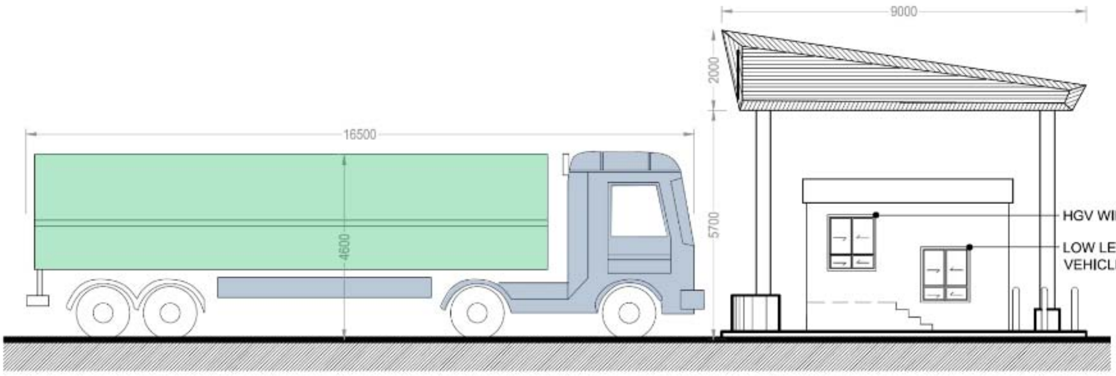


Figure 13-12 Typical Side Elevation of Dual Use Check-in Booths and Canopy

Following check-in, accompanied HGVs will be routed through internal circulation roads to a dedicated HGV pre-boarding holding area to await departure. Toilet facilities will be provided in this area and a pedestrian route to the terminal building will also be available via the proposed pedestrian underpass which will maintain all accompanied passengers within the ISPS restricted area. Once called from the holding area by the operator the HGVs will be routed through the internal circulation roads to the relevant berth for departure.

Unaccompanied HGVs will be directed through internal circulation routes to the relevant unaccompanied HGV staging area. Each HGV will be routed to the relevant set down space and drop off the HGV trailer before the HGV tractor unit will depart. The trailers will be collected by port tractor units and moved onto the relevant ship for departure.

Car / Tourism Vehicles

It is proposed that check-in for car / tourism vehicles will be facilitated at the new 8 lane dual use (HGV and light vehicle) check-in facility at the north eastern corner of the site. Gantry signage will be used to designate lanes and separate cars and HGVs queuing in this area. The queue lengths have been estimated for various scenarios, based on anticipated traffic, booth numbers and check-in times. This TTA confirms that the queuing will be minimal at the check-in facilities.

Following check-in, accompanied cars will be routed through the internal circulation routes to the dedicated car staging area to await departure. Toilet facilities will be provided in this area and a pedestrian route to the terminal building will also be available via the proposed pedestrian underpass which will maintain all accompanied passengers within the ISPS restricted area. Once called from the holding area by the operator the vehicles will be routed through the internal circulation roads to the relevant berth for departure.

Importing Transportation Movements for UFT

A new state services facility is proposed as part of the Interim Unified Ferry Terminal (IUFT) Project to the north of the UFT. All vehicles using the UFT will be required to depart via this area where checkpoint and inspection facilities are provided for An Garda Síochána, Revenue and the Department of Agriculture, Food & Marine.

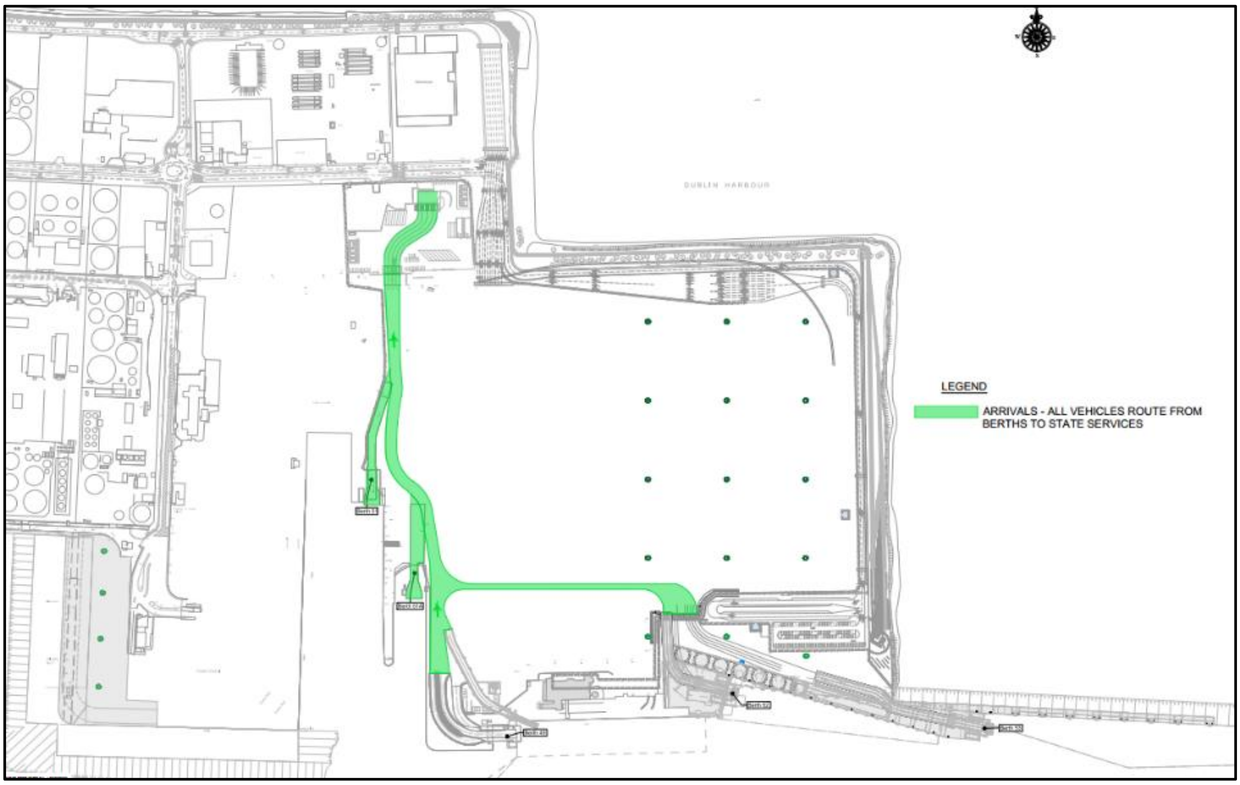


Figure 13-13 Importing Traffic Movements

Accompanied Vehicles

Accompanied vehicles will be unloaded from the ships and directed through internal circulation routes to the state services yard. The operational layout of the UFT is provided which indicates how internal circulation could be provided with flexibility in mind to ensure it is possible to re-route vehicles arriving on the ships through the UFT to reach the back of any arrivals queue in the event of a delay in the state services yard. Lanes within the pre-boarding staging areas may also be used to hold arrival vehicles if required in the event of a significant delay.

Unaccompanied Units

The unaccompanied units will be unloaded by port tractors to a designated unaccompanied trailer holding area. The articulated tractors collecting the vehicles will enter the port through the HGV check-in lanes and route to the relevant unaccompanied staging area and collect the relevant trailer. The HGV tractor and trailer unit will then exit via the state services yard.

13.5.2 Proposals for DFT

Dublin Ferry Terminal (DFT) are a Lo-Lo operator located within the Dublin Port Estate and are currently the tenant on the footprint described below. For convenience throughout this chapter of the EIAR the term DFT has been used to refer to this footprint.

The proposals relating to the DFT site, were relevant to the TTA, are described below. These works result in additional lands and berthage, which facilitate growth at the site:

- Infill of existing Oil Berth 4 to provide additional lands;
- Demolition of Pier Head at the Eastern Breakwater (including the Harbour Office) and the extension of Berth 50A westwards;
- Further extension of Berth 50A by c90m over high voltage ESB cables (buried beneath the river bed);
- Reconstruction of Oil Berth 3 to future proof it for future uses as a container berth as petroleum volumes decrease;

Figure 13-14 indicates the proposed DFT site, and confirms that the existing vehicular exit onto Tolka Quay Road and the existing vehicular entry and exit routes at Breakwater Road South will be retained within the proposals.

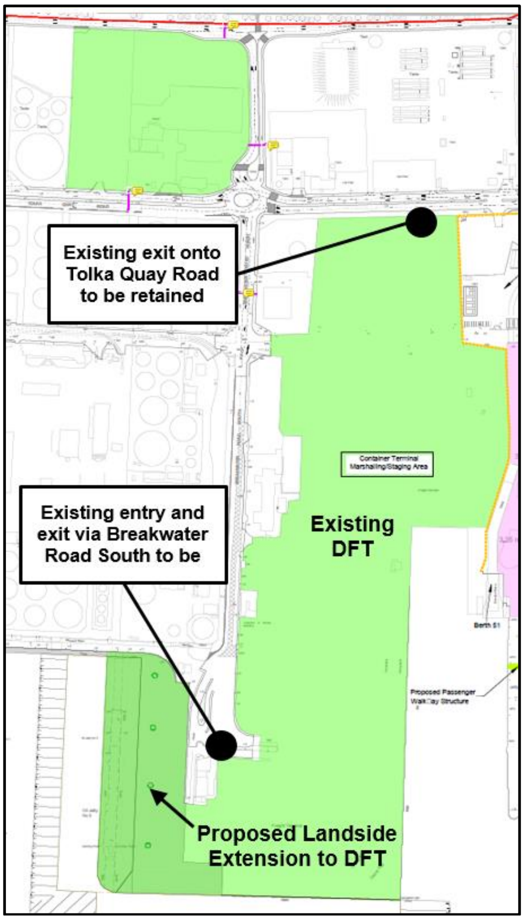


Figure 13-14 Summary of Proposals and Access Arrangements for DFT

13.5.3 Distance from Adopted Road Network

It is highlighted that the accesses to both UFT and DFT are both c1.9km from the adopted road network. Figure 13-15 shows the roads within the Port's ownership as yellow and the public road network in white.

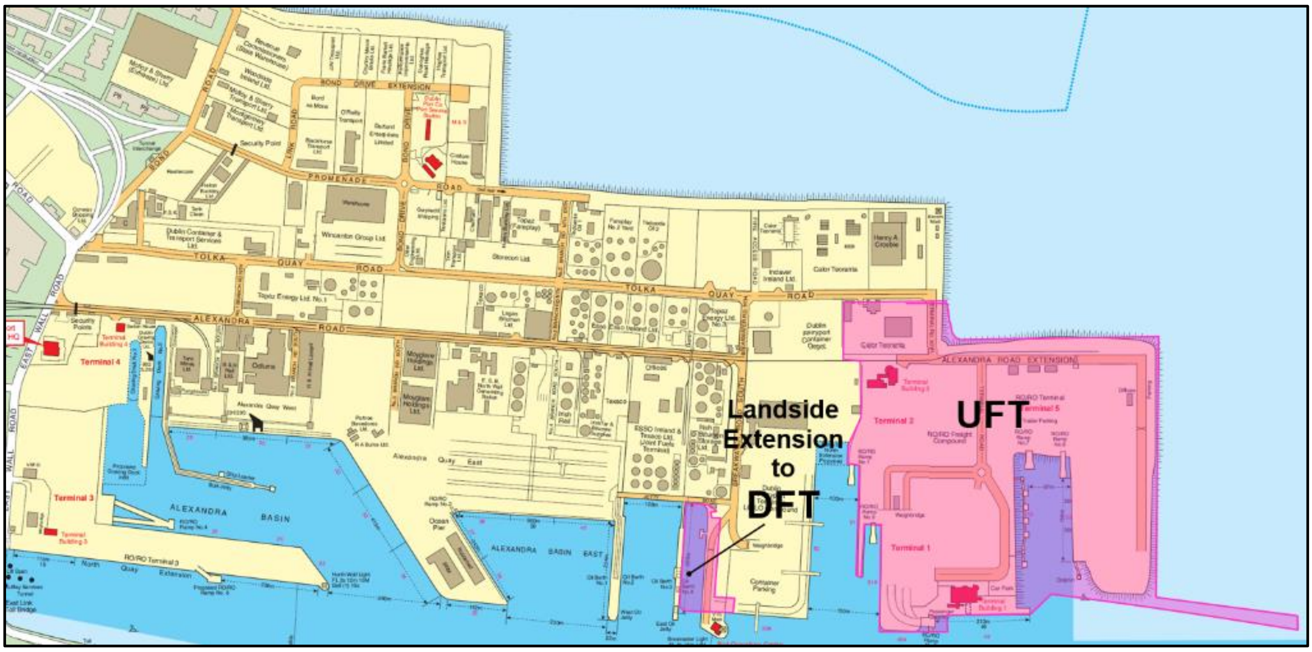


Figure 13-15 MP2 Project in the Context of Road Ownership

13.6 Pre-Application Consultation

Several pre-application meetings were held with relevant stakeholders, and DPC sent information scoping request letters to a number of bodies:

- Transport Infrastructure Ireland (TII);
- Land Use, Planning and Transportation Section of the South Dublin County Council;
- National Transport Authority (NTA);
- Commission for Railway Regulation;
- Irish Rail.

An Bord Pleanála (ABP)

Three pre-application meetings were held with An Bord Pleanála (ABP) in respect of the MP2 Project. In the ABP Inspector's Report on the pre-application process (ref. no. 29N.PC0252), paragraph 5.5(f) recommends that a comprehensive and detailed EIAR should be prepared which has particular regard to the impact of the MP2 Project on traffic management (including any new or modified road or rail proposals such as a Luas extension). Accordingly, in line with EU and Irish legislative requirements, as well as the Board's Inspector's recommendation, this chapter of the EIAR has been prepared which, in Section 13.7.8, confirms that the MP2

Project will not impact on the potential extension of the Luas as currently included in NTAs Transport Strategy for the Greater Dublin Area for 2016-2035.

It is noted that a proposed rubber wheeled public transport provision is envisaged to serve the Dublin Port Estate and MP2 Project; either the provision of a new dedicated bus route or the extension of the existing bus route to link with the LUAS terminal at the 3 Arena and the DART.

Transport Infrastructure Ireland (TII)

TII responded to the information scoping request letter in three main themes. A copy of the response is included in Appendix 5-3:

- M50 Dublin Tunnel: The safety efficiency and capacity of the M50 Dublin Tunnel must be considered at the construction and operational phases of the MP2 Project;
- Eastern Bypass and M50 South Port Access: TII raised concerns as the original application boundary for the MP2 Project overlapped with the *Dublin Eastern Bypass Corridor Protection Study, Sector A: Dublin Tunnel to Sandymount Strand* dated September 2014. TII highlighted that it continues to afford protection for the M50 Dublin Port South Access within the Eastern Bypass corridor. Generally, TII also advise careful coordination between TII, NTA, DCC and DPC in relation to future year M50 Dublin Port South Access road project;
- Assessment Scoping: TII provided a list of general guidance for the preparation of an EIAR which may affect the National Roads Network, including future roads schemes, the M50 Dublin Tunnel or Luas.

These comments were taken into account in the preparation of this chapter of the EIAR. A full TTA has been undertaken which incorporates the M50 Dublin Tunnel. The assessment has been carried out in accordance with the TTA Guidelines 2014.

It is noted that the application red line has reduced from the extent originally included in the informal Scoping Report**.** Figure 13-16 shows that the application boundary for the MP2 Project does not overlap with the road protection corridor as identified in Dublin Eastern Bypass Corridor Protection Study. The reduction in the extent of the application boundary since the scoping stage should alleviate TII's concerns relating to the protection corridor for the Eastern Bypass and the M50 South Port Access.

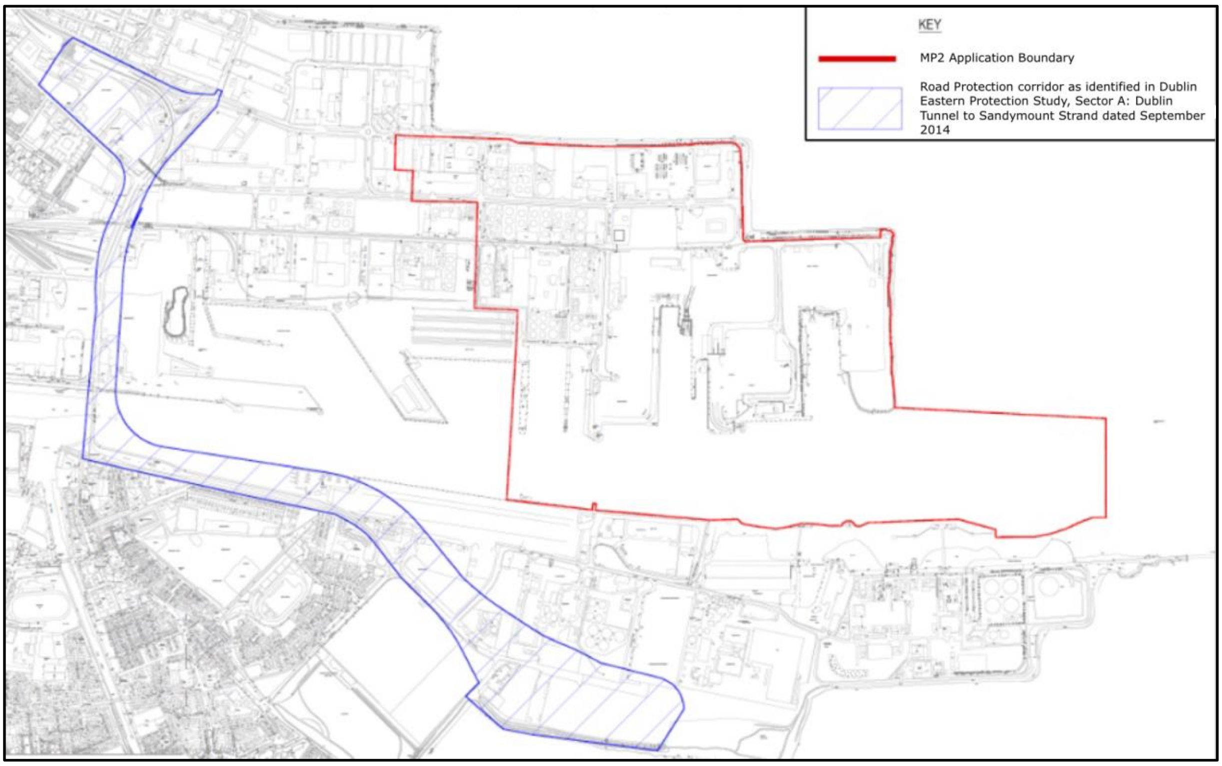


Figure 13-16 MP2 Application Boundary and the Dublin Eastern Bypass Road Protection Corridor

Land Use, Planning and Transportation Section of the South Dublin County Council

In its informal scoping response, dated 19 July 2018, the Land Use, Planning and Transportation Section of the South Dublin County Council stated that they are supportive and welcome investment from DPC to deliver the necessary infrastructure at Dublin Port.

South Dublin County Council requested to be able to view the Strategic Transportation Study carried out to inform the Dublin Port Masterplan 2040, reviewed 2018. The correspondence is included in Appendix 5-3, and the Council was subsequently advised that the Strategic Transportation Study is available with the full suite of related documents at the following webpage: http://www.dublinport.ie/masterplan/masterplan-documents/

Transportation Planning Division, Dublin City Council (DCC)

On the 25 June 2018 a pre-application meeting was held at the DCC offices in Dublin, including representatives from the Transportation Planning Division of the DCC. The following topics were discussed during the meeting:

- An update on the implementation of the ABR Project and consented Dublin Port internal roads project;
- The status of the Dublin Port Dublin Port Masterplan 2040, reviewed 2018 and Strategic Transportation Study;
- The envisaged approach and methodology for undertaking the TTA for the MP2 Project;
- Sustainable transport measures and the commitment to provide a multi-modal Mobility Management Plan (MMP) for both staff and passengers.

DCC were positive regarding the proposals and methodology explained in relation to the transportation aspects of the MP Project.

DCC enquired about the timings of the access closures along East Wall Road, citing concerns of port related traffic on North Wall Quay, Castleforbes Road and Sheriff Street Upper in the short term. This chapter of the EIAR provides an assessment of the MP2 Project in accordance with the TTA guidelines. The first Assessment Year considered in this report is 2026, in which it has been considered that the accesses to the Port Estate along East Wall Road will have closed in the manner described above in Section 13.4.2.

Concerns were raised that existing Ro-Ro foot passengers utilising Terminal 3 will be disadvantaged by a relocation from the current position at the western side of the Port Estate to the UFT. These concerns were alleviated when it was highlighted that the current Ro-Ro operator in Terminal 3, P&O, doesn't accommodate foot passengers, hence no existing foot passengers would be directly disadvantaged.

In response to DCC's queries on sustainable transport, an outline MMP is contained with this chapter of the EIAR, along with confirmation of the aspiration for an enhanced public transport provision to connect UFT to the Luas and the DART. The chapter also summarises the suite of existing and consented sustainable transport measures to facilitate the users of the MP2 Project including the use of the cycle lockers at the Port Centre to facilitate multi-modal active travel options at the MP2 Project.

13.7 Accessibility

An accessibility assessment was undertaken to establish the existing, consented and proposed sustainable travel and active transport provision serving the MP2 Project. The assessment considers travel by walking, cycling and public transport.

The main components that provide a high level of accessibility for the MP2 Project are the:

- Consented active travel measures incorporated within the internal roads scheme to connect the MP2 Project to the City;
- Existing density of active travel facilities available in Dublin City Centre;
- Existing density of sustainable travel facilities in Dublin City Centre including bus, rail, DART and Luas;
- Existing provision of cycle locker facilities of the Port Centre public realm scheme to facilitate multi-modal journeys by sustainable travel;
- Proposal for DPC to subsidise the provision of a shuttle bus service to the MP2 Project;
- Proposed connectivity on foot and by cycle to the UFT footprint;
- Proposed commitment to a Mobility Management Plan for the MP2 Project, as outlined in this chapter of the EIAR.

13.7.1 Consented Pedestrian and Cycling Facilities Incorporated into the Internal Road Scheme

A major consideration for provision of sustainable transport for the MP2 Project is the already consented internal roads scheme within the Dublin Port Estate. The integration of the consented roads scheme to the MP2 Project is consistent with a core aim of the Dublin Port Masterplan 2040, reviewed 2018 to achieve closer integration between the Dublin Port Estate and the people of Dublin.

Figure 13-17 summarises the consented internal roads, cycle and pedestrian networks at the Dublin Port Estate.

The consented internal roads scheme is of vital importance to the vehicular and sustainable transport connectivity to the MP2 Project. It is therefore confirmed that this scheme will be complete and operational prior to the completion of the construction of the MP2 Project.

The consented internal roads scheme satisfies the following objectives for the MP2 Project:

- Promote movement linkages in the form of pedestrian and cycle routes between the MP2 Project and Dublin City;
- To promote within the development of future port facilities, the principles of universal design to make environments inherently accessible for those with and without disabilities;
- Facilitating public access to the Port in a manner which is consistent with the safe and secure operation of a modern busy port;
- Facilitate multi-modal integration between public transport facilities and walking and cycling facilities;

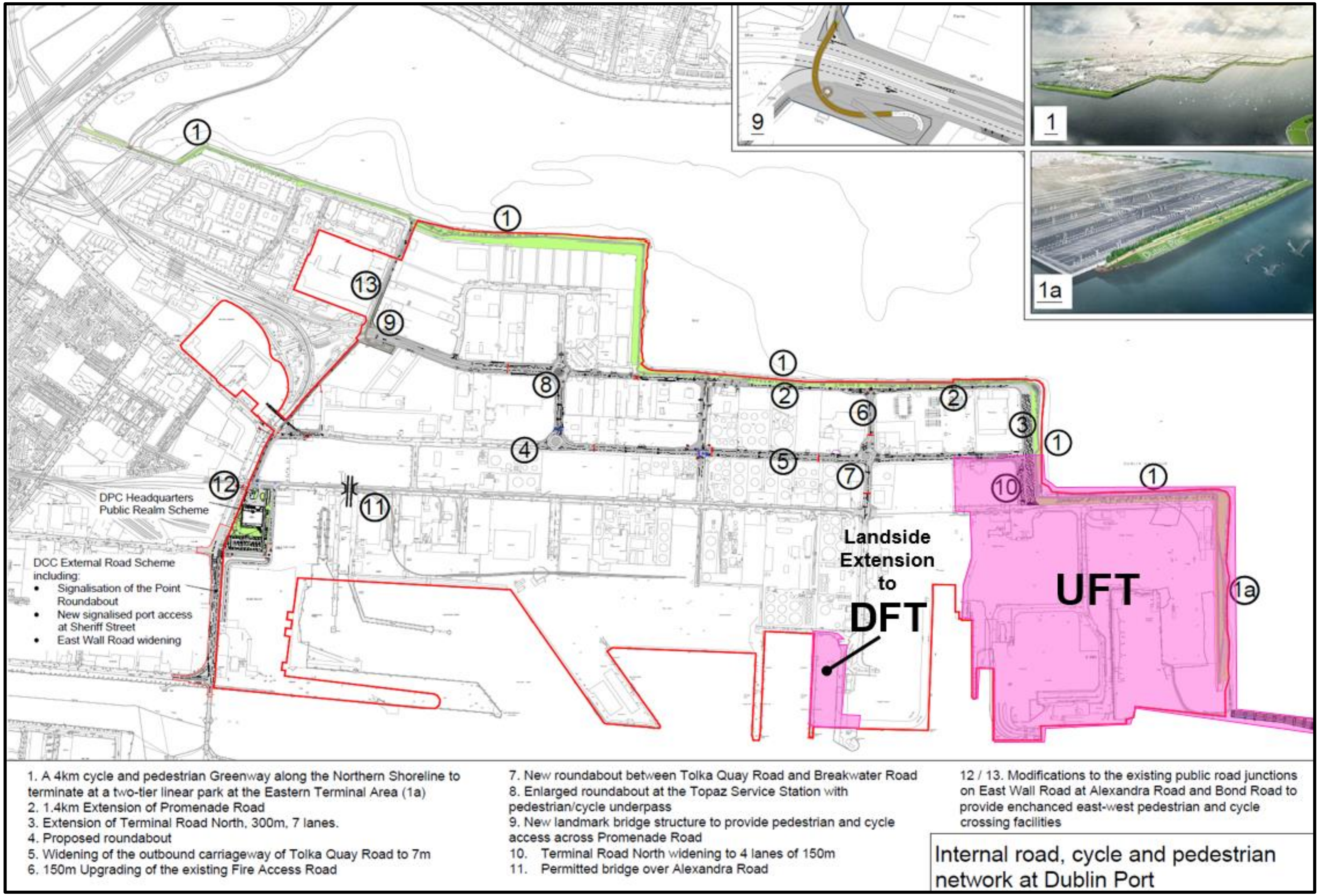


Figure 13-17 Indicative internal Roads, Cycle and Pedestrian networks at Dublin Port Estate

Figures 13-18 and 13-19 illustrate two sections of the consented 4km cycle and pedestrian Greenway along the northern shoreline overlooking the Tolka Estuary. The Greenway connects the City to the MP2 Project, and particularly to the proposed enhanced public realm and heritage area located to the east of the UFT footprint.

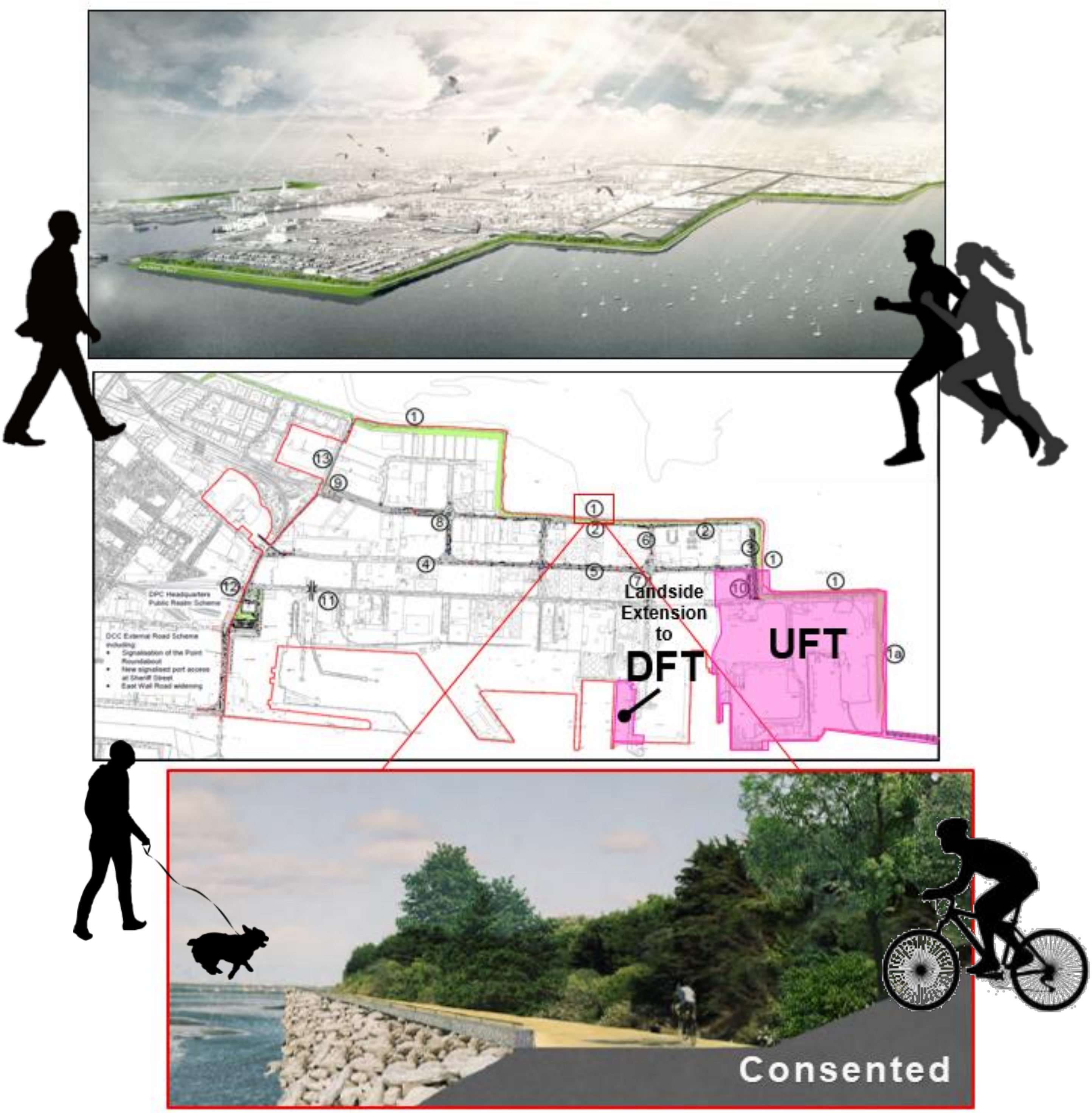


Figure 13-18 Part of the Consented 4km Cycle and Pedestrian Greenway along the Northern Shoreline

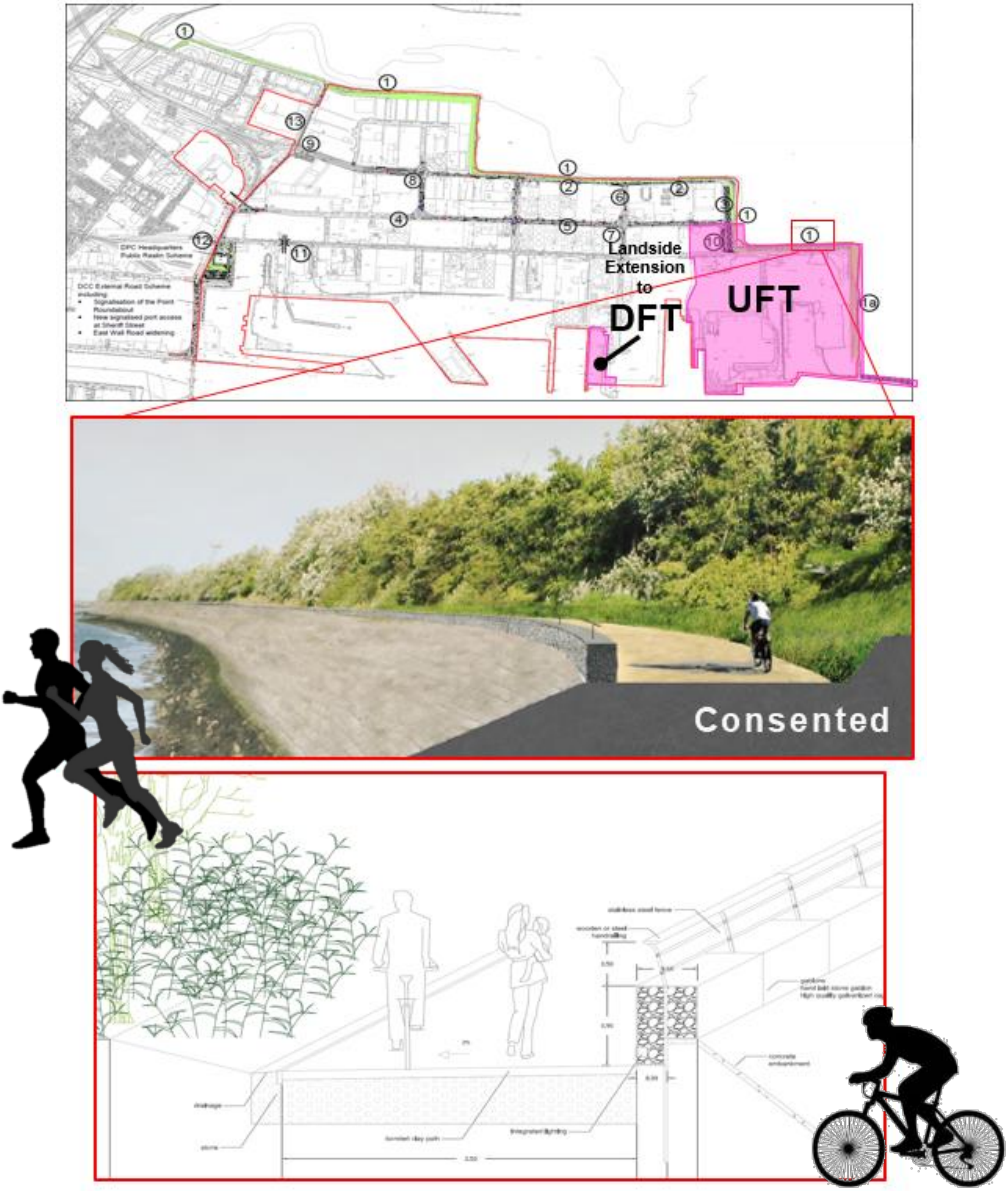


Figure 13-19 Part of the Consented 4km Cycle and Pedestrian Greenway along the Northern Shoreline

Figure 13-20 illustrates the consented landmark bridge structure to provide pedestrian and cycle access across Promenade Road. The bridge connects the northern shoreline Greenway to the pedestrian network on East Wall Road. The bridge will be grade separated allowing safer crossing point for pedestrians and cyclists generated by the MP2 Project and away from traffic flows on Promenade Road.

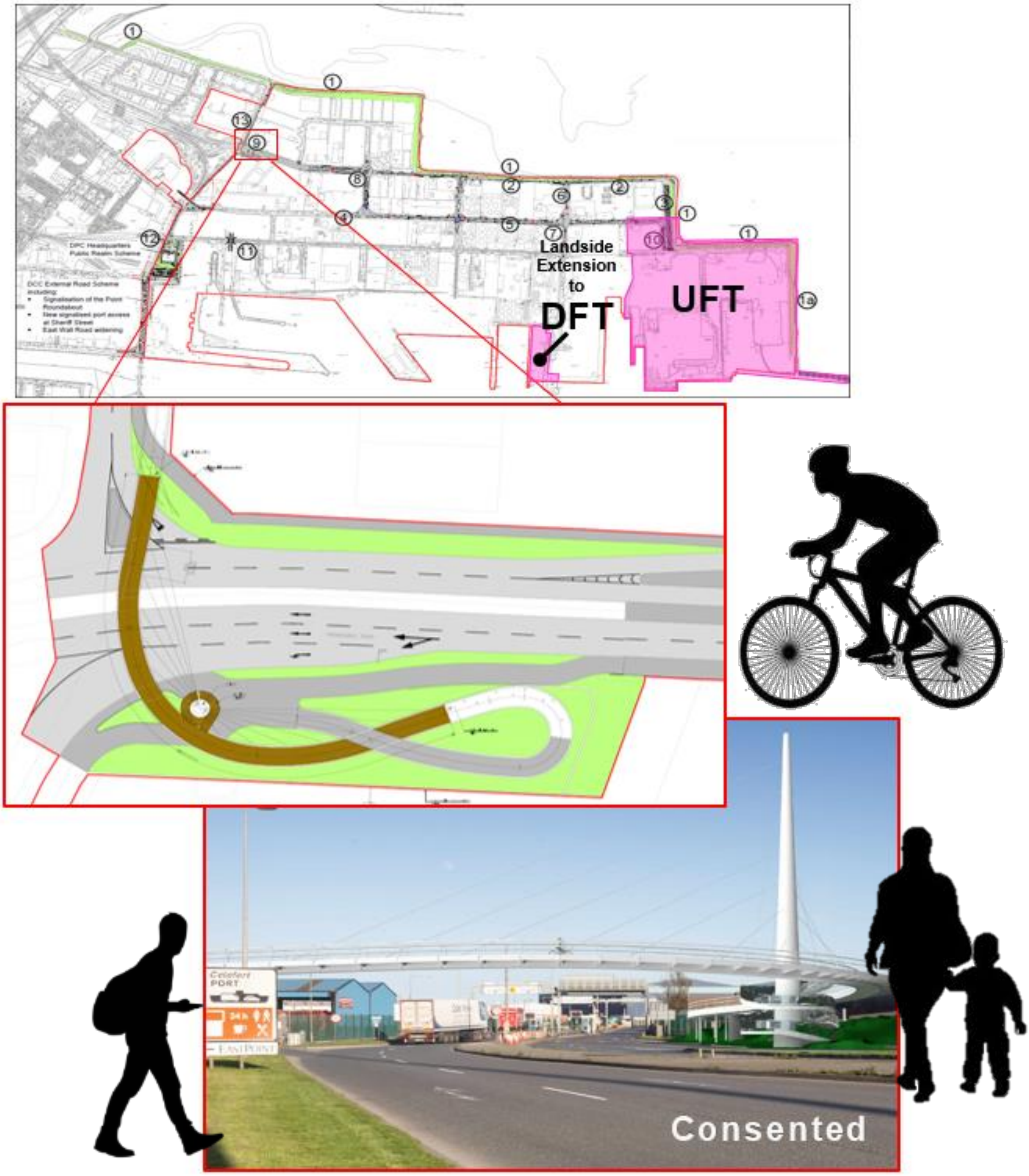


Figure 13-20 Consented Landmark Bridge Structure to Provide Pedestrian and Cycle Access across Promenade Road

As part of the consented road improvements the Promenade Road Roundabout is to be enlarged and incorporate a pedestrian/cycle underpass as illustrated in Figure 13-21. The underpass allows pedestrian and cyclists generated by the MP2 Project to pass safely under the roundabout and away from traffic flows.

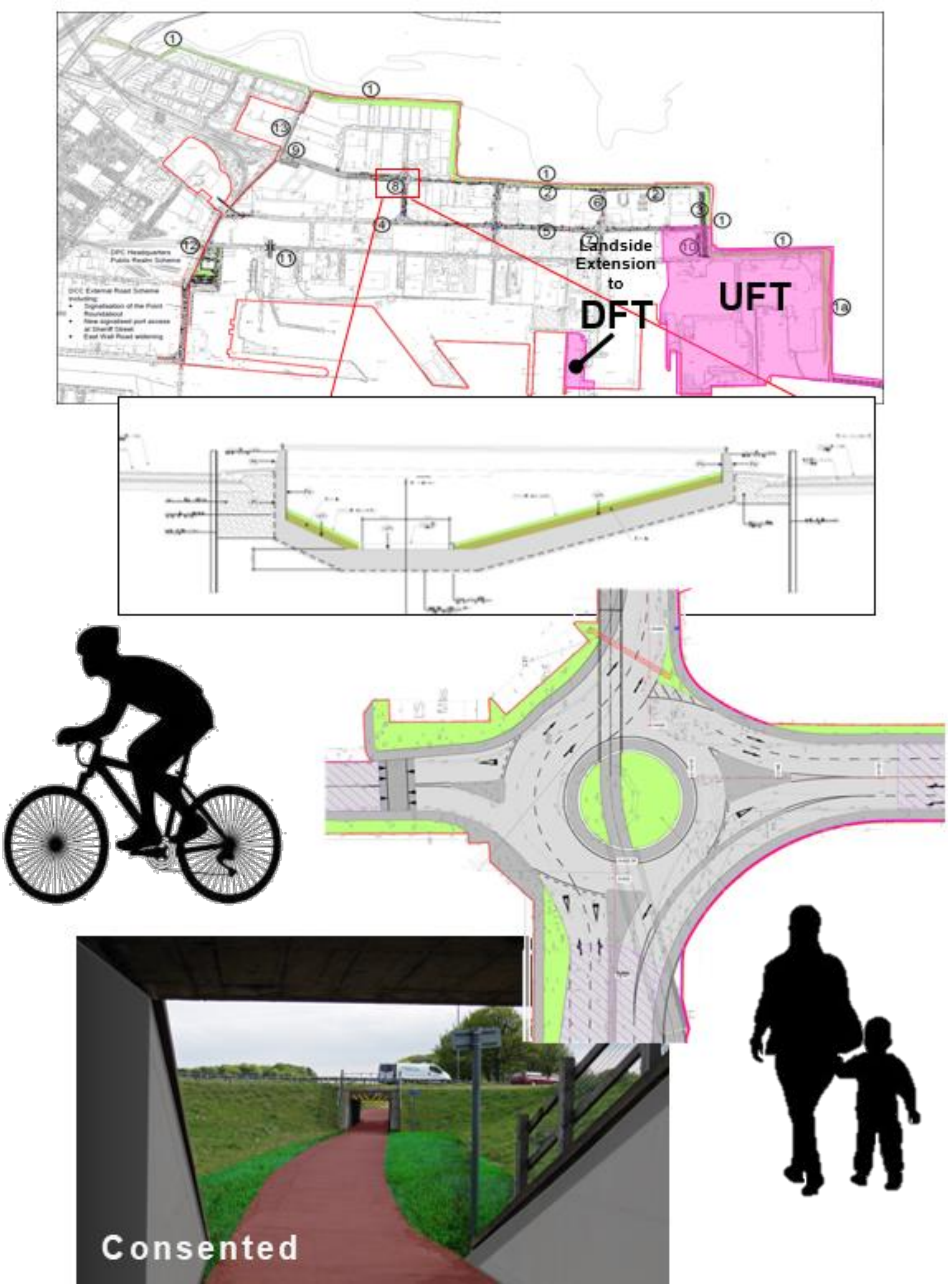


Figure 13-21 Consented Enlarged Promenade Road Roundabout with Pedestrian / Cycle Underpass

13.7.2 External Existing Pedestrian and Cycling Facilities

In addition to the consented active travel improvements within the Dublin Port Estate that connect to the MP2 Project there is an existing, established density of walkways and cycle-ways throughout Dublin City that can be utilised by users of the MP2 Project.

There are three main existing public bicycle schemes in Dublin that can be utilised by users of the MP2 Project;

- DublinBikes;
- Urbo; and
- BleeperBike.

A public bicycle system is a service in which bicycles are made available for shared use to individuals on a short term basis.

DublinBikes

Figure 13-22 Example of the DublinBike Stations Located on North Wall Quay

DublinBikes is a DCC led self-service bicycle rental scheme which has operated in the city of Dublin since 2009. Figure 13-22 shows a typical DublinBike Stations located on North Wall Quay.

Figure 13-23 shows the location of the DublinBike stations throughout the City and Figure 13-24 shows the location of the existing stations located immediately west of the Port boundary.

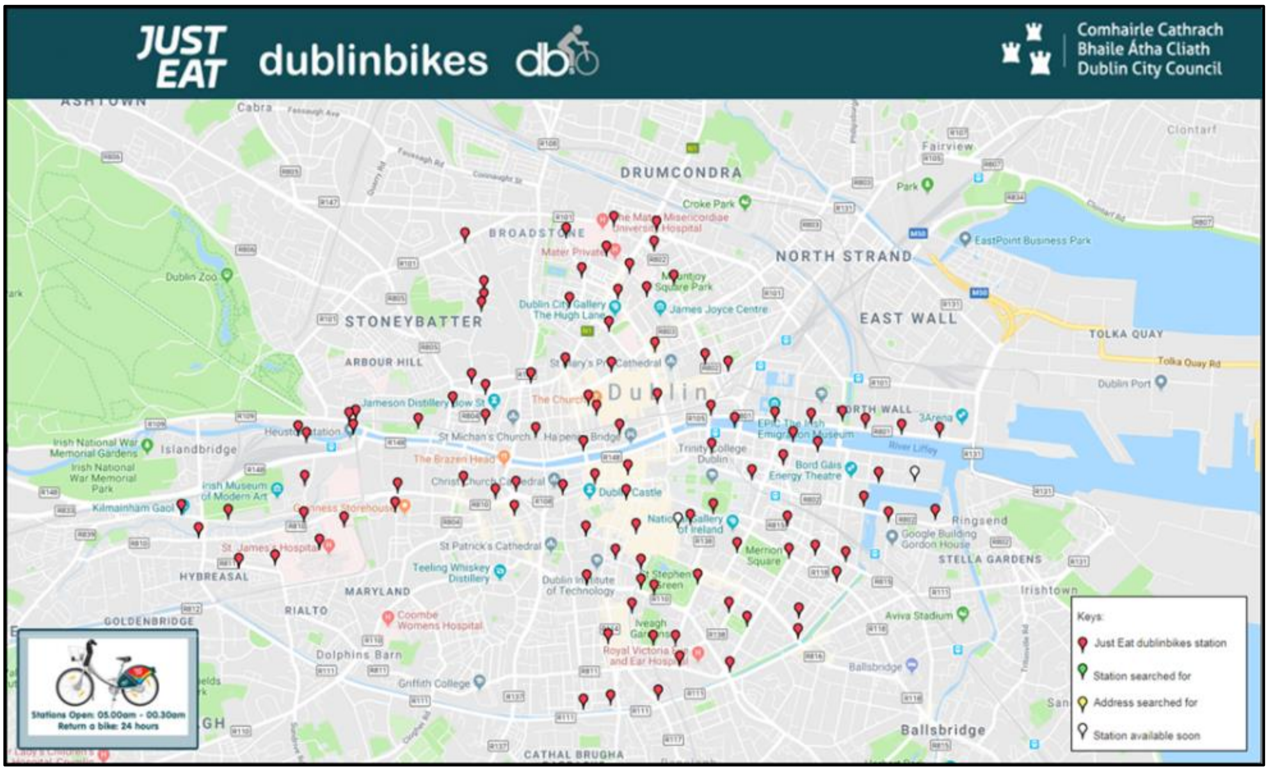
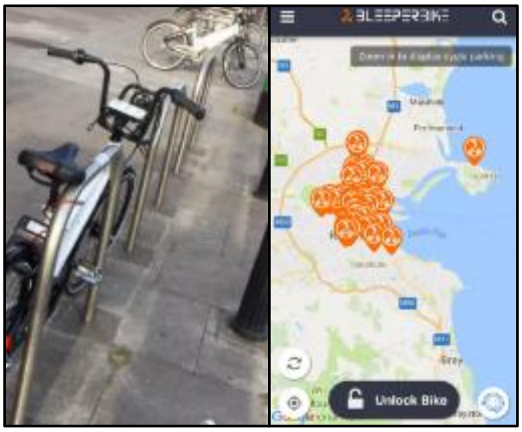


Figure 13-23 DublinBike Stations

Figure 13-24 DublinBike Stations in the Environs of the Dublin Port

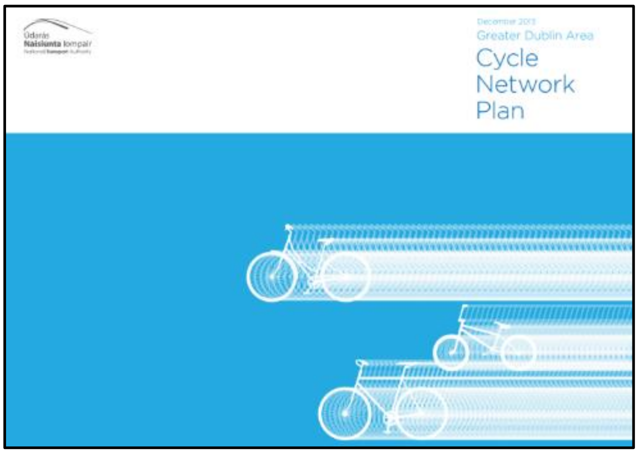
Urbo and BleeperBike

More recently private providers, such as Urbo and BleeperBike, have introduced dockless shared public bicycle systems to Dublin. The schemes are evolving and anticipate providing a more flexible service in terms of geographical range for locating and returning the bicycles.



GPS-tracked smart bike software is used provide a situationless bike sharing system. The rental system is sourced through an app it will assist to locate, lock and unlock the closest available bike. These facilities can be utilised by users of the MP2 Project.

Greater Dublin Area Cycle Network Plan



The NTA produced the Greater Dublin Area Cycle Network Plan in December 2013.

Figure 13-25 is an extract of the Existing Cycle Facility Type, Sheet E1, which shows that Dublin City is currently a well serviced area. These networks can be utilised by users of the MP2 Project.

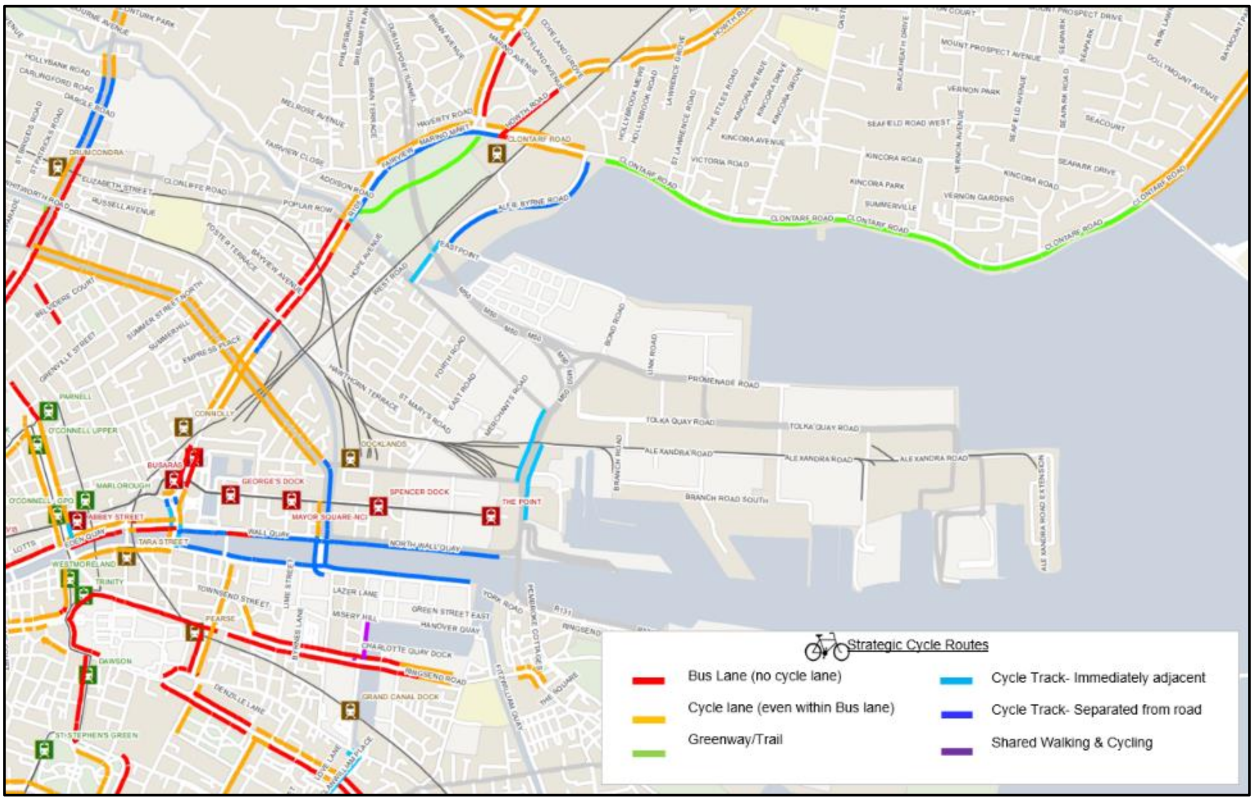


Figure 13-25 Existing Cycling Facilities in the Environs of the Dublin Port

Figure 13-25 confirms that although Dublin City is currently a well serviced area, there is an absence of existing cycle facilities within the Port. The consented internal roads scheme addresses this gap. Figure 13-26 illustrated how the consented Greenway within the Port Estate will link the MP2 Project to Dublin's wider strategic cycle network.

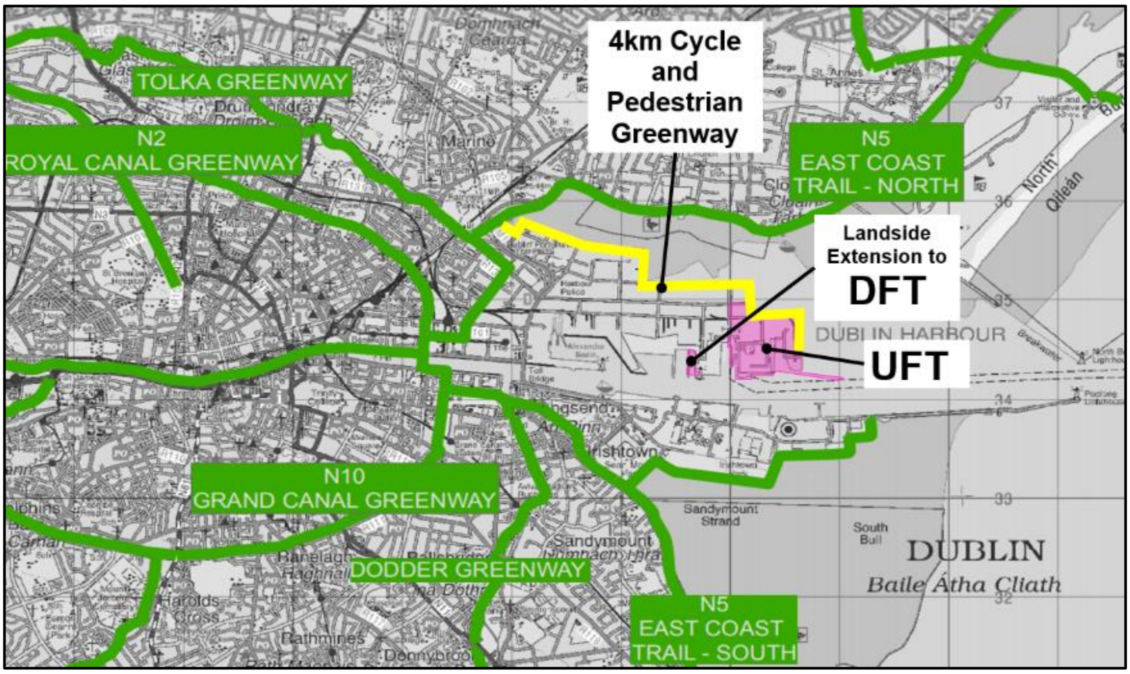


Figure 13-26 Consented Greenway within the context of Dublin's Proposed National Cycle Network

13.7.3 Cycle Parking and Integrated Multi-Modal Transport Options

The MP2 Project will have end user facilities such as cycle parking, showering and changing facilities to facilitate and encourage active travel. These will be provided within the administrative buildings for UFT and DFT.

As discussed in section 13.4.3 cycle parking facilities have been provided as part of the recent public realm provision at the Port Centre. There is a combination of free standing cycle parking, an enclosed secure compound for communal parking and private individual lockers as shown in Figure 13-27.

The cycle lockers facilitate integrated multi-modal non-motorised sustainable transport modes. They allow staff to store their privately owned bicycle in a secure space at the Port Centre. This will allow staff within the MP2 Project to commute to the Port Centre via public transport (Bus/Train/Luas/DART) and then cycle to their final destination within the Dublin Port Estate.

Figure 13-27 Location of Cycle Lockers at Port Centre

13.7.4 Potential DCC Road Scheme along East Wall Road

As previously discussed, DCC are progressing a potential road scheme along East Wall Road, being facilitated by the closure of the Port Estate’s accesses. Should the scheme be realised, additional controlled walking and cycling crossing facilities will be provided across East Wall Road, particularly at the Point Roundabout which is to be signalised. This has the potential to increase the safety of users of the MP2 Project, all Port users and the public generally for active travel or for accessing public transport facilities.

13.7.5 Existing Public Transport Facilities in Dublin City

A summary of some of the existing public transport facilities in the vicinity of Dublin Port is illustrated in Figure 13-28 and Table 13-2.

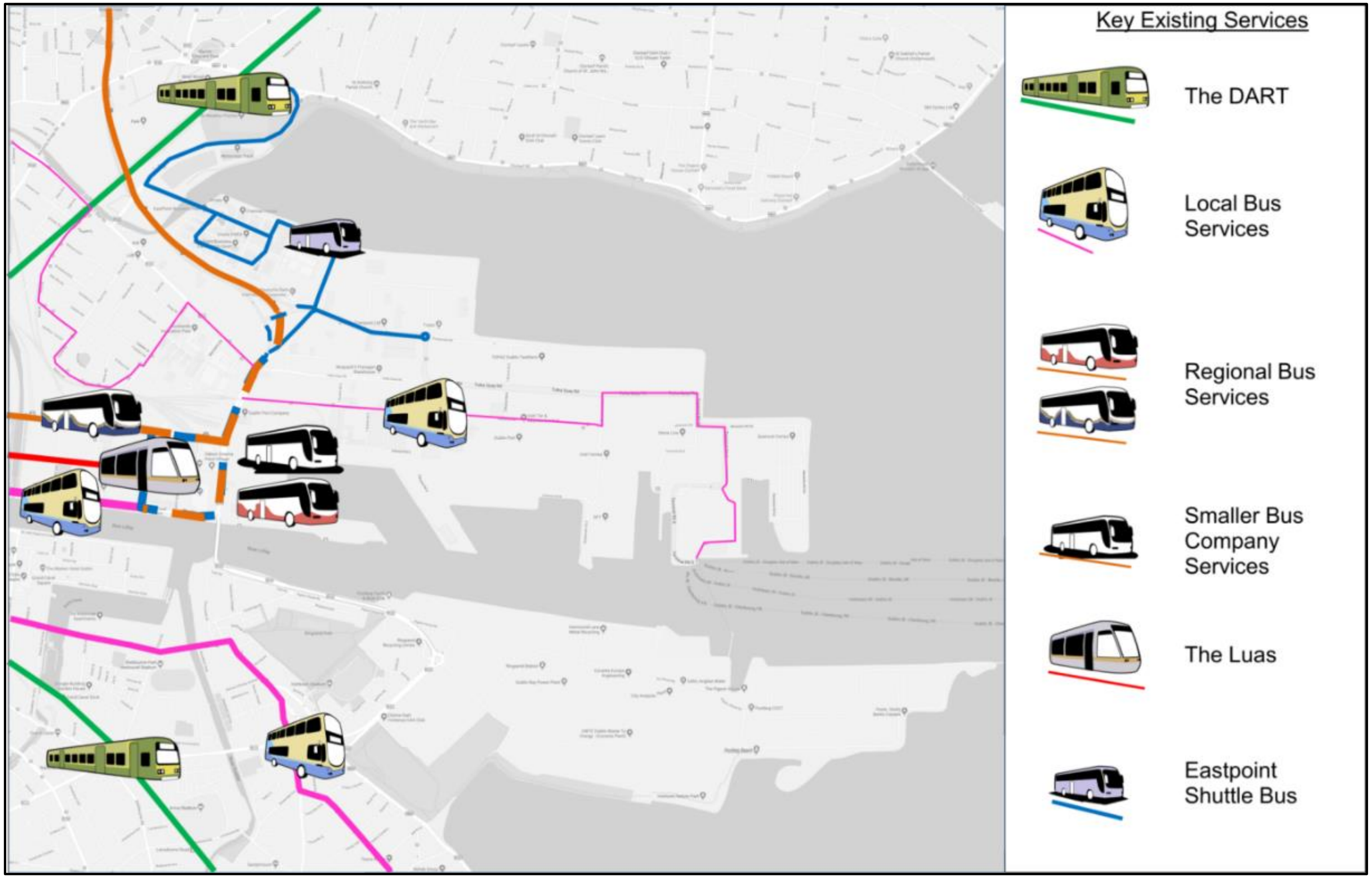


Figure 13-28 A summary of some of the existing public transport facilities in the vicinity of Dublin Port Estate

13.7.6 Bus Facilities

Córas Iompair Éireann (CIÉ) is Ireland's national public transport provider. Over 230 million journeys are made annually on the network of national, regional, local and urban services across Iarnród Éireann, Dublin Bus and Bus Éireann.

Regional Bus Facilities

Bus Éireann

Bus Éireann was formed in 1987 as a subsidiary of CIÉ to provide bus services throughout Ireland with the exception of Dublin City. However Bus Éireann services do provide a link to and from Dublin for the rest of Ireland.

Local Bus Facilities

Dublin is served by a network of nearly 200 bus routes which cover the City and suburbs. The majority of the bus routes that cover Dublin City and suburbs are controlled by local bus operator Dublin Bus, however a number of smaller companies are also in operation.

Dublin Bus

Dublin Bus operates the Public Service Obligation network in the Greater Dublin Area under a contract of services with the NTA. Their network covers a region from Newcastle in County Wicklow to the south, Balbriggan in north County Dublin and Maynooth in County Kildare to the west.

Smaller companies Bus Facilities

There are many smaller bus companies that operate in and around Dublin. The two main operators that serve the port area are Swords Express and Aircoach.

Swords Express

Swords Express is a coach service linking Swords to Dublin City Centre via the Port Tunnel. A division of Eirebus Ltd, Swords Express offers 130 departures every weekday between Swords and Dublin City Centre and 75 at weekends.

AirCoach

Aircoach is a private bus and coach operator and provides scheduled coach services to and from Dublin City Centre and Dublin Airport. Aircoach operates five key services connecting Dublin Airport with Dublin City Centre and its suburbs, as well as non-stop express services connecting Dublin Airport with both Cork and Belfast.

Bus Facilities in the Vicinity of Dublin Port Estate

The closest bus stops to the Dublin Port Estate are indicated in Figure 13-29.

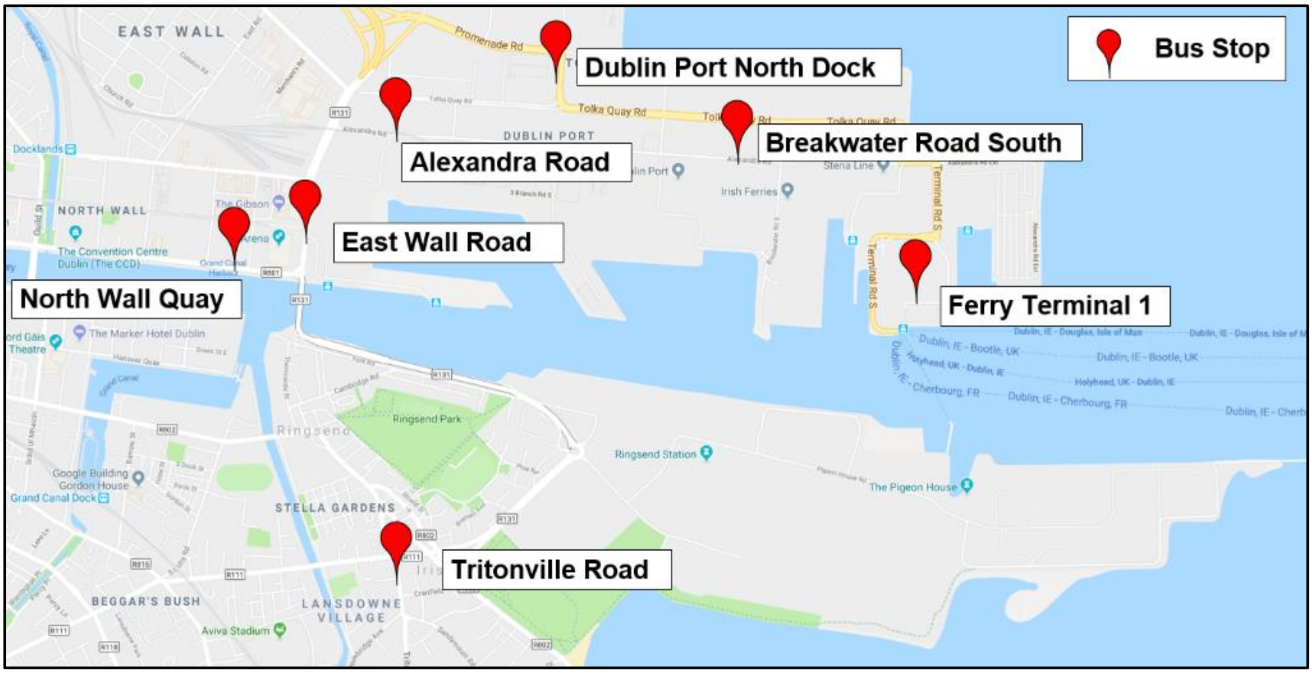


Figure 13-29 Bus Stop Locations in the Vicinity of Dublin Port Estate

The highest frequency bus stops for the Dublin Port Estate are located at the North Wall Quay and East Wall Road near the 3 Arena, with the closest highest frequency bus stops on the southern side of the River Liffey being at Tritonville Road, Sandymount. The locations of these three bus stops in relation to the Dublin Port Estate are indicated in Figures 13-30 to 13-32.

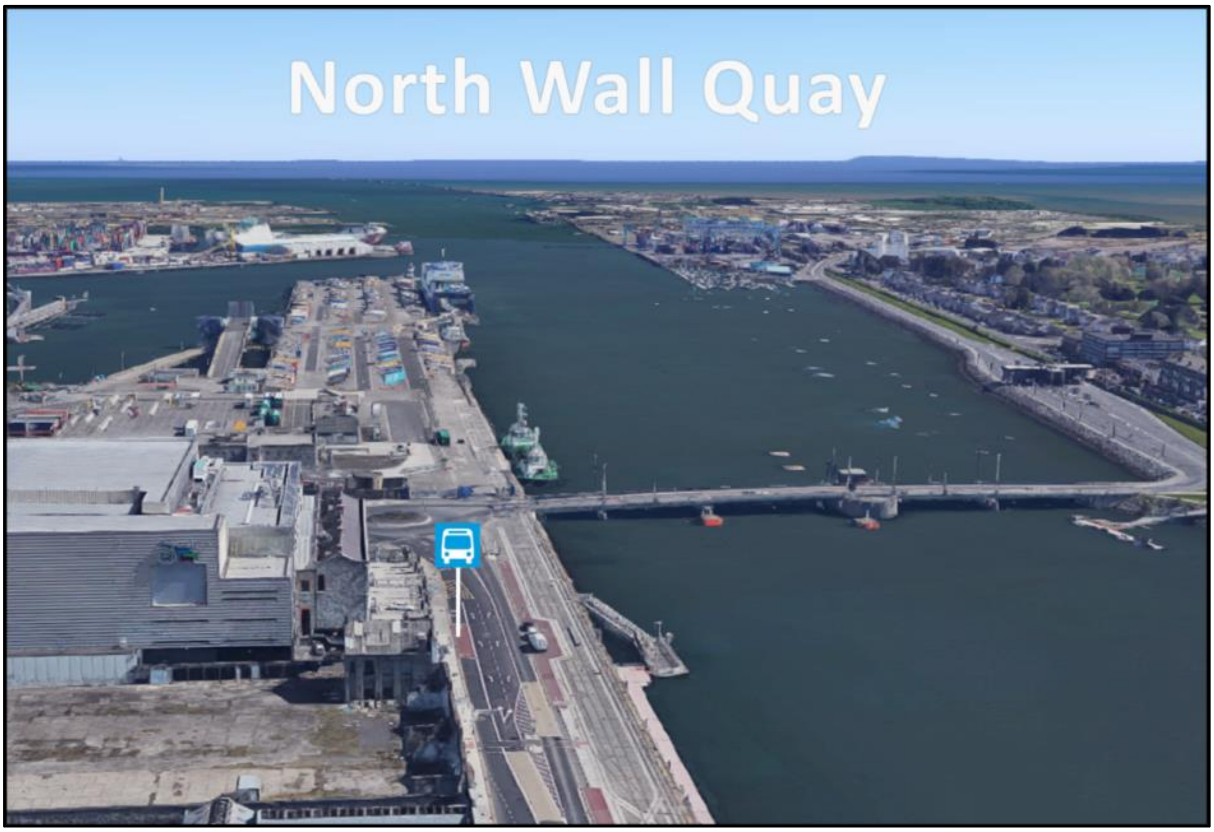


Figure 13-30 Bus Stop Facilities on North Wall Quay in Relation to Dublin Port Estate

Figure 13-31 Bus Stop Facilities on East Wall Road in Relation to Dublin Port Estate

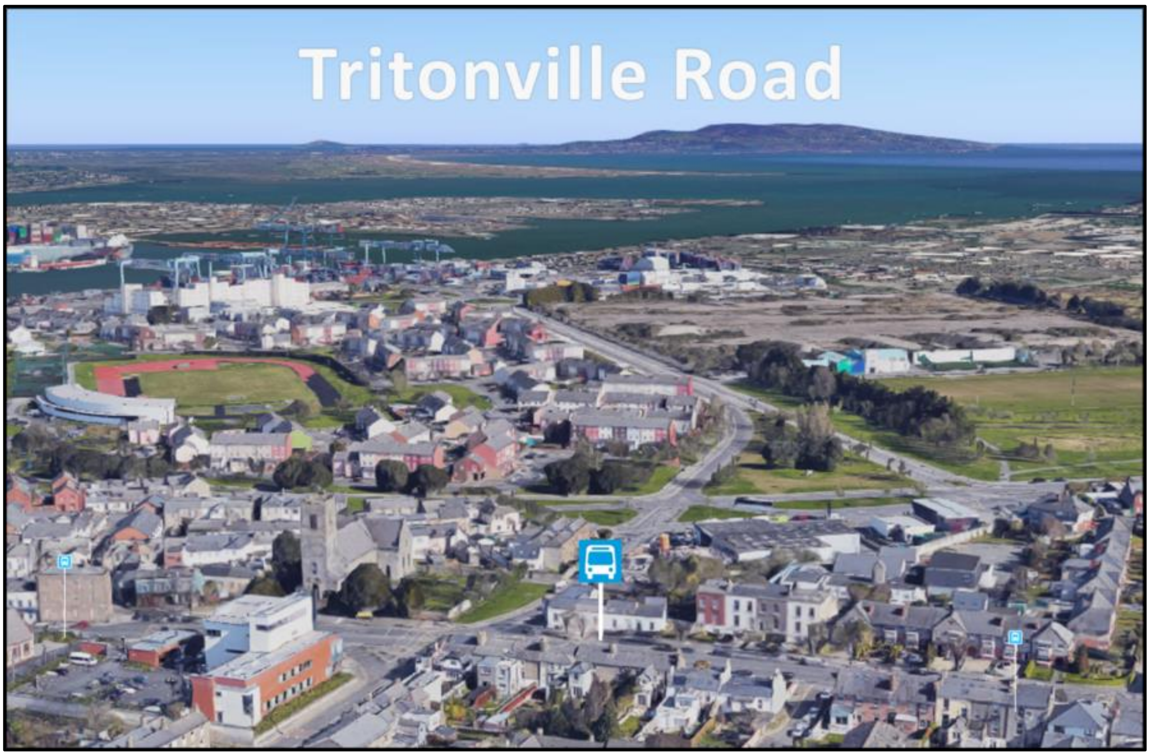


Figure 13-32 Bus Stop Facilities on Tritonville Road in Relation to Dublin Port Estate

North Wall Quay Bus Stop

An eastbound flagged bus stop is located opposite the south facing side of the 3 Arena on North Wall Quay, approximately 300m from the Dublin Port Estate as shown in Figure 13-33. The main bus operators serving this bus stop are Bus Éireann and Dublin Bus Airlink.

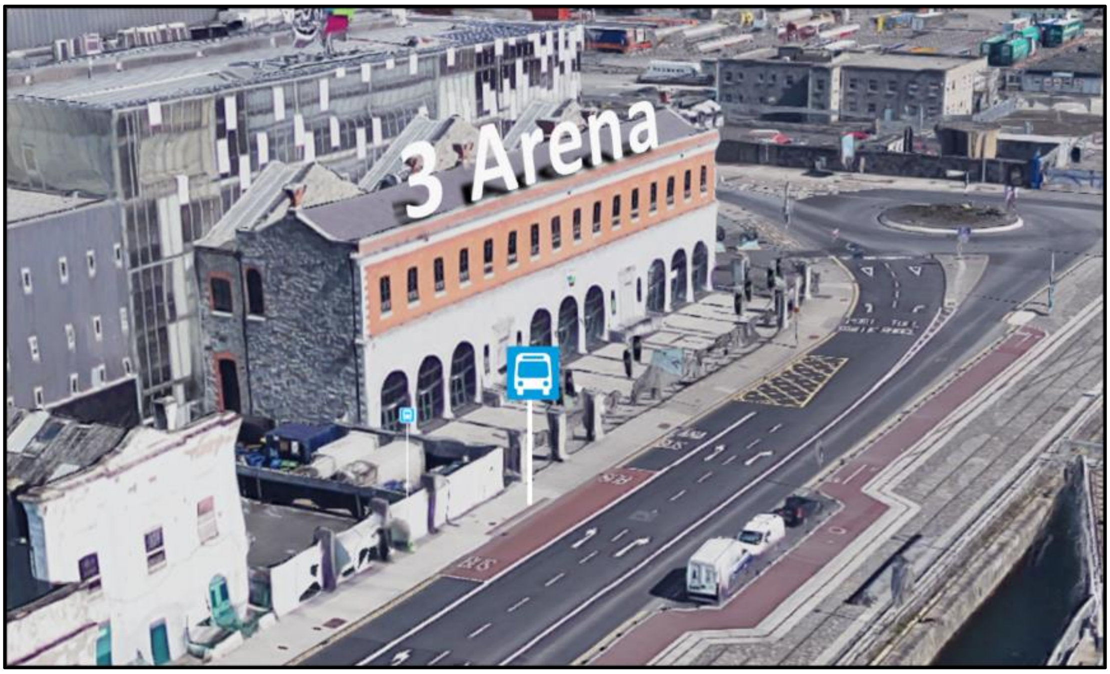


Figure 13-33 Bus Stop Facilities on North Wall Quay

North Wall Quay is a two way road with two eastbound lanes and one westbound. There is a signalised pedestrian crossing approximately 55m from the North Wall Quay bus stop.

The East Wall Road Bus Stops

East Wall Road is a high frequency bus corridor providing links to the local and strategic network including Dublin Airport. It is also the link that connects the M50 to Dublin City. There are two flagged bus stops located on the East Wall Road approximately 50m from the Dublin Port Estate as indicated in Figure 13-34.

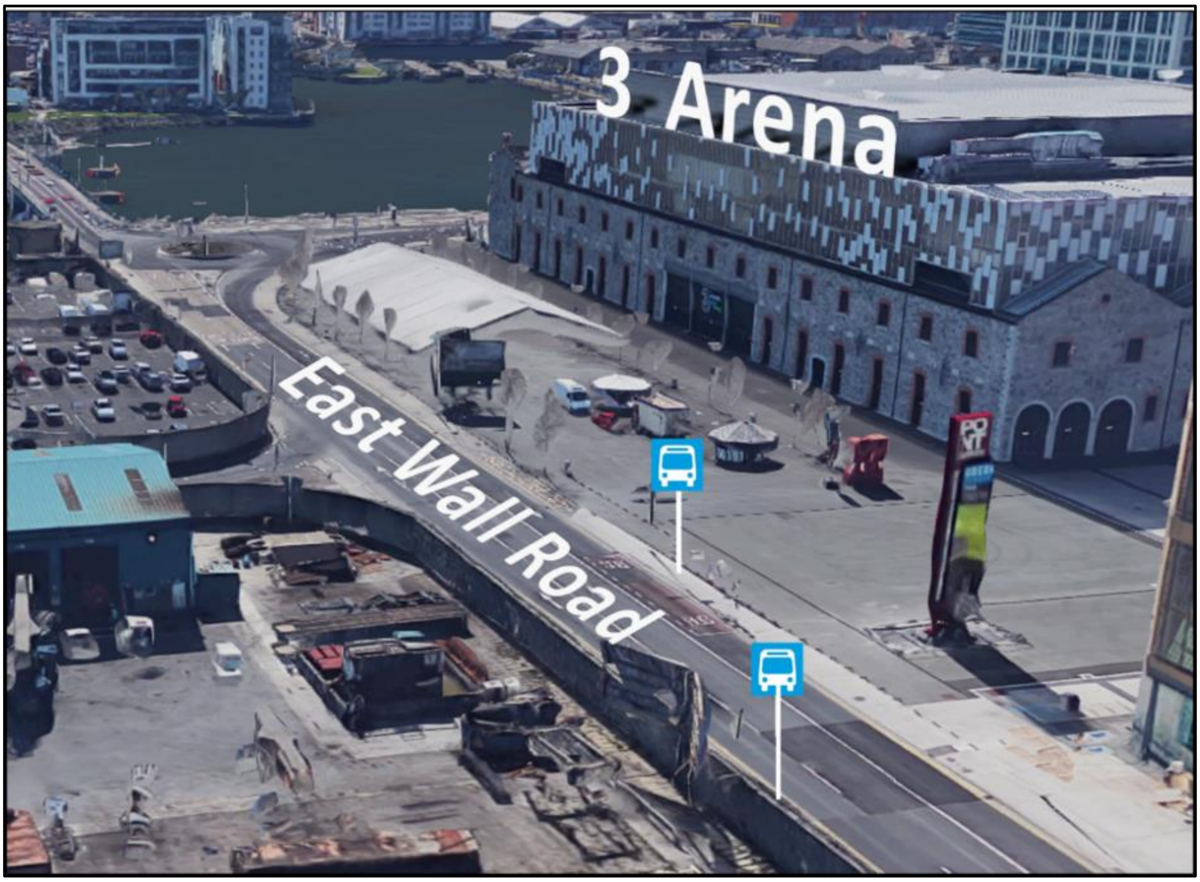


Figure 13-34 Bus Stop Facilities on East Wall Road

The main bus operators serving these bus stops are Dublin Bus and Bus Éireann, and other smaller bus companies that also operate at the stops.

Dublin Bus 53 Serving the Dublin Port Estate

There is an existing bus that provides a service within the Dublin Port Estate as illustrated in Figure 13-28. It is Dublin Bus 53 and it serves the Dublin Port Estate and existing Ferry Terminal 1 at Irish Ferries. It runs from 07:00 to 19:00 Monday to Saturday and 11:00 to 18:00 on Sundays.

FerryLink Connecting Irish Ferries and Stena to Dublin City Centre

FerryLink is run by a private coach company that connects the existing Irish Ferries and Stena sites with Dublin City Centre.

The coach operates from Westmoreland Street – Port - Connolly Station - Westmoreland Street 7 days a week and takes approximately 15 minutes in normal traffic conditions between Dublin Port and Connolly Station.

The Bus departs from Irish Ferries Terminal 1 building once all ferry passengers have disembarked and therefore departure times from Dublin Port can vary. Figure 13-35 shows the timetable and the existing service as captured by the traffic survey cameras at 07:36 on the day of the traffic survey (23 May 2018).

Figure 13-35 FerryLink

EastPoint Shuttle Bus

There is a private shuttle bus that connects the DART and the Luas to the EastPoint Business Park located close to the northwest of the Dublin Port Estate. The EastPoint Shuttle Bus is run by EastPoint Business Park and has two routes servicing Clontarf Road Dart Station and the Point Luas stop as shown in Figure 13-36.

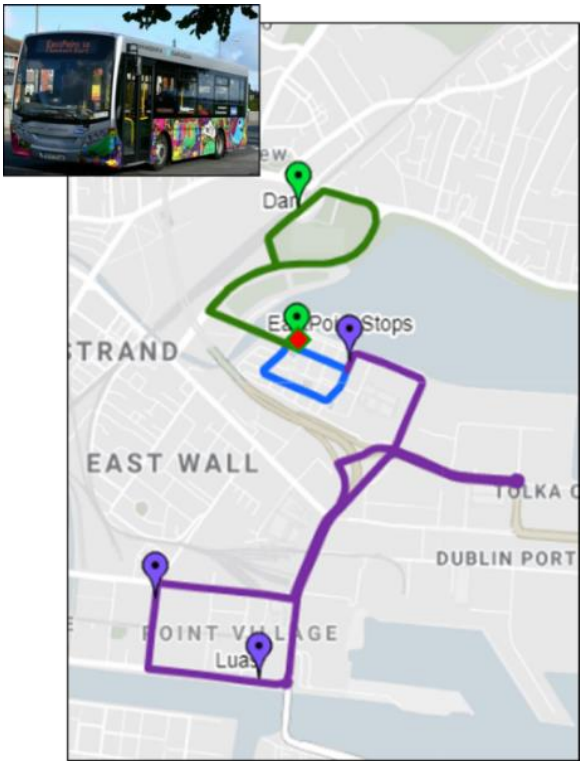


Figure 13-36 Route of the EastPoint Shuttle Bus

13.7.7 Rail Facilities

Luas

The Luas (Gaeilge word for "speed") is the tram/light rail transit in Dublin which began operating in 2004. The Luas is operated by Transdev Ireland, under tender from TII. There are two main lines: The Green Line and the Red Line. The Green runs from Brides Glen to Broombridge and is 24.5km in length with 35 Stops. The Red Line is 20kms in length and has 32 Stops. The Red Line runs from Tallaght to The Point and from Saggart to Connolly.

The Red Line service runs the closest to Dublin Port Estate as shown in Figure 13-37.

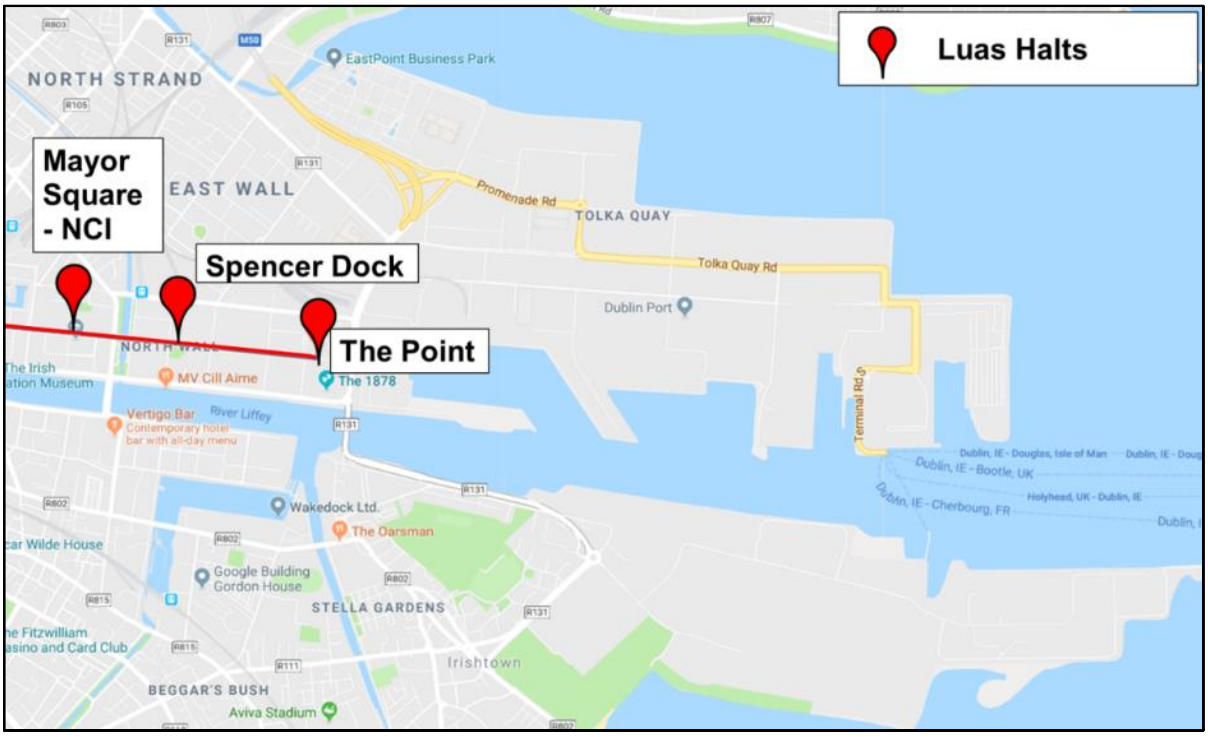


Figure 13-37 Luas Halt Locations in the Vicinity of Dublin Port Estate

'The Point' Luas Halt is located behind the 3 Arena along Mayor Street Upper, approximately 200m from Dublin Port as indicated in Figure 13-38.

Figure 13-38 The Point Luas Halt Facility in Relation to Dublin Port Estate

The Point Luas Halt has shelters, timetable information, is well lit and in a location that is visible by members of the public (important for security and alleviating any fear of intimidation for users), see Figure 13-39. The Red line operates from 05:00 to 00:00 Monday to Saturday and 07:00 to 23:00 on Sundays.

Figure 13-39 Luas Facilities at 'The Point'

Three pre-application meetings were held with ABP for the MP2 Project. In the ABP Inspector's Report (ref. no. 29N.PC0252), it was recommended that the EIAR should have particular regard to the impact of the MP2 Project on traffic management (including any new or modified road or rail proposals such as a Luas extension).

It is explained in Section 13.7.10 that the MP2 Project will not impact on the potential extension of the Luas as currently included in NTAs Transport Strategy for the Greater Dublin Area for 2016-2035. This chapter explains that a proposed rubber wheeled public transport provision is envisaged to serve the Dublin Port Estate and the MP2 Project; either the provision of a new dedicated bus route or the extension of the existing bus route to link with the LUAS terminal at the 3 Arena and the DART.

Iarnród Éireann

Iarnród Éireann, also known as Irish Rail, is the operator of the national railway network in Ireland. Established in 1987, it is a subsidiary of CIÉ. Iarnród Éireann provides passenger and freight rail services as well as operating Rosslare Europort. It operates all internal DART, Commuter, InterCity and freight railway services in Ireland.

The DART

The DART is Dublin's Electric Rail System. It stands for Dublin Area Rapid Transit. It runs along the coast of the Irish Sea from Malahide / Howth in north County Dublin and southwards as far as Greystones, Co Wicklow. DART services operate every 15 minutes all day.

The nearest DART Stations to Dublin Port are located in Figure 13-40.

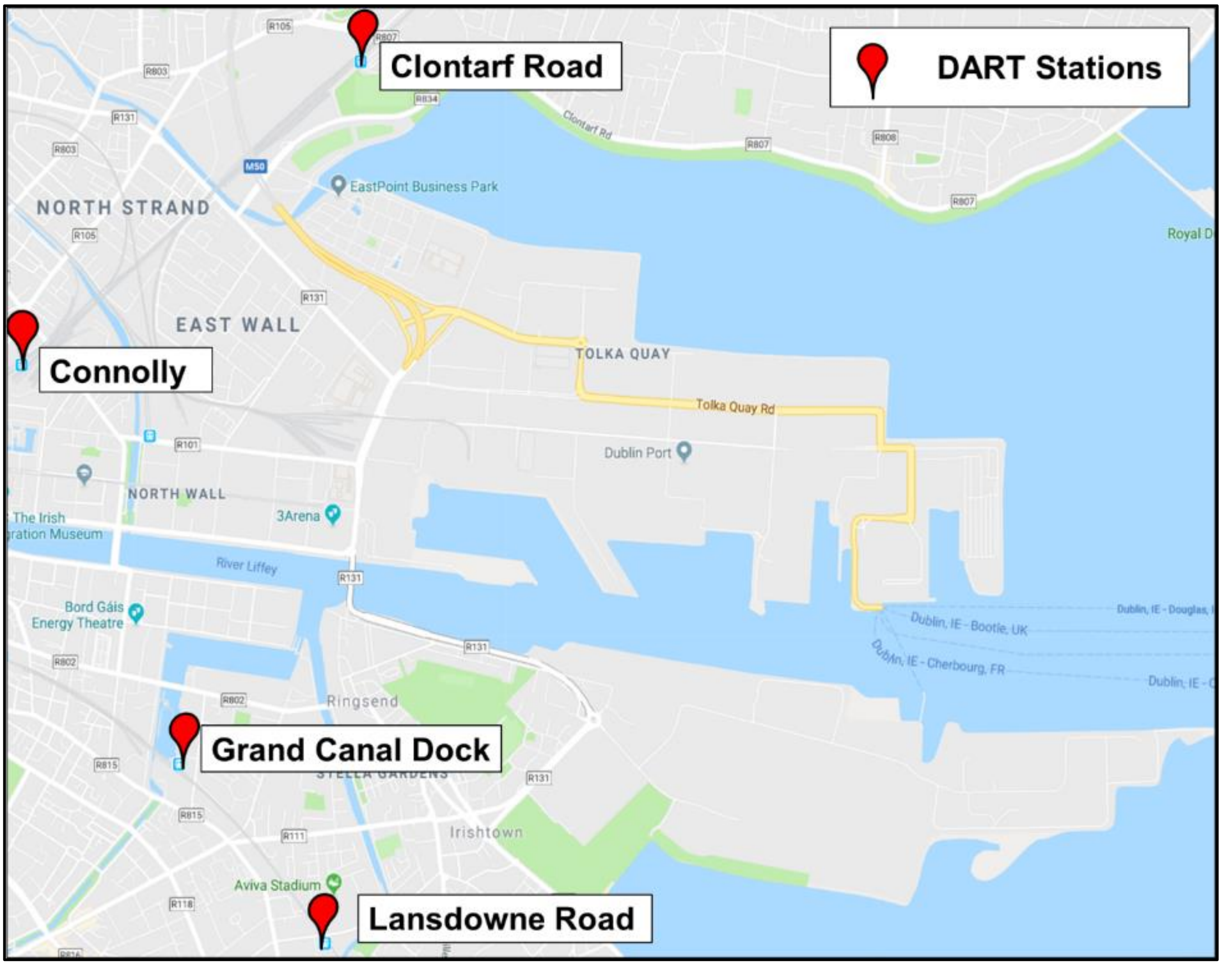


Figure 13-40 The DART Station Locations in the Vicinity of Dublin Port Estate

One of the closest DART stations to the Dublin Port Estate is Connolly Station at approximately 1.7km. Dublin Connolly is the busiest railway station in Dublin and Ireland, and is a focal point in the Irish rail network.

Services that run from this station are as follows:

- Dublin/Sligo;
- Dublin/Belfast;
- Dublin/Rosslare Europort;
- Commuter services to Drogheda, Dundalk, Maynooth and Longford;
- DART.

Lansdowne Road DART station is approximately 1.4km from the Dublin Port Estate with the main route serving Dublin to Dundalk and Dundalk to Bray/Gorey, illustrated in Figure 13-41.

Figure 13-41 Facilities at Lansdowne Road Station

The DART Expansion Programme

The DART Expansion Programme is a series of potential projects which would develop and expand the DART network in the Greater Dublin Area.

The programme includes:

- The DART Underground line, a high-capacity second DART line running underground through the heart of Dublin City;
- Electrification of the northern commuter line from the existing end of the DART network in Malahide on to Drogheda;
- Electrification of the line from Heuston to Hazelhatch and completion of the four-tracking of this line between Inchicore and Park West;
- Electrification of the line from Connolly to Maynooth, together with removal of level crossings and re-signalling; and
- Expansion of fleet and depot facilities.

The location of the DART expansion in relation to the Dublin Port Estate is illustrated in Figure 13-42.

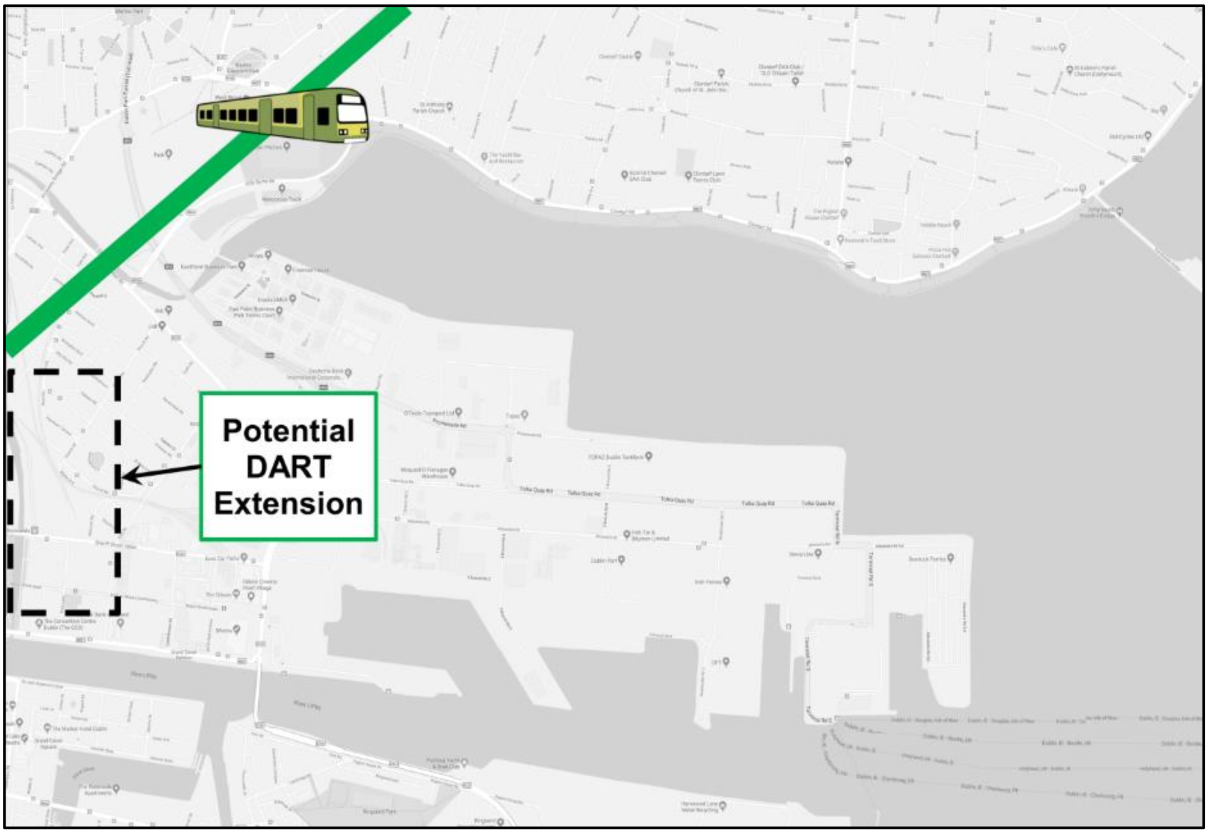


Figure 13-42 Location of the DRAT Expansion in Relation to the Dublin Port Estate

If the potential DART extension schemes come forward it will further enhance the already established services accessible to the users of the MP2 Project.

Local Rail Services

The closest local rail station to Dublin Port Estate is Docklands located about 800m from the Dublin Port Estate. The station is owned and operated by Iarnród Éireann. It was opened in 2007 and has two-platforms which it runs services from Dublin to Longford. The Facilities at Docklands Station is illustrated in Figure 13-43.

Figure 13-43 Facilities at Docklands Station

A summary of the public rail services in Dublin City is illustrated in Figure 13-44.

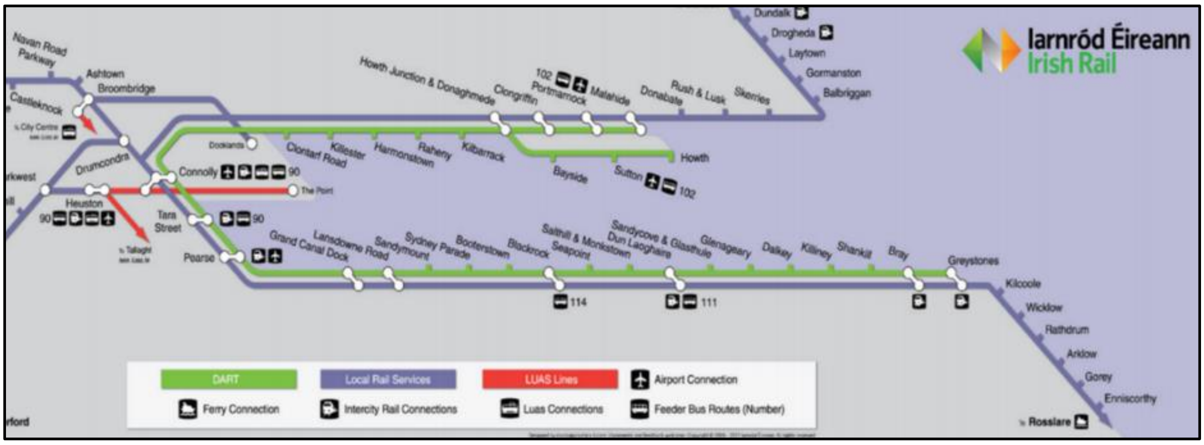


Figure 13-44 A Summary of the Public Rail Services in Dublin

13.7.8 Summary of Public Transport Facilities

A summary of the main existing public transport facilities in the vicinity of Dublin Port Estate is illustrated in Table 13-2.

Table 13-2 Summary of Existing Public Transport Facilities in the Vicinity of Dublin Port Estate

Company	Mode	Service No	Stop Location	Route	First Service	Last Service	No of Services: Mon- Fri	Sat	Sun
Bus Éireann	Bus	22	North Wall Quay 3 Arena	Dublin - Ballina	07:00	23:00	3	3	3
				Ballina - Dublin	01:00	18:15	3	3	3
		23	North Wall Quay 3 Arena	Dublin - Sligo	07:40	23:00	3	3	3
			East Wall Rd 3 Arena	Sligo - Dublin	01:00	18:45	2	2	2
		133	East Wall Rd 3 Arena	Dublin Airport - Wicklow	06:40	22:40	22	17	15
				Wicklow - Dublin Airport	07:00	22:00	22	16	15
		100x	North Wall Quay 3 Arena	Dublin - Dundalk	06:40	23:40	19	19	19
			East Wall Rd 3 Arena	Dundalk - Dublin	03:30	20:30	19	19	19
		101x	North Wall Quay 3 Arena	Wilton Terrace - Drogheda - Termon Abbey	10:30	17:30	4	-	-
			East Wall Rd 3 Arena	Termon Abbey - Drogheda - Wilton Terrace	05:40	16:00	7	-	-
Dublin Bus	Bus	53	Ferry Terminal	Talbot St - Dublin Ferryport	07:25	19:00	13	13	7
				Dublin Ferryport - Talbot St.	07:25	19:00	13	13	7
		33d	East Wall Rd 3 Arena	Custome House Quay - Portrane	17:45	17:45	1	-	-
				Portrane - Custome House Quay	07:02	07:02	1	-	-
		33x	East Wall Rd 3 Arena	Custome House Quay - Skerries	16:15	18:00	5	-	-
				Skerries - Custome House Quay	06:35	07:55	5	-	-
		41x	East Wall Rd 3 Arena	UCD Belfield - Knocksedan	17:00	17:30	3	-	-
				Knocksedan - UCD Belfield	07:40	07:50	6	-	-
		142	East Wall Rd 3 Arena	Portmarnock - UCD Belfield	07:10	15:30	11	-	-
				UCD Belfield - Portmarnock	11:00	17:35	10	-	-
		151	East Wall Rd 3 Arena	Docklands - Foxborough	06:30	23:20	48	46	30
				Foxborough - Docklands	06:00	23:30	51	48	34
		1	Sandymount Tritonville Rd	Santry - Sandymount	06:30	23:30	51	38	36
				Sandymount - Santry	06:40	23:30	52	38	36
		47	Sandymount Tritonville Rd	Poolbeg St. - Belarmine	07:40	23:30	19	17	15
				Belarmine - Poolbeg St.	06:30	23:30	19	17	15
	A	747	East Wall Rd	Airport - Heuston Rail Station	05:05	00:30	104	70	61

Company	Mode	Service No	Stop Location	Route	First Service	Last Service	No of Services Mon- Fri	Sat	Sun
			3 Arena	Heuston Rail Station - Airport	04:45	23:30	105	30	35
		757	East Wall Rd 3 Arena	Airport - Camden Street	05:00	00:25	39	39	35
			North Wall Quay 3 Arena	Camden Street - Airport	04:55	23:25	38	38	35
Swords Express	Bus	500/X	Dublin Liberty Hall	Dublin - Swords	07:00	23:00	47	23	10
				Swords - Dublin	06:15	22:00	40	28	9
		501/X	Dublin Liberty Hall	Dublin - Swords	07:45	08:05	2	-	-
				Swords - Dublin	07:55	18:10	6	-	-
		503	Merrion Square	Dublin - Swords	17:25	17:50	2	-	-
				Swords - Dublin	07:25	07:50	3	-	-
		504	Dublin Liberty Hall	Dublin - Swords	17:45	17:45	1	-	-
				Swords - Dublin	07:25	09:34	2	-	-
		505/X	Dublin Liberty Hall	Dublin - Swords	16:50	19:00	4	-	-
				Swords - Dublin	06:25	08:25	2	-	-
		506/X	Dublin Liberty Hall	Dublin - Swords	16:30	18:20	2	-	-
				Swords - Dublin	07:20	08:01	2	-	-
Aircoach	Bus	702	East Wall Rd 3 Arena	Greystones - Dublin Port	01:00	23:10	18	18	18
				Dublin Port - Greystones	00:05	23:05	18	18	18
		703	East Wall Rd 3 Arena	Killiney - Dublin Airport	00:55	23:55	18	18	18
				Dublin Airport - Killiney	00:35	23:35	18	18	18
Transport for Ireland	Luas	Red Line	The Point	Saggart - Connolly or The Point	05:30	00:00	50	49	34
				Tallaght - Connolly or The Point	05:42	23:52	52	47	34
				The Point - Saggart or Tallaght	05:30	00:30	52	41	34
Iarnród Éireann	DART	DART	Lansdowne Road	Dundalk - Dublin -Bray/Gorey	06:10	23:55	81	51	40
				Bray/Gorey - Dublin - Dundalk	05:40	23:10	82	67	40
	Train	Local Train	Docklands	Dublin - M3 Parkway - Longford	07:50	19:25	12	-	-
				Longford - M3 Parkway - Dublin	07:27	19:05	12	-	-
			Lansdowne Road	Dublin To Dundalk	08:04	16:50	2	-	-
				Dundalk To Dublin	06:30	14:37	5	-	-

In conclusion, there are numerous existing and proposed public transport connectivity opportunities for the MP2 Project.

13.7.9 Proposed Subsidised Shuttle Bus to Serve UFT

The Dublin Port Masterplan 2040, reviewed 2018 states on Page 66:

It is the objective of DPC to ensure that the Dublin Port Estate secures public transport provision to the passenger ferry terminals. This public transport provision could be through either the provision of a dedicated bus route or the extension of the existing bus route to link with the LUAS terminal at the 3 Arena.

This concept is illustrated in Figure 13-45.

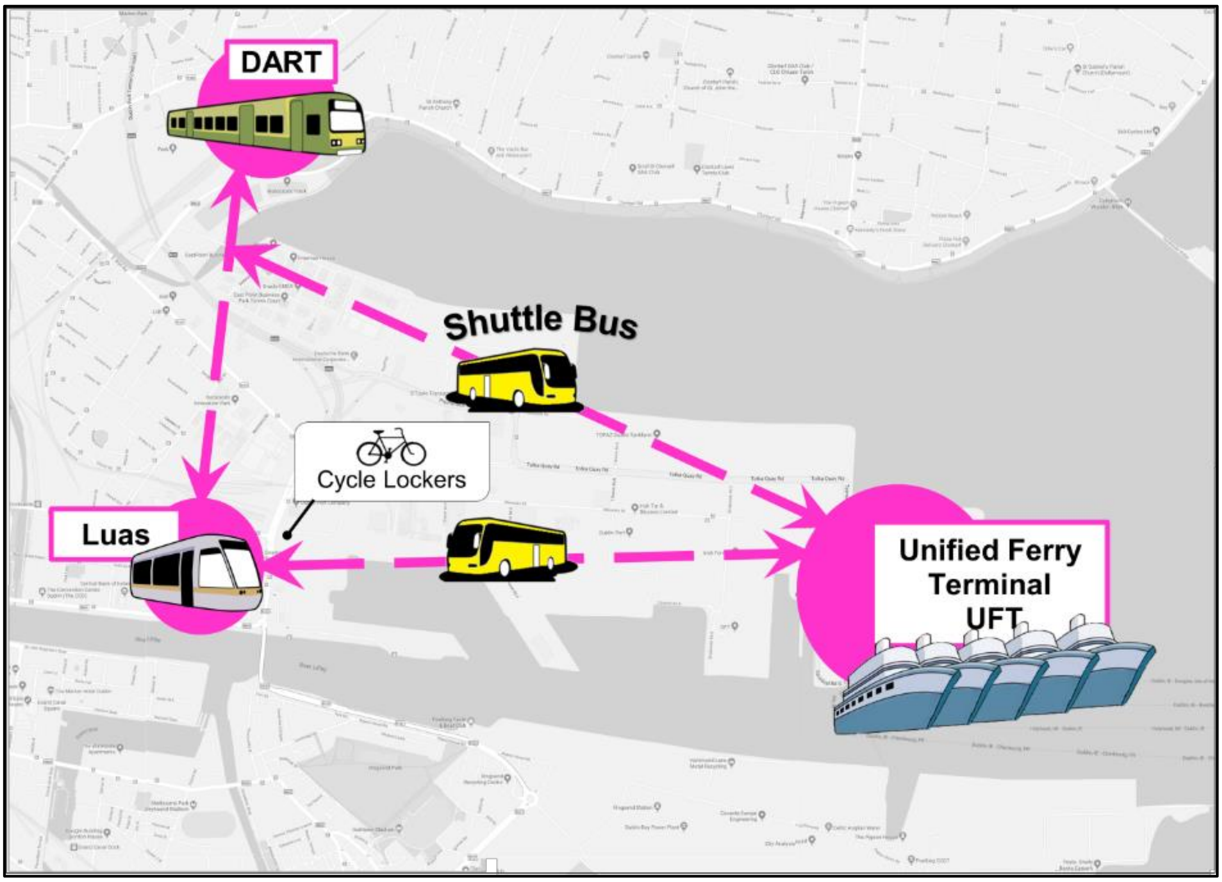


Figure 13-45 Illustration of Shuttle Bus Concept to Serve UFT

DPC is prepared to provide an annual financial subsidy of up to €100,000 for a period of five years (total €500,000) to a shuttle service operating to create a connection between the MP2 Project, the DART in Clontarf and the LUAS at the Point as illustrated in Figure 13-49. It would link into East Point Business Park, have multiple stops throughout the Dublin Port Estate and connect with the ferry Terminal 1 building.

DPC will progress this matter independently of, but in parallel to, the MP2 Project.

It is appropriate for NTA to design, tender and award the service as it can then be fully integrated and managed within the existing suite of bus services to provide an optimum service and cost benefit solution. To be successful, it would need to be relatively high frequency and seven days per week, which is reflected in the large subsidy.

The specification for the bus service is to be environmentally friendly to the greatest extent possible: preferably electrical, CNG at the very least (so as not to contribute to NOx and PMs), or hydrogen powered.

This enhances shuttle bus provision, in addition to the density of public transport services located at the perimeter of the Dublin Port Estate, the upgraded internal road network and cycle lockers at the Port Centre, will ensure that integrated multi-modal sustainable transport provision is possible to all users at the MP2 Project, both staff and visitors.

13.7.10 Potential Luas Extension

NTA is the authority for public transport provision. The NTAs Transport Strategy for the Greater Dublin Area for 2016-2035 gives details of the proposed Luas network in 2035 (Figure 5.3 on page 67 of the NTA Transport Strategy). This has been reproduced in Figure 13-46 for ease of reference.

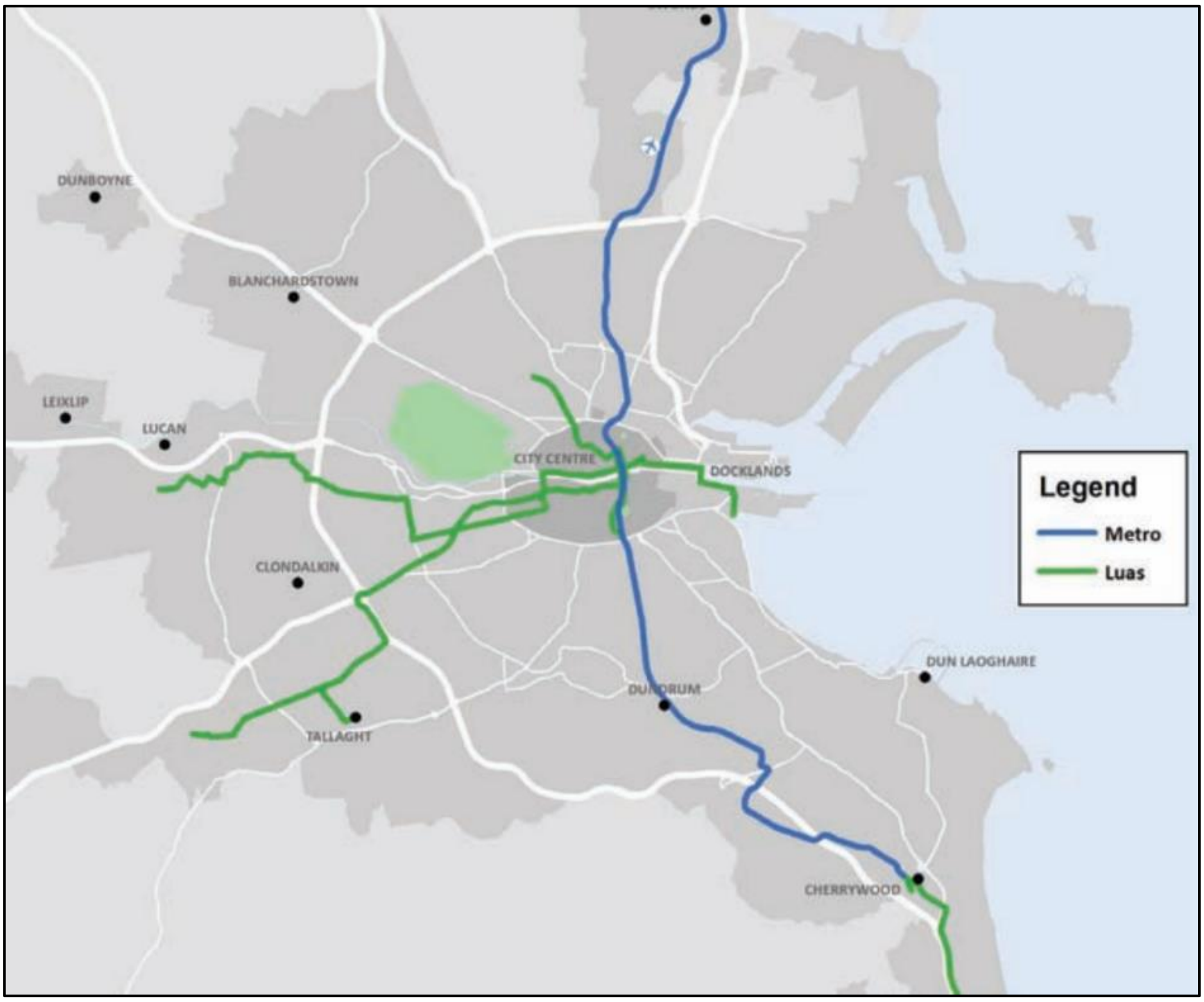


Figure 13-46 Metropolitan Light Rail Network (reproduced from the NTA Transport Strategy)

NTA make reference to an extension of the Luas Red Line to serve the Poolbeg Lands. Para 5.3.8 of the document states:

To serve the future development area of Poolbeg, in addition to Ringsend and Irishtown, it is intended to extend the Luas Red Line south of the River Liffey at, or close to, its eastern end. Potentially, this could be achieved by crossing the Liffey on a new bridge in the vicinity of existing East Link Bridge. Luas services would be extended past the Point, continuing onto Poolbeg development area. This extended link will provide a fast and convenient connection from this area into the City Centre and westwards.

The MP2 Project will not impact on the potential extension of the Luas as currently included in NTAs Transport Strategy.

It is also noted that currently the concept of a Luas extension into the Dublin Port Estate is not compatible with wider transportation policy, however the proposals for the MP2 Project do not preclude the possibility. Generally DPC would consider that such an extension would not be compatible with the travel demand patterns applicable to UFT and unlikely to be economically feasible for the MP2 Project.

It is noteworthy that there are no proposals to extend the Luas to the UFT in the Dublin Port Estate, despite the UFT being in the Dublin Port Masterplan since 2012 and the NTA report being issued in 2016. The NTA are informed in their decision-making by the strategic multi-modal model of the Greater Dublin Area, and the proposed future year Dublin Port Estate uses would have been included in the modelling. Hence an interpretation could be that the modelling ascertained that the Luas did not need to be extended into the Dublin Port Estate.

According to Transderv Ireland the Luas accommodated 41.8 million passengers in 2018, 110,000 passengers per day. The general principle of a Luas extension would be based on connecting a large density of permanent residences to the major employment zone of Dublin City Centre to accommodate the guaranteed daily commuter travel demand. This is readily applicable to the proposals to extend the Luas to the Poolbeg West SDZ Scheme.

However, UFT will not have the same travel demand patterns. UFT will be operational 24 hours per day. It will have a relatively low number of staff working on shift patterns. Although UFT will have 3 million passengers per year, only a relatively small proportion will be tourist related foot passengers. These users will have an irregular pattern of volumes, arrival times, departures times, origins and destinations which will fluctuate depending on the time of year, school holidays, social events etc. DPC consider that it is intuitive that the UFT will not have a sufficient number of staff and foot passengers to justify the construction and operational costs of extending the Luas service.

It is considered that the rubber wheeled solution summarised in Section 3.7.10 has the flexibility, appropriate capacity and can be integrated and managed within the existing suite of bus services to provide an optimum service and cost benefit solution.

13.7.11 Access and Movement Facilities within UFT

Chapter 3 of the EIAR and Section 13.5 of this chapter has summarised and illustrated the vehicular access connections for UFT.

Chapter 3 of the EIAR also describes the proposals for foot passengers, public transport provision, staff parking, set down and pick up for UFT. These have been summarised below for convenience.

Connectivity by Foot and Cycle

Figures 13-47 and 13-48 highlight the location of the consented Greenway in the vicinity of the UFT footprint. They show the proposed footway and cycleway connections for UFT along with the location and connectivity to the enhanced public realm and heritage scheme proposed as part of the MP2 Project.

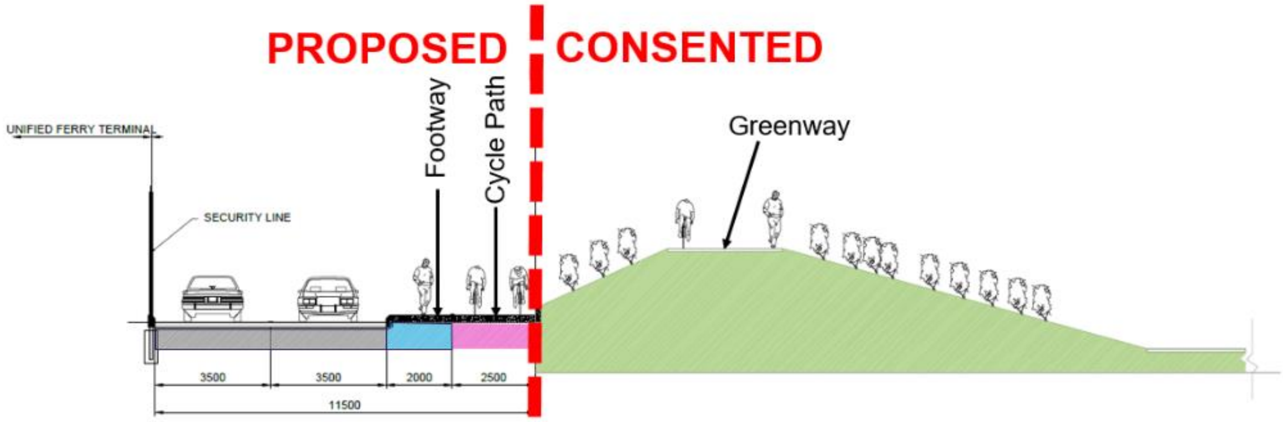


Figure 13-47 Cross Section of Proposed Pedestrian and Cyclist Access to UFT (See location in Figure 13-48)

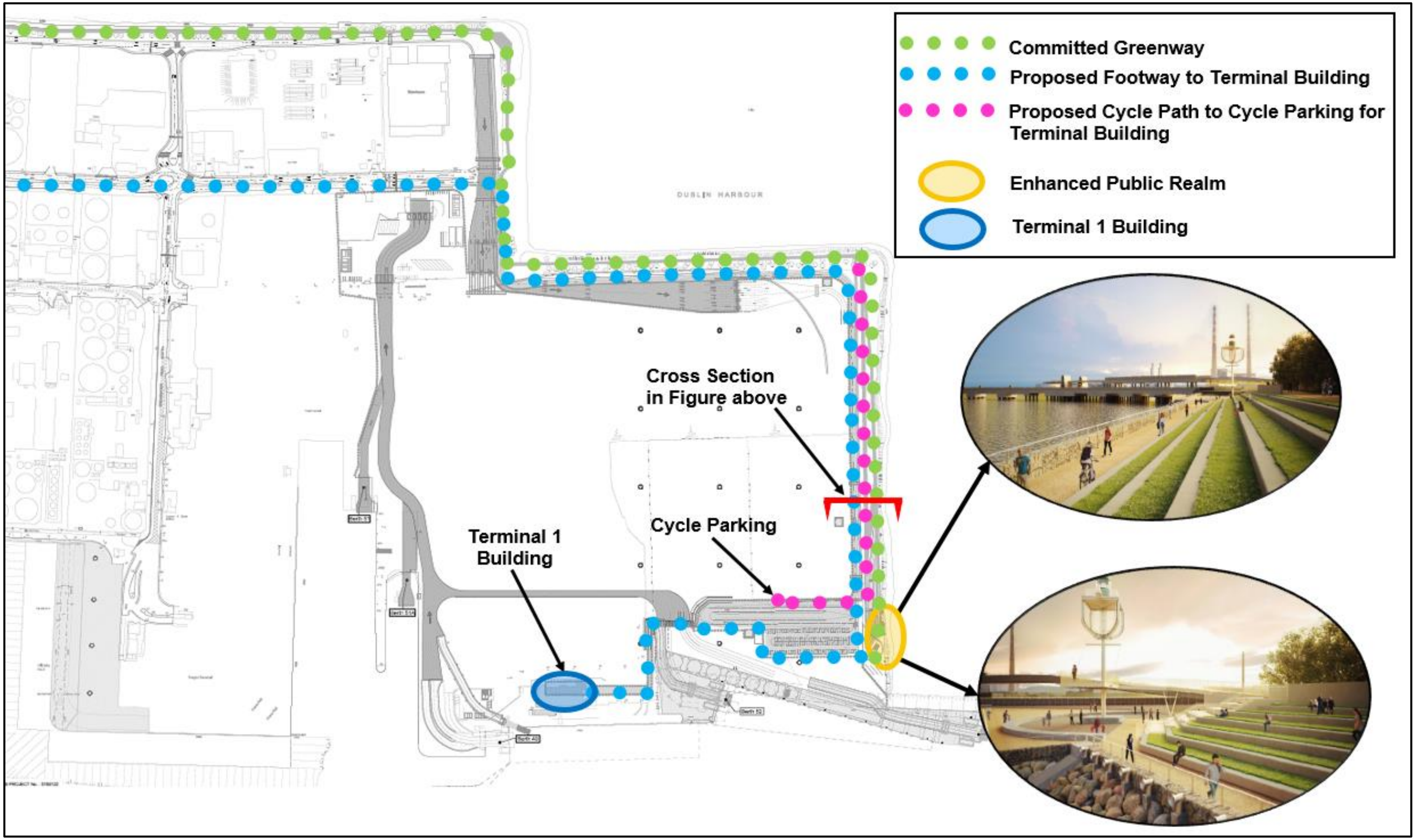


Figure 13-48 Proposed Pedestrian and Cyclist Access to UFT

Access to the Existing Passenger Terminal

It is proposed to retain the existing Terminal 1 building to serve UFT. The location of the building is shown in Figure 13-48.

Figure 13-49 shows the location of:

- 171 Car Parking spaces;
- Cycle Parking;
- Bus / coach / set down / pick up turning circle;
- Bus / coach / set down / pick up spaces.

Patrons access between the parking area and the Terminal 1 building by a pedestrian underpass. Routes to access and exits points at the building will be adjusted to maintain separation of passengers and the public using the pedestrian underpass.

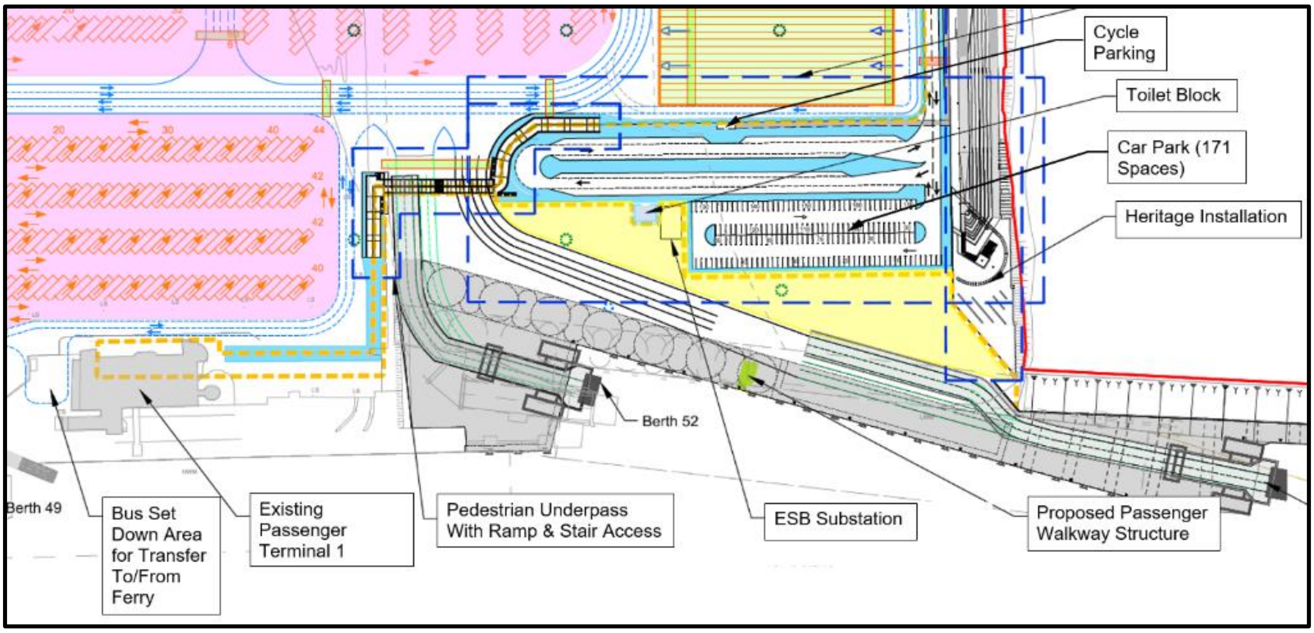


Figure 13-49 Section of Proposed Layout of UFT - Bus Turning, Car Parking and Pedestrian Walkway to Terminal 1 Building

Pedestrian Underpass

A pedestrian underpass is proposed to facilitate pedestrian links to the existing Terminal 1 building. It is proposed that the structure will have two independent corridors to separate passengers within the ISPS restricted area, accessing the Terminal 1 building from the Accompanied Staging Area, from members of the public, accessing the Terminal Building from the set down and parking area. On each approach on each side of the ISPS line it is proposed to install part M Compliant ramps and ambulant disabled stairs. The proposed pedestrian underpass plan is presented in Figure 13-50 and a section through the underpass as indicated on plan is present in Figure 13-51.

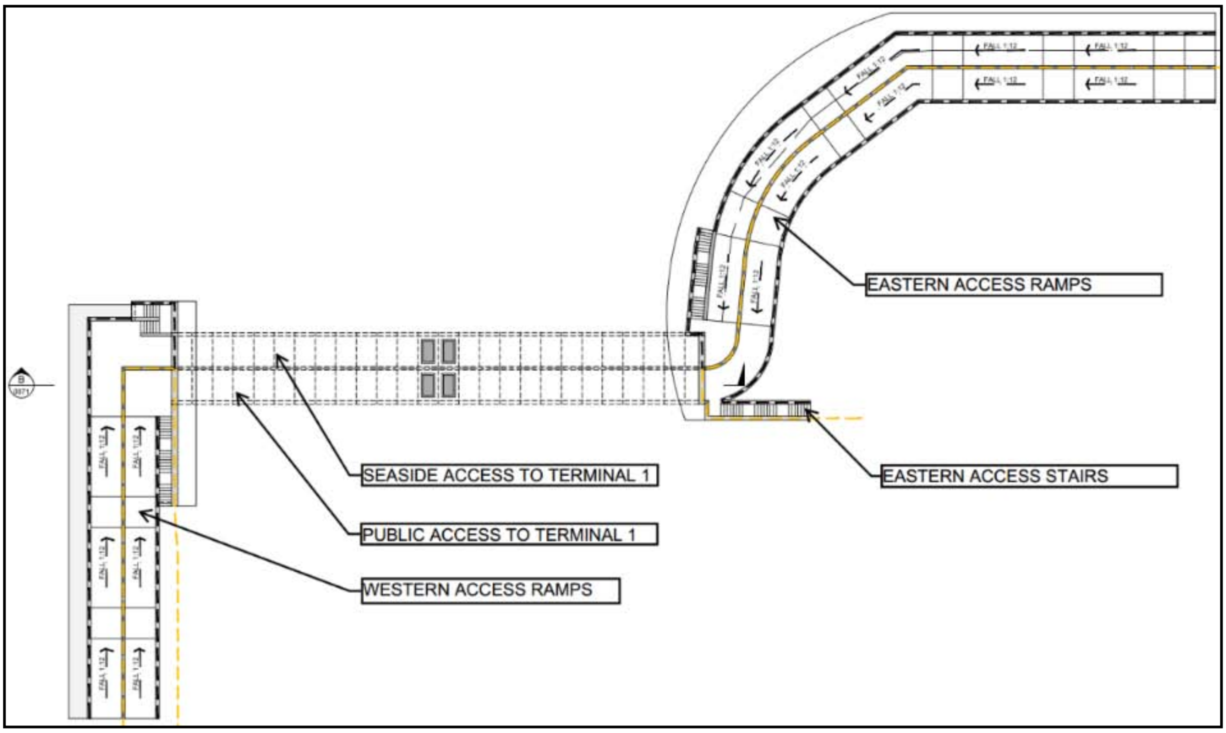


Figure 13-50 Proposed Pedestrian Underpass Plan

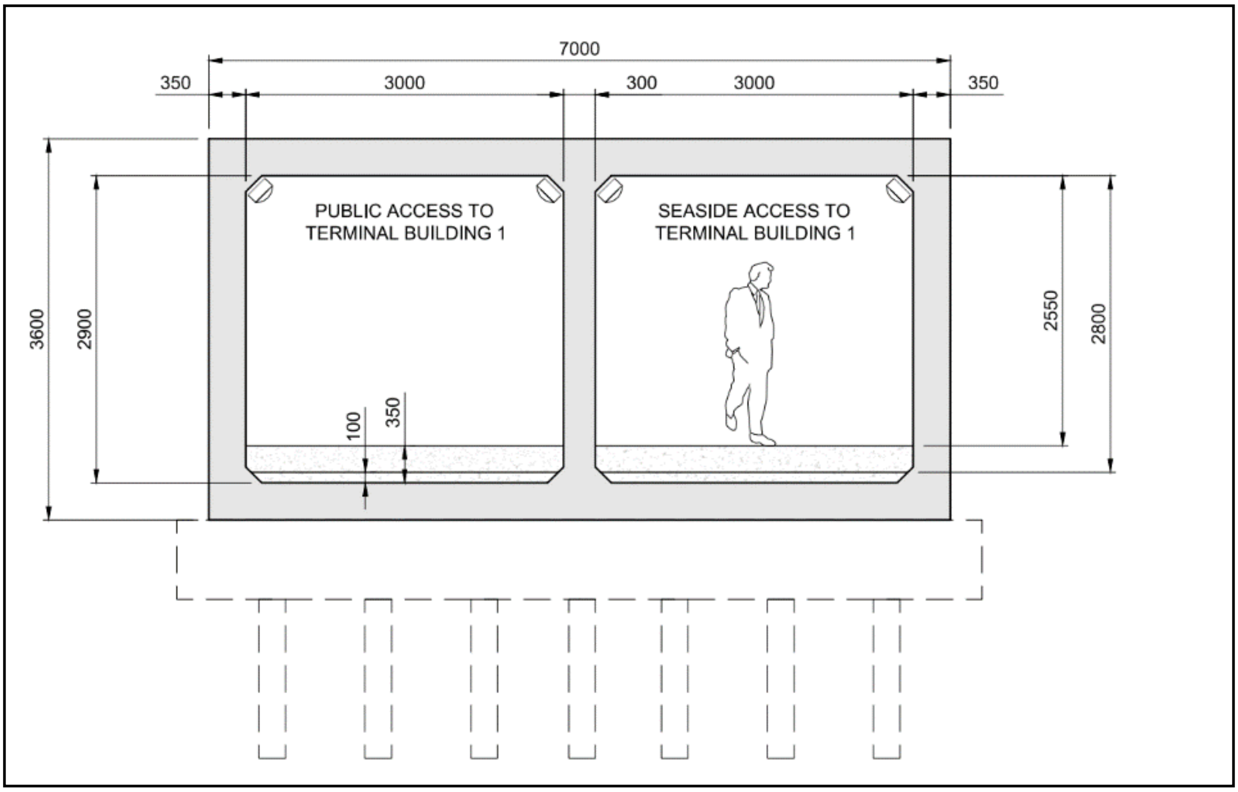


Figure 13-51 Proposed Pedestrian Underpass Section

Outbound Foot Passengers

The existing Terminal 1 building will facilitate foot passengers for all berths. As illustrated above access to the Terminal will be via the proposed public road which runs around the northern and eastern perimeter of the UFT outside of ISPS Restricted Area. A set down area for both cars and buses and parking facilities is provided outside the south-east corner of the UFT. Access from this point to the terminal building will be on foot with a pedestrian underpass provided to cross pedestrians beneath vehicle movements associated with Berth 52 and Berth 53. Foot passengers will use the existing check-in facilities to cross into the ISPS restricted area within the building. Access to ships on Berth 49 will be available directly from Terminal 1 with access to vessels on other berths by bus from the building. For Berth 51 and Berth 53 the bus will drop passengers off within the vessel and the busses will drop off at passenger walkway structures for Berth 51A and Berth 52.

Inbound Foot Passengers

Arriving foot passengers will be transported back to the Terminal 1 building by bus (and walkway from Berth 49). They will exit the ISPS Restricted Area through the check point for An Garda Síochána; Revenue and the Department of Agriculture, Food & Marine using the facilities already in place in Terminal 1. They will then walk through the public side of the pedestrian underpass to access the pick-up and public transport facilities available at the set down and parking area. Vehicles departing this area will then pass along the public perimeter road on the north and east boundary of the UFT and cross the HGVs queuing pre check-in using the proposed signalised junction before joining the main port exit route on Tolka Quay Road.

Passenger Walkway Structures to Access the Vessels.

It is proposed to provide passenger walkway plant to access Berth 51A and Berth 52. Each unit will include an ambulant disabled stairs and an enclosed high-level walkway to facilitate access to the ship.

13.8 Mobility Management Plan & Smarter Travel

13.8.1 Mobility Management Plan

An outline Mobility Management Plan (oMMP) for the MP2 Project is included in Appendix 19. The oMMP sets out the type of measures which will progressed by DPC, in liaison with the operator(s), to ensure that the sustainable transport facilities are made available and are utilised by the users of the MP2 Project.

13.8.2 Port Wide Dublin Port Travel Plan

One of the key objectives and aspirations of the Dublin Port Masterplan 2040, reviewed 2018 is to create a Transport/Travel Plan for the Port. Many of the aspirations to be included in the Transport/Travel Plan have already been progressed, such as the internal road scheme in the Dublin Port Estate and Opening Up of Port Centre. Some will be progressed as part of the MP2 Project such as provision of end user facilities for sustainable transport users at UFT.

It is envisaged that the MMP for the UFT and the Lo-Lo operator (currently DFT) will, in the fullness of time, fall under the hierarchy of the Port wide Transport/Travel Plan as the Masterplan continues to be implemented over the next 21 years.

13.8.3 Measures to Reduce Transport Related Environmental Emissions

As described above the development of an innovative and environmentally friendly (e.g. electric, CNG or hydrogen fuelled) bus operation to service the Dublin Port Estate, including UFT, and to link the Dublin Port Estate to Dublin City's public transport networks, will be progressed in parallel to the MP2 Project.

The Dublin Port Masterplan 2040, reviewed 2018 also states that shore-side electricity facilities will be provided at all new berths. Vessels will no longer be required to leave engines idling while docked. Once these facilities are operational there should be moderate reductions in local air emissions at the docksides at the MP2 Project reducing air emissions, carbon usage and noise levels.

This will form part of the smarter travel incentives at the Dublin Port Estate to reduce transport related emissions.

13.9 Rail Freight Facilities

Dublin Port facilitates freight trains within the Dublin Port Estate on a daily basis. Figure 13-52 shows the existing rail freight facilities and services for Dublin Port.

Figure 13-52 Rail Networks in Ireland and Existing Rail Freight Facilities for Dublin Port Estate

The MP2 Project does not affect the existing operations of the freight trains. These services will continue as normal during the construction and operation of the MP2 Project. The proposed land elements of the works will not impede on the existing railway lines present within the site boundary.

13.10 Traffic Impact Assessment

This Section describes the methodology used to assess the impact of the traffic generated by the MP2 Project on the local road network based upon the guidance set out within the TII Traffic and Transport Assessment Guidelines (2014) as specified in the TII response to the scoping letter.

13.10.1 Existing Traffic Flows Information

Classified Turning Counts

In order to determine the traffic flows in the vicinity of the site, new classified traffic turning count surveys were undertaken by Streetwise for a 24 hours period on Wednesday 23 May 2018, from midnight to midnight. This day was selected as a typical day of activity relating to Ro-Ro and Lo-Lo activities. Just one cruise vessel visited the Port on this day, and was berthed at Cruise Berth 18, which is located at the western end of the Port close to the Tom Clarke Bridge. Hence cruise activities do not impact on the unitised freight activities for the typical day selected.

Traffic data from the permanent traffic data loop on Promenade Road in May 2019 was compared against the data collated in May 2018. The results found that traffic flows had decreased compared with the same period the previous year, perhaps due to the uncertainly relating to Brexit in Q1 and Q2 of 2019. Hence the use of the May 2018 survey data provides a robust assessment for the TTA.

24 junctions were surveyed to cover the extent of the selected road network. The 24 junctions are listed as follows and the locations are shown in Figure 13-53.

1. East Wall Road / North Wall Quay / Tom Clarke Bridge Roundabout;
2. East Wall Road / Terminal 3 Access;
3. East Wall Road / Sheriff Street Upper Signalised Junction;
4. East Wall Road / Alexandra Road Signalised Junction;
5. East Wall Road / East Wall Road Signalised Junction;
6. West Facing Slip Roads / Access to Port / Access to Port Tunnel Signalised Junction;
7. Slip Road from Port Tunnel / Entry to Port at Promenade Road Signalised Junction;
8. Promenade Road / Bond Road / Slip to East Wall Road Priority Junction;
9. Promenade Road / Link Road Priority Junction;
10. Promenade Road Roundabout;
11. Promenade Road / No2 Branch Road North Extension Priority Junction;

12. Tolka Quay Road / Breakwater Road North Priority Junction;
13. Alexandra Road Extension / Terminal Road North Signalised Junction;
14. Alexandra Road / Breakwater Road South / Breakwater Road North Priority Junction;
15. Alexandra Road / No2 Branch Road North / 4 Branch Road South Priority Junction;
16. Tolka Quay Road / No2 Branch Road North / No2 Branch Road North Extension Priority Junction;
17. Tolka Quay Road / Bond Drive Priority Junction;
18. Alexandra Road / No1 Branch Road North Priority Junction;
19. Tolka Quay Road / No 1 Branch Road North Priority Junction;
20. Alexandra Road / 3 Branch Road South Priority Junction;
21. Alexandra Road Extension / Terminal Road Priority Junction;
22. Alexandra Road / Port Centre Car Park Priority Junction;
23. Tolka Quay Road / Exit from DFT Priority Junction;
24. Bond Road / Cold Storage Access Priority Junction.

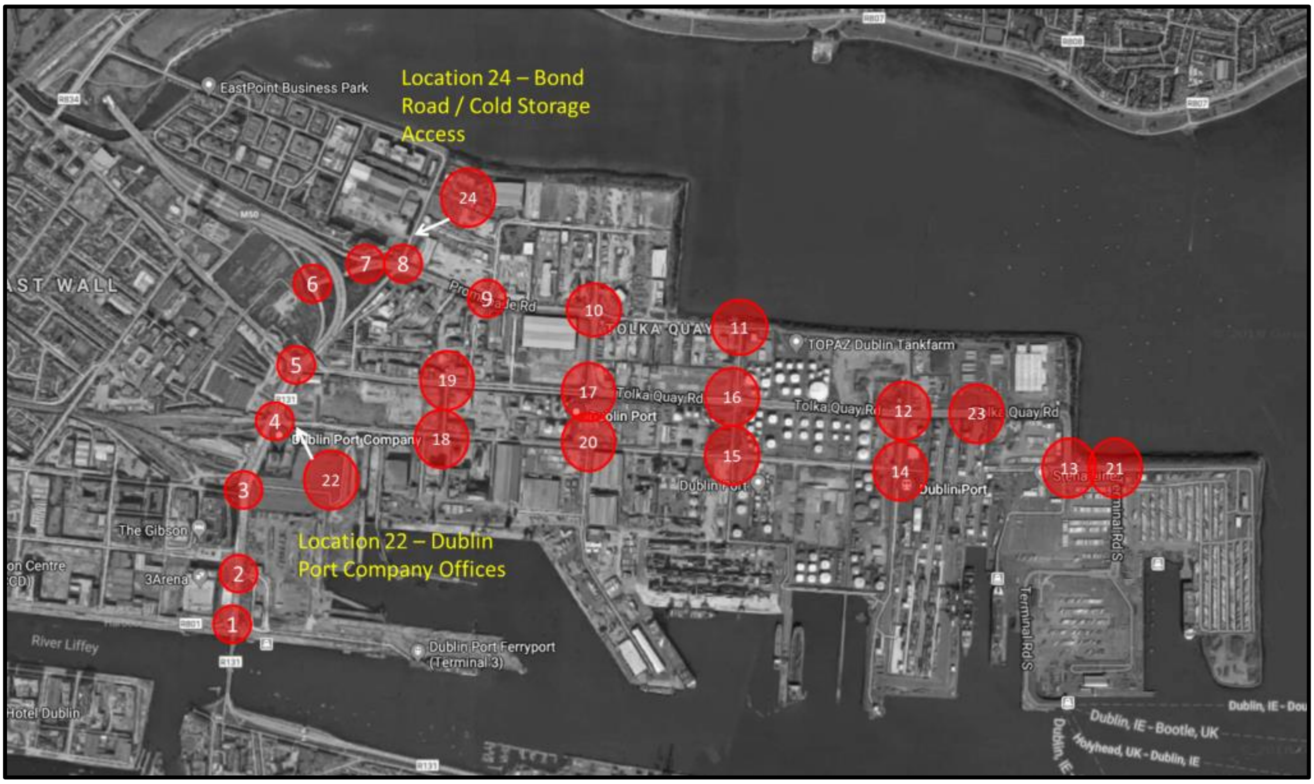


Figure 13-53 Location of Traffic Surveys

Dublin Port Tunnel Toll Plaza

This TTA has also reviewed the traffic survey carried out on Tuesday 21 and Wednesday 22 November 2017 at the Dublin Port Tunnel Toll Plaza, which was used to inform the Strategic Transportation Study.

Recorded End Queue Lengths

At priority / roundabout controlled junctions the queues were recorded every 5 minutes and for traffic signal controlled junctions the queues were recorded at the start of each green period. This information is used to understand the existing traffic issues and validate the traffic models.

Camera Footage of the Traffic Survey

Camera footage of the traffic survey is retained. It provides the opportunity to validate the data/models and collect additional data. Examples include:

- Validate bus timetables;
- Surveying the frequency, volume and direction of pedestrians crossings at junctions;
- Ensuring that the freight train at Alexandra Road didn't enter the Port during the peak traffic hours.

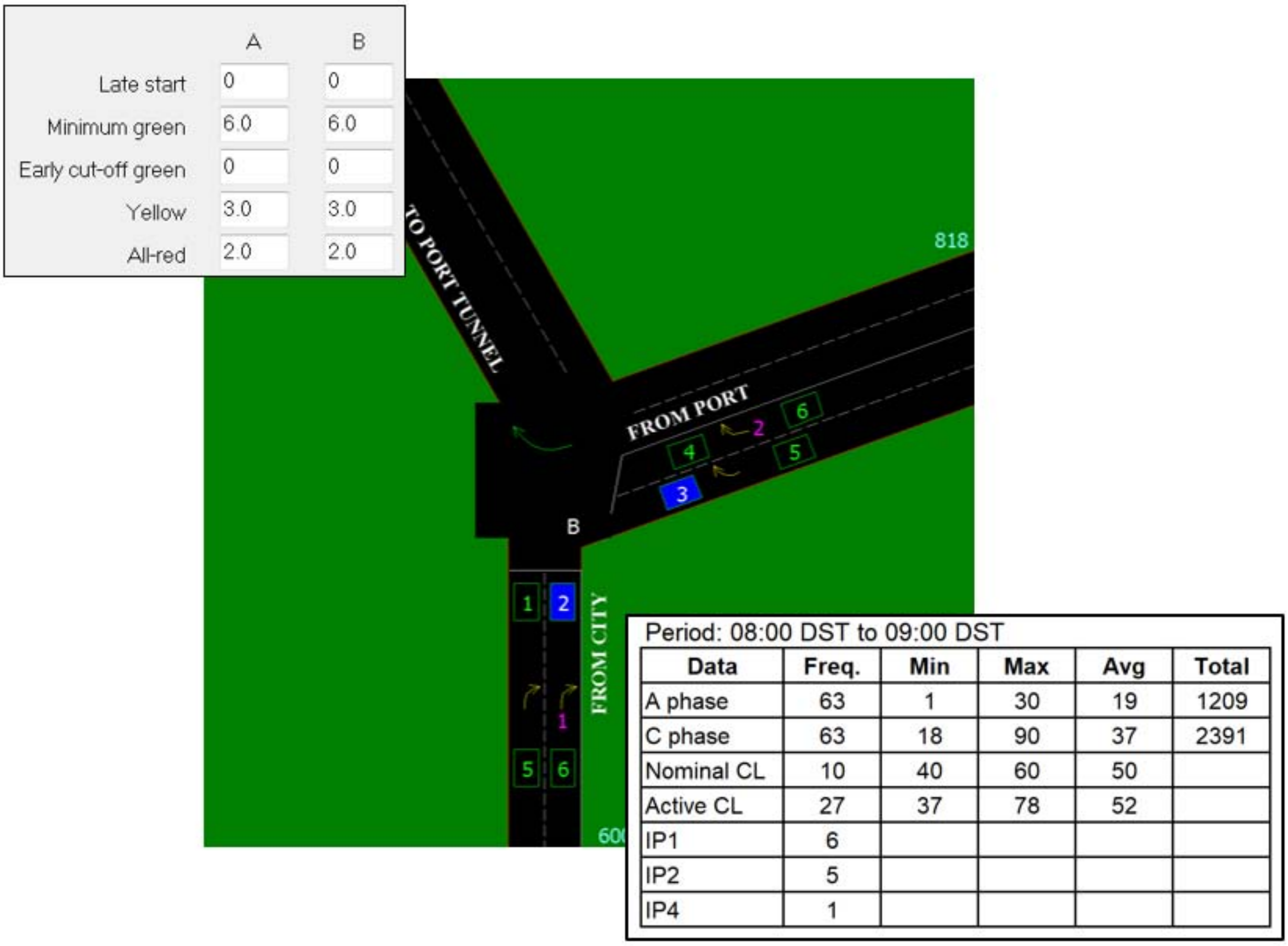
Figure 13-54 shows some examples of the camera footage. These examples show pedestrians crossing East Wall Road at Junction 3 (East Wall Road / Sherriff Street Upper) at 07:48 and traffic coming from the Dublin Port Tunnel at Junction 5 at 08:32 (East Wall Road / East Wall Road).

Figure 13-54 Examples of the Camera Footage

Traffic Signal Controller Specifications from DCC

The specifications from the traffic signal controller at each of the signalised junctions for the day of the traffic survey was procured from DCC. This information gives the following details from each of the traffic signals as illustrated in Figure 13-55. This information is used to assess the traffic network and validate the traffic models

- Stage times;
- Intergreen table;
- Phase type and conditions;
- Traffic detector volumes;
- Cycle time;
- Staging diagrams.



	A	B
Late start	0	0
Minimum green	6.0	6.0
Early cut-off green	0	0
Yellow	3.0	3.0
All-red	2.0	2.0

Period: 08:00 DST to 09:00 DST

Data	Freq.	Min	Max	Avg	Total
A phase	63	1	30	19	1209
C phase	63	18	90	37	2391
Nominal CL	10	40	60	50	
Active CL	27	37	78	52	
IP1	6				
IP2	5				
IP4	1				

Figure 13-55 Example of DCC Data from the Traffic Signal Controller at Junction 6

Manifest of Vessel Movements at Dublin Port

A manifest of vessel movements at the Port from midnight to midnight on the 23 May 2018 is included in Appendix 13-1 and is illustrated in Figure 13-58. It shows the times, berths and vessel for each of the 50 vessel movements that occurred at the Port on the day of the traffic survey. This allows for assessment of the patterns between the traffic flows and the vessel movements.

The websites www.vesselfinder.com and www.marinetraffic.com, as illustrated in Figure 13-56, were then utilised to assess the vessel movement patterns and to ensure that the 23 May 2018 represented a typical weekday at the Port.

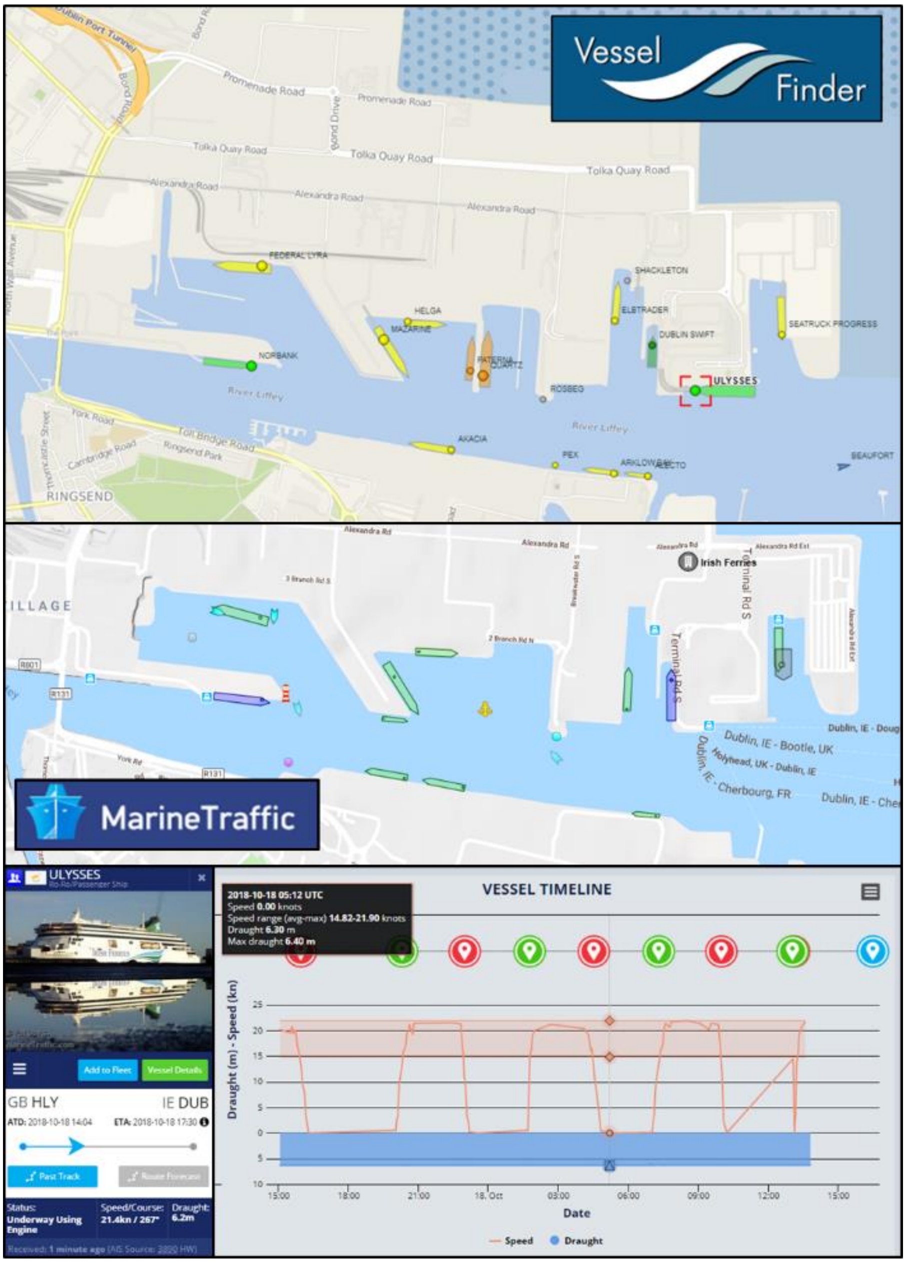


Figure 13-56 Example of Live Vessel Information Available Online

13.10.2 PCU Conversion Rates

The surveyed traffic flows were converted to Passenger Car Units (PCUs) using the conversion factors from the TII Project Appraisal Guidelines for National Roads Unit 5.2 – Data Collection, Oct 2016 (Page 8). The conversion factors are included in Table 13-3.

Table 13-3 PCU Conversion Factor – TII Project Appraisal Guidelines for National Roads Unit 5.2

Class	Description	Typical Length (m)	(PCU) Factor
Push Cycle		0.96-2.32	0.2
Motor cycle	 Motorcycles, scooters, mopeds, motor-powered bicyles and three-wheeled mototcycles.	0.96-2.32	0.4
Car/Taxi	 All passenger carrying vehciles, including those that pull light trailers: sedans, coupes, station wagons, SUVs, vans, limos, campers, motorhomes, small ambulances.	3.98-6.84	1
Light Goods Vehicle (LGV)	 All light good-carrying vehciles, inlcuding those that pull light trailers: pickup, panel vans, tow trucks.	39.98-6.84	1
Other Goods Vehicle Type 1 (OGV1)	 All rigid vehicles over 3.5 tonnes gross vehicle weight. All large vehicles on single frames: trucks, tow trucks, campers, motor homes, large ambulances.	6.17-10.50	1.5
Other Goods Vehicle Type 2(OGV2)	 All articulated vehicles.	9.51-23.65	2.3
Bus /Coach (PSV - Passenger Service Vehicle)	 All passenger-carrying buses, inclduing school buses and articulated buses.	9.51-13.69	2

1 PCU is equal to 5.75m of road space.

Therefore an OVG2 with a PCU conversation rate of 2.3 considers that each OGV2 occupies 13.2m of road space.

OGV2 = 2.3 PCU = 2.3 x 5.75m = 13.2m

Dublin Port has a high proportion of unitised freight or containerisation. Trailers and vehicles loaded with containers are normally longer than 13.2m. Therefore, despite the TII approved conversation rate for OGV2 being 2.3, this TTA has provided an additionally robust assessment which increases the PCU conversion rate for OGV2 from 2.3 to 2.9.

OGV2 = 2.9 PCU = 2.9 x 5.75m = 16.7m

This results in each OVG2 being assigned 16.7m of road space within this assessment.

13.10.3 Determining of Peak Hours for Assessment

The existing traffic survey data in PCUs was compiled to determine the existing external network morning and evening peak hour periods, presented in Table 13-4 and Table 13-5. Junctions 1 to 5 were used to determine peak hours on the external road network.

Table 13-4 – Assessment of External Network Peak Hour (PCUs) – Morning Period

Identification of External Network AM Peak - PCUs						
Hourly Assessment	**J1**	**J2**	**J3**	**J4**	**J5**	**Total J 1-5**
06:30 – 07:30	2,371	2,448	2,578	2,735	2,717	12,850
06:45 – 07:45	2,584	2,614	2,782	2,907	2,913	13,801
07:00 – 08:00	2,873	2,831	3,112	3,295	3,243	15,353
07:15 – 08:15	2,962	2,882	3,130	3,189	3,202	15,364
07:30 – 08:30	**2,987**	**2,879**	**3,137**	**3,200**	**3,253**	**15,456**
07:45 – 08:45	2,954	2,825	3,106	3,145	3,218	15,249
08:00 – 09:00	2,899	2,773	3,038	2,990	3,140	14,841
08:15 – 09:15	2,851	2,704	2,963	2,981	3,136	14,635
08:30 – 09:30	2,897	2,761	3,033	3,016	3,212	14,920

Table 13-5 – Assessment of External Network Peak Hour (PCUs) – Evening Period

Identification of External Network PM Peak - PCUs						
Hourly Assessment	**J1**	**J2**	**J3**	**J4**	**J5**	**Total J 1-5**
16:00 – 17:00	2,298	2,331	2,687	2,730	2,842	12,888
16:15 – 17:15	2,311	2,356	2,721	2,769	2,934	13,091
16:30 – 17:30	2,343	2,372	2,744	2,816	2,953	13,228
16:45 – 17:45	**2,589**	**2,591**	**2,903**	**2,885**	**2,987**	**13,956**
17:00 – 18:00	2,483	2,522	2,840	2,895	3,078	13,817
17:15 – 18:15	2,456	2,448	2,753	2,799	2,932	13,387
17:30 – 18:30	2,453	2,407	2,701	2,704	2,836	13,101
16:00 – 17:00	2,298	2,331	2,687	2,730	2,842	12,888
16:15 – 17:15	2,311	2,356	2,721	2,769	2,934	13,091

From these surveys, it was determined that the morning and evening peak hours to be taken forward for detailed traffic impact assessment will be as follows:

- Morning Peak: 07:30-08:30; and
- Evening Peak: 16:45-17:45.

Port Internal Peak Hour

The Port has a unique set of circumstances that create an early internal traffic peak hour.

Dublin City Centre HGV Management Strategy

The Dublin City Centre HGV Management Strategy bans vehicles with 5 or more axles travelling between the hours of 07:00 and 19:00 to within a cordoned area around Dublin City Centre, as illustrated In Figure 13-57.

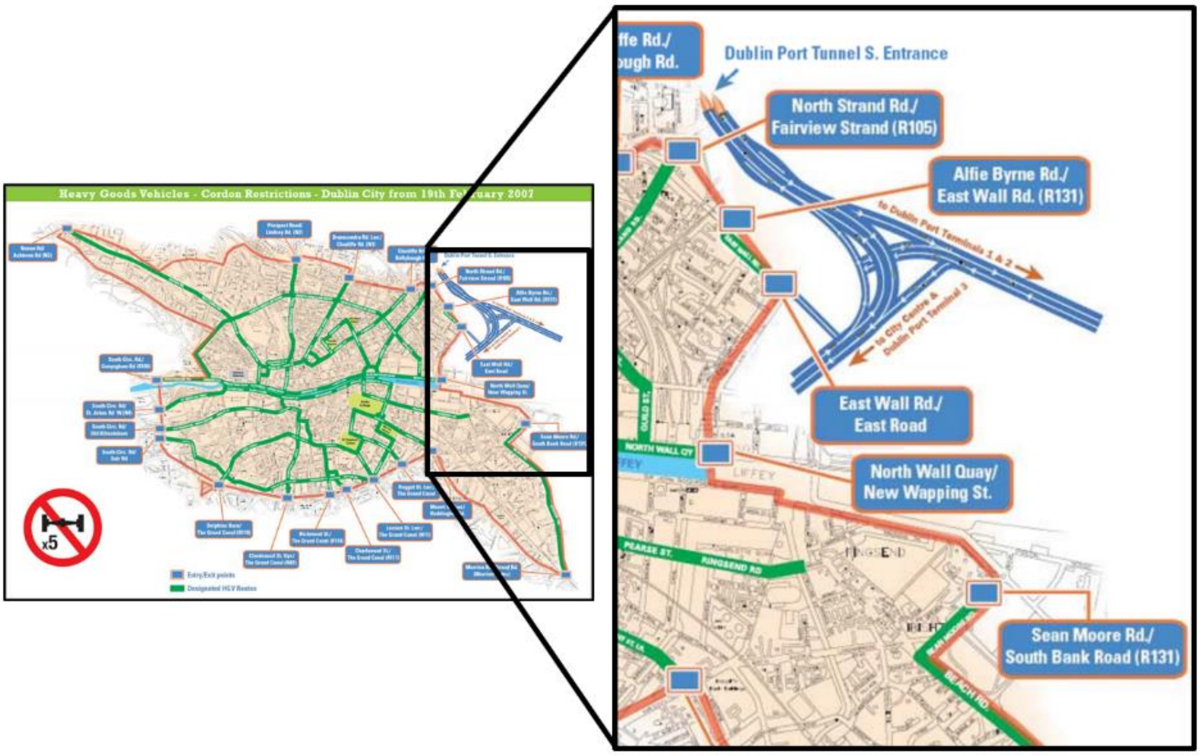


Figure 13-57 Cordon Area for Dublin City Centre HGV Management Strategy

Therefore 5+axle vehicles have no option but to use the Dublin Port Tunnel between 07:00 and 19:00, being prohibited from using the other four routes unless they have a permit to load/unload within the city centre area. The ban came into force in 2007.

This creates a demand for the imported accompanied 5+axles vehicles to disembark from the Ro-Ro vessels at Dublin Port, enter the City Centre to unload time-critical goods, and exit the City Centre cordon before the 07:00am deadline.

This results in the time period of between 05:30am and 08:00am being the worst case for traffic generation at Dublin Port throughout the day, peaking at 06:15am to 07:15am.

Table 13-6 shows the sum of the vehicle movements at the internal Port junctions, Junctions 6 to 24, and confirms that that the internal peak hour is 06:15am to 07:15am.

Table 13-6 Assessment of Internal Network Peak Hour (PCUs)

Identification of Internal Network Peak Hours - PCUs					
Hourly Assessment	Total J6-24	Hourly Assessment	Total J6-24	Hourly Assessment	Total J6-24
00:00 – 01:00	4,711	08:00 – 09:00	12,260	16:00 – 17:00	13,885
00:15 – 01:15	3,463	08:15 – 09:15	12,367	16:15 – 17:15	14,452
00:30 – 01:30	3,582	08:30 – 09:30	12,743	16:30 – 17:30	15,622
00:45 – 01:45	3,490	08:45 – 09:45	12,878	16:45 – 17:45	16,973
01:00 – 02:00	3,392	09:00 – 10:00	13,098	17:00 – 18:00	16,890
01:15 – 02:15	3,256	09:15 – 10:15	13,686	17:15 – 18:15	15,783
01:30 – 02:30	2,361	09:30 – 10:30	13,856	17:30 – 18:30	13,964
01:45 – 02:45	1,807	09:45 – 10:45	13,880	17:45 – 18:45	11,254
02:00 – 03:00	1,592	10:00 – 11:00	13,685	18:00 – 19:00	10,395
02:15 – 03:15	1,420	10:15 – 11:15	13,292	18:15 – 19:15	9,893
02:30 – 03:30	1,753	10:30 – 11:30	12,915	18:30 – 19:30	10,373
02:45 – 03:45	1,774	10:45 – 11:45	14,397	18:45 – 19:45	10,884
03:00 – 04:00	1,873	11:00 – 12:00	14,544	19:00 – 20:00	10,569
03:15 – 04:15	2,049	11:15 – 12:15	15,253	19:15 – 20:15	9,738
03:30 – 04:30	2,100	11:30 – 12:30	16,464	19:30 – 20:30	8,129
03:45 – 04:45	2,462	11:45 – 12:45	17,264	19:45 – 20:45	6,770
04:00 – 05:00	2,888	12:00 – 13:00	18,098	20:00 – 21:00	5,859
04:15 – 05:15	3,527	12:15 – 13:15	18,097	20:15 – 21:15	5,103
04:30 – 05:30	4,601	12:30 – 13:30	19,066	20:30 – 21:30	4,484
04:45 – 05:45	5,971	12:45 – 13:45	17,985	20:45 – 21:45	3,663
05:00 – 06:00	8,260	13:00 – 14:00	17,871	21:00 – 22:00	3,353
05:15 – 06:15	12,331	13:15 – 14:15	18,012	21:15 – 22:15	2,969
05:30 – 06:30	16,392	13:30 – 14:30	16,767	21:30 – 22:30	2,492
05:45 – 06:45	19,030	13:45 – 14:45	15,429	21:45 – 22:45	2,597
06:00 – 07:00	21,332	14:00 – 15:00	14,662	22:00 – 23:00	2,355
06:15 – 07:15	**21,932**	14:15 – 15:15	14,493	22:15 – 23:15	2,346
06:30 – 07:30	21,746	14:30 – 15:30	13,744	22:30 – 23:30	2,279
06:45 – 07:45	21,392	14:45 – 15:45	14,454	22:45 – 23:45	2,375
07:00 – 08:00	20,280	15:00 – 16:00	14,842	23:00 – 00:00	3,821
07:15 – 08:15	17,431	15:15 – 16:15	14,472	23:15 – 00:15	5,154
07:30 – 08:30	14,556	15:30 – 16:30	14,772	23:30 – 00:30	5,655
07:45 – 08:45	13,362	15:45 – 16:45	14,485	23:45 – 00:45	5,941

Therefore 3 peak hour assessments have been taken forward for detailed traffic impact assessment will be as follows:

- Internal Morning Peak Hour: 06:15-07:15 AM1
- External Morning Peak: 07:30-08:30; and AM2
- Evening Peak: 16:45-17:45. PM

For ease of reference throughout the TTA, the internal morning peak hour is referred to as AM1 and the external morning peak hour is referred to as AM2. The evening peak is referred to as PM in the usual fashion.

The Existing Traffic Flows Diagrams (in PCUs) for the 3 peak hours, AM1, AM2 and PM, for the survey year of 2018 are presented in Appendix 13-2**.** For ease of reference each Diagram has a unique reference number.

Diagram Name	**Unique Reference Number**
Existing Traffic Flows Diagram, AM Peak Hour for the Internal Road Network, 2018	AM1-EX-18
Existing Traffic Flows Diagram, AM Peak Hour for the External Road Network, 2018	AM2-EX-18
Existing Traffic Flows Diagram, PM Peak Hour for the External Road Network, 2018	PM-EX-18

13.10.4 Vessels Movements contained within the 3 Peak Hour Assessments

The vessel movements contained within each of the 3 peak hours selected to demonstrate the robustness of the assessment.

As referenced above a manifest of vessel movements at the Port from midnight to midnight on the 23 May 2018 is illustrated in Figure 13-58. The details are contained in A3 size in Appendix 13-1 for ease of viewing. The sailing times, berths and vessels for each of the 50 vessel movements that occurred at the Port on the day of the traffic survey are detailed on the manifest. The vessel movements relating to the 3 selected peak hours are highlighted.

Manifest of Vesssel Movements at Dublin Port from Midnight on 22 May 2018 to Midnight on the 23 May 2018							
Sort Date	**End Time**	**Move Type**	**Ship**	**Category**	**To**	**From**	
23/05/2018 00:02	23/05/2018 00:51	DEP	THUN GRATITUDE	Bulk Liquid	SEA (DBB)	Oil Berth No. 2	
23/05/2018 01:09	23/05/2018 02:05	DEP	STOLT FUJI	Bulk Liquid	SEA (DBB)	Oil Berth No. 3	
23/05/2018 02:00	23/05/2018 02:22	DEP	EPSILON	RoRo Freight/Passenger	SEA (DBB)	49	
23/05/2018 02:16	23/05/2018 02:48	DEP	STENA SUPERFAST X	RoRo Freight/Passenger	SEA (DBB)	51	
23/05/2018 02:19	23/05/2018 03:02	ARR	SEATRUCK PACE	RoRo Freight/Passenger	52	SEA (DBB)	
23/05/2018 02:44	23/05/2018 03:39	ARR	ELBSTRAND	LoLo	50N	SEA (DBB)	
23/05/2018 03:48	23/05/2018 04:28	ARR	HENDRIK-S	Bulk Solid	Ocean Pier 37	SEA (DBB)	
23/05/2018 04:27	**23/05/2018 05:12**	**ARR**	**NORBAY**	**RoRo Freight/Passenger**	**P&O 21**	SEA (DBB)	
23/05/2018 04:59	**23/05/2018 05:33**	**ARR**	**SEATRUCK PROGRESS**	**RoRo Freight/Passenger**	**53**	SEA (DBB)	
23/05/2018 05:13	**23/05/2018 05:48**	**ARR**	**STENA ADVENTURER**	**RoRo Freight/Passenger**	**51**	SEA (DBB)	
23/05/2018 05:19	23/05/2018 06:03	**DEP**	**VICTORIA**	**LoLo**	SEA (DBB)	**50A**	AM1
23/05/2018 05:29	**23/05/2018 05:58**	**ARR**	**ULYSSES**	**RoRo Freight/Passenger**	**49**	SEA (DBB)	
23/05/2018 05:36	**23/05/2018 06:44**	**ARR**	**HANSEATIC**	**Cruise Liners**	**Cruise 18**	SEA (DBB)	
23/05/2018 06:11	23/05/2018 06:36	**DEP**	**SEATRUCK PACE**	**RoRo Freight/Passenger**	SEA (DBB)	**52**	
23/05/2018 08:05	23/05/2018 08:32	**DEP**	**ULYSSES**	**RoRo Freight/Passenger**	SEA (DBB)	**49**	
23/05/2018 08:10	23/05/2018 08:38	**DEP**	**STENA ADVENTURER**	**RoRo Freight/Passenger**	SEA (DBB)	**51**	AM2
23/05/2018 08:30	23/05/2018 08:46	**DEP**	**DUBLIN SWIFT**	**RoRo Fast Ferry**	SEA (DBB)	**51A**	
23/05/2018 09:01	23/05/2018 09:23	DEP	SEATRUCK PROGRESS	RoRo Freight/Passenger	SEA (DBB)	53	
23/05/2018 09:15	23/05/2018 09:48	DEP	NORBAY	RoRo Freight/Passenger	SEA (DBB)	P&O 21	
23/05/2018 09:27	23/05/2018 10:28	ARR	AASNES	Bulk Solid	Alex Basin East 38	SEA (DBB)	
23/05/2018 10:06	23/05/2018 10:57	ARR	EUROPEAN ENDEAVOUR	RoRo Freight/Passenger	P&O 21	SEA (DBB)	
23/05/2018 10:24	23/05/2018 10:57	ARR	CLIPPER POINT	RoRo Freight/Passenger	53	SEA (DBB)	
23/05/2018 10:45	23/05/2018 11:21	ARR	EPSILON	RoRo Freight/Passenger	51A	SEA (DBB)	
23/05/2018 11:06	23/05/2018 11:39	SHFT	X-PRESS MULHACEN	LoLo	MTL 42	Alex Basin East 40	
23/05/2018 11:40	23/05/2018 12:20	ARR	STENA SUPERFAST X	RoRo Freight/Passenger	51	SEA (DBB)	
23/05/2018 12:50	23/05/2018 13:18	ARR	DUBLIN SWIFT	RoRo Fast Ferry	49	SEA (DBB)	
23/05/2018 14:10	23/05/2018 14:35	DEP	CLIPPER POINT	RoRo Freight/Passenger	SEA (DBB)	53	
23/05/2018 14:14	23/05/2018 14:39	DEP	EPSILON	RoRo Freight/Passenger	SEA (DBB)	51A	
23/05/2018 14:18	23/05/2018 15:06	ARR	CLIPPER RANGER	RoRo Freight/Passenger	52	SEA (DBB)	
23/05/2018 14:21	23/05/2018 14:41	DEP	DUBLIN SWIFT	RoRo Fast Ferry	SEA (DBB)	49	
23/05/2018 14:46	23/05/2018 15:19	DEP	STENA SUPERFAST X	RoRo Freight/Passenger	SEA (DBB)	51	
23/05/2018 15:13	23/05/2018 15:52	DEP	EUROPEAN ENDEAVOUR	RoRo Freight/Passenger	SEA (DBB)	P&O 21	
23/05/2018 15:34	23/05/2018 16:30	ARR	RMS WEDAU	Bulk Solid	Ocean Pier 35	SEA (DBB)	
23/05/2018 16:31	**23/05/2018 17:03**	**ARR**	**SEATRUCK POWER**	**RoRo Freight/Passenger**	**53**	SEA (DBB)	
23/05/2018 16:34	**23/05/2018 17:08**	**ARR**	**STENA ADVENTURER**	**RoRo Freight/Passenger**	**51**	SEA (DBB)	
23/05/2018 16:48	**23/05/2018 17:25**	**ARR**	**NORBANK**	**RoRo Freight/Passenger**	**P&O 21**	SEA (DBB)	PM
23/05/2018 16:57	**23/05/2018 17:27**	**ARR**	**ULYSSES**	**RoRo Freight/Passenger**	**49**	SEA (DBB)	
23/05/2018 17:58	23/05/2018 18:25	DEP	CLIPPER RANGER	RoRo Freight/Passenger	SEA (DBB)	52	
23/05/2018 17:58	23/05/2018 18:48	DEP	HANSEATIC	Cruise Liners	SEA (DBB)	Cruise 18	
23/05/2018 18:53	23/05/2018 19:10	ARR	DUBLIN SWIFT	RoRo Fast Ferry	51A	SEA (DBB)	
23/05/2018 19:00	23/05/2018 20:01	ARR	BRO DELIVERER	Bulk Liquid	Oil Berth No. 1	SEA (DBB)	
23/05/2018 19:13	23/05/2018 19:54	DEP	HENDRIK-S	Bulk Solid	SEA (DBB)	Ocean Pier 37	
23/05/2018 20:35	23/05/2018 21:08	DEP	STENA ADVENTURER	RoRo Freight/Passenger	SEA (DBB)	51	
23/05/2018 20:53	23/05/2018 20:53	EXT	THUN GEMINI	Bulk Liquid	Quadrant 2	SEA (Open water)	
23/05/2018 20:55	23/05/2018 21:19	DEP	SEATRUCK POWER	RoRo Freight/Passenger	SEA (DBB)	53	
23/05/2018 20:58	23/05/2018 21:25	DEP	ULYSSES	RoRo Freight/Passenger	SEA (DBB)	49	
23/05/2018 21:16	23/05/2018 21:55	DEP	NORBANK	RoRo Freight/Passenger	SEA (DBB)	P&O 21	
23/05/2018 22:47	23/05/2018 23:22	DEP	MIRROR	LoLo	SEA (DBB)	50S	
23/05/2018 22:48	23/05/2018 23:22	ARR	EPSILON	RoRo Freight/Passenger	49	SEA (DBB)	
23/05/2018 23:28	24/05/2018 00:07	ARR	STENA SUPERFAST X	RoRo Freight/Passenger	51	SEA (DBB)	
			50				

Figure 13-58 Manifest of Vessel Movements at the Port from Midnight to Midnight on 23 May 2018

It is noted that 40 of the 50 vessel movements within the Dublin Port Estate on the day of the traffic survey relate to vessels that will ultimately be facilitated by the MP2 Project and the consented ABR Project, indicating the extent of influence of the MP2 Project at the Port.

Table 13-7 summarises the information shown on the manifest for ease of viewing. It shows the vessel movements that are incorporated into the AM1 peak hour assessment.

Table 13-7 Vessel Movements Incorporated within AM1

AM1			
Time	**Arrives / Departs Berth**	**Name of Vessel**	**Type of Vessel**
05:12	Arrives	 P&O Norbay	Ro-Ro Freight & Passenger Accompanied & Unaccompanied
05:19	Departs	 Victoria from DFT	Lo-Lo
05:33	Arrives	 Seatruck Progress	Ro-Ro Mostly Unaccompanied Freight
05:48	Arrives	 Stena Adventurer	Ro-Ro Freight & Passenger Accompanied & Unaccompanied
05:58	Arrives	 Irish Ferries Ulysses	Ro-Ro Freight & Passenger Accompanied & Unaccompanied
06:11	Departs	 Seatruck Pace	Ro-Ro Mostly Unaccompanied Freight
06:44	Arrives	 Hanseatic	Cruise Vessel

The traffic from 5 Ro-Ro vessels, 1 Lo-Lo vessel and a Cruise vessel has been captured during the AM1 peak hour along with all of the other traffic movements associated with the Dublin Port Estate. It is evident that this represents the peak traffic activity at the Port for land and marine traffic.

Table 13-8 shows the vessel movements occurring at the Port that are incorporated into the AM2 peak hour assessment.

Table 13-8 Vessel Movements Incorporated within AM2

AM2				
Time	**Arrives / Departs**	**Name of Vessel**		**Type of Vessel**
08:05	Departs		Stena Adventurer	Ro-Ro Freight & Passenger Accompanied & Unaccompanied
08:10	Departs		Irish Ferries Ulysses	Ro-Ro Freight & Passenger Accompanied & Unaccompanied
08:30	Departs		Irish Ferries Dublin Swift	Ro-Ro Mostly Passenger Mostly Accompanied

Table 13-8 shows that the traffic associated with 3 Ro-Ro vessels all departing within a 25 minute period is captured during AM2 peak hour along with all of the other traffic movements associated within the Port. This coincides with the traffic being at its peak on the external road network for the morning period.

Finally, Table 13-9 shows the vessel movements occurring at the Port that are incorporated into the PM peak hour assessment.

Table 13-9 Vessel Movements Incorporated within PM

PM			
Time	**Arrives / Departs**	**Name of Vessel**	**Type of Vessel**
17:03	Arrives	 Seatruck Power	Ro-Ro Mostly Unaccompanied Freight
17:08	Arrives	 Stena Adventurer	Ro-Ro Freight & Passenger Accompanied & Unaccompanied
17:25	Arrives	 Norbank to P&O	Ro-Ro Freight & Passenger Accompanied & Unaccompanied
17:27	Arrives	 Irish Ferries Dublin Swift	Ro-Ro Freight & Passenger Accompanied & Unaccompanied

Table 13-9 shows that the traffic associated with 4 Ro-Ro vessels all arriving within a 24 minute period is captured during PM peak hour along with all of the other traffic movements associated within the Port. This coincides with the traffic being at its peak on the external road network for the evening period.

The UFT will contain Irish Ferries, Stena and P&O. It is highlighted that, as demonstrated above, the existing traffic from 3 Freight & Passenger Ro-Ro vessels are contained within each of the 3 peak hours being assessed:

- AM1: Irish Ferries Ulysses, Stena Adventurer and P&O Norbay;
- AM2: Irish Ferries Ulysses, Stena Adventurer and Irish Ferries Dublin Swift;
- PM: Irish Ferries Ulysses, Stena Adventurer and P&O Norbank;

13.10.5 Existing Traffic Profiles for the Main Operators

This section of the report shows the existing traffic profiles for each of the main operators within the Port that are relevant to the MP2 Project.

Irish Ferries

Figure 13-59 indicates the existing location of Terminal 1 at the eastern side of the Port which currently hosts the Irish Ferries operator. Irish Ferries use an existing double ramp at Berths 49 and a single ramp at Berth 51A. They handle Freight & Passenger Ro-Ro vessels and have 6 vessel arrivals and 6 vessel departures per day. They have accompanied and unaccompanied freight, tourist vehicles and foot passengers. Terminal 1 is accessed via Terminal Road located at the end of Tolka Quay Road.

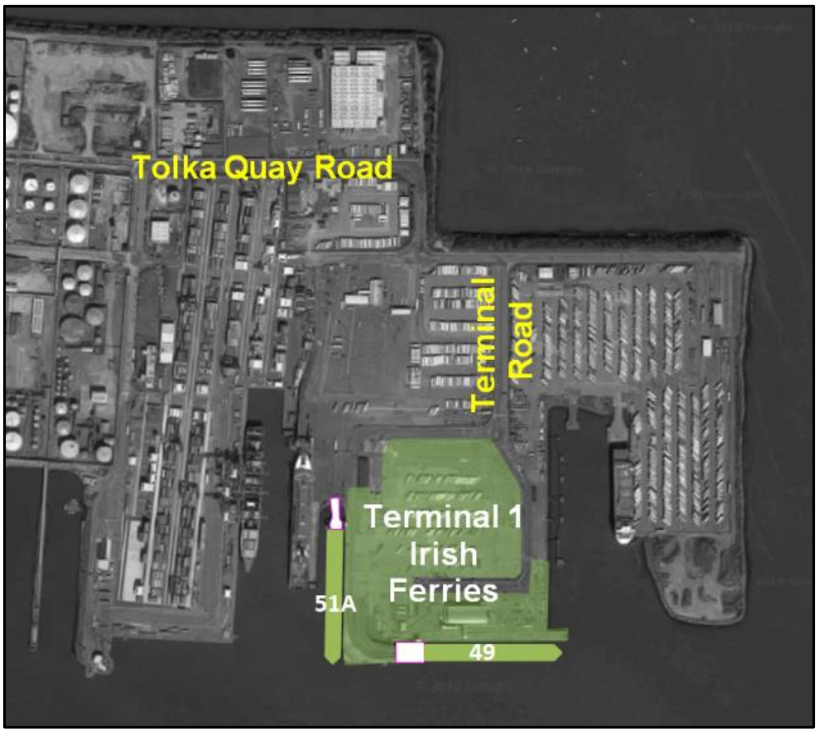


Figure 13-59 Existing Location of Irish Ferries at Dublin Port

Figure 13-60 shows the existing daily traffic pattern for Irish Ferries. It shows 6 spikes associated with the traffic disembarking from the Ro-Ro vessels about 15 minutes after the vessel arrives at the berth. The spike for the AM1 peak, just after Ulysses arrives at 05:58, is not as high as the PM peak occurring after Ulysses arrives at 17:27, but the first arrival has a higher number of HGVs and generates high volumes of traffic over a longer period of time, about 45 minutes compared to 15 minutes.

Figure 13-60 shows that traffic arriving at the Port to embark onto the vessels increases at a much steadier pace, reaching a peak about 45mins before the vessel sails. The AM1 peak time is the worst case for vehicles arriving to the Irish Ferries site to broad the vessels.

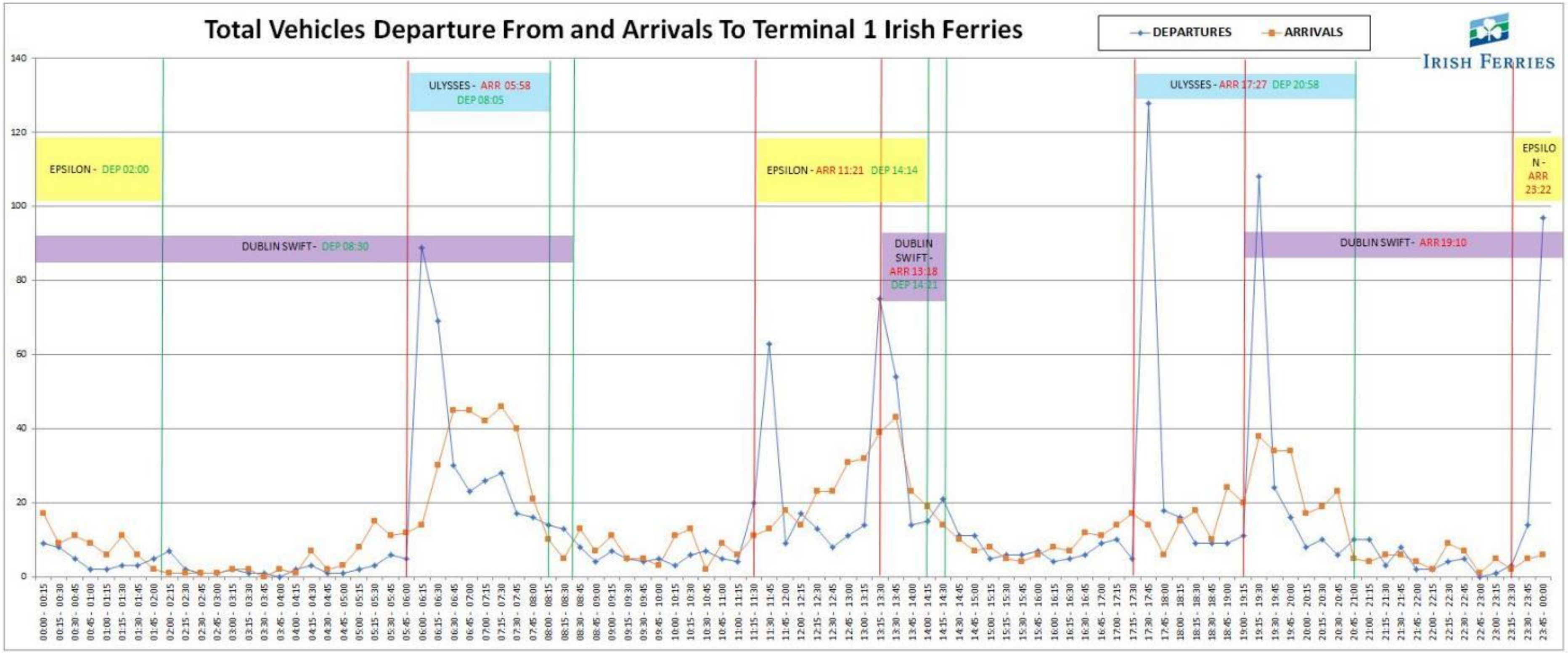


Figure 13-60 Total Vehicles Departing from and Arriving to Irish Ferries

Stena

The Stena operator is currently located in Terminal 2 and utilises Berth 51 via a double ramp as shown in Figure 13-61. They handle Freight & Passenger Ro-Ro vessels and have 4 vessel arrivals and 4 vessel departures per day. Stena also have accompanied and unaccompanied freight, tourist vehicles and foot passengers. Terminal 2 is also accessed at the end of the existing Tolka Quay Road.

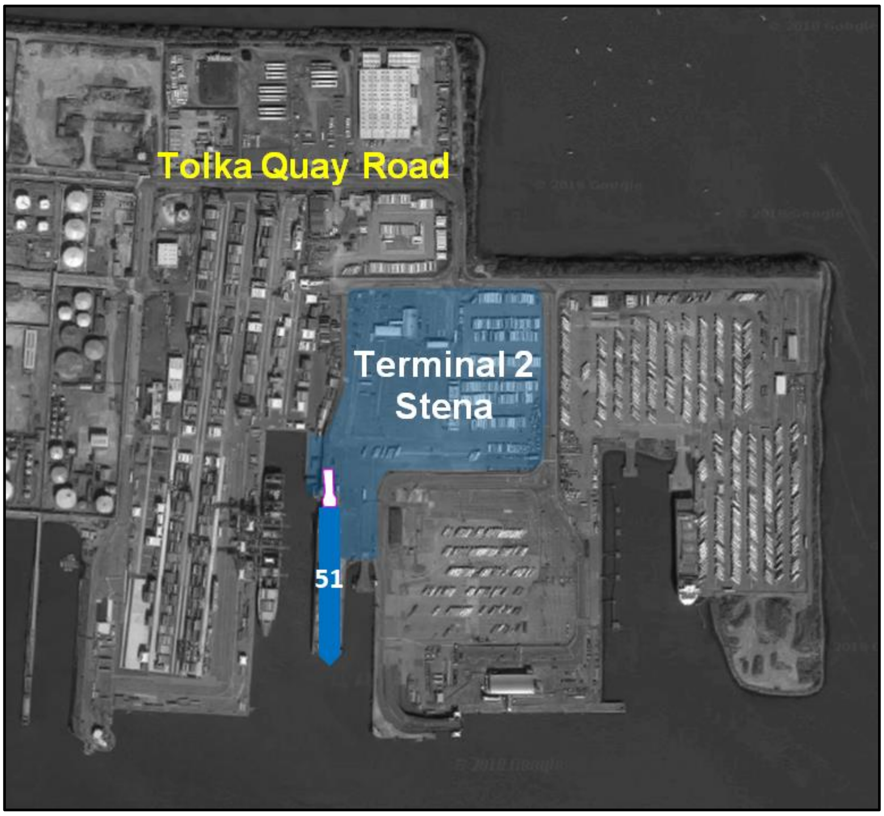


Figure 13-61 Existing Location of Stena at Dublin Port

Figure 13-62 shows the existing daily traffic pattern for Stena. It has the same traffic patterns as Irish Ferries, showing 4 spikes associated with the traffic disembarking from the Ro-Ro vessels about 15 minutes after the vessel arrives at the berth. The spike for the AM1 peak for the Adventurer arrival isn't as high as the PM peak occurring after Adventure arrives for the second time. However again the first arrival has a higher number of HGVs and generates high volumes of traffic over a longer period of time, about 45-60 minutes compared to 15 minutes.

Figure 13-62 shows that traffic arriving at the Port to embark onto the vessels increases at a much steadier pace, reaching a peak about 45mins before the vessel sails. The AM1 peak time is the worst case for vehicles arriving to the site to board the vessels.

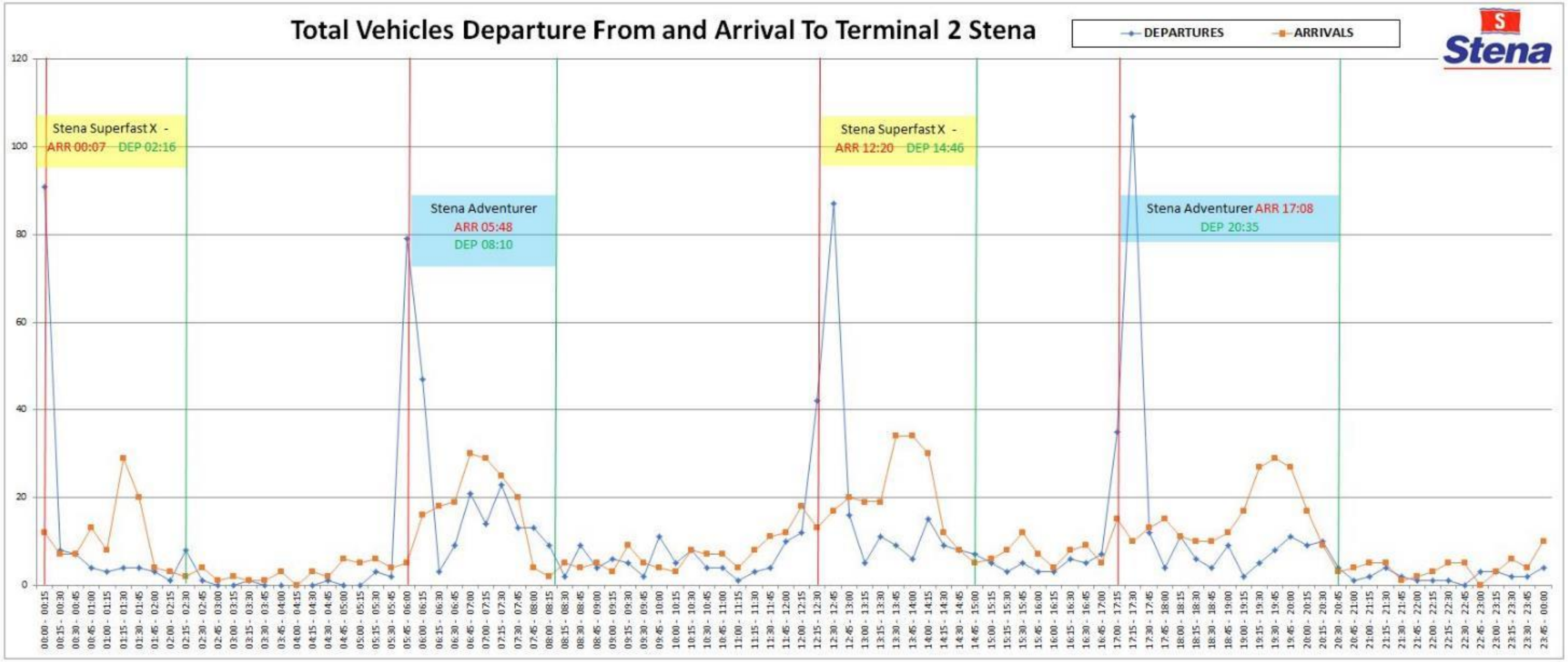


Figure 13-62 Total Vehicles Departing from and Arriving to Stena

P&O

P&O currently occupy Terminal 3 at the western side of the Port and utilise a single ramp at Berth 21 as indicated in Figure 13-63. They handle Freight & Passenger Ro-Ro vessels and have 3 vessel arrivals and 3 vessel departures per day. Stena have accompanied and unaccompanied freight and tourist vehicles. They currently don't have foot passengers on their vessels. Terminal 3 has a dedicated access directly from East Wall Road.

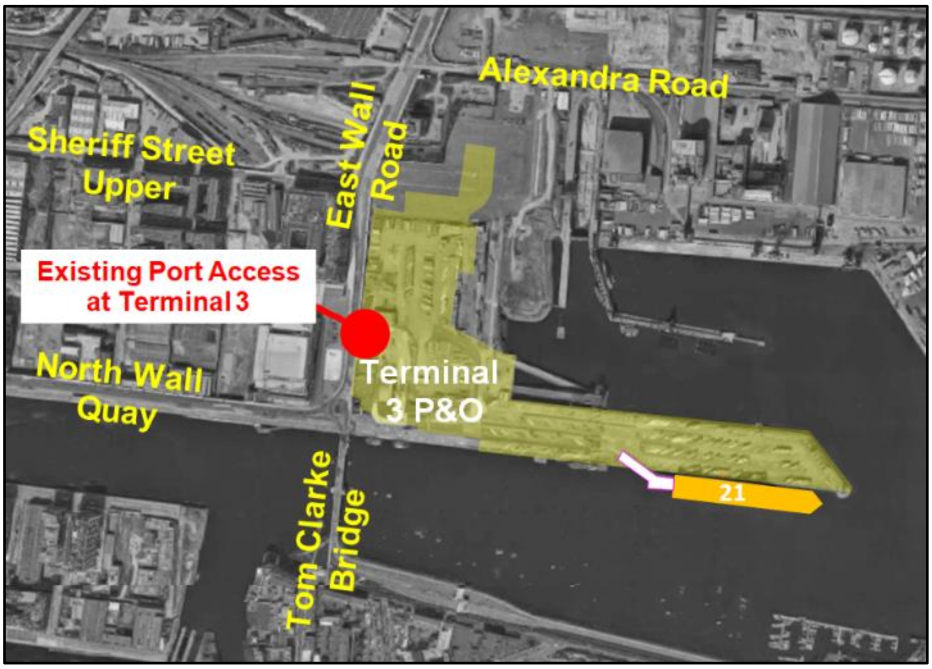


Figure 13-63 Existing Location of P&O at Dublin Port

Figure 13-64 shows the existing daily traffic pattern for P&O. Although peaks are evident shortly after the first two vessels arrive, they aren't as dramatic as Irish Ferries and Stena. This is due to smaller vessels (2000 lane metres verses 3500 / 4000 lane metres) and due to the larger proportion of unaccompanied freight that P&O handle compared to the other operators. The unaccompanied element contributes to the more constant pattern of traffic generation at this site compared to the more dramatic fluctuations observed at Irish Ferries and Stena.

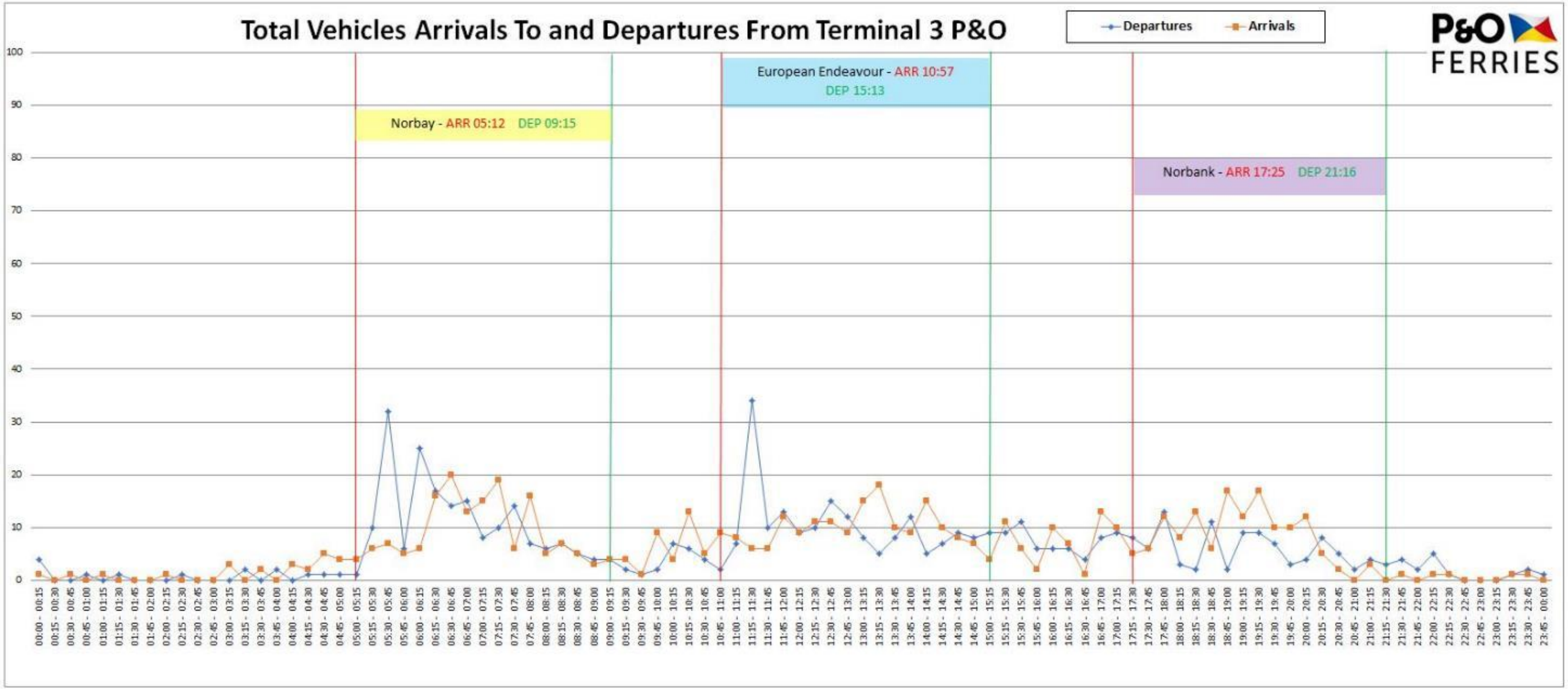


Figure 13-64 Total Vehicles Departing from and Arriving to P&O

Seatruck Ferries

The majority of Seatruck's business is unaccompanied freight. They don't handle tourist traffic or foot passengers. Figure 13-65 indicates that they are currently located in Terminal 5 at the eastern side of the Port, and utilise 2 single ramps at Berth 52 and Berth 53. There were 5 vessel arrivals and 5 vessel departures at Seatruck at the time of the traffic surveys. Terminal 5 is accessed via Alexandra Road Extension located at the end of Tolka Quay Road.

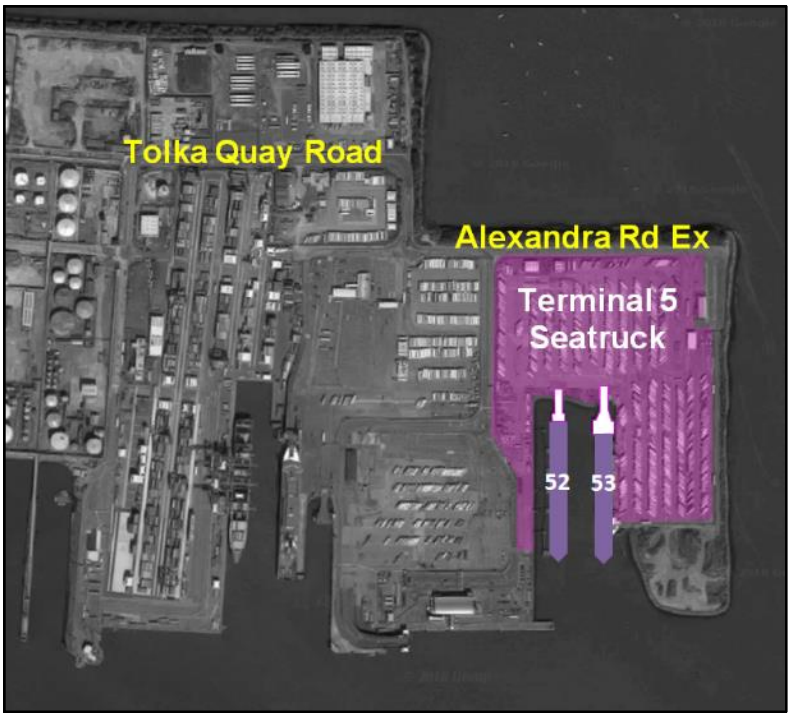


Figure 13-65 Existing Location of Seatruck at Dublin Port

Figure 13-66 shows the existing daily traffic pattern for Seatruck. The large unaccompanied element contributes to the constant pattern of traffic generation during the operational hours. This is very different to the fluctuations observed at the large Ro-Ro operators with high proportions of accompanied vehicles. Even so, a peak can be observed at the AM1 peak period, spiking at 06:15-06:30, ensuring that a worst case for traffic has been included in the TTA.

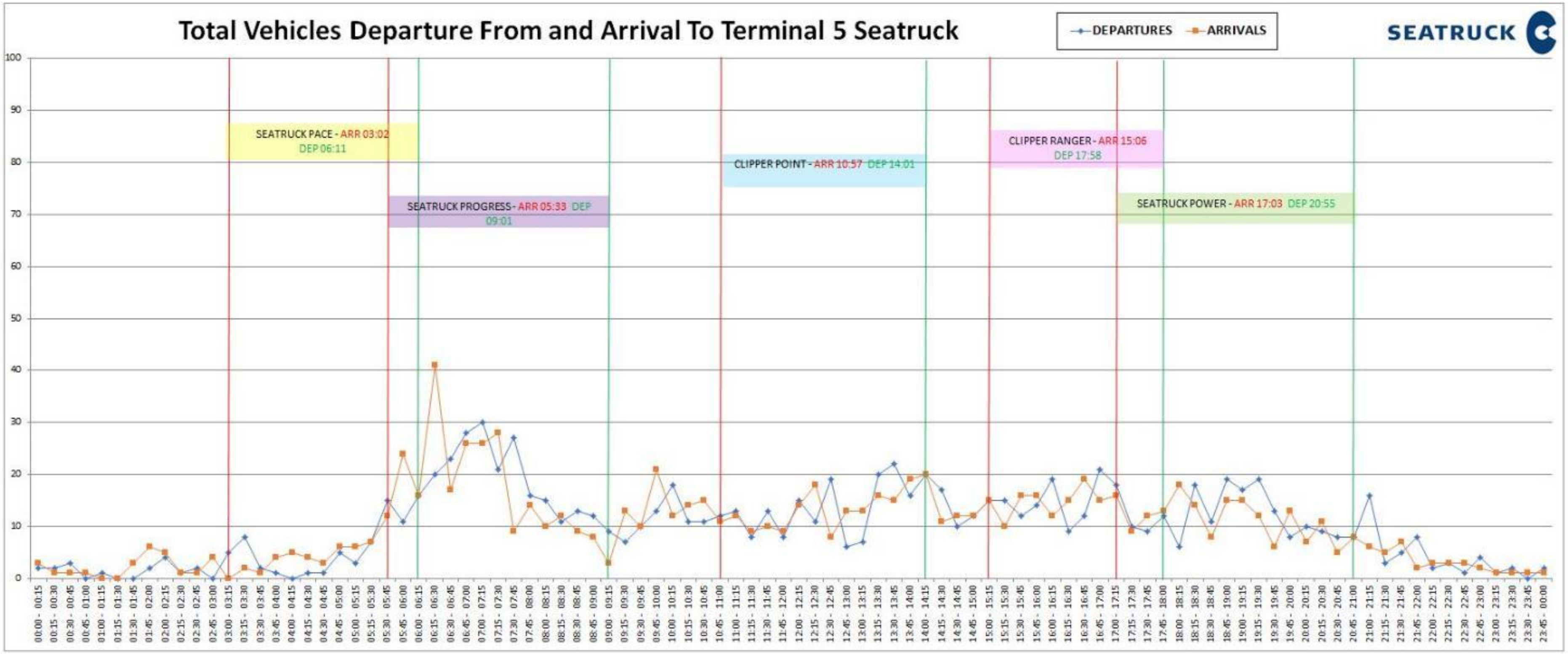


Figure 13-66 Total Vehicles Departing from and Arriving to Seatruck

Dublin Ferryport Terminals (DFT)

DFT is a Lo-Lo operator located as indicated in Figure 13-67. DFT has two berths, River Berth 50A and Berth 50, which can at times accommodate 2 vessels referred to as 50N (for north) and 50S (for south). On the day of the traffic surveys DFT had 1 vessel arrival and 2 vessel departures. Lo-Lo operations by nature generate a lower number of vessels on a less regular schedule compared to Ro-Ro operations. These vessels also have a much longer dwell time at the berths. Traffic enters DFT along Breakwater Road South. It has an exit directly onto Tolka Quay Road, and also has some exiting traffic heading north on Breakwater Road.

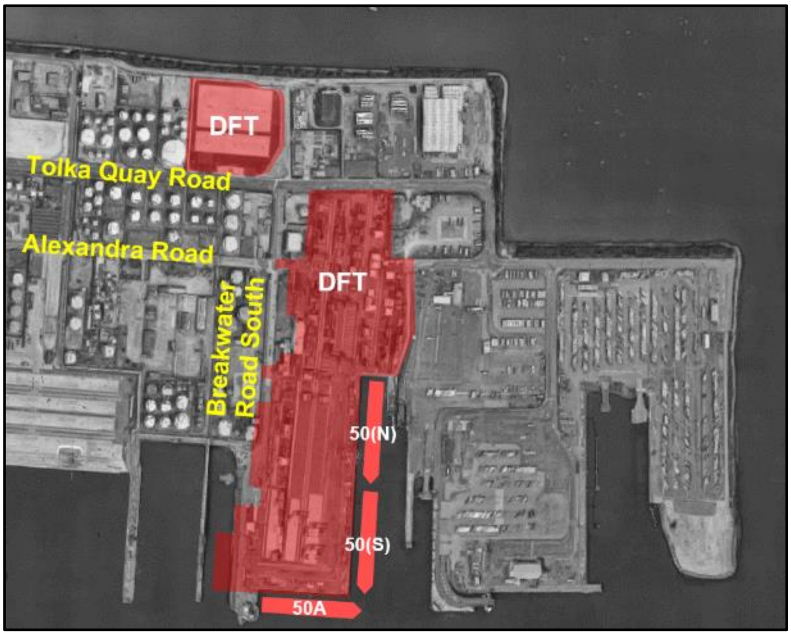


Figure 13-67 Existing Location of DFT at Dublin Port

Figure 13.68 shows the existing daily traffic pattern for DFT. There is a separation between vessel sailing times and traffic generation at Lo-Lo sites. A constant pattern of traffic generation during the operational hours can be observed. The traffic pattern is not influenced by the sailing times, which occur during the night when land operations are minimal which is a contrast from the fluctuations observed at accompanied Ro-Ro sites. At the end of the working day the number of arrivals tapers to a lower level, about 2 hours before the number of departures tapers down, as would be expected towards the end of the core working hours.

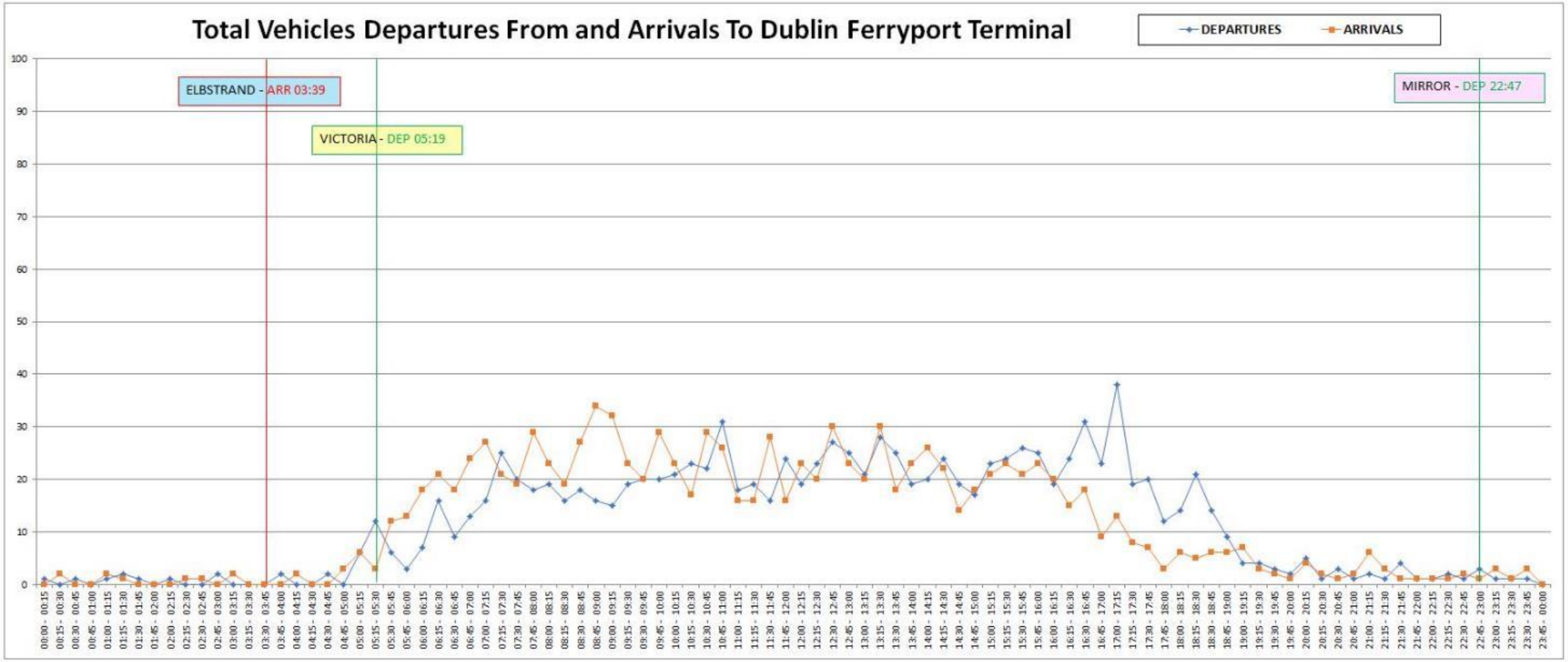


Figure 13-68 Total Vehicles Departing from and Arriving to DFT

The surveyed information therefore allows the relationship between the vessel movements and traffic flows to be understood for Ro-Ro and Lo-Lo operators:

- Disembarking traffic from the Ro-Ro vessels spike about 15 minutes after the vessel arrives at the berth;
- Traffic arriving to embark onto Ro-Ro vessels increases at a much steadier pace;
- Unaccompanied Ro-Ro freight results in a constant pattern of traffic generation during the operational hours, very different to the fluctuations observed with high proportions of accompanied Ro-Ro;
- There is a separation between vessel sailing times and traffic generation at Lo-Lo sites. A constant pattern of traffic generation during the operational hours can be observed, with no bearing on the sailing times.

13.10.6 Existing Traffic Flows at Dublin Port Tunnel

Dublin Port Tunnel has 2 northbound lanes and 2 southbound lanes. There are 11 toll lanes at Dublin Port Tunnel - 5 dedicated northbound, 4 dedicated southbound and 2 that can be bi-directional, as illustrated in Figure 13-69.

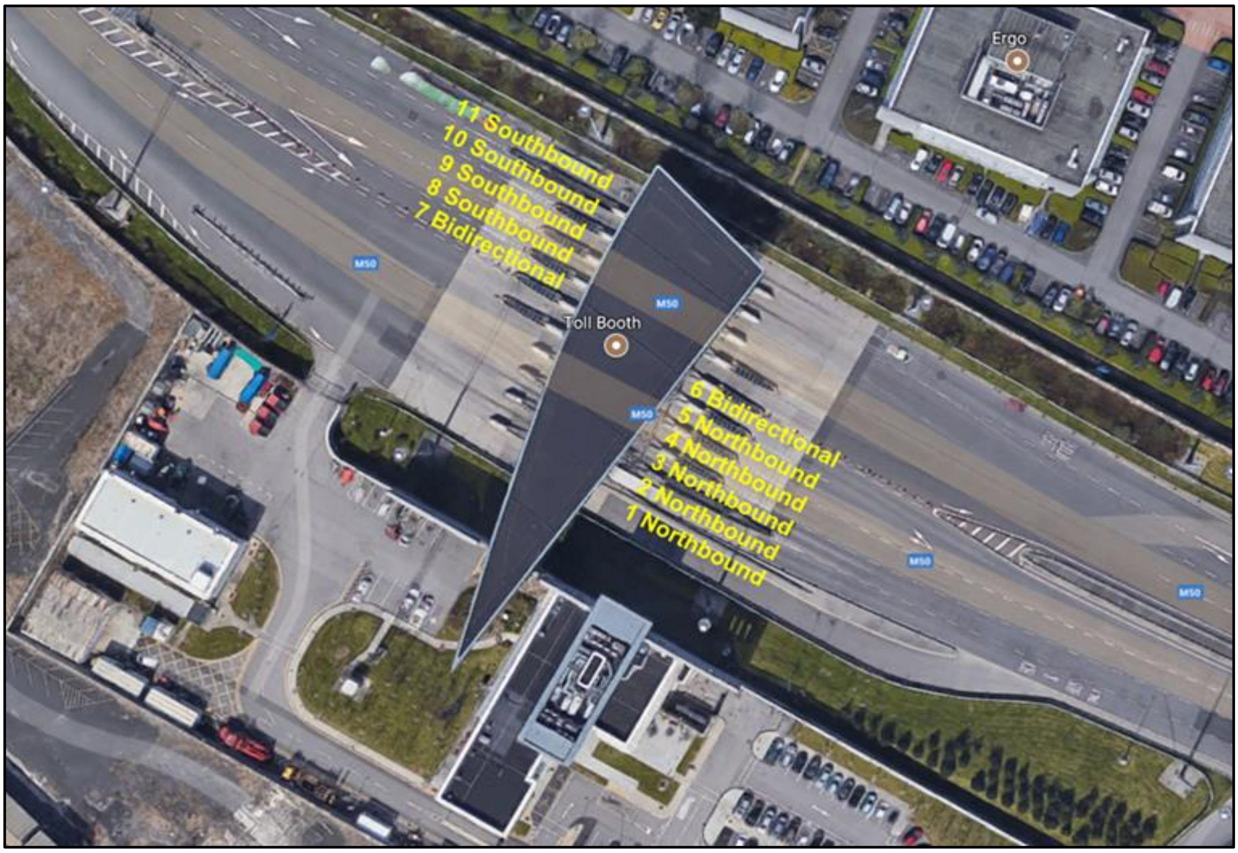


Figure 13-69 Toll Lanes at Dublin Port Tunnel Toll Plaza

Tables 13-10 and 13-11 show the existing daily traffic flows through the Tunnel and for each of the 3 peaks hours being assessed and for the entire day. Table 13-10 shows vehicle numbers and Table 13-11 shows PCUs.

Table 13-10 Existing Traffic Flows, Port Tunnel, 2018 - Vehicles

	Vehicles 2018											
	Northbound				**Southbound**				**2-Way Flow**			
	AM1 0615-0715	**AM2 0730-0830**	**PM 1645-1745**	**ALL DAY**	**AM1 0615-0715**	**AM2 0730-0830**	**PM 1645-1745**	**ALL DAY**	**AM1 0615-0715**	**AM2 0730-0830**	**PM 1645-1745**	**ALL DAY**
M/CYCLE	0	0	2	19	2	1	6	35	2	0	8	54
CAR	134	199	725	5,967	229	709	299	6,529	363	908	1,024	12,496
LGV	25	20	142	916	119	188	24	1,130	144	208	166	2,046
OGV1	37	41	67	833	136	112	19	1,040	173	153	86	1,873
OGV2	394	313	254	4,013	353	221	193	4,264	747	534	447	8,277
BUS	23	48	61	822	44	93	57	787	67	141	118	1,609
TOTAL	**612**	**613**	**1,251**	**14,618**	**883**	**1,325**	**640**	**13,889**	**1,495**	**1,938**	**1,891**	**28,507**
HGV & BUS	454	402	382	5,668	533	426	269	6,091	987	828	651	11,759
	74.2%	65.6%	30.5%	38.8%	60.4%	32.2%	42.0%	43.9%	66.0%	42.7%	34.4%	41.2%

Table 13-10 shows that 28,507 vehicles used the Dublin Port Tunnel on the day of the survey, 41.2% of which were HGVs and Buses. During the AM1 peak hour of 06:15-07:15, 74.2% of the 612 vehicles heading northbound in the Tunnel were HGVs or Buses.

Table 13-11 Existing Traffic Flows, Port Tunnel, 2018 – PCUs

	PCUs 2018											
	Northbound				Southbound				2-Way Flow			
	AM1 0615-0715	AM2 0730-0830	PM 1645-1745	ALL DAY	AM1 0615-0715	AM2 0730-0830	PM 1645-1745	ALL DAY	AM1 0615-0715	AM2 0730-0830	PM 1645-1745	ALL DAY
M/CYCLE	0	0	1	12	1	0	2	14	1	0	3	26
CAR	134	199	725	7,433	229	709	299	6,529	363	908	1,024	13,962
LGV	25	20	142	1,191	119	188	24	1,330	144	208	166	2,321
OGV1	56	62	101	1,481	204	168	29	1,560	260	230	129	3,041
OGV2	1,143	908	737	12,090	1,024	641	560	12,366	2166	1549	1296	24,456
BUS	46	96	122	1,660	88	186	114	1,574	134	282	236	3,234
TOTAL	**1,403**	**1,282**	**1,827**	**23,862**	**1,665**	**1,893**	**1,036**	**23,193**	**3,067**	**3,175**	**2,863**	**47,056**
HGV & BUS	1,245	1,066	960	15,231	1,316	995	703	15,500	2,560	2,061	1,661	30,731
	88.7%	83.2%	52.5%	63.8%	79.0%	52.6%	67.9%	66.8%	83.5%	64.9%	58.0%	65.3%

Table 13-11 shows that this translates to 47,056 PCUs that used Dublin Port Tunnel on the day of the survey, 65.3% of which were HGVs and Buses. During the AM1 peak hour of 06:15-07:15, 88.7% of the 1,403 PCUs heading northbound in the Tunnel were HGVs or Buses.

Within the NTA Regional Transport Model for the Greater Dublin Area, the Dublin Port Tunnel is coded with a capacity of 3,800 PCUs per hour per direction. This may be an underestimation of the capacity with 2-lane motorways elsewhere in Ireland have observed flows exceeding 4,000 PCU/hour.

Analysis carried out in the Strategic Transportation Study showed that the Dublin Port Tunnel is operating at approximately half of its modelled capacity, as is confirmed by the recent traffic survey. Table 13-11 shows that even half of the one-way flow of 1,900 PCU/hour per direction wasn't exceeded on the day of the traffic survey. The northbound PM 16:45-17:45 flows reached 1,827 PCUs and the southbound AM2 07:30-08:30 was 1,893 PCUs.

It is understood that the NTA Regional Transport Model has been the subject of some previous concerns relating to the quality of presentation of results and real world delays compared to the modelled average. However, this Chapter only makes reference to the Motorway capacity coded into the NTA model, and to our understanding this parameter hasn't been subject to previous concerns.

13.10.7 Existing Traffic Flows at Dublin Port Accesses

Table 13-12 summarises the traffic volumes in PCUs generated by the Dublin Port Estate on the day of the traffic survey over its four existing accesses.

Table 13-12 Existing Traffic Flows Generated by the Port

Port Access	AM1 06:15-07:15		AM2 07:30-08:30		PM 16:45-17:45	
	Arrive to Dublin Port	Depart from Dublin Port	Arrive to Dublin Port	Depart from Dublin Port	Arrive to Dublin Port	Depart from Dublin Port
Promenade Road	958	1,171	710	809	483	1,184
Alexandra Road	415	127	283	119	196	151
Terminal 3 P&O	132	131	40	31	91	59
Cruise Berth	10	2	5	7	4	1
Total	**1,516**	**1,431**	**1,065**	**1,019**	**775**	**1,391**

The table confirms that the Port Estate generates more traffic during the AM1 peak hour compared to the other external peak hours.

As referenced earlier a Strategic Transportation Study was prepared to inform the Strategic Environmental Assessment process associated with the Dublin Port Masterplan 2040, reviewed 2018.

Saturn models were built for the Strategic Transportation Study based on cordoned extracts from the NTA multi-modal model for Dublin City. The Saturn cordoned extract was combined with the latest traffic surveys to establish an origin-destination matrix for existing traffic flows between each of the four Port accesses and each of the five approach roads to the Port. The traffic distribution matrix for each of the 3 peak hours is included in Tables 13-13 to 13-15.

By way of example the first entry in Table 13-13 shows that 670 PCUs arrived from the Dublin Port Tunnel to the Promenade Road access of the Port Estate during AM1 peak hour. In the same hour 995 PCUs departed from the Promenade Road access of the Port Estate towards the Dublin Port Tunnel.

Table 13-13 Existing Origin / Destination Traffic Distribution Matrix for AM1

	AM1 PCU 06:15-07:15				
	Approach Road	To Dublin Port PCU	From Dublin Port PCU	To Dublin Port %age	From Dublin Port %age
Promenade Road Access	Dublin Port Tunnel	670	995	69.9%	85.0%
	East Wall Road	141	76	14.7%	6.5%
	Sherriff Street Upper	17	17	1.8%	1.5%
	North Wall Quay	53	64	5.6%	5.5%
	Tom Clarke Bridge	76	18	8.0%	1.5%
	Total	958	1171	100.0%	100.0%
Alexandra Road Access WITHOUT THE DPC OFFICES	Dublin Port Tunnel	193	61	47.6%	49.4%
	East Wall Road	64	5	15.7%	3.9%
	Sherriff Street Upper	7	15	1.6%	12.1%
	North Wall Quay	87	32	21.6%	25.9%
	Tom Clarke Bridge	55	11	13.5%	8.7%
	Total	405	124	100.0%	100.0%
P&O Access	Dublin Port Tunnel	103	43	78.1%	33.2%
	East Wall Road	19	9	14.6%	6.9%
	Sherriff Street Upper	10	8	7.3%	6.4%
	North Wall Quay	0	62	0.0%	47.0%
	Tom Clarke Bridge	0	8	0.0%	6.4%
	Total	132	131	100.0%	100.0%
Cruise Berth	Dublin Port Tunnel	3	1	32.8%	50.0%
	East Wall Road	4	1	46.9%	50.0%
	Sherriff Street Upper	0	0	3.5%	0.0%
	North Wall Quay	1	0	6.3%	0.0%
	Tom Clarke Bridge	1	0	10.5%	0.0%
	Total	10	2	100.0%	100.0%
DPC Port Offices Only	Dublin Port Tunnel	0	0	2.8%	2.6%
	East Wall Road	4	0	41.2%	15.2%
	Sherriff Street Upper	0	1	2.5%	43.9%
	North Wall Quay	4	1	43.1%	31.7%
	Tom Clarke Bridge	1	0	10.4%	6.6%
	Total	10	3	100.0%	100.0%
TOTAL	Dublin Port Tunnel	970	1101	64.0%	77.0%
	East Wall Road	233	91	15.4%	6.4%
	Sherriff Street Upper	34	42	2.2%	3.0%
	North Wall Quay	146	159	9.6%	11.1%
	Tom Clarke Bridge	133	37	8.8%	2.6%
	Total	**1516**	**1431**	**100.0%**	**100.0%**

Table 13-14 Existing Origin / Destination Traffic Distribution Matrix for AM2

	AM2 PCU 07:30-08:30				
	Approach Road	**To Dublin Port PCU**	**From Dublin Port PCU**	**To Dublin Port %age**	**From Dublin Port %age**
Promenade Road Access	Dublin Port Tunnel	395	656	55.6%	81.1%
	East Wall Road	100	76	14.0%	9.4%
	Sherriff Street Upper	27	17	3.8%	2.1%
	North Wall Quay	54	40	7.6%	4.9%
	Tom Clarke Bridge	135	20	19.0%	2.4%
	Total	710	809	100.0%	100.0%
Alexandra Road Access WITHOUT THE DPC OFFICES	Dublin Port Tunnel	115	61	47.2%	52.6%
	East Wall Road	18	4	7.5%	3.6%
	Sherriff Street Upper	6	18	2.6%	15.8%
	North Wall Quay	64	24	26.3%	20.4%
	Tom Clarke Bridge	40	9	16.4%	7.5%
	Total	244	115	100.0%	100.0%
P&O Access	Dublin Port Tunnel	40	31	59.6%	36.6%
	East Wall Road	16	8	23.8%	9.6%
	Sherriff Street Upper	11	1	16.6%	1.0%
	North Wall Quay	0	37	0.0%	44.1%
	Tom Clarke Bridge	0	7	0.0%	8.7%
	Total	40	31	59.6%	36.6%
Cruise Berth	Dublin Port Tunnel	0	3	9.5%	40.0%
	East Wall Road	1	2	26.0%	31.0%
	Sherriff Street Upper	0	1	4.5%	15.5%
	North Wall Quay	0	1	0.0%	13.5%
	Tom Clarke Bridge	3	0	60.0%	0.0%
	Total	5	7	100.0%	100.0%
DPC Port Offices Only	Dublin Port Tunnel	2	0	5.1%	7.0%
	East Wall Road	8	0	20.0%	3.1%
	Sherriff Street Upper	3	1	8.2%	42.8%
	North Wall Quay	20	2	50.4%	45.2%
	Tom Clarke Bridge	6	0	16.3%	1.9%
	Total	39	4	100.0%	100.0%
TOTAL	Dublin Port Tunnel	552	751	51.8%	73.6%
	East Wall Road	143	91	13.4%	8.9%
	Sherriff Street Upper	48	39	4.5%	3.8%
	North Wall Quay	138	103	13.0%	10.1%
	Tom Clarke Bridge	184	36	17.3%	3.5%
	Total	**1,065**	**1,019**	**100.0%**	**100.0%**

Table 13-15 Existing Origin / Destination Traffic Distribution Matrix for PM

	PM PCU 16:45-17:45				
	Approach Road	To Dublin Port PCU	From Dublin Port PCU	To Dublin Port %age	From Dublin Port %age
Promenade Road Access	Dublin Port Tunnel	351	773	72.7%	65.4%
	East Wall Road	34	208	7.0%	17.6%
	Sherriff Street Upper	8	34	1.7%	2.9%
	North Wall Quay	45	96	9.4%	8.1%
	Tom Clarke Bridge	44	70	9.1%	6.0%
	Total	483	1,181	100.0%	100.0%
Alexandra Road Access WITHOUT THE DPC OFFICES	Dublin Port Tunnel	110	36	56.2%	29.0%
	East Wall Road	13	2	6.5%	1.8%
	Sherriff Street Upper	2	37	1.1%	29.7%
	North Wall Quay	35	35	18.1%	28.2%
	Tom Clarke Bridge	36	14	18.2%	11.4%
	Total	195	125	100.0%	100.0%
P&O Access	Dublin Port Tunnel	73	31	80.1%	51.9%
	East Wall Road	9	3	10.2%	5.3%
	Sherriff Street Upper	9	0	9.8%	0.5%
	North Wall Quay	0	16	0.0%	27.3%
	Tom Clarke Bridge	0	9	0.0%	15.1%
	Total	91	59	100.0%	100.0%
Cruise Berth	Dublin Port Tunnel	0	1	0.0%	94.5%
	East Wall Road	0	0	0.0%	5.4%
	Sherriff Street Upper	0	0	0.0%	0.2%
	North Wall Quay	4	0	100.0%	0.0%
	Tom Clarke Bridge	0	0	0.0%	0.0%
	Total	4	1	100.0%	100.0%
DPC Port Offices Only	Dublin Port Tunnel	0	3	0.8%	12.4%
	East Wall Road	0	0	27.6%	1.1%
	Sherriff Street Upper	0	11	6.8%	42.8%
	North Wall Quay	1	9	58.7%	33.6%
	Tom Clarke Bridge	0	3	6.1%	10.1%
	Total	1	26	100.0%	100.0%
TOTAL	Dublin Port Tunnel	534	843	68.9%	60.7%
	East Wall Road	56	214	7.2%	15.4%
	Sherriff Street Upper	20	82	2.5%	5.9%
	North Wall Quay	86	155	11.0%	11.2%
	Tom Clarke Bridge	80	96	10.3%	6.9%
	Total	**775**	**1,391**	**100.0%**	**100.0%**

13.10.8 Assessment Years

The key Assessment Years of 2026, 2031 and 2040 have been selected for the TTA:

- 2026 reflects about two thirds of the construction works for the MP2 Project being completed ;
- 2031 reflects the substantial completion of the MP2 Project construction works;
- 2040 is the end of the Dublin Port Masterplan 2040, reviewed 2018.

Figure 13-70 illustrates how the assessment years 2026 and 2031 fit into the construction programme.

These years also are generally consistent with the typical assessment year process for TTAs, which is the year of opening, 5 years after the year of opening and 15 years after the year of opening.

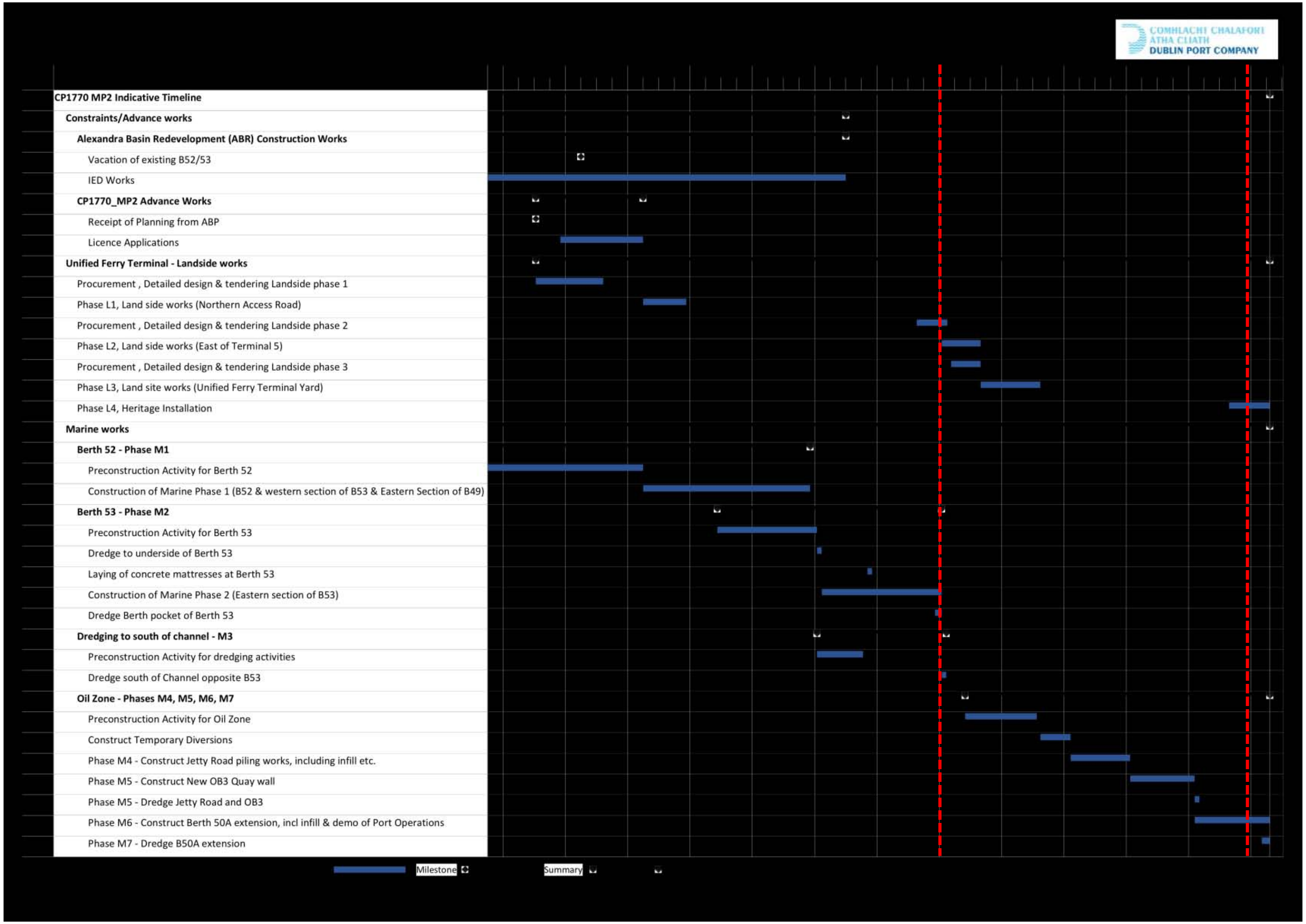
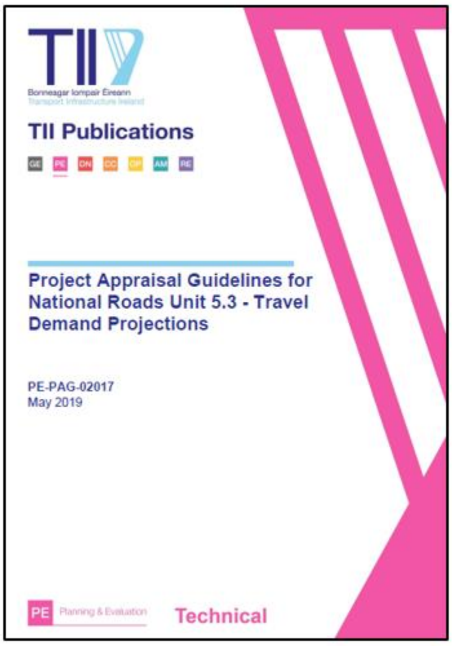


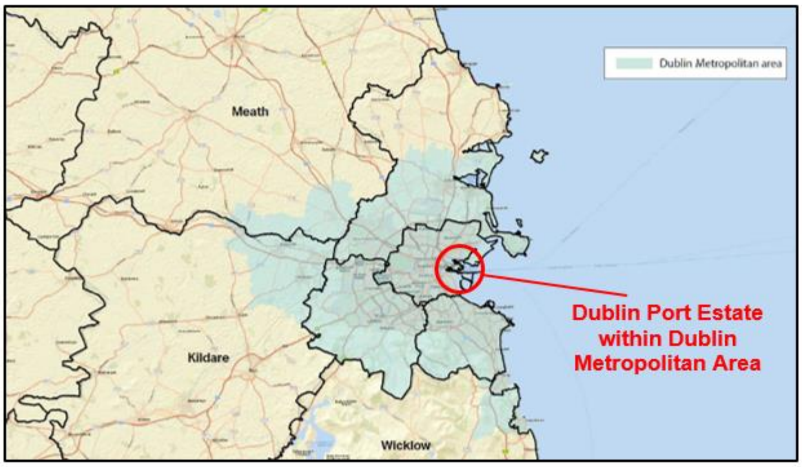
Figure 13-70 Construction Programme Highlighting the 2026 and 2031 Assessment Years

13.10.9 Traffic Growth for Non-Port Traffic

The use of growth rates from TII's Project Appraisal Guidance (PAG) for National Roads Unit 5.3 – Travel Demand Projections (May 2019) have been applied to the non-Port traffic on the road network.

Table 6.1 of the PAG guidelines set out the criteria for projecting traffic growth for non-Port traffic. Figure 13-71 shows an extract from the PAG guidelines for the MP2 Project within the Dublin Metropolitan Area.





Metropolitan Area	Low Sensitivity Growth Rates						Central Growth Rates						High Sensitivity Growth Rates					
	2016-2030		2030-2040		2040-2050		2016-2030		2030-2040		2040-2050		2016-2030		2030-2040		2040-2050	
	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV
Dublin	1.0146	1.0280	1.0034	1.0116	1.0028	1.0144	1.0162	1.0295	1.0051	1.0136	1.0044	1.0162	1.0191	1.0328	1.0087	1.0172	1.0093	1.0256

Figure 13-71 Extracted PAG Table 6.1 Link-Based Growth Rates: Metropolitan Area Annual Growth Rates

For the purposes of this assessment, it is proposed to use PAG growth rates 'High Sensitivity Growth' in order to provide a more robust assessment of the non-Port traffic on the external road network.

Light Vehicle (LV) to Heavy Vehicle (HV) Ratio for the Non-Port Traffic

An assessment of the non-Port traffic on the selected toad network for each of the 3 selected peak hours showed the following:

- AM1 06:15 to 07:15: Non-Port traffic heavy vehicle percentage = 15.9%
- AM2 07:30 to 08:30: Non-Port traffic heavy vehicle percentage = 14.1%
- PM 16:45 to 17:45: Non-Port traffic heavy vehicle percentage = 10.8%

The proportion of non-Port heavy vehicles never exceeds 15.9% for any of the peak hours. A Light Vehicle (LV) to Heavy vehicle (HV) ratio for the non-Port traffic was taken as 80%(LV) : 20%(HV) to provide a robust assessment.

Therefore, assuming High Sensitivity Growth this will be as follows:

- 2016 - 2030 (1.0191 x 0.8) + (1.0328 x 0.2) = 1.02184
- 2030 - 2040 (1.0087 x 0.8) + (1.0172 x 0.2) = 1.0104

The growth factors where then calculated for the future assessment years, centred on the 2018 surveyed base year, using these calculated annual growth rates (see Table 13-16).

Table 13-16 PAG Growth Factor for Non-Port Traffic

Growth Factor	Base Year	Future Year	Factor
High Sensitivity Growth	2018	2026	1.1887 (118.9% increase)
		2031	1.3094 (130.9% increase)
		2040	1.4372 (143.7% increase)

13.10.10 MP2 Project Traffic Generation

The Dublin Port Masterplan 2040, reviewed 2018 anticipates that throughput will have grown to 77.2m gross tonnes by 2040, resulting in an Average Annual Growth Rate (AAGR) of 3.3% between 2010 and 2040 at the Port. Therefore all Port related traffic flows have been assigned the 3.3% per annum growth rate.

Table 13-17 shows the percentage increase in traffic growth from the base year, 2018, until the end of the Masterplan at 2040.

Table 13-17 Port Traffic Growth Rates

Time Period		Growth Rate
From	To	
2018	2019	103.3%
2018	2020	106.7%
2018	2021	110.2%
2018	2022	113.9%
2018	2023	117.6%
2018	2024	121.5%
2018	2025	125.5%
2018	2026	129.7%
2018	2027	133.9%
2018	2028	138.4%
2018	2029	142.9%
2018	2030	147.6%
2018	2031	152.5%
2018	2032	157.5%
2018	2033	162.7%
2018	2034	168.1%
2018	2035	173.7%
2018	2036	179.4%
2018	2037	185.3%
2018	2038	191.4%
2018	2039	197.7%
2018	2040	204.3%

Table 13-17 demonstrates that, using the 3.3% per annum growth rate results in the 2026 traffic being 129.7% higher than the base year of 2018. 2031 traffic flows will be 152.5% higher and in 2040 the Port traffic will be 204.3% higher than the 2018 flows, more than double.

13.10.11 Growth Rate of 3.3% per annum provides a Robust Assessment

This section of the report explains how the use of the 3.3% growth rate per annumr provides a robust assessment for the traffic to be generated by the MP2 Project.

Number of Vessels in the UFT Assessed in the TTA

The assessment is based on UFT containing Irish Ferries, Stena and P&O. Importantly, it is highlighted that the traffic from 3 Freight & Passenger Ro-Ro vessels are contained within each of the peak hours above:

- AM1: Irish Ferries Ulysses, Stena Adventurer and P&O Norbay;
- AM2: Irish Ferries Ulysses, Stena Adventurer and Irish Ferries Dublin Swift;
- PM: Irish Ferries Ulysses, Stena Adventurer and P&O Norbank;

As the proposed growth rate of 3.3% per annum more than doubles the traffic flows at the Port, the TTA therefore assesses the traffic from the equivalent of 6 Freight & Passenger Ro-Ro vessels within each peak hour assessment. As there are only 5 berths at the UFT this methodology is considered as a robust assessment, assessing just beyond the upper limit of what is physically achievable on the ground.

Number of Lane Metres in the UFT Assessed in the TTA

To explore this concept further, the number of lane metres being assessed during each peak hour has been summarised in Table 13-18.

The Ulysses is the one of the world's largest Ro-Ro Freight & Passenger vessels, and converting the lane metres in the equivalent number of Ulysses vessels helps to portray the number of lane metres in a real world context.

As the Table shows, using the 3.3% per annum methodology assesses19,677 lane metres during the AM1 and PM peak hour, the equivalent of 4.8 Ulysses. During the AM2 peak hour traffic generated by 18,094 lane metres have been assessed, or the equivalent of 4.4 Ulysses vessels.

The UFT will have 4 double Ro-Ro ramps and 1 single Ro-Ro ramp. It takes a double ramp to serve a large Ro-Ro such as Ulysses, so the handling capacity of the ramps on the ground is about 4.5 Ulysses vessels.

Therefore assessing the traffic generated by the equivalent of 4.4 and 4.8 Ulysses vessels within the TTA is again just beyond the upper limit of what is physically achievable on the ground, and therefore represents a robust assessment.

Table 13-18 Existing and Proposed Lane Metres being assessed in the UFT

Peak Hour	Vessel		Number of Lanes Metres			Equivalent No. of Ulysses Assessed in the Proposed Flows
			Per Vessel	Total No. of Existing Lane Metres	Total No. of Proposed Lane Metres Assessed in 2040	
AM1		Irish Ferries Ulysses	4,076	9,633	19,677	4.8
		Stena Adventurer	3,517			
		P&O Norbay	2,040			
AM2		Irish Ferries Ulysses	4,076	8,858	18,094	4.4
		Stena Adventurer	3,517			
		Irish Ferries Dublin Swift	1,265			
PM		Irish Ferries Ulysses	4,076	9,633	19,677	4.8
		Stena Adventurer	3,517			
		P&O Norbank	2,040			

Larger Ro-Ro Vessels in the UFT

It is acknowledged in the Dublin Port Masterplan 2040, reviewed 2018 that vessels are getting bigger, and DPC anticipates that Ro-Ro Freight & Passenger Vessels with up to 5,600 lane metres could utilise UFT towards the end of the life span of the Masterplan.

The number of lanes metres assessed in the TTA is equivalent to 3.5 of these larger vessels berthed simultaneously during the AM1 and PM peak hours, and 3.2 of these vessels berthed simultaneously during the AM2 peak hour.

Equally, it is equivalent to a combination of up to 5 Ro-Ro vessels of various sizes. For example, the number of lanes metres assessed in the TTA is equivalent to two larger 5,600 lane metre vessels, two Stena Adventures and the Dublin Swift within UFT in both the AM1 and PM peak hour assessments. The traffic assessed in the proposed AM2 peak hour is equivalent to two larger 5,600 lane metre vessels and two Stena Adventures.

These particular examples are illustrated fully in full in Table 13-19.

These theoretical scenarios, or any combination of vessels coming to approximately the same total, have all been assessed within the TTA.

Table 13-19 Vessels Equivalent to the Lane Metres being assessed in the UFT in 2040

Peak Hour	Example of a Combination of Vessels	Number of Lanes Metres		
		Per Vessel	Total No. of Lane Metres for the Example Shown	Total No. of Proposed Lane Metres Assessed in 2040 in the TTA
AM1	 Larger Ro-Ro Freight & Passenger	5,600	19,499	19,677
	 Larger Ro-Ro Freight & Passenger	5,600		
	 Stena Adventurer	3,517		
	 Stena Adventurer	3,517		
	 Dublin Swift	1,265		
AM2	 Larger Ro-Ro Freight & Passenger	5,600	18,234	18,094
	 Larger Ro-Ro Freight & Passenger	5,600		
	 Stena Adventurer	3,517		
	 Stena Adventurer	3,517		
PM	 Larger Ro-Ro Freight & Passenger	5,600	19,499	19,677
	 Larger Ro-Ro Freight & Passenger	5,600		
	 Stena Adventurer	3,517		
	 Stena Adventurer	3,517		
	 Dublin Swift	1,265		

Number of Ro-Ro Units in the UFT assessed in the TTA

The indicative increase in Ro-Ro throughput within the UFT from 2018 to 2040 was presented earlier in Chapter 2 of the EIAR (Project Rationale, Table 2-5). The Volume of Units at the UFT is predicted to increase from 725,000 to 1,164,000. This represents a 2.2% increase per annum. A 3.3% per annum increase between 2018 and 2040 would result in 1,481,000 Units, much higher than anticipated in the Project Rationale.

Table 2-6 of the Project Rationale shows that the Ro-Ro berths in the MP2 Project are expected to accommodate 1,280,000 Units pa. This is included in Table 13-20 for convenience.

Table 13-20 Indicative Ro-Ro Berth Throughput Capacities for the MP2 Project

Berth with UFT	Ro-Ro Ramp	Ramp Capacity (Units pa)
Berth 51	Double	240,000
Berth 51A	Single	100,000
Berth 49	Double	350,000
Berth 52	Double	350,000
Berth 53	Double	240,000
Total		**1,280,000**

Hence the TTA assessment, which reflects 1,477,000 Units through UFT in the year 2040, is robust and once again is beyond the upper limit of what is physically achievable on the ground.

Therefore, the TTA methodology of applying a 3.3% per annum to the existing traffic provides an assessment of the UFT which is additionally robust and beyond the upper limit of what is physically achievable on the ground in 2040 in terms of the number of vessels berthed, the number of lane metres and the number of Ro-Ro Units.

13.10.12 Existing Future Year Traffic Flows

Existing Traffic Flow Diagrams have been established for each of the peak hours for the 3 future assessment years. These flows assume no changes to the surrounding road network, port accesses or internal road layout, and essentially provide a ‘do nothing’ baseline for the traffic flows.

Table 13-21 includes a schedule that summaries how the ‘do nothing’ future year traffic flows were derived.

Table 13-21 Schedule of Derivation of the Do Nothing Future Year Traffic Flows

Step No.	Action to Derive the Existing Future Year Traffic Flows
1	Using the origin-destination traffic distribution detailed in Tables 13-13, 13-14 and 13-15 above to separate Port traffic from non-Port traffic.
2	Apply the TII TAG future year growth rates as shown in Table 13-16 to the non-Port traffic flows for the years 2026, 2031 and 2040. These are: • 2018-2016: 118.9%; • 2018-2031: 130.9%; and • 2018-2040: 143.7%.
3	Apply the Port traffic growth rates from Table 13-17 to provide traffic flows for the Port only traffic flows, which are: • 2018-2016: 129.7%; • 2018-2031: 152.7%; and • 2018-2040: 204.3%.
4	Add the future year non-Port traffic flows from Step No 2 above to the Port traffic flows described in Step 3 to provide Existing Traffic Flows for each of the 3 peak hours.

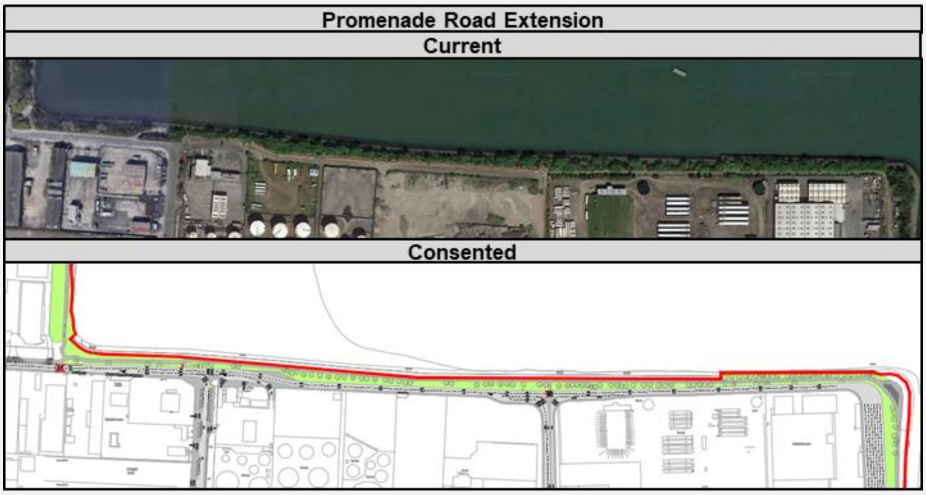
The resultant Do Nothing Traffic Flows Diagrams are included in Appendix 13-2 for each of the 3 peak hours. For ease of reference each Diagram has a unique reference number.

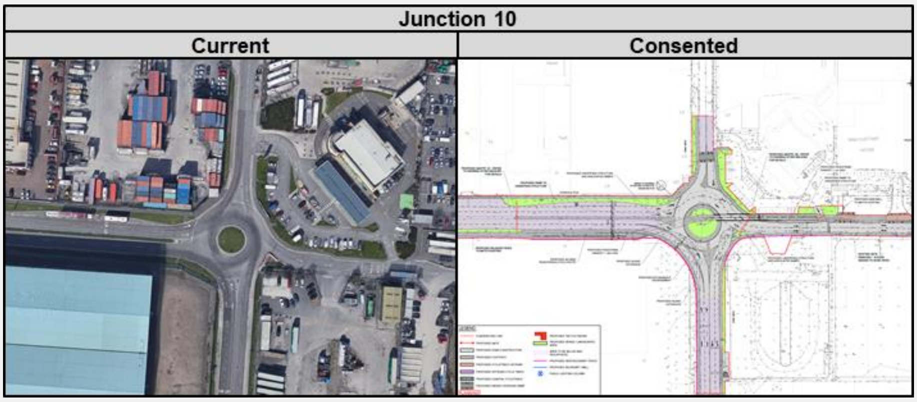
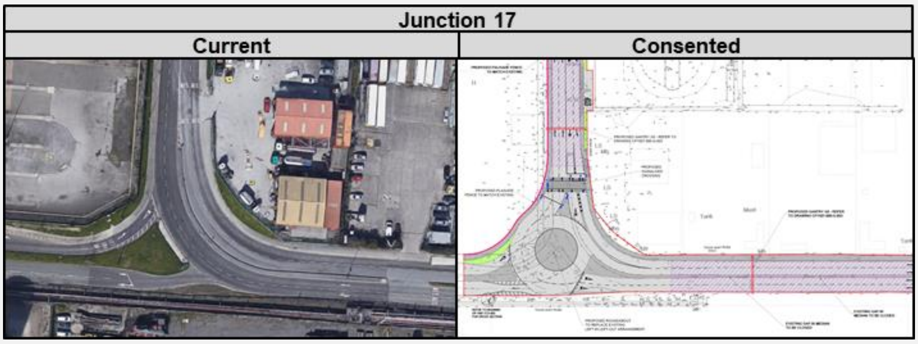
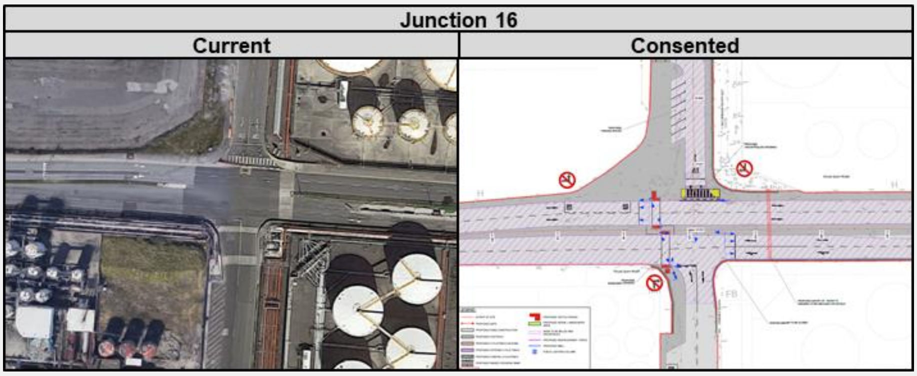
Diagram Name	Unique Reference Number
Existing Traffic Flows Diagram, AM Peak Hour for the Internal Road Network, 2026	AM1-EX-26
Existing Traffic Flows Diagram, AM Peak Hour for the Internal Road Network, 2031	AM1-EX-31
Existing Traffic Flows Diagram, AM Peak Hour for the Internal Road Network, 2040	AM1-EX-40
Existing Traffic Flows Diagram, AM Peak Hour for the External Road Network, 2026	AM2-EX-26
Existing Traffic Flows Diagram, AM Peak Hour for the External Road Network, 2031	AM2-EX-31
Existing Traffic Flows Diagram, AM Peak Hour for the External Road Network, 2040	AM2-EX-40
Existing Traffic Flows Diagram, PM Peak Hour for the External Road Network, 2026	PM-EX-26
Existing Traffic Flows Diagram, PM Peak Hour for the External Road Network, 2031	PM-EX-31
Existing Traffic Flows Diagram, PM Peak Hour for the External Road Network, 2040	PM-EX-40

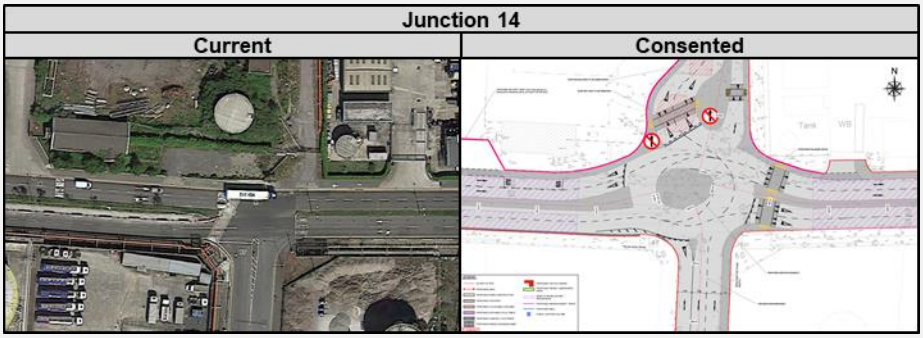
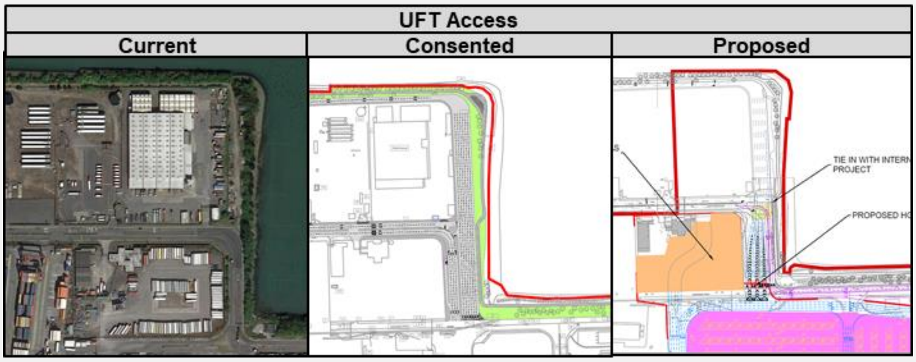
13.10.13 Proposed Traffic Flows

All of the proposed changes to the external road layout, the Dublin Port Estate accesses, the internal road layout, the MP2 Project and the future year traffic growth rates have been progressed to produce Proposed Traffic Flow Diagrams. Table 13-22 includes a schedule that summaries how the Proposed Traffic flows were derived.

Table 13-22 Schedule of Derivation of the Proposed Traffic Flows

Step No.	Action to Derive the Proposed Traffic Flows
1	Using the origin-destination traffic distribution detailed in Tables 13-13, 13-14 and 13-15 above to separate Port traffic from non-Port traffic.
2	Apply the TII TAG future year growth rates as shown in Table 13-16 to the non-Port traffic flows for the years 2026, 2031 and 2040. These are: • 2018-2016: 118.9%; • 2018-2031: 130.9%; and • 2018-2040: 143.7%.
3	Redistribute the internal Port only traffic flows to take account of the upgrade of the new internal road network. These are summarised below in Steps 4 to 9.
4	The construction of the Promenade Road Extension giving access from the existing Promenade Road to the UFT (From Junction 11 to Junction 13) 

5	Enlargement and lane reconfigurations to the Promenade Road Roundabout (Junction 10) 
6	Proposed Bond Road Roundabout which permits all turning movements (Junction 17). 
7	Reconfiguration of Junction 16 which permits left-in left-out turning movements only with traffic signal controlled pedestrian crossing. 

8	New roundabout at Junction 12. Note that this has been considered as southbound only with the traffic models. 
9	Reconfigure the Irish Ferries and Stena traffic flows to take account of the new UFT access arrangements as part of the MP2 Project. The UFT predominantly uses Promenade Road Extension for direct entry and Tolka Quay Road for direct exit. 
10	Reallocate the Seatruck traffic movements from the eastern side of the port to a new access at the western end of Tolka Quay Road, taking advantage of the consented ‘all movements’ roundabout at Bond Drive (Junction 17).
11	Reallocate the traffic from the Terminal 3 P&O access on East Wall Road to the UFT Access at the eastern end of the Port.
12	Close the Alexandra Road Access with East Wall Road to all operational Port traffic (Junction 4). Only the traffic for the Port Centre continues to use this access. Reallocate the operational traffic to the Promenade Road Access taking account of the revisions to the internal road network.

13	Close the Cruise Berth Access at North Quay Extension (Junction 1). Reallocate the traffic to the Promenade Road Access.
14	Redistribute the existing DFT traffic taking account of the revisions to the internal road network and Port access arrangements with East Wall Road.
15	Once all of the changes are in place used the Port traffic growth rates from Table 13.17 to provide Port only traffic flows for the assessment years, which are • 2018-2016: 129.7%; • 2018-2031: 152.7%; and • 2018-2040: 204.3%.
16	Add the future year non-Port traffic flows from Step 2 above to the Port reconfigured traffic flows described in Step 16 to provide Proposed Traffic Flows for each of the 3 peak hours.

The resultant Proposed Traffic Flows Diagrams are included in Appendix 13-3 for each of the 3 peak hours. For ease of reference each Diagram has a unique reference number.

Diagram Name	Unique Reference Number
Proposed Traffic Flows Diagram, AM Peak Hour for the Internal Road Network, 2026	AM1-PR-26
Proposed Traffic Flows Diagram, AM Peak Hour for the Internal Road Network, 2031	AM1-PR-31
Proposed Traffic Flows Diagram, AM Peak Hour for the Internal Road Network, 2040	AM1-PR-40
Proposed Traffic Flows Diagram, AM Peak Hour for the External Road Network, 2026	AM2-PR-26
Proposed Traffic Flows Diagram, AM Peak Hour for the External Road Network, 2031	AM2-PR-31
Proposed Traffic Flows Diagram, AM Peak Hour for the External Road Network, 2040	AM2-PR-40
Proposed Traffic Flows Diagram, PM Peak Hour for the External Road Network, 2026	PM-PR-26
Proposed Traffic Flows Diagram, PM Peak Hour for the External Road Network, 2031	PM-PR-31
Proposed Traffic Flows Diagram, PM Peak Hour for the External Road Network, 2040	PM-PR-40

13.10.14 Proposed Barrier Capacity

This Section considers the entrance capacity of the barriers at the UFT in both peak hour and 15 minutes segments for the combined 14 barriers, and for the 6 HGV and 8 dual use barriers separately.

Combined Capacity of the 14 Barriers

This chapter has described the existing daily traffic volumes and patterns for Irish Ferries, Stena and P&O. Figure 13-72 shows the total daily traffic patterns for the 3 operators on the day of the traffic survey, a typical day (in vehicles).

Combining the traffic flows for the 3 operators, and increasing then by 204.3%, gives an indication of the traffic patterns that will be arriving and departing at the proposed UFT in 2040. This is indicated in Figures 13-73 and 13-74, shown in PCUs. Figure 13-73 shows the distinct spike in traffic flows associated with the disembarking Ro-Ro vessels.

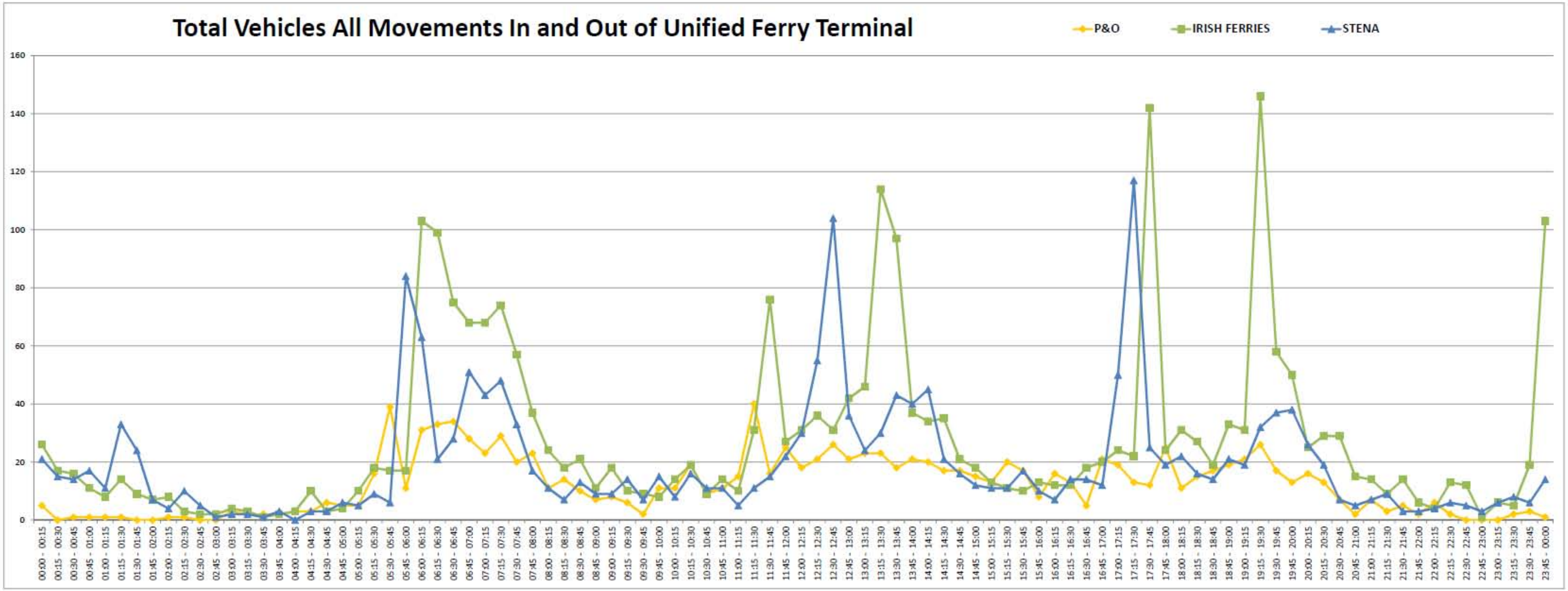


Figure 13-72 Total Vehicles Departing from and Arriving to Irish Ferries, Stena and P&O, 2018

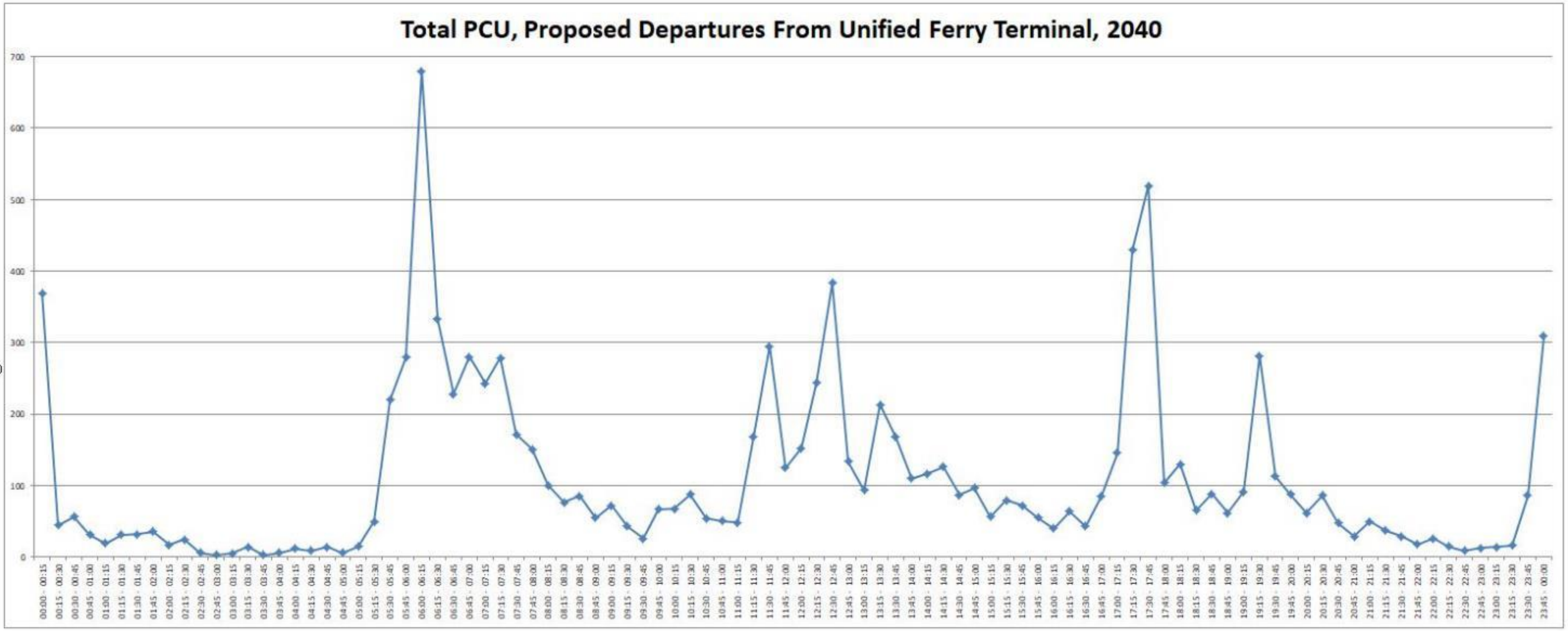


Figure 13-73 Daily Vehicles Departing from UFT in 2040 in PCUs

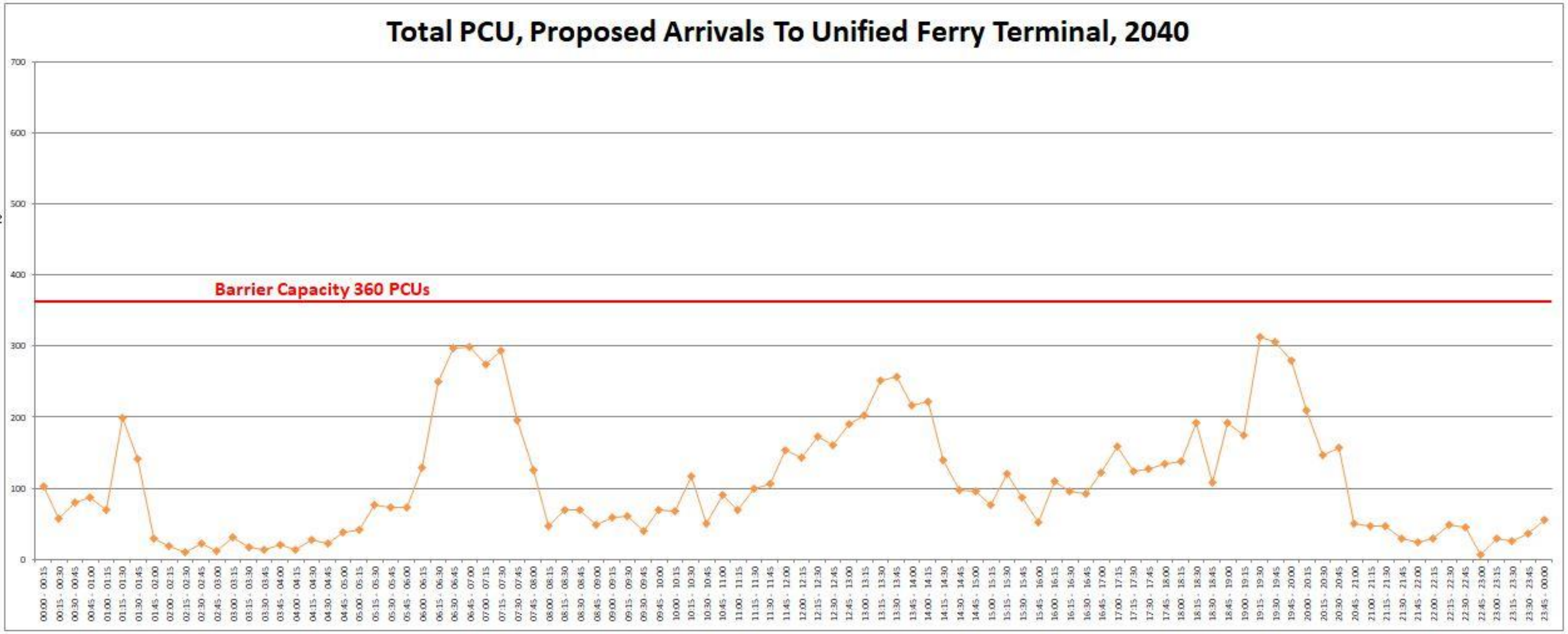


Figure 13-74 Daily Vehicles Arriving at the UFT in 2040 in PCUs

Each PCU is considered as having 30 second delay at the barrier. Table 13-23 shows that the resulting delays per vehicle type are 30 seconds for cars and LGVs, 45 seconds per OGV1 and 87 seconds per OGV2. This is considered a representative assessment.

Table 13-23 Number of Second Delay per Vehicle Type at the Barrier

Class	Description	(PCU) Factor	No of Seconds delayed at the Barrier
Car/Taxi		1	30
Light Goods Vehicle (LGV)		1	30
Other Goods Vehicle Type 1 (OGV1)		1.5	45
Other Goods Vehicle Type 2(OGV2)		2.9	87

There are 14 barriers proposed at the entrance to the UFT. The capacity of the barriers is considered to be 420 PCUs per 15 minute period, calculated as follows.

- 1 Hour is 3,600 seconds.
- 14 Barriers is 3,600 x 14 = 50,400 Seconds.
- Each PCU is considered as having 30 second delay at the barrier.
- This equates to 50,400 / 30 = 1,680 PCUs per hour
- 1,680 / 4 = 420 PCUs per 15 minutes.

A line is shown on Figure 13-74 at the 360 PCU mark. Figure 13.74 shows that the predicted arriving traffic flows to the UFT in 2040 does not exceed this line during any 15 minute period throughout the day. Therefore, combined, the 14 barriers have sufficient capacity to accommodate the PCUs arriving at the UFT in 2040 with no cumulative queueing occurring.

Separate Capacity of the 6 HGV Barriers and the 8 Dual-Use Barriers – Peak Hour

Linked LinSig modelling was carried out to assess the 6 barriers allocated to HGV traffic and the 8 dual use barriers. The results of the modelling are presented diagrammatically in Appendix 13-5 and are tabulated in Appendix 13-6. The Linked LinSig digital files are included in Appendix 13-8. As above, the model is based on each PCU having a 30 second delay at the barrier. Note that Linked LinSig assesses the traffic over an hour.

The modelling has been based on 2 of the dual use barriers being used for HGVs and the remaining 6 dual use barriers being used for non-HGVs.

The model includes the signalisation of the Tolka Quay Road / Promenade Road Extension with pedestrian crossing facilities, and the entry and exit of the from the access road to the parking and set down / pick up area.

The Linked LinSig model results show that during the worst case peak hour, AM1 0615-1715, there is ample spare capacity at the 6 non-HGV barriers and spare capacity at each of the 8 HGV barriers. This is evidenced in Figure 13-76.

Note that Figure 13-75 shows how the results are presented on each link within each Linked LinSig diagram. The capacity of each arm of the junction is measured in Degree of Saturation (DOS). A DOS of less than 100% indicates that the junction arm is operating within capacity. A percentage exceeding 100% indicates the arm is operating over capacity. The queue shown is the maximum queue that occurs on the lane during the modelled hour in PCUs.

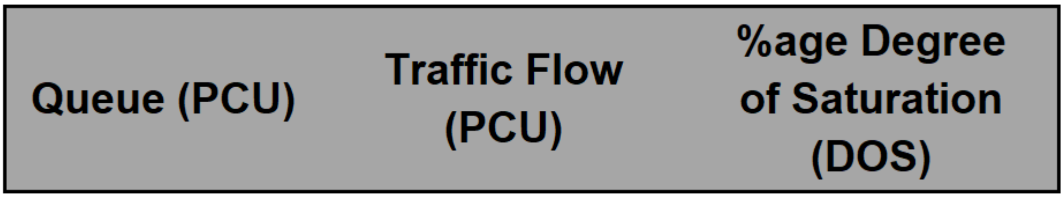


Figure 13-75 Format of Linked LinSig Results on Network Diagrams

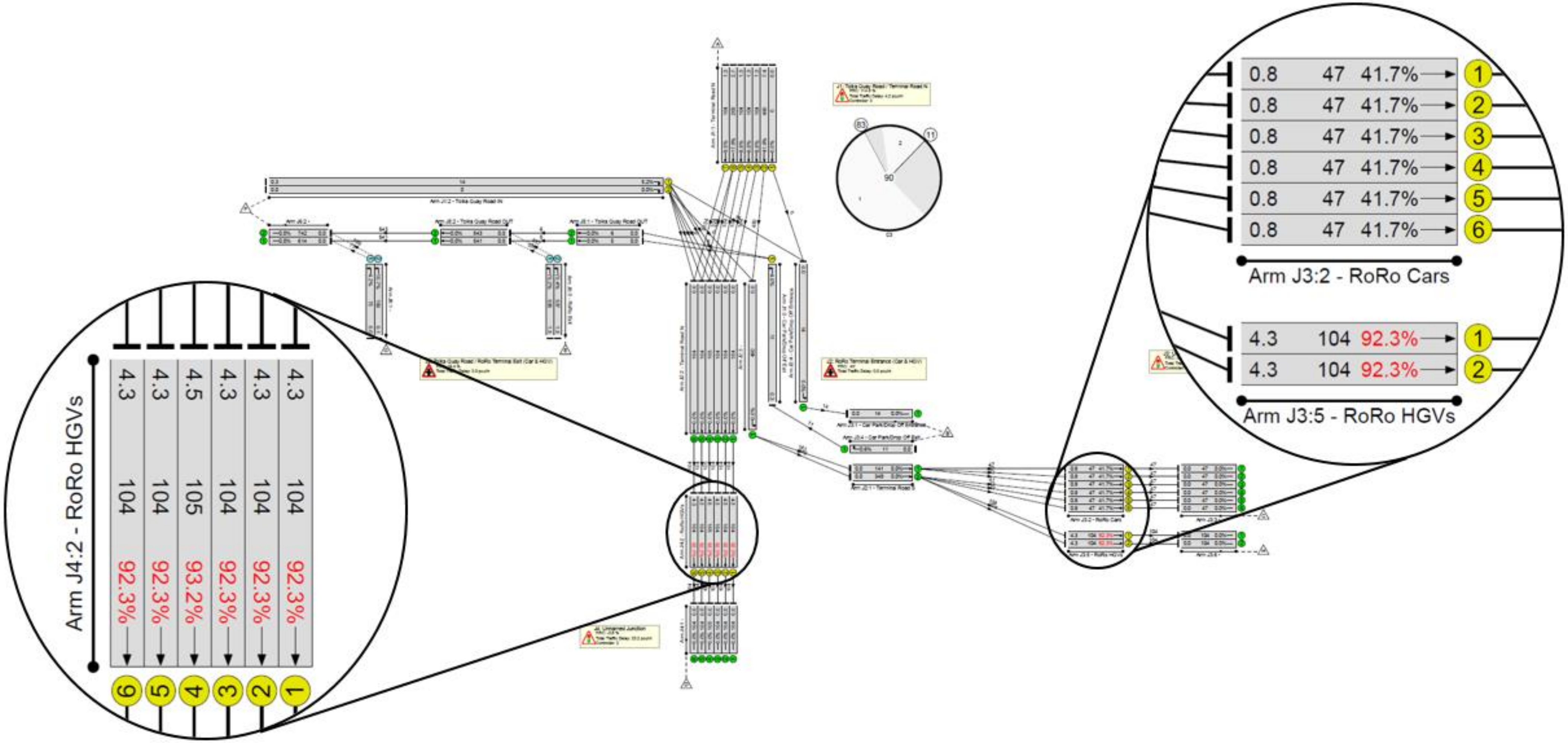


Figure 13-76 Linked LinSig Model Results of the HGV Barrier Access, AM1 2040

Figure 13-76 shows that a total of 833 PCUs are assigned to the HGV barriers in the AM 1 peak hour in 2040.

[104 + 104 + 105 + 104 + 104 + 104 + 104 + 104 = 833 PCUs]

Each arm operates within capacity, indicated by the DOS of less than 100% on each arm. (Maximum 93.2%).

The subsequent queuing, for the hour, is a maximum of 4.5 PCUs for any arm.

[4.5 PCU x 5.75m = 25.9m].

Hence, the Linked LinSig modelling results show that during the worst case peak hour, AM1 0615-1715, a queue of c26 lane metres occurs at each of the 8 HGV barriers. This queue can comfortably be contained locally within the stacking area in front of the barriers. Note that there is a total stacking distance of 5.6km between the entrance barriers to UFT and the Promenade Road Roundabout.

Figure 13-76 also shows that during this same time, there are 282 PCUs assigned to the non-HGV barriers.

[47 + 47 + 47 + 47 + 47 + 47 = 282 PCUs]

These lanes operate comfortably within capacity at just 41.7% DOS.

Each barrier has negligible queue of only 0.8 PCUs, just 4.6m that can be comfortably accommodated in the stacking area in front of the barriers.

[0.8 PCU x 5.75m = 4.6m]

This assessment has been based on 2 of the dual use barriers being used for HGVs and the remaining 6 dual use barriers being used for non-HGVs. Should demand be greater than expected, HGVs can be allocated to any of the 8 dual use barriers, ensuring that sufficient capacity is available.

Sensitivity Test on the Access Road to Terminal Parking and Set Down Area

The model of the UFT access includes the signalisation of the Tolka Quay Road / Promenade Road Extension with pedestrian crossing facilities, and the entry and exit of the from the access road to the parking and set down / pick up area.

To provide a sensitivity test on the UFT access model, it has been assumed that 214 PCUs arrive to the Terminal parking and set down area, and 211 PCUs depart in the worst case peak hour of AM1. This would represent a complete turnaround of the 171 car parking spaces, 10 private vehicle set downs and 10 bus / coaches occurring within the same worst case peak hour for freight movements, 06:15 to 07:15. A very robust test.

The modelling results are included in Appendix 13-5 and 13-6, and are illustrated in Figure 13-77. As before, the Linked LinSig digital files and geometric parameters drawings are included in Appendix 13-8.

Figure 13-77 shows the 214 PCU arrivals and the 211 PCU departures from the Terminal 1 parking and set down area. The model shows that the DOS at the barriers is the same as Figure 13-76 and all operate within capacity.

Figure 13-77 shows that the access arms to the barriers on Promenade Road Extension also continue to work within capacity despite a maximum number of right turners from Terminal 1 exiting at the signalised junction.

Lane 6 has 490 PCUs accessing to the Terminal 1 parking and set down area, and still continues to operate comfortably at 43.6% DOS with a queue of just 7.7 PCU (45m).

Hence the sensitivity test finds that even if a complete turnaround of the Terminal 1 parking and set down area occurred within the same worst case peak hour for freight movements, 06:15-07:15, the proposed access and egress arrangements for the MP2 Project would continue to operate within capacity with minimal queueing.

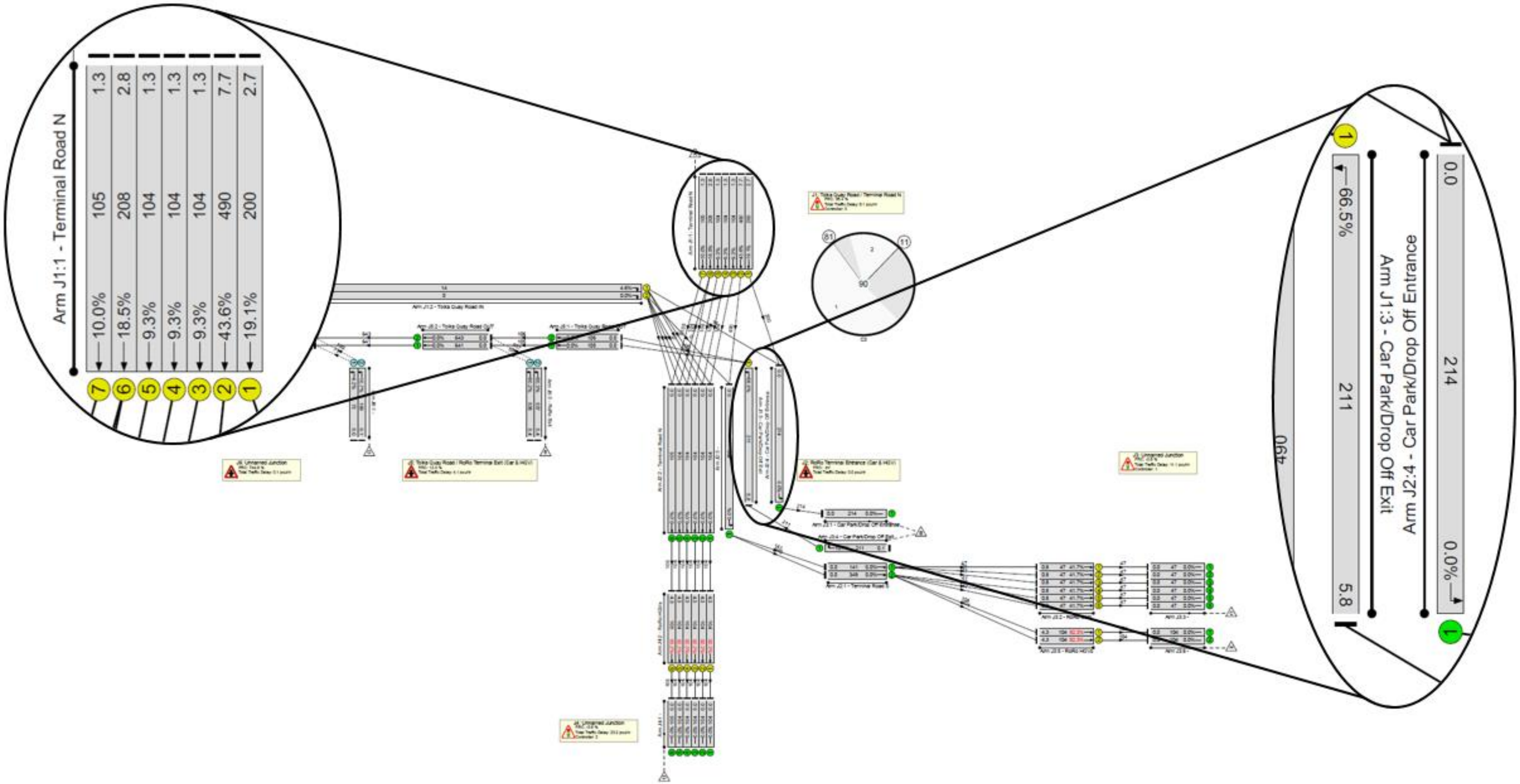


Figure 13-77 Linked LinSig Model Results of the HGV Barrier Access, AM1 2040

Separate Capacity of the 8 HGV Barriers and the 6 Non-HGV Barriers – 15 Minutes

A further exercise has been carried out to assess the scenario of 8 barriers allocated to HGV traffic and the 6 barriers allocated to non-HGV traffic in 15 minutes segments.

Table 13-24 breaks down the existing and proposed traffic flows to the UFT in PCUs during 05:00 to 09:00, which covers the worst case for continuous high arrivals during the early morning. The numbers of HGVs and non-HGVs has been provided in 15 minutes segments.

Table 13-24 Existing and Proposed Traffic Flows to the UFT in PCUs

TIME	EXISTING ARRIVALS 2018 PCUs							PROPOSED ARRIVALS 2040 PCUs		
	Irish Ferries	Stena	P&O	Total	NON-HGV	HGV	Total	NON-HGV	HGV	Total
05:00-05:15	8	7	6	**20**	9	12	**20**	18	24	**42**
05:15-05:30	18	5	14	**37**	18	19	**37**	37	39	**76**
05:30-05:45	14	10	12	**36**	11	25	**36**	22	51	**73**
05:45-06:00	17	11	8	**36**	11	25	**36**	22	51	**73**
06:00-06:15	22	29	13	**63**	13	50	**63**	27	102	**129**
06:15-06:30	54	30	37	**121**	14	107	**121**	29	219	**247**
06:30-06:45	75	29	40	**144**	26	118	**144**	53	240	**294**
06:45-07:00	79	44	24	**146**	48	98	**146**	98	200	**299**
07:00-07:15	53	47	33	**133**	49	84	**133**	101	171	**271**
07:15-07:30	56	45	43	**144**	61	83	**144**	124	170	**294**
07:30-07:45	54	31	9	**95**	43	51	**95**	89	105	**193**
07:45-08:00	24	6	31	**61**	28	34	**61**	56	69	**125**
08:00-08:15	9	4	10	**23**	11	12	**23**	22	24	**46**
08:15-08:30	11	6	17	**34**	4	29	**34**	9	60	**69**
08:30-08:45	14	7	13	**34**	10	23	**34**	21	48	**69**
08:45-09:00	11	7	5	**24**	9	15	**24**	18	30	**48**
Barrier Capacity (PCUs per 15 minutes)								**180**	**240**	**420**

The 8 HGV barriers have a total capacity of 240 PCUs and the 6 non-HGV barriers have capacity for 180 PCUs every 15 minute period.

The results in Table 13-24 show that the 420 PCUs capacity for the 14 barriers is never exceeded.

The 180 PCUs capacity is never reached for the non-HGV traffic. The worst case is 124 PCUs at 07:15 to 07:30. Therefore there is always surplus capacity at these barriers.

The table shows that the 240 PCUs capacity for HGVs is also never exceeded. It is reached during the 15 minute period of 0630-0645 and has surplus capacity at all other times.

In any case, there are a suite of measures available to DPC to control and manage the pattern of traffic arriving to, and the operations within, the UFT that can be utilised as required as the Masterplan progresses, described as follows.

Consented and Proposed Gantry Signs

A total of 36 gantries will be used to control and manage traffic flows at the Dublin Port Estate and at the MP2 Project; 11 already consented on the Dublin Port Estate, 7 proposed for the MP2 Project and 18 indicatively included within UFT footprint.

Figure 13-78 shows a typical gantry sign to include a combination of Variable Message Signage (VMS) and static signs. There are a total of 11 such consented gantry signs (labelled G1 to G11) included in the consented internal roads upgrade scheme, located as indicated in Figure 13-79.

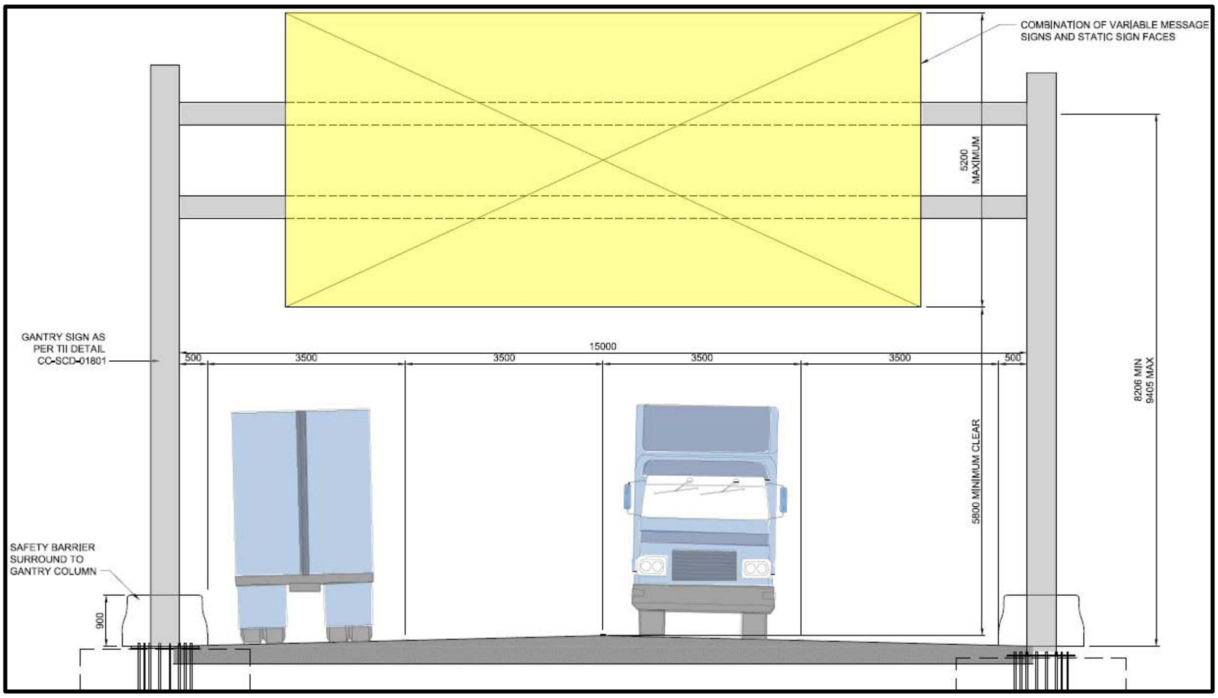


Figure 13-78 Illustration of Consented Gantry Sign

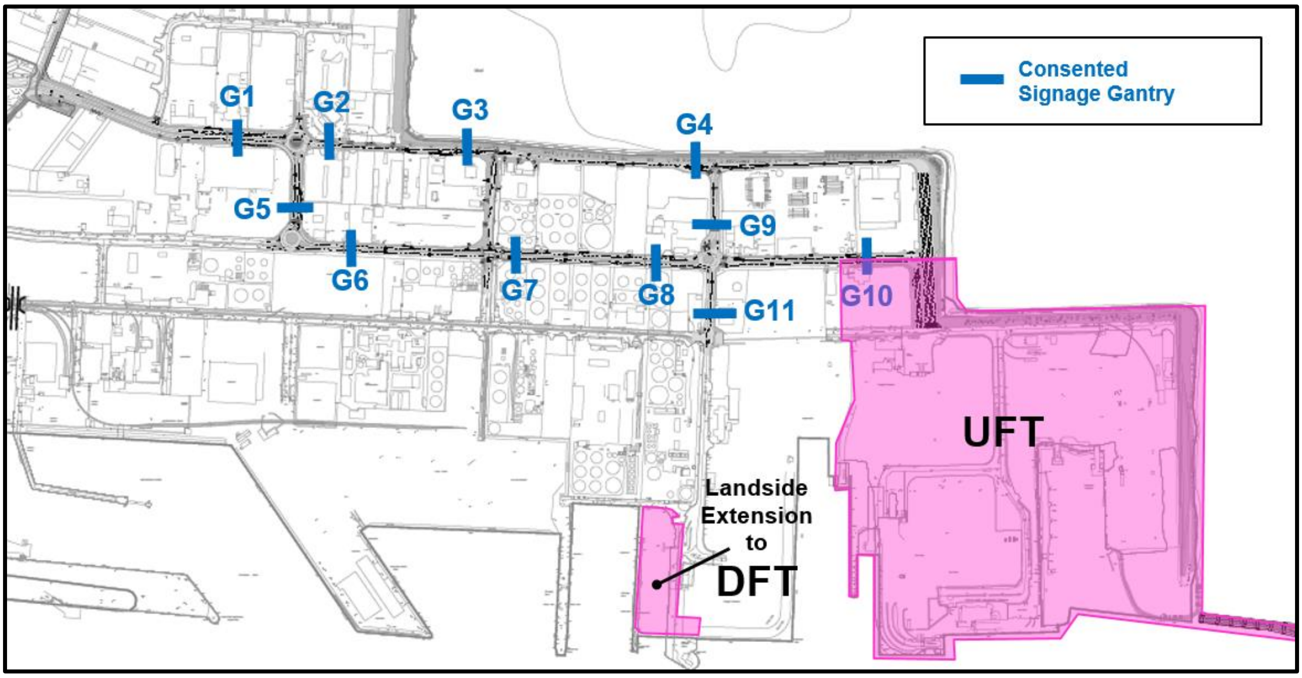


Figure 13-79 Location of Consented Gantry Signage

The proposals for MP2 Project include 7 proposed additional gantry signs to manage traffic movements at the UFT, and 18 gantry signs within the UFT to control internal traffic circulations, indicatively located as shown in Figure 13-80.

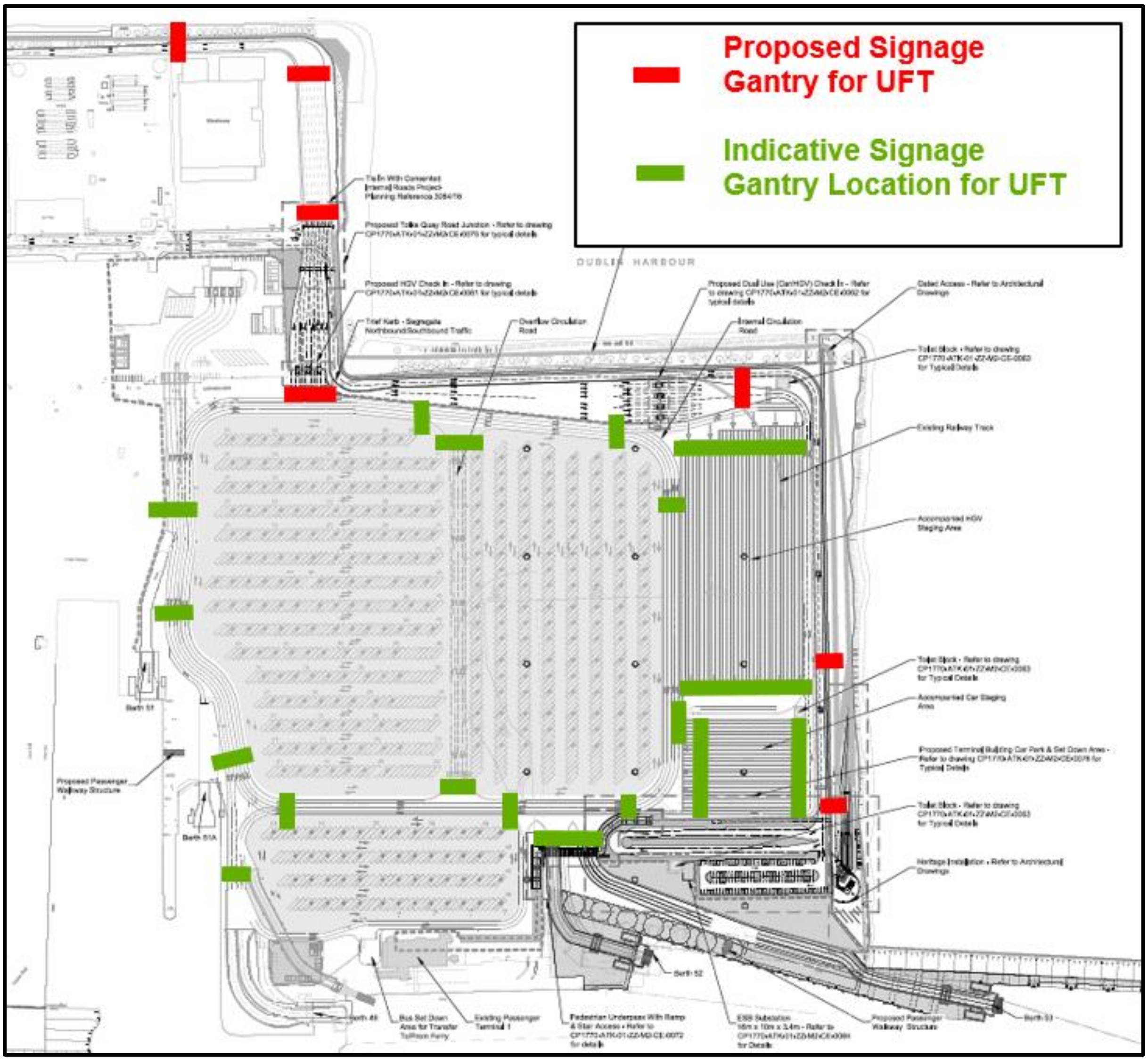


Figure 13-80 Location of Proposed and Indicative Gantry Signage for MP2

Other Measures to Control and Manage UFT Traffic

In addition to the gantry signage, a suite of measures are available to DPC to control and manage the pattern of traffic arriving to, and the operations within, the UFT that can be utilised as required the MP2 Project and the Masterplan progresses. These include:

- Reallocate or add additional access barriers as discussed above;
- Vary vessel departures times to smooth out the pattern of the arriving traffic;
- Control arriving traffic flows using check-in times at the barriers, for example 'Boarding onto the vessel will not be permitted for vehicles arriving after 45mins from the vessel departure time';
- Invest in improved technology to reduce the barrier check-in times;
- The Dublin Port Masterplan 2040, reviewed 2018 includes 8 'E Plots' in the north-western section of the Port close to the Port access on Promenade Road, as shown in Figure 13-81. These Plots have

been identified to be redeveloped primarily for the transit storage of unitised cargo. Hence these Plots may become available in future years to accommodate overflow traffic if required.

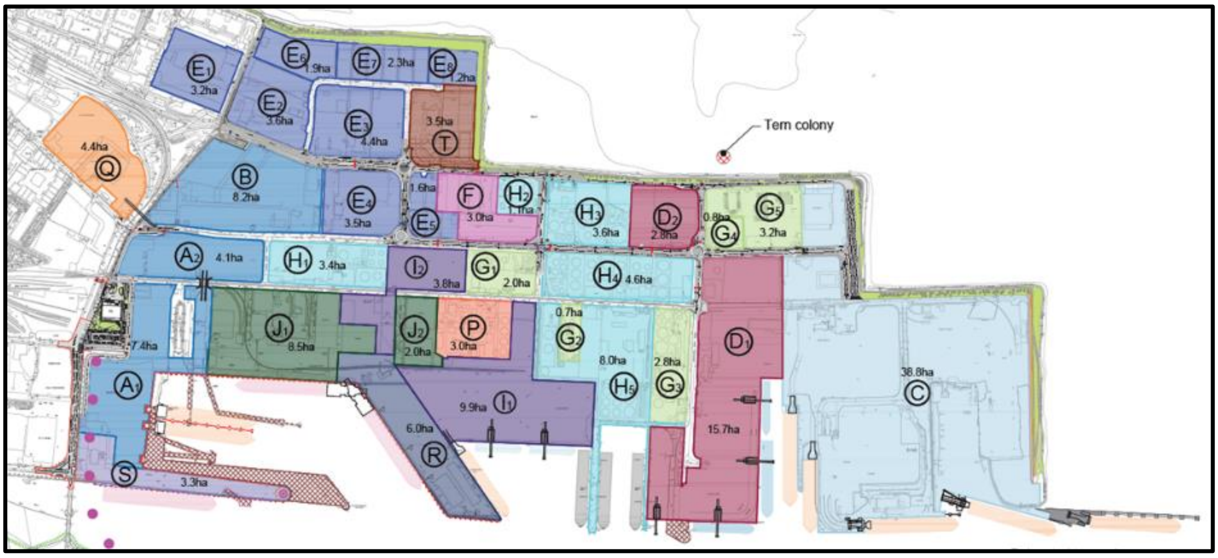


Figure 13-81 Extract of Dublin Port Masterplan 2040, reviewed 2018 Figure 3

Area of UFT

The UFT comprises an area of over 38ha. Figure 13-82 visually puts this in context to the size of Croke Park, the Aviva Stadium, and the 3 Arena. UFT therefore comprises a large footprint, and as explained in the Project Description in Chapter 3 the restricted area will be capable of being adapted to the requirements of the trade to ensure that the needs of the UFT are continually met.

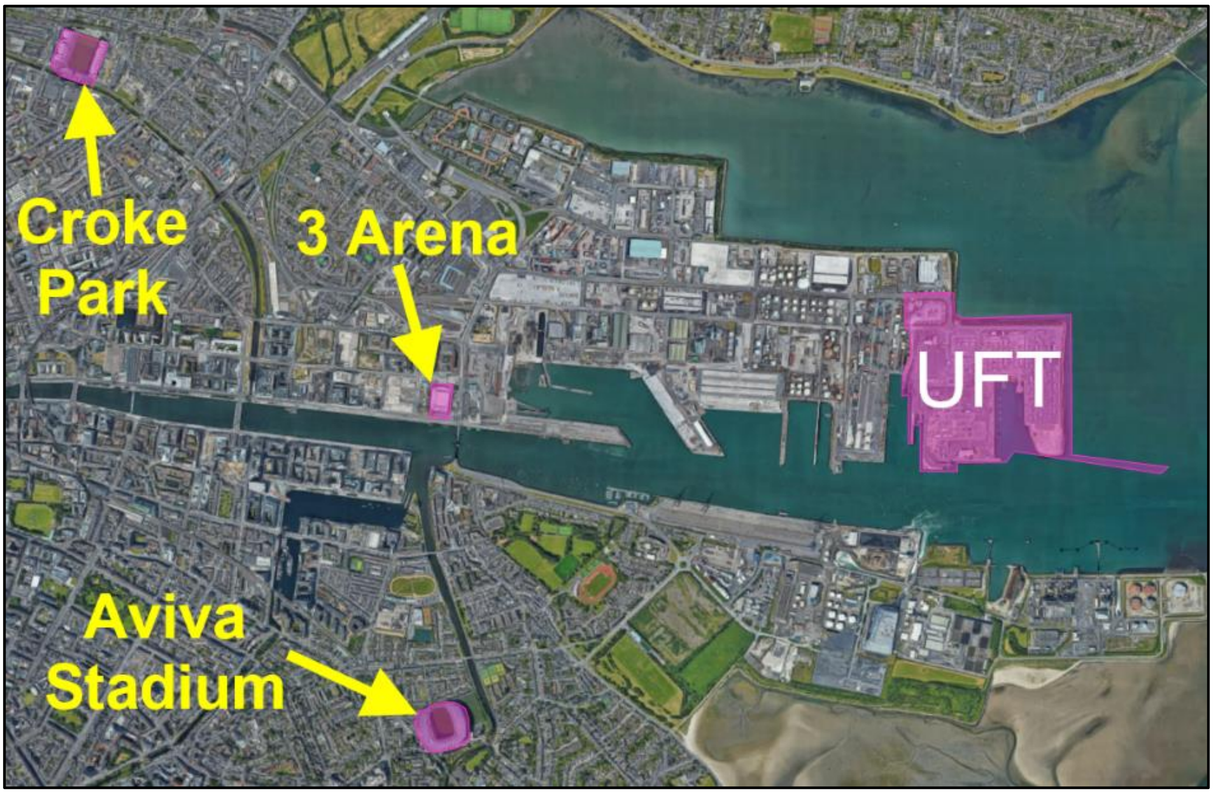


Figure 13-82 UFT Visually in Context to the Size of Croke Park, the Aviva Stadium, and the 3 Arena

Stacking Area for Contingency Purposes

It has been determined that on a typical operational day at the end of the Masterplan in 2040 there is sufficient capacity at the entrance barriers to ensure that accumulative queuing will not occur, and that there are a suite of measures available to DPC to control and manage the pattern of traffic arriving to, and the operations within, the UFT.

There can be seasonal fluctuations in the traffic flows, such as higher freight deliveries on the approach to the Christmas period or higher tourist traffic at Easter, midterm breaks and other school holiday periods. Also, on occasion delays and cancellations can occur for occurrences such as technical errors or, more commonly, adverse weather conditions.

It has already been highlighted that the access to UFT is located a distance of c1.9km from the adopted road network. Figure 13-83 shows the area in which a stacking distance of 5.6km is available between the 14 entrance barriers to UFT and the Promenade Road Roundabout.

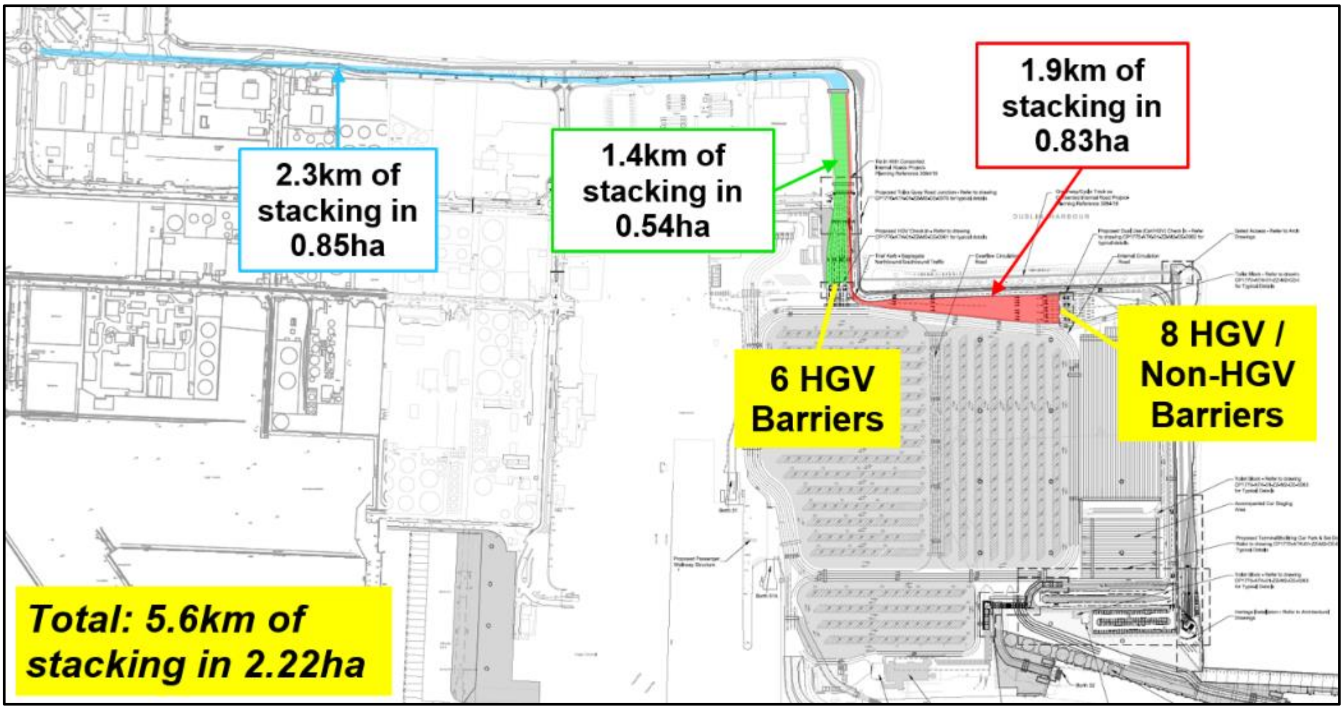


Figure 13-83 Stacking Area in front of UFT Entrance Barriers

The areas highlighted in Figure 13-83 can be described as:

- 2.3km (0.85ha) shared stacking space for HGVs and non-HGVS;
- 1.4km (0.54ha) dedicated to HGVS before the HGV barriers;
- 1.9km (0.83ha) dedicated to non-HGVs before the non-HGV barriers.
- **5.6km (2.22ha) Total**

Table 13-24 showed that the worst-case 15 minute period for existing traffic flows is 146 PCUs arriving at the UFT is between 06:45-07:00. The proposed traffic in 2040 multiplies this figure by 2.04% to give 299 PCUs as the worst case 15 minutes. This TTA has shown that the barrier capacity is 420 PCUs every 15 minutes, higher than required. Calculations show that it would take 660 PCUs arriving every 15 minutes for an hour, or a total of 2,640 per hour, to fill the 5.6km stacking area. This would be equivalent to the current worst case 15 minutes of 146 PCUs more than quadrupling and occurring constantly for an hour, or an AAGR rate of over 7% occurring between 2018 and 2040 instead of 3.3%.

It is considered therefore that there are adequate measures incorporated within the location and design of UFT to provide contingency for such occurrences and minimise any inconvenience that could potentially be caused to the Promenade Road Roundabout or the external adopted road network.

Summary

It is concluded that for a typical day the combined 14 barriers collectively have sufficient capacity to accommodate the PCUs arriving at the UFT with no accumulative queueing occurring even at the end of the Masterplan in 2040.

Modelling has been based on 8 HGV barriers (the 6 dedicated HGV barriers, 2 of the dual use barriers being used for HGVs and the remaining 6 dual use barriers being used for non-HGVs). The model includes the signalisation of the Tolka Quay Road / Promenade Road Extension with pedestrian crossing facilities, and the entry and exit from the access road to the parking and set down / pick up area.

The Linked LinSig model results show that during the worst case peak hour, AM1 0615-1715, there is ample spare capacity at the 6 non-HGV barriers and spare capacity at each of the 8 HGV barriers with minimal queueing.

Sensitivity testing finds that even if a complete turnaround of the Terminal 1 parking and set down area occurred within the same worst case peak hour for freight movements, 0615-0715, the proposed access and egress arrangements for the MP2 Project would continue to operate within capacity with minimal queueing.

This assessment has been based on 2 of the dual use barriers being used for HGVs and the remaining 6 dual use barriers being used for non-HGVs. Should demand be greater than expected, HGVs can be allocated to any of the 8 dual use barriers, ensuring that sufficient capacity is available.

In addition, there are a suite of measures available to DPC to control and manage the pattern of traffic arriving to, and the operations within, the UFT that can be utilised if necessary. A total of 36 gantries will be used to control and manage traffic flows at the Dublin Port Estate and for the MP2 Project; 11 consented on the Dublin Port Estate, 7 proposed for the MP2 Project and 18 indicatively included with UFT. UFT is a large footprint that will be capable of being adapted to the requirements of the trade to ensure that the needs of the UFT are continually met.

A stacking distance of 5.6km between the 14 entrance barriers to UFT and the Promenade Road Roundabout is considered comfortably adequate to provide contingency for occurrences such as technical faults and adverse weather conditions, minimising any inconvenience that could potentially be caused to the Promenade Road Roundabout or the external adopted road network.

13.10.15 Traffic Impact on the Dublin Port Tunnel and Toll Plaza

Traffic Impact on the Dublin Port Tunnel

Table 13-25 summaries the proposed traffic flows in the Dublin Port Tunnel in 2040 compared with the surveyed flows from 2018 for each of the peak hours assesses and for 24 hours.

The peak hour 2040 flows for the Dublin Port Tunnel are included in Appendix 13-3. The all-day proposed traffic flows are based on the Table 7.7 of the Strategic Transportation Study which originally determined a growth rate for traffic through the Dublin Port Tunnel at 77.5% between 2017 and 2040, equivalent to an increase of 2.5% per annum. Taking account of the uplifted TII traffic growth projections in May 2019 and the change in base year to 2018, the all-day growth rate for the traffic through the Tunnel between 2018 and 2040 is has been calculated as 80.6%, equivalent to 2.7% per annum.

Table 13-25 Existing and Proposed Traffic Flows, Dublin Port Tunnel

	PCUs											
	Northbound				Southbound				2-Way Flow			
	AM1 0615-0715	AM2 0730-0830	PM 1645-1745	ALL DAY	AM1 0615-0715	AM2 0730-0830	PM 1645-1745	ALL DAY	AM1 0615-0715	AM2 0730-0830	PM 1645-1745	ALL DAY
Existing 2018	1,403	1,282	1,827	23,862	1,665	1,893	1,036	23,193	3,067	3,175	2,863	47,056
Proposed 2040	2,683	2,298	3,136	43,101	2,979	3,054	1,812	41,893	5,662	5,352	4,948	84,996

As referenced earlier, within the NTA Regional Transport Model for the Greater Dublin Area, the Dublin Port Tunnel is coded with a capacity of 3,800 PCUs per hour per direction, and that this may be an underestimate of the capacity as 2-lane motorways elsewhere in Ireland have observed flows exceeding 4,000 PCU/hour.

Table 13-25 shows that the 3,800 PCU capacity per direction, or a total 7,600 PCU per hour, is not reached during any of the 3 peak hours.

The total of 84,996 PCUs per day does not exceed the 182,400 daily PCU capacity of the Tunnel, or the capacity of 91,200 PCUs per direction.

These results correlate with the results from the Strategic Transportation Study which was based on surveys from 2017. Figure 7.13 from the Strategic Transportation Study, replicated in Figure 13-84, shows that the proposed demand for travel through the Dublin Port Tunnel will remain within the nominal capacity of 3,800 PCUs per hour.

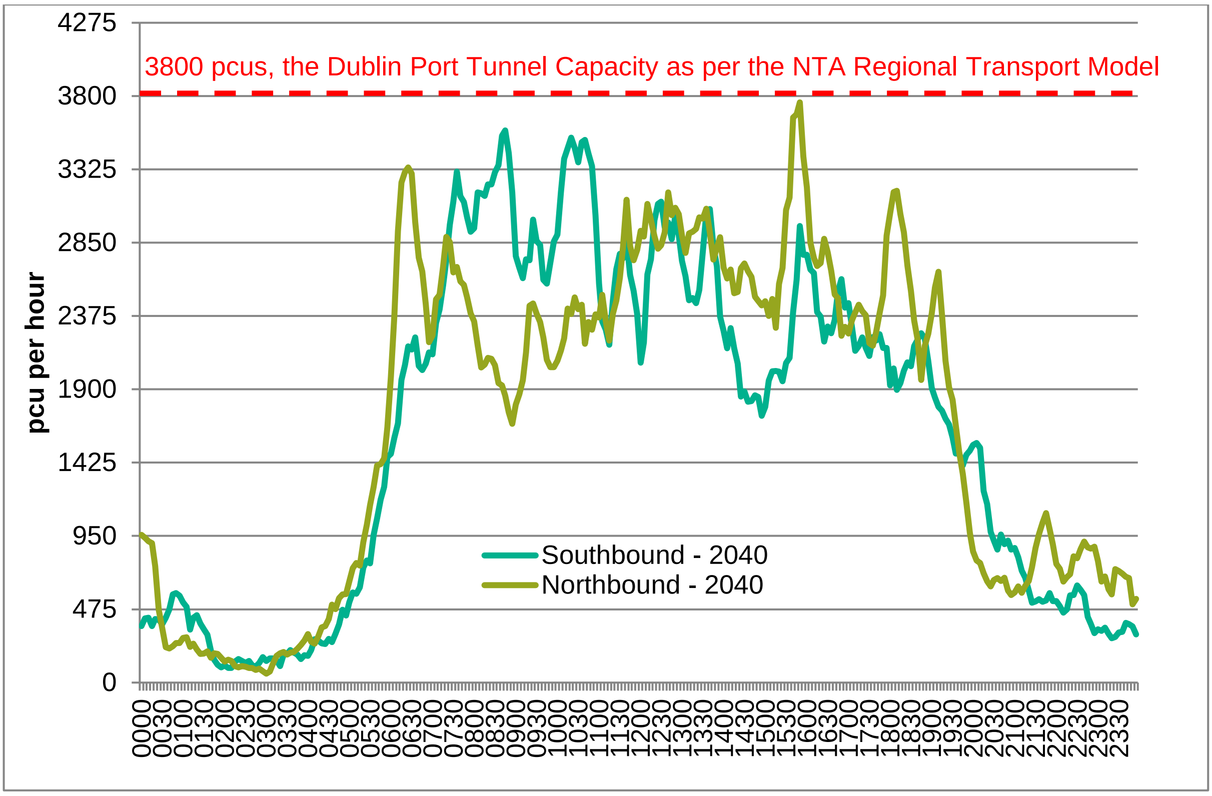


Figure 13-84 Projected Future Flows – Dublin Port Tunnel 2040

Toll Plaza Capacity

Anecdotally, it has been suggested that the "pinch point" may be the Toll Plaza – that this may have less capacity than the Dublin Port Tunnel itself.

A survey of traffic through the Toll Plaza was carried out in November 2017 for the Strategic Transportation Study. The resulting observed profiles of traffic flow gives no indication that flow is hitting a "ceiling" caused by lack of capacity at the Toll Plaza.

As referenced earlier in the report, there are 11 toll lanes at Dublin Port Tunnel - 5 dedicated northbound, 4 dedicated southbound and 2 that can be bi-directional.

The maximum observed throughput at the Toll Plaza was 187 vehicles in one 5-minute time-slice. This occurred northbound, at a time when 4 toll lanes were operating in this direction. This rate of flow equates to approximately 2,850 PCU/hour.

This suggests that if the full 6 northbound lanes were operating, the capacity of the Toll Plaza may be around 4,275 PCU / hour – sufficient for the Tunnel it serves.

In any case, TII are preparing plans for a major upgrade of the tolls at the Dublin Port Tunnel, including replacing the tolling related equipment and software at the Plaza. The project is anticipated to go out to tender in Q3 2019, and the major upgrade is expected to result in the performance of the tolls to be significantly better than existing.

Furthermore, TII are considering upgrading the toll collection system to be barrier free (or free-flow) in future years, likely to happen before the 2040 horizon year for the Masterplan.

It is therefore demonstrated that the Dublin Port Tunnel and the Toll Plaza have sufficient capacity to accommodate the MP2 Project.

13.10.16 External Road Network

Figure 13.85 shows Junctions 1 to 5 on the external road network along East Wall Road on the boundary with the Dublin Port Estate.

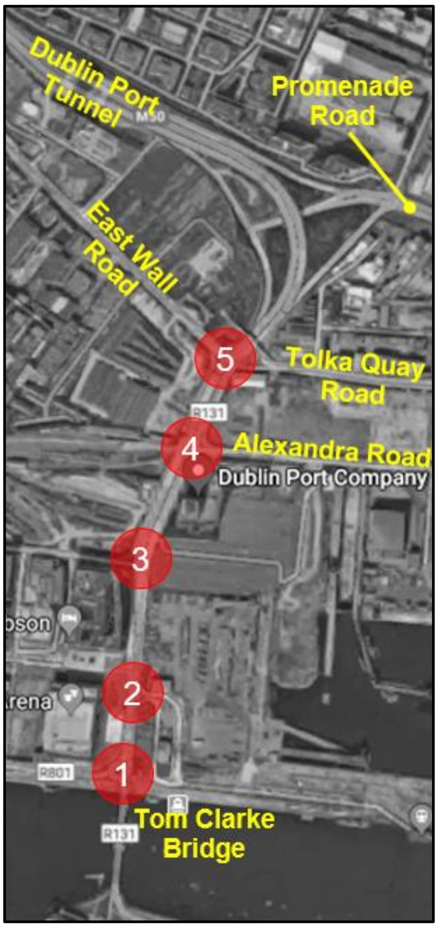


Figure 13-85 Junctions 1 to 5 External Roads

The Percentage Impact Diagrams for the year of opening, 2026, are included in Appendix 13-4. The percentage impacts are based on the existing and proposed two-way traffic flows on the external road network for the AM1, AM2 and PM peak hours. Additionally, Table 13.26 and Figure 13-86 show the percentage impact during the AM1 peak hour. Table 13-27 and Figure 13-87 show the percentage impact during the AM2 peak hour and the PM peak hour is shown in Table 13-28 and Figure 13-88.

Table 13-26 Percentage Impact on External Road Network, AM1 Peak Hour

AM1 2026, 06:15 – 07:15							
Junction	**Existing 2026**			**Proposed 2026**			**Percentage Impact**
	North-bound	**South-bound**	**Total**	**North-bound**	**South-bound**	**Total**	
North of Junction 5	870	1,442	2,311	1,053	1,250	2,303	**-0.4%**
South of Junction 5	848	1,782	2,630	899	1,457	2,357	**-10.4%**
North of Junction 4	879	1,770	2,649	930	1,445	2,375	**-10.3%**
South of Junction 4	1,079	1,596	2,675	937	1,443	2,380	**-11.0%**
North of Junction 3	1,094	1,572	2,666	952	1,419	2,371	**-11.1%**
South of Junction 3	1,007	1,516	2,523	842	1,339	2,182	**-13.6%**
North of Junction 2	1,005	1,509	2,514	840	1,332	2,172	**-13.6%**
South of Junction 2	1,005	1,507	2,512	840	1,332	2,172	**-13.6%**
North of Junction 1	1,038	1,495	2,533	873	1,320	2,194	**-13.4%**

The negative percentage impacts in Table 13-26 and Figure 13-86 show that during AM1 peak hour traffic the closure of the Port Estate accesses results in a removal of traffic along East Wall Road. This demonstrates the planning gain that is provided by closing the Port Estate accesses, even with the recently adopted uplift in Port Estate traffic growth from 2.5% per annum to 3.3% per annum, to which the MP2 Project contributes. Up to 13.6% of traffic is removed between Junctions 2 and 3 during the AM1 peak hour.

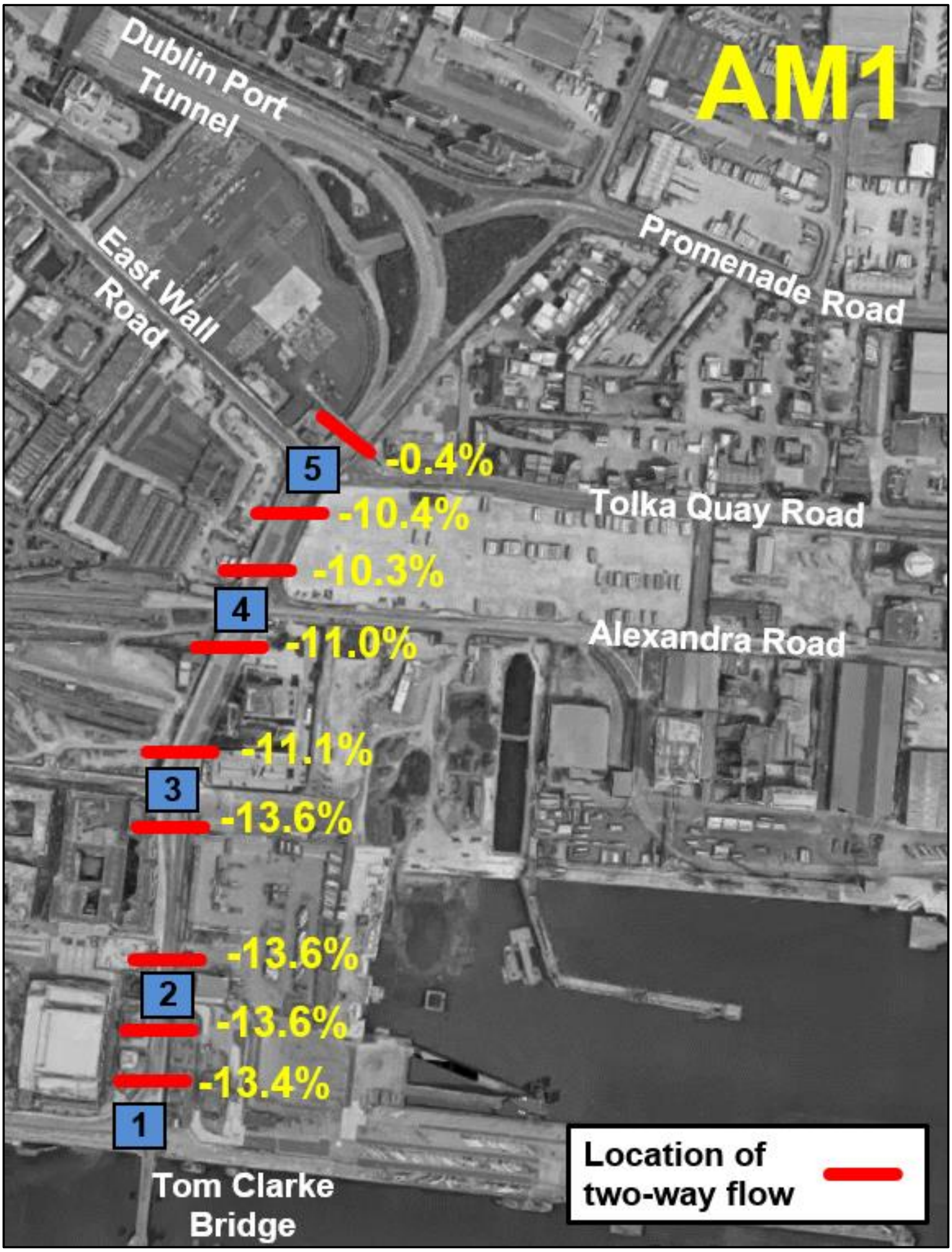


Figure 13-86 Percentage Impact on External Road Network, AM1 Peak Hour

Table 13-27 Percentage Impact on External Road Network, AM2 Peak Hour

AM2 2026, 07:30 – 08:30							
Junction	Existing 2026			Proposed 2026			Percentage Impact
	North-bound	South-bound	Total	North-bound	South-bound	Total	
North of Junction 5	1,164	1,995	3,159	1,249	1,940	3,189	**0.9%**
South of Junction 5	1,355	2,178	3,533	1,375	2,058	3,433	**-2.8%**
North of Junction 4	1,373	2,188	3,561	1,393	2,068	3,461	**-2.8%**
South of Junction 4	1,554	2,156	3,710	1,431	2,060	3,491	**-5.9%**
North of Junction 3	1,526	2,127	3,653	1,403	2,031	3,434	**-6.0%**
South of Junction 3	1,422	1,969	3,391	1,282	1,856	3,138	**-7.5%**
North of Junction 2	1,411	1,980	3,391	1,271	1,867	3,138	**-7.5%**
South of Junction 2	1,412	2,004	3,416	1,272	1,867	3,139	**-8.1%**
North of Junction 1	1,452	1,981	3,433	1,312	1,844	3,156	**-8.1%**

Table 13-27 and Figure 13-87 show that during the AM2 peak hour traffic a modest increase of 0.9% occurs to the north of Junction 5, and negative percentage impacts occur elsewhere along East Wall Road, again demonstrating the planning gain that is provided by closing the Port Estate accesses. Up to 8.1% of traffic is removed from the north of Junction 1 during the AM2 peak hour.

Figure 13-87 Percentage Impact on External Road Network, AM2 Peak Hour

Table 13-28 Percentage Impact on External Road Network, PM Peak Hour

PM Peak Hour 2026, 16:45 – 17:45							
Junction	Existing 2026			Proposed 2026			Percentage Impact
	North-bound	South-bound	Total	North-bound	South-bound	Total	
North of Junction 5	1,432	1,362	2,794	1,484	1,277	2,761	**-1.2%**
South of Junction 5	1,757	1,390	3,147	1,774	1,269	3,044	**-3.3%**
North of Junction 4	1,781	1,445	3,226	1,798	1,324	3,122	**-3.2%**
South of Junction 4	1,877	1,480	3,357	1,799	1,357	3,156	**-6.0%**
North of Junction 3	1,876	1,539	3,415	1,799	1,416	3,214	**-5.9%**
South of Junction 3	1,615	1,439	3,054	1,526	1,303	2,829	**-7.4%**
North of Junction 2	1,616	1,459	3,075	1,526	1,324	2,850	**-7.3%**
South of Junction 2	1,616	1,417	3,033	1,526	1,324	2,850	**-6.0%**
North of Junction 1	1,637	1,432	3,069	1,548	1,338	2,886	**-6.0%**

Similarly, the negative percentage impacts in Table 13-28 and Figure 13-88 show that during the PM peak hour traffic the closure of the Port Estate accesses results in a removal of traffic along East Wall Road. Up to 7.4% of traffic is removed south of Junction 3 during the PM peak hour.

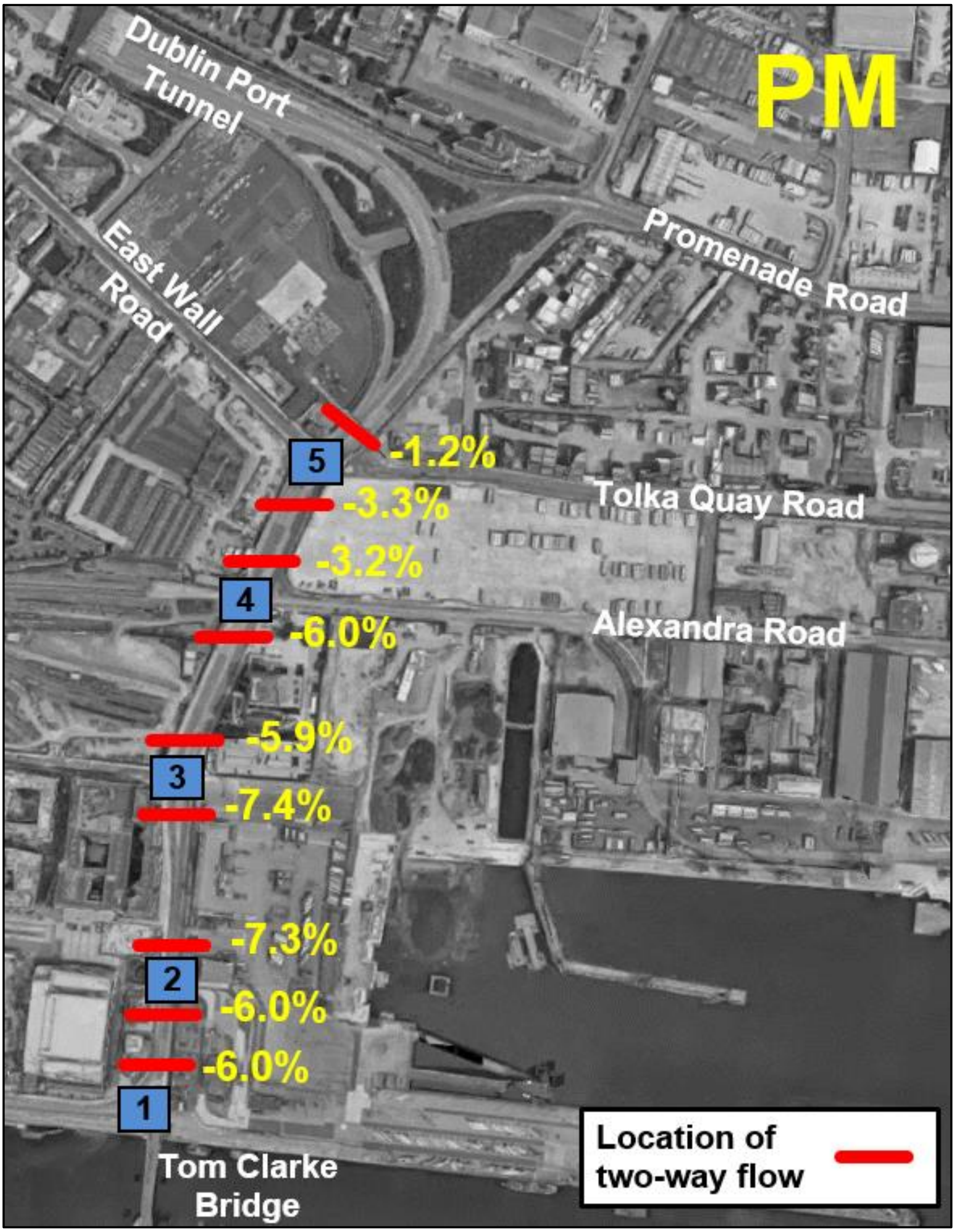


Figure 13-88 Percentage Impact on External Road Network, PM Peak Hour

The TII TTA Guidelines (Section 2.3, Page 10) state that the study area for TTAs should include all road links and associated junctions where traffic to and from the development exceeds 10% of the existing traffic movements, or 5% in congested or other sensitive locations. It has been demonstrated above that in all cases of the percentage impacts along East Wall Road are negative, apart from a modest increase of 0.9% north of Junction 5 during AM2 peak hour. Hence detailed junction modelling is not required for these junctions.

The percentage impacts demonstrate the planning gain that is provided by closing the Dublin Port Estate accesses along East Wall Road, even with the recently adopted uplift in Dublin Port Estate traffic growth from 2.5% per annum to 3.3% per annum, to which the MP2 Project contributes.

There are environmental benefits in reducing the number of large vehicles that travel along this section road with the associated noise & air pollution benefits and a reduction in the wear & tear of the adopted carriageway.

As discussed in Section 13.4.3, the closure of the Dublin Port Estate accesses facilitates the potential for DCC to implement their proposals for East Wall Road, which if realised, will provide enhanced walking and cycling crossing facilities and replace the Point Roundabout with a signalised junction.

One of the key features of the Dublin Port Masterplan 2040, reviewed 2018 is the provision of the Southern Port Access Route (SPAR) anticipated for delivery towards the last third of the lifespan of the Masterplan. The DPC SPAR concept is indicated in Figure 3 of the Dublin Port Masterplan 2040, reviewed 2018, and highlighted in Figure 13.89 for convenience.

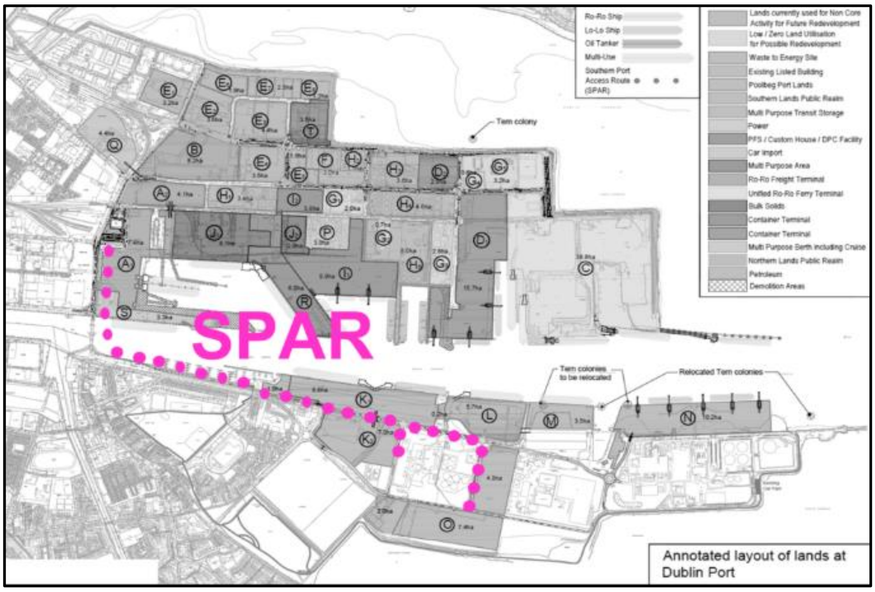


Figure 13-89 Annotated Layout of Lands at Dublin Port, Highlighting the SPAR Concept

As highlighted in the Dublin Port Masterplan 2040, reviewed 2018, the SPAR concept is consistent with national and regional planning policy. As part of the continuing rolling out of the Masterplan, it is envisaged the SPAR will be progressed in terms of detailed design and planning between 2020 and 2025 with an aim to be constructed and operational by 2031.

Traffic modelling carried out for the Strategic Transportation Study shows that the SPAR relieves the Tom Clarke Bridge of approximately one-third of its traffic and demonstrates it will provide further mitigation along East Wall Road. The SPAR is not part of the MP2 Project, however, should it be realised in future years it will provide further planning gain along this section of the external road network.

The camera footage confirmed that the freight train at Alexandra Road didn't enter or exit the Dublin Port Estate during the peak traffic hours assessed, demonstrating that the operation of the train doesn't typically impact on the peak hour traffic flows along East Wall Road.

In summary, the planning gain provided by DPC by closing the Dublin Port Estate accesses and removing traffic from the external road network has been demonstrated for each of the junctions along East Wall Road, even with the recent uplift in Port traffic from 2.5% per annum to 3.3% per annum, to which the MP2 Project contributes. There are environmental benefits in reducing the number of large vehicles that travel along this section of road, with associated noise & air pollution benefits and reduction in the wear & tear of the adopted carriageway. In accordance with TII TTA Guidelines detailed modelling is not required on the external road network as the percentage impacts never exceed 5% or 10%. The closure of the Dublin Port Estate accesses facilitates DCC to implement their potential scheme which, if realised, will provide enhanced walking and cycling crossing facilities along East Wall Road and replaces the Point Roundabout with a signalised junction. It has been highlighted that although the SPAR is not part of the proposals for the MP2 Project, should it be realised in future years it will provide even further planning gain this section of the adopted road network. The camera footage confirmed that the freight train at Alexandra Road didn't enter or exit the Port during the peak traffic hours assessed, demonstrating that the operation of the train doesn't impact on the peak hour traffic flows along East Wall Road.

13.10.17 Junction Modelling – Internal Road Network

Linked LinSig computer modelling has been used to assess the Dublin Port Estate access and permitted internal road network connecting to the MP2 Project.

Figure 13-90 confirms the locations and labelling of the junctions modelled in the Linked LinSig, and an illustration of the Linked LinSig network built is included in Figure 13-91.

The models are based on the Proposed Traffic flows as included in Appendix 13-3. The modelling results for each of the Assessment Years are tabulated and included in Appendix 13-7. The Linked LinSig digital files and geometric parameters drawings are included in Appendix 13-8, along with the model results presented diagrammatically.

Within Linked LinSig modelling the overall junction has a value of Practical Reserve Capacity (PRC) measured as a percentage. A positive PRC indicates that the overall junction has spare capacity. The higher the percentage, the more spare capacity available. A PRC of between 0% and -11.11% indicates that the overall junction is approaching capacity. A PRC of -11.12% or lower shows that the junction is operating over capacity. This is summarised in Table 13-29 using a 'traffic lights' style colour coding of green, amber and red to help to interpret the results.

Table 13-29 Interpretation of PRC Results

PRC	Overall Junction Capacity
0.1% and above	Junction operates within capacity, the higher the PRC the better the capacity
0% to -11.11%	Junction is approaching capacity
-11.12% and lower	Junction operates over capacity, the lower the PRC the less capacity

The Linked LinSig modelling results for the internal road network are summarised in Table 13-30. The 'traffic lights' style colour coding of the PRC values as green, amber and red are again used to help to interpret the results.

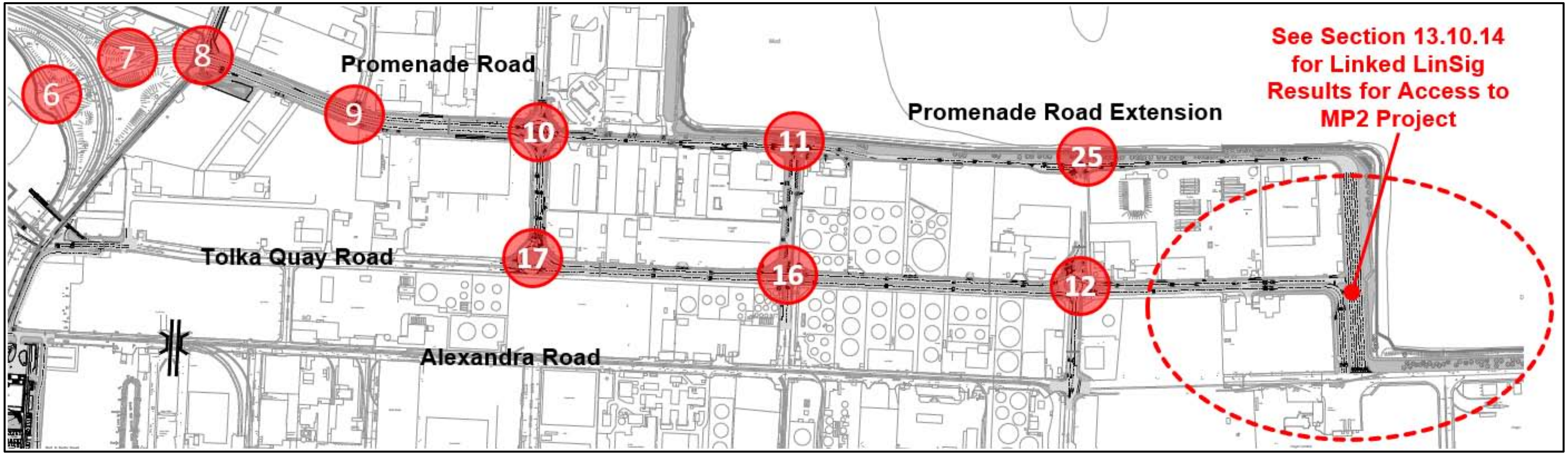


Figure 13-90 Locations and labelling of the Junctions Modelled in the Linked LinSig for the Internal Roads

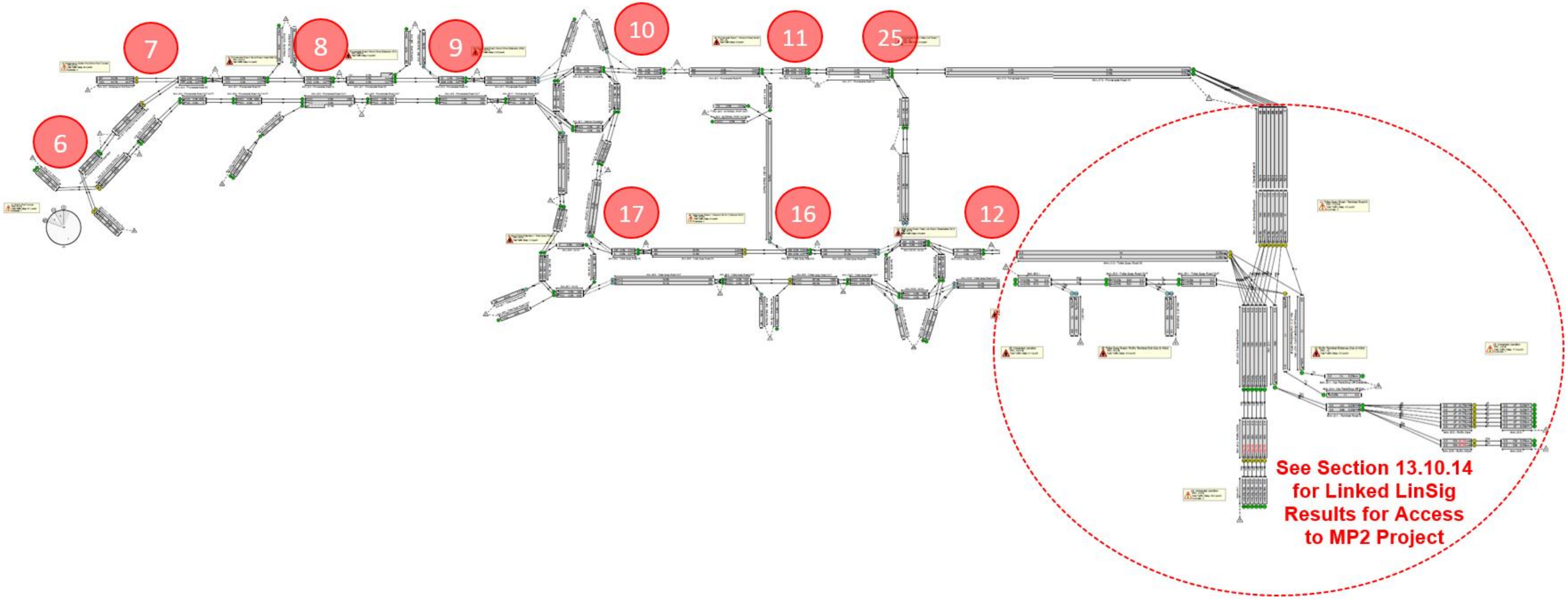


Figure 13-91 Illustration of Linked LinSig Network Diagram for Internal Roads

Table 13-30 Summary of Linked LinSig Modelling Results for the Internal Road Network

Junction	PRC								
	2026			2031			2040		
	AM1	AM2	PM	AM1	AM2	PM	AM1	AM2	PM
6	45.0%	90.9%	100.5%	23.5%	62.7%	79.2%	-5.4%	24.8%	40.4%
7	55.3%	130.8%	185.1%	36.2%	105.2%	135.3%	6.3%	53.9%	83.5%
8	283.1%	372.2%	138.9%	226.2%	301.1%	103.1%	143.6%	199.7%	49.0%
9	912.4%	1365.2%	1330.5%	679.3%	1080.6%	1047.5%	339.6%	687.6%	645.1%
10	9.6%	55.3%	18.4%	-7.5%	31.4%	-0.2%	-44.7%	-3.3%	-36.6%
17	73.6%	144.1%	69.3%	41.1%	101.6%	42.7%	-5.5%	40.9%	4.9%
16	108.5%	232.2%	142.9%	77.9%	183.6%	106.7%	33.6%	114.6%	55.1%
12	114.2%	268.2%	123.7%	77.2%	212.6%	87.9%	24.4%	131.8%	36.5%

The majority of the PRC results in Table 13-30 demonstrate that the consented internal road network on the Dublin Port Estate will have comfortable capacity available to deal with the peak traffic flows even at the end of the Masterplan in 2040. This occurs even with the uplift in Port Estate traffic from 2.5% per annum to 3.3% per annum, to which the MP2 Project contributes. For example, Junction 12 will operate at a capacity of 131.8% during the AM2 peak hour of 07:30 to 08:30 in the year 2040.

Note that PRC is an indicator of capacity and the full capacities can be further appreciated by a detailed examination of the modelling results tabulated in Appendix 13-7 and shown diagrammatically in Appendix 13-8.

The modelling shows that Junction 6, which is the signalised junction giving access to the Port Estate from East Wall Road and providing an exit to the Tunnel, will be approaching capacity at the end of the Masterplan in 2040 during the AM1 peak hour, indicated by the PRC of -5.4%. Note that Junction 7, giving entry to the Dublin Port Estate from the Dublin Port Tunnel, operates within capacity for all peak hours even at the end of the Masterplan period in 2040.

Junction 17, the new roundabout located at the south of Bond Drive, will be approaching capacity during the AM1 peak hour of 06:15 to 07:15 at the end of the Masterplan in 2040, indicated by an PRC of -5.5%.

The Linked LinSig results show that the consented Promenade Road Roundabout design at Junction 10 will be approaching capacity during the AM2 peak hour of 07:30-08:30 at the end of the Masterplan in 2040 with an PRC of -3.3%. However, the proposed design will exceed capacity sometime between 2031 and 2040 during the early morning peak hour AM1 06:15-07:15 and the PM peak of 16:45-17:45. This is indicated by the PRC during AM1 going from -7.5% in 2031 to -44.7% in 2040. For the PM peak hour it goes from -0.2% in 2031 to -36.6% in 2040.

The full tabulated Linked LinSig modelling results for Junction 10 have been included in Table 13-31 to identify where the junction exceeds capacity in future years.

Table 13-31 Junction 10, Consented Promenade Road Roundabout, Summary of Linked LinSig Modelling Results

Promenade Road / Bond Drive Extension Roundabout								
Period of Assessment	Arm	Movement	AM1 Peak		AM2 Peak		PM Peak	
			DoS%	MMQ	DoS%	MMQ	DoS%	MMQ
2026 Proposed	Promenade Road	Ahead/Left	82.1%	2	38.4%	0	40.4%	0
		Ahead	80.7%	2	58.0%	1	76.0%	2
	Bond Road Extension	Ahead	48.3%	1	31.3%	0	24.6%	0
	Bond Drive Extension	Ahead/Left	8.2%	0	14.9%	0	21.5%	0
	PRC		9.6%		55.3%		18.4%	
2031 Proposed	Promenade Road	Ahead/Left	96.7%	10	45.4%	0	47.9%	1
		Ahead	95.4%	8	68.5%	1	90.1%	4
	Bond Road Extension	Ahead	61.7%	1	38.8%	0	30.3%	0
	Bond Drive Extension	Ahead/Left	9.7%	0	17.8%	0	25.8%	0
	PRC		- 7.5%		31.4%		- 0.2%	
2040 Proposed	Promenade Road	Ahead/Left	130.2%	330	61.5%	1	65.3%	1
		Ahead	128.8%	321	93.0%	6	122.9%	268
	Bond Road Extension	Ahead	94.2%	6	56.8%	1	45.8%	0
	Bond Drive Extension	Ahead/Left	13.3%	0	24.3%	0	36.0%	0
	PRC		- 44.7%		- 3.3%		- 36.6%	

The capacity of each arm of the junction is measured in DOS (Degree of Saturation). A DOS of less than 100% indicates that the junction arm is operating within capacity. A percentage exceeding 100% indicates the arm is operating over capacity. The modelling results for the consented Promenade Road Roundabout reconfirm the findings shown in Table 13-33 for this junction. It can be seen that the capacity issues are attributable to the Promenade Road approach arm to the junction. During the AM1 peak hour the approach lanes have a DOS of 130.2% and 128.8%. During the PM peak hour one of the approach lanes has a DOS of 122.9%. The DOC is less than 100% on all other turning movements.

This was to be expected and is consistent with the findings of the Strategic Transportation Study.

The design of the consented roundabout was based on the original AAGR at the Port of 2.5% per annum rather than the current 3.3% per annum, therefore the consented design comes to the end of its design life prior to the end of the Masterplan.

As part of the continuing rolling out of the Masterplan, the SPAR will be assessed and submitted to planning between 2020-2025 with a view to being constructed between 2025 and 2030 to be operational by 2031. This timeframe coincides with the consented roundabout coming to the end of its design life.

The Promenade Road Roundabout forms part of the SPAR, therefore the upgrade of the roundabout junction will be considered as the Masterplan continues to be implemented.

The situation is self-regulating. If the Masterplan is not implemented, the full growth potential will not be reached and the capacity of the consented roundabout will be adequate to accommodate the traffic generated by the ABR Project and MP2 Project.

The Chartered Institution for Highways and Transportation Guidelines for Traffic Impact Assessment 1994, suggests that although traffic flows are assessed for 15 years after the year of opening, the mitigation works need to be adequate for 5 years growth. The consented roundabout will operate with in capacity to at least 2031, 13 years from the assessment. This is considered to be a satisfactory provision when assessing the impact of the MP2 Project. It should also be noted that the roundabout should operate within capacity at the off-peak times until 2040, even for the Dublin Port Masterplan 2040, reviewed 2018 flows.

In addition to the above, there are a suite of measures available to DPC to control and manage the pattern of traffic arriving to the Port Estate that can utilised in future years as the Masterplan continues to be implemented. These include:

- Close the barrier between the Dublin Port Estate and the Eastlink Business Park to prevent non-Port running traffic entering the estate and u-turning at the roundabout;
- The Dublin Port Masterplan 2040, reviewed 2018 includes 8 'E Plots' in the north-western section of the Port Estate close to the Port Access on Promenade Road, as shown in Figure 13-92. These Plots have been identified to be redeveloped primarily for the transit storage of unitised cargo;
- The non-core users currently located within the E Plots will be relocated to the Dublin Inland Port. New land and access reconfigurations will occur in the region of the E Plots, which will change the traffic patterns and volumes in the surrounding area, providing the opportunity to refine the future year road design solutions for this area;
- The E Plots may be check-in facilities for unitised freight, and can hold non-critical traffic until the peak event at AM1 and PM has passed;
- The non-core users currently located within the E Plots will be relocated to the Dublin Inland Port. New land and access reconfigurations will occur in the region of the E Plots, which will change the traffic patterns and volumes in the surrounding area, providing the opportunity to refine the future year road design solutions for this area;

- The E Plots may be check-in facilities for unitised freight, and can hold non-critical traffic until the peak event at AM1 and PM has passed;
- The E Plots could have an exit route along Bond Drive Extension that could channel vehicles to the Promenade Road Extension bypassing the Promenade Road Roundabout. This would effectively be a third lane entry to the Port;
- Demand management could occur at the Port Estate at peak times to control the level of traffic flows. There are suite of measures including:
  - Adjust vessel sailing times, especially the time critical Ro-Ro sailings, to smooth out the peak of the vehicles arriving during AM1 and PM;
  - Increased charges for dwell times and early arrivals times to encourage vehicles to arrive within preferred windows of time.

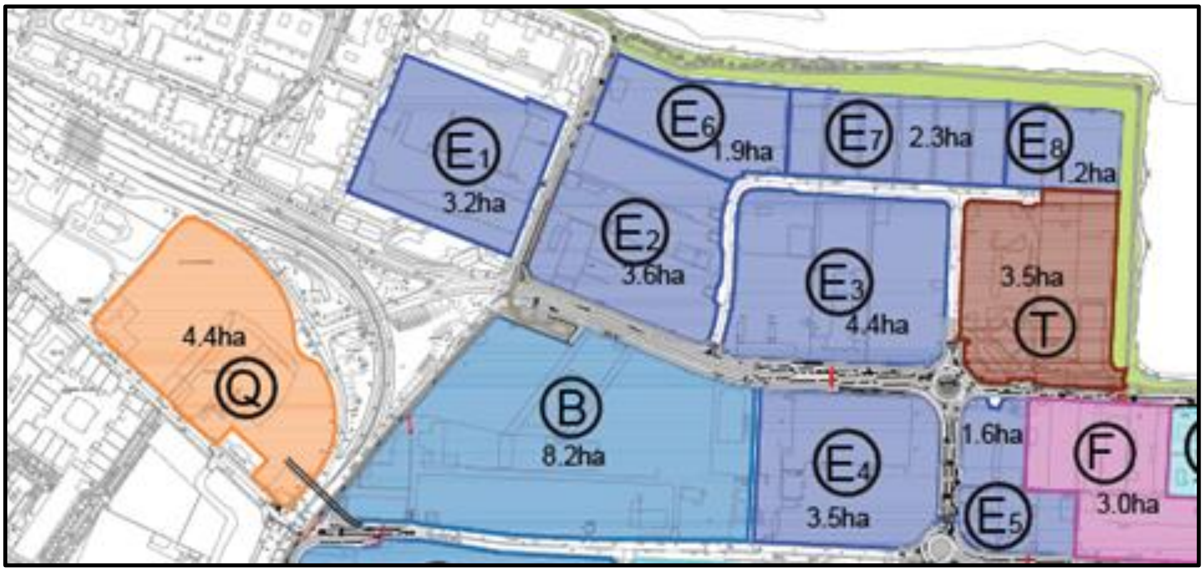


Figure 13-92 Illustration of Linked LinSig Network Diagram for Internal Roads

Summary

The modelling results demonstrate that the accesses and majority of the consented internal road network within the Dublin Port Estate will have comfortable capacity available to deal with the peak traffic flows even at the end of the Masterplan in 2040. This occurs even with the uplift in Dublin Port Estate traffic from 2.5% per annum to 3.3% per annum, to which the MP2 Project contributes.

Note particularly that Junction 7, giving entry to the Dublin Port Estate from the Dublin Port Tunnel, operates within capacity for all peak hours even at the end of the Masterplan period. Junction 6, which is the signalised junction giving access to the Dublin Port Estate from East Wall Road and providing an exit to the Dublin Port Tunnel, and Junction 17, the new roundabout located at the south of Bond Drive, will both be approaching capacity at the end of the Masterplan in 2040 during the AM1 peak hour.

The Linked LinSig results show that the consented Promenade Road Roundabout design at Junction 10 will be approaching capacity during the AM2 peak hour at the end of the Masterplan in 2040. The Promenade Road approach arm to the junction will exceed capacity sometime between 2031 and 2040 during the early morning peak hour AM1 and the PM peak hour.

The design of the consented roundabout has been based on the original AAGR at the Port Estate of 2.5% rather than the current 3.3%, therefore the consented design comes to the end of its design life prior to the end of the Dublin Port Masterplan 2040, reviewed 2018. The Promenade Road Roundabout forms part of the SPAR, therefore the upgrade of the roundabout junction will be considered as the Masterplan continues to be implemented. The SPAR is due to be operational by 2031, which coincides with the consented roundabout coming to the end of its design life. The situation is self-regulating.

In any case, the consented roundabout will have adequate capacity until at least 2031, which is comfortably within the 5 future year mitigation requirement as per the Chartered Institution for Highways and Transportation Guidelines for Traffic Impact Assessment 1994. Additionally, there are a suite of measures available to DPC to control and manage the pattern of traffic arriving to the Port Estate that can utilised in future years as the current Masterplan comes towards the end of its lifespan, including:

- Close the barrier between the Dublin Port Estate and the Eastlink Business Park;
- Redevelopment of the 8 E Plots surrounding the Promenade Road Roundabout primarily for the transit storage of unitised cargo;
- Demand management at peak times to control the level of traffic flows.

13.10.18 Cumulative Impact

An assessment has been carried out of the cumulative impact of the consented schemes within the environs of the MP2 Project.

Consents within the Port Estate

There are a suite of minor consents relating to facilitating the continuing Port-related operations within the Dublin Port Estate. These are already incorporated within the TTA by use of the 3.3% per annum growth rate applied to the Port-related traffic movements, which represents the continued growth at the Dublin Port Estate and continued implementation of the Masterplan.

Recently a bridge was permitted over Alexandra Road (Reg Ref 4521/18) which will connect Terminal 4 to the plot north of Alexandra Road. This bridge has been included and considered in the Proposed Traffic Flow Diagrams, as illustrated in Figure 13-93.

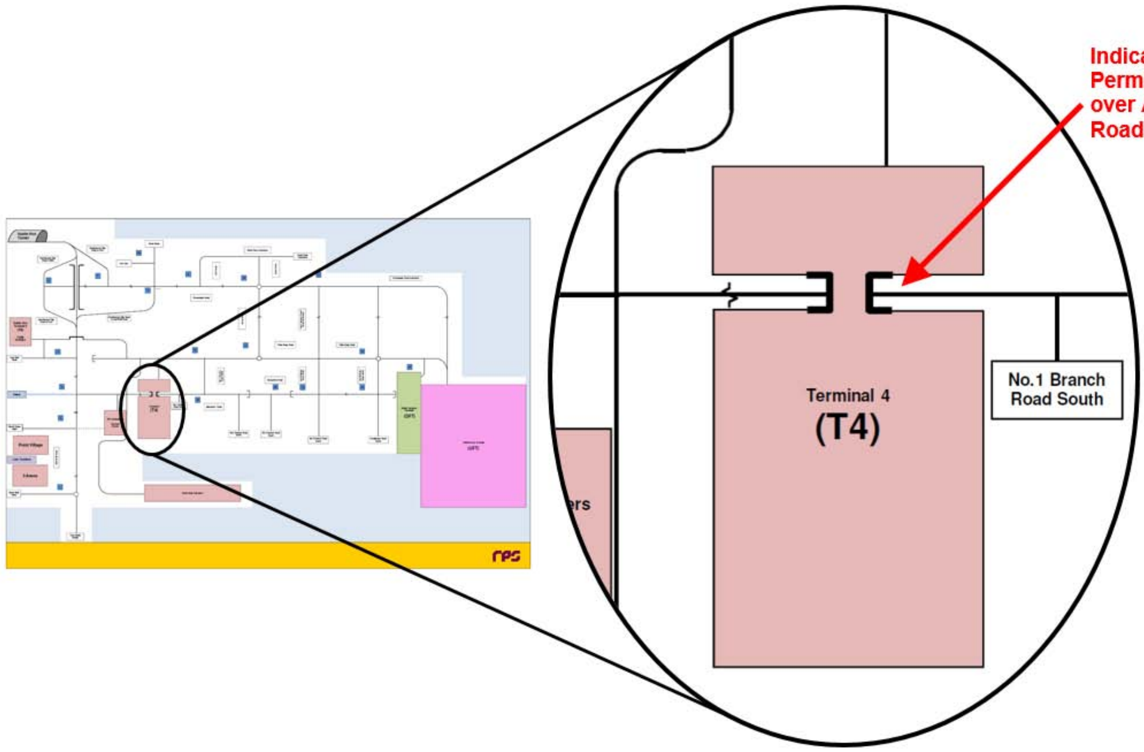


Figure 13-93 Permitted Bridge over Alexandra Road incorporated into Proposed Traffic Flows

Consents outside of the Port Estate

There are two schemes located just outside of the Port boundary;

- North Lotts & Grand Canal Dock Planning Scheme 2014 – Approved. The Exo Building, (DSDZ3632/15, DSDZ3686/16, DSDZ3776/17), currently under construction and illustrated in Figure 13-94, is part of this approved Planning Scheme.
- Poolbeg West Strategic Development Zone – Approved 2019.

Figure 13-94 Illustration of the Consented Exo Building Currently Under Construction

Section 13.9.9 explained how the use of growth rates from TII's Project Appraisal Guidance (PAG) for National Roads have been applied to the non-Port traffic on the road network, providing a very robust assessment for the following reasons:

- The PAG growth rates 'High Sensitivity Growth' have been used in the assessment;
- It has been considered that the Light Vehicle (LV) to Heavy vehicle (HV) ratio for the non-Port traffic is 80%LV:20%HV, even though the proportion of non-Port Heavy Vehicles never exceeds 15.9% for any of the peak hours;

In addition to use of high growth rates to non-Port traffic, it has also become evident that these schemes will not be car based.

The Exo Building has consent for only 62 car parking spaces and 320 cycle parking spaces, and it is likely that other developments in the same general area as the North Lotts & Grand Canal Dock Planning Scheme will have similar travel profiles.

The NTA regional model confirms that the Poolbeg West SDZ Planning Scheme will be a sustainable transport based scheme. Walking, cycling and public transport provision will be progressed to mitigate the impact of the scheme on the local road network and ensure sustainable modes of transport are a viable and real alternative to the private car.

Therefore these schemes have already been considered in this TTA.

Minor Amendments to the already Permitted Dublin Port Road Network Improvements Project

Permission was granted in 2017 to some minor amendments to a localised section of the internal roads upgrade scheme (Ref 2684/17). The amendment affects No.2 Branch Road North Extension and considers the road as northbound as opposed to southbound. See Figure 13-95.

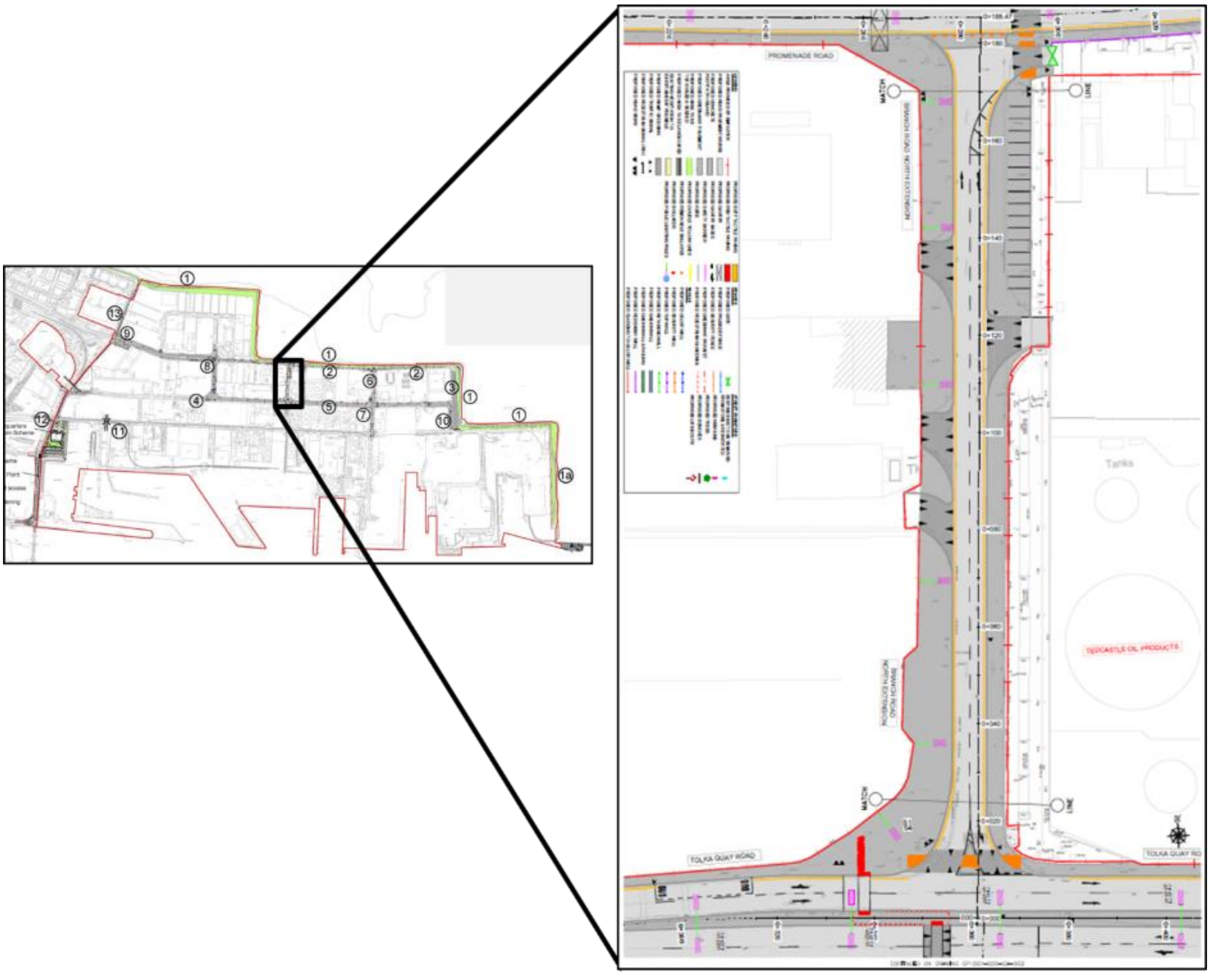


Figure 13-95 Consented Amendment to No.2 Branch Road North Extension

This permitted amendment has been considered and will result in northbound traffic assigned to the road will be reassigned to utilise the Bond Drive and the proposed roundabout at Junction 10. This is indicated in Figure 13-96. Proposed Junction 10 has a dedicated left turning slip lane that gives way to minimal traffic flows. In each of the assessment years, for the year 2040, the DOS is 0% on both of the southbound approach roads to the roundabout. Hence the roundabout has sufficient capacity to readily accommodate the traffic distribution attributable to the alternative design.

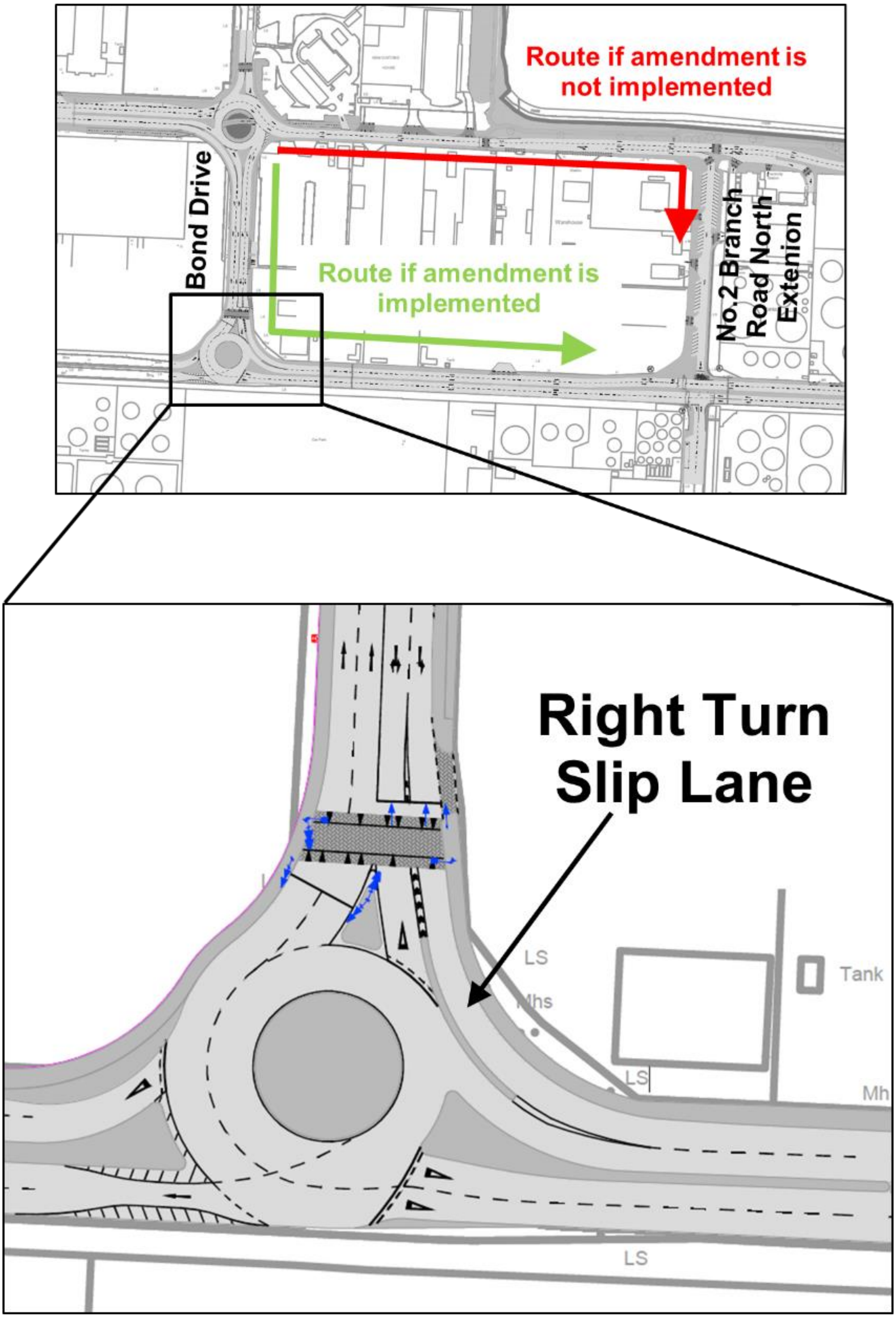


Figure 13-96 Traffic Routing if Alternative Layout is Implemented

Hence, in terms of cumulative impact, it has been demonstrated that:

- The suite of relatively minor consents within the Port are already incorporated within the TTA by use of the 3.3% per annum growth rate applied to the Port-related traffic movements;

- The consented schemes located close to the Port boundary – Exo Building, North Lotts & Grand Canal Dock Planning Scheme 2014, and the Poolbeg West Planning Scheme, have also already been inherently considered in the TTA. These schemes will not be car based, and are considered to already be incorporated in the assessment by use of the robustly high level of traffic growth rates applied to the non-Port traffic flows;
- An examination of the traffic modelling results concludes that the consented internal network will have adequate capacity to accommodate either consented road design layout of No.2 Branch Road North Extension.

Order for Possible Brexit Compounds

The concept of Brexit has been considered in the MP2 Project Rationale and in the Dublin Port Masterplan 2040, reviewed 2018. This TTA takes cognizance of these documents and therefore inherently takes account of the wider context of Brexit up to the end of the Masterplan.

A recent order (Planning and Development Act, 2000 Section 181(2)(A) Order No.1 2019) makes reference to specific emergency localised Brexit measures within the Dublin Port Estate relating to a worse case ‘no-deal’ Brexit scenario, and if required, might only be place for a limited amount of time. The first assessment year in the TTA is 2026, which would be 5+ years after a ‘no-deal’ Brexit scenario should it occur, at which time it could be reasonably assumed that the matter will be resolved.

Therefore, the order does not have an impact of the TTA carried out for the MP2 Project.

13.10.19 Construction Traffic and Management Plans

Construction Traffic

Construction traffic will arrive and depart the Port via the national road network. All HGV movements will be in compliance with the Dublin City Council HGV Management Strategy. Within the Dublin Port Estate, traffic will be routed through the existing road network to reach the MP2 Project site boundary. Traffic within the proposed site will be diverted in a phased manner to ensure the existing facilities at Terminal 1 (Irish Ferries) and Terminal 2 (Stena) remain operational with minimal impact.

The indicative Construction Programme for the MP2 Project has been used to determine the anticipated construction traffic on the road network. Anticipated staffing levels are also presented. The predicted daily flows split per quarter over the duration of the project are presented in Table 13-33.

Table 13-32 Predicted Construction Daily Traffic Flows

Average Daily	2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Staff	0	0	0	0	29	43	43	41	28	28	28	54
HGV movement (1 way)	0	0	0	0	15	21	28	29	29	41	32	31
Internal HGV movement (1 way)	0	0	0	0	2	1	8	10	14	1	0	1
Average Daily	2024				2025				2026			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Staff	54	54	12	0	28	54	54	52	54	46	70	70
HGV movement (1 way)	29	21	3	0	6	5	5	4	5	4	4	6
Internal HGV movement (1 way)	1	2	1	0	1	1	1	1	0	1	1	0
Average Daily	2027				2028				2029			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Staff	57	35	21	13	13	13	6	0	28	28	32	54
HGV movement (1 way)	13	13	8	5	5	5	3	0	0	0	3	2
Internal HGV movement (1 way)	0	0	0	0	0	0	0	0	1	1	0	0
Average Daily	2030				2031				2032			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Staff	28	28	28	52	49	28	28	50	36	0	0	0
HGV movement (1 way)	9	0	57	40	22	2	0	7	6	0	0	0
Internal HGV movement (1 way)	2	3	1	0	0	2	1	0	0	0	0	0

The average daily construction related HGV movements anticipated are presented in Figure 13-97.

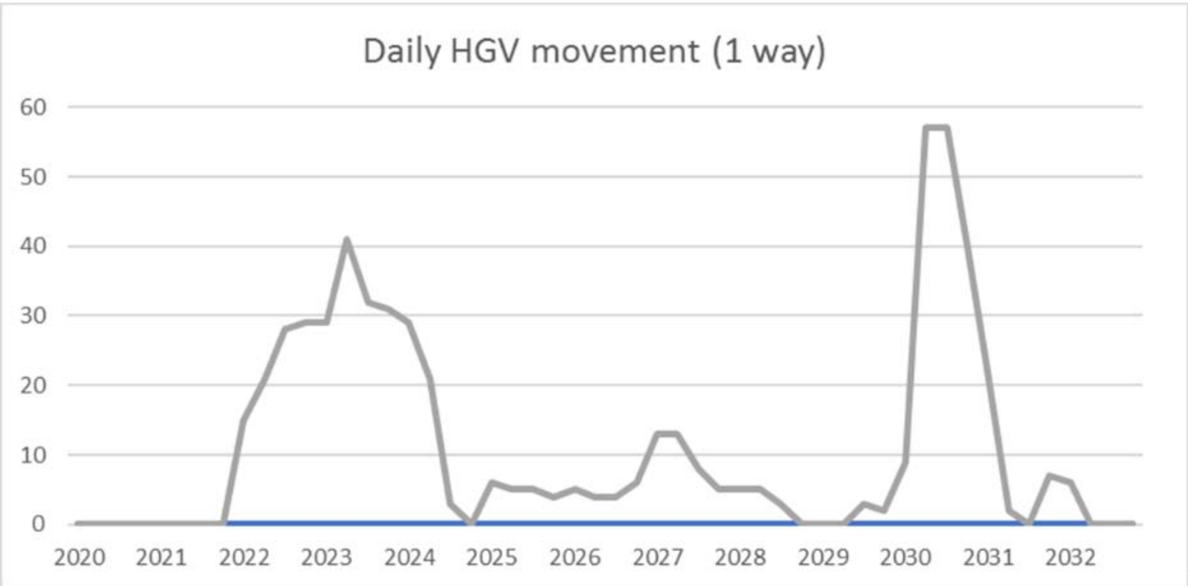


Figure 13-97 Daily Construction Related HGV Movements

The anticipated peak HGV traffic volume will occur in Q3 of 2030. It is anticipated that there would be an average daily traffic movement over this period of 57 vehicles per day, based on a 5 day working week. The peak week within the construction phase will be Q4 2030 where on average there will be 81 HGV movements per day. This would incorporate a peak of 17 HGVs per hour between 07:00am and 08:00am. This peak level of hourly construction traffic will be imperceptible to the external road network, no more noticeable than the ordinary daily fluctuations in traffic flows.

Construction Environmental Management Plan

The MP2 Project construction works will be undertaken in compliance with a Construction Environmental Management Plan (CEMP) which will include mitigation measures brought forward from the environmental assessments undertaken during the preparation of this EIAR. A Draft CEMP has been prepared to enable a comprehensive assessment of the construction phase of the MP2 Project. The CEMP will be finalised subject to consent and appointment of Contractors.

Construction Traffic Management Plan

The construction related vehicles will be controlled by a Construction Traffic Management Plan (CTMP), within the hierarchy of the CEMP. The CTMP will contain a detailed suite of traffic management measures and can confirm the following information at construction stage:

- Location and operational organisation of the construction site and the construction site compound;
- Haulage route to access the construction site/compound;
- Expected numbers and nature of the construction vehicles;
- Site construction times and details of any time restrictions relating to construction vehicles on the adopted road network;
- Details of temporary warning signage that may be required; and
- Provision for wheel washing, roadside cleaning, load checking and general maintenance of larger vehicles.

A Draft Construction Traffic Management Plan is presented in Appendix 19 and within the Draft CEMP.

13.11 Summary and Conclusions

This Chapter of the EIAR summarises the existing terminals, operators, berths, Dublin Port Estate accesses and approach roads relevant to the Traffic and Transportation Assessment (TTA) for the MP2 Project. The surveyed information allows the relationship between the vessel movements and traffic flows to be understood for Ro-Ro and Lo-Lo operations.

Aspects from the original Dublin Port Masterplan 2012-2040, the Dublin Port Masterplan 2040, reviewed 2018 and the accompanying Strategic Transportation Study suite of documents have been considered in the preparation of the TTA, where appropriate.

The TTA considers several schemes and transportation infrastructure improvements, both within the Port and its environs, which are of particular relevance to the TTA for the MP2 Project. They are:

- Consented road upgrade scheme within the Dublin Port Estate. This scheme is of vital importance to the vehicular and sustainable transport connectivity to the MP2 Project and it is therefore confirmed that this scheme will be complete and operational prior to the completion of the construction of the MP2 Project;
- The ABR Project and committed closure of the Port accesses along the East Wall Road;
- The opening-up of the Port Centre public realm scheme, currently complete and operational.

The vehicular accesses to both UFT and DFT are located a distance of c1.9km from the adopted road network.

Several scoping correspondence / meetings were held with the bodies listed below, and the received comments have been considered within the assessment:

- An Bord Pleanála (ABP);
- Transport Infrastructure Ireland (TII);
- Land Use, Planning and Transportation Section of the South Dublin County Council;
- Transportation Planning Division, Dublin City Council (DCC).

The methodology for the TTA was described in detail at a pre-application meeting with DCC, including members from the Transportation Planning Division, and the method was received positively.

Sustainable and Active Travel

The high quality cycle and walking connections to the MP2 Project provided by the consented roads scheme within the Dublin Port Estate has been demonstrated, including:

- 4km Greenway along the northern shoreline overlooking the Tolka Estuary leading to a two-tier linear park at the east of UFT connecting the NTA's Dublin's Proposed National Cycle Network to the MP2 Project.
- Landmark cycle and pedestrian bridge across the Promenade Road Access;
- Enlarged Promenade Road Roundabout with segregated cycle/walkway.

An accessibility assessment was undertaken to establish the density of existing, consented and proposed sustainable travel and active transport provision serving the MP2 Project. The main components that provide a high level of accessibility for the MP2 Project are the:

- Consented active travel measures incorporated within the internal roads scheme to connect the MP2 Project to the City;
- Existing density of active travel facilities available in Dublin City Centre;
- Existing density of sustainable travel facilities in Dublin City Centre including bus, rail, DART and Luas;
- Existing provision of cycle locker facilities of the Port Centre public realm scheme to facilitate multi-modal journeys by sustainable travel;
- Proposal for DPC to subsidise the provision of a shuttle bus service to the MP2 Project;

- Proposed connectivity on foot and by cycle to the UFT footprint;

To ensure a high quality public transport service between the UFT and the density of sustainable transport services located at the perimeter of the Dublin Port Estate, DPC is prepared to provide finance, of up to €100,000 for a period of five years (€500,000 total) to a shuttle service operating to create a connection between the UFT, the DART in Clontarf and the LUAS at the Point. It would link into EastPoint Business Park, have multiple stops throughout the northern Port estate and connect with the ferry terminal building at UFT.

The MP2 Project will not impact on the potential extension of the Luas as currently included in NTAs Transport Strategy for the Greater Dublin Area for 2016-2035.

The MP2 Project does not affect the existing operations of the freight trains within the Dublin Port Estate. The proposed land elements of the works will not impede on the existing railway lines present within the MP2 Project site boundary.

An outline Mobility Management Plan (oMMP) has been developed which sets out the type of measures which will be adopted by DPC, in liaison with the operator(s), to ensure that the sustainable transport facilities are made available and are utilised by the users of the MP2 Project. It is envisaged that the MMP for the UFT and DFT will, in the fullness of time, fall under the hierarchy of the Port wide Transport/Travel Plan as the Masterplan continues to be implemented over the next 21 years.

Traffic Impact Assessment Methodology

24 Junctions including the Dublin Port Estate, East Wall Road and the Dublin Port Tunnel, were surveyed for 24 hours on 23 May 2018 for a typical day with only a relatively small cruise vessel in Cruise Berth 18. Classified traffic turning count surveys were carried out, and supplemented with the following existing information:

- Existing queue length surveys;
- Dublin Port Tunnel and Toll Plaza surveys carried out in November 2017 for the Strategic Transportation Study;
- Camera footage of each junction,
- Traffic signal controller information from DCC for each signalised junction,
- Manifest of vessel movements at Dublin Port for the survey day;
- The websites www.vesselfinder.com and www.marinetraffic.com to monitor the vessel movements.

The surveyed traffic flows were converted to Passenger Car Units (PCUs) using the conversion factors from the TII Project Appraisal Guidelines, with the exception of OGV2 for which the PCU conversion rate of 2.3 has been increased to 2.9 to provide an additionally robust assessment.

Due to a unique set of circumstances that create an early internal traffic peak hour within the Port, driven by the Dublin City Centre HGV Management Strategy, 3 peak hour assessments have been taken forward for detailed traffic impact assessment:

- Internal Morning Peak Hour, 06:15-07:15, Referred to as AM1;

- External Morning Peak Hour, 07:30-08:30, Referred to as AM2;
- External Evening Peak Hour, 16:45-17:45, Referred to as PM.

An examination of the existing vessel movements demonstrated that the existing traffic from 3 Freight & Passenger Ro-Ro vessels are contained within each of the 3 peak hours being assessed.

Cordoned extracts from the NTA multi-modal model for Dublin City were combined with the latest traffic surveys to establish an existing origin-destination matrix for the existing Port traffic.

The Assessment Years 2026, 2031 and 2040 were selected.

The use of high growth rates from TII's Project Appraisal Guidance for National Roads Unit 5.3 have been applied to the non-Port traffic on the road network.

Port related traffic flows have been assigned the 3.3% per annum growth rate in accordance with the Average Annual Growth Rate between 2010 and 2040 at the Port as enshrined in the Dublin Port Masterplan 2040, reviewed 2018.

Considerable justification has been included in the TTA as to how the 3.3% per annum approach provides a robust assessment for the MP2 Project, just beyond the upper limit of what is physically achievable on the ground:

Future year existing traffic flows were derived by applying the differing growth rates to the Port and non-Port traffic flows.

Proposed Traffic flow models were built to include all of the consented and proposed changes at the Port which affect the road network.

Linked LinSig models were built to assess the impact of the traffic generated by the MP2 Project on the existing and committed road network.

The model results allow the following to be assessed:

- Assess arrangements to the MP2 Project, particularly the entrance barrier capacity at UFT and determine if accumulative queueing occurs;
- Determine if the consented internal road network can accommodate the traffic generated within the Dublin Port Estate, to which the MP2 Project contributes.

UFT - Barrier Capacity, Traffic Control and Contingency Measures

For a typical day, the combined 14 barriers collectively have sufficient capacity to accommodate the PCUs arriving at the UFT with no accumulative queueing occurring even at the end of the Masterplan in 2040.

Modelling has been based on 8 HGV barriers (the 6 dedicated HGV barriers, 2 of the dual use barriers being used for HGVs and the remaining 6 dual use barriers being used for non-HGVs). The model includes the signalisation of the Tolka Quay Road / Promenade Road Extension with pedestrian crossing facilities, and the entry and exit from the access road to the parking and set down / pick up area.

The Linked LinSig model results show that during the worst case peak hour, AM1 0615-1715, there is ample spare capacity at the 6 non-HGV barriers and spare capacity at each of the 8 HGV barriers with minimal queueing.

Sensitivity testing finds that even if a complete turnaround of the Terminal 1 parking and set down area occurred within the same worst case peak hour for freight movements, AM1 06:15-07:15, the proposed access and egress arrangements for the MP2 Project would continue to operate within capacity with minimal queueing.

This assessment has been based on 2 of the dual use barriers being used for HGVs and the remaining 6 dual use barriers being used for non-HGVs. Should demand be greater than expected, HGVs can be allocated to any of the 8 dual use barriers, ensuring that sufficient capacity is available.

In addition, there are a suite of measures available to DPC to control and manage the pattern of traffic arriving to, and the operations within, the UFT that can be utilised if necessary. A total of 36 gantries will be used to control and manage traffic flows at the Dublin Port Estate and for the MP2 Project; 11 consented on the Dublin Port Estate, 7 proposed for the MP2 Project and 18 indicatively included with UFT. UFT is a large footprint that will be capable of being adapted to the requirements of the trade to ensure that the needs of the UFT are continually met.

A stacking distance of 5.6km between the 14 entrance barriers to UFT and the Promenade Road Roundabout is considered comfortably adequate to provide contingency for occurrences such as technical faults and adverse weather conditions, minimising any inconvenience that could potentially be caused to the Promenade Road Roundabout or the external adopted road network.

Dublin Port Tunnel and Toll Plaza

The recent traffic survey reconfirmed the analysis carried out in the Strategic Transportation Study that the Dublin Port Tunnel is operating at approximately half of its modelled capacity. Within the NTA Regional Transport Model for the Greater Dublin Area, the Dublin Port Tunnel is coded with a capacity of 3,800 PCUs per hour per direction, and the data shows that even half of the one-way flow of 1,900 PCU/hour per direction was not exceeded on the day of the traffic survey.

The report finds that the 3,800 PCU lane capacity per direction, or a total 7,600 PCU per hour, and the capacity of the northbound Toll Plaza of 4,275 PCUs per hour, is not reached during any of the 3 peak hours for the Proposed Traffic flows in 2040.

The total of 84,996 PCUs per day does not exceed the 182,400 daily PCU capacity of the Dublin Port Tunnel, or even the capacity of 91,200 PCUs per direction.

In any case, TII are preparing plans for a major upgrade of the tolls at the Dublin Port Tunnel, including replacing the tolling related equipment and software at the Toll Plaza. The project is anticipated to go out to tender in Q3 2019, and the major upgrade is expected to result in the performance of the tolls to be significantly better than existing. Furthermore, TII are considering upgrading the toll collection system to be barrier free (or free-flow) in future years, likely to happen before the 2040 horizon year for the Masterplan.

It is therefore demonstrated that the Dublin Port Tunnel and the Toll Plaza have sufficient capacity to accommodate the MP2 Project.

Planning Gain to the External Road Network

The planning gain provided by DPC by closing the Dublin Port Estate accesses and removing traffic from the external road network has been demonstrated for each of the junctions along East Wall Road, even with the recent uplift in Port traffic from 2.5% per annum to 3.3% per annum, to which the MP2 Project contributes.

There are environmental benefits in reducing the number of large vehicles that travel along this section road, with associated noise & air pollution benefits and reduction in the wear & tear of the adopted carriageway.

In accordance with TII TTA Guidelines detailed modelling is not required on the external road network as the percentage impacts never exceed 5% or 10%.

The closure of the Dublin Port Estate accesses facilitates DCC to implement their potential scheme which, if realised, will provide enhanced walking and cycling crossing facilities along East Wall Road and replaces the Point Roundabout with a signalised junction. It has been highlighted that although the South Port Access Road (SPAR) is not part of the proposals for the MP2 Project, should it be realised in future years it will provide further planning gain this section of the adopted road network.

The camera footage confirmed that the freight train at Alexandra Road didn't enter or exit the Port during the peak traffic hours assessed, demonstrating that the operation of the train doesn't impact on the peak hour traffic flows along East Wall Road.

Modelling Results for the Internal Road Network

The modelling results demonstrate that the majority of the consented internal road network within the Dublin Port Estate will have comfortable capacity available to deal with the peak traffic flows even at the end of the Masterplan in 2040. This occurs even with the uplift in Port traffic from 2.5% per annum to 3.3% per annum, to which the MP2 Project contributes.

Note particularly that Junction 7, giving entry to the Port from the Dublin PortTunnel, operates within capacity for all peak hours even at the end of the Masterplan period.

Junction 6, which is the signalised junction giving access to the Port from East Wall Road and providing an exit to the Dublin Port Tunnel, and Junction 17, the new roundabout located at the south of Bond Drive, will both be approaching capacity at the end of the Masterplan in 2040 during the AM1 peak hour.

The Linked LinSig results show that the consented Promenade Road Roundabout design at Junction 10 will be approaching capacity during the AM2 peak hour at the end of the Masterplan in 2040. The Promenade Road approach arm to the junction will exceed capacity sometime between 2031 and 2040 during the early morning peak hour AM1 and the PM peak hour.

The design of the consented roundabout has been based on the original AAGR at the Port of 2.5% rather than the current 3.3%, therefore the consented design comes to the end of its design life prior to the end of the Dublin Port Masterplan 2040, reviewed 2018. The Promenade Road Roundabout forms part of the SPAR and the upgrade of the roundabout junction will be considered as the Masterplan continues to be implemented. The SPAR is due to be operational by 2031, which coincides with the consented roundabout coming to the end of its design life. The situation is self-regulating. If the Masterplan doesn't continue to be implemented, the full growth potential won't be reached and the capacity of the consented roundabout will be adequate to accommodate the traffic generated by the ABR Project and MP2 Project.

In any case, the consented roundabout will have adequate capacity until at least 2031, which is comfortably within the 5 future year mitigation requirement as per the Chartered Institution for Highways and Transportation Guidelines for Traffic Impact Assessments. Additionally, there are a suite of measures available to the Port to control and manage the pattern of traffic arriving to the Port that can utilised in future years as the current Masterplan comes towards the end of its lifespan, including:

- Close the barrier between the Port Estate and the Eastlink Business Park;
- Redevelopment of the 8 E Plots surrounding the roundabout primarily for the transit storage of unitised cargo;
- Demand management at peak times to control the level of traffic flows.

Cumulative Impact

An assessment has been carried out of the cumulative impact of the consented schemes within the environs of the MP2 Project. It has been demonstrated that:

- The suite of relatively minor consents within the Port are already inherently incorporated within the TTA by use of the 3.3% per annum growth rate applied to the Port-related traffic movements;
- The consented schemes located close to the Port boundary – Exo Building, North Lotts & Grand Canal Dock Planning Scheme 2014, and additionally the Poolbeg West Strategic Development Zone have also already been inherently considered in the TTA. These schemes will not be car based, and are considered to already be incorporated in the assessment by use of the robustly high level of traffic growth rates applied to the non-Port traffic flows;
- An examination of the traffic modelling results concludes that the consented internal network will have adequate capacity to accommodate either consented road design layout of No.2 Branch Road North Extension.

Construction Traffic

The anticipated peak HGV traffic volume will occur in Q2 of 2021 during which a peak of 17 HGVs per hour is estimated between 07:00am and 08:00am. This peak level of hourly construction traffic will be imperceptible to the external road network, no more noticeable than the ordinary daily fluctuations in traffic flows.

The MP2 Project construction works will be undertaken in compliance with a Construction Environmental Management Plan (CEMP) and a Construction Traffic Management Plan (CTMP) containing a suite of traffic management measures such as haulage routes, expected numbers of construction vehicles for each phase, details of temporary warning signage, provision for wheel washing, roadside cleaning, load checking and general maintenance of larger vehicles.

Overall Summary

A TTA has been carried out which has demonstrated that the existing, consented and proposed road network and transportation measures will accommodate the trips generated by the MP2 Project.

The existing, consented and proposed sustainable and active travel facilities provide a comprehensive suite of measures for users of the MP2 Project, including a €500,000 funding commitment from DPC for the new shuttle bus service to connect the MP2 Project to the Luas and the DART.

Detailed computer modelling has demonstrated that the proposed access arrangements for the MP2 Project, particularly the 14 UFT entry barriers, will have sufficient capacity with no accumulative queueing occurring at 2040, even under sensitivity testing.

Increased road capacity and planning gain will be provided on the external road network by the closure of the Port Estate accesses along East Wall Road, and though the SPAR is not part of the MP2 Project, should it be delivered in future years it will provide further capacity benefits along East Wall Road.

The Dublin Port Tunnel and Toll Plaza will have sufficient capacity at 2040 when the MP2 Project is complete and operational.

Detailed computer modelling has demonstrated that the consented internal road network will have sufficient capacity at 2040 to accommodate the traffic generated by the MP2 Project.

The consented Promenade Road Roundabout will exceed capacity until at least 2031 when a 3.3% pa growth rate is considered. The Promenade Road Roundabout forms part of the SPAR and the upgrade of the roundabout junction will be considered as the Masterplan continues to be implemented. The SPAR is due to be operational by 2031, which coincides with the consented roundabout coming to the end of its design life. The situation is self-regulating. In any case, the consented roundabout will have adequate capacity until at least 2031, which is comfortably within the 5 future year mitigation requirement as per the Chartered Institution for Highways and Transportation Guidelines for Traffic Impact Assessments. Additionally, there are a suite of measures available to DPC to control and manage the pattern of traffic arriving to the Port Estate that can utilised in future years as the current Masterplan comes towards the end of its lifespan.

14 CULTURAL HERITAGE (INCLUDING INDUSTRIAL & ARCHAEOLOGICAL)

14.1 Introduction

This chapter of the EIAR presents the appraisal undertaken of the potential effects of the MP2 Project on cultural heritage assets, which was conducted to identify and record the location, nature, and dimensions of any archaeological and industrial heritage features, fabric or artefacts that may be impacted by the MP2 Project. The appraisal includes an examination of existing sources and the acquisition of new data arising from site inspections and surveys. The appraisal gauges the likely significant effects of the MP2 Project on cultural heritage (including industrial and archaeological heritage) and, where necessary, includes detailed recommendations for the mitigation of any effects on cultural heritage assets potentially impacted upon within the area of the MP2 Project.

The archaeological aspects of the cultural heritage assessment were undertaken by Dr Niall Brady and Rex Bangerter of the Archaeological Diving Company Ltd (ADCO). This work was supplemented by a conservation and industrial heritage appraisal that was undertaken by Chris Southgate, Ciara O'Flynn and Trevor Wood of Southgate Associates, and detailed laser-scan and multi-beam surveys conducted by Hydromaster.

The cultural heritage appraisal includes a comprehensive review of existing records and maps and the undertaking of project-related site inspections above and below the waterline, under licence from the Department of Culture, Heritage and the Gaeltacht's (DCHG) National Monuments Service (NMS).

The results and observations are described in the present chapter, whilst detailed descriptions are provided in Appendix 14-1.

The archaeological survey area extends from Oil Berth 3 within the deepwater basin of Alexandra Basin on the north side of the River Liffey, to a point east of the Oil and Gas Jetty on the south side of the channel (Figure 14-1). The survey area includes the active river channel and its associated built structures.

14.2 Assessment Methodology

Desk-based assessment included a review of existing cartographic sources; the archival records maintained by the National Monuments Service that deal with pre-1750 sources and post-1750 sources; Dublin Port's accessible archives, and ADCO's own records from previous work conducted in the Port area since 2014.

A marine geophysical survey was commissioned separately to include the sea area of the MP2 Project that extends beyond that of the survey completed in 2014 for the Alexandra Basin Redevelopment (ABR) Project. The specification required a similar set of comprehensive data acquisition, to maintain consistency between data sets and to ensure similar high standards of outputs, updated to take account of new technologies. The survey was completed in June 2018 by Hydromaster, whose report is included in Appendix 14-1.

Site investigations were conducted in July and August 2018, to inform the engineering design, and the logs were presented to ADCO to ascertain the nature of the buried stratigraphy at the locations investigated. The Site Investigations work is reported on in Appendix 8 of this EIAR.

A topographic survey was commissioned separately to include the above-water and below-water elements of the pier head of Breakwater Road on the north side of the channel. The work comprised laser-scan survey of the above-water elements and multi-beam survey of the below-water elements to generate metrically accurate data that allows for Digital Terrain Modelling of the structure and to generate measured plan, elevation and section drawings of the structure. The work was completed in 2018 and 2019 by Hydromaster, whose report is included in Appendix 14-1 to the EIAR.

Walkover inspections were completed in July, August and September 2018 by Niall Brady and by Southgate Associates. The work focussed on the standing remains of cultural heritage interest; namely the Breakwater terminus area on the north side of the channel. Walkover inspection extended to include the area of the modern port within the footprint of the MP2 Project.

Underwater inspections licensed by the National Monuments Service were completed in August 2018 by ADCO, and the illustrated report is included as Appendix 14-1. The work focussed on a list of anomalies detected in the marine geophysical survey and on the Breakwater terminus area on the north side of the channel.

A conservation strategy and industrial heritage appraisal has been prepared by Southgate Associates, and is included within the application for consent submission as a standalone report

The results of these elements are brought together in this chapter to understand the cultural heritage environment, to appraise the potential impacts and to present appropriate mitigation within the context of the MP2 Project.

14.3 Receiving Environment

14.3.1 Cartographic sources

The history of Dublin Bay and the development of the city and its port are well documented by series of historic maps and sea charts. As the city grew, the wide channel of the River Liffey’s estuary was the subject of attempts to improve navigation and access to the commercial centre. The Port moved downriver and eastwards from its origins in the Wood Quay area. The present location of the Port remained open water for many centuries in Dublin’s development. As charted by the Dutch military engineer, Bernard de Gomme, in his map of the City and Suburbs of Dublin in 1673, much of the estuary remained hazardous to shipping, as indicated by complex sand flats, while various attempts to overcome these restrictions are also recorded and include the planned (but never realized) construction of a large star-shaped fort out on Ringsend Spit (Figure 14-2). The presence of the spit helps to explain the slight angle in what became the Great South Wall (begun in 1715 and completed in 1795), which mirrored the easterly alignment of the channel on the seaward side of the spit.

When the cartographer John Rocque prepared his map of the City Harbour and Environs in 1757, he provided a detailed perspective on the various sand flats and constraints on shipping, which suggests the extent to which the prosperous city was expanding (Figure 14-3). It is an important source of information that provides detailed insight to maritime works along the estuary’s mouth. Rocque records a series of navigation markers that highlight the shallows on the north and south sides of the channel as far east as what was then the termination point of the Great South Wall, at what became Pigeon House Fort. The markers appear to be constructed on a basic timber tripod frame, with a more substantial construction close to the terminus of the Wall. This more robust marker, shown with a heap of stone at its base, may highlight the former tip of the Ringsend Spit that was mapped by de Gomme eighty years earlier. The channel at this location in 1757 was much straighter, which suggests a programme of extensive dredging had occurred in the intervening time. A formal buoy, the 'West Buoy' marks the Port side of the harbour entrance further to the east, while a floating buoy or 'Light Ship' marks the starboard side; both of which foreshadow the North Bull light and Poolbeg lighthouse respectively today.

Reclamation of the intertidal areas on the north side of the Liffey downstream of the city was well under way by 1757, and the North Lotts was laid out and parcelled into blocks terminating at 'East Quay', which is on the line of East Wall Road today. The site of the future Port remained an undeveloped wedge-shaped sandflat to the east, while further east Rocque's map records the names of individual sand banks, such as 'Brown's Patch', and highlights the extensive footprint of the Clontarf oysterbeds.

In contrast, the south side was much more developed, with construction of the South Wall well underway. The wall made landfall in the west at Ringsend Point, and had two slipways: Macarel's Slip gave access north into the channel and seems to be on the same location of the later Coastguard slip, east of the present-day Poolbeg Yacht Club; while George's Slip gave access south of the wall onto Sandymount. To the east of the Wall and running at an angle aligned East-Northeast were 'The Piles', which represent Dublin Corporation's first attempt (completed in 1731) to secure the shipping channel by building a timber breakwater out into the bay along the south bank of the River Liffey. The Piles are recorded as a parallel line of timber-post couplets. The Piles recorded by Rocque would soon be replaced during the 1760s fully by a solid wall that is the Great South Wall today, completed in 1796.

The ships recorded by Rocque are substantial three-masted ocean-going vessels, as one might expect to service the city. The ships are shown within the area of the Piles, but do not reach substantially further upriver. This is in contrast to Rocque's 1756 map of the City and Suburbs of Dublin, which shows a wealth of shipping along the city's quays but does not map the area downriver of North Wall Quay and Rogerson's Quay. The point to take from this variation is that on the 1757 map Rocque conveys an indication of the constraints on shipping, insofar as the deepwater vessels did not extend onto the shallower waters upriver and west of the Clontarf Pool. In their place, smaller vessels and ferries were used to convey merchandise into and out of the city. Rocque's representation is a cartographic convention, used to indicate variation in seabed levels and consequently factors that affect navigation.

As indicated on Figure 14-3, which shows an overlay of the present-day port on top of Rocque's 1757 map, the development area for the MP2 Project occupies an area that includes the eastern end of the mudflat known as Brown's Patch, and the adjacent deep-water space of Clontarf Pool and the former Clontarf oyster bed on the north side of the channel. The area on the south side of the channel touches on a location referred to as The Pacquet Moorings, where cross-channel ships would lie at anchor; the localised channel widening area for the MP2 Project will extend into part of this space.

The mapping of Dublin harbour and Bay attracted a host of different hydrographers, many of whom were commissioned to assist in developing measures to improve navigation along the Liffey. George Semple's charts of 1762 may be cited in this regard, as can the map of the Bay by Captain Bligh in 1800, who was appointed by the Admiralty to report on the Bay, the harbours within it and the problems of shallowness in the approaches to

Dublin.[1] By 1837, the Ordnance Survey produced the first metrically accurate maps at 6-inch-to-the-mile scales, and established a new standard for mapping the landscape (Figure 14-4). Reclamation works had begun on the seaward side of East Wall road, extending the Port onto the mudflats. The construction of the Patent Slip is recorded, along with a narrow line of buildings to the south, heralding the advance of the deepwater basin. The developments on the south side of the river were also much in evidence, and the map shows the extension of the Great South Wall eastwards, replacing the timber Piles and terminating at the Poolbeg light house. Pigeon House Fort (completed by 1800) is also constructed, along with its harbour (completed by 1793) on the north side.

Commander Langdon's 'Ireland. Dublin Bar and the River Liffey to Carlisle Bridge' (Admiralty Chart 1447) shows soundings in feet and inches taken between 1878 and 1880 across Dublin Bar outside the harbour, and along the approach channel to what is today O'Connell Bridge. The recording of Basin Shelter Wall is an early outline of what becomes the breakwater that defines the eastern limit of Alexandra Basin, and what is today Breakwater Road (Figure 14-5). Langdon also records a series of navigation beacons and maps the mud and sandflats that continued to define the estuary prior to the reclamation works of the twentieth century.

From this point on, it is possible to see the developing port emerge. The blocky rectangular form of the deepwater port is recorded on Admiralty Chart 1468, which also provides accurate soundings along the channel, reaching out across Dublin Bar to the east of Poolbeg (Figure 14-6).

By 1907, many of the principal features of the deepwater port were established, and Ordnance Survey mapping records the shipbuilding yard, Graving Dock 1 and North Quay Extension within the deepwater facility of Alexandra Basin, while the Breakwater defined the eastern extent of the Basin and marks the entrance to the Port (Figure 14-7). Much of the Basin had yet to be dredged and was still populated with sandflat. The terminus or Pier Head of the Breakwater was defined by an angled roundel on which was placed Breakwater Lighthouse. On the south side of the channel, Pigeon House Harbour has been infilled to serve as an Outfall Works for Dublin Corporation (Figure 14-8), while further east a slipway is indicated on the Great South Wall along with a series of buildings that are not yet recorded as those of the former lifeboat complex they would become.

The historic cartographic information available for the project area helps to convey the consistent process of development and the maps that survive make them a useful set of archives to work with.

14.3.2 Known Monuments and Features

The existing cultural heritage assets speak to the development of the port area and are principally related to buildings and structures on the Great South Wall (Table 14-1, Figure 14-9). A smaller selection of features exists on the north side of the channel.

[1] Gerard Daly, 'Captain Bligh in Dublin, 1800-1801', *Dublin Historical Record* 44.1 (1991): 20-33, at p. 23.

Table 14-1 Known archaeological and industrial heritage sites within and in proximity to the MP2 Project.

Reference	Site type	Status	Impacts from MP2 Project
North side of Channel			
DCIHR 19-09-002	Breakwater	Buried. Terminus is a standing structure.	Overburden will be removed close to sea area to facilitate new quay, potentially exposing elements of the buried site. The terminus will be removed. Granite will be salvaged and stored for heritage gain projects.
DCIHR 19-09-003	Breakwater Lighthouse	Removed.	Contemporary design to mark the final end of Dublin port using salvaged elements of the Lighthouse to be built as a heritage gain asset as part of the MP2 Project.
W01465	Wreck	300m N of Berth 53.	None.
W01466	Wreck	600m N of Berth 53.	None.
Channel			
None	n/a	n/a.	n/a.
South side of Channel			
RMP DU019-027, RPS 6794	Blockhouse, Pigeon House Fort	Remnants survive.	None.
RMP DU019-028	Battery	Swimming pool.	None.
RMP DU019-029002, DCIHR 19-09-010, RPS 6797, RPS 6798	Sea wall. Great South Wall to Poolbeg Lighthouse.	Upstanding.	None.
RPS 6793	St Catherine's Hospital and surviving boundary walls, Pigeon House Rd	Remnants survive.	None.
RPS 6795	Former Pigeon House Hotel, Pigeon House Rd		None.
DCIHR 18-12-151	Syphon House	Derelict.	None.
DCIHR 18-12-152	Dublin Main Drainage Pumping Station, Pigeon House Rd	Upstanding.	None.
DCIHR 19-09-001	Boat slip, Pigeon House Rd		None.
DCIHR 19-09-004	Outfall works, Pigeon House Rd		None.
DCIHR 19-09-005	Lifeboat House, Pigeon House Rd		None.
DCIHR 19-09-006, NCEHD 3271, RPS 6796	Electricity works/Power Station, Pigeon House Rd	Upstanding.	None.

Reference	Site type	Status	Impacts from MP2 Project
DCIHR 19-09-007	Cooling water intake dolphin ramp, Dublin Harbour	Upstanding.	None.
DCIHR 19-09-007	Lifeboat House, South Wall	Ruined.	None.
DCIHR 19-09-009	Sluice House, South Wall	Upstanding.	None.
DCIHR 19-09-011	Slip, South Wall	Upstanding.	None.
DCIHR 19-09-012	Landing slip, Pigeon House Rd		None.
DCIHR 19-09-015	Poolbeg Generating Station chimneys, Pigeon House	Upstanding.	None.

Note: RMP-Record of Monuments and Places; RMP-Record of Protected Structures; DCIHR-Dublin City Industrial Heritage Record; NCEHD-National Civil Engineering Database; W-Historic Shipwreck Inventory.

The two known wreck sites within the study area lie north of the development area, in the sandflats that are east of the Port area and north of the new Berth 53.

The breakwater that defines the eastern limit for the nineteenth-century deepwater basin is the principal feature on the north side of the channel. The breakwater is registered as two elements; DCIHR 19-09-002 is the breakwater itself, constructed between 1858 and 1884, and DCIHR 19-09-003 is the site of the lighthouse, built *c*. 1884, that was located at its terminus. The breakwater today lies under the active road surface that is Breakwater Road, which leads from Tolka Quay Road south to the quayside at the Port Operations/VTS building. The lighthouse does not survive *in situ* and was formerly a stone-built square-planned structure on which was placed the necessary lantern and bell. The lantern, its housing and the bell are retained within the Port and are to be reused sympathetically as part of the MP2 Project, reinstating a heritage element to the active port area, as described in Section 14.5.1. The terminus or Pier Head of the breakwater is stone-built and is described in sections 14.3.3.4 and 14.3.3.5. It is constructed in the same manner as the North Quay Extension that was built under the direction of Port Engineer Bindon Blood Stoney, and it marks the original entrance to the deep-water basin of Dublin Port.

The assemblage of features on the south side of the channel comprise the Great South Wall (RMP DU019-029002, DCIHR 19-09-010, RPS 6797, RPS 6798) and the structures built on it over several centuries, and include Pigeon House harbour and fort, as well as the more recent elements of industrial heritage, including the iconic chimneys that are part of the Pigeon House generating station. More modest features include a stone-built slipway, a sluice house and a former lifeboat building complex (DCIHR 19-09-011, -009, and -007 respectively). None of these elements will be impacted by the MP2 Project.

Photographic records from 1981 retained by Dublin Port show lines of exposed timbers that represent the remains of the Piles recorded by John Rocque in 1757.[2] The Piles lie on the south side of the Great South Wall and were revealed following a severe storm. Rock armour has since been laid in this area, burying the surface of the piles and protecting the south-facing side of the Wall. A programme of Site Investigations conducted on the Great South Wall in 2015 has permitted further insight to its construction and state.[3] Five boreholes were cut through the wall between the Slipway DCIHR 19-09-11 and Poolbeg Lighthouse. The archaeological report concluded that the wall was built as a solid structure using cut granite blocks and gravel or shingle as fill, with some limestone and sandstone evident in the lower layers. Cut granite blocks were set dry on the seabed, flanked by two retaining walls. The seabed surface was sand that reaches depths of up to 10m. The sand in turn overlies strata of gravel, shale and boulder clay.

Bedrock was recorded 30-45m below the surface of the wall. In BH3, which lies close to the Half Moon Battery lying to the east of the MP2 Project footprint, timber was observed underneath the wall and this was interpreted as the possible remains of wreckage.

The MP2 Project works will have no impact on the Great South Wall.

14.3.3 New Observations

The new observations are based on the results of the following work completed for the MP2 Project:

- Marine geophysical survey
- Site Investigations
- Topographic survey
- Walkover archaeological and industrial heritage survey
- Underwater archaeological inspection

14.1.1.1 Marine Geophysical Survey

A marine geophysical survey was commissioned for the MP2 Project to assess the archaeological potential of the seabed in those locations that extended beyond the area surveyed in 2013 for the ABR Project (Appendix 14-1). The new survey focussed on two areas north and south of the approach channel respectively; namely where the new Berth 53 is proposed and potential areas for ships to manoeuvre. Survey work also extended into Berth 50A and Oil Berth 3 (Figure 14-10). The work comprised multi-beam survey, magnetometry survey and sub-bottom profile survey. Line-spacing was at 20m intervals East-West and 100m intervals North-South. The results provide a robust and comprehensive suite of information that compares well with that acquired in 2013 and shows suitable levels of overlap that is enhanced by the multi-beam data sets.

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[2] The photographs are dated 15/12/1981. The series is entitled ‘Storm Damage South Wall’, and number some 632 photographs. They are retained by the Port Engineer.

[3] Anon, ‘DPC historical structures studies, Great South Wall, Port of Dublin. Site Investigation report’, Irish Drilling Ltd, unpublished report for Dublin Port Company 2016; David O’Connor, ‘Archaeological monitoring of ground investigations (boreholes) at Great South Wall, Poolbeg, Dublin 2. 15E0454’, Magnus Archaeology, unpublished report for Dublin Port Company.

A series of sixteen acoustic anomalies were detected by the multi-beam survey while many more anomalies were detected in the magnetometry data, suggesting that most of the sources lie buried within the covering silts. No distinct anomaly was detected in the sub-bottom profile data, but the survey has produced a useful record of the buried soft sediment across the area surveyed.

No defined anomalies indicative of shipwreck were identified, and the series of acoustic anomalies appear to be associated with port activities and include one outfall, a possible foundation of a former navigation marker, and debris. The locations that were subsequently diver-truthed are reported on in section 14.3.3.5.

14.1.1.2 Site Investigations

A series of seven borehole logs acquired for the MP2 Project (Appendix 8) were reviewed.[4] Consistent patterns were identified. Sand overlies gravel and clay that overlies bedrock on the north side, with bedrock occurring at depths of 16.5m, 21.5m and 25.5m respectively, while on the south side the stratigraphy did not reveal bedrock. The southern boreholes revealed sand overlying gravel and then very deep deposits of clay. In no instance was there any report of ship's timbers or other indicators of historic activity.

14.1.1.3 Topographic Survey

Detailed laser-scan and multi-beam surveys were commissioned to capture the current state of the Pier Head of the Eastern Breakwater on the north side of the channel (Figure 14-11 – Figure 14-14). The data set is recorded to Level 4 Inventory standard as defined by *English Heritage Recording Practice: Historic England, Understanding Historic Buildings, A Guide to Good Recording Practice*, and has been used in this chapter to assist in the description of the Pier Head presented in sections 14.3.3.4 and 14.3.3.5.

14.1.1.4 Walkover Survey

A walkover survey of the land area associated with the MP2 Project was undertaken. This survey extended from a point north of Tolka Quay Road and the land area east of Breakwater Road, including the waterfront area of Oil Berth 3 (see Figure 14-10).

The land area to the east and north of Breakwater Road is all reclaimed land associated with port development in the twentieth century. It is intensely used today to facilitate Ro-Ro container storage. It also accommodates the passenger ferry terminals and associated parking. Much of the land area is covered in tarmacadamed working surfaces, and the buildings that are present are quite modern. The foreshore areas outside of the modern concrete quays are covered in rock-armour and do not reveal underlying shoreline.

The single exception is the Pier Head of Breakwater road, which ends at the riverfront as a stone-built structure that marked the original entrance to Dublin Port's deepwater basin. Much of the original outline of the Pier Head is intact. The detail recorded in the 1907 Ordnance Survey map is still apparent, with the Pier Head aligned Northwest-Southeast, lying at an angle to the main breakwater that runs North-South. A series of granite capstone blocks form the perimeter edge, and the granite work is continued down the length of the walls, as visible on the exposed seaward facades. A set of steps gives access to berthing vessels, and this is currently used by the Port's fleet of working vessels and pilot boats. Additional reclamation on the northeast side of the Pier Head, associated with Berth 50A undertaken by the 1980s, has buried the full return of the terminus, but

[4] The logs presented were those for Boreholes (BH): BH17, BH41, BH47, BH59, BH75, BH77, BH78.

its line is traceable in the line of capstone blocks that are exposed on the modern surface. The western limit of the Pier Head is not so clearly defined as it is buried by later works and by reclamation.. A significant structural crack and associated surface collapse is evident on the southeast side of the feature. A fuller description is given in Section 14.3.3.5.

14.1.1.5 Underwater Inspection

A programme of underwater inspection was carried out to inspect the acoustic anomalies observed in the marine geophysical survey and to inspect the sub-tidal areas of the Breakwater Pier Head (Appendix 14-1). The observations of the acoustic anomalies are presented in Table 14-2 (Figure 14-11). In no instance was any of the anomalies determined to be of archaeological interest. Several are clearly modern concrete blocks, others are isolated boulders that have become separated from adjacent rock-armour protection measures. In four instances, anomalies were detected in the same locations in 2013 (anomalies T7, T9, T12 and T12) but only one of these (T7) was dive-inspected at the time as the others lay outside the development footprint of the ABR Project.

A mass of concrete blocks lying on the seabed at the very eastern limit of the surveyed area on the south side of the channel (anomaly T1) appears to be a random dump of material; there is no charted navigation buoy here that might otherwise explain the feature. In contrast, a second mass of concrete material on the north side of the channel, some 50m west of the North Bank Lighthouse could indicate the footings for an earlier navigation aid. The acoustic imagery highlights a circular array that would be in keeping with such. A linear anomaly (T2) extending northeast from the Great South Wall was confirmed to be an outfall pipe that has a sequence of greenwood timbers set into the seabed, creating its T-shaped plan. This feature is thought to be associated with the Sluice House (DCIHR 19-09-009).

Table 14-2 Underwater inspection observations of acoustic anomalies identified.

Ref.	Latitude	Longitude	Location	Hydromaster Description	ADCO Description
T1	53º 20.51916 N	6º 10.00290 W	South side of channel	Debris; masonry	A series of eighteen (18) rectangular concrete blocks of fine cement-type fabric. Blocks piled together across a 6.5m East-West and 7m North-South area. The blocks are partially buried to the south and more fully exposed to the north. Some of the blocks noted overlying each other in places; up to three (3) blocks in depth. A modern feature.
T2	53º 20.46981 N	6º 10.55209 W	South side of channel	Outflow Pipe	Disused iron outfall pipe, measuring *c.* 34m in length, which extends from base of the Great South Wall. Terminus of pipe exposed (along 2.5m length) and measures *c.*900mm in diameter. Remainder of pipe encased in rough-poured concrete which is severely eroded in places. Eight (8) greenheart timber piles are located to the west of the

Ref.	Latitude	Longitude	Location	Hydromaster Description	ADCO Description
					outfall terminus; two (2) of which are within 2.5m of the pipe.
T3	53º 20.46303 N	6º 10.72167 W	South side of channel	Unknown Object	Displaced boulder from rock-armour protection along base of Great South Wall.
T4	53º 20.46513N	6º 10.59457 W	South side of channel	Sheet Pile	Displaced boulders from rock-armour protection along base of Great South Wall.
T5	53º 20.50502 N	6º 10.89302 W	South side of channel, within localised channel widening area	Sheet Pile	Large boulder (poss. displaced rock armour); upstanding 615mm from seabed, length 810mm, width 700mm. Scouring present on channel side (north), measuring 300mm depth x 500mm width. Surrounding seabed is flat/featureless; composed of silty-sand, occasional cobbles and crushed shell inclusions. Good holding content noted.
T6	53º 20.48040 N	6º 10.91289 W	South side of channel	Sheet Pile	Collapsed section of sheet pilling from *Larson* pile wall. Scouring along base of upstanding piles measures 600m width x 400mm depth.
T7	53º 20.55960 N	6º 10.92413 W	South side of channel, within localised channel widening area	Anchor Block	In 2013, this location (ref 100_5) was identified as a side-scan sonar anomaly that was subsequently dived and determined to be two pieces of metal. Concrete mooring/anchor block (for navigation buoy) lying upside-down and half-buried into side of channel slope; heavy link chain is partially buried within seabed leading to riser-chain located *c.* 5m to NNE of the base of the channel slope. Lower part of slope rises at *c.*60º angle. Further up-slope changes to a *c.*45 º angle. Seabed surrounding the mooring block composed of a deposit of silty-clay with penetration depth of 150mm-200mm overlying a compact layer of silty-sand. At base of slope silty-clay deposit measures *c.* 500mm in depth.
T8	53º 20.50990 N	6º 10.86153 W	South side of channel, within localised channel widening area	Unknown Object	Isolated boulder; upstanding 250mm from seabed, length 300mm, width 150mm. Surrounding seabed flat/featureless; composed of silty-sand (*c.* 70%/30% mix), occasional cobbles and crushed shell inclusions. Good holding content.

Ref.	Latitude	Longitude	Location	Hydromaster Description	ADCO Description
T9	53º 20.55895 N	6º 10.12094 W	South side of channel	Anchor Block	In 2013, this location (ref 100_3) was identified as a side-scan sonar anomaly determined to be a poorly defined linear feature. Concrete mooring/anchor block (for navigation marker) with chain to surface. Surrounding seabed flat/featureless, composed of silty-sand with penetration depth of 200mm.
T10	53º 20.53431 N	6º 10.12094 W	South side of channel	Anchor block for nesting platform	Concrete mooring/anchor block for floating pontoon (eastern mooring of two-point mooring system); measures 1m length x 1m width x 1m depth. Half buried (500mm depth) in the seabed with chain leading to south and buried to depth of 300mm. Block protruding from seabed at an angle with one corner of base pointing to surface.
T11	53º 20.52704 N	6º 10.16810 W	South side of channel	Anchor block for nesting platform	Concrete mooring/anchor block for floating pontoon (western mooring of two-point mooring system); measures 1m length x 1m width x 1m depth. Lying flat on seabed with scouring evident on its west side. Chain lying on seabed for distance of 5m before rising to pontoon.
T12	53º 20.69130 N	6º 10.58612 W	North localised channel widening area	Foundation of North Bank Lighthouse	In 2013, this location (ref 24_4) was identified as a side-scan sonar anomaly determined to be the base of the Lighthouse. Foundation of North Bank Lighthouse. This was not dived as its identification was clear from the standing structure above the waterline.
T13	53º 20.69212 N	6º 10.63859 W	North localised channel widening area	Former structure and masonry/ debris	In 2013, this location (ref 24_5) was identified as a side-scan sonar anomaly determined to be an areas of shoals. Boulder scatter and debris field. Concentration of fourteen (14) boulders with average size of 500mm x 500mm. Two of the boulders a larger, measuring 1.2m x 500m. Electric cables, once servicing the North Bank Lighthouse, are visible protruding from beneath the scatter of boulders. Area of boulders measures *c.*6m north-south and 1.5m east-west. A partially buried mooring block is located 4m to the east of this area; measures 1m

Ref.	Latitude	Longitude	Location	Hydromaster Description	ADCO Description
					length, x 800mm width and is upstanding from seabed by 500mm. At a point 3m north of the boulder scatter, dumped material comprising mix of concrete rubble and tile fragments is present. Seabed composed of silty-clay with a penetration depth of 100mm.
T14	53º 20.66898 N	6º 10.80371 W	North localised channel widening area	Anchor block	Barrel-shaped concrete block (lying fully exposed on its side). Block has no visible lifting eye. Measures 1m length x 500mm in diameter (max.). Two (2) flat iron straps visible along circumference of the block. The first is positioned to centre and measures 100mm width x 20mm in thickness. The second is positioned half-way between centre-point and one end, measures 50mm width x 10mm thickness. A shallow indentation is present at centre of each end and measures 80mm in depth.
T15	53º 20.67136 N	6º 11.38151 W	North localised channel widening area	Anchor block	Not dived.
T16	53º 20.67751 N	6º 12.20282 W	Berth 50A-OB3	Tyre	Tyre used as boat fender.
Storage			Pilot Boat pontoon	Ship's timbers and related	5 ship's timbers and 1 metal piece recovered during dive assessment work in 2013–14 (licence 13D019) remain in waterlogged storage underneath the pontoon.

The underwater inspection of the Eastern Breakwater Pier Head permitted additional observations to be made (Figure 14-11 – Figure 14-14. See also Appendix 14-1 for a topographic survey of the pier head). The historic quayside is built using large ashlar granite blocks. The structure's capping stones measure on average 1.52m long, 1.15m wide, and 610mm deep. A number of the cap stones have pairs of Lewis holes on their upper surface, inserted as part of the process of lifting the blocks into place. Six (6) masonry courses are exposed at mean Low Water, with nine (9) courses exposed on a Spring Low Tide. The first four (4) courses measure 460mm in height, after which blocks of a greater height were used to construct the below-water elements of the quay wall. A number of fixtures/fittings adorn the quay and include two pairs of iron mooring hooks and a set of iron mooring bollards. A set of twenty-one (21) masonry steps are recessed into the south-facing wall, running East to West (top-bottom), and provide access during Low and Mid-water tide states. A series of small iron bollards adorn every third step and allow for the mooring of boats alongside. A recessed iron mooring-ring is located immediately to the east of the boat access steps.

The submerged sections of the quayside are not as well defined as the structure's upper element, as fine concretion and marine growth cover much of quay wall. A rolled moulding or champher on the quay's façade is located at a point 2m beneath the Low Water mark, forming a lip that protrudes outwards and measures 230mm in circumference. Below the champher, the construction changes and the granite blocks are replaced with approximately 3m-wide concrete caissons that continue uninterrupted to the seabed. The foundation of the quay wall is not visible because a deposit of silty-clay has built up along the base of the structure. The silty-clay deposit measures 300mm-400m in width, *c.* 300mm in depth, and slopes at a 40º angle from the quay wall. From there, the seabed continues to slope gently at a *c.* 20º angle for a distance for 6m before dipping 500mm at an angle of *c.* 80º angle, after which the seabed levels off.

The west-facing surface of the Pier Head is buried beneath a concrete quay that has been added to it. The concrete quay has five (5) layers of poured mass-concrete. A series of possible footing grooves are located along the terminus of the masonry quay, where it meets the adjoining concrete structure, placed to help tie the two structures together. Five (5) square-profiled timber beams have been placed horizontally across the top of the concrete quay. A number of timbers are also affixed to the quay wall, using iron fastenings at a point *c.* 1.5m down the façade; presumably placed as a horizontal fender for boats mooring alongside. Vertical timbers have been placed on the inner side of the concrete quay, with corresponding cross/bracing beams that extend from the adjacent rock armour. Larson piles have been used to underpin the concrete quay and these extend northward around the entrance to the Pilot’s berth. A section of this sheet-pilling has collapsed towards the southeast of the structure, behind which the quay wall has been eroded to form a rectangular hole along the base of the concrete quay.

To the east of the steps, there is a build-up of debris on the seabed and a series of sheet-piling has been added as an outer skin approximately 3m out from the masonry, with the intervening space filled using loose rock armour, thereby burying the full depth of the quay wall. Four courses of uniform masonry (460mm depth) span the upper part of the quay wall, positioned between the larger capping stones and the more substantial masonry that has been used below the High Water mark. A recessed iron mooring-ring is located a short distance after the quay begins its northward curve. Another identical mooring-ring is located further north, mirroring the position of the latter. In addition, a recessed iron ladder is located at the structure’s northwest extent. A semi-ornate, hand-operated, iron-derrick adorns the quay and is positioned a short distance to the north of the Pier Head’s apex.

A vertical fissure in the masonry extends to the base of the quay structure from a point 2.64m below the LWM. It has straight, clearly defined sides and measures 40mm in width at its top, and 150mm at its base. The fissure extends *c.*500mm into the quay wall towards the top and *c*.800mm at its base. The uniform nature of the fissure suggests that it is a construction joint that has spread apart over time, rather than the result of the movement of individual masonry blocks. Overall, the southern façade remains in a relatively good state of preservation, although a number of cracks are visible along its extent. Two structural cracks are evident along the east-facing façade. The first is located where the nib begins to curve northeastwards, while the other is located along its east-facing façade and corresponds with a subsidence of the deck area above it. Two eroded, vertically-placed, timbers have also been fixed to the quay wall to protect a drainage pipe that protrudes from it, just below its capping stones. Similar timbers have been inserted further (north) around the nib to protect a steel access ladder at that location.

Visual assessment was conducted of a 30m-wide extent of the foreshore/seabed on the south side of the channel at a point opposite to the eastern silo of Poolbeg Electricity Power Station (ITM: 721081E, 733835N) where a semi-circular, raised, concrete gantry extends along the adjacent intertidal zone. The base of the gantry is composed of poured mass concrete and rock-armour has also been placed along the channel side of its foundations. On the eastern side of the concrete gantry structure, a heavily eroded sheet-pile wall extends eastward for a distance of *c.*15m, before turning at right-angles to travel a further *c.*10m (north) across the intertidal zone. To the east of these elements, the seabed is a compact deposit of flat/featureless silty-sand (*c.* 60%/40% mix) with a penetration depth of 100mm.

No features were encountered protruding from the surface of the seabed. However, a good holding content can be expected and the likelihood of buried, *in situ*, material of archaeological or historic interest can be considered high.

A series of five (5) ship's timbers and one (1) metal piece recovered from the Approach Channel in 2013–2014 as part of the archaeological assessment work for the ABR Project lie in temporary wet storage under the Pilot Boat pontoon. This temporary storage location was inspected as part of the 2018 assessment and the artefacts remain in good condition. The location will be infilled at part of the works associated with Oil Berth 3, and the artefacts will be moved from there to the secure heritage storage area for the ABR Project at the Pumphouse of Graving Dock 1.

14.3.4 Conclusions

The existing knowledge base highlights the historical associations of the land- and seascape that the MP2 Project is associated with. The area remained open water until the 1700s, populated only with mud- and sand-flats that formed part of the delta that was the Liffey's estuary into Dublin Bay. From the 1700s, Dubliners began to engage with this area directly, motivated principally to ensure safe passage through the tidal shallows for shipping. It resulted firstly in the construction of what was to become the Great South Wall on the south side of the Liffey, while the area to the north of the approach channel was where the Port was to develop its deepwater basin.

A suite of new survey work has been conducted in order to identify and consider any potential cultural heritage impacts arising from the MP2 Project. That work has included new marine geophysical survey, walkover inspections and underwater inspections, as well as access to borehole logs. There are not any striking in-water features of archaeological interest exposed on the seabed surface, although it is likely that T13 refers to the footings of a pre-existing navigation aid.

The principal cultural heritage feature within the MP2 Project footprint is the Eastern Breakwater of Alexandra Basin. The Breakwater was constructed as part of Port Engineer Bindon Blood Stoney's grand design that was realised in the opening of Alexandra Basin, which was celebrated in 1885 when the Prince and Princess of Wales (the future King Edward VII and Queen Alexandra) visited Dublin and officially opened the North Wall Quay Extension. The Pier Head of the Eastern Breakwater marked the original entrance to the deepwater basin of the Port. Underwater inspection confirms that the Pier Head is built using the same design as that of North Wall Quay Extension. The Port created 350-tonne blocks filled with granite, cement and reinforcing bars to act as the principal foundation blocks, on top of which were then laid courses of granite ashlar to create the finished quayside above the waterline. It was a bold design and one that earned Bindon Blood Stoney a global reputation and is widely regarded as an engineering marvel for its day. The Pier Head will be removed as part of the MP2

Project, and this presents an opportunity to recover exemplars of Bindon Blood Stoney's work, and to understand more fully the construction process developed to create the deepwater basin.

14.4 Description of likely Significant Impacts

14.4.1 Land

The potential impacts on cultural heritage assets on land arising from the MP2 Project focus on works associated with ground disturbance activities that might expose elements of the Breakwater, which are assumed to remain undisturbed beneath Breakwater Road. These activities will be associated with the works to enable the expansion of the container terminal (see Chapter 3, Project Description).

To facilitate the construction of Oil Berth 3, reclamation work is planned along the west side of the Breakwater to build up the quayside of the Oil Berth. This will necessitate the reclamation of the sea pocket that accommodates the Pilot Boat pontoon, and the five ship's timbers and one metal piece that are in temporary storage under the pontoon.

14.4.2 Eastern Breakwater Pier Head

It is necessary to demolish the Pier Head of the Eastern Breakwater to facilitate the construction of Berth 50A (Chapter 3). This work will remove the existing Port Operations Building and ancillary structures and the Pier Head. It will salvage and store the masonry elements for heritage gain projects.

The works represent direct and permanent impacts on the historic quay terminus. In anticipation of the steel-work required to tie-in the new quayside, it is anticipated that elements of the nineteenth-century breakwater that currently lie buried will be exposed.

The works provide opportunities to record archaeologically and recover exemplars of Bindon Blood Stoney's work, and to understand more fully the construction process developed to create the deepwater basin.

14.4.3 Marine

Capital dredging is required to deepen the seabed at Berth 50A to –11.0m CD, at Oil Berth 3 to –13m CD, Berth 53 to -10.0m CD and across the localised channel widening area to a standard depth of –10m CD. The total volume of material to be dredged will be 424,644m^3. A trailing suction dredger and/or a backhoe dredger will carry out the dredging work. Dredged spoil will be disposed of at the licensed dump site used by DPC on the west side of the Burford Bank.

Where dredging will take place on the north slopes for Berth 53, concrete mattresses or their equivalent will be placed on the dredged slopes to provide stabilisation and scour protection to the Tolka Estuary.

The localised channel widening area crosses the approach channel. The approach channel is permitted through the ABR Project to be deepened to achieve a standard depth of –10m CD.

The extension of capital dredging into the south side of the localised channel widening area represents direct and permanent impacts on what appears to be previously un-dredged locations. As recorded on Rocque's 1757 map (Figure 14-3), this area was a wider mooring for ships in the eighteenth century before the construction of Pigeon House Harbour. It is an area of high archaeological potential and the recovery of shipping debris and/or shipwreck can be anticipated. The work commissioned to further inform the cultural heritage risk for the MP2 has conducted a series of comprehensive surveys (marine geophysical survey, site investigations and archaeological inspection, as outlined in this chapter), and this work did not identify significant materials of archaeological importance. The location is a shallow area filled with silt. The removal of that silt provides the opportunity to further examine the potential, and this will be done by archaeological monitoring of the dredging works at construction time, and recording by record any observations made at that point.

14.4.4 Great South Wall

The integrity and stability of the Great South Wall will be maintained. No impacts are predicted.

14.5 Mitigation Measures

14.5.1 Heritage Gain Proposals

It is proposed to extend a Greenway along the northern perimeter of the Port estate that will converge on the north side of the river at the eastern end of the Port operation. This place of convergence will be an opportunity to appreciate the industrial heritage of the Port within the context of a new Heritage Zone that will create a memorable destination that is accessible to the public (see standalone Industrial Heritage Impact & Compensation Planning and Design Report by MOLA, which forms part of the MP2 Project application for consent). The location will be the most eastern limit of the North Port, marking its growth and development since the Breakwater Lighthouse defined the eastern limit and entrance to the deep water basin in the nineteenth century. To celebrate this resonance, Dublin Port will create a public realm visitor experience at the new eastern limit that includes the re-use of the granite blocks and related elements of the Eastern Breakwater Pier Head and the Breakwater Lighthouse (demolished circa 20 years ago),, reconceived as an experiential place where walkers and cyclists can learn about the cultural and natural heritage of the Port and can continue to enjoy views of Dublin Bay in all its tidal cycles and weather-induced power and beauty. In addition, as set out in the Conservation appraisal of the Eastern Breakwater’s Pier Head (see standalone Conservation19 Strategy and Industrial Heritage Appraisal by Southgate Associates), the former location of the pier head will be marked with inscribed commemorative text, to ensure that there is a permanent *in situ* record of its former presence.

14.5.2 Pre-construction mitigation measures

14.1.1.6 Land

Archaeological monitoring licensed by the National Monuments Service will be conducted of all ground disturbances, including site investigations, with the proviso to resolve fully any archaeological material observed at that point.

The five ship’s timbers and one metal piece located in temporary wet storage under the Pilot Boat pontoon will be removed to the secure Heritage Zone storage area for the ABR Project, where they will be placed in water-filled tanks.

14.1.1.7 Eastern Breakwater Pier Head

Prior to demolition works commencing, the 3D record of the existing structure and associated features will be amended where necessary to ensure that the permanent outputs can produce metrically accurate plan, elevation and section drawing information at 1:20 scale.

14.1.1.8 Marine

Archaeological monitoring licensed by the National Monuments Service will be conducted of all seabed disturbances that might take place prior to construction, including site investigations, with the proviso to resolve fully any archaeological material observed at that point.

14.1.1.9 Great South Wall

As there will be no impacts to the Great South Wall arising from the MP2 Project, no mitigation measures are necessary.

14.5.3 Construction phase mitigation measures

14.1.1.10 Land

Archaeological monitoring licensed by the National Monuments Service will be conducted of all ground disturbances, with the proviso to resolve fully any archaeological material observed at that point.

14.1.1.11 Eastern Breakwater Pier Head

Archaeological monitoring licensed by the National Monuments Service will be conducted of all ground disturbances, with the proviso to resolve fully any archaeological material observed at that point. The project archaeologist will be facilitated by Dublin Port to complete a comprehensive record of any archaeological features that become exposed in the course of the construction works.

14.1.1.12 Marine

Archaeological monitoring of all dredging activities and associated seabed disturbance activities conducted within the berth pockets and the localised channel widening area will be carried out, with the proviso to resolve fully any material of archaeological significance observed at that point.

14.1.1.13 Great South Wall

As there will be no impacts to the Great South Wall arising from the MP2 Project, no mitigation measures are necessary.

14.6 Residual impacts

It is unlikely that works to create the new container terminal will encounter archaeological materials since these works will take place on land that has been reclaimed and developed in the twentieth century.

Demolition of the Eastern Breakwater Pier Head will remove the original entrance to the Port's deepwater basin from the land- and seascape of the Port. However, the careful recording of that structure prior to its demolition and the archaeological monitoring of its removal will provide the opportunity to enhance the record of the Pier Head and to understand how it was built. The granite will be salvaged and re-used in the public realm space that is to be created at the new eastern limit of the North Port, where the former Pier Head and the Breakwater Lighthouse will be reconceived as part of an installation that celebrates the Port's cultural and natural heritage. The original location of the pier head will also be commemorated with an *in situ* text applied to the surface of the new quay wall, to be a permanent record of its former presence.

The dredging works to be carried out to facilitate Oil Berth 3, Berth 50A, new Berth 53 and the localised channel widening area will be capital dredging activity that will extend into seabed that has not previously been dredged.

The potential for this work to uncover and expose previously unrecorded archaeological material, and principally shipwreck, exists, and the protocols are in place to ensure that any new discoveries will be fully and properly resolved.

14.2 Monitoring

The following archaeological monitoring and management measures will be undertaken:

- Retaining a project archaeologist/s. An archaeologist experienced in maritime archaeology will be retained by Dublin Port Company for the duration of the relevant works.
- Retaining a heritage architect. A heritage architect experienced in industrial and maritime architectural heritage will be retained by Dublin Port Company for the duration of the relevant works, to advise specifically in relation to works associated with the Easter Breakwater Pier Head.
- Archaeological licences will be required to conduct the on-site archaeological works. Licence applications require the inclusion of detailed method statements, which outline the rationale for the works, and the means by which the works will be resolved. Licence applications take a minimum of four weeks to process through the Department, and advance planning is required to ensure that the necessary permits are in place before site works commence. It is anticipated that 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. Since 2017, Excavation licence applications must be accompanied by a letter from the client on their letterhead 'confirming that sufficient funds and other facilities are available to the archaeologist to complete the archaeological excavation, post-excavation, and preliminary and final reports (including specialist reports)'. Dublin Port Company has confirmed that sufficient funds and other facilities as required will be made available to the project archaeologist to complete all reports required.
- Archaeological monitoring will be carried out by suitably qualified and experienced maritime archaeological personnel licensed by the Department of Culture, 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.
- The time scale for the construction phase will be made available to the archaeologist, with information on where and when ground disturbances will take place.
- Discovery of archaeological material. 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.
- Archaeological 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.

- Archaeological team. It is recommended that the core of a suitable archaeological team be on standby to deal with any such rescue excavation. This would be complimented in the event of a full excavation.
- Archaeological dive team. It is recommended that an archaeological dive team is 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.
- A site office and facilities will be provided by Dublin Port Company on site for use by archaeologists.
- Secure wet storage facilities will be provided on site by the Dublin Port Company 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.
- Post-construction project report and archive. It is a condition of archaeological licensing that a detailed project report is lodged with the DCHG 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.

These measures are subject to the approval of the National Monuments Service at the Department of Culture, Heritage and the Gaeltacht. DPC has, and will continue to engage with the Department of Culture, Heritage and the Gaeltacht.

14.3 Conclusions

The EIAR has identified, recorded and assessed the cultural heritage assets and potential impacts associated with the MP2 Project. Existing records and newly-commissioned work present a robust baseline of information above and below the waterline.

The principal cultural heritage constraint identified is the demolition of the Eastern Breakwater Pier Head, which was built in the nineteenth century to mark the original entrance to the Port's deepwater basin. Dublin Port

Company has adopted a best practice approach to conservation on the site to preserve the cultural significance of Dublin Port as a Deep Water Port. The Pier Head will be removed and this work will be archaeologically monitored. The stonework will be salvaged and incorporated into a new public realm element that celebrates the heritage of the Port. The former location of the Pier Head will be recorded on the adjacent section of new quay at Berth 50A. It is expected that elements of the original Eastern Breakwater exist under Breakwater Road, and that these elements will survive *in situ* beneath Berth 50A.

Archaeological monitoring of ground and seabed disturbance activities will take place across the MP2 Project area, ensuring that a robust record is maintained and that any new archaeological observations are resolved fully.

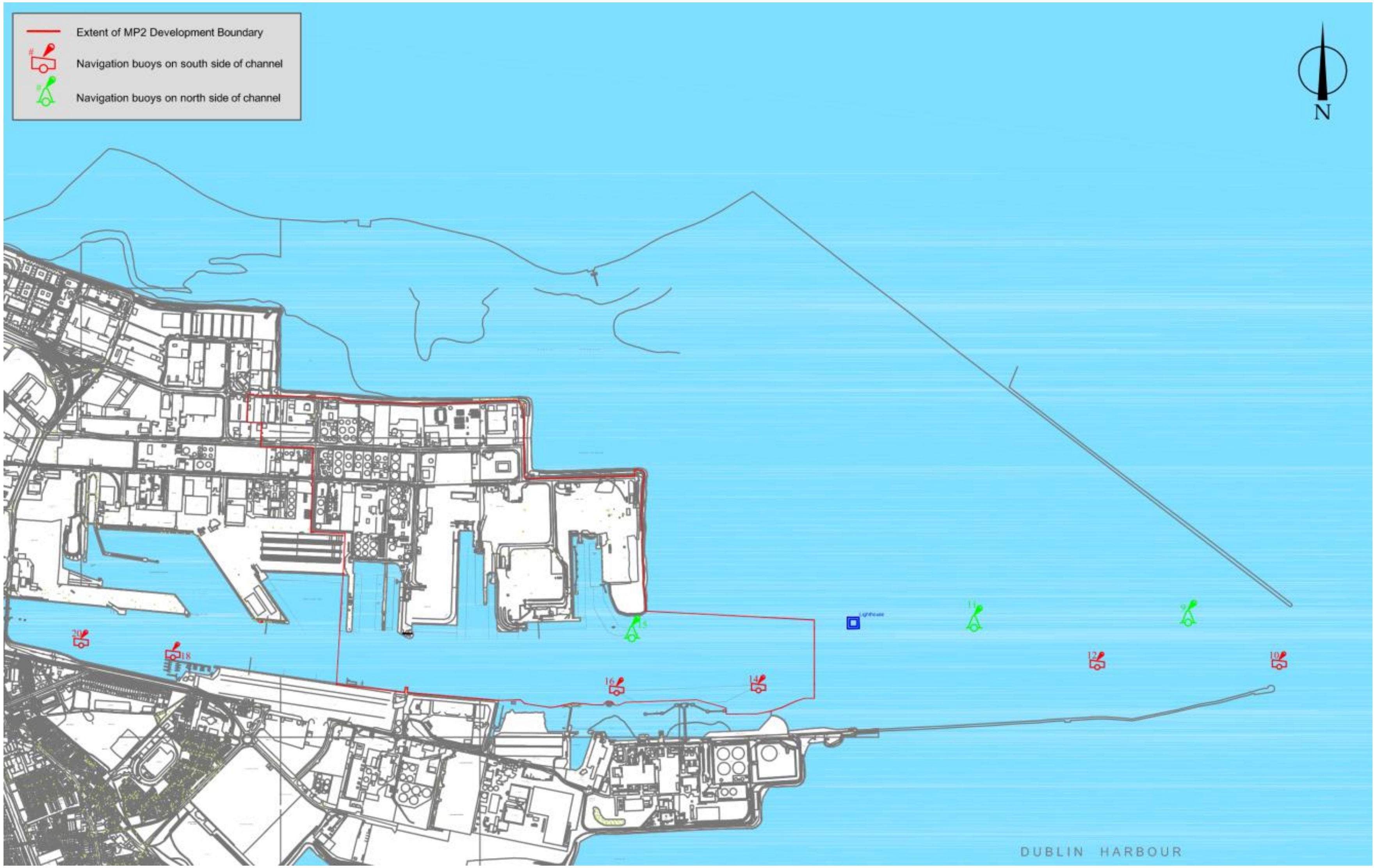


Figure 14-1 OS Background Mapping with MP2 Project Application Boundary superimposed

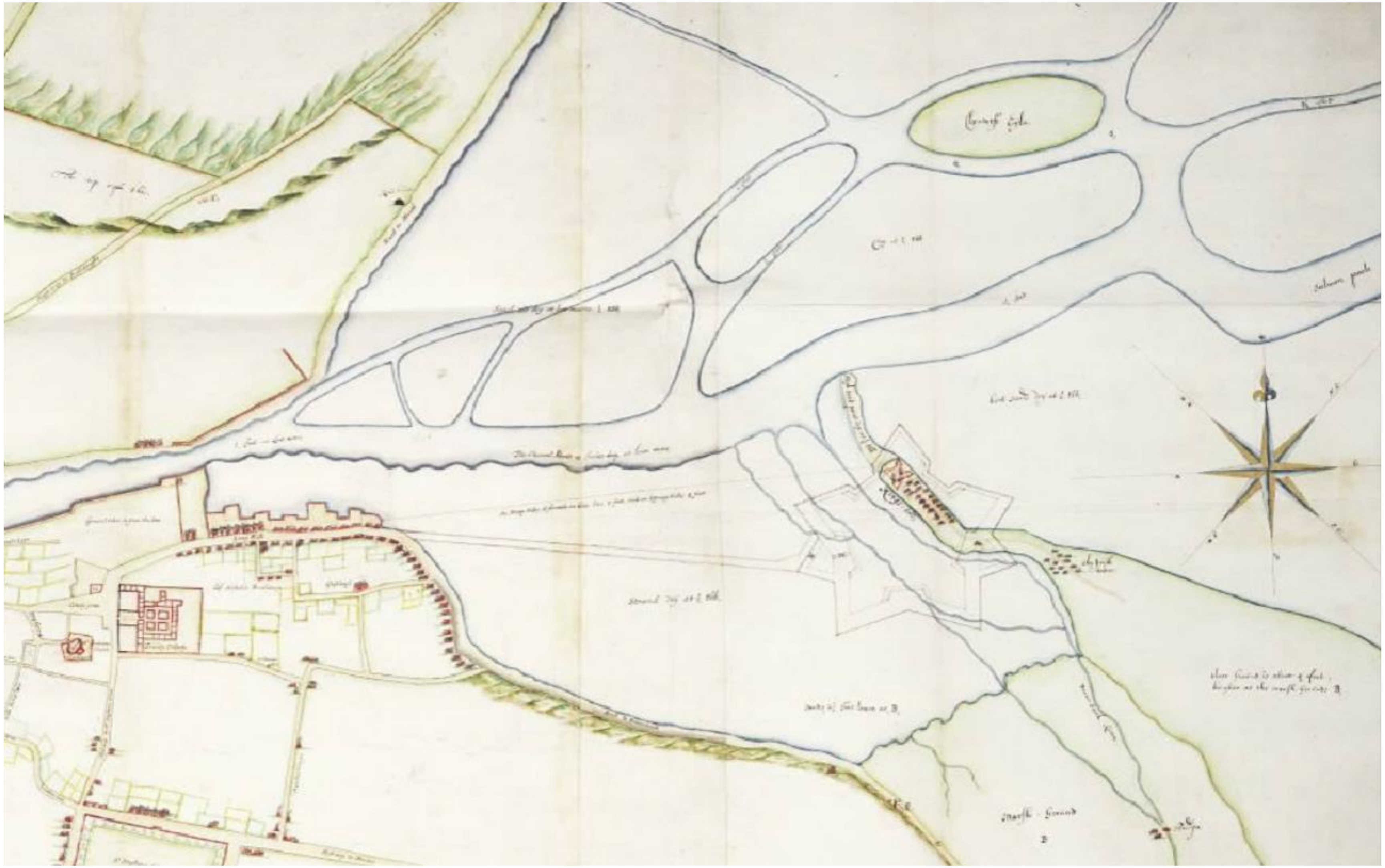


Figure 14-2 Details from Bernard de Gomme's Map of 1673, 'city and Suburbs of Dublin' showing the river mouth area.

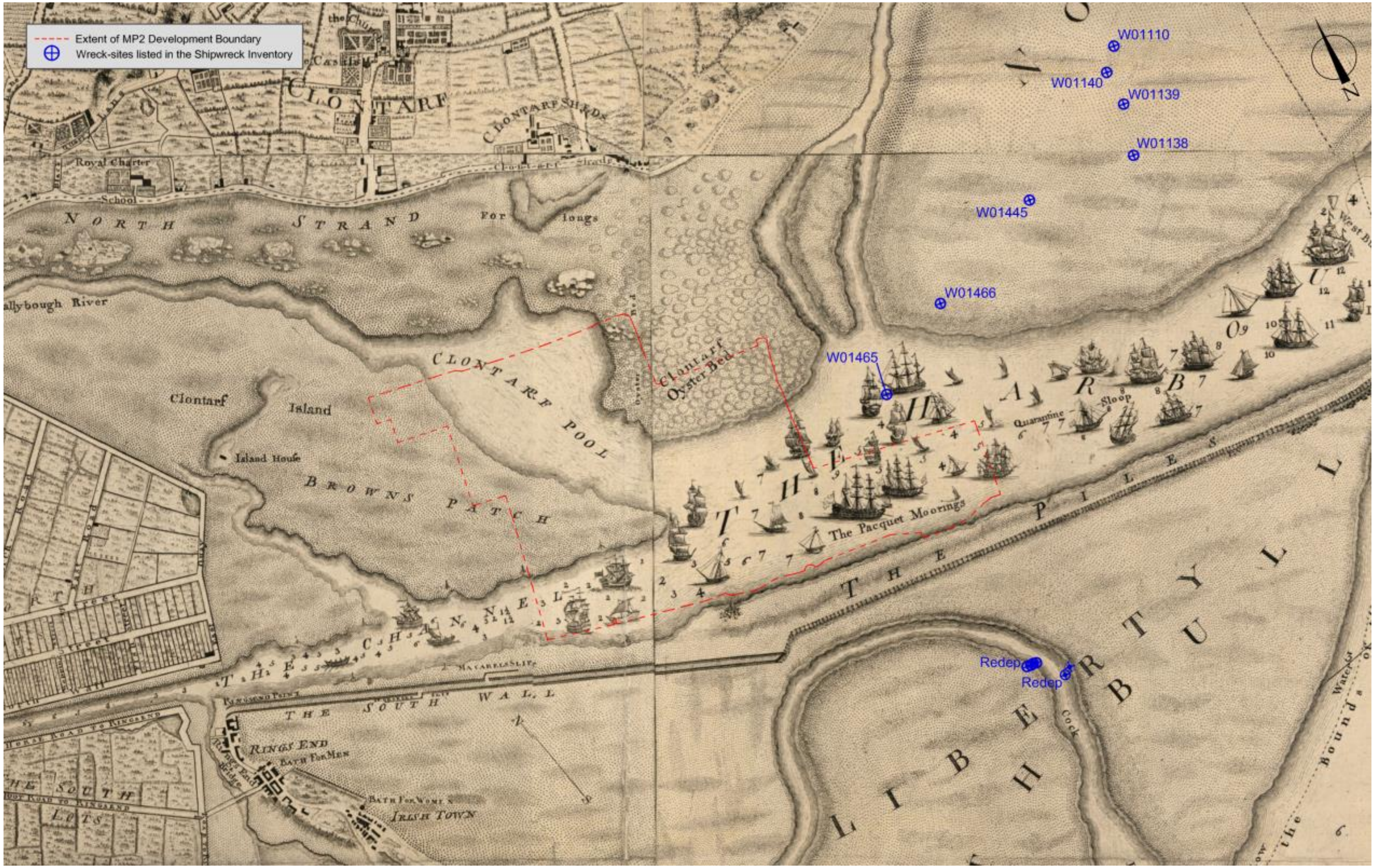


Figure 14-3 Details from John Roque's Map of 1756. 'A Survey of the City Harbour and Environs of Dublin', with approximate location of MP2 Project Boundary superimposed.

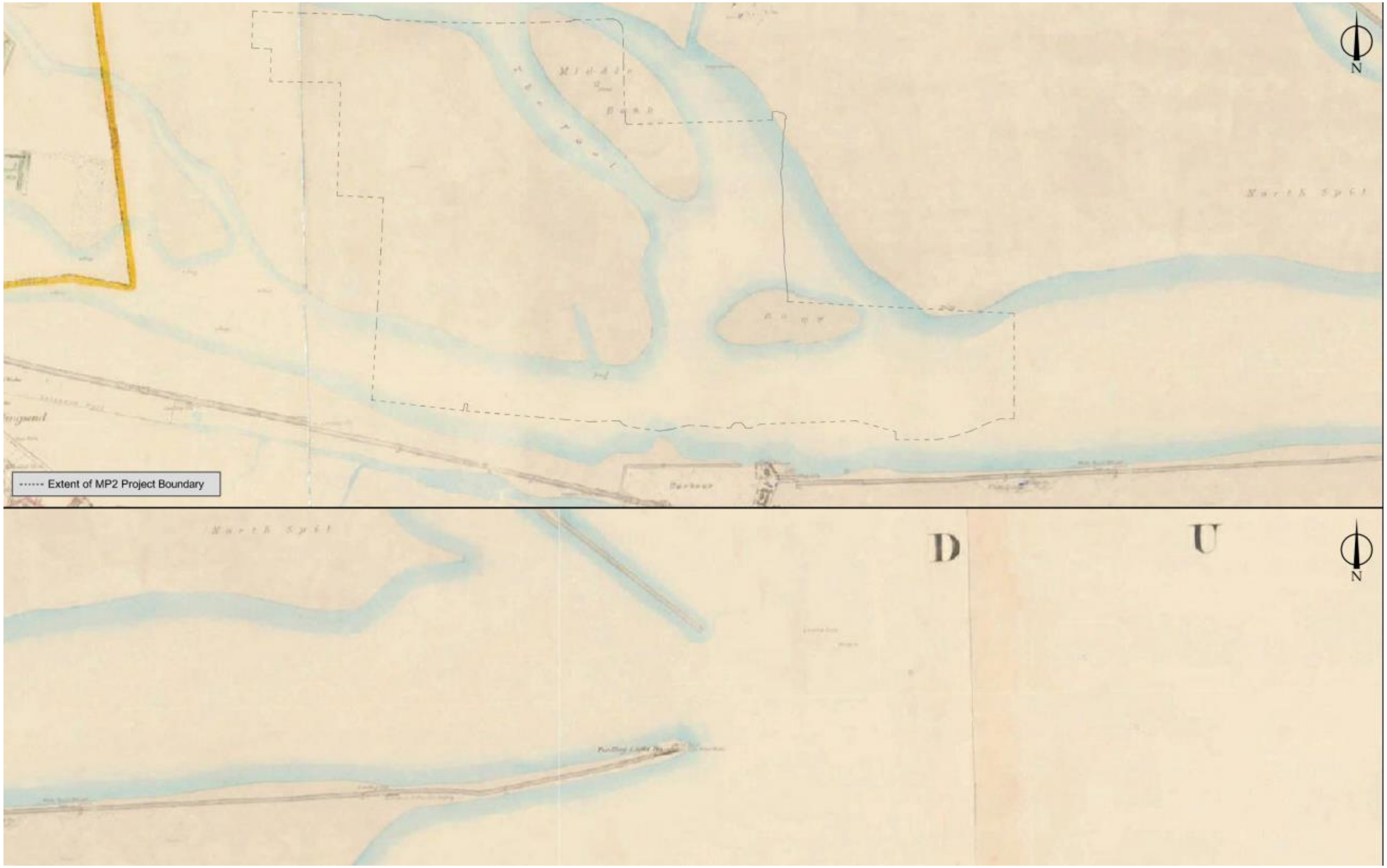


Figure 14-4 Extracts from OS First Edition (1843) map with approximate location of MP2 Project Application Boundary superimposed.

Figure 14-5 Detail from Commander Langdon's Chart of 1880, 'Dublin Bar & the River Liffey to Carlisles Bridge'.

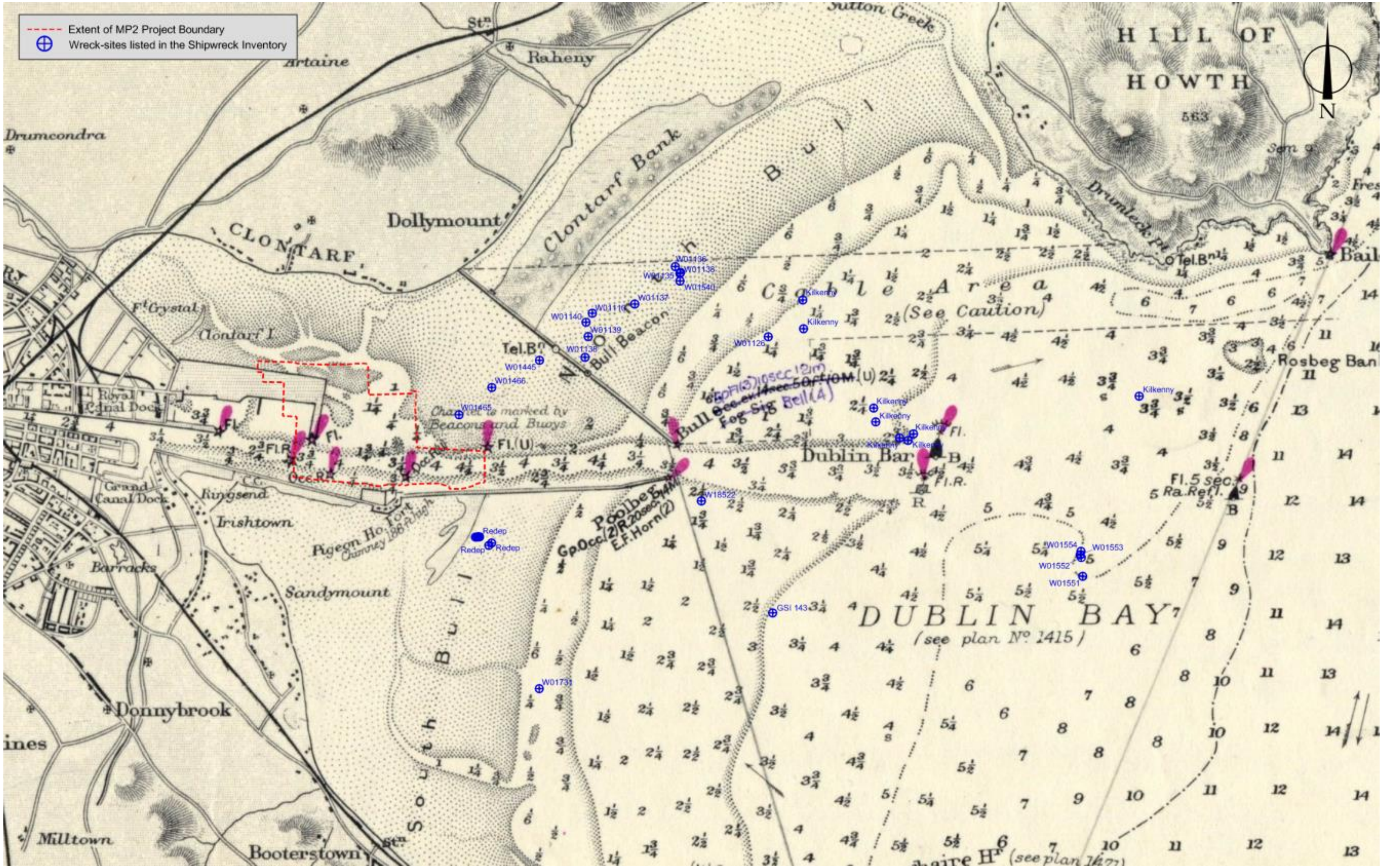


Figure 14-6 Detail from Admiralty Chart No.1468 (1883) with 1965 additions and approximate extent of MP2 Project Application Boundary superimposed.

Figure 14-7 Extract from OS 25-inch Edition (1907) map depicting the principle feature of the deepwater facility comprising Alexandra Basin.

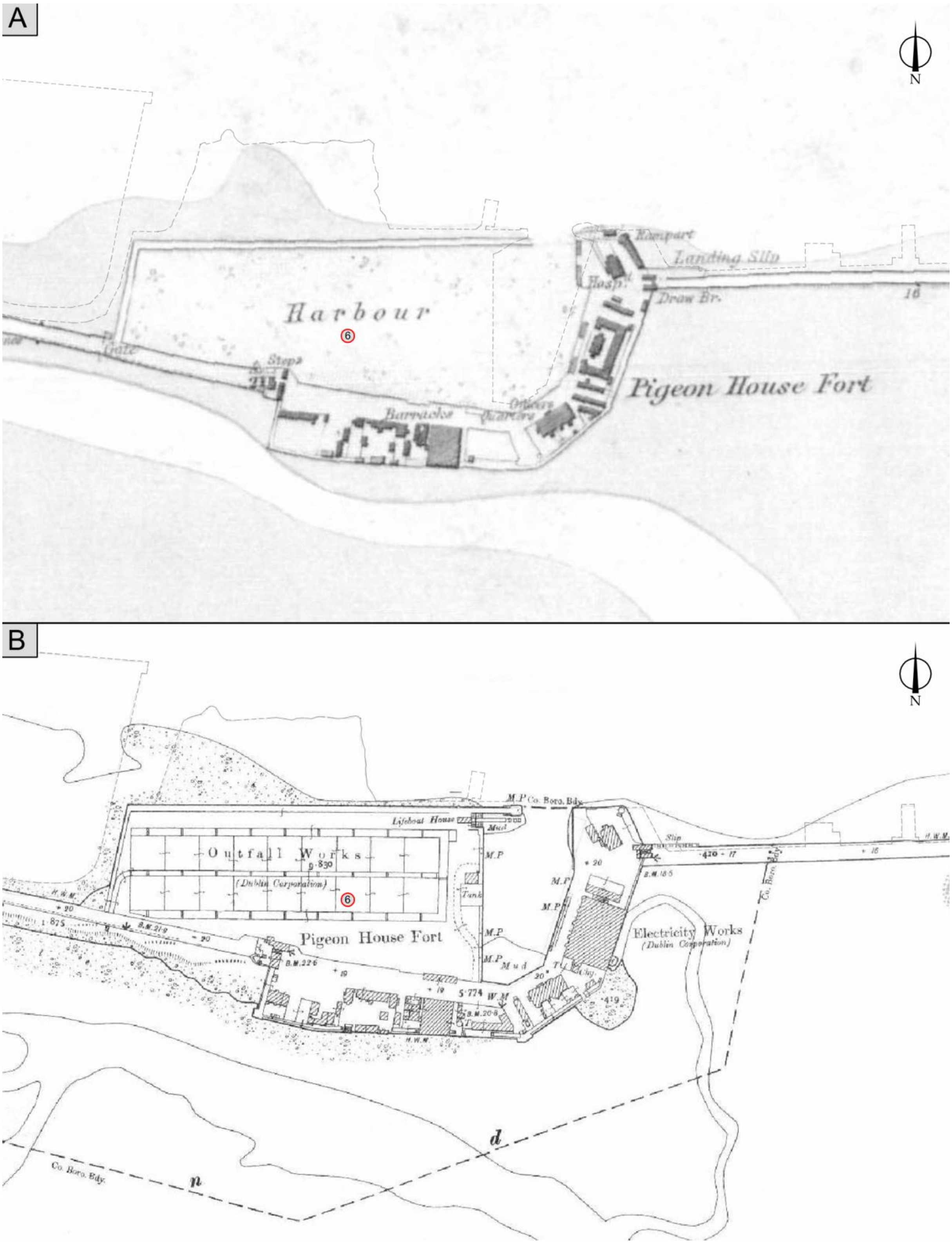


Figure 14-8 (A) Extract from OS First Edition map showing extend of Pigeon House Harbour in the 1840s. (B). Extract from OS 25-inch Edition (1907) map showing reclamation of the harbour area.

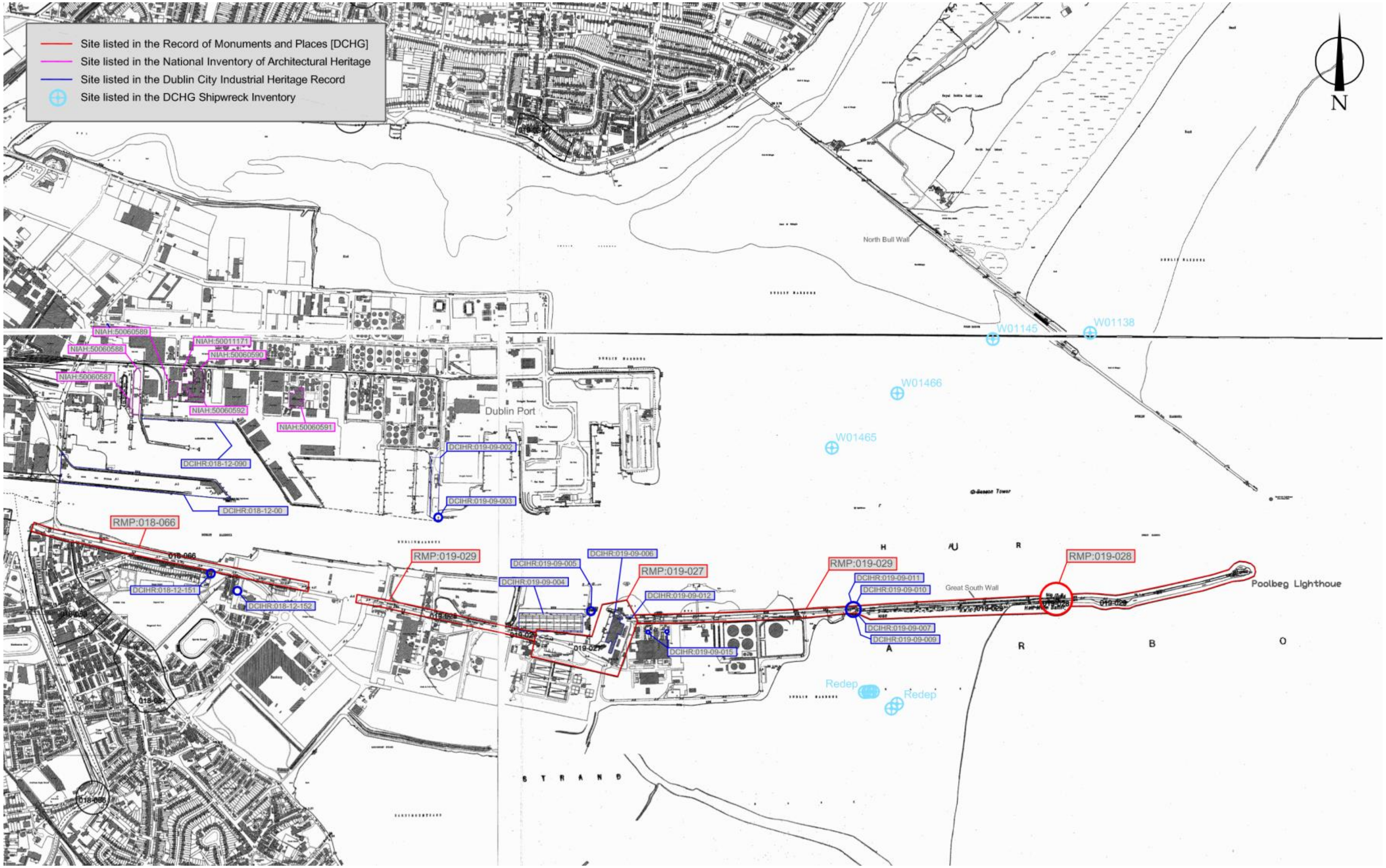


Figure 14-9 Extract from OS Third Edition map with Cultural Heritage Assets located in proximity to the MP2 Project highlighted

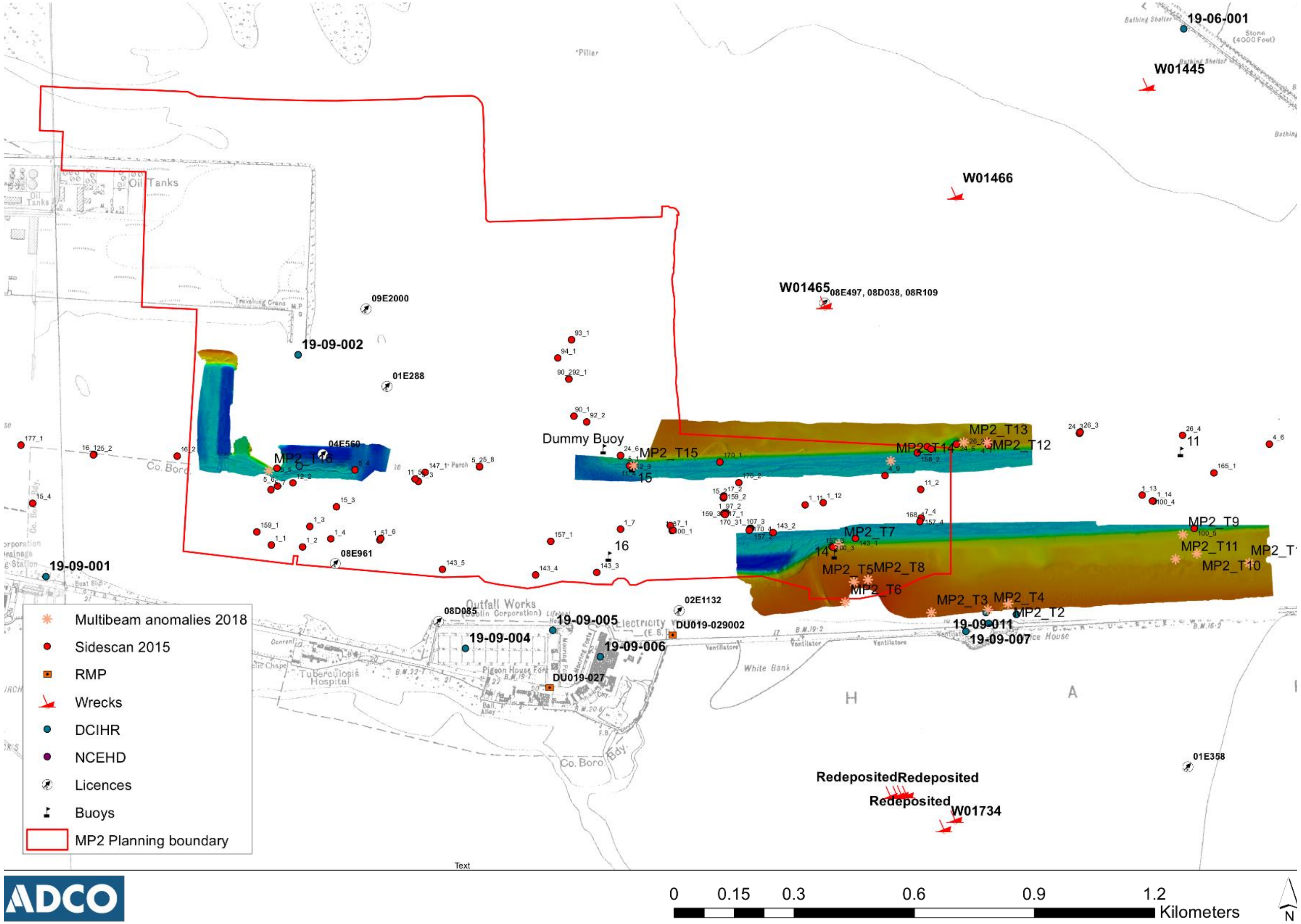
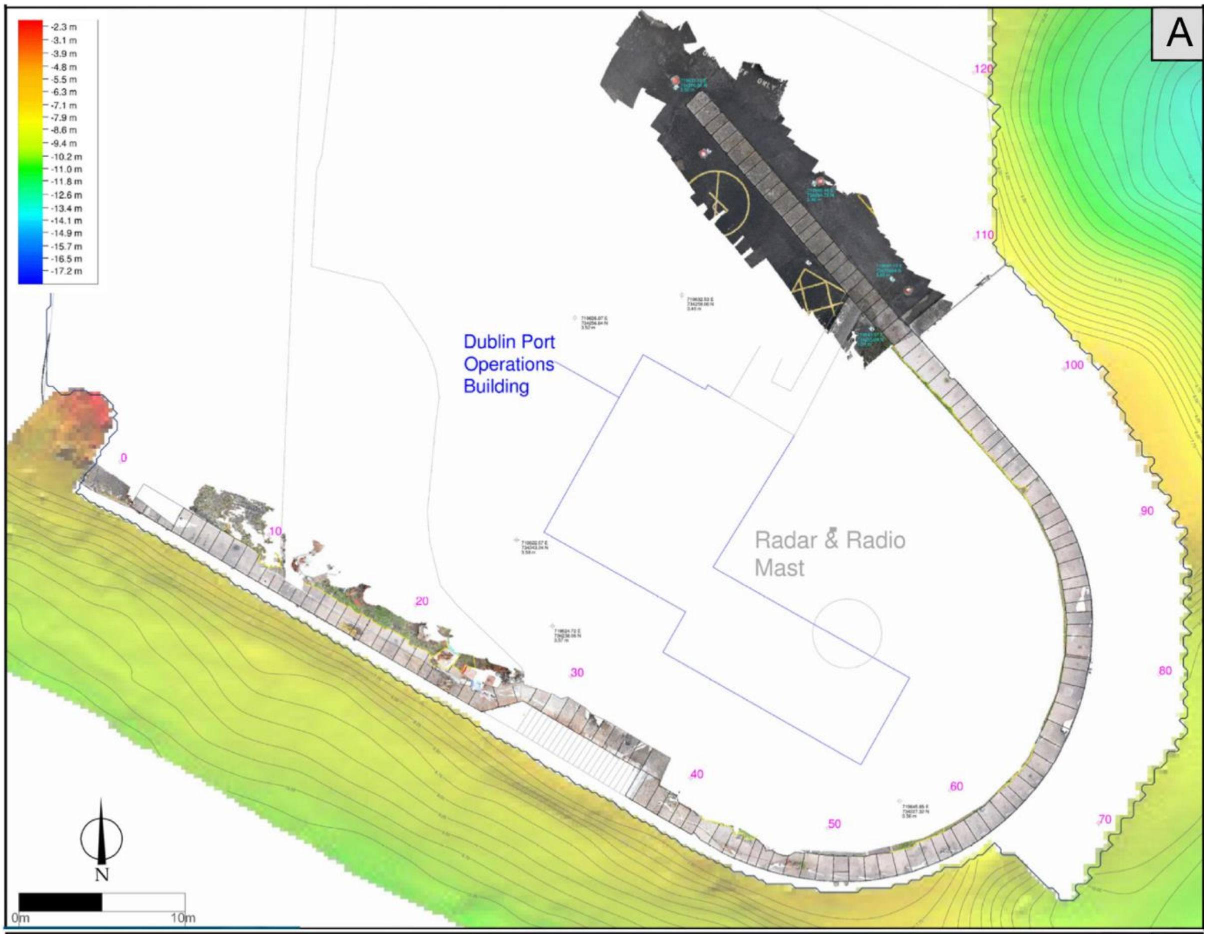
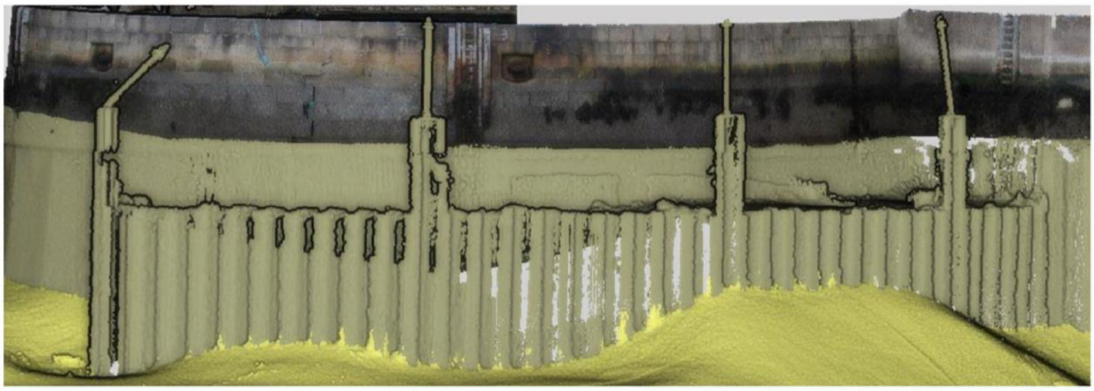


Figure 14-10 Extent of marine geophysical survey in 2017 shown by multi-beam bathymetry, overlaid onto OS 1907 map, with archaeological observations indicated



B

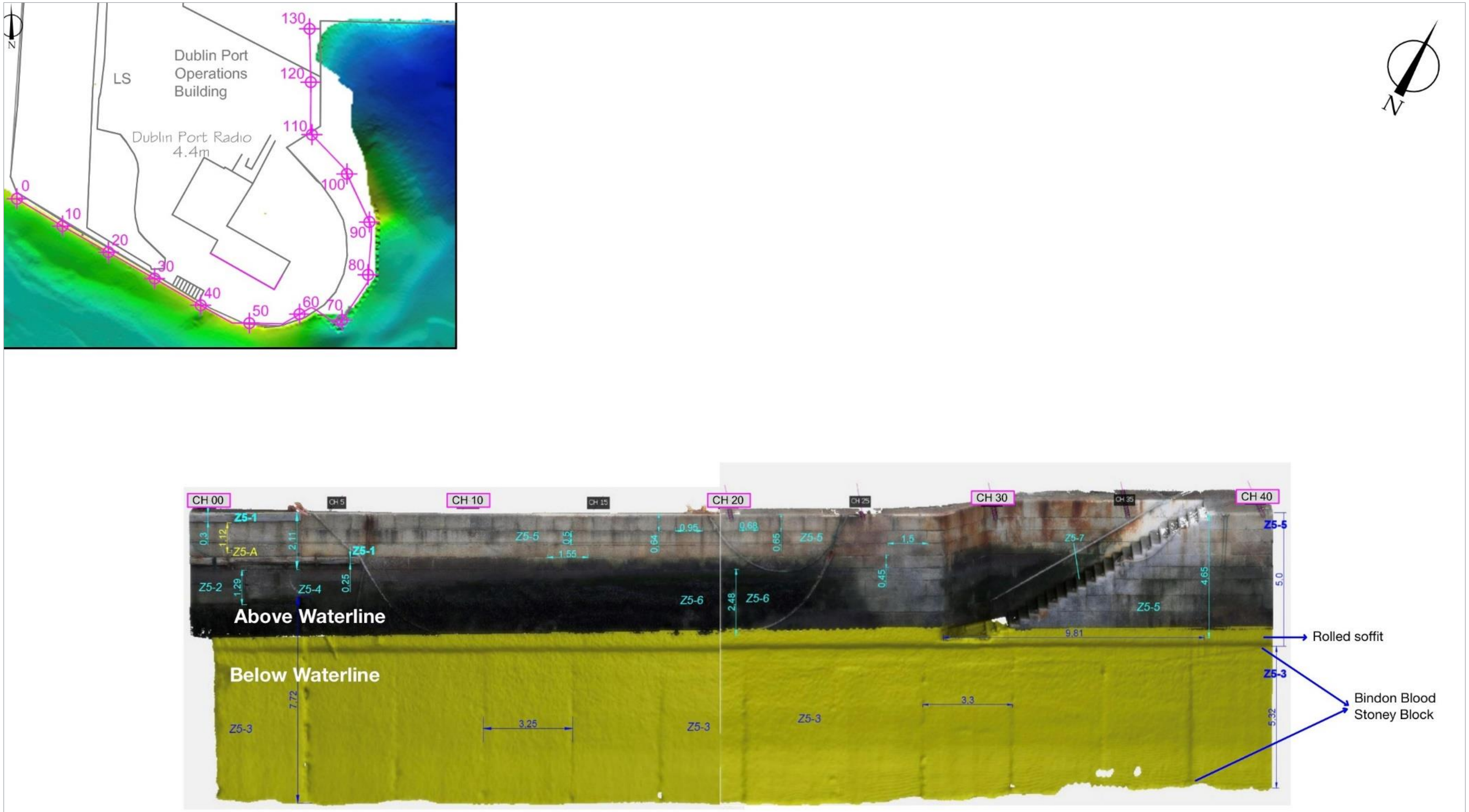
Elevation view of inserted Larson Piles to east of Pier Head, showing nature varied seabed level outside the piles



Source:
A - Image extracted from Cronin Miller / Hydromaster Drawing No. 002.
B - Image extracted from Dublin Port, Masterplan 2, Quay Wall & Seabed Assessment Report by Hydromaster [Figure 17, p.43]

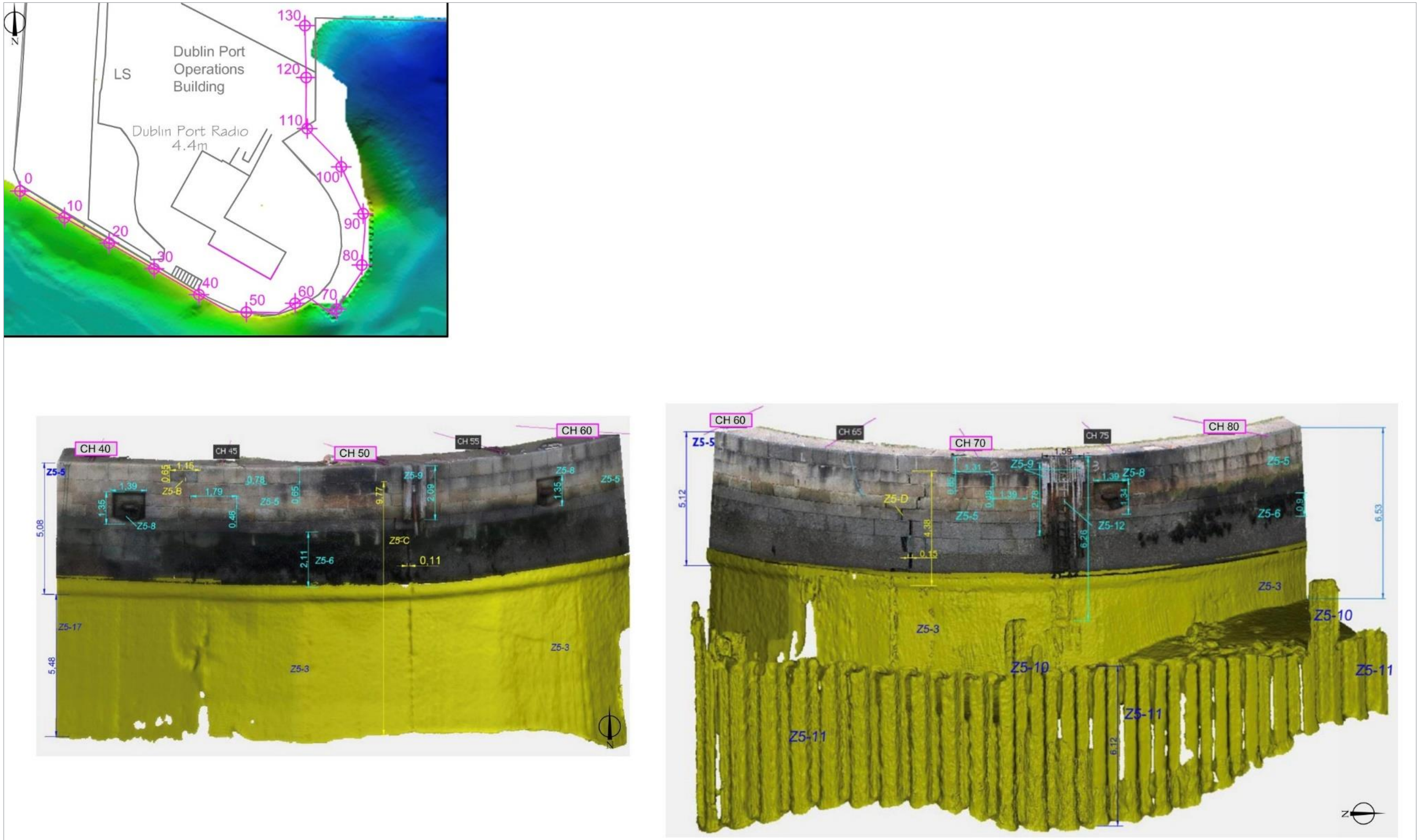
NTS

Figure 14-11 Plan of breakwater Pier Head, showing line of capstones that define the perimeter



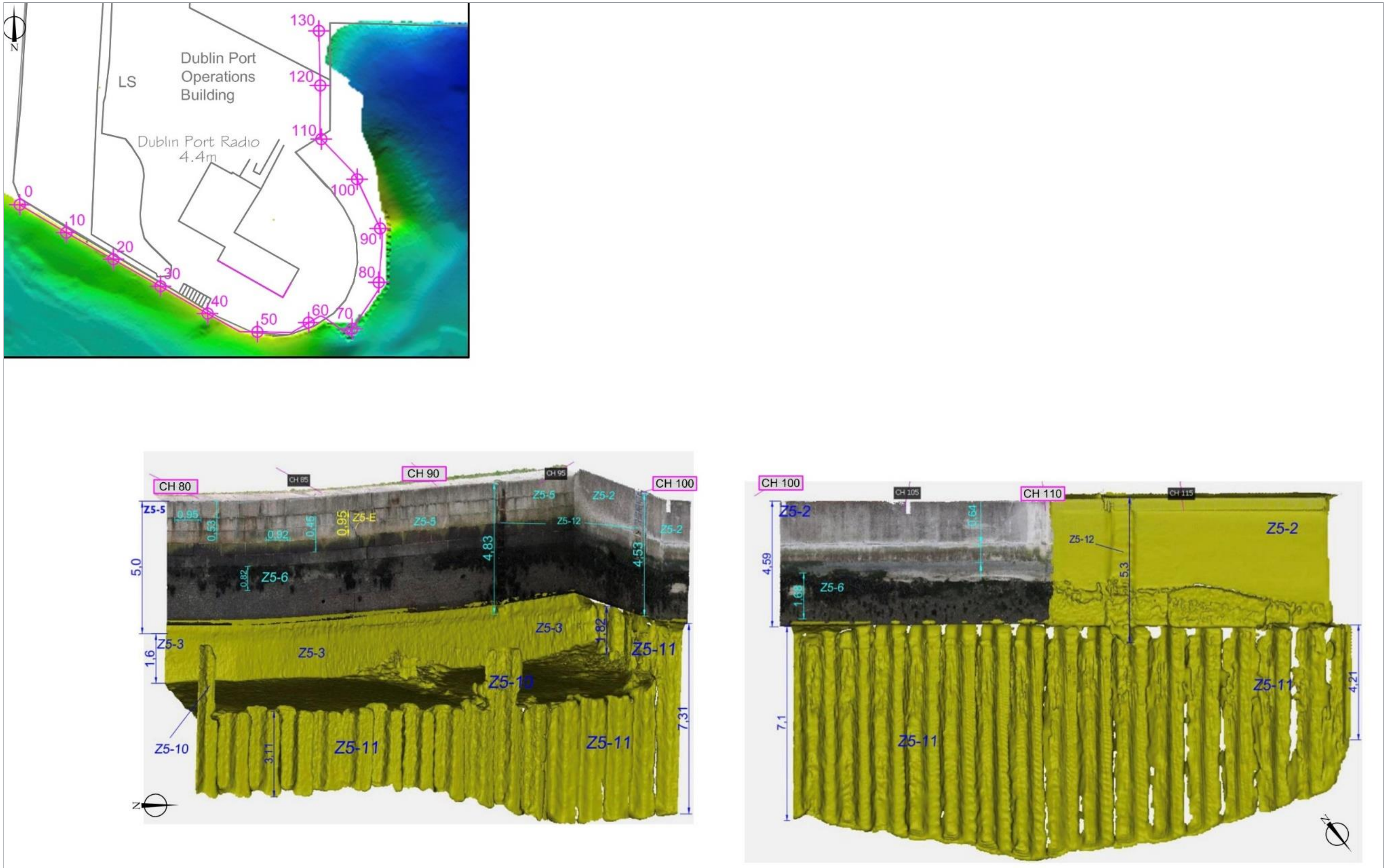
Source: elevations extracted from Dublin Port, Masterplan 2, Quay Wall & Seabed Assessment Report by Hydromaster [Figures 19-20, p44-45].

Figure 14-12 Elevation view of Pier Head showing structure above and below the waterline between chainages CH00 and CH40



Source: elevations extracted from Dublin Port, Masterplan 2, Quay Wall & Seabed Assessment Report by Hydromaster [Figures 21-22, p46-47].

Figure 14-13 12 Elevation view of Pier Head showing structure above and below the waterline between chainages CH40 and CH80



Source: elevations extracted from Dublin Port, Masterplan 2, Quay Wall & Seabed Assessment Report by Hydromaster [Figures 23-24, p48-49].

Figure 14-14 12 Elevation view of Pier Head showing structure above and below the waterline between chainages CH80 and CH110

15 LANDSCAPE & VISUAL

15.1 Introduction

This chapter of the EIAR considered the potential landscape and visual impacts of the MP2 Project and comprises a Landscape and Visual Impact Assessment (LVIA) of the MP2 Project.

This assessment seeks to:

a. *Establish the baseline conditions -*

Record and analyse the existing character, quality and sensitivity of the landscape and visual resource. This includes elements of the landscape such as;

– Landform;

– Land cover including the vegetation, the slopes, drainage, etc;

– Landscape character;

– Current landscape designations and planning policies; and

– Site visibility, comprising short, medium and long distance views.

b. *Analyse Baseline conditions*

– Comment on the scale, character, condition and the importance of the baseline landscape, its sensitivity to change and the enhancement potential where possible.

– A visual analysis (illustrated by photographic material) describing characteristics which may be of relevance to the impact of the design and to the method of mitigation.

c. *Description the MP2 Project*

d. *Identify the Potential Impacts of the MP2 Project on the Landscape and Visual Resource -*

Identify the landscape and visual impacts of the development at different stages of its life cycle, including:

– Direct & indirect landscape impacts of the development on the landscape of the site and the surrounding area; and

– Visual impacts including: the extent of potential visibility; the view and viewers affected; the degree of visual intrusion; the distance of views; and resultant impacts upon the character and quality of views.

e. *Assess the significance of the landscape and visual impacts in terms of the sensitivity of the landscape and visual resource, including the nature and magnitude of the impact.*

f. *Detail measures proposed to mitigate significant landscape and visual impacts and assess the effectiveness of these mitigation measures.*

g. *Assess the ability of the landscape and visual resource to absorb the residual impacts of the MP2 Project.*

15.2 Assessment Methodology

15.2.1 General Approach

The methodology for the LVIA has been derived from *Guidelines for Landscape and Visual Impact Assessment,* Third Edition (The Landscape Institute and Institute of Environmental Management & Assessment, 2013) (GLVIA3) and European Commission 2017 Guidance and Environmental Protection Agency (EPA) (2017) Draft Guidelines on the information to be contained in Environmental Impact Assessment Report.

The landscape has been appraised to allow it to be described and classified into landscape character areas that in turn enable the classification of landscape quality. The capacity of the landscape to accept change of the type proposed is assessed by determining the sensitivity of each landscape character area. Overall key landscape components are normally landform, vegetation and historical and cultural components. Landform relates to topography, drainage characteristics and geology. Historical and cultural components include historic landscapes, listed buildings, conservation areas and historic designed landscapes. Vegetation plays an important role in how the landscape and visual resources of an area are viewed and is an integral component of a landscape character.

Assessment has been undertaken through analysis of:-

- Up to date digital copies of OSI Discovery Series raster and OSI vector maps;
- Aerial photography;
- Dublin City Development Plan 2016 - 2022;
- Photomontages from selected viewpoints; and
- Detailed drawings of the MP2 Project including lighting proposals as described in Chapter 3: Project Description of the EIAR.

Site visits were undertaken to assess the location of the MP2 Project, in order to establish the existing visual resource and to identify sensitive receptors, i.e., residential properties, scenic viewpoints. Site visits were also used to establish whether it is likely that there will landscape and visual impacts associated with the MP2 Project.

The MP2 Project is then applied to this landscape and visual baseline and potential impacts identified and evaluated.

15.2.2 Assessment Criteria

The methodology for identification of potential impacts is set out below in section 15.2.3 for Landscape Impacts and Section 15.2.6 for Visual Impacts.

The objective of the assessment process is to identify and evaluate the likely significant effects arising from the MP2 Project. Significance is a function of the:

- Sensitivity of the affected landscape and visual receptors; and
- Scale or magnitude of impact that they will experience.

These definitions recognise that landscapes vary in their capacity to accommodate different forms of development according to the nature of the receiving landscape and the type of change being proposed.

Significance is not graded in bands, and a degree of informed judgement is required. Even with the application of pre-defined criteria, interpretation may differ between individuals, but this allows the process of reaching these conclusions to be transparent.

15.2.3 Landscape Impact Assessment

The LVIA firstly assesses how the MP2 Project would impact directly on any landscape features and resources. This category of effect relates to specific landscape elements and features (e.g. woods, trees, walls, hedgerows, watercourses) within the site that are components of the landscape that may be physically affected by the proposal. Physical effects are restricted to the area within the application boundary, and are the direct effects on the fabric of the site, such as the removal or addition of trees and alteration to ground cover and levels.

The LVIA then considers impacts on landscape character at two levels. Firstly, consideration is given to how the landscape character is affected by the removal or alteration of existing features and the introduction of new features. This is considered to be a direct impact on landscape character. Secondly, the indirect impacts of the MP2 Project on the wider landscape are considered. The assessment of impacts on the wider landscape is discussed using the surrounding character areas identified in the relevant regional or county landscape character assessments and further refined by this LVIA. It is acknowledged there is an overlap between perception of change to landscape character and visual amenity, but it should be remembered that landscape character in its own right is generally derived from the combination and pattern of landscape elements within the view.

The significance of effects on landscape features and character is determined by cross referencing the sensitivity of the feature or landscape character with the magnitude of impact.

Consideration of the sensitivity of the landscape resource against the magnitude of impact caused by the MP2 Project is fundamental to landscape and visual assessment and these two criteria are defined in more detail below.

15.2.4 Landscape Sensitivity

The determination of the sensitivity of the landscape resource is based upon an evaluation of each key element or characteristic of the landscape likely to be affected. The evaluation reflects such factors as its quality, value, contribution to landscape character and the degree to which the particular element or characteristic can be replaced or substituted.

For the purpose of this assessment, landscape quality is categorised as:-

- **Very High:** Areas of especially high quality acknowledged through designation or other landscape based sensitive areas. These are of landscape significance within the wider region or nationally;
- **High Quality:** Areas that have a very strong positive character with valued and consistent distinctive features that gives the landscape unity, richness and harmony. These are of landscape significance within the district;

- **Medium Quality:** Areas that exhibit positive character but which may have evidence of alteration/degradation or erosion of features resulting in a less distinctive landscape. These may be of some local landscape significance with some positive recognisable structure; and
- **Low Quality:** Areas that are generally negative in character, degraded and in poor condition. No distinctive positive characteristics and with little or no structure. Scope for positive enhancement.

As previously discussed, landscape sensitivity is influenced by a number of factors including value, condition and the type of change brought about by the proposal. In accordance with guidance provided in GLVIA3 and in order to assist with bringing these factors together the following five point scale has been used as presented in Table 15-1. The table defines the criteria that have guided the judgement as to the Sensitivity of the Landscape Resource.

Table 15-1 Landscape Sensitivity

Definition		Sensitivity
Landscape Resource Sensitivity	**Landscape Resource Value**	
Exceptional landscape quality, no or limited potential for substitution. Key elements / features well known to the wider public. Little or no tolerance to change.	Nationally / internationally designated/ valued landscape, or key elements or features of national / internationally designated landscapes. Little or no tolerance to change	Very High
Strong / distinctive landscape character; absence of landscape detractors. Low tolerance to change.	Regionally / nationally designated / valued countryside and landscape features. Low tolerance to change.	High
Some distinctive landscape characteristics; few landscape detractors. Medium tolerance to change	Locally / regionally designated / valued countryside and landscape features. Medium tolerance to change	Medium
Absence of distinctive landscape characteristics; presence of landscape detractors. High tolerance to change	Undesignated countryside and landscape features. High tolerance to change	Low
Absence of positive landscape characteristics. Significant presence of landscape detractors. High tolerance to change	Undesignated countryside and landscape features. High tolerance to change	Negligible

15.2.5 Magnitude of Landscape Impacts

Direct resource changes on the landscape character in the study area are brought about by the introduction of the proposal and its impact on the key landscape characteristics. The categories and criteria used and that reflect guidance in GLVIA3 are given in Table 15-2 below:

Table 15-2 Magnitude of Landscape Impact

Definition	Magnitude
Total loss or addition or/ very substantial loss or addition of key elements / features / patterns of the baseline, i.e., pre-development landscape and/ or introduction of dominant, uncharacteristic elements with the attributes of the receiving landscape.	Large
Partial loss or addition of or moderate alteration to one or more key elements / features / patterns of the baseline, i.e., pre-development landscape and / or introduction of elements that may be prominent, but may not necessarily be substantially uncharacteristic with the attributes of the receiving landscape.	Medium
Minor loss or addition of or alteration to one or more key elements / features / patterns of the baseline, i.e., pre-development landscape and or introduction of elements that may not be uncharacteristic with the surrounding landscape.	Small
Very minor loss or addition of or alteration to one or more key elements / features / patterns of the baseline, i.e., pre-development landscape and/or introduction of elements that are not uncharacteristic with the surrounding landscape approximating to a 'no-change' situation.	Negligible
No loss, alteration or addition to the receiving landscape resource.	No change

15.2.6 Visual Impact Assessment

The assessment of effects on views is an assessment of how the introduction of the MP2 Project will affect views throughout the study area. Assessment of visual effects therefore needs to consider:-

- Direct impacts of the MP2 Project upon views of the landscape through intrusion or obstruction;
- The reaction of viewers who may be affected, e.g., residents, walkers, road users; and
- The overall impact on visual amenity.

Viewpoints have been selected to meet the following criteria**:**

- Consultation responses received from Dublin City Council (Planning & Property Development Section), including a request for a viewpoint from the Great South Wall and that views are orientated towards the project particularly from Clontarf;
- A balance of viewpoints from where main direction of view is towards the MP2 Project;

- A range of views of the MP2 Project covering the extent of the study area Zone of Theoretical Visibility (ZTV). Selected viewpoints have all been located within the study area associated with the MP2 Project;
- A proportion representing areas known to be available to the community where people may frequently congregate; and
- Locations of interest, e.g., settlements; amenity or recreation areas.

The selected viewpoint locations are presented in Appendix 15.

15.2.7 Photographs, Photomontages and Zone of Theoretical Visibility (ZTV)

All site photography and photomontages have been completed in accordance the *Landscape Institute Advisory Note 01/11 Photography and Photomontages in LVIA*. As the site survey for the MP2 Project was limited to the footprint and immediate surrounds of the site, it was necessary to acquire additional elevation data from the OSI to include all viewpoint locations selected for photomontage. Enhanced digital terrain model (DTM) was chosen for this purpose. A digital terrain model was prepared for the entire visual study area with a simplified 3D model of the MP2 Project for use in the field.

The photographer was equipped with a professional level SLR camera (Canon 5D Mark II). Specifically to meet the requirements of best practice, this houses a full frame sensor and is fitted with a 50mm lens. A specialised panoramic head was fitted to the camera tripod for those viewpoints adjacent to the site. This enables the capture of multiple photographs in a linear sequence for the preparation of a panoramic image. Such imagery is required to include sufficient landscape context to depict the entire MP2 Project at close quarters. A mapping grade GPS (Trimble GeoXH) was used to record the precise coordinate position of the camera at each viewpoint. This offers corrected accuracy typically in the range of +/- 30cm in the x,y plane. In addition the photographer had all necessary information per viewpoint to capture the correct photographic detail – viewpoint map, photographic reference, Google Earth with a KMZ model of the MP2 Project (laptop), interactive topographic model of the MP2 Project and surrounding terrain (laptop). All photography was captured at a focal length of 50mm in RAW format for post-processing. The camera was consistently set up at 1.7m above ground level at each viewpoint location. The photography was captured in the clearest possible weather in the available time frame. This saw a mixture of broken cloud with sunny spells.

A completed 3D model of the MP2 Project was created. A full specification of finishes, textures and colours was provided in addition to reference photography and previous high quality renders. The photomontage team utilised all of the above to prepare a finished textured 3D model of the final design in 3D Studio Max.

The information captured at each viewpoint location was used to simulate a replica camera view in the 3D environment: Easting (from GPS); Northing (from GPS); Elevation (calculated from the Enhanced DTM data from OSI; GPS does not offer an accurate z-value reading); Angle of View (specific to focal length and camera sensor size); Direction of View (from GPS coordinate info); Date (from photography meta-data); Time of Day (from photography meta-data); Weather Conditions (from photography and recorded on site).

Draft renders were output and integrated into the photography for review. This was an iterative process involving tweaks to textures and lighting. Upon sign-off a full set of final calibrated renders were prepared ready for integration into the photography. The final renders were integrated into the photography with masking aided by detailed street maps and Google Earth photography. The final set of renders were formatted at A3 (dimensions 36cm x 24cm) for a recommended viewing distance of 50cm and are provided in Appendix 15 of this EIAR.

The ZTV illustrates the extents from which a feature would theoretically be visible and defines the study area. The ZTV maps do not take account of the orientation of a viewer, such as the direction of travel and there is no allowance for attenuation of visibility with distance, weather or light. A further assumption of the ZTVs is that climatic visibility is 100% (i.e. visibility is not impeded by moisture or pollution in the air). Climatic conditions inevitably reduce visibility with increasing distance from the MP2 Project.

These limitations mean that the ZTV maps tend to overestimate the extent of the influence on the landscape and visibility of the MP2 Project and they should be considered only as a tool to assist in assessing the theoretical visibility of developments and not a measure of the visual impact. Nevertheless ZTVs are a useful tool in representing the worst-case scenario when predicting the likely visibility of a development. They are particularly useful as a basis for selecting viewpoints where there may be significant impacts for which further assessment is required.

The ZTV for the MP2 Project is presented in Appendix 15.

15.2.8 Visual Sensitivity

Visual sensitivity is defined with reference to the landscape sensitivity of the viewpoint location and the view. Other factors affecting visual sensitivity include:-

- The location and context of the viewpoint;
- The expectations and occupation or activity of the receptor; and
- The importance of the view.

Although the interpretation of viewers' experience can have preferential and subjective components, there is generally agreement that the visual resources of certain landscapes have high visual quality.

Viewer sensitivity, as set out in

Table 15-3, is a combination of the sensitivity of the human receptor (for example resident, commuter, tourist, walker, recreationist or worker, and the numbers of viewers affected) and viewpoint type or location (for example house, workplace, leisure venue, local beauty spot, scenic viewpoint, commuter route, tourist route or walkers' route) and reflects guidance in GLVIA3.

Table 15-3 Viewer Sensitivity

Definition		Sensitivity
Visual Resource Sensitivity	**Visual Resource Value**	
Views of remarkable scenic quality, of and within internationally designated landscapes or key features or elements of nationally designated landscapes that are well known to the wider public. Little or no tolerance to change.	Observers, drawn to a particular view, including those who have travelled from around Ireland and overseas to experience the views. Little or no tolerance to change.	Very High
Views from residential property. Public rights of way, National Trails, long distance walking routes and nationally designated countryside/ landscape features with public access. Low tolerance to change.	Observers enjoying the countryside from their homes or pursuing quiet outdoor recreation are more sensitive to visual change. Little tolerance to change.	High
Views from local roads and routes crossing designated countryside / landscape features and 'access land' as well as promoted paths. Medium Tolerance to change.	Observers enjoying the countryside from vehicles on quiet/promoted routes are moderately sensitive to visual change. Medium tolerance to change.	Medium
Views from work places, main roads and undesignated countryside / landscape features. High tolerance to change.	Observers in vehicles or people involved in frequent or infrequent repeated activities are less sensitive to visual change. High tolerance to change.	Low
Views from within and of undesignated landscapes with significant presence of landscape detractors. High tolerance to change.	Observers in vehicles or people involved in frequent or frequently repeated activities are less sensitive to visual change. High tolerance to change.	Negligible

15.2.9 Magnitude of Visual Impacts

The magnitude of impact on the visual resource results from the scale of change in the view, with respect to the loss or addition of features in the view, and changes in the view composition. Important factors to be considered include: proportion of the view occupied by the proposal, distance and duration of the view. Other vertical features in the landscape and the backdrop to the MP2 Project will all influence resource change. Magnitude of visual impact in line with guidance provided in GLVIA3 is defined in Table 15-4.

Table 15-4 Magnitude of Visual Impact

Definition	Magnitude
Complete or very substantial change in view dominant involving complete or very substantial obstruction of existing view or complete change in character and composition of baseline, e.g., through removal of key elements	Large
Moderate change in view: which may involve partial obstruction of existing view or partial change in character and composition of baseline, i.e., pre-development view through the introduction of new elements or removal of existing elements. Change may be prominent, but would not substantially alter scale and character of the surroundings and the wider setting. Composition of the view would alter. View character may be partially changed through the introduction of features which, though uncharacteristic, may not necessarily be visually discordant	Medium
Minor change in baseline, i.e., pre-development view - change would be distinguishable from the surroundings whilst composition and character would be similar to the pre change circumstances.	Small
Very slight change in baseline, i.e., pre-development view - change barely distinguishable from the surroundings. Composition and character of view substantially unaltered.	Negligible
No alteration to the existing view	No change

15.2.10 Significance of Effects

The purpose of this LVIA is to determine, in a transparent way, the likely significant landscape and visual effects of the proposal. It is accepted that, due to the nature and scale of the MP2 Project, the proposal could potentially give rise to some notable visual and landscape effects.

GLVIA3 identifies that *'The Regulations require that a final judgment is made about whether or not each effect is likely to be significant. There are no hard and fast rules about what effects should be deemed 'significant' but LVIAs should always distinguish clearly between what are considered to be significant and non-significant effects'*.

Significance can only be defined in relation to each particular development and its specific location. The relationship between receptors and effects is not typically a linear one. It is for each LVIA to determine how judgements about receptors and effects should be combined to derive significance and to explain how this conclusion has been arrived at.

As a general guide it is considered that the following are likely to be considered effects of the greatest significance:-

- Major loss or irreversible negative effects, over an extensive area, on elements and/or aesthetic and perceptual aspects that are key to the character of nationally valued landscapes; or

- Irreversible negative effects on people who are particularly sensitive to changes in view, on recognised and important viewpoints or scenic routes, large-scale change which introduces non-characteristic, discordant or intrusive elements into the view.

The identification of significant effects would not necessarily mean that the effect is unacceptable in planning terms. What is important is that the likely effects on the landscape and visibility are transparently assessed and understood in order that the determining authority can bring a balanced, well-informed judgement to bear when making the planning decision.

The significance of effects on landscape, views and visual amenity are evaluated according to a six-point scale: Substantial, Major, Moderate, Minor, And Negligible or None.

For those effects indicated as being Moderate to Major the assessor will exercise professional judgement in determining if the effect is considered significant.

For the purposes of this assessment those effects indicated as being of Substantial, Major to Substantial are considered significant as highlighted in Table 15-5 in line with guidance provided in GLVIA3 (para 6.43). Effects of 'Moderate' and lesser significance have been identified in the assessment, but are not considered significant upon the character and quality of the landscape and on views although they remain worthy of consideration throughout the decision making process.

Table 15-5 Significance of Effects Matrix

Magnitude of Impact	Sensitivity				
	Negligible	***Low***	***Medium***	***High***	***Very High***
No Change	None	None	None	None	None
Negligible	Negligible	Negligible to Minor	Negligible to Minor	Minor	Minor
Small	Negligible to Minor	Negligible to Minor	Minor	Minor to Moderate	Moderate to Major
Medium	Negligible to Minor	Minor	Moderate	Moderate to Major	Major to Substantial
Large	Minor	Minor to Moderate	Moderate to Major	Major to Substantial	Substantial

Change can be adverse or beneficial. A conclusion that an effect is 'significant' should not be taken to imply that the proposal is unacceptable. Significance of effect needs to be considered with regard to the scale over which it is experienced.

15.2.11 Landscape & Visual Assessment Definitions

The following provides a list of landscape and visual definitions for the terms used within this assessment as derived from GLVIA3:-

- **Landscape Capacity:** The capacity of a particular type of landscape to absorb change without unacceptable adverse effects on its character;
- **Landscape Character Area:** Distinct types of landscape which are generic in character in that they may occur in different parts of the country, but wherever they are they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern. Landscape character area (LCA) names are generic, for example 'upland hills', 'river valley' and 'urban landscape';
- **Landscape Fabric:** Is the physical pattern of elements and features such as vegetation, landform and land use that combine to create landscape character. The effects of a development on landscape fabric are those that alter the physical pattern of elements. These effects are restricted to the landscape within which the proposal is located as it is within this area that the physical pattern will alter, for instance through loss of vegetation, re-contouring or changes to land use;
- **Landscape Quality (or Condition):** Is based on judgements about the physical state of the landscape, and about its intactness, from visual, functional, and ecological perspectives. It also reflects the state of repair of individual features and elements which make up the character in any one place;
- **Landscape Resource:** The combination of elements that contribute to landscape context, character and value;
- **Landscape Value:** The importance attached to a landscape (often as a basis for designation or recognition) that expresses national or local consensus, because of its quality, cultural associations, scenic or aesthetic characteristics;
- **Sensitivity:** Vulnerability of a sensitive receptor to change;
- **Sensitive Receptor:** Physical or natural resource, special interest or viewer group or observer that will experience an impact;
- **Magnitude:** Size, extent and duration of an impact;
- **Visual Amenity:** The value of a particular area or view in terms of what is seen;
- **Visual Character:** When a viewer experiences the visual environment, it is not observed as one aspect at a time, but rather as an integrated whole. The viewer’s visual understanding of an area is based on the visual character of visible features and aspects and the relationships between them. The visual character is descriptive and not evaluative;
- **Visual Effect:** Is a change to an existing view as a result of development or the loss of particular landscape elements or features already present in the view;

- **Visual Resources:** The visual resources of the landscape are the stimuli upon which actual visual experience is based. They are a combination of visual character and visual quality;
- **Visual Quality:** Although the interpretation of viewers' experience can have preferential and subjective components, there is generally clear public agreement that the visual resources of certain landscapes have high visual quality. The visual quality of a landscape will reflect the physical state of individual features or elements. Due to the subjective value of the evaluation there is no comprehensive official process for identifying visual quality. The visual quality of this evaluation has been carried out by one Chartered Landscape Architect and verified by another; and
- **Zone of Theoretical Visibility (ZTV):** This represents the area over which a development could theoretically be seen. The ZTV usually presents a 'bare ground' scenario – i.e. a landscape without screening structures or vegetation.

15.3 Receiving Environment

15.3.1 Scale and Character

From a landscape and visual perspective, the relevant elements of the MP2 Project is located on the north port area within the existing Dublin Port Estate and is surrounded by tall buildings and structures in a busy and active harbour context that is in a constant state of flux on a 24 hour basis with ships and HGV traffic coming and going on a very regular basis. The northern port area at Dublin Port Estate extend to 207 ha of land that is accessed via the Dublin Port Tunnel and the R131 road. The MP2 Project is located at the eastern side of the northern port area and covers an area of circa 57 hectares of this part of Dublin Port Estate.

To the southeast of the MP2 Project on the other side of the River Liffey are located the most notable features in the vicinity - the twin stacks of the Poolbeg Power Station, which are both 210m tall. The twin stacks are recognised landmarks in the Dublin City landscape and at the gateway to Dublin Port. The coastal location of the MP2 Project site results in potential extensive views north and south across Dublin Bay due to the flat nature of the coastline in this part of Dublin Bay. To the northwest, west and southwest lies the urban context of Dublin City that significantly limits potential landscape and visual influence of the MP2 Project site in these directions.

At Howth to the northeast and Dalkey/Killiney to the southeast the rocky coastline rises with cliffs and hills that offer long distance panoramic views across Dublin Bay and towards the MP2 Project.

There are two Oil Jetties in operation within the northern port area of Dublin Port namely the Western Oil Jetty and Eastern Oil Jetty. The Western Oil Jetty lies immediately adjacent to the boundary of the MP2 Project and has two berths (Oil Berth 1 and Oil Berth 2) and in 2017 Oil Berth 1 had 181 ship arrivals and Oil Berth 2 had 190 ship arrivals. The Eastern Oil Jetty lies within the boundary of the MP2 Project and has two berths (Oil Berth 3 and Oil Berth 4) and in 2017 Oil Berth 3 had 59 ship arrivals: Oil Berth 4 is rarely used and had only 5 ship arrivals in 2017. Numerous large oil tanks are prominent on lands adjacent to the oil jetties.

There is one Lo-Lo Container Terminal within the site of the MP2 Project. Primary handling equipment used to unload and load containers from ships include rail mounted gantry cranes and dock mobile cranes. Containers are moved between the stacks and the quay side cranes by special heavy duty truck and trailer combinations or by reach stackers. Secondary handling equipment, usually gantry cranes, are used to store containers in back areas in large stacks. Rubber-tyred gantries (RTG's) and rail mounted gantries are used. The largest RTG's can store containers in stacks up to six containers high and seven wide. These stacks occupy large areas of port land and DPC has an utilisation target of 40,000 TEU (twenty-foot equivalent units) per hectare per annum for the port's container terminals.

There are a currently five Berths within the development area with ramps for Ro-Ro freight and passengers. Some services are freight only; others carry a combination of freight and passengers. Accompanied freight units drive off the vessel and leave the port immediately. Unaccompanied freight requires larger areas of parking.

There are three ferry terminal buildings located within the MP2 Project application boundary. Terminal 2 and Terminal 5 will be demolished as part of the works, with the existing Terminal 1 Building being used as a unified terminal building thereafter.

The Alexander Basin Redevelopment (ABR) Project is currently at construction stage. The ABR Project includes the infilling of Basin 52/53 which currently hosts two Ro-Ro Ramps operated by Seatruck. The permission also allows for the construction of a new riverside berth at the entrance to Basin 52/53 (Berth 52).

Large cruise ships are a regular feature of the study area that are a positive feature and attraction to passers-by.

The site is bounded to the north and east by the Tolka estuary. The Tolka estuary is used for recreational purposes mostly by small sailing craft based at Contarf.

On the south side of the Port there is a small leisure boating area that contrasts in scale to the larger vessels to the north.

Further Port facilities are also located on the southern side of the river and adjacent to Poolbeg Power Station including container storage areas and Lo-Lo facilities.

The Great South Wall beyond the power station is used by the local community for walking and recreation purposes.

North Bull Island is similarly used by the local community and wider community for walking, recreational (including golf) and nature conservation activities.

Beyond the port residential landscape extends to the sea at Sandymount and Merrion to the south and Clontarf and Raheny to the north. The industrial harbour and residential areas are broken up by significant areas of public open space, which provide formal and informal recreation for the local community and visitors alike such as Fairview Park and St Anne's Park to the north and Sandymount Promenade to the south. The coastline is followed by an extensive footpath and cycle path systems that are popular with the local community for informal recreation and links a further open spaces along the eastern parts of Dublin City. The footpaths extend as far as Poolbeg Lighthouse on the Peninsula that permit extensive seascape views along the coast.

Dublin City has a generally flat topography and medium and long distance views within the built fabric of the city are extremely limited. The majority views that are available are from the banks of the River Liffey. Such views are channelled along the river in a west – east axis and defined by adjacent tall buildings on the north and south banks of the river.

Having assessed the host landscape and in the absence of a detailed Dublin City landscape character assessment, the landscape character areas (LCA) can be defined and described as part of this LVIA, using the methodology set out section 15.2 above, in the following terms:

Urban residential landscape: Residential development consisting of two and single storey buildings are the predominant landscape features in the surrounding study area. Dollymount, Clontarf and Fairview lie to the north of the MP2 Project. To the south lie Ringsend and Irishtown. Further to the south are located Sandymount, Merrion and Booterstown. Occasionally larger buildings in the form of schools, office blocks and churches break the residential landscape. The visual quality of the landscape is low. This landscape character area has a low sensitivity to change.

Harbour Based Industrial landscape: Dublin Port is a significant landmark on the eastern side of Dublin City. Industrial and commercial activity within the Port area is extensive. Passenger ferries depart from Dublin to Holyhead on a daily basis. The Port area also acts as a major transport route between north and south Dublin via the East Link Bridge. Poolbeg Power Station twin stacks dominate the industrial landscape. Vertical elements are frequent and include stacks, cranes and associated lifting facilities. The visual quality of this landscape is low. This landscape character area has a low sensitivity to change.

Urban parkland landscape: A number of large public open spaces are located in the study area. Coastal promenades and walkways are located to the north at Clontarf and south at Sandymount. These coastal walkways are popular with visitors and the local community and provide panoramic views of Dublin Bay. Bull Island is located to the north east of the MP2 Project site and consists of a flat duneland habitat. The island contains two golf courses (St. Anne's and Royal Dublin). The strand on the island is popular in summer months. Large formal gardens are also frequent such as Fairview Park and St. Anne's Park. Both parks contain mature parkland landscapes and recreational facilities. Irishtown Nature Park is located south of the MP2 Project. Further recreational facilities are also provided at Ringsend Park and Sean Moore Park. The visual quality of the urban parkland landscapes is high and they provide a valued resource to the local community. This landscape has a high sensitivity to change.

The location of the defined LCA is presented in Appendix 15.

15.3.2 Visual Context

The ZTV as illustrated in Appendix 15 indicates that potentially extensive views of towards the MP2 Project are available. As set out in section 15.2.7 due to limitations to ZTV maps they tend to overestimate the extent of influence on the landscape and visibility of a proposed development and should be considered only as a tool to assist in assessing the theoretical visibility of a development and not a measure of the visual impact. Views from the north-east extend to Howth and Sutton Strand. The existing twin stacks at Poolbeg and taller port infrastructure are visible in long distance glimpse views from as far as the M50 between the M1 junction and the N3 junction. Intermittent views only are available from the M50 and it is difficult to discern detail from such distances (approximately 10 km). West of the MP2 Project the built components of Dublin City severely restrict views beyond the quays. Individual tall buildings within the City Centre will potentially have views of the MP2 Project. Broadly, the views are limited to Custom House Quay in the direction of the City Centre. The coastal road from Sutton to Ringsend and from Sandymount to Dun Laoghaire will have intermittent views of the MP2

Project (R105; R131; R118; N31). Long distance views from the south extend as far as Killiney and the Dublin Mountains. Views within the ZTV are described in detail in Viewpoints 1 – 14 in section 15.4.2 below supported by photomontages in Appendix 15.

15.3.3 Planning Policy

This subject site is located within Dublin Port, the main seaport to the eastern side of Dublin on either side of the River Liffey. In terms of extant Development/Area Plan framework, the Dublin City Development Plan 2016-2022 provides the applicable planning policy framework within which to assess the potential visual impacts of the MP2 Project.

Dublin City Development Plan (DCDP) 2016-2022

Chapter 2 of the DCDP is entitled Vision and Core Strategy and outlines the Council's 30 year vision for the City going forward, which is for Dublin to be an "*established international reputation as one of Europe's most sustainable, dynamic and resourceful city regions. Dublin, through the shared vision of its citizens and civic leaders, will be a beautiful, compact city, with a distinct character, a vibrant culture and a diverse, smart, green, innovation-based economy.*"

From a Strategic perspective the DCDP outlines, in Chapter 4, the City Council's policy approach and objectives in relation to the shape and structure of the City. The approach to the Dublin Docklands and the Port (section 4.5.1.2) is as follows:

> "*Dublin Port will have a significant role to play in the future development and growth of the city and it is considered prudent to plan the structure of this part of the city, including the proposed public transport network, to fully integrate with the developing new city structure and character, while having regard to the Dublin Port Company Masterplan 2012–2040*.
>
> *New proposals by Dublin Port to accommodate cruise ships directly east of the Tom Clarke Bridge will further animate the campshires and general Docklands area, enhance the social and commercial environment of this urban quarter and will improve connectivity between the port and the city. There is potential to include a marine services, hotel and exhibition centre in the Point area immediately east of the SDZ, to consolidate this cluster and complement the cruise shipping facility. Dublin City Council recognises Dublin Port as a major source of employment in the area as well as the need for a ferry terminal service and linkages to the natural amenities of Dublin Bay."*

As such the following policy is applicable: -

- SC9: To support and recognise the important national and regional role of Dublin Port in the economic life of the city and region and to facilitate port activities and development, having regard to the Dublin Port Masterplan 2012–2040.

Zoning Z7

In accordance with the DCDP 2016-2022, the subject lands are zoned under Zone Z7 to '*provide for the protection and creation of industrial uses and facilitate opportunities for employment creation including Port related Activities'* as indicated on Map F of the Plan. Section 14.8.7 of the Plan is entitled 'Employment (Heavy)

- Zone Z7' and specifically provides the policy and objectives of Dublin City Council in relation to this land use zoning. Under zoning Z7, the:

> *"Majority of these lands are located in the Port area. The primary uses in these areas are those that can result in a standard of amenity that would not be acceptable in other areas. They can sometimes lead to dis-amenities which would need to be managed through the planning process to safeguard residential amenity when necessary. Activities include industry, other than light industry; manufacturing repairs, open storage, waste material treatment, and transport operation services."*

<u>*Landscape*</u>

Chapter 10 of the Plan is entitled 'Green Infrastructure, Open Space and Recreation'. Figure 14 of the Plan illustrates the strategic green network throughout Dublin within which policies include those aimed at implementing a green infrastructure strategy, creating sustainable connectivity between green areas and providing for recreational and amenity needs of the population. The site of the MP2 Project does not overlap with of these areas. In relation to 'Rivers, Canals and the Coastline', the following Policies are identified:

- GI15: To protect, maintain, and enhance the natural and organic character of the watercourses in the city, including opening up to daylight where safe and feasible. The creation and/or enhancement of riparian buffer zones will be required where possible. It is the policy of Dublin City Council to maintain and enhance the safety of the public in its use and enjoyment of the many public parks, open spaces, waterways and linkages within the city, including the River Dodder between Ringsend and Orwell (Waldron's) bridge, and at the area known as Scully's Field between Clonskeagh and Milltown.
- GI16: To protect and improve the unique natural character and ecological value of all rivers within and forming boundaries to the administrative area of Dublin City Council, in accordance with the Eastern River Basin District management plan.
- GI17: To develop sustainable coastal, estuarine, canal and riverine recreational amenities to enhance appreciation of coastal natural assets in a manner that ensures that any adverse environmental effects are avoided, remedied or mitigated
- GI18: To liaise with relevant State agencies responsible for the city's waterways, including Waterways Ireland, Inland Fisheries Ireland, the Environmental Protection Agency and Dublin Port Company

Among the "Plan Objectives", those identified in respect of River, Canals and the Coastline are:

- GIO17: To seek the continued improvement of water quality, bathing facilities and other recreational opportunities in the coastal, estuarine and surface waters in the city and to protect the ecology and wildlife of Dublin Bay.
- GIO18: To protect and improve the natural character of watercourses, including the Dodder, and to promote access, walkways, cycleways and other compatible recreational uses along them, having regard to environmental sensitivities.
- GIO19: To maintain beaches at Dollymount, Sandymount, Merrion and Poolbeg/Shelly Banks to a high standard, and to develop their recreational potential as a seaside amenity, in order to bring them to 'Blue Flag' standard subject to Article 6 Assessment of the Habitats Directive.

- GIO20: To establish, where feasible, river corridors, free from development, along all significant watercourses in the city.
- GIO21: To co-operate with the relevant adjoining local authorities of Dún Laoghaire–Rathdown and South Dublin Councils in developing a strategy for the preparation and graduated implementation of an integrated Maintenance, Improvement and Environmental Management Plan for the entire length of the River Dodder and to support the establishment of a co-ordinating River Dodder Authority or equivalent body to implement that strategy. This plan should reflect the relevant recommendations of the Eastern Catchment Flood Risk Assessment and Management and associated Unit of Measurement Flood Risk Management Plan(s) and associated Environmental Reports.

A "Key View and Prospect" is annotated within Figure 4 of the Plan that shows a range of city centre views designated towards the west of Dublin Port. The views are beyond the site to the west and also focused towards the City and away from the Port area.

There are no designated sites located within the MP2 Project application boundary. The South Great Wall is a Protected Structure (RPS 6798) and a Site of Archaeological Interest (DU019-028), located within a Conservation Area and a Zone of Archaeological Interest (019-029) is situated to the south of the MP2 Project. Poolbeg Lighthouse, a Protected Structure (RPS 7553), is located at the eastern end of the South Great Wall, also outside the MP2 application boundary.

15.4 Likelihood of Landscape and Visual Impacts

15.4.1.1 Landscape Character Area Impacts

As identified in the baseline assessment above - Section 15.3.1 – this appraisal has divided the extended host landscape into series of landscape character areas of which the MP2 Project is located directly within the Harbour Based Industrial landscape (see Appendix 15 – Landscape Character Areas).

Harbour Based Industrial landscape: The MP2 Project is located directly within the Harbour Based Industrial Landscape. This landscape is in a constant state of change as cranes, ships and cargo are moving around the Dublin Port area on a continuous basis. The MP2 Project is completely consistent with the key features of the existing landscape character in this area. The limited demolition of buildings will not be noticeable in the wider scale of this landscape.

The structures associated with the MP2 Project including at Berth 50A; Berth 52; Berth 53; Oil Berth 3 and in-filing Oil Berth 4; and the Unified Ferry Terminal; will all be read in the context of the existing harbour industrial landscape with negligible change in landscape character due to their similarity to the existing character at the port site. Re-orientated berths will still have ships coming and going from the port as with the existing situation and such ships are already a characteristic of the harbour landscape. Similarly new high mast lights and gantries at the Unified Ferry Terminal and associated traffic while being one of the more noticeable elements of the MP2 Project are fully read in the context of same existing features at the site and its urban surroundings with negligible change in landscape character.

The visual quality of this existing landscape is low. This landscape character area has a low sensitivity to change. The magnitude of change in landscape resource is negligible. The predicted significance of landscape impact is negligible to minor.

15.4.1.2 Planning Policy Impacts

Impacts on relevant planning policy designations contained within the Dublin City Development Plan – as referred to above in Section 15.3.2 – are assessed below.

Dublin City Development Plan 2016 – 2022

This site is located within Dublin Port - where the Dublin City Development Plan 2016-2022 provides the extant development plan framework. A review and assessment has taken place of the Plan to establish the relevant landscape related designations. There are no protected views or prospects in proximity to proposal. The nearest protected views and prospects (shown on Figure 4 of the Plan) are located along the Quays but are towards within the city centre from where it will not be possible to view the MP2 Project.

A range of other policies have been identified in the Plan but there is no landscape or visual impacts from the proposals on these remaining policies.

Overall when landscape related planning policy designations are assessed there will be no significant impacts.

15.4.1.3 Zone of Theoretical Visibility (ZTV)

The ZTV as illustrated in Appendix 15 indicates that potentially extensive views of the MP2 are available due to the coastal location of the MP2 Project within Dublin Bay. Potential views from the north-east extend to Howth and Sutton Strand. The existing twin stacks at Poolbeg and taller port infrastructure are visible in long distance glimpse views from as far as the M50 between the M1 junction and the N3 junction. Intermittent views only are available from the M50 and it is difficult to discern detail from such distances (approximately 10 km). West of the MP2 Project the built components of Dublin City severely restrict views beyond the quays. Individual tall buildings within the City Centre will potentially have views towards the MP2 Project site. The coastal road from Sutton to Ringsend and from Sandymount to Dun Laoghaire will have potential intermittent views of the MP2 Project (R105; R131; R118; N31). Potential long distance views from the south extend as far as Killiney and the Dublin Mountains. Views within the ZTV are described in detail in Viewpoints 1 – 15 in Section 15.4.2 below supported by photomontages in Appendix 15.

The actual visual impact of the MP2 Project is assessed in greater detail in the following sections.

15.4.1.4 Visual Impacts on Residential Properties

An assessment has been undertaken within the ZTV to determine the magnitude of visual impact of the MP2 Project on potential views from sensitive visual receptors including residential properties.

There is limited potential visibility of the MP2 Project from residential properties. The nearest properties are located at Ringsend on R131, York Road and Pigeon House Road to the southwest. Poolbeg Quay Apartments are the tallest buildings at this location and extend to 5 stories in height offering views across port infrastructure on the southern side of the River Liffey towards the MP2 Project. Where properties have an aspect to the north all such properties at the Ringsend area have an aspect that includes the existing Dublin Port and the busy East

Link Toll Plaza. With the exception of the Poolbeg Quay Apartments the residential properties are predominantly two and single storey type dwellings. In views north (when available) from all such properties the existing harbour and its activities are prominent. When ships are berthed it is notable that quayside activities on the northern side of the ships are obscured. This aspect will be maintained by the MP2 Project.

More extensive areas of residential development are located along the coast road north of the MP2 Project at Clontarf; Dollymount; Sutton and Howth adjacent to the R105 and R807 roads. The predominant house type is two storey. For houses that front on to the coast road and have potential views towards the MP2 Project the existing port facilities are distant in all views and the MP2 Project will be difficult to discern from existing facilities including gantries; high mast lighting and ships. The adjacent tall industrial infrastructure such as the Poolbeg Power Station chimney stacks and the Poolbeg Waste to Energy plant will remain much more prominent in views from these properties.

Overall in potential views from residential properties to the north and south of the port the MP2 Project will be extremely difficult to discern from the existing activities and features at Dublin Port. All aspects of the MP2 Project will be well screened from residential properties. The predicted change in visual resource will be low.

The visual sensitivity of receptors is negligible. The predicted significance of visual impact for residential properties will be minor negative.

15.4.2 Viewpoint Assessment

A series of representative viewpoints have been selected from locations throughout the study area and subjected to specific assessment below. The location of all viewpoints are presented in Appendix 15. Photomontages for Viewpoints 1 to 15 are included in Appendix 15 of this EIAR and should be read with the following text.

Viewpoint 1 – Sutton Cemetery

Viewer sensitivity: this view is from a local road that is predominantly used by the local community and walkers. The viewer sensitivity is high.

Existing visual resource: the existing view is available from a burial ground that is slightly elevated above the nearby coastline at Howth. Although trees partly screen views out to the coast in summer months there will be a more open view in winter months. The existing port facilities are located in the view direction to the southwest but will be a distant feature in views and read as part of the wider landscape.

Predicted view: the MP2 Project will be located within this view direction particularly in winter months but easily discernible due to the distance of the view and the presence of the existing port facilities within the existing visual resource. The tallest components of the MP2 Project namely ships and high mast lighting will be read distantly with similar existing features resulting in negligible change in visual resource. The majority of the MP2 Project will not be visible due to screening.

Magnitude of change: the magnitude of change in visual resource is negligible.

Significance of Visual Impact: the predicted significance of visual impact will be minor.

Viewpoint 2 – Sutton Strand

Viewer sensitivity: this view is from a local road that is predominantly and open space that is predominantly used by the local community and occasional tourists. The viewer sensitivity is high.

Existing visual resource: the existing view is available from the roadside looking across and area of open space at the coast. There is a lack of any screening and the view is open and panoramic. The existing port facility is a very distant feature and it is hard to make out much detail of its component parts. The Dublin Mountains form the backdrop to the view. The existing Poolbeg Power Station Twin Chimneys and Waste to Energy Plant are the most prominent structures in the view. Ships coming and going from the port will be noticeable visual features.

Predicted view: the MP2 Project will be directly located within this view direction but well screened by existing port buildings and structures. At this long distance it will not be possible to discern any aspect of the proposals during operation stage from the existing port operations. Berth 53 being the most easterly element of the MP2 Project will be located within the view direction particularly the jetty structure but all aspects will be extremely difficult to discern due to the distance of the view and existing context. Ships berthed at Berth 53 will be temporary features during the day read with ships coming and going from the port across day and night. Similarly, proposed high mast lights will be located within the view direction but difficult to discern from existing high mast lighting at the port.

Magnitude of change: the magnitude of change in visual resource is negligible.

Significance of Visual Impact: the predicted significance of visual impact will be minor.

Viewpoint 3 – Bull Island

Viewer sensitivity: this view is from a local road that is predominantly used by the local community and tourists. The viewer sensitivity is high.

Existing visual resource: the existing view is available from within the Bull Island site and across dune vegetation towards the existing port area. The Poolbeg Power Station Twin Chimneys are clearly visible and it is possible to discern taller aspects of the existing port operations. Lower level views to the port are well screened by topography in the foreground. The Dublin Mountains form the background to the view.

Predicted view: the MP2 Project will be located directly within the view from this location but all new features will be well screened and very difficult to discern from the existing port operations. The upper parts of high mast lights will be visible but read with existing tall cranes, gantries and lights located in the view with negligible change in visual resource. Ships berthed at Berth 53 will be partially visible but distant and read with ships coming and going from the port already.

Magnitude of change: the magnitude of change in visual resource is negligible.

Significance of Visual Impact: the predicted significance of visual impact will be minor.

Viewpoint 4 – St Anne's Park Clontarf

Viewer sensitivity: this view is from a local park that is predominantly used by the local community and occasional tourist. The viewer sensitivity is high.

Existing visual resource: the existing view is available from a slightly elevated location within the park that offers views across trees and buildings towards the coast. The majority of the existing port area is well screened but visibility will increase slightly in winter months slightly. Existing ships coming and going from the port will be visible to the left of the view in winter months.

Predicted view: the MP2 Project will be located in this view direction but completely screened by intervening trees and buildings in the foreground or read as part of the existing port facilities. Ships using the new berthing facilities will be a continuation of existing uses and read with existing ships coming and going from the port. There will be no significant change in visual resource as a result.

Magnitude of change: the magnitude of change in visual resource is no change.

Significance of Visual Impact: the predicted significance of visual impact will be none.

Viewpoint 5 – Clontarf Road

Viewer sensitivity: this view is from Clontarf Road, which is predominantly used by the local community and commuters. The viewer sensitivity is medium

Existing visual resource: the existing view from Clontarf extends across the inner Dublin Bay towards the existing port area. The Poolbeg Power Station Twin Chimneys are a notable landmark. Existing vegetation and buildings in the foreground prevent views to a large part of the port area. It is possible to discern a small number of individual cranes and structures at the port. Views to the Dublin Mountains are directly available broken by the port infrastructure and industry in the foreground.

Predicted view: the MP2 Project will be directly located within the view direction but will very difficult to discern amongst the existing port features. Upper portions of Berth 53 infrastructure will be partially visible along with high mast lights. The existing buildings in the foreground prevent views to the majority of the MP2 Project with no noticeable change in visual resource.

Magnitude of change: the magnitude of change in visual resource is negligible.

Significance of Visual Impact: the predicted significance of visual impact will be minor.

Viewpoint 6 – Bull Wall

Viewer sensitivity: this view is from Bull Wall that is predominantly used by the local community for walking. The viewer sensitivity is high

Existing visual resource: the existing view is available from Bull Wall that extends into Dublin Bay and due to the lack of any screening allows extensive and panoramic views across Dublin Bay towards the existing port area. It is possible to easily discern individual cranes and structures at the port against the skyline but they read as one massive harbour related industrial site. Partial views to the Dublin Mountains are available in the background.

Predicted view: the MP2 Project will be directly located within the view but will be extremely difficult to discern from the existing port features. All the operational stage features will be read as part of the existing port with little noticeable change in visual resource. Berth 53 and its associated jetty structure will extend to the centre left of the view but will be read against the background of the southern harbour shoreline. A photomontage has been prepared to illustrate the predicted visibility of ships berthed at Berth 53 – see Viewpoint 6a. As shown in Viewpoint 6a ships berthed at Berth 53 will be directly visible but transitory and read with ships coming and going from the port at this location. At other locations the orientation of berthed ships will change but this will be barely discernible from the existing situation. High mast lights and gantries will be read with existing cranes and lights.

Magnitude of change: the magnitude of change in visual resource is small.

Significance of Visual Impact: the predicted significance of visual impact will be minor to moderate.

Viewpoint 7 – Alfie Byrne Road

Viewer sensitivity: this view is from the roadside at Alfie Byrne Road, which is predominantly used by the local community and commuters. The viewer sensitivity is high.

Existing visual resource: the existing view is available from a roadside open space that offers views across tidal areas and trees and buildings towards the coast and Dun Laoghaire. The majority of the existing port area is well screened but visibility will increase slightly in winter months. Existing ships coming and going from the port will be visible to the left of the view but very distant.

Predicted view: the MP2 Project will be located in this view direction but completely screened by intervening trees and buildings in the foreground or read as part of the existing port facilities. Ships using the new berthing facilities will not be visible and when in transit will be read with existing ships coming and going from the port. There will be no significant change in visual resource as a result.

Magnitude of change: the magnitude of change in visual resource is no change.

Significance of Visual Impact: the predicted significance of visual impact will be none.

Viewpoint 8 – Fairview Park

Viewer sensitivity: this view is from Fairview Park that is predominantly used by the local community. The viewer sensitivity is high

Existing visual resource: the existing view from Fairview Park is available across open parkland towards the coast and Dublin Bay in winter months. A lack of shoreline vegetation permits medium to long distance views towards the sea in winter months. Existing tall stacks at the port area are local landmarks in the winter. Buildings in the foreground restrict views to most of the port area with only taller components such as cranes and mast lighting visible.

Predicted view: the MP2 Project will be directly located within the view but will not be discernible from the existing port features. All the operational stage features will either well screened or will be read as part of the existing port with no noticeable change in visual resource.

Magnitude of change: the magnitude of change in visual resource is no change.

Significance of Visual Impact: the predicted significance of visual impact will be none.

Viewpoint 9 – Toll Bridge North

Viewer sensitivity: this view is from the East Link Toll Bridge at the North Wall Quay that is predominantly used by the local community, local workers and occasional tourist. The viewer sensitivity is medium.

Existing visual resource: the existing view is available the North Wall Quay and is completely urban in character. The view is enclosed by port and road infrastructure that prevents any medium or longer distance views out. It is possible to observe existing ships at berth as well as taller cranes and gantries in the port. Busy traffic using the East Link Bridge is a predominant feature in the foreground.

Predicted view: the MP2 Project will be directly located within this view direction but frequently fully screened by ships at berth in the foreground. All parts of the MP2 Project when visible will be read in the context of the existing facilities and difficult to discern from these existing features. The majority of ground level aspects at the Unified Ferry Terminal facilities element of the MP2 Project are well screened in the view. The reorientation of berthed ships will be noticeable in this view.

Magnitude of change: the magnitude of change in visual resource is small.

Significance of Visual Impact: the predicted significance of visual impact will be minor.

Viewpoint 10 – East Link Toll

Viewer sensitivity: this view is from the East Link Toll area that is predominantly used by commuters. The viewer sensitivity is low.

Existing visual resource: the existing view is available from the roadside and directly towards the existing port. Ships coming and going from the port will be a continual and moving feature of this view. The view is predominantly enclosed by the port with several tall buildings, stacks, cranes, high mast lighting and gantries breaking the skyline. Small leisure craft are moored in the foreground and at Poolbeg Marina. The existing small lighthouse is located within the view but is difficult to read from the background clutter.

Predicted view: the MP2 Project will be directly located within this view. The proposals will be not be readily discernible in this view due to distance and prominence of existing port infrastructure in the view. The re-orientated berths will be located in this view direction with ships visual location altered but will be barely noticeable from the existing view. Berth 53 will extend the quayside infrastructure in the view but will not be prominent. The Unified Ferry Terminal facilities will be well screened. Ships coming and going will remain a feature of this view.

Magnitude of change: the magnitude of change in visual resource is small.

Significance of Visual Impact: the predicted significance of visual impact will be negligible to minor negative.

Viewpoint 11 – Sandymount Strand

Viewer sensitivity: this view is from a local park that is predominantly used by the local community and occasional tourist. The viewer sensitivity is high.

Existing visual resource: the existing view is available from a path within the park that offers views across the shoreline towards the coast and beyond. The existing stacks at Poolbeg are a notable landmark in the view. The majority of the lower level existing port facilities are well screened but visibility of the taller elements such as cranes, high mast lights and gantries is possible to the rear of existing buildings.

Predicted view: the MP2 Project will be located in this view direction but completely screened by intervening buildings in the foreground and at the existing port. Although high mast lighting will be partly visible in the view it will be barely noticeable and read with existing lights. There will be no change in visual resource as a result.

Magnitude of change: the magnitude of change in visual resource is no change.

Significance of Visual Impact: the predicted significance of visual impact will be none.

Viewpoint 12 – Clontarf Road Promenade

Viewer sensitivity: this view is from a coast road and footpath that is predominantly used by the local community and occasional tourist. The viewer sensitivity is high.

Existing visual resource: the existing view is available from a low lying coastal footpath beside Clontarf Road that offers panoramic views across the shoreline towards the coast and beyond. The existing stacks at Poolbeg are a notable landmark in the view. The majority of the existing port facilities located within the view particularly the taller elements such as cranes, high mast lights and gantries that occasional break the skyline. The lower portions of the taller structures and remaining port facilities are read against the background of the Dublin Mountains.

Predicted view: the MP2 Project will be located in this view direction but will be well screened by intervening buildings in the foreground and at the existing port or extremely difficult to discern from existing port infrastructure. The most noticeable component of the MP2 Project will be Berth 53 that will extend into the centre left of the view. Berth 53 and its associated jetty will be read against the Great South Wall and the backdrop on the existing Poolbeg Power Station. The upper portions of ships berthed at Berth 53 will be partly visible but read with ships and coming and going daily at the entrance to the port.

Magnitude of change: the magnitude of change in visual resource is small.

Significance of Visual Impact: the predicted significance of visual impact will be minor to moderate.

Viewpoint 13 – Idrone Terrace Blackrock

Viewer sensitivity: this view is from a coast road and footpath at Blackrock that is predominantly used by the local community and occasional tourist. The viewer sensitivity is high.

Existing visual resource: the existing view is available from an elevated footpath that offers panoramic views across the shoreline towards the coast and beyond. The existing stacks at Poolbeg are a notable landmark in the view. The majority of the lower level existing port facilities are well screened but visibility of the taller elements such as cranes, high mast lights and gantries is just possible to the rear of existing buildings albeit at a long distance.

Predicted view: the MP2 Project will be located in this view direction but will be well screened by intervening buildings and the Great South Wall in the foreground on the south side of the existing port. There will be no change in visual resource as a result.

Magnitude of change: the magnitude of change in visual resource is no change.

Significance of Visual Impact: the predicted significance of visual impact will be none.

iewpoint 14 – Killiney Hill

Viewer sensitivity: this view is available from Killiney Hill and is predominantly available to the local community, tourists and recreational users. The viewer sensitivity is high.

Existing visual resource: this view is very elevated and panoramic permitting views as far as Howth across Dublin Bay. The distant view is of a built up seaside town of Dun Laoghaire. The urban setting of Dun Laoghaire can be seen sprawling from the right of the view towards the left. It has the usual character of a seaside town with church spires notable. The tall stacks at Poolbeg are noticeable and it is just possible to discern some tall structures at the port area.

Predicted view: the MP2 Project at the port will not be visible due to the distance of the view. Ships coming and going to the MP2 Project area will be read with existing shipping activities with no discernible change in the view.

Magnitude of change: the magnitude of change in visual will be no change.

Significance of Visual Impact: the predicted significance of visual impact will be none.

Viewpoint 15 – Great South Wall

Viewer sensitivity: this view is from Great South Wall Quay that is predominantly used by the local community, local workers and visitors/tourists. The viewer sensitivity is high.

Existing visual resource: the existing view is available the pathway on the Great South Wall and is coastal and harbour related in appearance. There are distance views out towards Bull Island and Howth to the right of the view. It is possible to observe long lengths of the existing quayside on the northern side of the Liffey with existing ships at berth as well as taller cranes and gantries in the port visible. The existing Poolbeg Power Station with its twin chimneys dominates the local landscape.

Predicted view: the MP2 Project will be directly located within this view and will be noticeable. All elements of the MP2 Project will be read in the context of the existing port facilities that are prominent in the existing view. The Berths on the northern side of the Liffey will be directly visible with Berth 53 and the new jetty extending the quayside infrastructure to the right in the view. Berth 53 and associated jetty will be read against the landform in the background at Clontarf and below the built skyline. The Unified Ferry Terminal will be located in this view direction but very difficult to discern from existing port infrastructure and fully screened when ships are berthed in the foreground. A photomontage has been prepared to illustrate the predicted visibility of ships berthed at Berth 53 – see Viewpoint 15a. Ships berthed will be directly visible but transitory in nature and read with other vessels coming and going from the busy port.

Magnitude of change: the magnitude of change in visual resource is small.

Significance of Visual Impact: the predicted significance of visual impact will be minor to moderate.

15.4.3 Lighting Impacts

The operation of the MP2 Project will require the use of outdoor night time lighting. Permanent lighting will be used in port operations during night time hours and for security at the MP2 Project facilities. The street lighting within the MP2 Project has been designed in accordance with CIE 140 and EN 13201-2015. As described in EIAR Chapter 3 it is proposed to utilise the existing and consented lighting where possible with additional High

Mast Lighting (HML) and Street Lighting where required to provide required luminance and uniformity. The locations of HML poles and proposed street lighting for the MP2 Project is indicated within the project drawings.

The use of downward directional lighting will reduce the sky glow effect. However, the addition of lighting to existing night views of the port area will nevertheless result in an increase in sky glow on the night time views from areas around the port although this will be barely perceptible in the context of the level of sky glow in the eastern side of Dublin City. New lights along with illuminated ships will also have the effect of drawing attention to the new MP2 Project facilities at night. Such lights will be read against the background of significant existing lights in the Dublin Port area and the impact is predicted to be negligible adverse for night time views where such views are available.

15.4.4 Construction Phase Impacts

During the construction phase potential impacts on landscape and visual aspects include:

i. Site preparation/enabling works and operations;
ii. Site infrastructure and access;
iii. Vehicular and plant movements; and
iv. Dust emissions

A detailed description of the construction stage programme and phasing of works is provided in Chapter 3 of the EIAR. Landscape and visual impacts during the construction phase will be of short term in nature. A worst case scenario has been assumed for the assessment of construction phase impacts that consists of all works at constructed at once.

When considering the potential visibility of construction period works and as set out in section 15.2.7 due to limitations to ZTV maps they tend to overestimate the extent of influence on the landscape and visibility of a MP2 Project. This should be considered only as a tool to assist in assessing the theoretical visibility of a development and not a measure of the visual impact. Works will be visible from within the ZTV during construction period to a varied extent that will be related to the construction activity at any given time but very limited in extent due to the built up character of this part of Dublin City. Trucks and construction vehicles coming and going via the port access roads will be similar in nature to existing port traffic with low levels of visual resource change.

Ground level construction activities at the site of the MP2 Project will be well screened from views from surrounding areas throughout the construction phase due to adjacent port facilities and built form in the harbour related industrial landscape. Busy port-related activities will continue during the construction phase further detracting from the construction phase activities.

Ground level construction activities for the development for Berth 53 and associated jetty will be more noticeable in views from the Great South Wall but not extensively so and will be limited to a local level by the nature and character of the harbour related landscape on the south and north side of the River Liffey that has a generally low-lying topography in a busy port context that will decrease the prominence of any site works.

An assessment of the significance of the impact of the MP2 Project works during construction on the landscape character area described above has been completed and summarised below. The works are located directly within the Harbour Based Industrial Landscape Character Area.

The landscape character area at the site of the construction stage works of the MP2 Project is concentrated located on low-lying parts of the landscape at the mouth of the River Liffey and Dublin Bay. This is a generally robust frequently changing landscape. The current port activities are a prominent part of this landscape. The existing site has the appearance of constant movement provided by ships, cranes, containers, HGV's etc over a 24 hour period.

The Harbour Based Industrial Landscape Character Area has a low sensitivity to change. When potential landscape impacts are assessed during the construction stage there will be negligible negative impact due to the low landscape resource change that will result.

In visual terms an assessment was completed within the ZTV to determine the magnitude of visual impact of the MP2 Project on potential views from sensitive visual receptors including residential properties during the construction stage.

There will be limited potential for visibility of the MP2 Project from residential properties during the construction stage. The nearest properties are located at Ringsend to the southwest of the construction works. Longer distance views towards the construction works will be available from the north at Clontarf as far as Howth and in such views the existing harbour and its activities are noticeable. The introduction of the construction stage activities will have limited change in visibility from these residential areas and be read as part of the on-going existing port activities. Construction traffic will travel through the area but will be a component of the existing heavy traffic in this area with which it will blend with negligible visual impact. No significant visual impacts are predicted for construction traffic as such traffic is a key feature of this road network already. Overall no significant visual impacts are predicted for residential properties during the construction stage.

In conclusion, due to distance and the broad scale of the landscape within which the works are located, the change in landscape and visual resource will be negligible and, therefore, the significance of landscape and visual impacts during the construction stage will be minor. There are limited residential dwellings in close proximity to the construction works and no significant visual impacts are predicted at the construction stage as a result.

15.4.5 Cumulative Impacts

The full list of projects set out in Table 18.2 of EIAR Chapter 18, with which the MP2 Project may possibly have cumulative effects have been considered to identify the likely cumulative landscape and visual effects, if any.

When the in-port projects listed in Table 18.2 of EIAR Chapter 18 are considered cumulatively with the MP2 Project. The extensive harbour area that is continually in a state of flux will offset potential cumulative landscape and visual impacts. The in-port projects are located within a robust maritime industrial landscape and are read in this context along with the MP2 Project. There is limited opportunity to noticeably view the MP2 Project in-combination with other in-port projects with the exception of the Alexander Basin Redevelopment (ABR) Project in views from the East Link Toll area; Berth 49 Ramp and the Greenway.

The ABR Project is located closer to the city centre than the MP2 Project and will be more noticeable in local views from the East Link Toll area. The MP2 Project is hard to discern from existing port facilities at the area around the East Link Toll and no significant cumulative landscape or visual effects are predicted as a result.

The Berth 49 Ramp project is located in close proximity to the MP2 Project and cumulative photomontages have been included in this Chapter (Appendix 15) to assist in the assessment of cumulative effects. The Berth 49 ramp when not in use is kept in an upright position that results in potential visibility above lower level port infrastructure (see Cumulative Viewpoints 2C; 6C; 10C; 12C; and 15C – Appendix 15). In all of the cumulative viewpoints it is difficult to read the Berth 49 ramp in-combination with the MP2 Project facilities due to the character of the maritime industrial activities in which they are both read even in closer proximity as illustrated in Cumulative Viewpoint 15C. When potential cumulative landscape and visual impacts are considered for Berth 49 Ramp and the MP2 Project no significant effects are predicted.

The MP2 Project will be read with and overlaps with the Dublin Port Internal Road Network – Ref. Ref. 3084/16 & 2684/17 that includes the proposed Greenway. The Greenway extends along the shoreline on the eastern edge of the northern port area and terminates adjacent to Berth 53. The MP2 Project includes a heritage installation at the terminus of the Greenway as described in the MOLA Architecture Industrial Heritage Impacts & Compensation Planning & Design Report (under separate cover). The heritage installation fully compliments and enhances the Greenway with a beneficial impact locally at the site of the terminus. In wider views however the heritage installation and the Greenway are difficult to view due to their location on the eastern most edge of Dublin Port and the limited scale of the heritage installation in the context of the larger scale port facilities that lie adjacent. When potential cumulative landscape and visual impacts are considered, for the Greenway and the MP2 Project, no significant effects are predicted.

A range of projects have been identified in Chapter 18 Table 18.2 that are located in the area surrounding the port area and these have been considered for potential landscape and visual cumulative impacts. The nearest such project is the Poolbeg West SDZ. BP Ref. PL29N.ZD2013. The Poolbeg West Planning Scheme lands are located south of the Liffey, approximately half of which are owned by Dublin Port Company. Planning permission for this development was approved by An Bord Pleanála in April 2019. In addition to 3,500 residential units, its uses will include leisure, community, educational and commercial facilities. The SDZ scheme is well separated from the MP2 Project with significant harbour related and industrial development lands sited on port lands on the south side of the Liffey. This separation distance in combination with existing large scale development will prevent cumulative landscape and visual impacts and no significant cumulative effects are predicted.

For all remaining projects in the area surrounding the port area, due to the separation distance between the MP2 Project and the identified projects outside the port area, in combination with the low-lying nature of the topography in the landscape surrounding the Liffey and also in conjunction with extensive urban built form, it is extremely difficult to read the MP2 Project with any adjacent projects. When potential cumulative landscape and visual impacts are considered for the listed projects outside the port area with the MP2 Project, no significant effects are predicted.

Overall when potential construction and operational stage cumulative landscape and visual effects are considered for the MP2 Project in combination with permitted and planned projects they will not result in any significant cumulative landscape and visual effects due to a combination of separation distance, intervening development and the nature of the proposals. Construction stage activities involve an increase in construction traffic for all cumulative projects. HGV traffic is frequent feature of this marine industrial landscape and the existing Dublin road network consists of very busy roads with low potential for significant cumulative visual impacts as a result. The operational stage activities as part of the MP2 Project are sufficiently separated from any permitted or planned projects in the area surrounding the port to avoid potential cumulative effects while permitted or planned developments within the port area or so similar in character that they are difficult to discern from the existing busy port context.

15.5 Significance of Landscape & Visual Effects

The potential effects on landscape character have been assessed in Section 15.4.1.1 above and the significance of effects can be summarised as follows:

Table 15-6 Significance of Landscape Character Effects

Landscape Character Area	***Predicted Significance of Effect (Without Mitigation)***
Harbour Based Industrial landscape	Negligible to Minor and not significant

The potential landscape and visual effects on planning policy designations landscape character have been assessed in Section 15.4.1.2 above and the significance of effects can be summarised as follows:

Table 15-7 Significance of Landscape & Visual Effects on Planning Policy Designations

Planning Policy or Designation	Predicted Significance of Effect (Without Mitigation)
Dublin City Development Plan 2016 - 2022	
Views and Prospects	None
Architectural Conservation Area	None

The potential visual impact on residential properties has been assessed in Section 15.4.1.3 above and the significance of effects can be summarised as follows:

Table 15-8 Significance of Visual Effects on Residential Properties

Property Locations	Predicted Significance of Effect (Without Mitigation)
Properties at Ringsend with a view	Minor and not significant
Properties at Clontarf with a view	Minor and not significant
Properties at Dollymount with a view	Minor and not significant
Properties at Sutton with a view	Minor and not significant
Properties at Howth with a view	Minor and not significant

The potential visual impact from a series of viewpoints from within the ZTV has been assessed in Section 15.4.1.4 above and the significance of effects can be summarised as follows:

Table 15-9 Summary of Viewpoint Assessment

Viewpoint No.	*Viewpoint Name*	*Predicted Significance of Effect (Without Mitigation)*
1	Sutton Cemetery	Minor and not significant
2	Sutton Strand	Minor and not significant
3	Bull Island	Minor and not significant
4	St Anne's Park Clontarf	None
5	Clontarf Road	Minor and not significant
6	Bull Wall	Minor to moderate and not significant
7	Alfie Byrne Road	None
8	Fairview Park	None
9	Toll Bridge North	Minor and not significant
10	East Link Toll	Negligible to minor and not significant
11	Sandymount Strand	None
12	Clontarf Road Promenade	Minor to moderate and not significant
13	Idrone Terrace Blackrock	None
14	Killiney Hill	None
15	Great South Wall	Minor to moderate and not significant

15.6 Remedial & Mitigation Measures

Landscape mitigation measures are those taken to help remedy, reduce or compensate for significant landscape and visual impacts created by the development. As set out in the text above there have been no significant landscape or visual impacts predicted for the MP2 Project. There is therefore no requirement for specific landscape mitigation measures to address significant impacts.

The design evolution of the MP2 Project has undertaken to enable incorporation of the following built-in design measures:

- Integration of constructed elements with existing elements such as existing roads and buildings
- Appropriate colour of fencing and structures to reflect existing the port character
- Directional lighting

The existing port facilities and the openness of the harbour, and the size and the nature of the development in many ways mitigate the potential landscape and visual impact of the MP2 Project offsetting potential views and in view from across Dublin Bay towards the proposals that will appear to blend with existing port facilities.

No monitoring of mitigation measures is therefore proposed.

15.7 Residual Effects

This section of the chapter assesses the impact of the MP2 Project on the landscape character and visual receptors (previously identified in section 15.5 above), after the mitigation (described above in section 15.6) has been implemented. No significant landscape or visual impacts have been predicted for either the construction or operation stage of the MP2 Project.

Within the wider landscape the proposal will continue to blend with the existing port facilities around the site with no significant residual landscape character impacts predicted. With regards to visual impact on sensitive receptors impact on existing views will be offset by the existing visual context of the harbour landscape and also blend with the busy port activity that will continue at the port following completion of the works.

The residual landscape impact on landscape character and the significance of effects can be summarised as follows:

Table 15-10 Significance of Residual Landscape Character Effects

Landscape Character Area	*Predicted Significance of Effect (Without Mitigation)*	Predicted Significance of Effect (With Mitigation)
Harbour Based Industrial landscape	Negligible to Minor and not significant	Negligible to minor and not significant

The residual landscape & visual effects on Planning Policy Designations and the significance of effects can be summarised as follows:

Table 15-11 Significance of Residual Landscape & Visual Effects on Planning Policy Designations

Planning Policy or Designation	Predicted Significance of Effect (Without Mitigation)	*Predicted Significance of Effect (With Mitigation)*
Dublin City Development Plan 2016 - 2022		
Views and Prospects	None	None
Architectural Conservation Area	None	None

The residual visual impact on residential properties and the significance of effects can be summarised as follows:

Table 15-12 Significance of Residual Visual Effects on Residential Properties

Property Locations	*Predicted Significance of Effect (Without Mitigation)*	Predicted Significance of Effect (With Mitigation)
Properties at Ringsend with a view	Minor and not significant	Minor and not significant
Properties at Clontarf with a view	Minor and not significant	Minor and not significant
Properties at Dollymount with a view	Minor and not significant	Minor and not significant
Properties at Sutton with a view	Minor and not significant	Minor and not significant
Properties at Howth with a view	Minor and not significant	Minor and not significant

The residual visual impact from at a series of viewpoints from within the ZTV and the significance of effects can be summarised as follows:

Table 15-13 Summary of Residual Viewpoint Effects

Viewpoint No.	*Viewpoint Name*	*Predicted Significance of Effect (Without Mitigation)*	Predicted Significance of Effect (With Mitigation)
1	Sutton Cemetery	Minor and not significant	Minor and not significant
2	Sutton Strand	Minor and not significant	Minor and not significant
3	Bull Island	Minor and not significant	Minor and not significant
4	St Anne's Park Clontarf	None	None
5	Clontarf Road	Minor and not significant	Minor and not significant
6	Bull Wall	Minor to moderate and not significant	Minor to moderate and not significant
7	Alfie Byrne Road	None	None
8	Fairview Park	None	None
9	Toll Bridge North	Minor and not significant	Minor and not significant
10	East Link Toll	Negligible to minor and not significant	Negligible to minor and not significant
11	Sandymount Strand	None	None
12	Clontarf Road Promenade	Minor to moderate and not significant	Minor to moderate and not significant
13	Idrone Terrace Blackrock	None	None
14	Killiney Hill	None	None
15	Great South Wall	Minor to moderate and not significant	Minor to moderate and not significant

15.8 Conclusion

A Landscape and Visual Impact Assessment (LVIA) of the MP2 Project at Dublin Port during both the construction and operational stages has been completed.

The MP2 Project is located within a landscape character area identified as Harbour Based Industrial Landscape. This landscape character area has been identified as having a low sensitivity to change. The magnitude of landscape resource change will be negligible and the significance of landscape impact will be negligible to minor negative and not significant.

The Zone of Theoretical Visibility (ZTV) has been established for the MP2 Project to allow any potential areas of significant visual impact to be identified. Actual visual impacts from within the ZTV have been predicted by site survey and assessment during the construction and operational phase on potential views from sensitive visual receptors including residential properties.

There are large areas of Dublin and the adjacent settled coastline that will not have views of the proposal due to intervening vegetation and buildings and it is only in close proximity to the site that there will be potential direct views at Ringsend to the southwest and the Clontarf to Howth coast road to the north. The existing port facilities including ships and cranes and traffic are all features of the existing views and there will be few new features visible from the wider ZTV.

For residential properties with potential views in the direction of the MP2 Project the predicted significance of visual impact will be minor negative and not significant.

A total of 15 viewpoints have been assessed and no viewpoints have been predicted to have significant visual impacts.

No significant cumulative landscape and visual effects have been predicted.

Overall the MP2 Project will be difficult to discern from the existing activities and features at Dublin Port.

As no significant landscape or visual impacts have been predicted there is no requirement for specific landscape mitigation measures.

In conclusion the broader landscape character area and visual context around Dublin Port area has the capacity to absorb a development of this scale.

16 POPULATION & HUMAN HEALTH

16.1 Introduction

This Environmental Impact Assessment Report (EIAR) chapter applies a broad socio-economic model of health that encompasses conventional health impacts such as disease, accidents and risk, along with wider socio-economic health determinants vital to achieving good health and wellbeing. As such, the chapter combines a public health assessment (which focuses on environmental determinants of health), and a socio-economic assessment; providing additional commentary on how changes to some socio-economic factors have the potential to influence health and wellbeing.

This chapter draws from and builds upon detailed project information and the wider technical disciplines within the EIAR (most notably, Chapter 10: Air Quality and Climate; Chapter 11: Noise and Vibration; and Chapter 13: Traffic and Transportation) to communicate the potential influence upon population and health. For the sake of brevity, this chapter does not seek to repeat text or replicate data from the wider EIAR chapters.

This chapter is supported by Appendix 16: Population and Health Baseline. In addition, a human health risk assessment was undertaken regarding the risk posed by potential ground contamination to future site users; the results of this are presented in Chapter 8: Soils, Geology and Hydrogeology, and complement the findings of this chapter.

16.2 Assessment Methodology

16.2.1 Relevant Policy and Guidance

The Environmental Protection Agency's Draft Guidelines on the Information to be contained in EIAR (EPA Ireland, 2017), highlights the amendments to Article 3(1) of amended European Union (EU) Environmental Impact Assessment (EIA) Directive which states that:

> *"The environmental impact assessment shall identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of a project on the following factors: a) population and human health; […]"*

Moreover, Annex IV, paragraph 5(d) requires an EIAR to contain:

> *"A description of the likely significant effects of the project on the environment resulting from, inter alia, 'the risks to human health'".*

When outlining the scope of environmental factors covered by the EIA Directive within the European Commission's guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017), "population and human health" is defined as follows:

> *"Human health is a very broad factor that would be highly Project dependent. The notion of human health should be considered in the context of the other factors in Article 3(1) of the EIA Directive*

> *and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population."*

Additionally, when describing the likely significant effects of a project, the European Commission's guidance poses the following questions to consider:

> *"Have the primary and secondary effects on human health and welfare described and, where appropriate, been quantified? (e.g. health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups)."*

It is important to ensure that methods employed in a particular population and health assessment are proportionate and tailored to meet the assessment requirements of the project in question, which can differ considerably depending on the scale and nature of a proposal and are further influenced by local context and varying community circumstance and sensitivity.

There is a large body of guidance on Health Impact Assessment (HIA) generally and in the context of development planning (WMPHO, 2007; Chadderton, et al., 2012; The NHS Centre for Equality and Human Rights, n.d.; Ross & Chang, 2012), drawing from expert evidence and government policy regarding the importance of integrating public health into the planning system (Marmot, et al., 2010; Department of Health, 2010; DCLG, 2018). Such guidance has been applied to inform the development of a bespoke population and health EIAR chapter, where the scope, focus and assessment protocols are tailored to what is proposed; to local circumstance and the specific decision-making process in which it is intended to inform.

The assessment methodology follows a source-pathway-receptor model to identify and assess population and health effects that are plausible and directly attributable to the MP2 Project. As shown in Table 16-1, a hazard source itself does not constitute a health risk. It is only when there is a hazard source, a receptor and a pathway of exposure that there is any potential risk to human health. The same is true for potential health benefits where a positive influence must be present alongside a pathway of exposure and a receptor for there to be a potential health improvement.

Where a source-pathway-receptor linkage exists, it is then the nature of the specific hazard source or positive influence; the magnitude of impact via the pathway of exposure; and the sensitivity of the receptor that will determine what level of health risk or benefit is predicted, if any.

Table 16-1 Example of Source-Pathway-Receptor Model for Population and Health Effects

Source	Pathway	Receptor	Plausible Health Impact	Explanation
X	✓	✓	No	There is not a clear source from where a potential health impact could originate.
✓	X	✓	No	The source of a potential health impact lacks a means of transmission to a population.
✓	✓	X	No	Receptors that would be sensitive or vulnerable to the health outcome are not present.
✓	✓	✓	Yes	Identifying a source, pathway and receptor does not mean a health outcome is a likely significant effect; health impacts should be assessed (describing what effect will occur and its likelihood) and likely health effects are then evaluated for significance.

When defining potential population and health determinants associated with a proposed development, it is also useful to consider three broad domains of public health practice: health protection (i.e. environmental objective thresholds set to be protective of health); health promotion (i.e. ways in which to support healthy lifestyles, improve socio-economic status and address inequality); and health care (i.e. provision, effectiveness and equity of access to healthcare services).

In this instance, the assessment provides qualitative and quantitative analysis of potential population and health effects, and has been prepared using specialist knowledge and professional experience gained through carrying out studies for other projects.

16.2.2 Approach

The overarching approach has been to draw from and build upon the wider technical outputs of the EIAR to facilitate more health conscious planning, and test the final application for its potential impact (both adverse and beneficial) on population and health. As detailed below, the methodology is bespoke to the project, the community and the decision making process to which it is intended to inform, comprising the following key stages: scoping exercise; baseline; consultation; and assessment.

Scoping Exercise

Scoping is the process by which the focus of the assessment is set, defining the health determinants to be assessed (i.e. aspects with the potential to influence health, both adversely and beneficially); and just as importantly, identifying aspects that are considered to be outside of the scope. This is necessary to ensure the assessment is fit for purpose, meets stakeholder and consultee expectations, and identifies potential opportunities to support local and strategic health objectives but does not cover matters that it cannot influence or does not affect.

In this instance, scoping relating to the population and health chapter has been undertaken iteratively. This included multiple reviews of the project description, technical chapters and any pertinent formal consultee responses. This approach ensures that we have included all relevant health determinants to be taken forward for assessment, and addressed any stakeholder expectations. The results of the scoping exercise are provided in Table 16-2 and present the relevant health determinants that have been assessed within this chapter.

Table 16-2 Scoping Exercise Results

Phase	Population and Health Determinant	Potential Impact	Distribution	Duration
Construction	Changes to air quality (PM_{10}, NO_2, nuisance dust and nuisance odour)	Adverse	Local	Temporary
	Changes in noise exposure (including annoyance)	Adverse	Local	Temporary
	Changes in transport nature and flow rate on community severance and the risk of accident and injury	Adverse	Local, regional	Temporary
	Changes in direct, indirect and induced employment opportunities and associated income generation	Beneficial	Local, regional	Temporary
	Contribution to Gross Value Added (GVA)	Beneficial	National, regional	Permanent
Operation	Changes to air quality (PM_{10} and NO_2)	Adverse	Local	Permanent
	Changes in noise exposure (including annoyance and sleep disturbance)	Adverse	Local	Permanent
	Changes in transport nature and flow rate on community severance and the risk of accident and injury	Adverse	Local, regional	Permanent
	Increase in uptake of physical activity and recreation opportunities	Beneficial	Local	Permanent
	Changes in direct, indirect and induced employment opportunities and associated income generation	Beneficial	Local, regional	Permanent
	Contribution to GVA, tax and tourism	Beneficial	National, regional	Permanent

Definitions
Local – *ED's surrounding the MP2 Project (comprising North Dock B, Pembroke East A, Clontarf East B, Clontarf East C and Clontarf East D)*
Regional – Dublin-wide
Temporary – *inconsistent activity lasting only a limited period of time*
Permanent – *consistent activity which goes on for a long-term period*

Baseline

Different communities have varying susceptibility to population and health effects (both adverse and beneficial) as a result of social and demographic structure, behaviour and relative economic circumstance. The approach to defining the baseline involves the collation and interpretation of published demographic, socio-economic and existing health and health care data. From this, potential changes due to the MP2 Project can be investigated and their significance of effect assessed. Understanding the existing baseline socio-economic and health status within the study area also supports bespoke mitigation and community support initiatives tailored to local circumstance and need, where appropriate.

Consultation

The consultation process relating to the MP2 Project is summarised in Chapter 5: Project Scoping & Consultation. Any relevant consultee responses have been used to inform the scope and focus of the population and health assessment. This chapter further summarises the information presented in Chapter 5, listing relevant responses and explaining how this has been addressed (see Section **Error! Reference source not found.**: Consultation below).

Appraisal

The appraisal maps the information and health determinants against the baseline and receptor sensitivity to assess the magnitude of impact and significance of potential population and health effects (both adverse and beneficial), that would be directly attributed to the MP2 Project during construction and operation phases, and further considers any cumulative impact.

16.2.3 Study Area

Environmental health determinants (such as changes to air quality and noise exposure) are likely to have a local impact where potential change in hazard exposure is limited by physical dispersion characteristics. As a result, and where available, the study area for health-specific baseline statistics relating to population and health effects focus on the electoral divisions (EDs) immediately adjacent to the MP2 Project and the EDs where the MP2 Project is visible (i.e. North Dock B, Pembroke East A, Clontarf East B, Clontarf East C and Clontarf East D, as shown in Figure 16.1), using the Dublin City and Ireland averages as comparators. Where data for EDs are not available, statistics relating to Dublin City are collected using the Ireland average as a comparator.

Socio-economic health determinants (such as employment and related income generation) have a wider geographic scope of influence than environmental health determinants. The willingness to commute significant distances to work indicates that the study area for socio-economic baseline statistics relating to population and health effects should have a wider focus (i.e. Dublin City), using the Ireland average as a comparator.

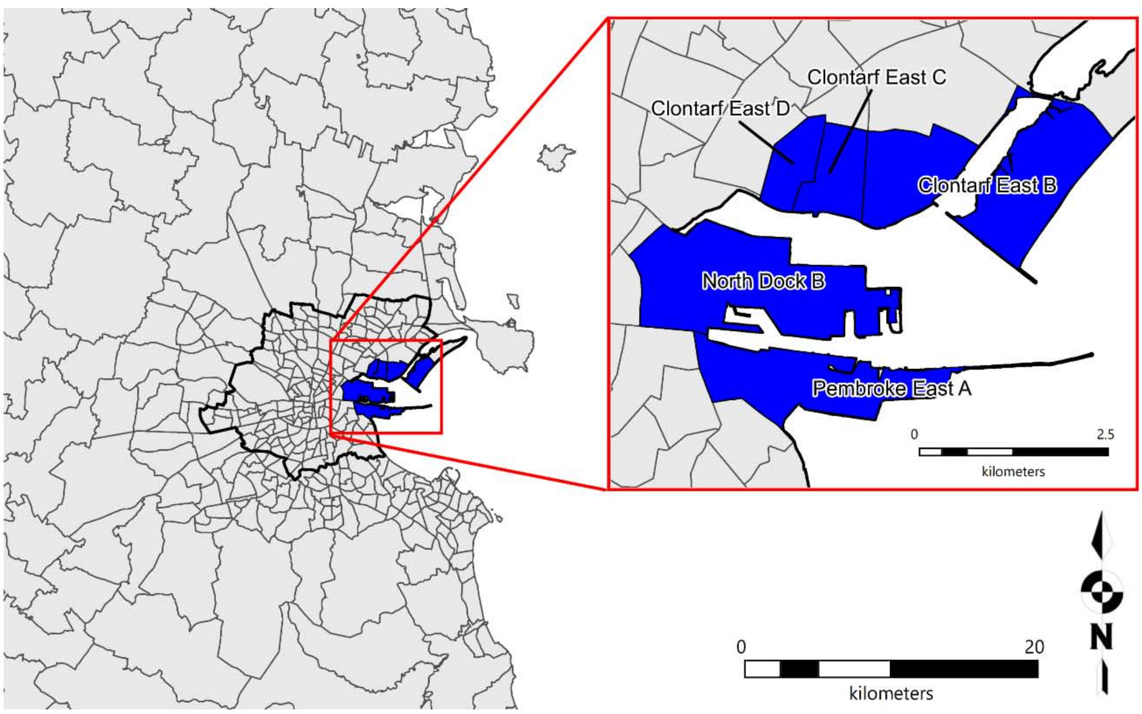


Figure 16-1 Environmental Health Determinant Study Area

16.2.4 Assessment Criteria and Assignment of Significance

The assessment of significance of effect is a professional judgement based on the sensitivity of the receptor (see Section 16.2.4.1) and the magnitude of any change (see Table 16-3).

16.2.4.1 Receptor Sensitivity

Within a defined population, individuals will range in level of sensitivity; as such, it is not possible to allocate a fair or accurate sensitivity classification to a population. On this basis, a precautionary approach has been applied by assuming that the population within the study area are of uniformly high sensitivity.

16.2.4.2 Magnitude of Impact

The terms in Table 16-3 have been used to describe the magnitude of predicted impacts.

Table 16-3 Definitions of Magnitude

Magnitude	Typical Descriptors
High	Change in environmental or socio-economic factor sufficient to result in a major change in baseline population health or socio-economic circumstance (adverse or beneficial)
Medium	Change in environmental and socio-economic factor sufficient to result in a moderate change in baseline population health or socio-economic circumstance (adverse or beneficial)
Low	Change in environmental and socio-economic factor sufficient to result in a minor change in baseline population health or socio-economic circumstance (adverse or beneficial)
Negligible	Change in environmental and socio-economic factor below that for which it is possible to result in any manifest health outcome at a population level but may impact at an individual level (adverse or beneficial)
No Change	No opportunity for change in health outcome or socio-economic circumstance (adverse or beneficial)

16.2.4.3 Significance of Effects

A combination of receptor sensitivity and the magnitude of impact (as defined in the assessment) have been applied to form a professional judgement as to the significance of effect, using the matrix shown in Table 16-4.

Table 16-4 Significance of Effects

Source	Magnitude of Impact			
	Negligible	**Low**	**Medium**	**High**
Negligible	Negligible	Negligible or minor	Negligible or minor	Minor
Low	Negligible or minor	Negligible or minor	Minor	Minor or moderate
Medium	Negligible or minor	Minor	Moderate	Moderate or major
High	Minor	Minor or moderate	Moderate or major	Major

16.2.5 Limitations of the Assessment

The population and health assessment partially draws from and builds upon the technical outputs from the air quality, noise and transport assessment chapters, and as a consequence are bound by the same limitations and assumptions therein applied.

16.3 Receiving Environment

16.3.1 Existing Baseline Conditions

The following open source websites and datasets have been used in order to develop the population and health baseline: SAPMAP (CSO, 2011; CSO, 2016); Statbank (CSO, n.d.); EBS DKM (DKM Economic Consultants, 2017); Eurostat (European Commission, n.d.); Institute of Public Health (IPH, n.d.); and Pobal (Pobal, 2016).

The remainder of this section summarises the findings of the full population and health baseline data collection and analysis, provided in Appendix 16.

Demographic and Socio-economic

The MP2 Project is situated within the Northern Lands of Dublin Port, Dublin City, on Ireland's Eastern Coastline. The closest communities are located directly adjacent to the Dublin Port site, on the western fringes of North Dock B and Pembroke East A EDs. In addition, Dublin Port is visible from communities within Clontarf East B, Clontarf East C and Clontarf East D. There is high level of population growth within North Dock B which is nearly three times the national average and twice the Dublin City average between the years of 2011 and 2016. In contrast, Pembroke East A and Clontarf East C has a relatively low level of population growth, below the national and Dublin City average. Changes in housing stock between the years of 2011 and 2016 show that North Dock B has higher growth than the national and Dublin City average, consistent with population trends, while housing stock within Clontarf East D has decreased.

There are higher levels of employment and lower levels of unemployment in the Port study area compared to Dublin City and the national average. There are also high levels of educational attainment in the Port study area. Total and disposable income levels in Dublin City are comparatively higher than the national average.

Deprivation statistics are derived for North Dock B and Pembroke East A EDs using the Pobal All-Island HP Deprivation Index (2016). The most recent statistics show that the population living within Clontarf East B, Clontarf East C, Clontarf East D and North Dock B are categorised as "Affluent", with a relative score ranging between +11 and +13 (where the minimum is -39.9 and the maximum is +40.3). The population living within Pembroke East A are categorised as "Marginally Above Average", with a relative score of +2. The average score for the study area is +11. A map of deprivation is provided within Appendix 16.

Physical Health

Both male and female life expectancy is increasing with male life expectancy consistently lower than female life expectancy. Healthy life expectancy (i.e. the number of years a person is in good health), is also generally increasing for both males and females, with male healthy life expectancy again consistently lower than female healthy life expectancy.

The hospital admission rate for diseases of the circulatory system are generally lower in Dublin City compared to the national average and has remained relatively static over the years. Hospital admissions for diseases of the respiratory system are similar to the national average and have generally increased in Dublin City over the years.

The proportion of the population within the Port study area with a disability is lower than the Dublin City and national average. The all-age all-cause mortality figure in Dublin City is lower than the national average.

The cancer mortality rate within Dublin City fluctuates year-on-year, but has generally remained below the national average. The respiratory disease mortality rate within Dublin City has remained relatively static over the years and remains lower than the national average. The circulatory disease mortality rate within Dublin City shows a similar trend to respiratory disease mortality rate, where mortality rate has remained relatively static over the years and remains consistently lower than the national average.

Mental Health

Suicide rate within Dublin City shows a general decrease and remains consistently below the national average year-on-year. The percentage of the population receiving benefits for depression and/or anxiety in Dublin City is decreasing, but remains higher than the national average.

Lifestyle

Obesity in Dublin City is consistently lower than the national average but is increasing, following the national trend. In addition, there is a higher proportion of the population in Dublin City who are physically inactive compared to the national average.

The rate of hospital admissions for alcohol related conditions within Dublin City are similar to the national average and is increasing following the national trend. The rate of hospital admissions for drug related conditions within Dublin City is higher than the national average and has remained relatively static over the years. Smoking prevalence within Dublin City increased between 2002 and 2007, following the national trend. Smoking prevalence in Dublin City is higher than the national average.

Tourism

In total, Ireland welcomed approximately 9 million overseas tourists in 2017 who spent €4.9 billion during their visit. Dublin is the most popular tourist destination within Ireland where in 2017, a total of 5.9 million overseas tourists visited Dublin (over half the nationwide figure), spending approximately €2 billion.

Dublin is also Ireland’s cruise capital where over 150 cruise ships docked at Dublin Port during 2018. Ferry operation is also facilitated by Dublin Port. Over 1.7 million passengers travel by ferry through Dublin Port each year, which is home to four ferry companies that operate up to thirteen daily sailings, connecting Dublin with Holyhead, Liverpool and Douglas.

Conclusion

Demographic and housing stock statistics show that there are high levels of growth in North Dock B. Generally, employment, educational attainment and income levels are all high as Dublin supports a large number of professional occupations.

Hospital admissions within Dublin City are generally similar to the national average. All-age all-cause mortality rate, respiratory disease mortality rate and circulatory disease mortality rate are lower in Dublin City compared to the national average, while cancer mortality within Dublin City is more consistent with the national trend. Mental health statistics are mixed; suicide in Dublin City is lower than the national average, however, there is a higher proportion of the population in Dublin City receiving benefits for anxiety or depression. In terms of lifestyle, while physical inactivity is higher than the national average, obesity is lower. Hospital admissions from alcohol related conditions are similar to the national average, while smoking prevalence and hospital admissions from drug-related conditions are higher than the national average.

Overall, the local community surrounding the MP2 Project are not considered particularly sensitive to population and health effects resulting from changes to environmental or socio-economic health determinants.

16.3.2 Future Baseline Conditions

As it is challenging to predict the future population and health baseline with high confidence, trends are analysed as part of the current baseline to provide insight into likely future local community circumstance. For the purpose of this assessment, the present-day baseline population and health data is used, in effect comparing two parallel situations in which the predicted with and without development scenarios were happening in the present day.

16.4 Consultation

The consultation process relating to the MP2 Project is summarised in Chapter 5: Project Scoping & Consultation. The process comprised several stages, using varied overlapping methods aimed at gaining input from the statutory consultees, stakeholders and the general public to inform the planning process, and further refine the scope and focus of the health assessment.

The potential impact from the MP2 Project on human health was not a common concern raised during the consultation process. As an example, the Department of Health was contacted but no response was received. Similarly, the Health and Safety Executive passed on details of the project and consultation request to the relevant person, but no further comments were received. Comments relating to the socio-economic aspects of the project, relevant to this topic (i.e. employment, GVA and tourism) were positive across the board.

As a result, the relevant population and health points raised during consultation and how/where these have been addressed, detailed in Table 16-5, is not extensive.

Table 16-5 Relevant Consultee Responses

Date	Consultee	Comment	Response
Various	Public Consultees	Public consultees commented primarily on City Farm proposal which is included as part of the Community Gain Proposal. Generally, public consultees expressed support for the proposal. Consultees were particularly supportive that the City Farm would facilitate the production and selling of fresh produce and would provide a "little oasis" within a built environment. There were suggestions that the opportunities to collaborate with other farms with an educational and recreational outlook was explored. In addition, some suggested that a community garden with a natural play area is provided rather than a City Farm.	Information regarding the Community Gain Proposal are detailed within the 'Mitigation Measures' section of the population and health chapter. The social benefits of this provision are further considered in the 'Residual Impact' section.
July 2018	Fáilte Ireland	Fáilte Ireland stated that they are fully supportive of the MP2 Project. Their response included a copy of the Fáilte Ireland Guidelines for the treatment of tourism in an EIS which they recommended should be taken into consideration into consideration in preparing the EIS.	Following a review of the Fáilte Ireland Guidelines for the treatment of tourism in an EIS, it is considered that the scope of the population and health chapter in relation to tourism effects is appropriate.

On this basis, the relevant consultee responses detailed above indicate that no gaps have been identified and the original scope of the population and health assessment remains appropriate.

16.5 Appraisal of Significance

16.5.1 Construction Phase

The following appraisal considers each of the previously identified potential population and health impacts in Table 16-2 associated with the construction of the MP2 Project including:

- the influence on population and health from changes in emissions to air;
- the influence on population and health from changes in noise exposure;
- the influence on population and health from changes to accessibility, transport nature and flow rate; and
- the influence on population and health from socio-economic factors (Employment and GVA).

Air Quality

On-site construction activities and associated transport movements have the potential to influence population and health by contributing to nuisance dust, odour emissions and PM_{10} and NO_2 levels (associated with construction traffic).

Sources of nuisance dust include general on-site construction activities, demolition of existing structures and dredging. In addition, dredging activities have the potential to cause adverse odour impacts due to the presence of decayed organic material within dredged material.

As stated in Chapter 10: Air Quality and Climate, there is a low potential for dust impacts during the construction phase on the basis that dredging is a low dust generating activity (due to the high moisture content of material), and there are no sensitive receptors located within 100m of the site. There is also low potential for odour impacts during the construction phase on the basis that the majority of decayed organic material would be released under water during dredging, and that there is limited means of exposure to sensitive receptors. In addition, there is a low potential for PM_{10} and NO_2 air quality impacts from increases in traffic as there would only be a circa 1% increase in existing volumes during peak construction (at East Wall Road). On this basis, Chapter 10: Air Quality and Climate has concluded that the magnitude of change for all construction emissions to air would be negligible.

As a result, neither the change in concentration or exposure to construction emissions to air (nuisance dust/odour, PM_{10} and NO_2) are sufficient to quantify any change in health outcome at a population level. On the above basis, the magnitude of impact on population and health would be negligible, where in an area of high sensitivity, would result in a minor adverse significance of effect, which is not considered significant in EIA terms.

Noise and Vibration

There is the potential for construction noise to be generated during day-time hours (between the hours of 08:00 and 18:00 on Monday to Fridays, between 08:00 and 13:00 on Saturdays) from on-site construction activities and associated transport movements. As a result, the timing of construction activities (during day time hours only), limits the potential population and health effects to temporary annoyance, with no risk of sleep disturbance and associated health outcomes. As stated in Chapter 11: Noise and Vibration, the worst-case predicted construction noise level is expected to be 47.8dB(A) at 11 Poolbeg Quay, which is substantially below the noise threshold limit for construction noise. In addition, noise generated from construction traffic would represent less than a 1dB(A) increase on all relevant road links (i.e. not a perceptible change[1]). Overall, Chapter 11: Noise and Vibration does not identify any significant effects.

The potential change in noise is not of a timing, duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level resulting from annoyance. On the above basis, the magnitude of impact on population and health would be negligible, where in an area of high sensitivity, would result in a minor adverse significance of effect, which is not considered significant in EIA terms.

Transport and Accessibility

A change in transport nature and flow rate has the potential to increase risk of accident and injury and severance – defined within DMRB Part 8 as, “the separation of residents from facilities and services they use within their community, caused by new or improved roads or by changes in traffic flow.”

[1] As stated in Chapter 11: Noise and Vibration, it is generally accepted that it takes an approximate 3dB(A) increase in noise levels to be perceptible to the average person

As stated in Chapter 13: Transport and Transportation, the peak HGV traffic volume will occur Q3 2030. There will be an average daily traffic over this period of 57 HGV movements per day, based on a 5-day working week. The peak week within the proposed construction phase will be Q4 2030 where on average there will be 81 HGV movements per day. This would incorporate a peak of 17 HGV movements each way per hour between 07:00am and 08:00am.

This peak level of hourly construction traffic will be imperceptible to the external road network, no more noticeable than the ordinary fluctuations in traffic flows. As a result, and on the basis that the magnitude of change in transport nature and flow rate is not anticipated to result in any manifest health outcome at a population level, the magnitude of impact on population and health would be negligible, where in an area of high sensitivity, would result in a minor adverse significance of effect, which is not considered significant in EIA terms.

Socio-Economic

Introduction

Socio-economic factors make up a collection of wider determinants of health which refer to the social, cultural, political, economic and commercial factors, in addition to environmental factors, that shape the conditions in which people are born, grow, live, work and age – ultimately affecting health and wellbeing (Health Foundation, 2018).

Construction Employment

Within the 15-year proposed consent period, construction activities associated with the MP2 Project are anticipated to span over 11 years, beginning in 2022 and ending in 2032. The construction of the MP2 Project would generate direct construction employment, the level of which has been forecast using detailed information on the construction schedule. An annual average of 38 Full Time Equivalent (FTE)[2] jobs are expected to be required to deliver the project. The peak annual average FTE is expected to be 66 in 2021.

As set out in the baseline section, there is a total of 1,389 residents who class themselves as “skilled manual workers” (which includes construction workers) living within North Dock B (741 residents) and Pembroke East A (648 residents) EDs. Within Dublin City, there is a total of 62,892 residents who class themselves as “skilled manual workers”. As such, it can be concluded that there is a sufficient pool of local labour to meet the construction demands of the MP2 Project. However, the uptake of employment locally would depend on the specific procurement strategy.

In addition, expenditure by Dublin Port Company (DPC) on the MP2 Project would result in increased employment in the wider supply chain, this is classified as indirect employment effects. The additional construction employees would be expected to spend some of their increased income, and thereby increase employment in local shops and services, this is classified as induced employment effects.

As a result, and on the basis that construction employment is only likely to provide benefits at an individual level, the magnitude of impact on population and health from construction-related employment would be low, where

[2] An FTE employee is a unit which represents equivalent employees working full-time based on full-time and part-time workers. Each part-time employee counts as a portion of a full-time employee. When you add together multiple part-time employees, you can create FTE employees

in an area of high sensitivity, would result in a minor beneficial significance of effect, which is not considered significant in EIA terms.

Construction GVA

GVA measures the contribution to an economy of an individual producer, industry, sector or region. In this instance, this contribution is from a proposed development, and is calculated by output minus intermediate consumption.

Expenditure by DPC during the construction phase of the MP2 Project is expected to be approximately €312 million. Based on data provided by the CSO Ireland[3], it is estimated that 41.1% of basic prices across branches within the manufacturing, building and construction sectors would be GVA. As such, it is estimated that approximately €128 million of total construction costs would be GVA.

As a result, the magnitude of impact on population and health from construction-related GVA would be medium, where in an area of high sensitivity, would result in a moderate beneficial significance of effect, which is considered significant in EIA terms.

16.5.2 Operational Phase

The following assessment investigates each of the previously identified potential population and health determinants in Table 16-2 associated with the construction of the MP2 Project, including:

- the influence on population and health from changes in emissions to air;
- the influence on population and health from changes in noise exposure;
- the influence on population and health from changes to accessibility, transport nature and flow rate; and
- the influence on population and health from socio-economic factors (Employment, GVA, Tax and Tourism).

Air Quality

Traffic on the road network is predicted to increase during the operation phase in line with the increased throughput of cargo and passengers as predicted under the Masterplan. These increases have the potential to influence population and health from contributing to NO_2 and PM_{10} background concentrations.

As detailed in Chapter 10: Air Quality and Climate, the contribution to background air pollution concentrations from increased road traffic associated with the MP2 Project would be classed as negligible and is predicted to remain within objective thresholds set to be protective of the environment and health at all receptors. The air quality assessment uses atmospheric dispersion models to estimate the worst-case process contributions from the operation of the MP2 Project.

Table 16-6 shows that the maximum increase in NO_2 and PM_{10} annual mean concentrations at any receptor between the 2026 and 2040 do-minimum and do-something scenarios would be 1.09 µg/m^3 for NO_2 and 0.43

[3] RAA01: Gross Value Added (GVA) by Region, Year and Statistic

μg/m³ for PM_{10}. This would occur at R3 Apartments on Sheriff Street Upper between the 2040 'do-minimum' and 2040 'do-something' scenario.

Table 16-6 Changes in Air Pollutants during Operations

Receptor	Scenarios	Annual Average NO_2	Annual Average PM_{10}
R1 Royal Oak Housing (Santry)	2018 Baseline	24.70	15.19
	2026 Do-Minimum	24.85	15.22
	2026 Do-Something	25.07	15.28
	Change	0.22	0.06
	2026 Do-Minimum	25.05	15.27
	2026 Do-Something	25.89	15.51
	Change	0.84	0.24
R2 Residential Housing on East Wall Road	2018 Baseline	23.26	15.36
	2026 Do-Minimum	23.29	15.40
	2026 Do-Something	23.45	15.47
	Change	0.16	0.07
	2026 Do-Minimum	23.43	15.49
	2026 Do-Something	24.03	15.77
	Change	0.6	0.28
R3 Apartments on Sheriff Street Upper	2018 Baseline	21.76	14.61
	2026 Do-Minimum	21.90	14.68
	2026 Do-Something	22.15	14.77
	Change	0.25	0.09
	2026 Do-Minimum	22.15	14.79
	2026 Do-Something	23.24	15.22
	Change	1.09	0.43
R4 Residential Houses on Pigeon House Road	2018 Baseline	24.8	15.76
	2026 Do-Minimum	24.81	15.80
	2026 Do-Something	25.04	15.89
	Change	0.23	0.09
	2026 Do-Minimum	24.98	15.91
	2026 Do-Something	25.82	16.27
	Change	0.84	0.36

Such changes are not of a concentration or exposure enough to quantify any manifest health outcome locally.

To clarify, the air quality assessment results detailed within Table 16-6 and baseline health data collected for Dublin City were applied using the WHO HRAPIE guidance (HRAPIE, 2013) to quantitatively assess the potential population and health impacts from the operation of the MP2 Project.

As shown in Table 16-7, in a worst-case hypothetical scenario (grossly overestimating exposure) where the entire population within North Dock B and Pembroke East A ED's (a total of 12,773 people) were to reside in a single household exposed to the maximum increase in NO_2 and PM_{10}, the change in concentration and exposure are orders of magnitude lower than what is required to quantify any measurable adverse health impact and would represent less than 1% of the baseline rate.

Table 16-7 Health Outcome Assessment Results

Health Outcome	Worst-case Additional Health Outcomes (2040 Do-Minimum vs. 2040 Do-Something)	Proportion of Baseline Rate
All-cause mortality	0.14	<1%
Cardiovascular disease hospital admissions	0.17	<1%
Respiratory disease hospital admissions	0.88	<1%

In addition to changes in air quality from road traffic emissions, shipping emissions also have the potential to contribute to air pollution during operation. The generation of shipping emissions within the port area would be inherently managed through port procedures and best practice. As such, impacts from shipping emissions would primarily occur at sea; while this would generate a direct transboundary impact, there would be a limited means of exposure to sensitive receptors on land.

Changes in operational emissions would remain within air quality objectives set to be protective of the environment and health, and is not of a concentration or exposure sufficient to result in any manifest health outcome at a population level. On the above basis, the magnitude of impact on population and health would be negligible, where in an area of high sensitivity, would result in a minor adverse significance of effect, which is not considered significant in EIA terms.

Noise and Vibration

As detailed in Chapter 11: Noise and Vibration, there would be no discernible increase in the numbers of various items of plant/equipment as a result of the MP2 Project from what is currently in operation. Operational phase traffic noise increases associated with the MP2 Project are predicted to be +1.9dB(A) higher in the 'do-something' scenario compared to the 'do-minimum' scenario (i.e. not a perceptible change). In addition, the existing night-time activities in the port would not significantly increase as a result of the MP2 Project, thereby not influencing the likelihood of potential population and health effects resulting from sleep disturbance. Overall, Chapter 11: Noise and Vibration does not identify any significant effects.

Changes in operational noise will not be of a magnitude sufficient to result in any manifest health outcome at a population level. On the above basis, the magnitude of impact on population and health would be negligible, where in an area of high sensitivity, would result in a minor adverse significance of effect, which is not considered significant in EIA terms.

Transport and Accessibility

An Annual Average Growth Rate (AAGR) of 3.3% has been applied to increases in traffic flows which are directly attributable to the MP2 Project. As such, in 2026 Port traffic flows are estimated to be 129.7% higher than the base year of 2018; 2031 Port traffic flows will be 152.5%; and in 2040 the Port traffic flows will be 204.3% higher than the 2018 flows, which is more than double.

All operational traffic movements would occur on the existing consented road network. With the exception of the consented Promenade Road Roundabout, which is anticipated to exceed capacity in 2032, the remaining consented road network is considered sufficient to meet the capacity of the forecast increase at 2040 outlined above.

The Promenade Road Roundabout forms part of the Southern Port Access Route (SPAR) which is due to be operational by 2031 and coincides with the consented roundabout coming to the end of its design life. The upgrade of the Promenade Road Roundabout will be considered as the Masterplan continues to be implemented. Furthermore, a range of mitigation measures can be applied in future years to control and manage traffic arriving as the current Masterplan comes towards the end of its lifespan. Overall, and considering the consented road network as a whole, there is limited potential for adverse severance impacts and risk of accident and injury.

In addition, Chapter 13: Traffic and Transportation highlights a number of objectives for the MP2 Project and within the Masterplan. This includes provision of a 4km cycle and pedestrian Greenway along the northern shoreline, overlooking the Tolka Estuary. While the Greenway does not offer a direct benefit, there would be active promotion of these routes which would contribute to supporting both connectivity and the uptake of physical activity, indirectly benefitting population and health. In addition, facilities would be provided for viewing wildlife, viewing the Bay and wider environment which would contribute to increased engagement in recreational activities.

Research shows that regular physical activity can reduce your risk for a number of health conditions and diseases such as, cardiovascular disease (including angina and stroke), obesity, and mental health conditions such as depression and anxiety. As a result, there is a clear indirect population and health benefit associated with the health promotion that the cycle and pedestrian Greenway offers to individuals.

As a result, the magnitude of impact on population and health would be low, where in an area of high sensitivity, would result in a minor beneficial significance of effect, which is not considered significant in EIA terms.

Socio-economic

Operational Employment

The employment generated at Dublin Port already makes an important contribution to the regional economy. The operational employment figures for Dublin Port for 2017 (Annual Report and Financial Statements) states that there was an average number of 148 operational employees (DPC, 2017).

According to OECD research (OECD, 2013), an increase of one million tonnes of port throughput has the potential to generate up to 300 additional jobs[4] (direct, indirect and induced). In this instance the throughput

[4] Indicative based on analysis for a number of ports and does not take into account regional variation

during 2016 totalled 34.9 million tonnes. This is anticipated to increase to 77 million tonnes by 2040 which, based on OECD research, has the potential to generate an additional 12,630 jobs (direct, indirect and induced).

The direct, indirect and induced employment opportunities generated by the operation of the MP2 Project have the potential to provide individual and population health benefits not only at the local level but also at the regional and national level, further down the supply chain and through local spending.

As a result, the magnitude of impact on population and health from operational employment would be medium, where in an area of high sensitivity, would result in a moderate beneficial significance of effect, which is considered significant in EIA terms.

Operational GVA

In 2017, Dublin Port had a turnover of approximately €85.5 million. Using the Bernard Cox (1979) method of calculating GVA (cited in Hossain, 2017), it is estimated that approximately €70.9 million of this was GVA (direct only) which represents approximately 13% of the direct GVA generated by the entire shipping & maritime transport sector[5] within Ireland during 2016 (Socio-Economic Marine Research Unit, 2017).

Without major infrastructure development at Dublin Port, it would not be possible to maintain current growth levels. In 2012, Dublin Port predicted an AAGR of approximately 2.5%, which is used to represent the estimated growth rate in a 'do-minimum' scenario. However, DPC estimates that the MP2 Project has the potential to contribute to a 3.3% AAGR (following the end of MP2 Project construction in 2029), representing the anticipated growth rate in a 'do-something' scenario.

In real terms, it has been calculated that at the end of the masterplan period (2040), the difference in direct GVA between a 'do-minimum' scenario (2.5% AAGR) and a 'do-something' scenario (3.3% AAGR from 2029 onwards), would be approximately €11.5 million.

Applying the multiplier for indirect GVA effects of the shipping & maritime transport sector, which is estimated to be 2.42 (Socio-Economic Marine Research Unit, 2017), the difference in indirect GVA between a 'do-minimum' scenario (2.5% AAGR) and 'do-something' scenario (3.3% AAGR from 2029 onwards), would be approximately €16.3 million.

Overall, a total addition of approximately €27.7 million (direct and indirect GVA) can be attributed to the MP2 Project.

As a result, the magnitude of impact on population and health from operational GVA would be high, where in an area of high sensitivity, would result in a major beneficial significance of effect, which is considered significant in EIA terms.

Operational Tax

In 2017, Dublin Port contributed approximately €5.8 million in tax payments to the Irish Government. Using the same method as above, the difference in tax benefits between a 'do-minimum' and 'do-something' scenario would equate to a total of approximately €932,000 in tax, which would go towards funding public expenditure.

[5] Includes: sea and coastal passenger water transport; sea and coastal freight water transport; services incidental to water transport; cargo handling; renting and leasing of water transport equipment; and other transportation support activities

As a result, the magnitude of impact on population and health from tax generated would be low, where in an area of high sensitivity, would result in a minor beneficial significance of effect, which is not considered significant in EIA terms.

Tourism

Tourism is one of Ireland's most important economic sectors where in 2016, total revenue from tourism contributed approximately €7.8 billion to the Irish economy (DTTAS, 2016). As a key access point to Ireland, Dublin Port is an important contributor to the facilitation of tourism in Ireland.

While the increase in capacity at Dublin Port following the MP2 Project is primarily directed at growth of freight services, the MP2 Project also supports growth in passenger services. During 2017, a total of 1.85 million passengers passed through Dublin Port[6]. Based on levels of existing growth, the future baseline in the year of 2029 (end of construction) for passengers passing through Dublin Port is anticipated to be 2.49 million passengers.

By applying the predicted AAGR of 3.3% to this figure, between 2029 (end of the construction period) and 2040 (end of the masterplan period), the difference between a 'do-minimum' and 'do-something' scenario is estimated to represent approximately 290,000 additional passengers who would pass through Dublin Port.

A growth in passenger services would increase the potential to further accommodate, sustain and grow Ireland's tourism industry, with associated socio-economic health benefits at a local, regional and national level.

In addition, as mentioned in Chapter 13: Transport and Transportation, part of the MP2 Project is to promote the use of Dublin Port for recreation and amenity by making it a more attractive and accessible area to visit. This would be achieved through the provision of a pedestrian Greenway along the northern Shoreline overlooking the Tolka Estuary, and by highlighting walks and cycle routes offering facilities for bird watching and viewing wildlife, views of the Bay and the wider environment. As a result of the accessibility improvements and promotion of use, it is anticipated that there would be an increase in tourism within the port area itself.

As a result, the magnitude of impact on population and health from tourism would be low, where in an area of high sensitivity, would result in a minor beneficial significance of effect, which is not considered significant in EIA terms.

16.6 Mitigation Measures

During construction, there are a number of mitigation measures outlined within the Draft Construction Environmental Management Plan (CEMP) which includes a Construction Traffic Management Plan (CTMP), and by adhering to the Dublin City Council HGV Management Strategy which seeks to control the potential impacts of HGV movements. In addition, a Noise Management Plan has been provided which details mitigation measures and monitoring regimes to help reduce and enforce construction noise levels to within the relevant limit.

[6] Figure taken from Dublin Port Masterplan 2040: Reviewed 2018

The CEMP, CTMP, Dublin City Council HGV Management Strategy and Noise Management Plan all focus on environmental precursors to adverse health outcomes, thereby providing the opportunity for intervention to prevent any manifest health outcome.

There are also several design measures which seek to provide much improved walking and cycling facilities within the Port Estate, thereby reducing barriers to the uptake of active transport. This includes promoting pedestrian and cycle routes and promoting Dublin Port for recreation and amenity opportunities such as bird watching. These measures have the potential to contribute to an increase in active transport, thereby supporting healthy behaviours.

In addition to the mitigation measures outlined above, DPC are exploring the provision of a suitable community gain proposal which will comprise the establishment of two Trust Funds. The first Trust Fund is to make a contribution towards the establishment of a city farm. The provision of a new community asset such as a city farm has the potential to positively influence population and health by providing social benefits and contributing to community cohesion.

16.7 Residual Impacts

All mitigation measures which provide intervention to prevent any manifest health outcome have been taken into consideration within Section 16.5: Appraisal of Significance. As such, there is no change to the assessment conclusions reached.

16.8 Cumulative Impact

Due to the inter-relationship between population and health and the wider technical disciplines, potential cumulative effects from other developments have already been considered within the technical disciplines on which the population and health assessment is derived. No further cumulative effects on population and health are considered likely.

16.9 Monitoring

Where necessary, monitoring would focus on environmental precursors to any health impact, thereby enabling a monitoring regime that enables intervention before any manifest health outcome. The necessity of such monitoring would be established within the relevant technical disciplines, namely Chapter 10: Air Quality and Climate, Chapter 11: Noise and Vibration, and Chapter 13: Transport and Transportation.

As part of annual reporting, DPC already monitor and publish data on number of direct employees and several financial Key Performance Indicators (KPIs) (such as turnover, profit, tax contributions) to measure year-on-year progress. The continued measurement of these would ensure that socio-economic benefits of the MP2 Project are captured.

16.10 Summary of Effects

Table 16-8 provides a summary of potential population and health effects prior to and following any proposed mitigation measures and monitoring.

16.11 Conclusions

While it is predicted that there would be adverse increases in ambient levels of environmental health determinants directly attributed to the construction and operation of the MP2 Project (such as air quality and noise), the magnitude of these changes is minimal and not sufficient to quantify any measurable adverse change in population health outcomes.

The MP2 Project is strategic in nature and is expected to provide a number of direct, indirect and induced socio-economic benefits, not only on a local scale, but also at a regional and national scale. Some of these socio-economic benefits have the potential to positively influence health and wellbeing at an individual level in the short-term and at the population level in the long term.

Overall, it can therefore be concluded that in terms of population and health, the significant positive socio-economic effects outweigh the negligible effects relating to minor increases in environmental health determinants.

Table 16-8 Summary of Effects

Description of impact	Magnitude of impact	Sensitivity of receptor	Significance of effect	Remedial and mitigation measures	Residual effect	Proposed monitoring
Construction						
Changes in emissions to air	Negligible	High	Minor adverse (not significant)	As per Chapter 10: Air Quality and Climate	Minor adverse (not significant)	As per Chapter 10: Air Quality and Climate
Changes in noise exposure	Negligible	High	Minor adverse (not significant)	As per Chapter 11: Noise and Vibration	Minor adverse (not significant)	As per Chapter 11: Noise and Vibration
Changes to accessibility, transport nature and flow rate	Negligible	High	Minor adverse (not significant)	Adhering to a CTMP and the Dublin City Council HGV Management Strategy	Minor adverse (not significant)	As per Chapter 13: Transport and Transportation
Employment generation	Low	High	Minor beneficial (not significant)	None	Minor beneficial (not significant)	None
GVA generation	Medium	High	Moderate beneficial (not significant)	None	Moderate beneficial (not significant)	None
Operation						
Changes in emissions to air	Negligible	High	Minor adverse (not significant)	As per Chapter 10: Air Quality and Climate	Minor adverse (not significant)	As per Chapter 10: Air Quality and Climate
Changes in noise exposure	Negligible	High	Minor adverse (not significant)	As per Chapter 11: Noise and Vibration	Minor adverse (not significant)	As per Chapter 11: Noise and Vibration
Changes to accessibility, transport nature and flow rate	Low	High	Minor beneficial (not significant)	As per Chapter 13: Transport and Transportation	Minor beneficial (not significant)	As per Chapter 13: Transport and Transportation
Employment generation	Medium	High	Moderate beneficial (not significant)	None	Moderate beneficial (not significant)	Continued annual reporting of direct employees
GVA generation	High	High	Major beneficial (not significant)	None	Major beneficial (not significant)	Continued annual reporting of financial KPIs
Tax contribution	Low	High	Minor beneficial (not significant)	None	Minor beneficial (not significant)	Continued annual reporting of financial KPIs
Facilitation of tourism	Low	High	Minor beneficial (not significant)	None	Minor beneficial (not significant)	None

17 WASTE

17.1 Introduction

This section assesses the waste management aspect of the MP2 Project. It discusses the potential waste streams that will be generated during the construction and operation of the MP2 Project. The potential effects from the forecast waste generation are assessed in the context of the effects on waste management infrastructure and legislation, policy and strategy targets. Mitigation measures are proposed where the potential for significant effects has been identified.

17.2 Assessment Methodology

This assessment comprises the following stages:

- Assessment of waste related terms and definitions applicable to the MP2 Project;
- A review of applicable legislation and policy;
- A review of the MP2 Project design, undertaken in consultation with the project design team, to estimate the waste generation during the various phases;
- Consideration of potential interactions between proposals and the current site conditions, and identification of possible impacts;
- Assessment of impacts, within the context of the receiving waste management environment;
- Identification of measures and solutions to avoid, minimise or mitigate potential impacts; and
- Assessment of residual impacts, taking account of mitigation measures.

There are no accepted criteria for determining the value (sensitivity) of material resources and waste (including waste infrastructure). In the absence of such guidance, the assessment has been undertaken using professional judgement of waste and resources specialists. The assessment criteria used for assessing environmental value (or sensitivity) and typical descriptors is included in Table 17-1 – Table 17-3. Furthermore, professional judgement has been applied to determine the likely significance of effects.

Table 17-1 Assessment Matrix

Importance / Sensitivity of resource or receptor				
Very High	**High**	**Medium**	**Low**	**Negligible**
Very high scarcity of required material resource. There is no available waste management infrastructure capacity within the study area for any waste arisings from the Scheme. Very high importance and rarity of resource on a national scale. Very limited materials reuse, recycling and or recovery.	High scarcity of required material resource. There is limited waste management infrastructure capacity within the study area in relation to the forecast waste arisings from the Scheme. High importance and rarity of resource on a regional scale. Limited materials reuse, recycling and or recovery.	Medium scarcity of required material resource. There is adequate waste management infrastructure capacity within the study area for the majority of waste arisings from the Scheme. High or medium importance and rarity of resource on a regional scale. Moderate materials reuse, recycling and or recovery.	Low scarcity of required material resource. There is adequate available waste management infrastructure capacity within the study area for all waste arising from the Scheme. Low or medium importance and rarity of resource on a local scale. High materials reuse, recycling and or recovery.	Negligible scarcity of required material resource. There is waste management infrastructure capacity within the study area for all waste arisings from the Scheme. Negligible importance and rarity of resource on a local scale. Very high materials reuse, recycling and or recovery.
Magnitude of impacts				
Major	**Moderate**	**Minor**	**Negligible**	**No change**
Loss of natural resources and or quality and integrity of natural resources; severe damage to key characteristics, features or elements. Waste arisings from the Scheme are predominantly disposed of to landfill or to incineration without energy recovery with little or no prior segregation. Generation of large quantities of hazardous and inert waste which are managed for disposal using methods lower down the waste hierarchy (e.g. landfill or incineration with energy recovery).	Loss of natural resources, but not adversely affecting the integrity; partial loss of or damage to key characteristics, features or elements. Waste arisings from the Scheme are predominantly disposed of by incineration with energy recovery. Generation of moderate quantities of hazardous and inert waste which are managed for disposal using methods lower down the Waste Hierarchy (e.g. landfill or incineration with energy recovery).	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements Waste arisings from the Scheme are predominantly segregated and sent for composting, recycling or for further segregation and sorting at a materials recovery facility. Generation of small quantities of hazardous and inert waste which is managed for disposal using methods lower down the Waste Hierarchy (e.g. landfill or incineration with energy recovery).	Very minor loss or detrimental alteration to one or more characteristics, features or elements. Waste arisings from the Scheme are predominantly reused on site or at an appropriately licensed or registered exempt site elsewhere. Generation of negligible quantities of hazardous and inert waste which are managed for disposal using methods lower down the Waste Hierarchy (e.g. landfill or incineration with energy recovery).	No loss or alteration of characteristics, features or elements; no observable impact in either direction. All waste arisings from the Scheme are reused on site or at an appropriately licensed or registered exempt site elsewhere. No generation of hazardous waste. All inert materials reused onsite.

Table 17-2 Assessing significance of effects

Sensitivity of the receptor	Magnitude of impact				
	No Change	**Negligible**	**Minor**	**Moderate**	**Major**
Very high	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Negligible	Neutral	Neutral or Slight	Neutral or Slight	Neutral or Slight	Slight

Table 17-3 Assessing significance of effects

Very Large	Large	Moderate	Slight	Neutral
Significant change in environmental conditions. Impacts are likely to be of a very high magnitude and frequency and will impact on the existing strategy to deal with material resources and waste. Impact likely to be on a permanent basis.	Considerable change in environmental conditions. Impacts are likely to be of a high magnitude and frequency and will have an effect on the existing strategy to deal with material resources and waste. Impact likely to be on a permanent basis.	Noticeable change in environmental conditions. Impacts are likely to be of a high magnitude and frequency and will have an effect on the existing strategy to deal with material resources and waste. Impact likely to be on a permanent basis.	Barely perceptible change in environmental conditions. Impacts are likely to be of a low magnitude and frequency and will have an effect on the existing strategy to deal with material resources and waste. Impact likely to be on a temporary basis.	No discernible change in environmental conditions. Impacts are likely to be of a negligible magnitude and frequency and will not have an effect on the existing strategy to deal with material resources and waste. No impact.

17.3 Waste related terms and definitions

17.3.1 Definition of Waste

Waste is legally defined in EU and Irish law as "any substance or object which the holder discards or intends or is required to discard".

17.3.2 Definition of Construction and Demolition Waste (CDW)

CDW is not clearly defined in Irish legislation, however a number of official documents provide a definition for CDW as follows:

- The Department of the Environment, Community and Local Government in 2006 defined CDW as waste which arises from construction, renovation and demolition activities, together with all waste categories mentioned in chapter 17 of the European Waste Catalogue (EWC). Also included within the definition are surplus and damaged products and materials arising in the course of construction work or used temporarily during the course of on-site activities.
- The EPA adopted a broad definition of CDW (in line with the opening part of the definition of CDW as set out in Article 1(4) of Commission Decision 2011/753/EU12) as all waste that arises from construction and demolition activities (including excavated soil from contaminated sites). These wastes are listed in Chapter 17 of the European Waste Catalogue (EWC).

The definitions in Ireland for CDW do not provide any clear distinction between waste originating from construction or demolition.

Waste generated within the MP2 site will be classified as CDW.

17.3.3 Definition of waste treatment operations

The EU and Irish definitions of re-use, recycling and recovery may be stated as follows:

- **Reuse** is defined as "*any operation by which products or components that are not waste are used again for the same purpose for which they were conceived.*"
- **Recycling** is defined "*as any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.*"
- **Recovery** is defined as
  - *"(a) any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy, and*

- *(b) without prejudice to the generality of paragraph (a), includes the recovery operations listed in the Fourth Schedule,."*

In relation to backfilling, when reporting on recovery operations the official statistics in Ireland follow the Eurostat guidance on backfilling and include it. Ireland follows the definition provided in the European Commission Decision of 18 November 2011[18] and Eurostat guidance on backfilling.

- **Backfilling** was defined by the European Commission Decision of 18 November 2011 as: *"a recovery operation where suitable waste is used for reclamation purposes in excavated areas or for engineering purposes in landscaping and where the waste is a substitute for non-waste materials". This definition applies in Ireland but there has been no official translation into Irish law.*

17.4 Waste Management Policy

An extensive document review was completed to assist in identifying current and future requirements for waste management which included:

National and Regional Policies and Strategies such as:

- Changing Our Ways; A Policy Statement on Waste Management, Department of Environment, Heritage and Local Government, 1998;
- Preventing and Recycling Waste – Delivering Change, Department of Environment, Heritage and Local Government, 2002;
- Taking Stock and Moving Forward, Department of Environment, Heritage and Local Government, 2004;
- National Strategy on Biodegradable Waste, Department of Environment, Heritage and Local Government, 2006;
- A Resource Opportunity – Waste Management Policy in Ireland, Department of the Environment, Community and Local Government (DoECLG), 2012;
- National Hazardous Waste Management Plan 2014 – 2020, EPA, 2014;
- The Eastern – Midlands Region Waste Management Plan 2015 – 2021;
- National Hazardous Waste Management Plans published by the EPA;
- Planning guidelines for future developments published by the DECLG; and
- Best practice guidance and industry support documentation such as Dublin City Council Waste Management Best Practice Guidance for Construction Activities.

Irish legislation on waste that impact CDW management includes:

- **Movement of Waste:** Subject to minor exceptions, Section 34 of the Waste Management Act requires all bodies involved in the collection of waste to have this activity authorised by a waste collection permit. Besides the legal obligation to be in possession of a permit, the holder has to abide by its conditions. For example, these may limit collection activities to certain types of waste or require the permit holders to use specified tiers of the Waste Hierarchy. The details of the waste collection permit system are set down in the Waste Management (Collection Permit) Regulations S.I. No. 820 of 2007 27, S.I. No. 87 of 2008 28 and S.I. No. 197 of 201529. Offaly County Council has been appointed as the National Waste Collection Permit Office (NWCPO).

- **Authorisation of Waste Facilities:** The Waste Management Act contains a hierarchy of control systems, with the most stringent of these being licensed by the EPA. Local authorities are generally required for the regulation of non-disposal waste sites below specified thresholds (small scale and with a low degree of environmental significance). Because local authorities operate their own infrastructure, the EPA is mandated to oversee such activities. The following type of authorisations apply to waste management facilities in Ireland:

a. **Industrial emissions licences:** Directive 2010/75/EC of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) was transposed in Ireland by the European Union (Industrial Emissions) Regulations 2013, S.I. 138 of 2013 and Environmental Protection Agency (Industrial Emissions) (Licensing) Regulations 2013, S.I. 137 of 2013. These regulations place a number of additional waste activities under the EPA licensing regime for the first time such as biological or thermal treatment facilities above a certain threshold. These regulations have limited impact on CDW treatment.

b. **Waste licences:** The waste licensing system is operated by the EPA and is the main waste authorisation issued for major facilities in Ireland. This system provides for high environmental standards to apply for the development, operation, closure and aftercare of such sites. The Waste Management Act and the Waste Management (Licensing) Regulations 2004 govern the process under which the licences are applied for and maintained. CDW facilities that are managed by this regime include: landfills and materials reclamation facilities that handle more than 50 000 tonnes of non-hazardous waste.

c. **Waste facility permits and certificates of registration** are issued by local authorities under the under the Waste Management (Facility Permit and Registration) Regulations, S.I. No. 821 of 2007 (as amended) 3132. CDW facilities falling under the permit regime include places where concrete and brick crushers are being operated to recover up-to 50,000 tonnes per year of inert CDW and materials reclamation facilities (e.g. processing pre-treatment activity or backfilling activity) that handle less than 50,000 tonnes of non-hazardous waste. Certificates of registration are used for small scale CDW recovery activities processing less than 10,000 tonnes and generating less than 15% of residual waste. The revised facility permit and certificate of registration regulations introduced clear classes of activity, for the pre-treatment and backfilling of CDW, enabling operators to apply for an appropriate waste authorisation with more certainty. The previous regulations did not specify the type of and scale of recovery activities requiring a permit and were open to interpretation, particularly for CDW recovery activities. This uncertainty has been addressed with more CDW activities receiving a facility permit or certificate of registration, rather than a waste license. In this regard, Article 11 of S.I. No. 821 of 2007 introduced a process whereby the Environmental Protection Agency is designated as the responsible body for determining whether a particular activity requires a waste licence, a waste facility permit, a Certificate of Registration or none of these. Such determinations may be made by the Environmental Protection Agency:

– Following a request made by a prospective applicant for a waste authorisation for a decision on the type of waste authorisation that applies to the proposed facility/ activity;

– Following a request made by a local authority to whom an application for a waste facility permit or a Certificate of Registration has been made; and

– On its own initiative in relation to an existing facility.

Specifically in relation to the waste management requirements at Port facilities, a summary of this legislation is contained within the legislative summary of the SOP-DPC-ENV-053 entitled Dublin Port Ship's Waste Management Plan contained in Appendix 17-1.

17.4.1 National Waste Policy in Ireland

The statutory basis for waste management policy in Ireland comes from the Waste Management Act 1996. This Act provided the framework for the then Government's 1998 Policy Statement entitled "Waste Management: Changing Our Ways". This document outlined national targets and plans to modernise waste management practice over a 15 year period. A key concept of the Policy Statement was the Hierarchy of Waste Management, whereby waste prevention and re-use is preferable to non-sustainable practices such as disposal to landfill.

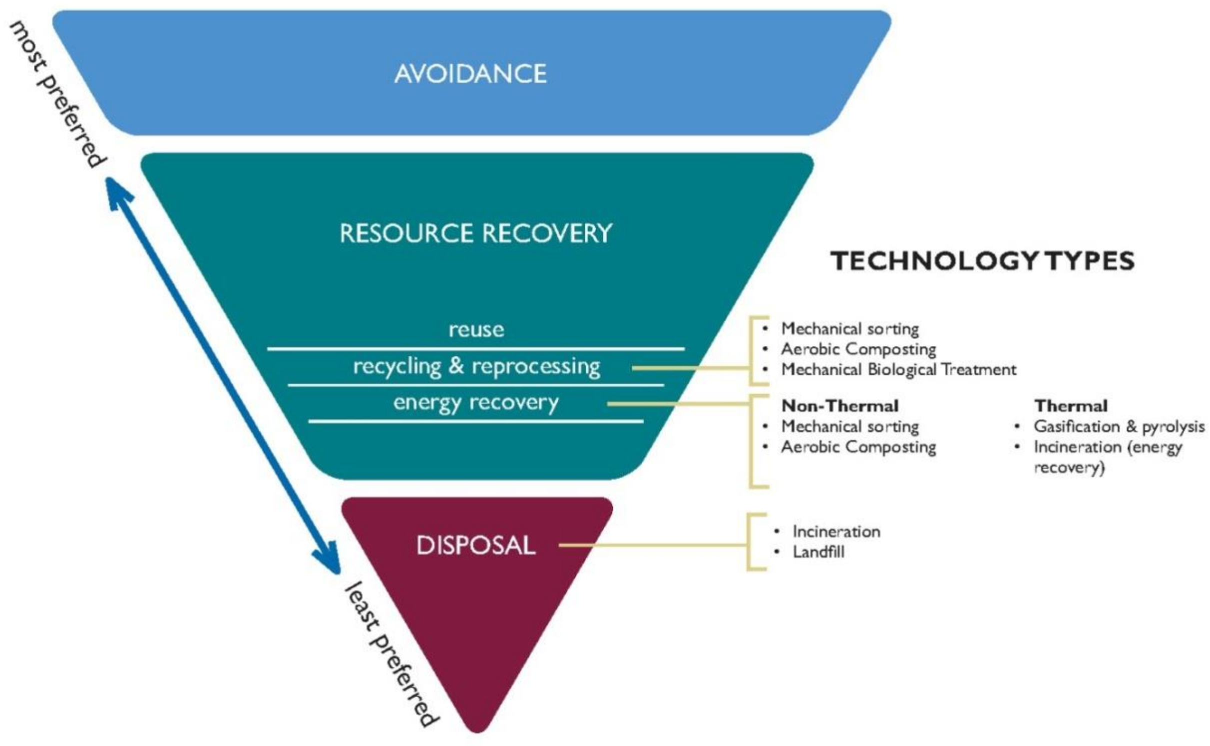


Figure 17-1 Waste Management Hierarchy

In Ireland, the Department of the Environment, Community and Local Government (DoECLG) has divided the responsibility for waste regulation between the Environment Protection Agency (EPA) and the local authorities. With respect to waste management planning, the EPA manages hazardous waste nationally while the responsibility for non-hazardous waste facilities lies with the local authorities.

Eastern-Midlands Region Waste Management Plan 2015-2021

In terms of waste management planning, Dublin Port is part of the Eastern-Midlands Region and is subject to the requirements of the associated Waste Management Plan (WMP). Specifically relevant is that the *Eastern-Midlands Region WMP 2015-2021* also set a long term targets to:

- Reduce and where possible, eliminate landfilling of all major waste streams including municipal, industrial and construction and demolition wastes in favour of the recovery of residual wastes by 2030.

Dublin City Council 'Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects'

Dublin City Council issued '*'Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects'* in June 2006 to promote an integrated approach to CDW management. Construction projects that have adequate waste prevention practices will still generate significant quantities of waste therefore waste management facilities should be considered in the project planning and design process. The guidance highlights the importance of CDW management throughout the duration of a project to encourage sustainable development, environmental protection and optimum use of resources. The implementation of environmentally sound CDW management at the outset of the project requires commitment from all construction industry stakeholders to work cooperatively to reduce CDW throughout the duration of the project.

A Project C&D Waste Management Plan outlines best practice for managing and handling CDW and associated issues on projects. The guidance outlines that a Project C&D Waste Management Plan should be prepared for projects that exceed any of the following thresholds:

1. New residential development of 10 houses or more;
2. New developments other than above, including institutional, educational, health and other public facilities, with an aggregate floor area in excess of 1,250m^2;
3. Demolition/renovation/refurbishment projects generating in excess of 100m^3 in volume of CDW; or
4. Civil Engineering projects producing in excess of 500m^3 of waste, excluding waste materials used for development works on site.

DPC is committed to preparing a C&D Waste Management Plan for the MP2 Project in accordance with Dublin City Council's Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects – and a draft plan has been included in the Construction Environmental Management Plan.

In the event that development is granted, the final plan will be submitted to the Dublin City Council's Waste Management Department and implemented from the project outset. The plan will consider the waste management hierarchy which gives priority to waste prevention and minimisation followed by reuse and recycling. The plan will be applied to the following construction project phases:

- Project Conception/Resource Analysis Phase
- Preliminary Design/Planning Phase
- Detailed Design and Tendering Phase
- Pre-construction Demolition Phase

- Construction Phase

Dublin Port Ship's Waste Management Plan

DPC currently operates a port waste management plan 'Dublin Port Ship's Waste Management Plan' 2017 which is contained in Appendix 17-1. It aims to protect the marine environment by reducing discharge into the sea of ship generated waste and cargo residues; to improve the availability and use of reception facilities and strengthen the enforcement regime. The objectives of the Waste Management Plan (WMP) are:

- To reduce illegal discharge of waste from vessels;
- To fulfil legal duties with regard to waste management;
- To consult with users, agents, operators, contractors and regulators in the development and implementation of waste management strategies and measures;
- To minimise the production of waste wherever possible;
- To re-use or recycle waste wherever possible; and
- To dispose of waste so as to minimise negative environmental effects.
- The overall control of waste management at the Port remains with the Harbour Master.

17.5 Existing Environment

17.5.1 Current Operational Overview

The principle activities of DPC are to facilitate the efficient flow of goods and passengers through the port. The company provides the infrastructure, facilities, services and hard standing areas to meet with the needs of their customers and to allow the transfer of goods and passengers between sea and land.

DPC has an important and long standing commitment, firstly, to mitigate the negative environmental effects of Port operations and, secondly, to contribute to improving the environment. DPC has signalled its commitment to sustainability through its Sustainability Report[1] contained in Appendix 17-2.

DPC's commitment to sustainability requires the setting and achievement of targets for the impact of port operations in a range of areas including economic, environmental and social including waste. With record throughput of 34.9m gross tonnes in 2016 and continued growth projected into the future DPC understand the requirements set out in its environmental policy such as seeking to minimise environmental impacts of activities in the areas of waste generation and currently operates Standard Operating Procedures (SOP) in relation to waste management.

[1] http://www.dublinport.ie/wp-content/uploads/2017/08/19359_DPC_SustainabilityReport_2017-v6.1.pdf

17.5.2 Characteristics of Current Wastes

Current wastes arising at the Port are typically non-hazardous, and are classified in accordance with local procedures, national waste classification requirements, and relevant waste legislation.

Waste management procedures at the Port incorporate the Waste Framework Directive's principles of prevention, minimisation, re-use, recycling, recovery, and disposal. These waste management procedures are implemented on site through the *Standard Operating Procedure (SOP) for the Landing of Ship's Waste* and other procedures which are established on site for waste segregation, handling, labelling, documenting, storage and treatment / disposal of waste off-site.

A number of different waste types are generated on site as set out in Table 17-4

Table 17-4 Details on weight of waste managed at Dublin Port

Contractor Details	Waste Type
Mixed waste bins	Residual
Mixed waste compactor	Residual
General waste skip	Residual
Subtotal	Residual
Wood only skip	Recyclable
Dry recycling bins	Recyclable

Reception and storage are the key elements to the successful management of port waste reception facilities. All waste generated and/or received at Dublin Port is currently managed and disposed by licensed waste contractors. Details are provided in Table 17-5. In 2016, DPC reached its highest recycling rate recorded at 98% and in 2017 the recycling rate was 95%.

Table 17-5 Types of waste produced and current management route

<table>
<tr><th>Waste Type</th><th colspan="2">Details</th><th>Management Route</th></tr>
<tr><td rowspan="2">Ship Waste</td><td>International catering waste</td><td>This includes swill and other waste on board ships and will be varied and in the main bulky. This includes packaging, bottles, cartons, wood, paper, and many other items.</td><td>Dublin Port provides adequate reception facilities for ship generated waste.
There are 3 lockable skips for galley waste in the Port, two located in the common user area and the third located in the oil jetty. Two of these are satellite skips, each with 1100 litre wheeled bin capacity. Locations:
• western end of Alexandra Quay West (Berth 29)
• Jetty Road to service the Oil Berths
The third is a lockable skip (14 m^3) which is the hub and is located at Ocean Pier adjacent to the No 2 Ramp, Berth 38.
Dublin Port Company will maintain a current up-to-date permit for Landers for swill / galley waste.
Collection frequency – as required
Thorntons Recycling, Greyhound Waste Disposal, Panda and Greenstar are named contractors in the Standard Operation Procedure for ship waste management</td></tr>
<tr><td>Hazardous waste</td><td>MAPROL Annex
I Oily wastes,
II Noxious liquid substances,
V Garbage</td><td>Provision for this service will be arranged directly through Ship's Agent with ENVA or other suitable contractor.</td></tr>
</table>

Waste Type	Details	Management Route
Port Waste	This is all non-ship generated waste and does not include waste generated by companies operating within the port area, who provide for their own disposal.	Port waste is segregated into general waste and hazardous waste and disposed of accordingly. Collection frequency – skip is collected as required. Dublin Port also segregates recyclable waste into the following fractions: timber, steel, paper and cardboard. Batteries (non-lead acid batteries, lead acid batteries, mixed batteries including lead acid, NiCad's, Alkaline, NiMH, LiIon etc) are collected at a collection point in the Port. Waste oil – an approved waste oil removal contractor (Enva) uplifts and removes to an approved recycling facility. Thorntons Recycling, Greyhound Waste Disposal, Panda and Greenstar are named contractors in the Standard Operation Procedure for ship waste management
Cargo Waste	This is waste associated with the load / discharge of cargo.	It is the responsibility of the ship and the cargo receivers to collect and dispose of cargo waste. Thorntons Recycling, Greyhound Waste Disposal, Panda and Greenstar are named contractors in the Standard Operation Procedure for ship waste management

17.5.3 Current Method of Management / Receiving Environment

17.5.3.1 Pre-treatment and Recovery Infrastructure

Pre-treatment infrastructure covers a wide variety of facilities in the region, but is mainly mechanical sorting, separation and processing plants which can vary in scale and sophistication. Recovery infrastructure covers a wide range of activities which fall within the treatment tiers of preparing for reuse, recycling and other recovery. Pre-treatment and recovery facilities can be authorised either by the EPA, under a waste licence, or by the local authorities, under a waste facility permit (WFP) or certificate of registration (CoR).

Table 17-6 presents the number of facilities present in the Eastern-Midlands Region to show the treatment market available.

Table 17-6 Number of facilities authorised by activity group

Description	WFP Classes	COR Classes	No. of Facilities
Store / Processes / transfer of waste including MSW	1, 7, 10	1, 7, 10	80
Metals and ELVs	4, 12	-	36
Other waste vehicles	2	3	26
WEEE, Batteries	3, 9	4	9
Land Improvement	5, 6	5,6,9	56
Biological	8	11,12	12
Organic landspread	-	13	13
Non-hazardous & CFC	11	14	8
Temp. storage	-	2	7
Total	12 classes	13 classes	247

17.5.3.2 Disposal Infrastructure

It is understood that Drehid Landfill, Co. Kildare is the final destination for international catering waste.

There are a number of landfills licensed to accept non-hazardous waste, as set out in Table 17-7 with remaining capacity in the area.

Table 17-7 Permitted non-hazardous landfill sites with capacity available

Licensee	Landfill Site Name	EPA Licence Reg. No	Remaining consented disposal capacity (t)	Remaining constructed disposal capacity (t)	Remaining life expectancy consented (years)	Remaining life expectancy = constructed & consented (years)	Operational Status
Bord na Móna plc / Drehid Waste Management Facility	Drehid	W0201-03	1,794,825	200,000	13 Years & 1.5 months	9 Months	Open
Knockharley Landfill Limited	Knockharley	W0146-02	2,735,924	189,422	20	2	Open
Ballynagran Landfill Limited	Ballynagran	W0165-02	2,440,331	159,513	5	1	Open
			6,971,080	**548,935**	**-**	**-**	

17.6 Proposed Scheme Design – Waste related elements

Chapter 2 sets out the project description. In relation to waste the key project elements are set out below relating to three distinct phases: demolition; construction and operation.

1. Demolition Works

Construction and Demolition waste (CDW) will arise from the demolition works to be undertaken under the MP2 Project.

- Terminal 2 Building
- Terminal 2 Check in
- Terminal 5 Building
- Terminal 5 Check In
- Terminal 5 Sheds (3 no.)
- Terminal 5 Substations (2no.)
- Terminal 1 Car Check- In Booths
- Port Operations Centre building is to be demolished along with ancillary structures.

- The Pier Head, located at the terminus of Breakwater Road, which currently supports the Port Operations Centre, is to be demolished. This includes part of the 19th Century Eastern Breakwater which demarcated the end of Dublin Port in the Victorian era. The masonry units making up the facing of the Pier Head will be carefully removed and salvaged for relocation elsewhere on site for heritage gain projects and amenity value.
- Southern end of the Eastern Oil Jetty.

2. Construction Works

- Infilling of the basin at Oil Berth 4 with engineered fill material and suitable CDW arising from the proposed demolition works within the footprint of MP2 Project development area. The void between the existing Oil Berth 3 and the proposed new sheet pile wall will also be filled with engineered fill material. The quantity of fill material required is estimated to be approximately 145,000m^3.
- Backfilling of bridging structure in Berth 50A with engineered fill material and/or construction and demolition waste.
- General waste generated from the various construction works.

3. Operational Stage

- Operations at the proposed unified ferry terminal (UFT) which will facilitate Irish Ferries, Stena Line and P&O and extension to the existing container terminal.

17.7 Impact assessment

The predicted waste management impacts are assessed in accordance with Table 17-1– Table 17-3. Based on the MP2

Project proposals, the potential impacts associated with waste generation and management is considered for three distinct phases: Demolition Phase; Construction Phase; and Operation and Maintenance Phase.

1. Demolition Phase Potential Impacts

Waste materials will be generated as a result of demolition of existing buildings. The MP2 Project requires demolition of the following existing buildings in various states of repair:

- Terminal 2 Building;
- Terminal 5 Building;
- Terminal 5 Check In;
- Terminal 5 Sheds (3 no.);
- Terminal 1 Car Check In Booths;
- Port Operations Centre building is to be demolished along with ancillary structures;
- The Pier Head, located at the terminus of Breakwater Road, which currently supports the Port Operations Centre.
- Southern end of the Eastern Oil Jetty; and

- Internal roads and fences.

Waste arising from the demolition phase is typically made up of several sub-waste streams, which are often mixed, depending on the amount of selective demolition and separate collection that has taken place.

Demolition waste can also contain hazardous substances such as Asbestos Containing Materials (ACMs) that are present in buildings when demolished or renovated. The Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006 as amended (S.I. No. 386 of 2006) and The Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) provides the legislative backdrop to all aspects of asbestos control in construction. Any actions related to ACMs must be in accordance with these regulations.

It is estimated that there is 17,640 m^3 of material comprising concrete, bricks / blocks and steel from above ground demolition works.

Approximately 7,000m^3 of masonry units from the Pier Head, located at the terminus of Breakwater Road which currently supports the Port Operations Centre will be carefully removed and salvaged for relocation elsewhere on site.

There is the potential for large volumes of materials to be managed off-site. Poor management of demolished or excavated waste could lead to the required disposal to landfill of waste deemed unsuitable for reuse or recycling. Correct segregation, storage, handling and transport of all waste will be required to ensure there are no adverse effects on human health and that litter is not generated.

Table 17-8 Demolition phase impact assessment summary

Activities	Description and quantities	Potential significance of effect prior to mitigation
Demolition of buildings/ structures	Likely to be inert/non-hazardous waste arisings Quantities estimated to be demolished: • Buildings (7,900 m^3) • Concrete & inert (4,740 m^3) • Made ground (28,000 m^3) • Masonry (7,000 m^3) • Concrete (5,000 m^3)	Moderate or Large

2. Construction Phase Potential Impacts

CDW will arise from the construction phase. Typical waste materials arise from site management practices during the construction phase, for example, excess materials and packaging, over-ordering materials, off-cuts, damaged materials and poor storage during the construction phase. Typically, construction waste is 'cleaner' than demolition waste. Packaging waste makes up a significant part of this waste stream.

Construction waste can also include waste materials generated as a result of excavations, typically consisting of materials, for example, soil, made ground and existing foundations removed as a function of design or from excavations for new construction. Depending upon the previous use of the site, this may, or may not be contaminated.

The European Waste Codes (EWC) for typical waste materials that may possibly be generated during the construction phase are outlined in Table 17-9.

Table 17-9 Applicable list of waste (LoW) code

Waste Material	LoW
Soil, stone and dredged spoil	17 05
Bituminous mixtures, coal tar and tarred products	17 03
Concrete, bricks, tiles and ceramics	17 01
Metals	17 04
Waste hydraulic oils *	13 01
Wastes of liquid fuels *	13 07

** Denotes hazardous materials*

Correct segregation, storage, handling and transport of all waste will be required to ensure there are no adverse effects on human health and that litter is not generated.

The use of non-permitted waste contractors or unlicensed facilities could give rise to inappropriate management of waste and result in environmental impacts/pollution. It is essential that all waste materials are dealt with in accordance with regional policies and national legislation and that time and resources are dedicated to ensuring efficient waste management practices.

Fuels and hydraulic oils/lubricants that will be used during the construction phase are classed as hazardous. There will be fuels stored on site for machinery and construction vehicles along with oils and lubricants. Should any spillages, waste or surplus liquids be disposed of incorrectly it could cause serious harm to the surrounding environment.

There is the potential for significant quantities of materials to be deposited in landfill sites unless proper management plans are implemented.

If asbestos materials are not correctly identified, segregated and appropriately managed, there may be incorrect handling of the material which could have negative impacts on workers as well as environments both onsite and offsite.

Table 17-10 Construction phase impact assessment summary

Activities	Description and quantities	Potential significant of effect prior to mitigation
It is envisaged that there will be construction related waste generated from the various construction works which includes **Berth 52** Encompassing the proposed Berth 49 eastern dolphins within a new quay wall structure; New Ro-Ro jetty structure; New linkspan structure allowing two-tier access; Reinforced concrete bankseat **Berth 53**	Surplus construction materials including: • concrete, • metals, • plastic etc Waste packaging, wrapping, formwork etc Waste cabling, pipework, ductwork etc	Neutral or Slight

Activities	Description and quantities	Potential significant of effect prior to mitigation
New Ro-Ro jetty structure; 8 concrete mooring dolphins; New linkspan access and ramp structure; Concrete bankseat; Concrete access route to the dolphins **Berth 50A** New sheet pile combi-wall and sheet pile anchor wall; Bridging structure to avoid existing 220KV ESB cables and backfilling of structure; Steel piles to support crane rail extension; New reinforced concrete deck **Oil Berth 3** New sheet pile combi-wall; Infilling of Oil Berth 4; Sheet pile anchor wall; Steel piles to support crane rail extension; New concrete deck; New 2m high wall between Dublin Ferryport Container Terminal and Oil Berth **Quay Wall (Jetty Road)** Sheet pile combi-wall in front of existing Jetty Rd quay wall with fill material behind the new wall; Construction of a concrete capping beam and re-decking existing Jetty Rd		

3. Operation Phase Potential Impacts

Waste materials will also arise from the operational phase of the MP2 Project, these will typically be general waste materials generated from the terminal building operations and operating the port waste reception facilities.

Waste from the operational phase of the facilities will originate from a number of distinct sources, namely:

- Operational wastes generated on-board vessels arriving in Dublin Port including hazardous wastes (waste fuels and hydraulic oils/lubricants, bilge water, filters, WEEE) and non-hazardous wastes (residual waste, food waste, bulk waste). Other vessel wastes include cargo residues, sludge, ballast water, glass, paper, plastic packaging and metal packaging.
- Waste generated by terminal building staff and occasional contractors employed on the site, including food waste and office type waste. This waste, classed as commercial waste, is anticipated to be of a similar composition to household waste and will include, but not be limited to food wastes, paper, packaging, cardboard and plastics;
- Waste generated by members of the public in the passenger terminal building. It is anticipated that the majority of this waste would be food based waste and associated packaging materials and hence will be similar in nature to household waste;
- Wastes produced as a result of the activities on site. This will include for example waste cleaning and sanitisation materials, ground maintenance waste, waste chemicals and waste oils.

Potential wastes generated from materials handled at Dublin Port within the MP2 Project area will vary depending on trade requirements but the following is anticipated;

- Lo-Lo containers
- Ro-Ro containers
- Project cargoes such as wind turbine components, steel pipes etc.

The MP2 Project will provide greater capacity to cater for the large projected growth in port volumes (freight and passengers) by 2040; therefore it has been assumed that waste arisings will also increase.

Operational waste from vessels, if not properly managed, could potentially end up in the sea where the potential for contamination or pollution occurs.

Waste management at the port is currently operated to best practice guidance and in accordance with Dublin Port Ship's Waste Management Plan 2017. The potential impacts on the environment of improper, or lack of, waste management during the operational phase would be a diversion from the priorities of the waste hierarchy which would lead to significant volumes of waste being sent unnecessarily to landfill.

The use of non-permitted waste contractors or unlicensed facilities could give rise to inappropriate management of waste and result in negative environmental impacts of pollution.

In addition, if waste materials are not managed and stored correctly, it is likely to lead to litter or pollution issues within the site, on adjacent lands and in the sea. The knock-on effect of litter issues is the presence of vermin within the development and surrounding areas.

Table 17-11 Operation and maintenance phase impact assessment summary

Activities	Description and quantities	Potential significant of effect prior to mitigation
Potential increase in waste quantities currently produced during routine operation and maintenance of ships due to increased freight and passenger capacity. Mainly general waste, non-hazardous	Moderate increase in quantities of general waste which are managed for disposal using methods lower down the waste hierarchy such as landfill and incineration with energy recovery	Moderate

17.8 Mitigating measures

In order to mitigate against the potential impacts that the MP2 Project could have on the production of waste during each phase, mitigation measures will be put in place to ensure that all waste is dealt with in a sustainable and legislatively compliant manner. These measures are set out below for the various phases of the development.

A Construction Waste Management Plan (CWMP) forms part of the Construction Environmental Management Plan (CEMP) in order to minimise potential impacts associated with waste on the site.

17.8.1 Demolition Phase Mitigation Measures

Table 17-12 sets out the mitigation measures to be implemented in relation to the demolition phase.

Table 17-12 Demolition phase mitigation measures

Demolition Mitigation Measure	Description
Main Works Contractor	A Main Works Contractor (MWC) will be appointed. DPC and its appointed MWC will ensure that demolition wastes will be collected by an appropriately licensed waste management contractor and that all management routes comply with the European Union waste hierarchy of prevention, preparing for reuse, recycling, and recovery with disposal being the last and final option and with other legal requirements. All waste materials leaving the site will be transported and disposed or recovered through licenced operators and in accordance with national waste legislation.
Demolition survey	A Demolition Survey is required prior to any demolition work commencing. The Demolition Survey will set out all high value waste materials, such as metals, that will be removed from buildings and segregated for possible onward reuse or recycling to maximise recovery. The Demolition Survey will also include intrusive surveying with sampling which will identify the exact extent and location of any ACMs in the building. Removal offsite of any ACMs from the buildings to be demolished will be required prior to demolition.
Segregation & storage of demolition materials	Demolition debris will be separated into five waste streams on-site: • Construction debris (i.e. ceramics, tiles, plasterboard) • Masonry materials (i.e. brick, concrete blocks) • Metals • Timber • Universal waste (i.e. fluorescent bulbs, ballast and mercury containing switches) On-site segregation of all hazardous waste materials into appropriate categories: • Waste oils and fuels; • Paints, glues, adhesives and other known hazardous substances The storage and reuse of demolition or excavation wastes on site may be subject to a number of waste licensing requirements. If these wastes are to be stored on site, prior to potential reuse or recovery during construction, this activity will be subject to a Waste Management Licence Exemption with a limited tonnage of material permitted to be stored on site. Storage will take place in a secure area on-site and the contractor will monitor the amount of waste stored to ensure that the permitted limits of the Exemption are not exceeded. Dublin Port Company and its appointed contractor will consult with the EPA prior to construction to ensure that the appropriate Waste Management Licence or Exemption is in place.
Reuse of demolished material on site	In order to divert waste from landfill, possibilities for reuse of inert demolition material as fill on site will be considered, following appropriate testing to ensure materials are suitable for their proposed end purpose. The following areas will be infilled using engineered fill material and suitable CDW arising from demolition works within the footprint of the development: • Basin of Oil Berth 4 • Void between the existing Oil Berth 3 and the new sheet pile wall

Demolition Mitigation Measure	Description
	• Bridging structure in Berth 50A A waste permit will be required for the infilling of <50,000 tonnes of CDW into Oil Berth 4. CDW will be subject to treatment at the site prior to recovery in Oil Berth 4. It is anticipated that mobile plant may be installed to crush and screen suitable CDW. The operations will be as follows: • Loading; • Crushing and grinding; • Screening; • Unloading; • On-site off-site transfer of CDW; • Stockpiles; and • Recovery of waste into Oil Berth 4. A permit for the recovery operation will be required Masonry units from the 19th Century Eastern Breakwater which currently supports the Port Operations Centre are of architectural heritage importance and will be carefully removed and salvaged for relocation elsewhere on site for future heritage gain projects. The quantity of masonry units is estimated to be approximately 7,000 m^3. DPC and its appointed MWC will consult with the EPA prior to construction to ensure that the appropriate licences, permits and exemptions are in place prior to initiation.

17.8.2 Construction Phase Mitigation Measures

Table 17-13 sets out the mitigation measures to be implemented in relation to the construction phase.

Table 17-13 Construction phase mitigation measures

Construction Mitigation Measure	Description
Duty of care in relation to correct waste authorisations[2]	Contractors working on site during the works will be responsible for the collection, control and disposal of all wastes generated by the works. DPC and its appointed MWC will ensure that waste it is handled only by a body authorised under the Waste Management Act to manage it. This duty implies, at the very least, checking to see that the required authorisation is in place, has not expired and is appropriate for the waste types that are to be handled. DPC and its appointed MWC will ensure that all waste materials leaving the site will be transported via a licensed carrier and disposed or recovered through licenced operators and in accordance with national waste legislation. Monitoring and updating of records will be implemented.
On-site waste management	Project design will incorporate adequate dedicated space to cater for the segregation and storage of all various waste streams during construction. This waste storage compound is fully enclosed within the development and will allow for waste segregation, handling activities such as bailing of cardboard and plastic and sufficient waste storage. Site compounds are indicated in Chapter 3, Figure 3.37. Separate compounds will be used for different phases of the works. Each compound is located in or immediately adjacent to the relevant works phase, such as to cause minimal interference to general port operations. All waste materials will be stored in skips or other suitable receptacles in designated areas of the site. The waste storage area(s) will be assigned and all construction staff provided with training regarding the waste management procedures on commencement of the project. Ensuring adequate security measures are put in place
Segregation of materials	Construction waste materials shall be segregated on-site for recycling into the following categories: • Timber • Metal • Cardboard & paper • Glass • Rubble • General waste
Reuse of demolished material on site	In order to divert waste from landfill, where possible, inert demolition material will be reused as fill on site, following appropriate testing to ensure materials are suitable for their proposed end purpose.

[2] Section 32 of the Waste Management Act, which requires that waste passes only to an organisation that is authorised to undertake its collection or its recovery or disposal.

Construction Mitigation Measure	Description
	The following areas will be infilled using engineered fill material and suitable CDW arising from demolition works within the footprint of the development: • Basin of Oil Berth 4 • Void between the existing Oil Berth 3 and the new sheet pile wall • Bridging structure in Berth 50A A waste permit will be required for the infilling of <50,000 tonnes of CDW into Oil Berth 4. CDW will be subject to treatment at the site prior to recovery in Oil Berth 04. Mobile plant may be installed to crush and screen suitable CDW. The operations will be as follows: • Loading; • Crushing and grinding; • Screening; • Unloading; • On-site off-site transfer of CDW; • Stockpiles; and • Recovery of waste into Oil Berth 4. A permit for the recovery operation will be required. Masonry units from the 19th Century Eastern Breakwater which currently supports the Port Operations Centre are of architectural heritage importance and will be carefully removed and salvaged for relocation elsewhere on site for future heritage gain projects. The quantity of masonry units is estimated to be approximately 7,000 m^3 Dublin Port Company and its appointed contractor will consult with the EPA prior to construction to ensure that the appropriate authorisations are in place.
Construction Environmental Management Plan (CEMP)	Construction waste will be managed as part of the CWMP contained in the CEMP, which will be implemented by the appointed contractor for the duration of the construction works. As demonstrated in the draft CEMP, the CEMP will contain procedures for the management of waste and related pollution control measures. The CEMP will be a live document and will be subject to revision throughout the course of the construction phase but will contain all measures outlined in the draft CEMP appended to the EIAR. Specific waste management requirements include: • Identify how the waste will be dealt with (i.e. disposal, re-use on/off site etc.). • Building materials should be chosen with an aim to 'design out waste.' • Identify potential end markets e.g. reuse, recycling facilities, waste treatment facilities and disposal sites. • All waste leaving site will be recycled, recovered or reused where possible, with the exception of those waste streams for which appropriate facilities are currently not available. • On-site segregation of non-hazardous waste materials into appropriate categories, where possible, including any excavated soils, concrete, bricks, tiles, ceramics and plasterboard, metals and timber.

Construction Mitigation Measure	Description
	• On-site segregation of all hazardous waste materials into appropriate categories including contaminated soils, waste oil and fuels and paints, glues, adhesives and other known hazardous substances. • Control measures and attention to materials quantity requirements to avoid over-ordering and generation of waste materials. • Agreements with materials suppliers to reduce the amount of packaging or to participate in a packaging take-back Scheme. • Implement a 'just in time' materials delivery systems to avoid materials being stockpiled, which increases the risk of the damage and disposal as waste. • Segregation of waste at source where practical. • All waste materials will be stored in skips or other suitable receptacles in designated areas of the site. The waste storage area(s) will be assigned and all construction staff provided with training regarding the waste management procedures on commencement of the project. • Measures to ensure appropriate staff training and levels of awareness in relation to waste management. • Waste streams will be collected by an appropriately licensed and permitted private waste contractor, appointed by the contractor for recycling, recovery or disposal at suitably licensed facilities. • Provide a method to calculate the difference between expected waste quantities prior to commencement of the project and actual waste quantities after the project is complete. • The appointed contractors for the site preparation, piling, earthworks and construction phases of the works will be contractually obliged to follow the CEMP and all relevant legislation.
Project Construction & Demolition Waste Management Plan	A Project C&D Waste Management Plan will be prepared in accordance with Dublin City Council's 'Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects.' A draft plan has been incorporated into the CEMP to ensure effective waste management and recycling of waste generated during the works. The Plan will be implemented from the outset of the project and throughout the duration of the project taking into consideration the waste management hierarchy to encourage sustainable development, environmental protection and optimum use of resources. The appointed contractors for the site preparation, piling, earthworks and construction phases of the works will be contractually obliged to follow the Project C&D Waste Management Plan and all relevant legislation.
Waste Arising from Wash Down Facility	Solid waste in the form of sediments will arise from the wheel wash unit settlement tank. The unit will be inspected daily (for example, to check automated features are working and settlement content) and emptied in accordance with manufacturer's instructions. The solid residues will be analysed and the disposal route appropriately selected based on the results of this analysis. A gully emptier tanker will be used to remove settlement tank waste which will be disposed of at an approved waste disposal site.
Fuels and hydraulic oils/lubricants	Contractors will ensure all plant is inspected and serviced in accordance with its schedule. A bunded disposal area will be provided. Contractors will provide staff training on the waste management strategy. Disposal/recovery under licence.

17.8.3 Operation and Maintenance Phase Mitigation Measures

Table 17-14 sets out the mitigation measures to be implemented prior to the operational phase. These will be reviewed on an ongoing basis as part of DPC's environmental management system.

Table 17-14 Operation and maintenance phase mitigation measures

Operational Mitigation Measure	Description
Waste Management Plan	The current *Dublin Port Ship's Waste Management Plan* (WMP) underpins all waste related operations at Dublin Port. DPC will continue to review and implement any required changes in the waste management plan in order to avoid and minimise the potential effects of vessel generated wastes once the unified ferry terminal and expanded DFT container terminal are operational. DPC will continue to provide adequate reception facilities and remove, as far as is practicable, any disincentives to landing waste in the port. DPC will continue to encourage the responsible management of waste, including minimisation and recycling, at the point of generation on ships, reception in ports/harbours, transportation and disposal, and ensure that port and harbour employees and users dispose of wastes responsibly in facilities provided. The WMP will continuously evolve to effectively capture materials generated to help ensure that recyclable materials are handled and diverted accordingly. Developing a clear WMP that incorporates a customer-facing recycling and organics collection program will help divert most materials from landfill. The revised WMP will include the following specific requirements: • It is important that waste arisings from the daily operations at the Port are managed appropriately in line with the waste management hierarchy in order to achieve good recycling performance and high landfill diversion. The Port will continue be managed in an environmentally responsible manner and in accordance with best practice. • On-site segregation of waste materials into appropriate categories. Appropriate separation of waste needs to occur in public (front of house) and operational (back of house) areas. In addition to recyclable items such as paper and drinks bottles, separation of food and food contaminated packaging and consumable items for composting will be implemented. Additional opportunities exist for further reuse and recycling streams, as well as the requirement for more specialist streams (for example, electrical items, hazardous materials). • Appropriate receptacles and recycling bins will be clearly labelled for the collection and segregation of each of these waste materials and will be provided throughout the development and open space areas, as appropriate. Wastes will be stored in these receptacles in a designated, easily accessible area of the site until collection by an appropriately licensed waste management contractor. • All waste types and amounts will be recorded and reviewed at regular intervals, to allow for continuous analysis and review of procedures that will be made to reduce waste to landfill, increase the percentage of recycling and reduce waste overall as much as possible. • All wastes generated will be managed in accordance with appropriate waste management legislation and policy, and will be transported and recovered / disposed of by licensed waste management contractors. • In order to ensure that these operations are carried out effectively, all staff, including those carrying out maintenance work on the buildings, will be required to receive training as part of their induction to the site including: instructions on the appropriate segregation, handling, recycling and reuse methods to be employed by all parties on-site for wastes generated. Furthermore the waste management strategy and relevant environmental

Operational Mitigation Measure	Description
	procedures will be communicated to staff, contractors and suppliers and it will be a requirement that supplies and contractors promote the adoption of environmentally sound practices.
On-site waste management	The MP2 Project design incorporates adequate dedicated space to cater for the segregation and storage of all various waste streams within the unified terminal building. This bin storage area will allow for waste segregation, handling activities such as bailing of cardboard and plastic and sufficient waste storage. All staff will be provided with training regarding the waste management procedures.
Environmental Management System	DPC will continue to implement its Environmental Policy and update its Environmental Management System for the development consistent with best practice.

17.9 Monitoring

All waste types and amounts generated will be recorded and reviewed at regular intervals, to allow for continuous analysis and review of procedures that will be made to reduce waste to landfill, increase the percentage of recycling and reduce waste overall as much as possible.

Waste storage will take place in a secure area on-site and the contractor will monitor the amount of waste stored to ensure that the permitted limits of any Exemption are not exceeded. The CEMP will set out measures and procedures to monitor waste flows on site and update records.

The contractor will appoint an Environmental Co-ordinator. The Environmental Co-ordinator will be trained in how to set up and maintain a record keeping system, how to perform, audit and how to establish targets for waste management on site. They will also be trained in the best method for segregation and storage of recyclable materials, have information on the materials that can be reused on-site and implement the Project C&D Waste Management Plan. Waste storage will take place in a secure area on-site and the contractor will monitor the amount of waste stored to ensure that the permitted limits of the Exemption are not exceeded.

Training of staff on site is the responsibility of the Environmental Co-ordinator and as such, a waste training programme will be organised. A basic awareness course will be held for all crew to outline the CWMP and to detail the segregation of waste at source. This may be incorporated with other training needs (e.g. general site induction, safety training etc.). This basic course will describe the materials to be segregated, the storage methods and the location of waste storage areas. A subsection on hazardous wastes will be incorporated and the particular dangers of each hazardous waste will be explained.

Records will be kept for each waste material which leaves the site, whether for reuse on another site, recovery, recycling or disposal.

A system will be put in place to record the waste arising on site during demolition and construction phases. The Environmental Co-ordinator will record the following:

- Waste taken off-site for reuse
- Waste taken off-site for recovery
- Waste taken off-site for recycling
- Waste taken off-site for disposal

For each movement of waste off-site a signed waste collection docket will be obtained by the Environmental Co-ordinator from the contractor. This will be carried out for each material type. This system will also be linked with the delivery records. A signed waste acceptance docket will be issued for each movement of waste on-site.

If waste movements are not accounted for, the reasons for this should be established in order to see if and why the record keeping system has not been maintained. Each material type will be examined in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how waste can be minimized.

The appointed Environmental Co-ordinator will be responsible for conducting a waste audit at the site during the C&D phase of the development. A review of all records for waste generated and transported off-site, should be undertaken mid-way through the C&D phase.

Upon completion of the C&D phase a final report will be prepared summarising the outcomes of waste management processes adopted and the total recycling / reuse / recovery figures for the development.

17.10 Cumulative Impacts

There are no anticipated cumulative impacts associated with waste management predicted as a result of the MP2 Project. There are a range of suitable permitted waste sites with capacity to accommodate waste arisings from the MP2 Project.

17.11 Residual impacts

17.11.1 Demolition and Construction Phases

A carefully phased approach to the demolition phase in line with the construction phase may facilitate treatment on site prior to recovery in Oil Berth 4. This would facilitate less waste requiring management off-site and as these materials would be a substitute for virgin aggregates and/or engineered fill material, would be a more sustainable use of resources.

Should the phasing of the works not facilitate the recovery of CDW within Oil Berth 4 then management routes for the material will be sought, with the worst case scenario being that this material is deposited in a landfill. There is available capacity within the existing waste management infrastructure in the Region to manage CDW from the MP2 Project works. Therefore the effect is deemed as **slight or moderate** dependant on whether the material is used as fill for Oil Berth 4 or not.

17.11.2 Construction Phase

Adherence to the CEMP and C&D Waste Management Plan during construction phase will ensure that waste arisings are minimised and any waste arisings produced during this phase will be recycled or recovered where possible. There is significant available capacity within the existing waste management infrastructure in the Region to manage CDW from the MP2 Project construction works. Therefore the effect of the construction phase in relation to waste management is deemed as **neutral**.

17.11.3 Operational Phase

While there may be a minor increase in waste arisings due to anticipated increased usage of the unified passenger terminal, there will be no discernible effects to waste management once operational due to recycling and reuse policies, procedures and the implementation of the Waste Management Plan. There is capacity within the existing waste management infrastructure to manage waste arising from the operational phase of the development works. Therefore the effect of the operational phase in relation to waste management is deemed as **neutral**.

Table 17-15 Summary of residual impacts

	Receptor	Predicted Effect	Adverse/ Beneficial	Permanent/ Temporary	Mitigation Measures	Residual Effect
Demolition Phase	Environment	Moderate or Large	Adverse	Temporary	See section 17.2.8.1	Slight or Moderate
Construction Phase	Environment	Neutral or Slight	Adverse	Temporary	See section 17.2.8.2	Neutral
Operational Phase	Environment	Moderate	Adverse	Permanent	See section 17.2.8.3	Neutral

17.12 Conclusions

The MP2 Project will generate construction related waste and once operational the extended capacity at the port will facilitate an increased number of berthing opportunities and the likelihood of increased waste arising associated with the additional port capacity during the operational phase.

In terms of the overall impact of the construction stage, a carefully planned approach to waste management and adherence to the Construction Environmental Management Plan (CEMP) and Construction & Demolition (C&D) Waste Management Plan during the construction phase will ensure that waste arisings are minimised and any waste arisings produced during this phase will be recycled or recovered where possible. DPC and the appointed Main Works Contractor (MWC) will be responsible for the collection, control and disposal of all wastes generated by the works and to meet all legal requirements. All wastes will be managed off site under the principles of the waste management hierarchy. There is available capacity within the existing waste management infrastructure in the Region to manage C&D Waste from the MP2 Project. Therefore the effect of the construction phase in relation to waste management is deemed as neutral.

DPC currently operates a port waste management plan 'Dublin Port Ship's Waste Management Plan' 2017. The Waste Management Plan underpins all waste related operations at Dublin Port.

DPC will continue to review and implement any required changes in this Waste Management Plan in order to avoid and minimise the potential effects of vessel generated wastes once operational. DPC will continue to provide adequate reception facilities and remove, as far as is practicable, any disincentives to landing waste in the port. DPC will continue to encourage the responsible management of waste, including minimisation and recycling, at the point of generation on ships, reception in ports/harbours, transportation and disposal, and ensure that port and harbour employees and users dispose of wastes responsibly in facilities provided. While there may be a minor increase in waste arisings due to anticipated increased usage of the Unified Ferry Terminal, there will be no discernible effects to waste management once operational due to recycling and reuse policies, procedures and the implementation of the Waste Management Plan. There is capacity within the existing waste management infrastructure to manage waste arising from the operational phase of the development works. Therefore the effect of the operational phase in relation to waste management is deemed as neutral.

18 CUMULATIVE EFFECTS & ENVIRONMENTAL INTERACTIONS

This chapter presents summaries of the assessment of cumulative effects and also the environmental interactions which have been examined and analysed within the individual technical assessment chapters (Chapters 7 – 17).

18.1 Cumulative Effects

This section summarises the potential for cumulative effects arising from the MP2 Project in association with other developments. Cumulative effects address the long-term changes that may result from the construction and operation of the proposed development and the combined effect of this development with other developments in the area.

Cumulative assessment is undertaken to ensure that the combined effects of the proposed development and other influences are assessed together, and not as individual aspects of the environmental assessment.

Cumulative effects are defined as changes to the environment that are caused by an action in combination with other actions, arising from:

- the interaction between all of the different (existing and/or approved) Projects in the same area; as required by Annex IV, point 5 (e) of the EIA Directive;
- the interaction between the various impacts within a single Project.

The MP2 Project is a discrete project within the overall Masterplan 2040 (the ABR Project). This is assessed as a distinct project for the purposes of this cumulative assessment. The cumulative effects of all consented aspects of the Masterplan has been taken into consideration. All future phases of the Masterplan 2040 have also been considered as far as practically possible. The overall Masterplan has been subject to Strategic Environmental Assessment (SEA).

The EU Guidance on the preparation of the Environmental Impact Assessment Report guidance states that it is important to consider effects, not in isolation, but cumulatively, as this may show that individually analysed impacts can become significant when they are added together, or with, other effects.

The coexistence of impacts may increase or decrease their combined impact. Impacts that are considered to be insignificant, when assessed individually, may become significant when combined with other impacts.

Cumulative effects can occur at different temporal and spatial scales. The spatial scale can be local, regional or global, while the frequency or temporal scale includes past, present and future impacts on a specific environment or region.

The methodology for selecting the relevant projects (as listed in Chapter 3 – Section 3.7) is presented in Section 18.1.1.

The experts leading each of the technical assessments (as presented in Chapters 7 to 17), have defined significance thresholds and criteria for the cumulative effects assessment, using professional judgement and consideration of the relevant standards and guidelines via a collaborative approach, involving all the interested parties in the process of data collection and analysis, to determine whether in-combination effects gives rise to additional levels of significance.

The overall summary of the assessment of the likely cumulative effects, and interactions, between the MP2 Project and other projects in the vicinity of Dublin Port is presented in Section 18.1.2, along with appropriate mitigation measures to address any identified cumulative effects.

18.1.1 Methodology

The following guidelines and publications were considered when determining the other projects to be considered for their potential to generate cumulative effects with the MP2 Project.

- European Commission (EC) Guidelines for the Assessment of Indirect and Cumulative Impacts (1999);
- European Commission (EC) Guidance on the preparation of the Environmental Impact Assessment Report (2017); and
- Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2017).
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, 2018.
- UK Planning Inspectorate (PINS) Advice Note 17: Cumulative effects assessment relevant to national significant infrastructure projects. Version 1, 2015.

The different developments considered as part of this cumulative assessment were identified through a desk study that identified developments, in close proximity to the MP2 Project and with the potential to interact with it.

The resulting selected developments, listed in

Figure 18-1 Shortlisted Projects within the MP2 Application Area (DCC Planning Portal)

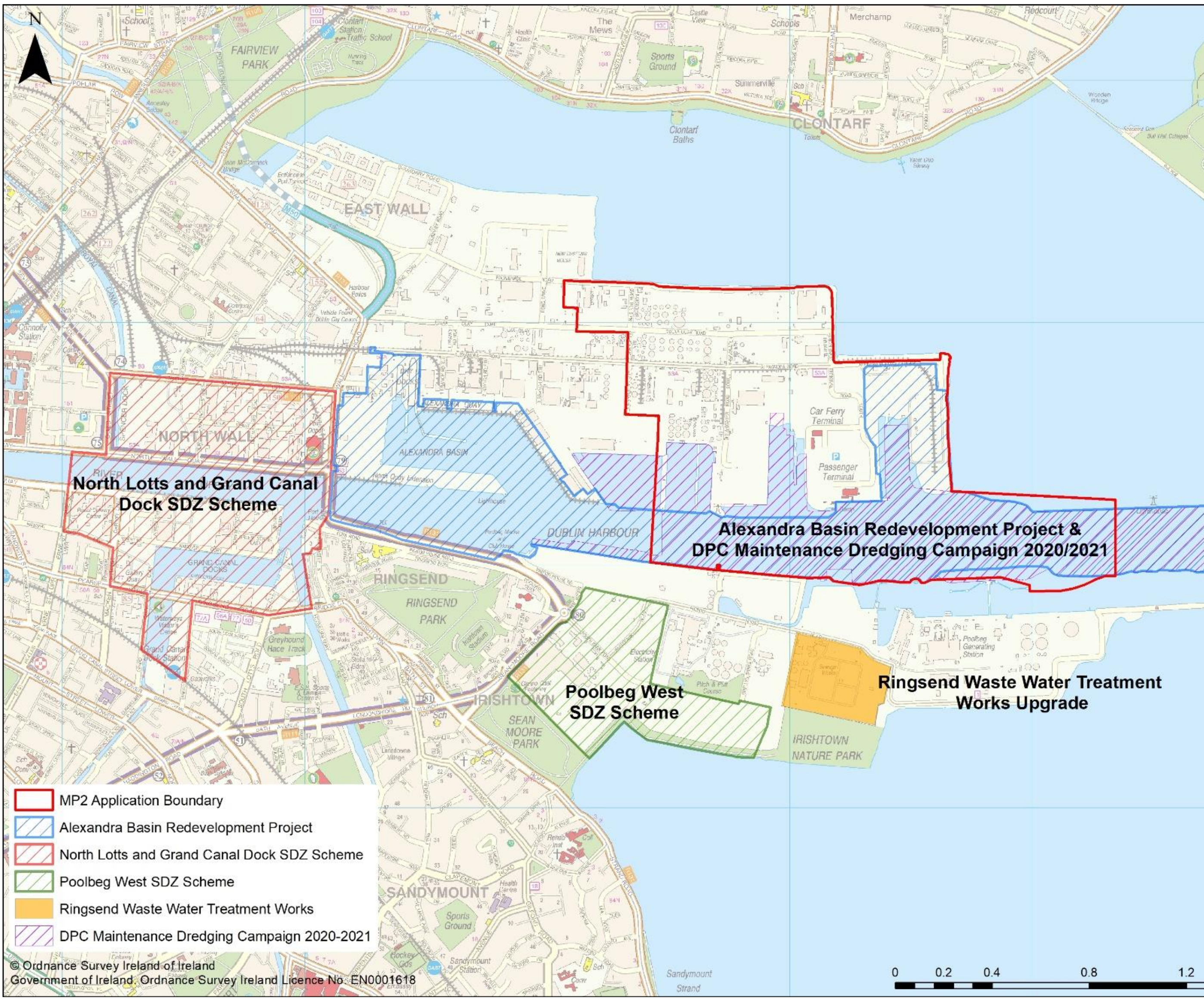


Figure 18-2 Other Shortlisted projects surrounding the MP2 Application Boundary

Table 18-2 comprise of:

- projects within Dublin Port that are listed on the local planning authority website.
- ongoing projects within the Dublin Port area; and
- planned future DPC projects that client and project staff are aware off;

The period up to the end of June 2019 was considered for the purposes of identifying existing and/or approved projects.

18.1.1.1 Stage 1 - Identification of "Existing and/or Approved Projects"

The first stage in determining cumulative effects entailed the identification of a long list of projects in the locality that exist or have been approved. Existing and/or approved projects have the potential to have an impact in combination with the MP2 Project based on available information. This stage involved a desktop study to review all existing and/or approved projects that are located in close proximity to the MP2 Project and, those that fall outside of the MP2 application boundary but still have the potential to interact with the MP2 Project.

This review was carried out using the local authority planning web portals, relevant DPC frameworks including the DPC Masterplan 2040 and any other sources to identify other projects that have the potential to interact with the MP2 Project.

Once the long list was established, a "Tier 1 or 2" rating was assigned to each project to indicate the level of certainty associated with its implementation. Table 18-1 shows the classification of Tier 1 and Tier 2 projects. This table was derived from the Planning Inspectorate Advice Note 17 (2015).

Table 18-1 Tier 1 and Tier 2 Classification for Existing and/or Approved Projects

Tier	Planning Stage	Decreasing level of detail likely to be available
1	Currently under construction or construction complete.	
	Planning Permission Granted but permitted application(s) not yet implemented	
	Planning Application(s) submitted but not yet determined by planning authority	
2	Identified in relevant Development Plan (and emerging Development Plans – with appropriate weight being given as they move close to adoption) recognising that much information on any relevant proposals will be limited	
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.	

The long list was then scrutinised to identify which of the projects fell within the MP2 Project zone of influence, which, for the purposes of this assessment, were those projects within the greater Dublin Port area.

The spatial extent of each planning application boundary was assessed in relation to the MP2 application boundary using GIS Analysis. This analysis determined whether the different projects fell within or outside the MP2 application boundary. This determination was used to screen out projects where there was no spatial overlap with the MP2 Project or where no source-pathway-receptor linkage was considered likely. This derived a "short list" of potentially applicable projects for further assessment during Stage 2 of the process.

18.1.1.2 Stage 2 – Shortlisting

Stage 2 of this assessment involved applying inclusion or exclusion criteria to the list of existing and/or approved projects to determine whether they had any potential to give rise to cumulative effects with respect to the following criteria:

- Temporal Scope – is there any temporal overlap and potential for interaction between the MP2 Project due to the relative construction operation and decommissioning programmes of other projects?
- Scale and Nature of the other existing and/or approved projects - Due to the scale and nature of the other projects, are they likely to interact with the MP2 Project to result in a cumulative effect? Statutory definitions of major development and EIA screening thresholds were considered in determining issues of scale.
- Other Factors - such as the nature and/or capacity of the receiving environment, that would make significant cumulative effects with 'other developments' more or less likely. A source-pathway-receptor approach was used to inform the assessment of other factors.

The identification and short list process is documented in Appendix 18.1. Professional judgement and consultation with chapter authors was used in applying theses thresholds. The reasons for excluding any development from further consideration is recorded. If the potential for any existing and/or approved project to give rise to significant cumulative effects was identified, those were taken forward to Stage 3 of the process.

18.1.1.3 Stage 3 – Information Gathering and Assessment of Cumulative Effects

For the shortlisted developments, all available information was compiled to inform the assessment of cumulative effects. The relevant data was sourced from websites of the relevant planning authorities (An Bord Pleanála / Dublin City Council/Fingal Council Council) and included information such as:

- The design and location of the existing and/or approved project;
- The proposed programme of construction, operation and decommissioning (if applicable);
- Compilation and review of relevant environmental assessments and planner reports that set out baseline data and effects arising from the other developments and;
- A review of the mitigation measures that will be applied to the MP2 Project to ensure they are sufficient to remove any cumulative effects when considered in combination with the other developments.

Information was limited for two sites; The Storecon Yard and the Crosbies Yard permitted under Planning Order SI57 of 2019. These gaps were acknowledged within the assessment and the associated uncertainly documented.

When determining the significance of the cumulative effects of the MP2 Project and other existing and/or approved projects, consideration was given to the following factors:

- The Spatial and Temporal interactions between the MP2 Project and other projects;
- Identification of potential of cumulative effects by environmental topics and establish if a potential linkage exists using the source-pathway-receptor model;

- The type and duration of the impact - will it be temporary or permanent;
- The value and resilience if the receptor affected; and
- Mitigation measures that will be employed and the likelihood of their success.

18.1.2 Assessment of Cumulative Effects

18.1.2.1 Stage 1 & 2 Identification and shortlisting of existing and/or approved projects

The identification and short list process is documented in Appendix 18.1. This process included a review of all successful applications for permission within the greater Dublin Port area since 2004 using planning application spatial data downloaded from data.gov.ie.

Many of the successful applications prior to 2013 were discounted from this assessment on the basis that construction has already occurred and any impacts have already been taken into account as baseline data used to assess the MP2 Project. Appendix 18-1 contains the list of successful planning applications considered, details of each planning proposal and it's current status. The reasons for excluding any existing or approved projects from further consideration is also documented.

18.1.2.2 Stage 3 Information Gathering and Assessment of Cumulative Effects

Figure 18-1 and Figure 18-2 illustrate the shortlisted developments that have been brought forward to Stage 3 for further assessments.

Figure 18-1 Shortlisted Projects within the MP2 Application Area (DCC Planning Portal)

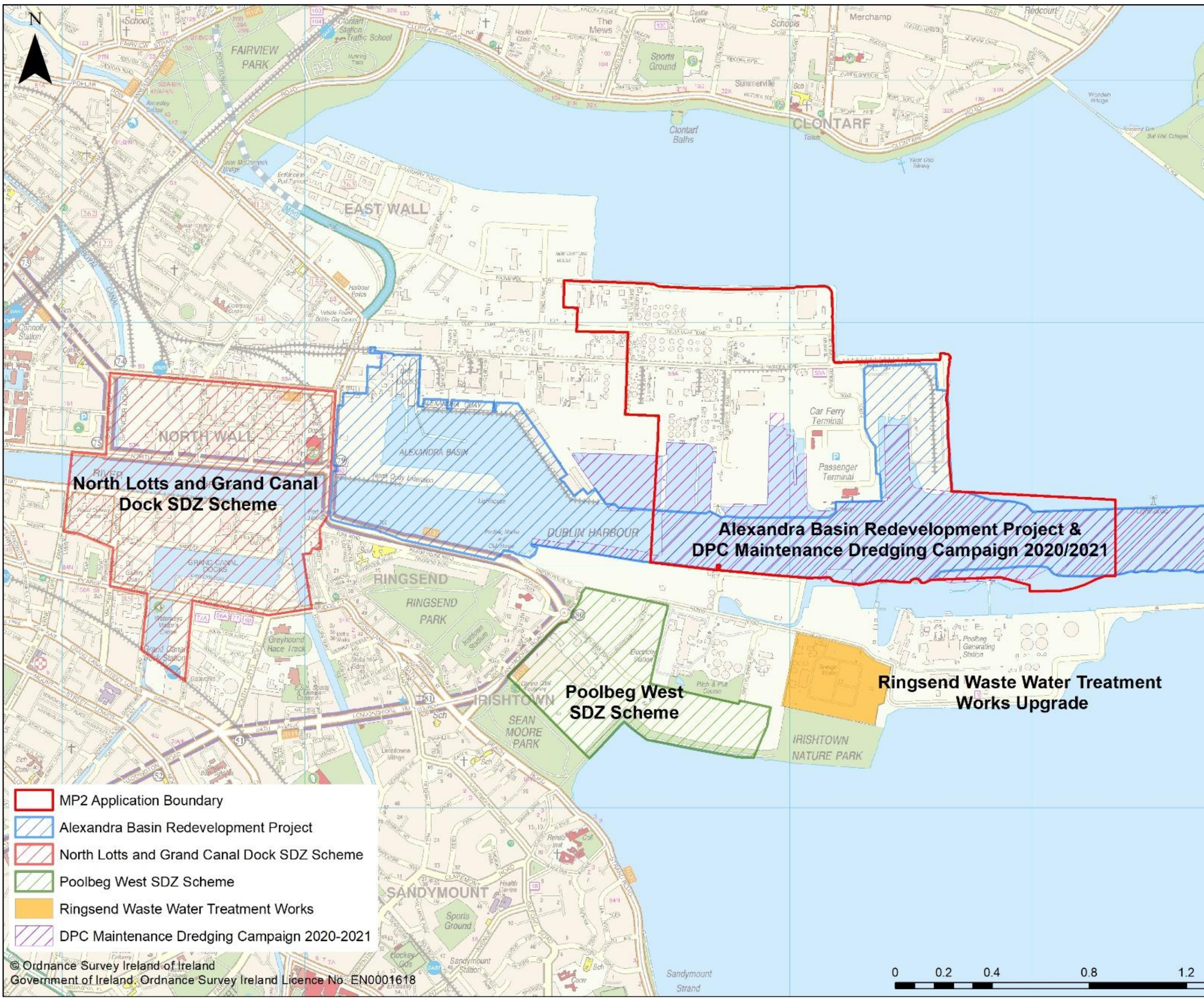


Figure 18-2 Other Shortlisted projects surrounding the MP2 Application Boundary

Table 18-2 shows a matrix of the shortlisted projects and environmental topics where the potential for cumulative effects exist.

Table 18-3 provides a brief description of each planning proposal, information on the potential effect on the receiving receptor when considered in combination with the MP2 Project and highlights the mitigation measures that have been employed to reduce any significant cumulative effects (such as temporal mitigations if any).

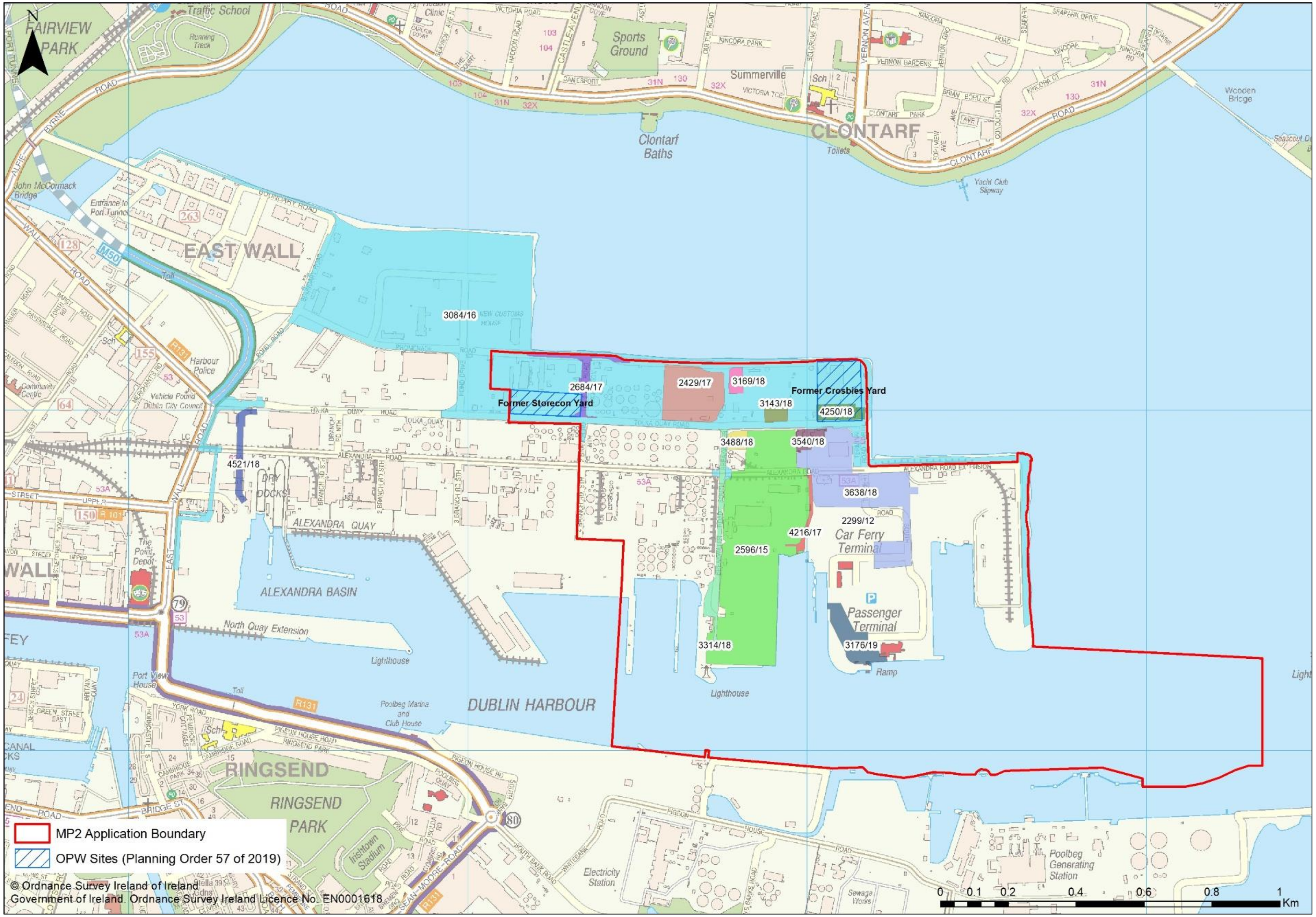


Figure 18-1 Shortlisted Projects within the MP2 Application Area (DCC Planning Portal)

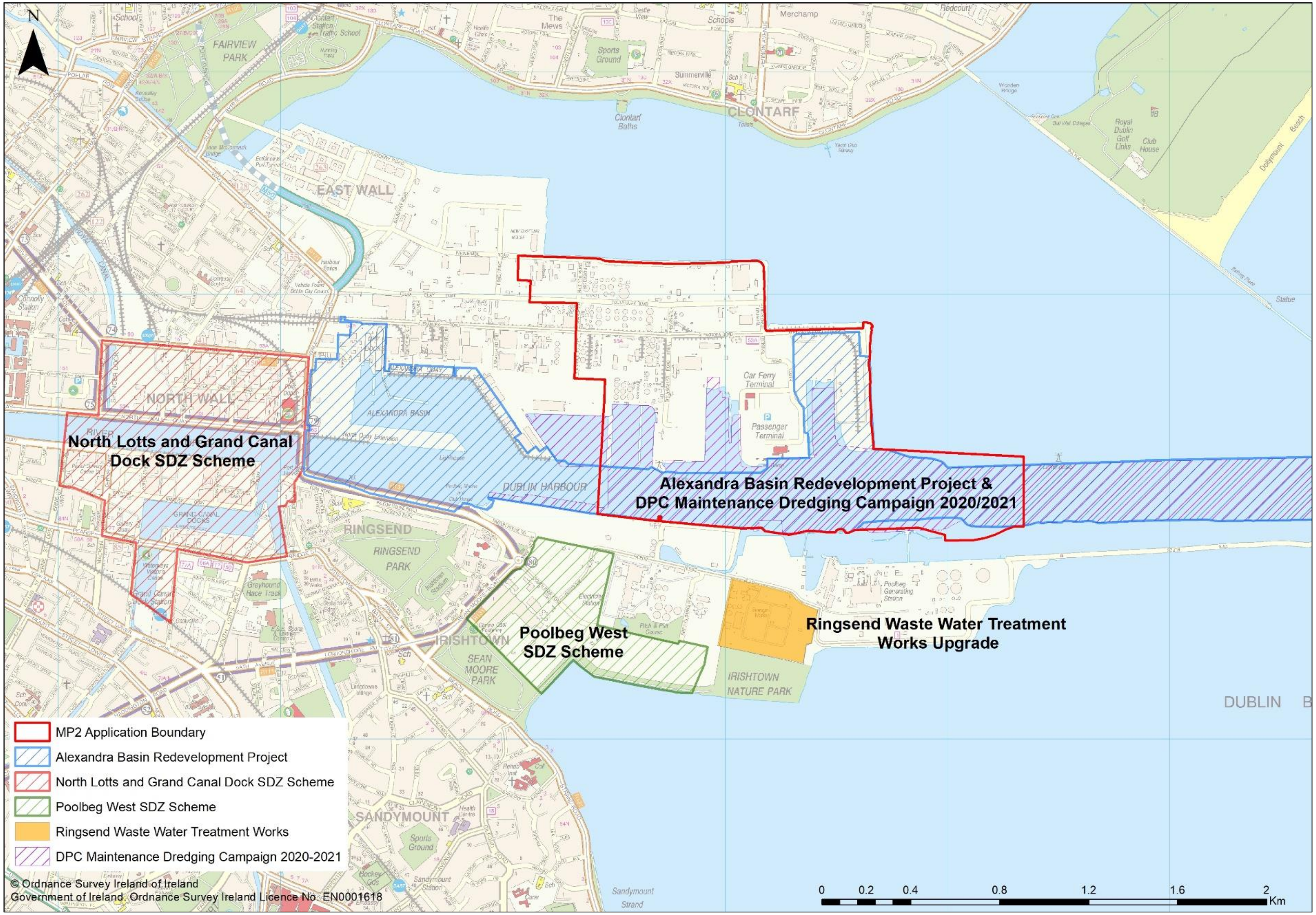


Figure 18-2 Other Shortlisted projects surrounding the MP2 Application Boundary

Table 18-2 Summary Matrix showing potential cumulative effects by environmental topic between the MP2 Project and other existing and/or approved projects in the vicinity of Dublin Port

	Biodiversity Flora & Fauna	Soil, Geology, Hydrogeology	Water Quality & Flooding	Air & Climate	Noise & Vibration	Coastal Processes	Traffic & Transport	Archaeology & Cultural Heritage	Landscape & Visual	Waste
In-port projects										
Alexandra Basin Redevelopment (ABR) – ABP Reg. Ref. PL29N.PA0034	✓		✓							
Vehicular and Pedestrian Entrances off Breakwater Road South – Reg. Ref. 2596/15	✓						✓			
Dublin Port Internal Road Network – Reg. Ref. 3084/16 and 2684/17.	✓						✓		✓	
Demolition of Buildings and Provision of Yard – Reg. Ref. 2429/17	✓									
Floating Dock Section Reg. Ref. 4216/17	✓									
Vehicle Service/Maintenance Facility and Office Accommodation – Reg. Ref. 3143/18	✓									
Dublin Ferry port Terminal Access – Reg. Ref. 3314/18	✓						✓			
Demolition of Calor Offices and Provision of Yard – Reg. Ref. 3540/18	✓									
Asahi Demolition and Provision of Yard – Reg. Ref. 3488/18	✓									
Interim Unified Passenger Terminal – Reg. Ref. 3638/18	✓						✓			
Yard Upgrade – Reg. Ref 3269/18	✓						✓			

	Biodiversity Flora & Fauna	Soil, Geology, Hydrogeology	Water Quality & Flooding	Air & Climate	Noise & Vibration	Coastal Processes	Traffic & Transport	Archaeology & Cultural Heritage	Landscape & Visual	Waste
ESB Substation Demolition and Construction – Reg Ref 4250/18	✓		✓							
Terminal 4 Bridge Alexandra Road, (Reg. Ref. 4521/18)							✓			
Berth 49 Approach and Ramp. Reg. Ref 3176/19							✓		✓	
Former Crosbies Yard & Storecon Yard (Planning Order 57 of 2019)	✓						✓			
DPC Post 2019/2021 Maintenance Dredging Campaign (Subject to Dumping at Sea Licence)	✓									
Dublin Inland Port - Reg Ref. F18A/0139							✓			
Projects in the area Surrounding Dublin Port										
North Lotts & Grand Canal Dock Planning Scheme 2014- BP Ref. PL29N.ZD2011							✓			
Exo Building – Reg. Ref. DSDZ3632/15, DSDZ3686/16, DSDZ3776/17							✓			
Poolbeg West SDZ. BP Ref. PL29N.ZD2013			✓				✓			
Irish Water – Ringsend WwTP –Upgrade Project BP Ref. PL29S.301798	✓		✓	✓	✓	✓				
The Howth Yacht Club Marina Extension	✓		✓		✓					✓

✓ Potential for interaction between the MP2 Project and existing and/or approved projects

Note: The following projects have been included in Chapter 3 and have been discounted from Stage 3 further assessment:

- Ship to Shore Gantry (Reg Ref 3140/14). A cumulative assessment was undertaken for the ship to Shore Gantry in combination with the MP2 Project. As described in Appendix 18-1 this project was discounted at Stage 2 on the basis that works are now complete and have been considered as part of baseline data collated as part of this EIAR. It is unlikely that this development will generate cumulative impacts during its operation when considered in-combination with the construction and operation of the MP2 Project.
- Pigeon House Road – Hammond Lane (Reg Ref 2130/18). A cumulative assessment was undertaken for the site development works at Hammond Lane in combination with the MP2 Project. As described in Appendix 18-1 this project was discounted at Stage 1 on the basis that the development is located within the Dublin Port Area but is situated outside of the MP2 application boundary on the south side of the River Liffey. Due to the nature of this planning proposal and distance away from the MP2 application boundary, it is unlikely to generate cumulative impacts when considered with in combination with the MP2 Project.
- Cruise Ship Turnaround Facilities (Reg Ref 4507/18). A cumulative assessment was undertaken for the Cruise Ship Turnaround Facilities in combination with the MP2 Project. As described in Appendix 18-1 this project was discounted on the basis that works are complete and have been considered as part of baseline data collated as part of this EIAR. It is unlikely that this development will generate cumulative impacts during its operation when considered in-combination with the construction and operation of the MP2 Project.
- Berth 47A, Pigeon House Road (Reg Ref 3711/18). Planning permission for this development has not been granted. A cumulative assessment assuming that planning permission is granted and a temporal overlap in construction occurs. As described in Appendix 18-1 this project was discounted at Stage 2 on the basis that the development is located within the Dublin Port Area but is situated outside of the MP2 application boundary on the south side of the River Liffey. Due to the nature of this Berth 47A planning proposal and distance away from the MP2 application boundary, it is unlikely to generate cumulative impacts when considered with in combination with the MP2 Project.

Table 18-3 Description of potential cumulative effect between the MP2 Project and existing and/or approved projects within Dublin Port

Chapter	Cumulative Interaction
Alexandra Basin Redevelopment (ABR) – ABP Reg. BP. Ref. PL29N.PA0034	**<u>Project Description</u>** DPC was granted planning permission subject to conditions (ABP Reg. Ref. PL29N.PA0034) in July 2015 for the redevelopment of Alexandra Basin, Berths 52 and 53 and dredging of the channel of the River Liffey together with associated works in Dublin Port. Elements of the proposed development can be summarised as follows: *Alexandra Basin West:* • The infilling of graving Dock No. 2 having an area of 6,055sq.m; • The excavation and restoration of historic Graving Dock No. 1; • The demolition of the bulk jetty having an area of 3,200sq.m; • A section of North Wall Quay extension having an area of 21,700sq.m; • Extension of Alexandra Quay West of 130m in length; • New 273 m long Ro-Ro jetty and provision of three Ro-Ro ramps; and • the dredging of: 470, 000sq.m of contaminated material to a depth of -10.0m Chart Datum (CD) over an area of 194,000sq.m within the redeveloped Alexandra Basin and its remediation. *Berth 52 and 53:* • The demolition of existing berths 52 and 53; • Jetty at Berth 52 having an area of 500sq.m; • Concrete Dolphin at Berth 53 having an area of 500sq.m; • The construction of: A new river berth at Berths 52/53, 300m long; New 75 m mooring jetty at new river berth; New 40 m long mooring jetty to extend existing berth 49, 50m long; • The infilling of the Terminal 5 Ro-Ro basin, an area of 45,650sq.m; Raising of existing levels by 1.4 m over an area of 95,000sq.m; and Dredging of new river berth to -10.0m CD. *Liffey Channel:*

Chapter	Cumulative Interaction
	• Construction of a marina protection structure to a height of +7.0m CD and a length of 220m on the south side of the river channel. • Dredging of the shipping channel to a depth of -10m CD from a point 55m to the east of the East link bridge, to a location in the vicinity of Dublin Bay, a total distance of 10,320m. The ABR Project is now being implemented by DPC. **Potential Cumulative Effects** Potential cumulative effects associated with the MP2 Project in combination with the ABR Project are: • Cumulative effects on Water Quality as a result of dredging and disposal of sediments in the offshore disposal site. • Cumulative effects on the Biodiversity through habitat deterioration, noise and visual disturbance. Cumulative effects on Water Quality: As highlighted in Chapter 9, both the ABR and MP2 Project are part of Dublin Port Company's Masterplan and have been planned and designed as part of a structured and integrated development programme that considers environmental impact and cumulative effects. The most relevant element of the ABR Project in considering potential cumulative impacts on water quality is the capital dredging. Capital Dredging will occur in both the ABR Project and the MP2 Project in the same water body (Liffey Estuary Lower) and spoil dumping will use the same licensed dumping site in Dublin Bay. Dublin Port Company will implement mitigation through scheduling for avoidance of overlap of dredging activity in both of these projects. This temporal separation will mitigate cumulative effects. Extensive mitigation measure as described in the ABR Environmental Statement and MP2 Project EIAR will be implemented during the dredging campaigns in both projects. On the basis of scheduling of works applied as a mitigation of cumulative impact, and with the implementation of comprehensive mitigation measures, it is concluded that no residual cumulative effects will occur. Cumulative effects on Biodiversity The most relevant element of the ABR Project in considering potential cumulative impacts on Biodiversity is the capital dredging operations. Dredging and disposal operations included in both the ABR and MP2 Projects will occur within the same water

Chapter	Cumulative Interaction
	body. Dredging and disposal operations have the potential to impact on Water Quality leading to an impact on Biodiversity through potential habitat deterioration as well as noise and visual disturbance. Water Quality & Habitat Deterioration: As highlighted above, the dredging and disposal of material at sea for the MP2 Project is proposed to occur sequentially after that for the ABR Project, and not concurrently. This temporal separation will mitigate cumulative effects. In addition Dublin Port Company will implement mitigation through scheduling for avoidance of overlap of dredging activity in both of these projects. Extensive mitigation measure as described in the ABR Environmental Statement and MP2 Project EIAR will be implemented during the dredging campaigns in both projects. On the basis of scheduling of works and comprehensive mitigation measures applied it can be concluded that no significant cumulative effects on water quality will occur. Noise & Visual Disturbance: When the timing of dredging and dumping for MP2 Project and its associated vessel movements and underwater sound produced are considered in combination with the ABR Project, the result is that the same magnitudes of underwater noise are predicted, but they will occur for six consecutive winter seasons associated with ABR Project alone, followed by a further four winter seasons, between 2024 and 2031 for MP2 Project. The temporal scale of these effects is increased from six events in six years to ten events in thirteen years. The magnitude of effect remains the same for each event. Cumulatively, when the mitigation measures implemented as part of the ABR Dredging Management Plan and Marine Mammal Management Plan are taken into consideration, the effect that dredging and disposal activities will have on sensitive marine mammal receptors both in the water and at known haul out sites is predicted to remain the same as it is as a result of the MP2 Project alone. Given the mitigation measures to be applied to the ABR activities, the extended temporal duration is not significant. No cumulative effects are considered likely. When aerial noise and visual disturbance effects are considered in combination, it is to be recalled that for the ABR Project alone, the ABR EIS considered that the only key waterbird species that were likely to be affected by the ABR Project were Black Guillemots and Light-bellied brent geese. Given that dredging and dumping were activities to be carried out over winter when the breeding tern population was not present, no significant effects were predicted occur. The ABR Project was sufficiently

Chapter	Cumulative Interaction
	spatially separated from the intertidal areas of the River Tolka estuary that no significant effects were predicted to occur upon the wintering wading and waterbird populations that use it. Cumulatively, when the waterbird mitigation measures implemented as part of the ABR Project are taken into consideration, no cumulative impacts are predicted as a result of the effects of the MP2 Project and the ABR Project.
Vehicular and Pedestrian Entrances off Breakwater Road South – Reg. Ref. 2596/15	**Project Description** DPC was granted planning permission (Reg. Ref.2596/15) on the 10th July 2015 for relocation of the existing vehicular and pedestrian entrances off Breakwater Road South to a new location off Breakwater Road South, and alterations to the existing layout of the road. This approval has been implemented by DPC. **Potential Cumulative Effects** Potential cumulative effects associated with the MP2 Project in combination with the Vehicular and Pedestrian Entrances off Breakwater Road South are: • Cumulative effects on Biodiversity • Cumulative effects on Traffic Cumulative effects on Biodiversity: The construction phase for this project has already occurred, only operational stage effects could possibly act in combination with the MP2 Project effects. The Planner's Report was reviewed, and no effects upon any European site were identified by the planning authority. A screening for appropriate assessment report was submitted with this application, and it was reviewed. That report did not predict any likely water quality, habitat deterioration or habitat loss effects; and it did not predict any underwater, aerial or visual disturbance effects. It is a landside project contained within the operational Port estate. At operational phase it results in no more emissions to the aerial or marine environment than the various operations and activities within Port estate currently discharge, and it will not result in any disturbance to those SPA feature species located in the South

Chapter	Cumulative Interaction
	Dublin Bay and River Tolka Estuary SPA. As such, when both projects are considered together, there will be no cumulative effects. Cumulative effects on Traffic: A traffic assessment has been carried out as part of this EIAR. This assessment has considered the cumulative effects of the consented schemes within the environs of the MP2 Project which have been inherently incorporated into the traffic assessments. Future capacity of the road network has been considered through the use of the 3.3% pa growth rate applied to the Port-related traffic movements, which represents the continued growth at Dublin Port and continued implementation of the Masterplan. The findings of the traffic assessment has concluded that the MP2 Project will not result in any cumulative effects on road traffic when considered in combination with consented developments within and in the vicinity of Dublin Port.
Dublin Port Internal Road Network – Ref. Ref. 3084/16 & 2684/17	**Project Description** DPC was granted planning permission on the 14th September 2016 (Reg. Ref. 3084/16) for works to the port's private internal road network which includes works on public roads at East Wall Road, Bond Road and Alfie Byrne Road. The development will consist of: • Construction of new roads and enhancements to existing roads within the Dublin Port estate north of River Liffey; • Construction of enhanced landscaping and a shared pedestrian and cycle amenity route of approximately 4km in length along the northern boundary of the port estate (the Greenway); • Construction of new pedestrian and cycle overbridge at Promenade Road; • Construction of access ramps to pedestrian and cycle overbridge at Promenade Road; • Construction of new pedestrian and cycle underpass at Promenade Road; • Construction of 11 no. new signage gantries; • Ancillary construction works, including site clearance, demolitions, earthworks, pavement construction, construction of verges, modifications to accesses, construction of new and amended drainage services, diversion and installation of utility services, installation of road markings and signs and accommodation works; • Works to existing boundaries and construction of new boundaries; and

Chapter	Cumulative Interaction
	• Construction of minor works to the junctions of East Wall Road with Tolka Quay Road and East Wall Road with Alexandra Road. In June 2017, an application to amendment to the already permitted Dublin Port Road Network Improvement Project (Planning Ref. 3084/16) at no. 2 Branch Road North Extension was submitted to DCC. The development consists of: a) Modifications to approved scheme Planning Ref. 3084/16 for Dublin Port Road Network Improvement Project at No. 2 Branch Road North Extension; b) Realignment and narrowing of c. 280 m of Promenade Road to omit 2 no. Right Slip Lanes; c) Reconfiguration of no. 2 Branch Road North Extension from one-way southbound to two-way with primary access from the south and emergency access only from the north; d) Minor modifications to junction of no. 2 Branch Road North Extension with Tolka Quay Road; e) Modifications to TOP Yard 1 boundary and access arrangements to complement proposed TOP Change of Use from office use to Product Storage Tank - Planning Ref. 3820/08/x1; f) Reduction in proposed car parking provision on No. 2 Branch Road North Extension from 50 spaces to 15 spaces, reflecting proposed TOP Change of Use - Planning Ref. 3820/08/x1; g) Associated amendments to services and culvert. The application is for a 10 year planning permission. Planning permission granted in July 2017. This approval is now being implemented by DPC. **Potential Cumulative Effects** Potential cumulative effects associated with the MP2 Project in combination with the Dublin Port Internal Road Network are: • Cumulative effects on Biodiversity • Cumulative effects on Traffic • Cumulative effects on Landscape & Visual Cumulative effects on Biodiversity: A ecology report accompanied the application and proposed mitigation to reduce the effects of pollution, spread of invasive species, disturbance to bats, birds and otters. The MP2 Project does not result in significant environmental effects on bats or otters or because of invasive species. Mitigation is proposed for disturbance effects on birds and as a result of pollution for the

Chapter	Cumulative Interaction
	MP2 Project alone. Cumulative imapcts could occur at operational stage of both projects due to the effect of visual disturbance stimuli of both users of the greenway and operation of Berth 53 and the industrial heritage installations resulting in a dispersive behaviour effect which could decrease the range, timing or intensity of use of this part of the South Dublin Bay & River Tolka Estuary SPA. The following mitigation measures will be applied to reduce the impact of the MP2 Project and therefore reducing the cumulative effects when considered in combination with the Internal Road network; Construction of Berth 53 and the heritage installations will temporarily cease during periods of low spring tides to avoid disturbance at feeding grounds within the Tolka Estuary and Gates will be used at the site of the Greenway to control the movement of people during periods of low spring tides, again, to avoid disturbance at feeding grounds within the Tolka Estuary. This will avoid any effects of human disturbance on the birds. When both projects are considered together and provided the appropriate mitigation measures are applied, there will be no cumulative effects. <u>Cumulative effects on Traffic:</u> A traffic assessment has been carried out as part of this EIAR. This assessment has considered the potential effects of the MP2 Project on all consented schemes within the environs of the MP2 application boundary. An examination of the traffic modelling results concludes that the consented internal network will have adequate capacity to accommodate either consented road designs including the layout of No.2 Branch Road North Extension. Therefore, the MP2 Project will not result in any effects on road capacity when both projects are considered together. As such, there will be no cumulative effects. <u>Cumulative Effects on Landscape & Visual:</u> The construction of the MP2 Project will overlap with the Dublin Port Internal Road Network – Ref. Ref. 3084/16 & 2684/17 that includes the proposed Greenway. The Greenway extends along the shoreline on the eastern edge of the northern port area and terminates adjacent to Berth 53. The MP2 Project includes a heritage installation at the terminus of the Greenway as described in the MOLA Architecture Industrial Heritage Impacts & Compensation Planning & Design Report (under separate cover). The heritage installation fully compliments and enhances the Greenway with a beneficial impact locally at the site of the terminus. In wider views however the heritage installation and the Greenway are difficult to view due to their location on the eastern most edge of Dublin Port and the limited scale of the heritage installation in the context of the larger scale port facilities

Chapter	Cumulative Interaction
	that lie adjacent. When potential cumulative landscape and visual impacts are considered, for the Greenway and the MP2 Project, no significant effects are predicted.
Demolition of Buildings and Provision of Yard – Reg. Ref. 2429/17	**<u>Project Description</u>** DPC was granted planning permission (Reg. Ref. 2429/17) on the 11th September 2017 for the demolition of 3 no. existing buildings comprising a blockwork structure of c. 283sq.m, a temporary modular structure of c. 303sq.m and a portal frame shed building of c. 112sq.m) and removal of all structural and infrastructural elements, vegetation, plinths, fences etc. A new concrete surface treatment is to be provided across entire site. The new yard facility includes CCTV, new lighting and new approx. 4m high security fence to northern, eastern and southern (Tolka Quay Road) boundaries. The development also includes the closure of the existing (eastern) vehicular entrance and widening of the existing western entrance to provide a 12m sliding gate on Tolka Quay Road. The subject site is to the northwest of the MP2 application boundary. This approval is now being implemented by the DPC. **<u>Potential Cumulative Effects</u>** Potential cumulative effects associated with the MP2 Project in combination with Demolition of Buildings and Provision of Yard are: • Cumulative effects on Biodiversity <u>Cumulative effects on Biodiversity:</u> Construction phase for this project and the MP2 Project will not overlap. The Planner's Report was reviewed, and no effects upon any European site were identified by the planning authority. A screening for appropriate assessment report was submitted with this application, and it was reviewed. The screening report did not predict any likely water quality, habitat deterioration or habitat loss effects; and it did not predict any underwater, aerial or visual disturbance effects. It is a landside project contained within the operational Port estate. At operational phase it results in no more emissions to the aerial or marine environment than the various operations and activities within Port estate currently discharge, and it will not result in any disturbance to those SPA

Chapter	Cumulative Interaction
	feature species located in the South Dublin Bay and River Tolka Estuary SPA. As such, when both projects are considered together, there will be no cumulative effects.
Floating Dock Section Reg. Ref. 4216/17	**<u>Project Description</u>** DPC was granted planning permission (Reg. Ref. 4216/17) on the 16th of February 2018 for floating dock sections (pontoons) with an area of c.321sq.m, access walkway and removal of internal structural and infrastructural elements including vegetation, plinths, fences and bollards; new access roadway. The pontoon shall provide enhanced docking facilities for tug boats operating in the port. This approval is now being implemented by DPC. **<u>Potential Cumulative Effects</u>** Potential cumulative effects associated with the MP2 Project in combination with the Floating Dock Section are: • Cumulative effects on Biodiversity <u>Cumulative effects on Biodiversity</u> The Planner's Report was reviewed, and no effects upon any European site were identified by the planning authority. A screening for appropriate assessment report was submitted with this application, and it was reviewed. The screening report did not predict any likely water quality, habitat deterioration or habitat loss effects; and it did not predict any underwater, aerial or visual disturbance effects. Construction phase will not overlap between this consented project and the MP2 Project. Operational phase of this development comprises the continuation of existing tug boat operations, albeit at enhanced facilities. As such, when both projects are considered together, there will be no cumulative effects.
Vehicle Service/Maintenance Facility and Office Accommodation – Reg. Ref. 3143/18	**<u>Project Description</u>** DPC was granted planning permission (Reg. Ref. 3143/18) on the 31st August 2018 for the construction of a vehicle service/maintenance facility and office accommodation contained in one building (approx. 946sq.m) incorporating vehicle service/maintenance bays, a two storey office area of 260sq.m with offices, meeting/training room, canteen and changing area,

Chapter	Cumulative Interaction
	toilets, building signage. Associated site works including fencing, 55 no. car parking spaces, reconfiguration and widening of existing entrances/exits and connection to existing services on Tolka Quay Road. The proposed development shall facilitate the consolidation of Calor activities within the Port lands. The subject site is directly to the north of and adjacent to the MP2 Project application boundary. **Potential Cumulative Effects** Potential cumulative effects associated with the MP2 Project in combination with Vehicle Service/Maintenance Facility and Office Accommodation are: • Cumulative effects on Biodiversity Cumulative effects on Biodiversity: The Planner's Report was reviewed, and no effects upon any European site were identified by the planning authority. A screening for appropriate assessment report was submitted with this application, and it was reviewed. The screening report did not predict any likely water quality, habitat deterioration or habitat loss effects; and it did not predict any underwater, aerial or visual disturbance effects. It is a landside project contained within the operational Port estate. At operational phase it will not result in any disturbance to those SPA feature species located in the South Dublin Bay and River Tolka Estuary SPA. As such, when both projects are considered together, there will be no cumulative effects.
Dublin Ferryport Terminal Access – Reg. Ref. 3314/18	**Project Description** DPC was granted planning permission (Reg. Ref. 3314/18) on the 18th September 2018 for the upgrade of access to the Dublin Port Operations Centre and the Dublin Ferryport Terminals (DFT), including; re-alignment of traffic lanes and modification of Alexandra Road and Tolka Quay Road junctions; provision of Optical Character Recognition system to include traffic lights, camera, barriers and gantry; DFT check points with associated barriers, kiosks and traffic signals and; associated site works including fencing, gates, underground drainage and electricity infrastructure. This approval is now being implemented by DPC.

Chapter	Cumulative Interaction
	<u>Potential Cumulative Effects</u> Potential cumulative effects associated with the MP2 Project in combination with the Dublin Ferryport Terminal Access are: • Cumulative effects on Biodiversity • Cumulative effects on Traffic & Transportation <u>Cumulative effects on Biodiversity:</u> Construction phase for this project and the MP2 Project will not overlap. The Planner's Report was reviewed, and no effects upon any European site were identified by the planning authority. A screening for appropriate assessment report was submitted with this application, and it was reviewed. The screening report did not predict any likely water quality, habitat deterioration or habitat loss effects; and it did not predict any underwater, aerial or visual disturbance effects. t is a landside project contained within the operational Port estate. At operational phase it results in no more emissions to the aerial or marine environment than the various operations and activities within Port estate currently discharge, and it will not result in any disturbance to those SPA feature species located in the South Dublin Bay and River Tolka Estuary SPA. As such, when both projects are considered together, there will be no cumulative effects. <u>Cumulative effects on Traffic & Transportation:</u> A traffic assessment has been carried out as part of this EIAR. This assessment has considered the cumulative effects of the consented schemes within the environs of the MP2 Project which have been inherently incorporated into the traffic assessments. Future capacity of the road network has been considered through the use of the 3.3% pa growth rate applied to the Port-related traffic movements, which represents the continued growth at Dublin Port and continued implementation of the Masterplan. The findings of the traffic assessment has concluded that the MP2 Project will not result in any cumulative effects on road traffic when considered in combination with consented developments within and in the vicinity of Dublin Port.

Chapter	Cumulative Interaction
Demolition of Calor Offices and Provision of Yard – Reg. Ref. 3540/18	**<u>Project Description</u>** DPC was granted planning permission (Reg. Ref. 3540/18) on the 18th October 2018 for the demolition of a single storey office building (785sq.m); maintenance shed building (840sq.m); reinforced concrete bund and steel tank (42sq.m); boiler room building; and all associated general site clearance. The development also comprises hard surfacing to provide a yard for storage across the extent of the site. The proposed development shall facilitate the consolidation of Calor activities within the Port lands. This approval is now being implemented by DPC. **<u>Potential Cumulative Effects</u>** Potential cumulative effects associated with the MP2 Project in combination with the Demolition of Calor Offices and Provision of Yard are: • Cumulative effects on Biodiversity <u>Cumulative effects on Biodiversity:</u> Construction phase for this project and the MP2 Project will not overlap. The Planner's Report was reviewed, and no effects upon any European site were identified by the planning authority. A screening for appropriate assessment report was submitted with this application, and it was reviewed. The screening report did not predict any likely water quality, habitat deterioration or habitat loss effects; and it did not predict any underwater, aerial or visual disturbance effects. It is a landside project contained within the operational Port estate. At operational phase it results in no more emissions to the aerial or marine environment than the various operations and activities within Port estate currently discharge, and it will not result in any disturbance to those SPA feature species located in the South Dublin Bay and River Tolka Estuary SPA. As such, when both projects are considered together, there will be no cumulative effects.
Asahi Demolition and Provision of Yard – Reg. Ref. 3488/18	**<u>Project Description</u>** DPC was granted planning permission (Reg. Ref. 3488/18) on the 14th November 2018 for the demolition of a redundant storage tank including associated pipework and general site clearance. The area is to be hard surfaced to provide a yard for storage

Chapter	Cumulative Interaction
	across the extent of the site. CCTV poles, new lighting and a new 4m high security fence on all boundaries is proposed. The development also includes the closure of the existing site access and provision of a 12m wide sliding gate access on Breakwater Road North. This development has not yet commenced. **<u>Potential Cumulative Effects</u>** Potential cumulative effects associated with the MP2 Project in combination with the Asahi Demolition & Provision of Yard are: • Cumulative effects on Biodiversity <u>Cumulative effects on Biodiversity:</u> Construction phase for this project and the MP2 Project will not overlap. The Planner's Report was reviewed, and no effects upon any European site were identified by the planning authority. A screening for appropriate assessment report was submitted with this application, and it was reviewed. The screening report did not predict any likely water quality, habitat deterioration or habitat loss effects; and it did not predict any underwater, aerial or visual disturbance effects. It is a landside project contained within the operational Port estate. At operational phase it results in no more emissions to the aerial or marine environment than the various operations and activities within Port estate currently discharge, and it will not result in any disturbance to those SPA feature species located in the South Dublin Bay and River Tolka Estuary SPA. As such, when both projects are considered together, there will be no cumulative.
Interim Unified Passenger Terminal – Reg. Ref. 3638/18	**<u>Project Description</u>** DPC was granted planning permission (Reg. Ref. 3638/18) on 15th January 2019 for the upgrade of Terminal 1 and 2 facilities including consolidated vehicle check-in facilities and revised stacking and circulation arrangements. The proposed development also includes the provision of State Services facility for control and inspections of passengers and freight comprising: 2 no. Inspection Sheds; 2 no. State Service office blocks;5 no. Immigration Control Booths;24 no. staff car parking spaces; 18 no. HGV parking spaces; 20 no. car parking spaces; Control Point with Canopy and gates (7.7m high) and 4 no. gateways; New 4 lane egress onto Tolka Quay Road. This approval is now being implemented by DPC.

Chapter	Cumulative Interaction
	Potential Cumulative Effects Potential cumulative effects associated with the MP2 Project in combination with the Interim Unified Passenger Terminal are: • Cumulative effects on Biodiversity • Cumulative effects on Traffic & Transportation Cumulative effects on Biodiversity: Construction phase for this project and the MP2 Project will not overlap. A screening for appropriate assessment report was submitted with this application, and it was reviewed. That report did not predict any likely water quality, habitat deterioration or habitat loss effects; and it did not predict any underwater, aerial or visual disturbance effects. It is a landside project contained within the heart of the industrial fabric of the operational Port estate. At operational phase it results in no more emissions to the aerial or marine environment than the various operations and activities within Port estate currently discharge, and it will not result in any disturbance to those SPA feature species located in the South Dublin Bay and River Tolka Estuary SPA. As such, when both projects are considered together, there will be no cumulative effects Cumulative effects on Traffic: A traffic assessment has been carried out as part of this EIAR. This assessment has considered the cumulative effects of the consented schemes within the environs of the MP2 Project which have been inherently incorporated into the traffic assessments. Future capacity of the road network has been considered through the use of the 3.3% pa growth rate applied to the Port-related traffic movements, which represents the continued growth at Dublin Port and continued implementation of the Masterplan. The findings of the traffic assessment has concluded that the MP2 Project will not result in any cumulative effects on road traffic when considered in combination with consented developments within and in the vicinity of Dublin Port.
Yard Upgrade – Reg. Ref. 3269/18	**Project Description** DPC was granted planning permission (Reg. Ref. 3269/18) on the 8th November 2018 for the yard upgrade works. The development will consist of: the removal of plinths, fences and vegetation etc; new pavement construction including

Chapter	Cumulative Interaction
	underground drainage and electricity infrastructure; 2 no. CCTV poles (18m high); new lighting (including 2 no. lighting columns 30m high and 10 no. lighting columns 12m high); new 4m high security fence on western and southern boundaries; new 7.2m high fire wall on the eastern boundary and; a 5m sliding gate as fire access on the south eastern corner of the site. The development will also include the closure of the existing site accesses and modifications to the proposed access permitted under Reg. ref. 3084/16, to provide a 12m wide sliding gate on Breakwater Road North. All development to take place on a site approx. 0.3 hectares. The application is for a 10 year planning permission. The site of the proposed development is a SEVESO site. **<u>Potential Cumulative Effects</u>** Potential cumulative effects associated with the MP2 Project in combination with the Yard Upgrade Works Interim are: • Cumulative effects on Biodiversity • Cumulative effects on Traffic & Transportation <u>Cumulative effects on Biodiversity</u> Construction phase for this project and the MP2 Project will not overlap. A screening for appropriate assessment report was submitted with this application, and it was reviewed. It noted that owing to the nature and scale of the Project, the duration of construction, ambient disturbance levels in the existing environment, the small area of the site likely to be affected, and the fact that the wide treeline along the northern edge of the port area provides an additional screen against disturbance from the Project to birds in the River Tolka Estuary. The report excluded the possibility of any likely significant effects. This permitted development is a landside project contained within the operational Port estate near the Tolka Estuary. At operational phase it results in no more emissions to the aerial or marine environment than the various operations and activities within Port estate currently discharge, and it will not result in any disturbance to those SPA feature species located in the South Dublin Bay and River Tolka Estuary SPA. Therefore the possibility of significant adverse impacts either cumulatively or in combination with the Yard Upgrade project can be excluded.

Chapter	Cumulative Interaction
	Cumulative effects on Traffic & Transportation: A traffic assessment has been carried out as part of this EIAR. This assessment has considered the cumulative effects of the consented schemes within the environs of the MP2 Project which have been inherently incorporated into the traffic assessments. Future capacity of the road network has been considered through the use of the 3.3% pa growth rate applied to the Port-related traffic movements, which represents the continued growth at Dublin Port and continued implementation of the Masterplan. The findings of the traffic assessment has concluded that the MP2 Project will not result in any cumulative effects on road traffic when considered in combination with consented developments within and in the vicinity of Dublin Port.
ESB Substation Demolition and Construction. Reg Ref. 4250/18	**Project Description** DPC was granted planning permission on the 6th of June 2018. The development will consist of; the demolition of existing ESB Substation (approx. 25sq.m and 3.2m height), general site clearance, and construction of new ESB Substation building (approx. 40sq.m and 3.1m height) to include access ramps, handrails, replacement fencing, and pedestrian access gate adjacent to proposed substation; and development also includes dropped kerb access off Tolka Quay Road. All development to take place on a site approximately 0.66 hectares. The application is for a 10 year planning Permission. This development has not yet commenced. **Potential Cumulative Effects** Potential cumulative effects associated with the MP2 Project in combination with the Substation are: • Cumulative effects on Biodiversity • Cumulative effects on Water Quality & Flooding Cumulative effects on Biodiversity: A screening for appropriate assessment report was submitted with this application, and it was reviewed. It noted that owing to the nature and scale of the Project, the duration of construction, ambient disturbance levels in the existing environment, the small area of the site likely to be affected, and the fact that the wide treeline along the northern edge of the port area provides

Chapter	Cumulative Interaction
	an additional screen against disturbance from the Project to birds in the River Tolka Estuary. The report excluded the possibility of any likely significant effects. This permitted development is a landside project contained within the operational Port estate near the Tolka Estuary. At operational phase it results in no more emissions to the aerial or marine environment than the various operations and activities within Port estate currently discharge, and it will not result in any disturbance to those SPA feature species located in the South Dublin Bay and River Tolka Estuary SPA. Therefore the possibility of significant adverse impacts either cumulatively or in combination with the ESB Substation Demolition and Construction project can be excluded Cumulative effects on Water Quality & Flooding: A Flood Risk Assessment (FRA) was submitted with this application, and it was reviewed. The FRA determined that the substation site is within lands at risk of flooding. The OPW Guidelines states that all primary infrastructure such as electrical sub-stations are classified as “highly vulnerable developments” and are only suitable within Flood Zone C. As the site falls within lands at risk of flooding a justification test was required as per the sequential approach. The FRA concluded that the substation shall be defended up to a minimum level of 3.82mOD. This level was derived from the CFRAM Study flood level plus an additional 0.5m freeboard to account for climate change. This will protect the site up to the 1 in 1000 coastal flood event. The relocation of the substation has been determined to have satisfied all requirement of the justification test and therefore suitable for the associated flood risk as per OPW guidelines. When both projects are considered together, there will be no cumulative effects.
Terminal 4 Bridge. Reg. Ref. 4521/18	**Project Description** DPC was granted planning permission on the 10th of May 2019. The development will consist of: a 150m long, 13m wide two lane vehicular bridge with access ramps over Alexandra Road connecting the CDL yard and Terminal 4, associated lighting columns of up to 8m in height and all associated site development works. The application has not yet been implemented by DPC.

Chapter	Cumulative Interaction
	<u>Potential Cumulative Effects</u> • Cumulative effects on Traffic and Transport <u>Cumulative effects on Traffic & Transportation:</u> A traffic assessment has been carried out as part of this EIAR. This assessment has considered the cumulative effects of the consented schemes within the environs of the MP2 Project which have been inherently incorporated into the traffic assessments. Future capacity of the road network has been considered through the use of the 3.3% pa growth rate applied to the Port-related traffic movements, which represents the continued growth at Dublin Port and continued implementation of the Masterplan. The findings of the traffic assessment has concluded that the MP2 Project will not result in any cumulative effects on road traffic when considered in combination with consented developments within and in the vicinity of Dublin Port.
Berth 49 Approach and Ramp Reg. Ref. 3176/19	**<u>Project Description</u>** The development will consist of: a c.189m long, c.10m wide approach way and ramp; 1 no. office and staff facilities building (c.193 sq.m and 7.7m in height); 1 no. control kiosk (c.6sq.m and 2.3m in height); 1 no. control cabin (c.20sq.m and 2.3m in height); new lighting (including 18 no. lighting columns 10m high); demolition of 5 no. existing staff facilities buildings with a combined area of c.329sq.m; building 1 has an area of c.198sq.m, building 2 has an area of c.10.7sq.m, building 3 has an area of c.35.5sq.m, building 4 has an area of c.42.4sq.m, building 5 has an area of c.42.4sq.m; and associated site works to include 15 no. tug parking spaces, drainage, utility services, fencing 2.4m in height and pedestrian gate 2.4m in height on a site of approx. 1.3 hectares. **<u>Potential Cumulative Effects</u>** • Cumulative effects on Landscape and Visual • Cumulative effects on Traffic and Transport

Chapter	Cumulative Interaction
	<u>Cumulative effects on Landscape & Visual:</u> The Berth 49 Ramp project is located in close proximity to the MP2 Project and cumulative photomontages have been included in this Chapter (Appendix 15.2) to assist in the assessment of cumulative effects. The Berth 49 ramp when not in use will be kept in an upright position that results in potential visibility above lower level port infrastructure (see Cumulative Viewpoints 2C; 6C; 10C; 12C; and 15C – Appendix 15). In all of the cumulative viewpoints it is difficult to read the Berth 49 ramp in-combination with the MP2 Project facilities due to the character of the maritime industrial activities in which they are both read even in closer proximity as illustrated in Cumulative Viewpoint 15C. When potential cumulative landscape and visual impacts are considered for Berth 49 Ramp and the MP2 Project no significant effects are predicted. <u>Cumulative effects on Traffic & Transportation:</u> A traffic assessment has been carried out as part of this EIAR. This assessment has considered the cumulative effects of the consented schemes within the environs of the MP2 Project which have been inherently incorporated into the traffic assessments. Future capacity of the road network has been considered through the use of the 3.3% pa growth rate applied to the Port-related traffic movements, which represents the continued growth at Dublin Port and continued implementation of the Masterplan. The findings of the traffic assessment has concluded that the MP2 Project will not result in any cumulative effects on road traffic when considered in combination with consented developments within and in the vicinity of Dublin Port.

Chapter	Cumulative Interaction
Former Crosbies Yard & Storecon Yard Planning Order 57 of 2019	**<u>Project Description</u>** In February 2019, the Minster for Public Expenditure and Reform, in advance of the impending withdrawal and/or the withdrawal of the United Kingdom from the European Union on 29th March 2019, made the Planning and Development Act 2000, Section 181(2)(a) Order No. 1, 2019 (SI 57 of 2019). This states that the provisions of the Planning and Development Act 2000, and the provisions of Part 9 of the Planning and Development Regulations, 2001 shall not apply to the development being carried out on behalf of the Minister by the Office of Public Works. The locations and descriptions of the development are set out in the schedule included within the order. The order relates to development on the following sites: • Former Crosbie's Yard at Crosbies Yard, Tolka Quay Road, Dublin Port, Dublin 1, DO1 K7T3. • Former Storecon site at Tolka Quay Road (site bounded by 1 Branch Road South to the east and by Promenade Road to the north), Dublin Port, Dublin 1, DO1 AH31. <u>Former Crosbies Yard</u> The development will include: the refurbishment of existing industrial buildings, the removal of a number of existing industrial buildings, the construction of ancillary custom, agriculture and health inspection structures, staff welfare structures, associated truck and car parking, access and egress gates including ancillary site works, signage and all other necessary works, all within the existing boundary of lands of the Dublin Port Company, for the provision of facilities that are required by reason of the impending withdrawal and/or the withdrawal of the United Kingdom from the European Union on 29 March 2019 in order to provide for the required infrastructure for customs, sanitary and phytosanitary and health checks and controls. <u>Former Storecon Yard</u> The development will include: the removal of a number of existing industrial buildings, the construction of ancillary custom, agriculture and health inspection structures, staff welfare structures, associated truck and car parking, access and egress gates including ancillary site works, signage and all other necessary works, all within the existing boundary of lands of the Dublin Port Company, for the provision of facilities that are required by reason of the impending withdrawal and/or the withdrawal of the

Chapter	Cumulative Interaction
	United Kingdom from the European Union on 29 March 2019 in order to provide for the required infrastructure for customs, sanitary and phytosanitary and health checks and controls. **<u>Potential Cumulative Effects</u>** • Cumulative effects on Biodiversity • Cumulative effects on Traffic and Transport <u>Cumulative effects on Biodiversity</u> There are no technical assessment reports to review, and there is no planning authority report on the development consent authorised pursuant to the Order. Both of these sites are located within the application boundary for the MP2 Project. It should be noted that the MP2 Project does not encompass or propose development at the former Crosbie's Yard site, however, temporary works are proposed at the Former Storecon Site, i.e., those lands are proposed to be used as a temporary construction compound when the site is not occupied by the Office of Public Works. The Former Storecon Site is proposed to be used when it is not occupied by the Office of Public Works. This may mean that it may not be available at all, or at particular times, for use as a construction compound for the MP2 Project, and may require the relocation of this compound, on an interim or permanent basis. To the extent that an alternative compound location is to be used as a construction compound for the MP2 Project, it will be located within the planning application area for the MP2 Project. Bearing in mind that construction of MP2 Project will be undertaken over a period of approximately 9 years, with existing port operations in the MP2 application boundary continuing throughout this construction period, changing the use of the Former Storecon Site from custom, agriculture and health inspection facilities to a MP2 Project construction compound and/or vice versa represents a *de minimis* change in port operations. The development envisaged by S.I. No. 57 of 2019 will comprise modest structures of a scale which is in keeping with the existing built fabric of the Port estate. At operational stage, the use of the development envisaged by S.I. No. 57 of 2019 will include people working within and around a building in the Port estate,

Chapter	Cumulative Interaction
	vehicles (i.e. cars, buses and taxis) entering and leaving these sites and moving around the internal port road network. This is so similar to what currently happens that there is no anticipated change as a result of the use of the development envisaged by S.I. No. 57 of 2019 above a *de minimis* level. No cumulative effects are predicted. Cumulative effects on Traffic & Transportation: The concept of Brexit has been considered in the MP2 Project Rationale and in the Dublin Port Masterplan 2040, reviewed 2018. This TTA takes cognizance of these documents and therefore inherently takes account of the wider context of Brexit up to the end of the Masterplan. The recent order (Planning and Development Act, 2000 Section 181(2)(A) Order No.1 2019) makes reference to specific emergency localised Brexit measures within the Dublin Port Estate relating to a worse case 'no-deal' Brexit scenario, and if required, might only be place for a limited amount of time. The first assessment year in the TTA is 2026, which would be 5+ years after a 'no-deal' Brexit scenario should it occur, at which time it could be reasonably assumed that the matter will be resolved. Therefore, the order does not have an impact of the TTA carried out for the MP2 Project.

Chapter	Cumulative Interaction
DPC Post 2019-2021 Maintenance Dredging Campaign	**<u>Project Description</u>** Dublin Port Company are proposing to carry out maintenance dredging in their navigation channel and various berths in 2020 and 2021. It is proposed that the dredged material will be disposed at the existing offshore dump site at the Burford Bank. It is proposed that 300,000 cubic metres of mostly material will be dredged from the Inner Liffey Channel and Dublin Bay during the 2020 and 2021 maintenance dredging campaigns. The Dumping at Sea License Application was submitted in April 2019 (decision from EPA is pending) **<u>Potential Cumulative Effects</u>** Potential cumulative effects associated with the MP2 Project in combination with Dublin Ports Post 2019 Maintenance Dredging Campaign are: • Cumulative effects on Biodiversity <u>Cumulative effects on Biodiversity:</u> The cumulative effects that might occur with the maintenance dredging in combination with the MP2 Project are impacts to water quality and habitat deterioration, underwater noise and aerial noise and visual disturbance. Water Quality & Habitat Deterioration: The proposed maintenance dredging works could undermine the conservation targets set for overwintering birds in either or both of South Dublin Bay & River Tolka Estuary SPA and North Bull Island SPA in the absence of mitigation if suspended sediment plumes were to travel into those areas and reduce the range, timing or intensity of use of areas by the target species. Measures must be prescribed to eliminate the risk of plumes causing a reduction in the range, timing or intensity of use of areas by the target species. The dredging and dumping of material at sea for the proposed maintenance dredging project is proposed to occur at alternate times of year (April – September) than for the MP2 Project (and ABR Project (October-March), and not concurrently. As such,

Chapter	Cumulative Interaction
	the rates of dredging and disposal modelled for ABR and used for Maintenance dredging predictions will not be exceeded at any given time, and the modelled spatial extent of dredge or disposal plumes, their predicted concentrations of suspended sediments and predicted rates of sedimentation at proximate shorelines remain the same when the rates of dredging or disposal do not increase and the MP2 Project dredging and disposal activities are not undertaken concurrently with any other consented dredging or disposal. No cumulative effects are predicted to occur. Noise & Visual Disturbance The potential for disturbance to marine mammals is greatest when elevated levels of underwater noise occur. Marine mammals, especially cetaceans, have well developed acoustic capabilities and are sensitive to sound at much higher frequencies than humans. Sources of noise include that generated by the vessel during dredging and transiting to and from the dump site, the noise generated by dredging and that generated during dumping. When the timing of dredging and dumping for the proposed maintenance dredging project and its associated vessel movements and underwater sound produced are considered cumulatively with the MP2 Project, and bearing in mind that the dredging and disposal of material at sea for the MP2 Project is proposed to first commence two winters after the final maintenance dredging campaign, and not concurrently, the result is that the same magnitudes of underwater noise are predicted, but the temporal scale of these effects is increased to six campaigns (two maintenance and four capital) over eleven years (between 2020 and 2031). The magnitude of effect remains the same for each event. Cumulatively, when the mitigation measures implemented as part of the Maintenance Dredging Management Plan and Marine Mammal Management Plan are taken into consideration, the effect that dredging and disposal activities will have on sensitive marine mammal receptors both in the water and at known haul out sites is predicted to remain the same as it is as a result of the MP2 Project alone. Given the mitigation measures to be applied to the DPC Post 2019-2021 Maintenance Dredging Campaign activities, the extended temporal duration is not significant. As such, when both projects are considered together and provided the appropriate mitigation measures are applied, there will be no cumulative effects.

Chapter	Cumulative Interaction
Dublin Inland Port Reg. Ref. F18A/0139	**<u>Project Description</u>** The construction of an extension to internal access road from Maple Avenue with associated works including public lighting and the development of 2 no. plots generally for industrial, warehouse, storage and logistic use and associated site works. **<u>Potential Cumulative Effects</u>** Potential cumulative effects associated with the MP2 Project in combination with Dublin Inland Port are: • Cumulative effects on Traffic <u>Cumulative effects on Traffic & Transportation:</u> A traffic assessment has been carried out as part of this EIAR. This assessment has considered the cumulative effects of the consented schemes within the environs of the MP2 Project which have been inherently incorporated into the traffic assessments. Future capacity of the road network has been considered through the use of the 3.3% pa growth rate applied to the Port-related traffic movements, which represents the continued growth at Dublin Port and continued implementation of the Masterplan which includes Dublin Inland Port. The findings of the traffic assessment has concluded that the MP2 Project will not result in any cumulative effects on road traffic when considered in combination with consented developments within and in the vicinity of Dublin Port.

Table 18-4 Description of potential interactions between the MP2 Project and existing and/or approved projects surrounding Dublin Port

Chapter	Interaction
North Lotts & Grand Canal Dock Planning Scheme 2014 BP Ref. PL29S.ZD2011	**<u>Project Description</u>** The North Lotts and Grand Canal Planning Scheme was approved by An Bord Pleanála on 16th May 2014 and includes lands adjacent to Dublin Port to the west. The proximity of Dublin Port to the Planning Scheme lands and the opportunity to maintain the maritime character of the area and integrate better with Dublin Port is recognised in the Planning Scheme. There are limited policies and objectives within the Planning Scheme pertaining to Dublin Port, however a number of objectives support improved cruise liner and passenger facilities including: “ER17 To engage with Dublin Port Company, Fáilte Ireland and the Department of Transport, Tourism and Sport to facilitate the development of a new cruise tourism terminal at Alexandra Basin. PR12 To support the provision of a suitable terminal for cruise liners and other passenger vessels with Dublin Port”. The proposed development of the MP2 Project, have been designed to enable the Port to accommodate larger ships and substantially increase its capacity through the provision of multipurpose berths for multiple transport modes, which include passenger vessels. The proposed development is consistent with the policy’s set out within the Planning Scheme with regard to the Port. **<u>Potential Cumulative Effects</u>** Potential cumulative effects associated with the MP2 Project in combination with North Lotts & Grand Canal Dock Planning Scheme 2014 are: • Cumulative effects on Traffic <u>Cumulative effects on Traffic & Transportation:</u> A traffic assessment has been carried out as part of this EIAR. This assessment has considered the cumulative effects of the consented schemes located close to the Port boundary including the Exo Building, North Lotts & Grand Canal Dock Planning

	Scheme 2014, and the Poolbeg West Planning Scheme. These schemes will not be car based, and are considered to already be incorporated in the assessment by use of the robustly high level of traffic growth rates applied to the non-Port traffic flows. An examination of the traffic modelling results concludes that the consented schemes located close to the Port boundary (Exo Building, North Lotts & Grand Canal Dock Planning Scheme 2014 and the Poolbeg West Planning Scheme) will not result in any cumulative effects when considered together with the MP2 Project.
Exo Building – Reg. Ref. DSDZ3632/15, DSDZ3686/16, DSDZ3776/17	**Project Description** Grant Thornton has sought permission for a development at a site of 1.1507 ha at the junction of North Wall Quay and East Wall Road, Dublin bounded by North Wall Quay to the South, East Wall Road to the East, the 3Arena to the West and The Point Village District Centre to the North. The overall site is located within City Block 5 and 10, as identified in the North Lotts & Grand Canal Dock SDZ Planning Scheme. The development consists of: Construction of a commercial office building ranging in height from 8 storeys to 17 storeys (including one level of plant) at the northern end. The total gross floor area above ground of this building will be circa 19263 sq.m. The building is raised at ground level to 8m and supported by three elliptical cores. Access via dedicated northern and southern glass entrance foyers. As part of the development there will be an external roof terrace and plant at eighth floor level. Construction of one level of basement beneath the proposed commercial building connecting to the existing constructed basement beneath the Point Village Square (as constructed under Section 25 DD478) accommodating 300 bicycle parking spaces, plant, staff facilities, storage areas and other associated facilities. Cycle access to the basement will be via a dedicated, access controlled cycle ramp in the central core. Reconfiguration of the existing basement level -1 beneath the Point Village Square to facilitate 48 No. car parking spaces at -1 level, plant, storage areas and other associated facilities. This will also involve associated structural reconfiguration of existing basement levels -2 and -3. Vehicular access to the basement will be via the existing ramped access on Sheriff St servicing the Point Village District Centre. The reconfiguration of the basement will involve the removal of the existing external stairs from the Point Village Square to existing underground bar located at -1 level. Construction of 14.5m high restaurant/bar glass box with mezzanine level located within the Point Village Square. The total above ground gross floor will be circa. 519.4 sq.m. Permission is also sought for revisions to the Point Village Square Public Realm including proposed hard and soft landscaping works. This includes a new bus shelter, taxi shelter, 5 number glass screens and the relocation of existing Point Village Signage on East Wall Rd. The proposed development includes all associated and ancillary works, including site development works. Minor amendments to permitted

	permission have been applied under DSDZ3686/16 and DSDZ3776/17. Permission for the development was granted in February 2016 and construction is currently ongoing. **Potential Cumulative Effects** Potential cumulative effects associated with the MP2 Project in combination with Exo Building are: • Cumulative effects on Traffic Cumulative effects on Traffic & Transportation: A traffic assessment has been carried out as part of this EIAR. This assessment has considered the cumulative effects of the consented schemes located close to the Port boundary including the Exo Building, North Lotts & Grand Canal Dock Planning Scheme 2014, and the Poolbeg West Planning Scheme. These schemes will not be car based, and are considered to already be incorporated in the assessment by use of the robustly high level of traffic growth rates applied to the non-Port traffic flows. An examination of the traffic modelling results concludes that the consented schemes located close to the Port boundary (Exo Building, North Lotts & Grand Canal Dock Planning Scheme 2014 and the Poolbeg West Planning Scheme) will not result in any cumulative effects when considered together with the MP2 Project.
Poolbeg West SDZ BP Ref. PL29S.ZD2013	**Project Description** The Poolbeg West SDZ Planning Scheme has been prepared on foot of the Planning and Development act 2000 (Designation of Strategic Development Zone: Poolbeg West, Dublin City) Order 2016. The Order states the SDZ is designated a "*mixed use development which may principally include residential development, commercial and employment activities including, office, hotel, leisure and retail facilities, port related activities and the provision of educational facilities, transport infrastructure, emergency services and the provision of community facilities as referred to in Part III of the First Schedule to the Act, including health and childcare services, as appropriate".* Article 4 of the Order states development of this area shall take into consideration inter alia the Dublin Port Masterplan 2012-2040.

	The Poolbeg West Planning Scheme lands are south of the Liffey, approximately half of which are owned by Dublin Port Company. Planning permission for this development was approved by An Bord Pleanála in April 2019. In addition to 3,500 residential units, its uses will include leisure, community, educational and commercial facilities. **<u>Potential Cumulative Effects</u>** Potential cumulative effects associated with the MP2 Project in combination with Poolbeg West SDZ are: • Cumulative effects on Traffic • Cumulative effects on Water Quality <u>Cumulative effects on Traffic & Transportation:</u> A traffic assessment has been carried out as part of this EIAR. This assessment has considered the cumulative effects of the consented schemes located close to the Port boundary including the Exo Building, North Lotts & Grand Canal Dock Planning Scheme 2014, and the Poolbeg West Planning Scheme.An examination of the traffic modelling results concludes that the consented schemes located close to the Port boundary (Exo Building, North Lotts & Grand Canal Dock Planning Scheme 2014 and the Poolbeg West Planning Scheme) will not result in any cumulative effects when considered together with the MP2 Project. Cumulative effects on Water Quality: In relation to potential water quality issues and cumulative impact, the primary consideration is wastewater discharges from the SDZ. Wastewater discharges will be treated at Ringsend WwTP. A review of the Ringsend Wastewater Treatment Plant Upgrade EIAR (June 2018) has highlighted that there is potential for a temporary negative but not significant effect in the Tolka Estuary during the upgrade due to a number of secondary treatment tanks being temporarily out of operation. However, it concludes that the benefit of the permanent positive impact after the completion of construction outweighs the insignificant, temporary negative impact observed during the construction phase. Therefore, given the positive impact of the WwTP upgrade on receiving water quality it is unlikely that there will be any cumulative adverse effects when considered in combination with the MP2 Project and the Poolbeg West SDZ.

Irish Water – Ringsend Wastewater Treatment Plant Upgrade Project - BP Ref. PL29S.301798	**<u>Project Description</u>** Irish Water has submitted a planning application for strategic infrastructure development to the Board (Ref. PL29S.301798) seeking permission to further progress the upgrade of the Ringsend Wastewater Treatment Plant (WwTP). The application seeks permission for works required to facilitate the use of Aerobic Granular Sludge (AGS) technology, to omit the previously permitted long sea outfall tunnel and to upgrade the sludge treatment facilities at Ringsend, Dublin 4, and to provide for a Regional Biosolids Storage Facility in Newtown, Dublin 11. The proposed development at Ringsend is to the south of the MP2 Project application boundary, south of the River Liffey. Planning permission was granted by An Bord Pleanála in April 2019 with conditions. **<u>Potential Cumulative Effects</u>** Potential cumulative effects associated with the MP2 Project in combination with the Ringsend WWTW Upgrade are: • Cumulative effects on Biodiversity / Water Quality • Cumulative effects on Coastal Processes Cumulative effects on Biodiversity: A screening for appropriate assessment and NIS was prepared for this submission. These documents were reviewed and concluded that further evaluation and analysis predicted that: Water quality in Inner Dublin Bay will be enhanced because of a reduction in nutrient load once the proposed development is operational; it is unlikely that the food resource of waterbirds in the Tolka Estuary will be negatively affected; reductions in nutrients in the receiving waters resulting from the proposed development will not have any impacts on fish populations in Dublin Bay; disturbance and displacement of certain qualifying SPA feature species during construction may occur; accidental spillage of hazardous substances resulting in water quality deterioration of the Liffey Channel and hydrologically connected areas during construction may occur and; significant dust deposition on the grasslands to the south of the site that form part of the South Dublin Bay and River Tolka Estuary SPA may occur. Measures intended to avoid or reduce these potentially significant effects on the European sites were proposed as part of the Stage Two Appropriate Assessment, and there will be no adverse effect on the integrity of any European site as a result.

	The Ringsend WwTP Upgrade project is sufficient spatially separated from the MP2 Project to prevent any significant cumulative visual or noise disturbance effects on waterbirds. . With the measures proposed to avoid or reduce the significant pollution effects predicted for the WwTP Upgrade Project and the MP2 Project alone are taken into consideration, there will be no cumulative effects. <u>Cumulative effects on Coastal Processes:</u> The coastal processes assessment considers the potential effects of dredging associated with MP2 Project on existing outfalls and power station cooling water systems in the Liffey channel to see if changes in bathymetry as a result of dredging would alter the dispersion characteristics of the Ringsend WwTP outfall effluent. The coastal processes assessment predicts that there will be some minor effect on the tidal current speeds around the Berth 53 structure and dredged areas but these will not be such that they will affect the dispersion of effluent from the WwTP. The water quality assessment predicts that given the positive effect of the WwTP project on receiving water quality there will not be any adverse cumulative effects when considered in combination with the MP2 Project.
The Howth Yacht Club – Maintenance Dredging and Disposal.	**<u>Project Description</u>** Only Howth Yacht Club (HYC) and Dublin Port Company currently hold Dumping at Sea Permits for use of the Dublin Bay dumping site. HYC has the benefit of a Dumping at Sea Permit (Ref. No. S0010-01) to load and dump a maximum of 120,000 tonnes of dredged material from Howth Marina over a one year period. In its application documents, HYC estimated a maximum daily quantity for dumping of 1,200 tonnes and 800 tonnes in each load. It also suggested a spring or winter commencement and campaign duration of six months. This volume of material is equivalent to approximately 6% of the annual permitted quantity of material that may be dumped at this site by Dublin Port Company under Dumping at Sea Permit S0024-01. While dumping by DPC is restricted to the winter months (October to March), no such restriction applies to HYC activities. Dumping will however be subject to the approval of the Dublin Port Harbour master and dumping activity will not be permitted by the Harbour master for DPC and HYC operations simultaneously. The rates of dumping at sea will therefore not exceed those predicted in the model described in the coastal processes assessment and the model predictions remain valid. When this project is considered together with the MP2 Project, there will be no effects cumulatively or in combination between disposal of dredged material from HYC and MP2 Projects.

18.2 Environmental Interactions within MP2 Project

The potential interaction between environmental aspects, arising from within the MP2 Project were considered, again to ensure that the combination of impacts was correctly examined and any required mitigation measures included.

Each technical chapter of the EIAR details, individual environmental baseline information and identifies the significant potential and residual construction and operational effects/impacts of the proposed development. In addition, the potential for other environmental interactions are identified and the relevant impact either on, or from, these other aspects is analysed via data exchange between and assessment review by the relevant experts.

This Chapter summarises the significance of these interactive and inter-related impacts within the MP2 Project. Table 18-5 shows a matrix of potential interactions between each technical chapter of this EIAR with a detailed description of each interaction presented in Table 18-6.

While many potential inter-relationships and inter-actions have been identified, it is anticipated that the discrete environmental mitigation measures included in the MP2 Project (and outlined in the relevant sections of the EIAR) will also minimise or off-set potential for significant effects due to interactions.

Table 18-5 Matrix to show Interactions between Technical Chapters 7-17 (KEY✓ Potential interaction between technical chapters)

	Biodiversity Flora & Fauna	Soils, Geology Hydrogeology	Water Quality & Flood Risk Assessment	Air Quality & Climate	Noise & Vibration	Coastal Processes	Traffic & Transport	Archaeology & Cultural Heritage	Landscape & Visual	Population & Human Health	Waste
Chapter 7- Biodiversity, Flora & Fauna											
Chapter 8 - Soils/Geology & Hydrogeology	✓										
Chapter 9- Water Quality & Flood Risk Assessment	✓	✓									
Chapter 10- Air Quality & Climate		✓									
Chapter 11- Noise & Vibration	✓										
Chapter 12- Coastal Processes	✓	✓	✓								
Chapter 13- Traffic & Transport				✓	✓						
Chapter 14- Archaeology & Cultural Heritage											
Chapter 15- Landscape & Visual				✓							
Chapter 16 – Population & Human Health		✓	✓	✓	✓	✓	✓		✓		
Chapter 17 – Waste	✓		✓	✓						✓	

Table 18-6 Summary of potential interactions between technical chapters

Chapter	Interaction
Chapter 7 – Biodiversity, Flora & Fauna	The most significant interactions in relation to Biodiversity, Flora & Fauna are considered to be Soils, Geology & Hydrogeology /Waste, Water Quality & Flood Risk Assessment, Noise and Vibration and Coastal Processes. Consideration of each are provided in relevant chapters within the EIAR with appropriate mitigation measures included. ***Soils, Geology & Hydrogeology / Waste*:** An inter-relationship exists between Marine Ecology, Water Quality and Soil, Geology, Hydrogeology & Waste. The MP2 capital dredging operations has the potential to cause the re-suspension of seabed sediments leading to a potential impact on water quality and benthic ecology. An extensive ground investigation was undertaken in August 2018 which included the targeted collection of soil and groundwater samples around the MP2 application areas. The results of laboratory analysis indicate that all sediments planned for capital dredging have been categorised as "Class 1" non-hazardous soils. Therefore the risk of disturbing potentially hazardous sediments causing deterioration to water quality and marine ecology is very low, and where it does arise appropriate water quality mitigation measures have been proposed. In addition to the potential impacts assessed in Chapter 8, the impact of the dredging and disposal operations has been assessed in Chapter 7 Biodiversity, Flora & Fauna, Chapter 9 Water Quality and Chapter 12 Coastal Process. The findings of each assessment has indicated that provided the implementation of mitigation measures as listed in Chapter 7, 9 and 12, no impacts to water quality and marine ecology are expected. ***Water Quality & Flood Risk Assessment***: An interaction link between Biodiversity, Flora & Fauna and Water Quality exists, The interaction link is as follows: • Avian & aquatic ecology is dependent on surface water quality; • Surface water quality can be affected during demolition works through the generation of fine materials eroded as a result through clearing surfaces and exposing soils/rubble to rainwater and drainage water.

Chapter	Interaction
	• These sediments may be deposited in watercourses and could potentially result in an increase in suspended sediments concentrations in run-off from the site. • Suspended sediment due to run off from these activities can have a negative impact on water quality, water dependant habitats and aquatic ecology particularly in areas immediately adjacent to the River Liffey Lower and River Tolka Estuary. Chapter 9 Water Quality has assessed the impact of construction operations on water quality, with the implementation of the mitigation measures (listed in each chapter) during demolition, clearing and berth construction activities, the potential impact to receiving water environment will be reduced to negligible thus reducing the significance of environmental effect to Imperceptible and therefore reducing the risk to aquatic ecology. ***Noise & Vibration:*** An interaction link between Biodiversity, Flora & Fauna and Noise & Vibration exists. Terrestrial and underwater noise generated during the construction of MP2 Project has the potential to impact on avian and marine species and their foraging areas. An assessment of potential impacts of on benthic biodiversity & fisheries; terrestrial biodiversity; marine mammals; avian ecology and designated sites has been carried out based on project specific baseline noise surveys, supported by acoustic monitoring data collected as part of the ABR project. The findings of the biodiversity assessment concludes that with the implementation of the mitigation measures (as listed in Chapter 7) during construction and operational phases to reduce the effects of airborne and underwater noise on benthic ecology, marine mammals and waterbirds, significant residual effects are not predicted. ***Coastal Processes:*** An interaction link between Biodiversity, Flora & Fauna and Coastal Processes exists. The interaction relates specifically to the potential morphological impacts on the Tolka Estuary of the operational stage manoeuvring and berthing of ship at Berth 53. Operational ship movements have the potential to cause a disruption to the sediment transport regime and seabed scouring leading to a long-term impact on seabed levels in a part of the Tolka Estuary used by wintering waterbirds. To assess the impact of MP2 Project, a series of sediment transport models combined with propeller and thruster

Chapter	Interaction
	jet scour calculations were undertaken to assess the long term stability of the dredged side slope at Berth 53 and thus, in the longer term, potentially affect bed levels and modify the position of the lowest astronomical tide across the winter foraging areas within the Tolka Estuary. The findings of an extensive coastal processes assessment has demonstrated that with the implementation of the mitigation measures highlighted within the coastal processes chapter, MP2 Project will have no effect on the morphology of the Tolka Estuary as a resource for the regularly occurring migratory waterbirds of South Dublin Bay & River Tolka Estuary SPA and North Bull Island SPA that utilise it.
Chapter 8 – Soils & Geology & Hydrogeology	The most significant interactions in relation to Soils, Geology & Hydrogeology are considered to be Biodiversity, Flora & Fauna, Water Quality & Flooding, Air & Climate, Noise & Vibration, Traffic & Transport and Population & Human Health. Consideration of each are provided in relevant chapters within the EIAR with appropriate mitigation measures included. ***Biodiversity, Flora & Fauna:*** An inter-relationship exists between Soils, Geology & Hydrogeology and Biodiversity Flora & Fauna. Avian & aquatic ecology is dependent on surface water quality and surface water quality can be affected during dredging operations. Dredging operations can cause temporary suspension and release of seabed sediments at the loading sites. Similarly, dumping operations will also give rise to temporary sediment plumes at the licensed dumping site in Dublin Bay. These operations can cause a localised negative impact on water quality, water dependant habitats and aquatic ecology. As indicated in Chapter 8 all sediments planned for capital dredging have been categorised as “Class 1” non-hazardous soils. Therefore the risk of disturbing potentially hazardous sediments causing deterioration to water quality and marine ecology is considered very low, and where it does arise appropriate water quality mitigation measures have been proposed. ***Water Quality & Flood Risk Assessment***: An inter-relationship link between Soils, Geology & Hydrogeology and Water Quality & Flood Risk Assessment exists. The link relates specifically to the erosion and mobilisation of sediment during construction, demolition and dredging operations resulting in the localised deterioration of Water Quality due to an increase in suspended sediments in the water column.

Chapter	Interaction
	The impact of the construction, demolition and dredging operations has been assessed in Chapter 9 using extensive water quality data that is been collected as part of the ABR project. The findings of the Water Quality assessment has confirmed that with the implementation of the mitigation measures during demolition, clearing and berth construction activities, and dredging operations, the potential impact to receiving water environment will be reduced to negligible thus reducing the significance of environmental effects to Imperceptible. ***Air Quality & Climate Change / Population & Human Health*:** An inter-relationship link between Soils, Geology & Hydrogeology, Air & Climate / Population & Human Health. The main potential impact relates to dust generation arising during construction activities such as such as stone importation, excavation, earth moving, dredging and backfilling may generate quantities of dust, particularly in dry weather conditions; and nuisance odours caused disturbance of organic seabed material during capital dredging operations. The potential impacts for nuisance Dust and Odours have been assessed in Chapter 10. In both cases, the impacts of MP2 Project are considered negligible. In addition, a number of mitigation measures will be employed during construction including the preparation of a dust minimisation plan and odour management plan. ***Coastal Processes:*** An inter-relationship exists between Soils, Geology & Hydrogeology and Coastal Processes. The potential impacts on soils and the geological environment relates to the erosion and mobilisation of sediment during dredging operations and disposal operations. Dredging loading operations will cause temporary suspension and release of sediments at the loading sites. Dumping operations will also give rise to temporary sediment plumes at the licensed dumping site in Dublin Bay. It should be noted that chemical analysis has shown that the sediments to be dredged from the Port's navigation channel and basins are suitable for conventional dumping at sea (see Chapter 8). A series of sediment transport simulations were undertaken as part of this study to simulate the dredging operations at Berth 53, the manoeuvring area and at Oil Berth 3 and Berth 50 and disposal of circa 425,000m^3 of mainly sands and gravels at the licenced disposal site. The dredge simulations have illustrated that the increase in suspended sediment during dredging

Chapter	Interaction
	operations is generally confined to within the immediate area of the dredging operations and concluded that the dredging operations required will not result in any significant impact to either the water quality in terms of suspended sediments, or the nearby environmentally designated areas in terms of sediment deposition. The disposal simulations in combination with monitoring data collected as part of the ABR projects has concluded that the disposal operations associated with MP2 Project will not result in any significant increases to the background level of suspended sediments and will therefore not impact the existing water quality in the greater Dublin Bay area. Chapter 12 lists a number of mitigation measures that will be applied during each dredging campaign of the MP2 Project. Whith the implementation of those mitigation measures during capital dredging and disposal operations, the potential risk to receiving water environment will be negligible thus reducing the significance of environmental impact to Imperceptible.
Chapter 9 – Water Quality & Flood Risk Assessment	The most significant interactions in relation to Water Quality & Flood Risk Assessment are considered to be Biodiversity, Flora & Fauna, Coastal Processes, Population & Human Health, Soils, Geology & Hydrogeology and Waste. Consideration of each are provided in relevant chapters within the EIAR with appropriate mitigation measures included. ***Biodiversity Flora & Fauna / Waste*:** The interaction link between Water Quality and Biodiversity, Flora and Fauna and Waste is; marine habitats and biodiversity is dependent on water quality; a deterioration in water quality as a result of suspended sediment levels or pollutants has potential to impact on marine habitats and the species that depend on them. The impact of the construction, demolition and dredging operations has been assessed in Chapter 9 using extensive water quality data collected during the dredging operations that have occurred during the ABR project. The findings of the Water Quality assessment has confirmed that assuming the mitigation measures are employed during demolition, clearing and berth construction activities, and dredging operations, the potential impact to receiving water environment will be reduced to negligible thus reducing the significance of environmental effect to Imperceptible. Therefore, in circumstances where there is no impact to water quality, no impacts to marine habitats and the species that depend on them are predicted.

Chapter	Interaction
	Coastal Processes / Population & Human Health: An inter-relationship between water environment and coastal processes exists. The interaction link potential relates to: the mobilisation of sediment during dredging and disposal operations and also the potential to increase flood risk as a result of changes to the inshore wave climate. *Suspended Sediments*: A series of coastal model simulations combined with monitoring data collected as part of the ABR have concluded that the dredging and disposal operations associated with MP2 Project will not result in any significant impact to water quality in terms of suspended sediments. *Inshore wave climate*: Changes in seabed bathymetry has the potential to alter the energy with which waves break. This alteration could result in wave overtopping of structures and flood defences in proximate areas such as Clontarf, Fairview and Ballybough bordering the Tolka Estuary. Consideration of changes to the wave climate resulting from the MP2 Project presented in chapter 12 show no discernible changes to the wave climate in area bordering the Tolka estuary and changes in the wave height within the port itself are not significant. Therefore the risk of potential coastal flooding due to the MP2 Project in these areas is determined to be negligible and no further mitigation is required. ***Soils, Geology & Hydrogeology***: An inter-relationship link between Water Quality & Flood Risk Assessment and Soils, Geology & Hydrogeology exists. The link relates specifically to the erosion and mobilisation of sediment during construction, demolition and dredging operations resulting in the localised deterioration of Water Quality due to an increase in suspended sediments in the water column. The impact of the construction, demolition and dredging operations on water quality has been assessed using extensive water quality data collected during the dredging operations that have occurred during the ABR project. The findings of the Water Quality assessment has confirmed that with the implementation of mitigation measures during demolition, clearing and berth construction activities, and dredging operations, the potential impact to receiving water environment will be reduced to negligible thus reducing the significance of environmental effect to Imperceptible.

Chapter	Interaction
Chapter 10 – Air Quality & Climate	The most significant interactions in relation to Air Quality & Climate to are considered to be Soils Geology, Hydrogeology/Waste Waste; Traffic & Transport, Population & Human Health and Landscape and Visual. Consideration of each are provided in relevant chapters within the EIAR with appropriate mitigation measures included. ***Soils, Geology and Hydrogeology / Waste;*** The main interaction link between Air Quality and Soils, Geology, Hydrogeology & Waste relates specifically to the generation of dust during construction activities such as; stone importation, excavation, earth moving, dredging and backfilling may generate quantities of dust, particularly in dry weather conditions. The potential impacts of construction dust have been assessed in Chapter 10. The findings of the assessment have concluded that the impacts of MP2 Project are considered negligible. A dust minimisation plan will be prepared detailing the specific dust suppression measures that will be employed during construction. ***Traffic & Transportation / Population & Human Health:*** The main interaction relates to the potential decrease in Air Quality as a result of increased operation traffic. As highlighted in Chapter 10, road traffic from MP2 Project can impact directly on local air quality and any sensitive receptors that are located adjacent to the local road network may experience the impacts to local air quality. Traffic on the road network is predicted to increase during the operation stage in line with the increased throughput of cargo and passengers as predicted under the Masterplan 2040. An assessment of the potential impact associated with the increase in Traffic in terms of air quality upon local population centres has been undertaken. The results indicate that all levels of pollutants are predicted to remain within the limits for the protection of human health along each of main traffic routes with the full predicted growth in traffic by 2040. Using the NRA significance criteria the predicted increases associated with the MP2 Project relative to the “do-minimum” scenario are classed as “imperceptible” to “small”. While the levels remain below the relevant limits these increases and air quality impact from this traffic are classed as “negligible”. This includes for the wider masterplan traffic and hence the cumulative traffic impact on air quality is also considered “negligible”.

Chapter	Interaction
	Landscape & Visual: The main potential interaction between Air Quality and landscape relates to dust arising during construction: stone importation, excavation, earth moving, dredging and backfilling may generate quantities of dust, particularly in dry weather conditions. The potential impacts for nuisance dust have been assessed and the impacts of MP2 Project are considered negligible (Chapter 10). A number of mitigation measures will be employed during construction including the preparation of a dust minimisation plan. With the implementation of the the dust minimisation measures the impact of dust on landscape and visual will be negligible.
Chapter 11 – Noise & Vibration	The most significant interactions in relation to Noise & Vibration are considered to be Biodiversity, Flora & Fauna and Population & Human Health. Consideration of each are provided in relevant chapters within the EIAR with appropriate mitigation measures included. ***Biodiversity Flora & Fauna:*** An interaction between Noise & Vibration exists with Biodiversity, Flora & Fauna. Airborne and underwater noise generated during the construction and operation of MP2 Project has the potential to impact on avian and marine species and their foraging areas. An assessment of potential impacts of on benthic biodiversity & fisheries; terrestrial biodiversity; marine mammals; avian ecology and designated sites has been carried out based on project specific baseline noise surveys, supported by acoustic monitoring data collected as part of the ABR project. The findings of the biodiversity assessment concludes that with the implementation of the mitigation measures (as listed in Chapter 7) during construction and operational phases to reduce the effects of airborne and underwater noise on benthic ecology, marine mammals and waterbirds, significant residual effects are not predicted. ***Traffic & Transportation:*** An interaction between link between Noise & Vibration and Traffic & Transport exists. During the construction phase of MP2 Project, there is potential for noise impacts at the nearest noise sensitive properties from the use of noisy plant and equipment, from construction traffic and vibration impacts from the use a certain construction phase activities (e.g. piling). An assessment of all significant impacts of Noise and Vibration has been undertaken using worst case construction

Chapter	Interaction
	noise and vibration criteria. The assessment concluded that there will be no significant adverse noise and vibration impact from the MP2 Project assuming that the mitigation measures are employed. ***Population & Human Health:*** An interaction link between Noise & Vibration and Population and Human Health exists. Noise and vibration generated from the construction and operational of MP2 Project has the potential to impact upon local population centres. An assessment of construction noise was undertaken using worst case scenario noise level combined with noise data collected as part of the ABR project. The assessment concluded that the noise levels are not expected to exceed the existing levels with the implementation of the proposed mitigation measure during construction.
Chapter 12 – Coastal Processes	The most significant interactions in relation to Coastal Processes are considered to be Biodiversity Flora & Fauna and Water Quality & Flood Risk Assessment, Population & Human Health and Soils Geology and Hydrogeology. Consideration of each are provided in relevant chapters within the EIAR with appropriate mitigation measures included. ***Biodiversity, Flora & Fauna:*** There is an inter-relationship between coastal modelling and marine ecology impacts, such that an altering of tidal flows can directly impact on marine habitat. An extensive coastal modelling assessment of the potential impacts of MP2 Project on Coastal Processes has been undertaken to assess the impacts of the changes to seabed morphology and the creation of a new berthing structure on the designated sites. This study has demonstrated that MP2 Project will have no long term effects on the morphology of the Tolka Estuary will arise with the implementation of the mitigation measures proposed. In addition, there has been close cooperation between the designer, ecological and Coastal Modelling consultants and following suitable mitigation measures no significant impacts on marine ecology are predicted. ***Water Quality & Flood Risk Assessment / Population & Human Health:*** There is a potential inter-relationship between water quality & flood risk assessment and coastal processes. The impact of the dredging operations combined with coastal processes has the potential to impact on water quality at water intakes and outfalls as listed below:

Chapter	Interaction
	• Water from the Liffey is abstracted by 4 power plants within the Dublin Port area. The water is abstracted as part of the electricity generation process and/or for cooling water components. High levels of suspended solids in cooling water has the potential to impact upon the plants cooling system and may result in an increase in operation and maintenance costs. • The Ringsend Waste Water Treatment Plant is located on the southern bank of the River Liffey. This plant discharges treated effluent into the Liffey Estuary via a cooling water discharge channel to the north east of Poolbeg Power Station whilst a storm water overflow pipe is located to the north of the storm tanks about 800m upstream. High levels of suspended solids and the ingress of settling material during periods of low flow may have the potential to impact the operational performance of this pipe. A review of dredging simulation results showed that that the increased levels of suspended sediment concentrations at the power station intakes and Ringsend WwTW outfall are generally very small by comparison with background levels in the Liffey Estuary and are unlikely to have a significant effect on the quality of intake waters at power stations in terms of suspended solids content. In addition when any dredging is scheduled to take place within a 500m radius of the intakes the relevant stakeholders are notified so that precautionary measures can be taken if deemed necessary. Another potential interaction exists between coastal processes and Flood Risk Assessment. Changes in bathymetry due to dredging activities have the potential to alter the energy with which waves break and could result in wave overtopping of structures and flood defences. Consideration of changes to the wave climate due to the MP2 Project presented in chapter 12 show no discernible change in relevant proximate areas such as Clontarf, Fairview and Ballybough bordering the Tolka Estuary. Changes in wave height within the Port are not significant. Therefore the risk of potential coastal flooding due to the MP2 Project in these areas is determined to be negligible and no further mitigation is required. ***Soils, Geology & Hydrogeology:*** An inter-relationship exists between Coastal Processes and Soils, Geology & Hydrogeology. The potential impacts on soils and the geological environment relates to the erosion and mobilisation of sediment during dredging operations and disposal operations. Dredging loading operations will cause temporary suspension and release of

Chapter	Interaction
	sediments at the loading sites. Dumping operations will also give rise to temporary sediment plumes at the licensed dumping site in Dublin Bay. It should be noted that chemical analysis has shown that the sediments to be dredged from the Port's navigation channel and basins are suitable for conventional dumping at sea (see Chapter 8). Chapter 12 describes the series of sediment transport simulations that were undertaken as part of this study to simulate the dredging operations at Berth 53, the manoeuvring area and at Oil Berth 3 and Berth 50 and disposal of circa 425,000m^3 of mainly sands and gravels at the licenced disposal site. The dredge simulations have illustrated that the increase in suspended sediment during dredging operations is generally confined to within the immediate area of the dredging operations and concluded that the dredging operations required will not result in any significant impact to either the water quality in terms of suspended sediments, or the nearby environmentally designated areas in terms of sediment deposition. The disposal simulations in combination with monitoring data collected as part of the ABR projects has concluded that the disposal operations associated with MP2 Project will not result in any significant increases to the background level of suspended sediments and will therefore not impact the existing water quality in the greater Dublin Bay area. Chapter 12 lists a number of mitigation measures that will be applied during each dredging campaign of the MP2 Project. With the implementation of those mitigation measures during capital dredging and disposal operations, the potential risk to receiving water environment will be negligible thus reducing the significance of environmental impact to Imperceptible.
Chapter 13 – Traffic & Transport	The most significant interactions in relation to Traffic & Transport are considered to be Air Quality & Climate, Noise & Vibration and Population & Human Health. Consideration of each are provided in relevant chapters within the EIAR with appropriate mitigation measures included. ***Air Quality & Climate:*** The main interaction relates to the potential decrease in Air Quality as a result of increased operation traffic. As highlighted in Chapter 10, Road traffic from the MP2 Project can impact directly on local air quality and any sensitive receptors that are located adjacent to the local road network may experience the impacts to local air quality. Traffic on the road

Chapter	Interaction
	network is predicted to increase during the operation stage in line with the increased throughput of cargo and passengers as predicted under the Masterplan 2040. An assessment of the potential impact associated with the increase in Traffic in terms of air quality upon local population centres has been undertaken. The results indicate that all levels of pollutants are predicted to remain within the limits for the protection of human health along each of main traffic routes with the full predicted growth in traffic by 2040. Using the NRA significance criteria the predicted increases associated with the MP2 Project relative to the "do-minimum" scenario are classed as "imperceptible" to "small". While the levels remain below the relevant limits these increases and air quality impact from this traffic are classed as "negligible". This includes for the wider masterplan traffic and hence the cumulative traffic impact on air quality is also considered "negligible". ***Noise & Vibration:*** An interaction between link between Traffic & Transport and Noise & Vibration exists. During the construction of MP2 Project, there is potential for noise impacts at the nearest noise sensitive properties from the use of noisy plant and equipment, from construction traffic and vibration impacts from the use a certain construction phase activities (e.g. piling). An assessment of all significant impacts of Noise and Vibration has been undertaken using worst case construction noise and vibration criteria. The assessment concluded that there will be no significant adverse noise and vibration impact from the MP2 Project with the implementation of the mitigation measures. ***Population & Human Health:*** An interaction between link between Traffic & Transport and Population & Human Health exists. Increased traffic volumes during construction and operation of MP2 Project has the potential to adversely impact human beings (increased traffic flows, noise and air quality). It has been demonstrated in Chapter 13 that there is adequate capacity in the road network to accommodate the proposed development and also Chapters 10 & 11 show that there will be negligible impacts arising from increased traffic.

Chapter	Interaction
Chapter 15 - Landscape & Visual	The most significant interactions in relation to Landscape & Visual are considered to be Air Quality & Climate, and Population & Human Health. Consideration of each are provided in relevant chapters within the EIAR with appropriate mitigation measures included. ***Air Quality & Climate:*** The main potential interaction between Air Quality and landscape relates to dust arising during construction: stone importation, excavation, earth moving, dredging and backfilling may generate quantities of dust, particularly in dry weather conditions. The potential impacts for nuisance dust have been assessed and the impacts of MP2 Process are considered negligible (Chapter 10). A number of mitigation measures will be employed during construction including the preparation of a dust minimisation plan. With the impmentation of the dust minimisation measures the impact of dust on landscape and visual will be negligible. ***Population & Human Health:*** The main interaction between Population & Human Health and Landscape & Visual relates to the impact of MP2 Project on visual receptors. An assessment has been undertaken to determine the magnitude of visual impact of the MP2 Project on potential views from sensitive visual receptors including residential properties (Chapter 15). The findings of the assessment has highlighted that; there is limited potential visibility of the MP2 Project from residential properties; the nearest properties are located at Ringsend on R131, York Road and Pigeon House Road to the southwest and all aspects of the MP2 Project will be well screened from residential properties. The assessment has concluded that because the predicted change in visual resource is low, the visual sensitivity of receptors is negligible. Therefore the predicted significance of visual impact for residential properties will be minor negative.
Chapter 16- Population & Human Health	The most significant interactions in relation to Population & Human Health are considered to be; Water Quality & Flood Risk Assessment, Coastal Processes, Air Quality & Climate, Soils Geology & Hydrogeology, Noise & Vibration, Landscape & Visual and Traffic & Transport. Consideration of each are provided in relevant chapters within the EIAR with appropriate mitigation measures included.

Chapter	Interaction
	Water Quality & Flood Risk Assessment / Coastal Processes: An interaction link between Population & Human Health and Water Quality/Coastal Processes exists. • *Water Quality*: The main interaction between Human Health & Population and Water Quality relates to the potential impact of MP2 Project on recreational bathing water. The bathing areas in the immediate vicinity of the MP2 Project are Dollymount Strand, Sandymount Strand, Merrion Strand and Seapoint. The potential impact of MP2 Project on water quality has been undertaken as part of this study. Baseline water quality within the receiving environment was established through review of national monitoring data used to establish water quality status in the context of the EU Water Framework Directive (WFD) and supporting environmental standards. High-frequency monitoring data, collected during Dublin Port Company's ABR Project was also reviewed. Using baseline water quality data and site specific water quality model simulation outputs (Chapter 12), an assessment of the proposed MP2 Project was conducted to determine the likelihood of significant impacts on water quality using the criteria for rating significance and magnitude as set out in the National Roads Authority (NRA) publication "*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*" (NRA, 2008) and appropriate mitigation measures to reduce impacts were proposed, where necessary. The assessment concluded that: the proposed works are compliant with the requirements and environmental objectives of the EU Water Framework Directive and the other relevant water quality objectives for these water bodies and; In circumstances where the appropriate mitigations measures are fully implemented during the construction and operational phases, the impact of the proposed development on the water quality in the area will be imperceptible. The MP2 Project is therefore not expected to have a significant effect on the water quality of the receiving waters. • *Flood Risk Assessment/ Coastal Processes:* The main interaction between Human Health & Population and Flood Risk Assessment relates specifically to the potential impact of MP2 Project on the wave climate. Changes in bathymetry due to dredging activities have the potential to alter the energy with which waves break and could result in wave overtopping

Chapter	Interaction
	of structures and flood defences. Consideration of changes to the wave climate due to the MP2 Project presented in chapter 12 show no discernible change in relevant proximate areas such as Clontarf, Fairview and Ballybough bordering the Tolka Estuary. Changes in wave height within the Port are not significant. Therefore the risk of potential coastal flooding due to the MP2 Project in these areas is determined to be negligible therefore the risk to human health as a result of MP2 Project is considered low. ***Air Quality & Climate / Soils, Geology & Hydrogeology:*** The construction and operational phases of the development have the potential to generate impacts in terms of air quality upon local population centres. The main potential impact relates to dust generation arising during construction activities such as such as stone importation, excavation, earth moving, dredging and backfilling may generate quantities of dust, particularly in dry weather conditions and nuisance odours caused disturbance of organic seabed material during capital dredging operations. Potential impacts for nuisance Dust and Odours have been assessed in Chapter 10 and the impacts of MP2 Project are considered negligible. A number of mitigation measures will be employed during construction including the preparation of a dust minimisation plan and odour management plan. Another potential interaction relates to the potential decrease in Air Quality as a result of increased operation traffic. Road traffic from the MP2 Project can impact directly on local air quality and any sensitive receptors that are located adjacent to the local road network may experience the impacts to local air quality. Traffic on the road network is predicted to increase during the operation stage in line with the increased throughput of cargo and passengers as predicted under the Masterplan 2040. An assessment of the potential impact associated with the increase in Traffic in terms of air quality upon local population centres has been undertaken. The results indicate that all levels of pollutants are predicted to remain within the limits for the protection of human health along each of main traffic routes with the full predicted growth in traffic by 2040. Using the NRA significance criteria the predicted increases associated with the MP2 Project relative to the “do-minimum” scenario are classed as “imperceptible” to “small”. While the levels remain below the relevant limits these increases and air quality impact from this

Chapter	Interaction
	traffic are classed as "negligible". This includes for the wider masterplan traffic and hence the cumulative traffic impact on air quality is also considered "negligible". ***Noise & Vibration:*** An interaction link between Noise & Vibration and Population and Human Health exist. Noise and vibration generated from the construction and operational of MP2 Project has the potential to impact upon local population centres. An assessment of construction noise was undertaken using worst case scenario noise level combined with noise data collected as part of the ABR project. The assessment concludes that the noise levels are not expected to exceed the existing levels with the implementation of the proposed mitigation measure during construction. ***Landscape & Visual:*** The main interaction between Landscape & Visual and Population & Human Health relates to the impact of MP2 Project on visual receptors. An assessment has been undertaken to determine the magnitude of visual impact of the MP2 Project on potential views from sensitive visual receptors including residential properties. The findings of this assessment have highlighted that; there is limited potential visibility of the MP2 Project from residential properties; the nearest properties are located at Ringsend on R131, York Road and Pigeon House Road to the southwest and all aspects of the MP2 Project will be well screened from residential properties. The assessment has concluded that because the predicted change in visual resource is low, the visual sensitivity of receptors is negligible. Therefore the predicted significance of visual impact for residential properties will be minor negative. ***Population & Human Health:*** An interaction between link between Traffic & Transport and Population & Human Health exists. Increased traffic volumes during construction and operation of MP2 Project has the potential to adversely impact human beings (increased traffic flows, noise and air quality). It has been demonstrated in Chapter 13 that there is adequate capacity in the road network to accommodate the proposed development and also Chapters 10 & 11 show that there will be negligible impacts arising from increased traffic.

Chapter	Interaction
Chapter 17 - Waste	The most significant interactions in relation to Waste is considered to be Biodiversity, Flora & Fauna and Water Quality & Flooding. Consideration of each are provided in relevant chapters within the EIAR with appropriate mitigation measures included. ***Biodiversity, Flora & Fauna:*** An inter-relationship exists between Waste and Biodiversity Flora & Fauna. Avian & aquatic ecology is dependent on surface water quality and surface water quality can be affected during dredging operations. Dredging operations can cause temporary suspension and release of seabed sediments at the loading sites. Similarly, dumping operations will also give rise to temporary sediment plumes at the licensed dumping site in Dublin Bay. These operations can cause a localised negative impact on water quality, water dependant habitats and aquatic ecology. As reported in Chapter 8, all sediments planned for capital dredging have been categorised as “Class 1” non-hazardous soils. Therefore the risk of disturbing seabed sediments causing deterioration to water quality and marine ecology is considered very low and where it does arise appropriate water quality mitigation measures have been proposed ***Water Quality & Flood Risk Assessment***: An inter-relationship link between Waste and Water Quality & Flood Risk Assessment exists. The link relates specifically to the erosion and mobilisation of sediment during construction, demolition and dredging operations resulting in the localised deterioration of Water Quality due to an increase in suspended sediments in the water column. The impact of the construction, demolition and dredging operations on water quality has been assessed using extensive water quality data collected during the dredging operations that have occurred during the ABR project. The findings of the Water Quality assessment has confirmed that with the implementation of the mitigation measures during demolition, clearing and berth construction activities, and dredging operations, the potential impact to receiving water environment will be reduced to negligible thus reducing the significance of environmental effect to Imperceptible. ***Air Quality & Climate Change / Population & Human Health*****:** An inter-relationship link between Waste and Air & Climate / Population & Human Health exists. The main potential impact relates to dust generation arising during construction activities such as such as stone importation, excavation, earth moving, dredging and backfilling may generate quantities of dust,

Chapter	Interaction
	particularly in dry weather conditions and nuisance odours caused disturbance of organic seabed material during capital dredging operations. The potential impacts for nuisance Dust and Odours have been assessed. The impacts of MP2 Project are considered negligible. A number of mitigation measures will be employed during construction including the preparation of a dust minimisation plan and odour management plan

18.3 Assessment Summary and Conclusion

18.3.1 Cumulative Effect between the MP2 Project and Projects in the same area

The potential cumulative effects of consented schemes nearby the MP2 Project were assessed. Relevant projects were selected and the Project team defined significance thresholds and criteria for assessment. These were based on professional judgement, alongside relevant standards and guidelines, to determine whether in-combination effects gives rise to additional levels of significance.

The most significant nearby Project identified was the ABR Project. The three key environmental factors with potential cumulative effects with the MP2 Project were: Biodiversity; Water Quality; Traffic and Transportation.

Construction and operation phase mitigation measures were identified to prevent the potential interaction of cumulative effects on both Biodiversity and Water Quality. For example, the potential cumulative effects resulting from dredging and disposal operations required inclusion of mitigation measures to temporarily separate operations. This means that the dredging element of the MP2 Project will not overlap with ABR capital dredging and/or DPC maintenance dredging campaigns, thus reducing potential impacts to water quality, habitat deterioration, underwater noise and biodiversity. A traffic assessment was undertaken and considered the potential cumulative effects of the consented schemes surrounding the MP2 Project on traffic and transportation. The assessment factored in 3.3% yearly growth of port-related traffic movements, to allow for continued growth in line with Dublin Port's Masterplan. This assessment concluded that the MP2 Project would not result in any cumulative effects on road traffic when considered in combination with consented developments and the future growth of Dublin Port.

Another significant interaction is the MP2 Project in combination with the Dublin Port Internal Road Network (3084/16). The interaction relates to the construction and operation of MP2 Project in combination with the Dublin Port Greenway. Both projects have the potential to cause disturbance to bird populations using the Tolka estuary during periods of very low spring tides (approximately 40 occasions a year). The following mitigation measures will be applied to reduce the impact of MP2 Project and therefore reducing the cumulative effects when considered in combination with the Internal Road network:

- Construction of Berth 53 and heritage installations will temporarily cease during periods of low spring tides to avoid disturbance at feeding grounds within the Tolka Estuary.
- Gates will be used at the site of the Greenway to control the movement of people during periods of low spring tides, again, to avoid disturbance at feeding grounds within the Tolka Estuary. This will avoid any effects of human disturbance on the birds.

18.3.2 Interactions between the various impacts within the MP2 Project.

The potential interactions between environmental aspects arising from within the MP2 Project were assessed. Each technical chapter within the EIAR identifies and analyses the potential for other environmental interactions. These chapters also detail environmental baseline information and identify the significant potential and residual construction and operational effects/impacts of the discrete MP2 Project. The cumulative assessment identified many potential inter-relationships and inter-actions. Additional mitigation measures were included to minimise and/or off-set the potential for significant effects resulting from such inter-actions.

For example, an interaction link exists between Water Quality and Human Beings. Dredging operations has the potential to impact on water quality at water intakes and outfalls. Four power plants within the Dublin Port area abstract water from the Liffey. The water is abstracted as part of the electricity generation process and/or for cooling water components. High levels of suspended solids in cooling water has the potential to impact upon the plants cooling system and may result in an increase in operation and maintenance costs. A review of dredging simulation results showed that that the increased levels of suspended sediment concentrations at the power station intakes are generally very small by comparison with background levels in the Liffey Estuary. It is therefore unlikely to have a significant effect on the quality of intake waters at power stations in terms of suspended solids content. Precautionary mitigation measures have been included as an additional safeguard. If dredging is scheduled to take place within a 500m radius of the intakes, the relevant stakeholders are notified so that additional measures can be taken if deemed necessary.

All potential cumulative effects and environmental interactions of the MP2 Project’s construction and operational stages are included in Chapter 18. All mitigation measures for the MP2 Project resulting from the individual assessments, and the cumulative effects and environmental assessment are listed in detail in Chapter 19 and the Project Construction Environmental Management Plan (CEMP). Provided the suggested mitigation measures as listed in the environmental chapters are employed during construction and/or operation the overall impact to the environment, even considered in combination, is considered negligible.

19 SUMMARY OF MITIGATION MEASURES & CONCLUSIONS

19.1 Summary of Mitigation Measures

DPC seeks to achieve the highest possible standards of environmental management during both the construction and operational phases of the MP2 Project. A summary of all mitigation measures and monitoring requirements proposed within the Environmental Impact Assessment Report (EIAR) are contained in this Section.

19.1.1 Construction Phase Mitigation Measures

The EIAR assesses the likely significant effects of the MP2 Project on the environment arising from the construction of the MP2 Project. Integration of the engineering design team with the planning and environmental team from an early stage in the project has enabled mitigation by design to be used, causing many likely significant effects to be eliminated or reduced to an acceptable level during the preliminary design stage. Following an examination, analysis and evaluation of the direct and indirect significant effects of the project in relation to the receiving environment, additional mitigation measures and monitoring programmes have been recommended which will be fully implemented during the construction phase of the MP2 Project.

Table 19-1 summarises the mitigation measures and monitoring programmes recommended within the EIAR during the construction phase of the MP2 Project. All mitigation measures proposed within the NIS have been captured by the EIAR.

Table 19-1 Mitigation measures and monitoring recommended within the EIAR

Potential Impact	Summary of Proposed Mitigation
Chapter 6 RISKS OF MAJOR ACCIDENTS & DISASTERS	
Potential for loss of life or injury to employees, Contractors, visitors and local residents. Potential for damage to the environment. Potential for damage to the facilities, plant and equipment of DPC, its commercial partners, tenant companies and neighbours.	• The design of the MP2 Project has been informed by a COMAH land use planning assessment, the purpose of which was to examine the development in the context of the Health and Safety Authority's COMAH land use planning guidance, and to identify the types of development that may be compatible with the COMAH risk zones around the Calor (and other COMAH) establishments. Based on this conservative assessment, it is considered that the final design layout of the MP2 Project would satisfy the HSA's criteria under its land use planning guidelines. The MP2 Project will therefore not increase the risk of major accidents and disasters. • To remain vigilant, DPC has developed a comprehensive Emergency Management Plan (see Appendix 6 of this EIAR) that caters for the range of accident and emergency events that may occur within its estate (or that may occur outside of the estate and that are likely to have a direct, knock on effect).

Potential Impact	Summary of Proposed Mitigation
	• In the event of an incident, DPC would activate its plan accordingly, in which case people would be directed away from the source of the hazard. • DPC's Emergency Management Plan competencies are continuously enhanced through participation in training and exercises at different levels.
Chapter 7 BIODIVERSITY, FLORA & FAUNA	
No regulated invasive plant species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011, as amended, were identified on site during baseline habitat surveys of the site in 2018 and 2019. Nevertheless, a precautionary approach will be undertaken to prevent the importation and spread of Invasive Alien Species	• An Invasive Alien Species (IAS) Management Plan will be implemented for the duration of the proposed construction works. A draft IAS Management Plan which includes an initial IAS Assessment.is presented in Appendix 19-2 of this EIAR. The IAS Management Plan links into the Construction Waste Management Plan and Construction Traffic Management Plan to prevent the introduction or spread of IAS. The Plan outlines containment and eradication measures to be implemented if any IAS are identified. Prevention • Prevention measures will range from raising awareness of IAS and the potential for their dispersal, to ensuring best practice in relation to the movement of materials into, within or out of the operations area. Measures to be implemented shall include: – Ensuring that rock armour, gravels, sand or soils to be imported to the site are sourced from authorised/licensed quarry operators; – Specifying that such material should be free of invasive plant species and their propagules; – Implementing a waste management plan for the proper storage and controlled movement of waste materials; – Implementing a materials handling plan for the proper storage and controlled movement of materials; – Implementing a construction traffic management plan for control of vehicle and plant access and movements, including wheel wash and plant inspection at site entrance; – Ensuring that all vehicles and construction plant arriving on site are reasonably clean and free of significant deposits of mud and plant debris (particularly tyres, wheel arches, excavator buckets and tracks) that might be a vector for spread of IAS; – Cordoning off any IAS locations on site identified and mapped in the initial IAS assessment; – Washing down machinery that has operated in IAS infested areas in designated locations before moving within the site or leaving the site;

Potential Impact	Summary of Proposed Mitigation
	– Inclusion of IAS awareness in toolbox talks using visual aids to identification for the most likely species to be encountered prepared by the initial IAS assessment; – Notification of any suspected new occurrences of IAS to the Environmental Facilities Manager. <u>Containment / Treatment</u> • If any IAS is identified on the construction site, the management plan will contain its spread in the first instance and subsequently eradicate it if possible from the site. This will include implementation of the following measures: – Cordoning off any invasive species infestations to limit movement of people / machinery in infested area and relevant buffer zones; – Confirmation of the identification of the species concerned, and collation of relevant information; – Selection of the most appropriate best practice methods for control / treatment; – Prioritisation of treatment areas; – Undertaking physical or chemical control measures as appropriate in line with best practice guidance and in compliance with health and safety requirements; – Ensuring control measures are undertaken by suitably qualified personnel; – Handling and disposal of treated material appropriately to prevent further spread.
Precautionary measures will be undertaken to minimise the risk of injury or disturbance to birds in the area of operations	• A Bird Management Plan will be implemented for the duration of the proposed construction works. A draft Bird Management Plan.is presented in Appendix 19-7 of this EIAR. • The following precautionary measures will be undertaken to minimise the risk of injury or disturbance to nesting and breeding birds in the area of operations – Black Guillemots –nest-boxes and other artificial nest sites will be provided prior to construction; – Breeding Terns – the capital dredging scheme will be confined to the winter months (October – March) when the terns have migrated from the site. • The following precautionary measures will be undertaken to minimise the risk of injury or disturbance to non-breeding waterbirds in the area of operations – Construction of Berth 53 will temporarily cease during periods of greatest low spring tides when bird feeding grounds adjacent to

Potential Impact	Summary of Proposed Mitigation
	Berth 53 in the Tolka Estuary are exposed to avoid disturbance of birds; – Gates will be used at the site of the Greenway to control the movement of people during the periods of low spring tides above, again, to avoid disturbance at feeding grounds within the Tolka Estuary. Monitoring • DPC is committed to continuing a programme to monitor Black Guillemots, Common Tern and Arctic Tern in Dublin Port throughout the construction phase of the MP2 Project and for a period of two years after the completion of such works. The results of this monitoring programme will be submitted to Dublin City Council at 12-monthly intervals to maintain a public record. • DPC will also continue to undertake a programme to monitor winter wetland birds in the adjacent European Sites at the South Dublin Bay and River Tolka Estuary Special Protection Area. This monitoring programme will continue throughout the construction phase and for a period of two years after the completion of such works, with monthly surveys from October to March. The results of this monitoring programme will be submitted to Dublin City Council at 12-monthly intervals to maintain a public record.
Precautionary measures will be undertaken to minimise the risk of injury or disturbance to marine ecology and fisheries in the area of operations	• A Marine Ecology Management Plan will be implemented for the duration of the proposed construction works. A draft Marine Ecology Management Plan.is presented in Appendix 19-7 of this EIAR. • A Dredging Management Plan will also be implemented for the duration of the proposed construction works. A draft Dredging Management Plan.is presented in Appendix 19-10 of this EIAR. • The following key mitigation measures apply to the Capital Dredging Scheme to minimise the impact of the proposed works on marine ecology – No over-spilling at the surface of the dredger for all dredging activities within the inner Liffey Channel will be permitted; – The dredger will work on one half of the channel at a time within the inner Liffey channel to prevent the formation of a silt curtain across the River Liffey; – The dredging of sediments within the navigation channel will be carried out during the winter months (October – March) to negate any potential impact on salmonid migration (particularly smolts) and summer bird feeding, notably terns, in the vicinity of the dredging operations; – A trailer suction head dredger (TSHD) or Back-hoe dredger will be

Potential Impact	Summary of Proposed Mitigation
	used for the capital dredging works. When operating in the River Liffey Channel, the TSHD pumps will be switched off when the drag head is being lifted and returned from the bottom as the dredger turns between successive lines of dredging to minimise the risk of fish entrainment; – A maximum of $4{,}100m^3$ of sediment and entrained water will be loaded into the dredger's hopper for each loading/dumping cycle, equivalent to approximately of 2,030 tonnes (wet weight). • The following key mitigation measures apply to piling activities to minimise the impact of the proposed works on fisheries: – No piling will take place along the riverside of 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 of the fact that smolts have a swim bladder which likely makes them more susceptible than lamprey to pressure trauma due to piling noise.
Precautionary measures will be undertaken to minimise the risk of injury or disturbance to marine mammals in the area of operations	• A Marine Mammals Management Plan will be implemented for the duration of the proposed construction works. A draft Marine Mammals Management Plan.is presented in Appendix 19-6 of this EIAR. • The following precautionary measures will be undertaken to minimise the risk of injury or disturbance to marine mammals in the area of operations in line with National Parks and Wildlife Service (NPWS) Guidelines (2014) – A trained and experienced Marine Mammal Observer (MMO) will be put in place during piling, dredging, demolition and dumping 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. The NPWS exclusion zone is 500m for dredging and demolition works and 1,000m for piling activities. – Noise-producing activities will 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 will be postponed until effective visual monitoring is possible. Visual scanning for marine mammals (in particular harbour porpoise) will only be effective during daylight hours and if the sea state is WMO Sea State 4 (≈Beaufort Force 4 conditions) or less. – 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

Potential Impact	Summary of Proposed Mitigation
	acoustic energy output will 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. – If there is a break in piling / dredging 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 1,000m for piling activities. – Any approach by marine mammals into the immediate (<50m) works area will be reported to the National Parks and Wildlife Service. • The MMO will keep a record of the monitoring using a 'MMO form location and effort (coastal works)' available from the National Parks and Wildlife Service (NPWS) and submit to the NPWS on completion of the works. • In line with best international practice, a combination of visual and acoustic mitigation techniques will be used to ensure there are no significant impacts on all Annex II marine species, including harbour porpoise, grey seal and harbour seal. Static Acoustic Monitoring (SAM) through the deployment of CPODs will be used. SAM monitoring sites will be established and maintained throughout the project and for two years post-construction. This technique is to complement and not replace visual techniques. • The deployment of a SAM system will complement and extend the extensive database currently being collected as part of the ABR Project environmental monitoring programme.
Chapter 8 SOILS, GEOLOGY, HYDROGEOLOGY	
The potential risk to construction workers from contaminants during the earthworks is low.	• Fill material will be sourced from authorised quarries and will have minimal potential to introduce contamination onto the site.
Chapter 9 WATER QUALITY and FLOOD RISK	
Mobilised suspended sediment and cement release through construction and demolition activities are the principal potential sources of water quality impact during the construction phase of the works.	• A Water Quality Management Plan will be implemented for the duration of the proposed construction works. A draft Water Quality Management Plan.is presented in Appendix 19-9 of this EIAR. • The following precautionary measures will be undertaken to minimise the risk of impacting on water quality within the receiving environment:

Potential Impact	Summary of Proposed Mitigation
	– sound design principles will be followed to adhere to relevant Irish guidelines and recognised international guidelines for best practice; – appropriate erosion and sediment controls during construction to prevent sediment pollution will be implemented; – Where preferential surface flow paths occur, silt fencing or other suitable barriers will be used to ensure silt laden or contaminated surface runoff from the site does not discharge directly to a water body or surface water drain. – In the event that dewatering of foundations or drainage trenches is required during construction and/or discharge of surface water from sumps, a treatment system prior to the discharge will be used; silt traps, settlement skips etc. This measure will allow additional settlement of any suspended solids within storm water arising from the construction areas. • Management and auditing procedures, including tool box talks to personnel will be put in place to ensure that any works which have the potential to impact on the aquatic environment are being carried out in accordance with required permits, licences, certificates and planning permissions. • Existing and proposed surface water drainage and discharge points will be mapped on the Drainage layout. These will be noted on construction site plans and protected accordingly to ensure water bodies are not impacted from sediment and other pollutants using measures to intercept the pathway for such pollutants. • A draft project specific Pollution Incident Response Plan has been prepared and suitable training will be provided to relevant personnel detailed within the Pollution Incident Response Plan (see Appendix 19-11 of this EIAR)
Accidental release of highly alkaline contaminants from concrete and cement may arise during the demolition of buildings and structures and the construction of hardstand areas, waterside berths, quay walls, jetties, bridging structures, etc. Concrete and cement pollution may give rise to significant impacts on water quality in the absence of mitigation.	• The following precautionary measures will be undertaken to minimise the risk of impacting on water quality within the receiving environment – Breaking of concrete (associated with structure demolition) has the potential to emit alkaline dust into the receiving environment. Where necessary a barrier between the dust source and the sensitive receptor (the water body in this case) will be erected to limit the possibility of dust contacting the receptor; – Concrete use and production shall adhere to control measures outlined in Guidance for Pollution Prevention (GPP5): Works and maintenance in or near water (2017). Any on-site concrete production will have the following mitigation measures: bunded designated concrete washout area; closed circuit wheel wash etc.; and initial siting of any concrete mixing facilities such that there is

Potential Impact	Summary of Proposed Mitigation
	no production within a minimum of 10 metres from the aquatic zone; – The use of wet concrete and cement in or close to any water body will be carefully controlled so as to minimise the risk of any material entering the water, particularly from shuttered structures or the washing of equipment. – Where concrete is to be placed under water or in tidal conditions, specific fast-setting mix is required to limit segregation and washout of fine material / cement. This will normally be achieved by having either a higher than normal fines content, a higher cement content or the use of chemical admixtures.
General water quality impacts may arise associated with works machinery, infrastructure and on-land operations including the temporary storage of construction materials, oils, fuels and chemicals. There is the potential for spillage or release of fuel oil and other dangerous substances to result in moderate to significant impacts on water quality in the absence of mitigation.	• The following precautionary measures will be undertaken to minimise the risk of impacting on water quality within the receiving environment – The risk of water quality impacts associated with works machinery, infrastructure and on-land operations (for example leakages/spillages of fuels, oils, other chemicals and waste water) will be controlled through good site management and the adherence to codes and practices, – Management and auditing procedures, including tool box talks to personnel, will be put in place to ensure that any works which have the potential to impact on the aquatic environment are being carried out in accordance with required permits, licences, certificates and planning permissions; – Existing and proposed surface water drainage and discharge points will be mapped on the Drainage layout. These will be noted on construction site plans and protected accordingly to ensure water bodies are not impacted from sediment and other pollutants using measures to intercept the pathway for such pollutants, – Fuel, oil and chemical storage will be sited on an impervious base within a bund and secured. The base and bund walls must be impermeable to the material stored and of adequate capacity. The control measures in GPP2: Above Ground Oil Storage Tanks and PPG 26 “Safe storage – drums and intermediate bulk containers” (Environment Agency, 2011) shall be implemented to ensure safe storage of oils and chemicals; – The safe operation of refuelling activities shall be in accordance with PPG 7 “Safe Storage – The safe operation of refuelling facilities” (Environment Agency, 2011).
Drainage systems need to be designed to prevent the release of polluted water to the receiving waters.	• The following precautionary measures will be undertaken to minimise the risk of impacting on water quality within the receiving environment – Storm water runoff will be collected in a dedicated storm water drainage system and will not be permitted to discharge directly

Potential Impact	Summary of Proposed Mitigation
	into the marine environment from new jetties and hardstanding areas. The surface water drainage system will consist, inter alia, of heavy duty gullies cast into the reinforced concrete deck, with concrete pipes cast into the in-situ concrete deck structure. These pipes will carry the storm water into an appropriate full retention oil separator which will trap oils and silts prior to being discharges into the harbour waters through a non-return flap valve. A readily and safely accessible monitoring chamber will be provided on the storm water pipeline as appropriate to allow for inspection and sampling of the storm water being discharged, – The oil interceptors on the surface water drainage network will be selected and sized based on the pollution prevention guideline: "Use and design of oil separators in surface water drainage systems: PPG3" (Environment Agency, 2006) and BS EN 858 which is the European Standard for the design, performance, testing, marking and quality control of separators within the EU. All separators must comply with this standard. In accordance with PPG3 a class 1 bypass separator will be required for general and car parking areas of the site whilst a class 1 full retention separator will be required for the HGV parking and loading area. Notwithstanding this, full retention separators are proposed for each phase of the development and will be sized in accordance with a design flow of 590l/s for a six hour duration storm and the drainage area to be serviced.
Monitoring Measures	• A water quality monitoring system has been designed to ensure robust protection of the marine environment and for users of the inner Liffey channel during the construction phase of the MP2 Project. – It is proposed to maintain the four water quality monitoring stations already in position for the ABR Project – The specification is based on state of the art 24/7 real time monitoring with water quality monitoring sensors giving high resolution data with respect to the following parameters ○ Turbidity ○ -Dissolved Oxygen ○ Temperature ○ Salinity ○ - pH (additional proposed parameter) – Water level is also measured at one monitoring station to provide information on tidal state. Turbidity is measured as a surrogate for suspended solids. Site specific tests have previously been undertaken by the ABR Project to define the relationship between Turbidity and suspended solids,

Potential Impact	Summary of Proposed Mitigation
	– A data acquisition and transfer system is being used to enable the transmission of high resolution data at approximately 15 minute intervals. – The following trigger levels that will prompt investigation are proposed: ○ Dissolved Oxygen level falling below 6 mg/l. ○ Peak Suspended Solids level rising more than 100mg/l above background (Based on the Turbidity v Suspended Solids relationship previously established this is equivalent to an Turbidity increase of 40 NTU above background) – The Dissolved Oxygen trigger level has been selected to safeguard fish-life. – The monitoring network infrastructure has been in place since 2016 and will continue for the duration of the construction phase of the MP2 Project. – This monitoring system has already generated a robust water quality baseline within the inner Liffey channel with the ability to identify water quality trends. The continuation of the monitoring system will serve to further strengthen the knowledge of water quality trends, a key indicator of the health of the marine environment. – The water quality data currently being collected is circulated to Dublin City Council on a monthly basis. It is proposed that this transfer of information continues for the duration of the construction phase of the MP2 Project – The data collected is also being shared with research organisations (Dublin City University, Maynooth University and University College Cork).
Chapter 10 AIR QUALITY & CLIMATE	
Construction works have the potential to result in local impacts through dust nuisance at the nearest sensitive receptors and also to sensitive ecosystems	• A draft dust minimisation plan has been prepared based upon the industry guidelines in the Building Research Establishment document entitled 'Control of Dust from Construction and Demolition Activities' (see Appendix 19-5 of this EIAR). • The following precautionary measures will be undertaken to minimise the potential nuisance caused by dust at the nearest sensitive receptors and on sensitive ecosystems – 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 traffic only; – Any site roads with the potential to give rise to dust will be

Potential Impact	Summary of Proposed Mitigation
	regularly watered, as appropriate, during dry and/or windy conditions (also applies to vehicles delivering material with dust potential); – All HGVs and other site vehicles exiting the site will make use of a wheel wash facility prior to entering onto Dublin Port estate roads and public roads, to ensure mud and other wastes are not tracked onto the roads. Wheel washes will be self-contained systems that do not require discharge of the wastewater to water bodies. – Wheel washes shall 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 the public road; – It will be required that all vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum; and – Monthly monitoring of dust deposition levels each month for the duration of construction for comparison with the guideline of 350mg/m^2/day (for non-hazardous dusts). This monitoring will 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 will be reviewed as part of a Dust Minimisation Plan.
The potential exists for odour generation and nuisance to occur during the construction phase.	• A draft Odour Management Plan (OMP) has been prepared and follows the guidance presented in the Environment Agency of England and Wales "Odour Management Guidance" (H4 Guidance, 2011) (see Appendix 19-5 of this EIAR). The odour monitoring and investigation aspects of the OMP will follow the EPA "Odour Impact Assessment Guidance for EPA Licenced Sites". The OMP will achieve the following: – Employ appropriate methods, including monitoring and contingencies, to control and minimise odour pollution; – Prevent unacceptable odour releasing incidents or accidents by anticipating them and planning accordingly. • The plan considers sources, releases and impacts of odour and uses these to identify opportunities for odour management. The OMP will

Potential Impact	Summary of Proposed Mitigation
	also include a 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. In addition, the plan includes for complaint recording and investigation to ensure that all complaints received at the site are suitably addressed.
Emissions of construction generated Green House Gases (GHG) will arise from embodied emissions in site material, direct emissions from plant machinery /equipment as well as emissions from vehicles delivering material and personnel to the construction site.	• Mitigation measures to minimise CO_2 emissions from the construction phase include the following: – Consultation with a wider variety of internal and external stakeholders to ensure all relevant information is included in the development of the plans; – Implementation of a Traffic Management Plan which will form part of the specification for the construction works. This will outline measures to minimise congestion and queuing, reduce distances of deliveries and eliminate unnecessary loads; – Reducing the idle times by providing an efficient material handling plan that minimizes the waiting time for loads and unloads. Reducing idle times could save up to 10% of total emissions during construction phase; – Turning off vehicular engines when not in use for more than five minutes. This restriction will be enforced strictly unless the idle function is necessary for security or functionality reasons; – Regular maintenance of plant and equipment. Technical inspection of vehicles to ensure they will perform the most efficiently. • Materials with a reduced environmental impact will be incorporated into the construction design through re-use of materials or incorporation of recycled materials in place of conventional building materials. The following materials will be considered for the construction phase:- – Ground Granulated Blast Furnace Slag (GGBS) & Pulverised Fuel Ash - Used as replacements for Portland cements to increase sustainability and carbon footprint of civil and structural works; – Steel - The recovery rates associated with using recycled steel are high and research exists which shows that 99% of structural steel arising from demolition sites is recycled or re-used. The carbon emissions emitted during the production of virgin steel can be higher than some other structural materials on a tonne by tonne basis, and recycled steel will be used where possible. • An The Energy Management system will include the following measures as:- – The use of thermostatic controls on all space heating systems in site buildings to maintain optimum comfort at minimum energy

Potential Impact	Summary of Proposed Mitigation
	use; – The use of sensors on light fittings in all site buildings and low energy lighting systems; – The use of adequately insulated temporary building structures for the construction compound fitted with suitable vents; – The use of low energy equipment and "power saving" functions on all PCs and monitors in the site offices; – The use of low flow showers and tap fittings; – The use of solar/thermal power to heat water for the on-site welfare facilities and contamination unit (sinks and showers).
Chapter 11 NOISE & VIBRATION	
There is the potential for noise impacts associated with the construction phase of the proposed development at the nearest noise sensitive receptors.	• A Noise Management Plan will be implemented for the duration of the proposed construction works. A draft Noise Management Plan.is presented in Appendix 19-4 of this EIAR. • *British Standard BS5228:2009+A1:2014 – Noise and vibration control on construction and open sites: Part 1 - Noise* outlines a range of measures that will be used to reduce noise impacts at the nearest noise sensitive receptors. The measures, which will be applied, include: – 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 will be kept closed whenever the machines are in use, – Any ancillary pneumatic percussive tools will be fitted with properly lined and sealed acoustic covers which will 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, – Handling of all materials will take place in a manner which

Potential Impact	Summary of Proposed Mitigation
	minimises noise emissions, – Audible warning systems will be switched to the minimum setting required by the Health and Safety Authority, – A complaints procedure will 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.
There is potential for underwater noise as a result of piling activities.	• The use of vibratory piles for a substantial portion of the piling requirements will reduce impact driving. • Pile driving activity will be carried out as efficiently as possible to reduce the duration of the piling activity. Piling will only take place for a portion of each working day and will not be carried out at night.
Monitoring Measures	• Continuous terrestrial noise monitoring will be undertaken for the duration of the construction works in accordance with BS7445: Description and Measurement of Environmental Noise. – All measurements will be made using Type 1 precision digital sound levels meters and associated hardware. The following parameters will be recorded as a minimum: LAeq, LAmax, LAmin, LA10 & LA90. – The number and location of noise meters will be agreed with Dublin City Council. These will operate for the entire duration of the construction phase. A permanent secure noise monitoring station has previously been established at the marina adjacent to Pigeon House Road as part of the ABR Project. It is representative of nearest sensitive noise receptors and may prove to be an appropriate location for the MP2 Project subject to approval as above. A second monitoring station is proposed at Clontarf, representative of nearest sensitive noise receptors to the north of the MP2 Project site. – All data will be collected and analysed on a weekly basis and the analysed data will be fed back to DPC and the Contractors with a view to reviewing the compliance of construction phase activities in the context of any relevant conditions in planning approval if granted, and the thresholds/requirements included in the draft Noise Management Plan. This will also include any liaison requirement with Dublin City Council in this regard. – Any noise nuisance issues associated with the construction phase activities will be immediately assessed and analysed in relation to the recorded noise levels and all correspondence with DPC, the Contractor, Dublin City Council and the residents will be conducted with the appropriate level of urgency. This will include the appropriate liaison with DPC and the Contractor to control

Potential Impact	Summary of Proposed Mitigation
	activities to ensure that the construction phase activities are in line with any relevant planning conditions and the CEMP. – Interim synoptic reports will be produced on a regular basis, usually calendar months, and submitted to Dublin City Council and the project liaison group. – Summary data and graphical outputs for each year of the construction phase will form part of an Annual Environmental Report. The data will be prepared in an analytical output that will aim to provide a concise representation of the construction phase noise levels from the port and will aim to avoid presentation of lengthy datasets. • Underwater noise surveys will be undertaken during the construction phase of the works: – The underwater noise surveys will complement the existing underwater noise level measurements which have been recorded during the impact piling carried out inside Alexandra Basin West for the ABR Project. This will provide additional validation of the underwater noise modelling and to ensure the underwater noise levels are contained within the operations area of the port, – Underwater noise surveys will be undertaken during the construction period at a minimum of 2 locations upriver and two locations downstream of the works when being carried out in the navigation channel. Monitoring will be carried out at the commencement of the piling activity.
Chapter 12 COASTAL PROCESSES	
Potential impact of Berth 53 upon tidal current speeds resulting in erosion of bed levels and a localised modification of the lowest astronomical tide mark. This has the potential to impact upon the winter foraging areas within the South Dublin Bay and Tolka Estuary SPA.	• The potential impact of Berth 53 on tidal currents and the movement of sediments was modelled and this process informed the final open piled berth design to mitigate any impact on the morphology of the South Dublin Bay and Tolka Estuary SPA. • A wash protection structure has been designed to reduce high thruster jet velocities associated with manoeuvring vessels, again to mitigate any impact on the morphology of the South Dublin Bay and Tolka Estuary SPA. • This mitigation by design has reduced the potential impact of the MP2 Project on coastal processes to an imperceptible level.
Chapter 13 TRAFFIC & TRANSPORT	
There will be an increase in construction traffic during the construction phase of the development.	• A Construction Traffic Management Plan will be implemented for the duration of the proposed construction works. A draft Construction Traffic Management Plan.is presented in Appendix 19-1 of this EIAR. • The following mitigation measures will be applied:

Potential Impact	Summary of Proposed Mitigation
	– Adhering to the Dublin City Council HGV Management Strategy; – A pre-defined haulage route will be agreed with Dublin City Council to avoid construction traffic through sensitive road networks at critical times; – Time restrictions will be implemented relating to construction vehicles on the adopted road network, – Temporary warning signage will be installed, as necessary, – Wheel washing, roadside cleaning, load checking and general maintenance of larger vehicles will be in place, – Appropriate parking facilities for site operatives and visitors within the site will be provided with all parking areas clearly signed and monitored.
Chapter 14 CULTURAL HERITAGE (including Industrial & Archaeological)	
There is a need for an overarching Archaeology and Cultural Heritage Management Plan to be implemented during the construction phase	• An Archaeology and Cultural Heritage Management Plan will be implemented for the duration of the proposed construction works. A draft Archaeology and Cultural Heritage Management Plan.is presented in Appendix 19-8 of this EIAR.
Ground disturbance activities have the potential to expose elements of the 19th Century Breakwater which are assumed to remain undisturbed beneath Breakwater Road.	• Archaeological monitoring licensed by the National Monument Service will be conducted of all ground disturbance activities, including site investigations, with the proviso to resolve fully any archaeological material observed at that point.
The construction of Oil Berth 3 will necessitate the reclamation of the sea pocket that accommodates the Pilot Boat pontoon, and the five ship's timber and one metal piece that are in temporary storage under the pontoon.	• There are five ship's timbers and one metal piece located in temporary wet storage under the Pilot Boat pontoon which will be removed to the secure Heritage Zone area for the ABR Project, where they will be placed in water-filled tanks.
It is necessary to demolish the Breakwater terminus or Pier Head to facilitate the construction of Berth 50A.	• Prior to demolition works commencing, the 3D record of existing structure and associated features will be amended where necessary to ensure that the permanent outputs can produce metrically accurate plan, elevation and section drawing information at 1:20 scale. • Archaeological monitoring licensed by the National Monuments Service will be conducted of all ground disturbances, with the proviso to resolve fully any archaeological material observed at that point. The archaeologist will be facilitated by DPC to complete a comprehensive record of any archaeological features that become exposed in the course of the construction works.
• The extension of capital dredging into the south side of the localised	• Archaeological monitoring licensed by the National Monument Service will be conducted of all seabed disturbances that might take place prior

Potential Impact	Summary of Proposed Mitigation
channel widening area represents direct and permanent impacts on what appears to be previously un-dredged locations. It is a area of high archaeological potential and the recovery of shipping debris and/or shipwreck must be anticipated.	to construction, including site investigation, with the proviso to resolve fully any archaeological material observed at that point. • Archaeological monitoring of all dredging activities and associated seabed disturbance activities conducted within the berth pockets and the localised channel widening area will be carried out, with the proviso to resolve full any material of archaeological significance observed at that point.
Monitoring Measures	• Retaining an Archaeologist: – An archaeologist experienced in maritime archaeology will be retained for the duration of the relevant works. • Retaining a Heritage Architect: – A heritage architect experienced in maritime and industrial heritage will be retained for the duration of the relevant works, to advise specifically in relation to works associated with the Breakwater terminus Pier Head. • Archaeological Licences: – Archaeological licences will be required to conduct the on-site archaeological works. Licence applications require the inclusion of detailed method statements, which outline the rationale for the works, and the means by which the works will be resolved. • Archaeological Monitoring: – Monitoring will be carried out by suitably qualified and experienced maritime archaeological personnel licensed by the Department of Culture, Heritage and the Gaeltacht. Archaeological monitoring will be 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 observations and the retrieval of objects that may be observed and that require consideration during the course of works. – The monitoring will include a finds retrieval strategy that is in compliance with the requirements of the National Museum of Ireland. • Time Scale: – The time scale for the construction phase will be made available to the archaeologist, with information on where and when ground disturbances will take place. • Discovery of Archaeological Material: – In the event of archaeologically significant features or material

Potential Impact	Summary of Proposed Mitigation
	being uncovered during the construction phase, machine works will cease in the immediate area to allow the archaeologist/s to inspect any such material. • Archaeological 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 DPC and the licensing authorities. • Archaeological team: – It is recommended that the core of a suitable archaeological team be on standby to deal with any such rescue excavation. This would be complimented in the event of a full excavation. • Archaeological Dive Team: – It is recommended that an archaeological dive team is 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. • A Site Office: – A site office and facilities will be provided by DPC on site for use by archaeologists. • Secure Wet Storage: – Secure wet storage facilities will be provided on site by DPC to facilitate the temporary storage of artefacts that may be recorded during the course of the site work. • Buoying/Fencing: – Buoying/fencing of any such areas of discovery will be necessary if discovered and during excavation. • Machinery Traffic: – Machinery traffic during construction will be restricted to avoid any identified archaeological site/s and their environs. • Spoil: – Spoil will not be dumped on any of the selected sites or their environs. • Post-construction Project Report and Archive: – It is a condition of archaeological licensing that a detailed project report is lodged with the DCHG within 12 months of completion of

Potential Impact	Summary of Proposed Mitigation
	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.
Chapter 15 LANDSCAPE & VISUAL	
There are no significant landscape or visual impacts predicted for the MP2 Project.	• The following measures have been incorporated within the engineering design to offset the landscape and visual impact: – Integration of constructed elements with existing elements such as existing roads and building sites; – Appropriate colour of fencing and structures; – Use of directional lighting.
Chapter 16 POPULATION & HUMAN HEALTH	
Embedded mitigation measures	• Monitoring of dust, odour and noise during the construction phase will act as precursors to any health impact, thereby enabling a monitoring regime that enables intervention before any manifest adverse health outcome. • As part of annual reporting, DPC already monitors numbers of employees and several financial Key Performance Indicators (KPIs) (such as turnover, profit, tax contributions) to measure year-on-year progress. The continued measurement of these will ensure that financial socio-economic benefits of the MP2 Project construction phase are captured.
Chapter 17 WASTE	
Waste will be generated during the demolition phase of the works	Main Works Contractor • A Main Works Contractor (MWC) Environmental Co-ordinator/Waste Manager will be appointed. The MWC will ensure that demolition wastes will be collected by an appropriately licensed waste management Contractor and that all proposed management routes comply with the European waste hierarchy of prevention, preparing for reuse, recycling, and recovery with disposal being the last and final option and with other legal requirements. All waste materials leaving the site will be transported and disposed or recovered through licenced operators and in accordance with national waste legislation. Demolition Survey • A Demolition Survey is required prior to any demolition work being undertaken. The Demolition Survey will set out all high value waste materials, such as metals, that will be removed from buildings and

Potential Impact	Summary of Proposed Mitigation
	segregated for possible onward reuse or recycling to maximise recovery. The Demolition Survey will also include intrusive surveying with sampling which will identify the exact extent and location of any asbestos containing materials (ACMs) in the building. Removal offsite of any ACMs from the buildings to be demolished will be required prior to demolition. <u>Segregation & Storage of demolition materials</u> • Demolition debris will be separated into five waste streams on-site: – Construction debris (i.e. ceramics, tiles, plasterboard), – Masonry materials (i.e. brick, concrete blocks) – Metals, – Timber, – Universal waste (i.e. fluorescent bulbs, ballast and mercury containing switches). • On-site segregation of all hazardous waste materials into appropriate categories will be undertaken: – Waste oils and fuels; – Paints, glues, adhesives and other known hazardous substances. • The storage and reuse of demolition or excavation wastes on site may be subject to a number of waste licensing requirements. If these wastes are to be stored on site, prior to potential reuse or recovery during construction, this activity will be subject to a Waste Management Licence Exemption with a limited tonnage of material permitted to be stored on site. Storage will take place in a secure area on-site and the Contractor will monitor the amount of waste stored to ensure that the permitted limits of the Exemption are not exceeded. DPC and its appointed Contractor will consult with the EPA prior to construction to ensure that the appropriate Waste Management Licence or Exemption is in place. <u>Reuse of demolished material on-site</u> • In order to divert waste from landfill, possibilities for reuse of inert demolition material as fill on site will be considered, following appropriate testing to ensure materials are suitable for their proposed end purpose. • Under certain circumstances and in order that uncontaminated excavated soil and stone is beneficially used on-site, DPC and its MWC may decide in accordance with the conditions of article 27 of the European Communities (Waste Directive) Regulations 2011, S.I. No. 126 of 2011 that such material is a by-product and not a waste and will notify the Environmental Protection Agency for a determination. • It is proposed the following areas will be infilled using engineered fill

Potential Impact	Summary of Proposed Mitigation
	material and suitable CDW arising from demolition works within the footprint of the development: – Basin of Oil Berth 4, – Void between the existing Oil Berth 3 and the proposed new sheet pile wall, – Bridging structure in Berth 50A. • A waste permit will be required for the infilling of <50,000 tonnes of CDW into Oil Berth 4. • CDW may be subject to treatment at the site prior to recovery in Oil Berth 4. Mobile plant may be installed to crush and screen suitable CDW. The operations will be as follows: – Loading; – Crushing and grinding; – Screening; – Unloading; – On-site off-site transfer of CDW; – Stockpiles; and – Recovery of waste into Oil Berth 4. • A permit for the recovery operation will be required which is subject to planning. • Masonry units from the 19th Century Eastern Breakwater which currently supports the Port Operations Centre are of industrial heritage importance and will be carefully removed and salvaged for relocation elsewhere on site for future heritage gain projects. The quantity of masonry units is estimated to be approximately 7,000m^3. • DPC and its appointed Contractor will consult with the EPA prior to construction to ensure that the appropriate licences, permits and exemptions are in place prior to initiation.
There is likely to be an increase in the amount of waste produced during the construction phase of the works.	• The current Dublin Port Ship's Waste Management Plan (see Appendix 17 of this EIAR) underpins all waste related operations at Dublin Port. DPC will continue to review and implement any required changes in the waste management plan in order to avoid and minimise the potential effects of vessel generated wastes. • DPC will continue to provide adequate reception facilities and remove, as far as is practicable, any disincentives to landing waste in the port. DPC will continue to encourage the responsible management of waste, including minimisation and recycling, at the point of generation on ships, reception in ports/harbours, transportation and disposal, and ensure that port and harbour employees and users dispose of wastes

Potential Impact	Summary of Proposed Mitigation
	responsibly in facilities provided. • The Ship's Waste Management Plan will continuously evolve to effectively capture materials generated to help ensure that recyclable materials are handled and diverted accordingly. Developing a clear waste management plan that incorporates a customer-facing recycling and organics collection program will help divert materials from landfill. • A draft MP2 Project specific Construction Waste Management Plan (CWMP) has been prepared (see Appendix 19-3 of this EIAR) and includes the following specific requirements: – Building materials will be chosen with an aim to 'design out waste'. – Control measures and attention to materials quantity requirements will avoid over-ordering and generation of waste materials. – Agreements with materials suppliers will reduce the amount of packaging or to participate in a packaging take-back Scheme where possible. – A 'just in time' materials delivery system will be implemented where possible to avoid materials being stockpiled, which increases the risk of the damage and disposal as waste. – Waste arisings will be managed appropriately in line with the Port's waste management hierarchy in accordance with best practice in order to achieve good recycling performance and high landfill diversion. – Waste materials will be segregated on-site into appropriate categories. In addition to recyclable items such as paper and drinks bottles, separation of food and food contaminated packaging and consumable items for composting will be implemented, as well as the requirement for more specialist streams (for example, electrical items, hazardous materials). – Appropriate receptacles and recycling bins will be clearly labelled for the collection and segregation of each of these waste materials and will be provided throughout the development and open space areas, as appropriate. Wastes will be stored in these receptacles in a designated, easily accessible area of the site until collection by an appropriately licensed waste management Contractor. – All waste types and amounts will be recorded and reviewed at regular intervals, to allow for continuous analysis and review of procedures that will be made to reduce waste to landfill, increase the percentage of recycling and reduce waste overall as much as possible. • All wastes generated will be managed in accordance with appropriate waste management legislation and policy, and will be transported and recovered / disposed of by licensed waste management Contractors.

Potential Impact	Summary of Proposed Mitigation
	• In order to ensure that these operations are carried out effectively, all staff will receive training as part of their induction to the site including: instructions on the appropriate segregation, handling, recycling and reuse methods to be employed by all parties on-site for wastes generated. Furthermore, the waste management strategy and relevant environmental procedures will be communicated to staff, Contractors and suppliers and it will be a requirement that suppliers, and Contractors promote the adoption of environmentally sound practices. On-site waste management • The MP2 Project design will incorporate adequate dedicated space to cater for the segregation and storage of all various waste streams within the site. This waste storage compound will allow for waste segregation, handling activities such as bailing of cardboard and plastic and sufficient waste storage. • All waste materials will be stored in skips or other suitable receptacles in designated areas of the site. The waste storage area(s) will be assigned and all staff will be provided with training regarding the waste management procedures on commencement of the project. • Construction waste materials shall be segregated on-site for recycling into the following categories: – Timber – Metal – Cardboard & paper – Glass – Rubble – General waste • Adequate security measures will be put in place. • DPC will continue to implement its Environmental Policy and update its Environmental Management System for the development consistent with best practice. Duty of care in relation to correct waste authorisations • Contractors working on site during the works will be responsible for the collection, control and disposal of all wastes generated by the works. DPC and its appointed MWC will ensure that waste it is handled only by a body authorised under the Waste Management Act to manage it. This duty implies, at the very least, checking to see that the required authorisation is in place, has not expired and is appropriate for the waste types that are to be handled. DPC and its appointed MWC will ensure that all waste materials leaving the site will be transported via a licensed carrier and disposed or recovered through licenced operators and in accordance with national waste legislation. Monitoring and

Potential Impact	Summary of Proposed Mitigation
	updating of records will be implemented.
Monitoring Requirements	• All waste types and amounts generated will be recorded and reviewed at regular intervals to allow for continuous analysis and review of procedures that will be made to reduce waste to landfill, increase the percentage of recycling and reduce waste overall as much as possible. • Waste storage will take place in a secure area on-site and the Contractor will monitor the amount of waste stored to ensure that permitted limits of any Exemption are not exceeded. Measures and procedures to monitor waste flows on site and update records will be clearly set out. • An Environmental Co-ordinator/Waste Manager will be appointed who will set up and maintain a record keeping system, perform audits and establish targets for waste management on site. The Environmental Co-ordinator/Waste Manager will also implement best practice methods for segregation and storage of recyclable materials, and for reuse of appropriate materials on-site in accordance with the MP2 Project's CWMP. • The Environmental Co-ordinator/Waste Manager will be responsible for organising and delivering a waste training programme to staff on site. This will provide basic awareness for all staff of the CWMP and the requirement to segregate waste at source. Training may be incorporated with other training needs (e.g. general site induction, safety training etc.). This basic course will describe the materials to be segregated, the storage methods and the location of waste storage areas. A subsection on hazardous wastes will be incorporated and the particular dangers of each hazardous waste will be explained. • A system will be put in place to record the waste arising on site during demolition and construction phases, and all waste material that leaves the site. The Environmental Co-ordinator/Waste Manager will record the following: – Waste taken off-site for reuse – Waste taken off-site for recovery – Waste taken off-site for recycling – Waste taken off-site for disposal • For each movement of waste off-site a signed waste collection docket will be obtained by the Environmental Co-ordinator/Waste Manager from the Contractor. This will be carried out for each material type. This system will also be linked with the delivery records. A signed waste acceptance docket will be issued for each movement of waste on-site. Periodic audits will ensure completeness of records and compliance with the established system.

Potential Impact	Summary of Proposed Mitigation
	• Each material type will be examined in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how waste can be minimized. • The Environmental Co-ordinator/Waste Manager will be responsible for conducting a waste audit at the site during the construction phase of the development. A review of all records for waste generated and transported off-site, will be undertaken mid-way through the construction phase. • Upon completion of the construction phase a final report will be prepared summarising the outcomes of waste management processes adopted and the total recycling / reuse / recovery figures for the development. Waste arising from wash down facility • Solid waste in the form of sediments will arise from the wheel wash unit settlement tank. The unit will be inspected regularly (for example, to check automated features are working and settlement content) and emptied in accordance with manufacturer's instructions. The solid residues will be analysed and the disposal route appropriately selected based on the results of this analysis. A gully emptier tanker will be used to remove settlement tank waste which will be disposed of at an approved waste disposal site. Fuels and hydraulic oils/lubricants • Contractors will ensure all plant is inspected and serviced in accordance with its schedule. A bunded disposal area will be provided. Contractors will provide staff training on the waste management strategy. Disposal/recovery under licence.

19.1.2 Implementation of Construction Phase Mitigation Measures

DPC intends to appoint a Contractor(s) to undertake each phase of the works. The mitigation measures set out in the EIAR have been incorporated into a Draft Construction Environmental Management Plan (CEMP) for the MP2 Project which forms part of the MP2 Project planning application (under separate cover). The draft CEMP sets out the **minimum requirements** which will be adhered to during the construction phase of the MP2 Project.

The Draft CEMP will form part of the Contract Documents for the construction stage to ensure that the Contractor undertakes the works required to implement the mitigation measures.

DPC has an established liaison group for the ABR Project which includes representatives of DPC, the Contractor, Dublin City Council (DCC) and The Department of Housing, Planning and Local Government (DHPLG) Foreshore Unit. The group meets at quarterly intervals each year with an agenda and minutes taken of the meetings. It is proposed that this liaison group will also provide environmental oversight of the construction phase of the MP2 Project.

DPC will appoint a suitably qualified person to the role of Environmental Facilities Manager (Environmental Clerk of Works) to monitor the MP2 Project construction works. The Environmental Facilities Manager will provide monthly reports to the members of the liaison group. The Environmental Facilities Manager will work closely with the Contractor's 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 Environmental Facilities Manager 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.

A suite of draft Construction Environmental Management Plans have been prepared for the construction phase of the MP2 Project and are presented in the Draft CEMP and in Appendix 19 of this EIAR. These draft Construction Environmental Management Plans will be finalised as required prior to the commencement of development and will incorporate the mitigation measures outlined in the documentation submitted with the application for permission, and will include any additional requirements pursuant to conditions attached to statutory consents. In addition, regular audits of the CEMP will be undertaken during the construction phase of the works by the Environmental Facilities Manager.

A summary of the Construction Environmental Management Plans is presented in Table 19-2. A summary of the Environmental Monitoring Programmes is presented in Table 19-3.

Table 19-2 Summary of the Construction Environmental Management Plans

Type of Environmental Management Plan	Ongoing Mitigation Required	Ongoing Mitigation Specific Requirements	Ongoing Monitoring/ Auditing Required	Timing of Ongoing Monitoring	Reporting Requirements	Reporting Procedures	Ongoing Liaison Required	Other Specific Requirements
Construction Traffic Management Plan	Yes	Compliance with DCC's HGV Management Strategy	Yes	During Construction	Quarterly Reports	Report submitted to Planning Authority	Yes	Complaints Procedure
Invasive Alien Species Management Plan	Yes	Precautionary measures to prevent importation and spread	Yes	During Construction	Quarterly Reports	Report submitted to Planning Authority	Yes	Containment / Treatment required if any Invasive Alien Species are found on the site
Construction Waste Management Plan	Yes	Collection, control and disposal of all wastes to be recorded	Yes	During Construction	Quarterly Reports	Report submitted to Planning Authority	Yes	Complaints Procedure
Noise Management Plan	Yes	Compliance with NRA Guidelines and BS5229:2009	Yes	Preconstruction and during construction	Monthly Reports, input to Annual Environmental Report	Report submitted to Planning Authority and EPA	Yes	Specific noise limits to be met at nearest noise sensitive receptors, Complaints Procedure
Dust and Odour Management Plan	Yes	Compliance with EPA and BRE Guidelines	Yes	Preconstruction and during construction	Monthly Reports, input to Annual Environmental Report	Report submitted to Planning Authority and EPA	Yes	Complaints Procedure
Marine Mammals Management Plan	Yes	Compliance with NPWS Guidelines	Use of MMOs, installation of SAM system	Preconstruction, during construction and for 2 years after works completion	Monthly Reports, input to Annual Environmental Report	Report submitted to Planning Authority and NPWS	Yes	Close liaison required with NPWS

Type of Environmental Management Plan	Ongoing Mitigation Required	Ongoing Mitigation Specific Requirements	Ongoing Monitoring/ Auditing Required	Timing of Ongoing Monitoring	Reporting Requirements	Reporting Procedures	Ongoing Liaison Required	Other Specific Requirements
Birds and Marine Ecology Management Plan	Yes	Adherence to piling and dredging mitigation measures	Specialist surveys required	Preconstruction, during construction and for 2 years after works completion	Monthly Reports, input to Annual Environmental Report	Report submitted to Planning Authority and NPWS	Yes	Existing Black Guillemot nest boxes to be removed and replaced at specific time of year.
Archaeology and Cultural Heritage Management Plan	Yes	Compliance with DCHG Guidelines	Monitoring to be undertaken by heritage engineer or architect and marine archaeologist	During Construction	Monthly Reports, input to Annual Environmental Report	Report submitted to Planning Authority and DCHG	Yes	Appropriate Licences required from DCHG
Water Quality Management Plan	Yes	Compliance with EPA Guidelines etc	Installation of real-time water quality monitoring system	Preconstruction and during construction	Monthly Reports, input to Annual Environmental Report	Report submitted to Planning Authority and EPA	Yes	Complaints Procedure
Dredging Management Plan	Yes	Adherence to mitigation measures and compliance with Dumping at Sea Permit and Foreshore Licence	Yes	During Construction	Monthly Reports, input to Annual Environmental Report	Report submitted to Planning Authority and EPA	Yes	Complaints Procedure
Pollution Incident Response Plan	Yes	Adherence to guidelines for rapid and efficient response to minimize environmental impact	Monitoring of pollution events required and records of pollution prevention equipment.	During construction	Detailed record of all pollution events and responses, costs involved and environmental impacts.	Report submitted to Planning Authority and EPA	Yes	Specific training, and debriefing post pollution events to establish causes of events, lessons learned and preventive or corrective action required.

Table 19-3 Summary of Environmental Monitoring Programmes

Monitoring Programme	Monitoring Element	Frequency of Monitoring	Location	Parameters Measured	Surveyors / Support	Sampling Constraints	Action Threshold	Monitoring and Reporting	Report / Frequency
BIRD MONITORING	**Census of Black Guillemot Population nesting in Dublin Port**	Annually in period 26 March to 15 May. Two surveys to be carried out on two separate dates.	Quaysides within Dublin Port	Number Black Guillemots on land or sea within 300m of the shore Number of occupied nest sites and associated adults Number of nest boxes occupied	2 / Boat Support	0500 - 0900 BST. Beaufort 4 or less. Calm Sea Conditions		Bird Specialist	Annually (year ending March) by 31st July each year.
	Census of Common and Arctic Terns nesting in Dublin Port	Annually in period 10 June to 15 July	Permanent Structures and Pontoons in Dublin Port	Number of apparently occupied nests (egg clutches or flush count).	2 / Boat Support	Moderate weather and sea conditions.		Bird Specialist	Annually (year ending March) by 31st July each year.
	Winter Wetland Birds	Monthly from October 1 to March 31 during each year of the project	Intertidal areas between Dún Laoghaire West Pier and Bull Wall.	Bird Flocks - species and approx. numbers.		Low tide ± 2 hours. Daylight. Good weather conditions.		Bird Specialist	Annually (year ending March) by 31st July each year.
MARINE MAMMALS	**Marine Mammal Observation in exclusion zones**	For piling, dredging, dumping and demolition operations within the foreshore	Within 500m of dredging / dumping operations. Within 1000m of piling operations.	Presence of marine mammals	1 to 3 as required	Suitable vantage point. Accommodation on dredging vessels.	Presence of marine mammal in exclusion zone.	Marine Mammal Observer	NPWS MMO Location and Effort Forms
	Continuous Static Acoustic Monitoring	Ongoing data logging at four stations (to be confirmed)	4 locations in Dublin Bay	Echolocation clicks of dolphins and porpoises				Marine Mammal Ecologist	

Monitoring Programme	Monitoring Element	Frequency of Monitoring	Location	Parameters Measured	Surveyors / Support	Sampling Constraints	Action Threshold	Monitoring and Reporting	Report / Frequency
	Seal Haul Out Sites Dublin Bay	Monthly	North Bull Island and adjacent areas. Dublin Bay within zones of influence.	Species. Maturity Stage. Behaviour.	Coordinate with NPWS surveys	Low water ± 2 hours.		Marine Mammal Ecologist	
MARINE BENTHOS	**Benthic Grab and Video Surveys**	Before and after capital dredging programme	Dublin Bay	Benthic Communities Biomass of major Phyla Granulometry Organic Matter Content	Boat Support	Good weather, sea and visibility conditions		Fisheries Specialist	
	Beam Trawl Surveys	Before and after capital dredging programme	Dublin Bay	Fish Communities - Species rank / size ranges					
WATER QUALITY	**Water quality in lower Liffey in Dublin Port**	High frequency (15min) real time at four stations	4 locations Inner Liffey channel	Dissolved Oxygen, Turbidity, Temperature, Salinity, pH				Environmental Facilities Manager	
ATMOSPHERIC NOISE AND DUST	**Dust Deposition**	Continuous over project duration	Poolbeg Marina; Clontarf	Dust deposition using Bergerhoff Dust Deposition Gauges				Environmental Facilities Manager	
	Noise Levels	Continuous for duration of Project	Poolbeg Marina; Clontarf	L_{Aeq}				Environmental Facilities Manager	Weekly to Contractor/DPC Annual AER
UNDERWATER NOISE	**Underwater Noise Levels**	Validation surveys	4 locations Inner Liffey Channel		Boat Support			Underwater Noise Specialist	Survey required at commencement of Piling
ARCHAEOLOGY		An Archaeologist and Heritage Architect will be	Capital Dredging, Landside works including Pier	Ground Disturbance Demolition of Pier Head Dredging				Archaeology Specialist	Monthly Reporting

Monitoring Programme	Monitoring Element	Frequency of Monitoring	Location	Parameters Measured	Surveyors / Support	Sampling Constraints	Action Threshold	Monitoring and Reporting	Report / Frequency
		retained for the duration of the works	Head						
WASTE	**Management of waste streams arising during the construction works**	Continuous for duration of Project		All Waste Streams				Main Works Contractor (MWC) Environmental Co-ordinator	Weekly to Contractor/DPC

19.1.3 Operational Phase Mitigation Measures

The existing land uses within the footprint of the MP2 Project comprise the manoeuvring and berthing of vessels, the handling of Ro-Ro and Lo-Lo cargo, HGV traffic distributing cargo to and from Dublin Port and the movement of ferry passengers arriving and departing to/from Dublin Port.

The MP2 Project is designed to provide port infrastructure which will improve the efficiency of port operations and thereby increase the throughput of both cargo and passengers.

The future land uses within the footprint of the MP2 Project will therefore not significantly change and consequently operational mitigation measures are largely based on the following:

- Integration of the new port infrastructure with existing operational plans and procedures;
- Integration with port-wide monitoring programmes to establish environmental trends in order to support future initiatives to enhance the environment or take corrective action, if required;
- Integration of the new port infrastructure with future port-wide initiatives such as the development of an over-arching Climate Change Adaptation Plan and Heritage Plan for the Great South Wall;
- Integration with the strategic objectives of the Dublin Port Masterplan 2040, reviewed 2018.

Table 19-4 summarises the operational phase mitigation measures recommended within the EIAR. All mitigation measures proposed within the NIS have been captured by the EIAR.

Table 19-4 Mitigation measures recommended within the EIAR

Potential Impact	Summary of Proposed Operational Mitigation
Chapter 6 RISKS OF MAJOR ACCIDENTS & DISASTERS	
Potential for loss of life or injury to Natural Events.	MP2 Project does not introduce any new risks that could cause or exacerbate a major accident, nor is it considered that the MP2 Project will significantly alter the risks presented to existing COMAH establishments during normal Port operations. The MP2 Project will operate under Dublin Port's existing Emergency Response Plan.
Potential for damage to the environment.	
Potential for damage to the facilities, plant and equipment of DPC, its commercial partners, tenant companies and neighbours.	
Chapter 7 BIODIVERSITY, FLORA & FAUNA	
No regulated invasive plant species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011, as amended, were identified on site during baseline habitat surveys of the site in 2018 and 2019. Nevertheless, a precautionary approach will be	DPC has committed to formulating an Invasive Alien Species (IAS) Management Plan for the entire port area. The Plan will outline containment and eradication measures to be implemented if any IAS are identified. The plan will include prevention measures which will range from raising awareness of IAS and the potential for their dispersal, to ensuring best practice in relation to the movement of materials into,

Potential Impact	Summary of Proposed Operational Mitigation
taken to prevent the importation and spread of Invasive Alien Species.	within or out of the operations area.
Potential risk of injury or disturbance to non-breeding waterbirds birds in the area of the MP2 Project during operation.	The following precautionary measures will be undertaken to minimise the risk of injury or disturbance to non-breeding waterbirds in the area of operations: • Gates will be operated at the site of the Greenway to control the movement of people during periods of extreme low spring tides when feeding grounds become available in the vicinity of Berth 53, in order to avoid disturbance. • DPC will continue to support a monitoring programme of winter wetland birds in the adjacent European designated site of the South Dublin Bay and River Tolka Estuary Special Protection Area for a minimum period of two years post MP2 Project construction works. The monitoring programme will comprise monthly surveys each winter season from October to March.
Potential impact of future maintenance dredging works on marine ecology including fisheries and marine mammals.	DPC need to carry out regular maintenance dredging of the navigation channel, basins and berthing pockets in order to maintain their advertised charted depths and hence provide safe navigation for vessels to and from the Port. When the MP2 Project capital dredging campaign is completed, the MP2 Project dredged areas will be incorporated into Dublin Port's maintenance dredging plan which will be subject to a Foreshore Licence and Dumping at Sea Permit. Maintenance dredging will be subject to the implementation of a comprehensive suite of mitigation measures to minimise impact on marine ecology including fisheries and marine mammals. These measures include: • Loading will be carried out by a backhoe dredger or trailing suction hopper dredger (TSHD). The TSHD's pumps will be switched off while the drag head is being lifted and returned to the bottom as the dredger turns between successive lines of dredging to minimise the risk of fish entrainment. Full time monitoring of Marine Mammals within 500m of loading and dumping operations will be undertaken in accordance with the measures contained in the Guidance to Manage the Risk to Marine Mammals from Man-Made Sound Sources in Irish Waters (NPWS 2014).
Potential opportunities for Fisheries Enhancement	DPC are committed to working with Inland Fisheries Ireland and 3rd level academic institutions to explore fisheries enhancement measures within the framework of the MP2 Project area, concentrating in particular in optimising biodiversity and fisheries

Potential Impact	Summary of Proposed Operational Mitigation
	biomass associated with new harbour structures.
Chapter 8 SOILS, GEOLOGY, HYDROGEOLOGY	
	No specific operational phase mitigation measures with regard to soils, geology and hydrogeology are required.
Chapter 9 WATER QUALITY, and FLOOD RISK	
Potential impact of future maintenance dredging works on Water Quality	DPC will continue to implement comprehensive mitigation measures during all maintenance dredging campaigns to mitigate against potential impacts to Water Quality. These measures include: • Loading will be carried out by a backhoe dredger or trailing suction hopper dredger (TSHD). • No over-spilling from the vessel will be permitted while the dredging activity is being carried out within the inner Liffey Channel. • The dredger's hopper will be filled to a maximum of 4,100 cubic metres (including entrained water), while dredging silts within the inner Liffey Channel, to control suspended solids released at the dumping site. This is equivalent to a maximum quantity per trip of 2,030 tonnes (wet weight). • A documented Accident Prevention Procedure will be put in place prior to commencement • A documented Emergency Response Procedure will be put in place prior to commencement • A full record of loading and dumping tracks and record of the material being dumped will be maintained for each trip. • Dumping will be carried out through the vessel's hull. • The dredger will work on one half of the channel at a time within the inner Liffey channel to prevent the formation of a silt curtain across the River Liffey. • When any dredging is scheduled to take place within a 500m radius of power station intakes, the relevant stakeholders will be notified so that precautionary measures can be taken if deemed necessary.
Potential impacts of the general operation of the MP2 Project on Water Quality.	The operational phase of the MP2 Project will be subject to Dublin Port's existing Environmental Management System (EMS) which is accredited to ISO 14001 standard and the Port Environmental Review System (PERS) which has gained Dublin Port designation as an 'Ecoport' at European level. The EMS will be updated to include all new port infrastructure

Potential Impact	Summary of Proposed Operational Mitigation
	constructed as part of the MP2 Project, including surface water drainage. The EMS is supported by a comprehensive suite of Standard Operating Procedures (SOP) providing mitigation of all environmental aspects identified and mechanisms to ensure effective implementation. SOPs have been prepared for oil and chemical spill responses, mineral oil handling, waste handling, monitoring and maintenance of surface water interceptors and handling of drain cleaning waste. Controls are in place for transport, handling and storage of hazardous materials, ship cargo, dry bulk material, surface water runoff, fuelling and bunkering of vessels and ship discharges. Site audits promote best practice and ensure compliance with the EMS requirements.
Chapter 10 AIR QUALITY & CLIMATE	
Potential impact of increase road traffic on Air Quality & Climate.	Mitigation of road traffic emissions are mainly achieved through EU legislation driven improvements in fuel and engine technology resulting is a gradually reducing emissions per vehicle profile. The collection of EU Directives, known as the Auto Oil Programme, have outlined improved emission criteria which manufacturers are required to achieve from vehicles produced in the past and in future years. DPC is currently developing an initiative with the haulier companies operating in the port to provide the necessary Compressed Natural Gas (CNG) fuelling infrastructure across the port to facilitate the future trend for HGVs to change fuel from diesel to CNG.
Potential impact on future shipping emissions on Air Quality & Climate.	A number of EU Directives and the requirements of the Marpol Convention regulate the fuels and emissions employed in the shipping industry. These requirements will remain in practice throughout the operation of the MP2 Project and may be replaced with more stringent emission limits. In addition to the international mitigation implemented by Marpol, DPC has proposed port specific mitigation with a view to reducing emissions while vessels are berthed at the port. DPC propose to provide shore to ship power (SSP) on berths 52 and 53 for vessels at these berths. This will facilitate powering of the berthed vessels by the national grid which will allow the vessel to turn off their main and auxiliary engines for the duration of berthing. This reduces direct emissions from the ships while in port and at the closest point to the sensitive human receptors in the area.

Potential Impact	Summary of Proposed Operational Mitigation
Potential impacts of Climate Change.	DPC has committed to formulating a Climate Change Adaptation Plan that is cognisant of the DTTAS plan and the *Sectoral Planning Guidelines for Climate Change Adaption* published by the Department of Communications, Climate Action & Environment. The Adaptation plan will be reviewed in line with the Climate Action and Low Carbon Development Act 2015. This will ensure that an iterative approach to adaptation planning is informed by the latest scientific evidence thus enabling DPC to modify or escalate adaptation actions as appropriate.
Chapter 11 NOISE & VIBRATION	
Operational noise as a result of the MP2 Project	Noise levels during the operation phase of the MP2 Project are not expected to change the noise levels in any measurable way. No mitigation measures are therefore required for the operational phase.
Potential future noise impact from vessel movements during the night-time period	In order to ensure that there is no increase in noise impact from changes to vessel movements during the night-time period, DPC will implement a Noise Management Plan in relation to the ongoing management of noise issues associated with changes to Port activities. This plan will include the following elements as a minimum: • the provision for noise management to be included as a key consideration for all significant changes made to Port operations by senior management within Dublin Port; • the prior assessment of potential noise impacts associated with any alteration to Port activities that may be likely to result in a significant noise impact at the nearest noise sensitive properties; • a range of procedures to mitigate noise during the night-time period, including measures to control tonal/impulsive noise sources (e.g. foghorn, tannoy announcements etc.) before 07:00 hours.
Potential future underwater noise impact from vessels entering and leaving the port	Dublin Bay is subject to commercial traffic from Dublin Port, Dun Laoghaire, Howth and leisure traffic from marinas around the bay. In order to monitor Dublin Port traffic related noise it is proposed to install a hydrophone at the eastern end of the port linked to a vessel identification system. Monitoring will provide information on background (absence of shipping) and ambient (shipping noise included) noise levels and link noise events to specific vessels. This approach ensures that particularly noisy vessels can be identified and appropriate measures outlined in the IMO (2014) guidelines

Potential Impact	Summary of Proposed Operational Mitigation
	taken to control noise emissions from those vessels.
Chapter 12 COASTAL PROCESSES	
Potential impact of future maintenance dredging works on Coastal Processes	Maintenance dredging is an ongoing requirement in Dublin Port. Maintenance dredging is subject to a Foreshore Licence and Dumping at Sea Permit. These licences prescribe strict environmental protection measures to minimise the potential impacts of maintenance dredging on the environment. No other specific operational phase mitigation measures with regard to coastal processes are required.
Chapter 13 TRAFFIC & TRANSPORT	
Mobility Management Plan & Smarter Travel	An outline Mobility Management Plan (oMMP) has been appended to Chapter 19 of the EIAR. The oMMP sets out the type of measures which will progressed by DPC, in liaison with the operator(s), to ensure that the sustainable transport facilities are made available and are utilised by the users of the MP2 Project. It is envisaged that the MMP for the operators within the UFT and the Lo-Lo operator (currently DFT) will, in the fullness of time, fall under the hierarchy of the Port wide Transport/Travel Plan as the Masterplan continues to be implemented over the next 21 years.
Requirement for a high quality public transport service between the MP2 Project and the sustainable transport services located at the perimeter of the Dublin Port Estate	DPC is prepared to provide finance, of up to €100,000 for a period of 5 years (€500,000 total) towards the provision of a shuttle service linking the MP2 Project to sustainable transport services located at the perimeter of the Dublin Port Estate.
Chapter 14 CULTURAL HERITAGE (including Industrial & Archaeological)	
Potential Impact of future developments on the Great South Wall.	The design of MP2 Project has ensured that the integrity and stability of the Great South Wall will be maintained and therefore no impacts are predicted. DPC is committed to developing an over-arching Heritage Plan for the Great South Wall.
Chapter 15 LANDSCAPE & VISUAL	
Potential impact of future developments on the Landscape	No specific operational phase mitigation measures with regard to Landscape & Visual are required.

Potential Impact	Summary of Proposed Operational Mitigation
Chapter 16 POPULATION & HUMAN HEALTH	
Dublin Port will contribute a significant Community Gain that will have a positive impact on Population and Human Health.	DPC's Community Gain proposal comprises the following two elements: DPC will provide a maximum contribution of €1,000,000 towards the provision and operation of a City Farm on lands owned by Dublin City Council adjacent to the port – either in Fairview Park or on Alfie Byrne Road. These lands will be of sufficient scale to support a viable City Farm Project. The provision of this new community asset has the potential to positively influence population and health by providing social benefits and contributing to community cohesion. DPC will also allocate a sum of €1,000,000 to be invested for the enhancement and support of education provision for St Joseph's Co-Educational Primary School, East Wall, in accordance with a scheme to be developed with local schools and key stakeholders
Chapter 17 WASTE	
Operational Phase Waste Management Plan	The current *Dublin Port Ship's Waste Management Plan* (WMP) underpins all waste related operations at Dublin Port. DPC will continue to review and implement any required changes in the waste management plan in order to avoid and minimise the potential effects of vessel generated wastes once the MP2 Project is operational. DPC will continue to provide adequate reception facilities and remove, as far as is practicable, any disincentives to landing waste in the port. DPC will continue to encourage the responsible management of waste, including minimisation and recycling, at the point of generation on ships, reception in ports/harbours, transportation and disposal, and ensure that port and harbour employees and users dispose of wastes responsibly in facilities provided. The WMP will continuously evolve to effectively capture materials generated to help ensure that recyclable materials are handled and diverted accordingly. Developing a clear WMP that incorporates a customer-facing recycling and organics collection program will help divert most materials from landfill.
On-Site Waste Management	The MP2 Project design incorporates adequate dedicated space to cater for the segregation and storage of all various waste streams at the Terminal 1 building. The bin storage area will allow for waste segregation, handling activities such as bailing of cardboard and plastic and sufficient waste storage. All staff will be provided with training regarding the waste management procedures.

Potential Impact	Summary of Proposed Operational Mitigation
Environmental Management System	DPC will continue to implement its Environmental Policy and update its Environmental Management System for the development consistent with best practice.

19.2 Conclusions

The key conclusions of the EIAR are set out below:

19.2.1 Introduction

This Environmental Impact Assessment Report (EIAR) has been prepared by RPS on behalf of Dublin Port Company (DPC) for the MP2 Project, the second Strategic Infrastructure Development (SID) project at Dublin Port from the Dublin Port Masterplan 2040, reviewed 2018, for which development consent is sought.

This EIAR will be used to support the relevant assessments to be carried out by the respective competent authorities on all relevant applications for development consent.

The primary objective of the EIAR is to identify the baseline environmental context of the proposed development, predict potential beneficial and/or adverse effects of the development and propose appropriate mitigation measures where necessary

The EIAR has been prepared in accordance with the requirements of EU Directives and Irish law regarding Environmental Impact Assessment (including the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018) and European Commission Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU) (European Commission, 2017)

The environmental appraisals have benefitted from the environmental monitoring programme which is currently in place for the construction of the Alexandra Basin Redevelopment (ABR) Project, the first Strategic Infrastructure Development brought forward to planning from the Dublin Port Masterplan 2040, and which is currently at the construction stage of development.

The site-specific scientific data collected to date was used to support the preparation of the EIAR for the MP2 Project and serves to illustrate the depth of understanding of the environment in and around Dublin Port, including the inner Liffey channel (Dublin Harbour) and Dublin Bay.

The preparation of the EIAR was further assisted by the extensive environmental datasets collated during the preparation of the Strategic Environmental Assessment (SEA), for the purposes of the review of the Dublin Port Masterplan during 2017 and 2018.

Additional survey work has been undertaken in order to provide up-to-date baseline information to support the environmental assessments, in addition to the site-specific information from the existing databases from official sources.

19.2.2 Need for the MP2 Project

The MP2 Project is the second major strategic infrastructure project to emerge from Dublin Port's Masterplan 2040. Completion of all of the developments needed to realise the vision of the Masterplan will likely involve one subsequent and final major strategic infrastructure project.

Between 2010 and 2018, 9.1% of the growth projected in Masterplan 2040 has occurred. The MP2 Project will provide capacity for a further 30.2% of the volume projected in 2040.

The MP2 Project will bring development at the eastern end of Dublin Port on the north side of the Liffey to its ultimate limit and will provide much needed capacity for both Ro-Ro and Lo-Lo cargo. The Masterplan, as a whole, will bring Dublin Port to its ultimate capacity by 2040 and the MP2 Project is an essential step on this path.

The MP2 Project redevelops assets currently used for the importation of petroleum products and future-proofs these assets for alternative uses as and when national and EU policies result in a transition away from fuels such as petrol and diesel.

Given the large rate of growth of cargo volumes in Dublin Port and the absence of either demand or significant capacity elsewhere in the Irish port's system, the MP2 Project is designed to provide essential nationally important port capacity in line with both Government policy (notably National Ports Policy and the National Planning Framework) and with EU transport policy (TEN-T).

The need for the MP2 Project is supported by EU, national, regional and local land use and transport planning and development policy.

DPC is seeking a 15-year permission to facilitate the construction of the MP2 Project. This is required for a number of reasons:

- The overriding imperative to ensure that Dublin Port continues to operate effectively during construction will require works to be staged in distinct phases.
- The works are to, a large extent, sequential and connected – one element cannot commence until an earlier related element is concluded.
- The works are all connected and need to be determined and assessed as a whole by An Bord Pleanála, rather than be subject to separate applications.
- Construction experience in Dublin Port in recent years shows that programme changes are both inevitable and difficult to predict. DPC's best estimate currently is that the MP2 Project works could be completed by 2032 but experience suggests that the actual construction period could be longer. DPC believes that it is preferable to address this reality at the outset and conduct the assessment of the MP2 Project on this basis.

The environmental appraisals presented in the EIAR have taken into account the environmental implications of a 15-year permission and conclude that there is no environmental impediment to the granting of a 15-year permission.

- In particular, the traffic and transportation appraisal considers a combination of port traffic growth and construction traffic volumes over a 15-year period. These combined traffic volumes have been used in the environmental appraisals for noise and air quality.
- The footprint of the MP2 Project lies entirely within the Dublin Port Estate together with localised widening of the navigation channel. There are no terrestrial habitats, flora & fauna of conservation value within the boundary of the site. Prolonged construction activities over a 15-year period will therefore have no impact on terrestrial biodiversity, flora & fauna as no natural changes are expected within that period of time.
- The MP2 Project has been engineered to ensure that any potential impact on the surrounding Natura 2000 sites is at a *de minimis* level. The construction period of 15-years has been assessed in the biodiversity, flora & fauna appraisals.
- The location of the MP2 Project is remote from the nearest noise and air quality sensitive receptors due to the natural separation caused by the presence of the Tolka estuary and River Liffey. No prolonged nuisance to the local communities is therefore expected as a result of a 15-year construction period.
- The landscaping and planting associated with Greenway Project, which will be in place prior to the construction phase of the MP2 Project, will be maturing as the MP2 Project construction works advance over 15-years, thereby providing an enhanced visual buffer to the construction works over time.

19.2.3 Project Description

The MP2 Project at Dublin Port is being proposed for development in accordance with the Dublin Port Masterplan, reviewed 2018. The Masterplan identifies the land uses and development projects on port lands which will allow the port to increase its capacity to 77.2 million gross tonnes by 2040. The Masterplan identifies that this is the ultimate capacity of Dublin Port.

The Dublin Port Masterplan 2040 envisages that the development of Dublin Port to this ultimate capacity will be achieved by not less than three large Strategic Infrastructure Development (SID) projects:

1. the Alexandra Basin Redevelopment (ABR) Project (29N.PA0034), which is under construction;
2. the MP2 Project, now proposed; and
3. a final project on the Poolbeg Peninsula and possibly also including the development of the Southern Port Access Route (SPAR) to provide connectivity between the Dublin Port Tunnel and the south port lands as envisaged in NTA’s Transport Strategy for the Greater Dublin Area 2016 to 2035.

The MP2 Project complements the ABR Project in providing capacity for growth in the Ro-Ro and Lo-Lo modes on the north side of the port and at its eastern end in addition to providing suitable infrastructure for increasing numbers of ferry passengers.

The landside works proposed in the MP2 Project are located on the north side of Dublin Port at its eastern end. It includes the DFT container terminal and Ro-Ro freight and passenger terminals currently operated by Sea Truck, Stena Line and Irish Ferries.

The existing Berth 52 and Berth 53 will be removed as part of the ABR Project and the basin between them will be infilled. The new river berth to be developed east of Berth 49 and to the south of this infilled basin will be designated as Berth 52. The designation Berth 53 is likewise being retained for the new jetty berth now proposed in the MP2 Project.

The site is bounded to the north and east by the South Dublin Bay and Tolka Estuary Special Protection Area (SPA), and to the south by the River Liffey and the Dublin Port navigation channel. Planning permission was previously granted for the infilling of Berths 52 & 53 and the creation of a new river-side berth under the Alexandra Basin Redevelopment (ABR) Project (29N.PA0034).

The works proposed in the MP2 Project comprise a number of elements:

- construction of a new Ro-Ro jetty (Berth 53) for ferries up to 240m in length on an alignment north of the port's fairway and south and parallel to the boundary of the South Dublin Bay and River Tolka SPA (004024);
- a reorientation of the already consented (ABR Project, 29N.PA0034) Berth 52. Berth 52 is also designed to accommodate ferries up to 240m in length. For the avoidance of doubt, development consent is being sought for the reorientation of Berth 52 as an integral part of the MP2 Project.
- [Elsewhere within the ABR Project, the extension of the existing Berth 49 which is already consented also makes this berth capable of accommodating ferries up to 240m in length. The combination of the ABR Project with the MP2 Project will therefore deliver three river berths, all capable of accommodating ferries up to 240m in length];
- Consolidation of passenger terminal buildings, demolition of redundant structures and buildings, and removal of connecting roads to increase the area of land for the transit storage of Ro-Ro freight units;
- a lengthening of an existing river berth (50A) to provide the DFT Container Terminal with additional capacity to handle larger container ships. These works will include the infilling of the basin east of the now virtually redundant Oil Berth 4 on the Eastern Oil Jetty; and
- the proposed redevelopment of Oil Berth 3, as part of the infilling of Oil Berth 4, as a future deep-water container berth (-13.0m CD) for the DFT Container Terminal. This will facilitate the change of use of the berth from petroleum importation to container handling when the throughput of petroleum products through Dublin Port declines as a result of national policies to decarbonise the economy.
- Localised widening of the navigation channel immediately to the east of the Poolbeg Oil Jetty to facilitate ferries of up to 240m in length to safely turn either on arrival at, or on departure from, the port.

19.2.4 Examination of Alternatives

At strategic level, the Masterplan identified that the MP2 Project is a key element of its implementation, underpinning the Masterplan's fundamental approach of providing capacity in Dublin Port for the 77.2m gross tonnes projected by 2040 by maximising the utilisation of Dublin Port's brownfield lands. The assessment process in support of the Masterplan identified that the development in this area of the Port is the most sustainable approach and the desired approach from a strategic point of view.

The MP2 Project is concluded to be an essential step in achieving the Port's ambitious throughput objective. The consolidation of the passenger ferry facilities and cargo shipments would allow optimisation of land-use for these activities. Such facilities need access to berths and must therefore be located accordingly. The use of existing access and facilities also supports the location selected at the north port's eastern extent.

At detailed design level the evolution of both the proposed marine and landside structural works, and the associated widening, dredging and infill works was considered to achieve the MP2 Project's objectives. The MP2 Project design evolution was carried out by ABL, supported by navigational and morphological studies and in consultation with the RPS environmental team.

The design team's approach to developing and progressing the scheme design was based on examining layouts of key infrastructure elements that avoided or minimised any adverse environmental impacts while meeting the requirements of the project brief. This design process and evolution was carried out in the context of a do-nothing scenario as a baseline case. This was informed by expert inputs, navigation simulation and morphological modelling to refine the design layouts.

There is a strong relationship between Berths 49, 52 and 53 and the channel widening area. This interrelationship required that all these elements were examined both separately and in combination in order to also determine the needs of the dredging and disposal activities.

- Berth 53 - The design of Berth 53 was developed via an iterative process, considering a wide range of environmental matters along with navigational safety within the port. A number of potential environmental impacts of this choice are less favourable than the do-nothing scenario, however these may be mitigated with good practice. The positive impacts of this aspect of the project upon the prosperity of the population (regionally and nationally as well as socially and economically) were the reason for choosing to pursue this design. The structural form, overall dimensions and location were evolved as part of the design and environmental collaborative process. The final design chosen had the least significant impact upon sediment movement. Resultantly, the low-tide feeding area of the nearby SPA will experience no significant impacts and thus there will be no significant impacts upon dependent bird populations.

- Berth 52 - The proposed works at Berth 52 will comprise a modification of Berth 52, which was previously granted planning permission (reference 29N.PA0034), by adjusting its orientation to accommodate Berth 53. Its orientation was evolved as part of the design and environmental collaborative process. There are no significant impacts of this design choice; which is optimal, in terms of technical feasibility and environmental sustainability.

- Berth 50A - The design progression for this element of the MP2 Project was conventional in nature and thus no other alternatives were considered. A number of potential environmental impacts of this choice are less favourable than the do-nothing scenario, however these may be mitigated with good practice. The positive impacts of this aspect of the project upon the prosperity of the population (regionally and nationally as well as socially and economically) were the reason for choosing to pursue this design.

- Oil Berth 3 and 4 - The overall design progression for this element of the MP2 Project (including an associated New Quay Wall at Jetty Road) was conventional in nature and thus no other alternatives were considered. A number of potential environmental impacts of this choice are less favourable than the do-nothing scenario, however these may be mitigated with good practice. The positive impacts of this aspect of the project upon the prosperity of the population (regionally and nationally as well as socially and economically) were the reason for choosing to pursue this design.
- Landside Works - The design progression for these landside elements of the MP2 Project was conventional in nature and there were no other alternatives were considered. A number of potential environmental impacts of this choice are less favourable than the do-nothing scenario, however these may be mitigated with good practice. The positive impacts of this aspect of the project upon the prosperity of the population (regionally and nationally as well as socially and economically) were the reason for choosing to pursue this design. The area will be flexible as the usage of the port evolves and will generally be split into stacking areas for accompanied heavy goods vehicles (HGVs), accompanied cars and unaccompanied trailers with circulation routes indicated to route vehicles to each zone and to and from the berths.
- Channel Widening - A suitable location and configuration was established taking account of operational and navigation requirements and also environmental design constraints. A number of potential environmental impacts of this choice are less favourable than the do-nothing scenario, however these may be mitigated with good practice. Design refinements resulted in a small area of channel widening with a wash protection structure proposed at Berth 53. The lack of impact of the design upon the nearby SPA, and associated dependent protected bird species, coupled with positive impacts of this aspect of the project upon the prosperity of the population (regionally and nationally as well as socially and economically), was the reason for choosing to pursue this design. The positive impacts of this aspect of the project upon the prosperity of the population (regionally and nationally as well as socially and economically) were the reason for choosing to pursue this design.
- Dredging & Disposal/Re-use Works - The total volume of material to be dredged is 424,644m^3. A number of alternative dredging and disposal options were examined including: do-nothing; beneficial re-use; disposal on land; incineration and disposal at sea. The option identified was a combination of disposal at sea and re-use with computational modelling undertaken to determine appropriate method, rate, timing and location of these activities. A sediment chemistry sampling and analysis programme, confirmed the sediments were not contaminated and thereby suitable for the safe disposal at sea. No significant environmental impacts of this design choice were identified.
- Piling Works – there are a number of MP2 Project elements that require piled foundations. Alternatives were examined including: do-nothing; alternative materials and associated alternative technologies, with different associated construction forms (such as concrete piles and gravity walls). The further alternatives assessment selected tubular sheet piles (open jetty structures and crane rails), with Steel Sheet Pile Combi-Walls (closed jetties and quay walls). A combination of vibrodriving and impact driving methods was selected. Landside structures and buildings utilise conventional driven pile foundations and raft foundations. A number of potential environmental impacts of this choice are less favourable than the do-

nothing scenario, however these may be mitigated with good practice, which is demonstrated by the ongoing ABR Project piling works. The positive impacts of this aspect of the project upon the prosperity of the population (regionally and nationally as well as socially and economically) were the reason for choosing to pursue this design.

The key environmental considerations which supported the assessment of alternatives and contributed to the design evolution process for the MP2 project elements are set out below:

- The construction of Berth 53 has been a key environmental consideration due to its close proximity to the South Dublin and Tolka Estuary SPA and its potential impact on views, notably from Clontarf.
  - Berth 53 with demarcate the most easterly development of the Dublin Port Estate. Its development will eliminate the requirement for future land reclamation within the Tolka Estuary.
  - A combination of detailed baseline surveys, computational modelling studies, consultation with statutory bodies including Dublin City Council and National Parks & Wildlife Service, consultation with local community groups and the general public, interaction between the DPC engineering design team and planning & environmental team has resulted in a design evolution of Berth 53 which satisfies the key environmental constraints identified during the scoping and consultation phase of the MP2 Project.
  - Berth 53 has been designed as an open-piled structure whose footprint lies outside the boundary of the SPA. The design minimises the impact of the structure on the natural tidal flows between the Liffey channel and the Tolka estuary. As a result, there will be no significant change to the coastal processes including the morphology of the Tolka estuary. Potential changes to the feeding grounds of waterbirds at extreme low spring tides are therefore expected to be *de minimis*.
  - The potential impact on the SPA as a result of dredging the berthing pocket and approach channel to Berth 53 together with the use of bow thrusters used to manoeuvre vessel's to and from the berth have also been considered. Mitigation by engineering design has been used to prevent changes to the morphology of the Tolka estuary including the use of mattresses on the side slopes of the berthing pocket to provide additional bank stability and wash protection structures attached to the open piled structure to reduce flow rates arising from the bow thrusters and thereby prevent scouring.
  - Berth 53 has also been designed to minimise disturbance to feeding waterbirds. Screens have been incorporated into the design of the jetty structure and the functionality of the berth has been reduced whereby passengers will be directly transferred to the vessel for embarkation by coach. Gates will also be operated on the Greenway to prevent its use during periods of extreme low spring tides when feeding grounds in the vicinity of Berth 53 become available. Appropriate signage will be used to explain to the public the importance of this mitigation measure to the protection of the Tolka estuary's bird life.
  - The length of Berth 53 has been designed to be kept as short as possible to both minimise its impact on the morphology of the Tolka estuary and minimise its impact on views from Clontarf, the North

Bull Wall and the Great South Wall. Activities on the jetty will be restricted to vessel berthing; the movement of Ro-Ro traffic and passengers to and from the berthed vessel via a linkspan located at the root of the jetty; and maintenance purposes.

- The potential impact on the Great South Wall has been a key environmental consideration due to its status as both a Protected Structure and Monument and its amenity value to the people of Dublin.
  - The original design of the MP2 Project included a manoeuvring area for vessels to turn in close proximity to the proposed berths at the eastern end of the Dublin Port Estate. To avoid encroachment into the South Dublin & Tolka Estuary SPA, the manoeuvring area was designed to include an area of foreshore directly to the north of the Great South Wall.
  - Consultation with the Department of Culture, Heritage & Gaeltacht and Dublin City Council confirmed the importance of the Great South Wall and the range of studies which would need to be undertaken to demonstrate that the construction and operation of the MP2 Project would have no impact on the integrity of the Great South Wall.
  - Subsequent studies, including the potential impact of vessel's using bow thrusters whilst turning and moving forward into the navigation channel found that engineering intervention measures between the manoeuvring area and the Great South Wall would be required to safeguard the integrity of the Great South Wall. To eliminate this potential risk, in the absence of an over-arching Heritage Plan for the Great South Wall, DPC decided to remove the manoeuvring area from the scope of the MP2 Project. This resulted in an alternative design comprising limited channel widening to the east of the Poolbeg Oil Jetty.
  - The alternative design safeguards the integrity and stability of the Great South Wall. No impacts are proposed.
- The proposal for a Unified Ferry Terminal within the footprint of the MP2 Project has been a key environmental consideration due to the Health & Safety implications of drawing passengers into an area in close proximity to existing COMAH sites.
  - The original design of the MP2 Project included the design of a new Unified Ferry Terminal Building and multi-storey carpark in close vicinity to the existing Calor Gas COMAH site. Consultations with the Health & Safety Authority with respect to the potential risk of major accidents determined that the proposed site of the Unified Ferry Terminal and multi-storey carpark was not suitable from a health & safety perspective. DPC therefore decided to remove the Unified Ferry Terminal and multi-storey carpark from the scope of the MP2 Project. This resulted in an alternative design comprising the demolition of the Terminal 2 and 5 buildings and the use of the existing Terminal 1 building as a Unified Terminal Building. Terminal use studies confirmed the suitability of the existing Terminal 1 Building for this use.
  - This change to the proposed design of the terminal buildings also assisted in maximising the flexibility required for the operational use of the MP2 Project land area in order to accommodate potential future changes as a result of a potential hard Brexit.

- The construction of Berth 50A and Oil Berth 3 has been a key environmental consideration due to the required demolition of the 19th Century Pier Head of the Eastern Breakwater of Alexandra Basin which marked the most easterly extent of Dublin Port within that era. The construction methodology of the Pier Head is of particular cultural heritage interest being designed by Port Engineer, Bindon Blood Stoney.
  - Extensive consultation was undertaken with the Department of Culture, Heritage & Gaeltacht and Dublin City Council with regard to the archaeological recording of the Pier Head and the opportunity to recover exemplars of Bindon Blood Stoney's work, and to understand more fully the construction process developed to create the 19th Century deep water basin.
  - Heritage gain proposals were also discussed in detail with the Department of Culture, Heritage & Gaeltacht and Dublin City Council. DPC will create a public realm visitor experience at the new eastern limit of the Dublin Port Estate that includes the re-use of the granite blocks and related elements of the Eastern Breakwater Pier Head and the Breakwater Lighthouse (demolished circa 20 years ago), reconceived as an experiential place where walkers and cyclists can learn about the cultural and natural heritage of the Port. The former location of the Pier Head will be marked with inscribed commemorative text, to ensure that there is a permanent in situ record of its former presence.

19.2.5 Project Scoping & Consultation

The development proposals advanced in the MP2 Project reflect the significant levels of consultation that have taken place since 2017 on the future of Dublin Port.

The various submissions and comments made in relation to the MP2 Project have been fully considered by the consultants in the preparation of the EIAR and by the applicants in the design of the scheme. Every effort has been made to address all concerns raised and, where possible, mitigation measures have been proposed to minimise the environmental impact of the MP2 Project.

Detailed scoping has been undertaken in respect to the MP2 Project by engaging in consultations with prescribed and other authorities, bodies and stakeholders and through public consultation, in accordance with in the European Commission's 2017 "Environmental Impact Assessment of Projects Guidance on Scoping" and the EPA's Environmental Impact Assessment Reports, Draft Guidelines (August 2017).

Through the scoping process which has been carried out in the preparation of this EIAR, the issues which are likely to be important during the environmental impact assessment have been identified. The scoping process has identified the sources or causes of potential environmental effects, the pathways by which the effects can happen, and the sensitive receptors, which are likely to be affected, and has defined the appropriate level of detail for the information to be provided in the EIAR.

19.2.6 Risk of Major Accidents & Disasters

The assessment of the risk of major accidents and disasters concludes that, from a COMAH perspective, the potential direct and indirect risks arising from the MP2 Project satisfy the Health and Safety Authority's

COMAH land use planning guidance. It is also concluded that other, non-COMAH direct and indirect major accident and disaster risks arising from the MP2 Project are not significantly different from the current risks.

DPC has developed a comprehensive emergency management plan that caters for the range of accident and emergency events that may occur within its estate (or that may occur outside the estate and that have a direct, knock-on effect), and this plan is provided to the other relevant stakeholders, including An Garda Síochána, Dublin City Council, Transport Infrastructure Ireland, and the Principal Response Agencies. In the event of an incident at a COMAH establishment that could impact on people at other facilities in the Port, or on road traffic entering or exiting the Port, DPC will activate its Emergency Management Plan, in which case people would be directed away from the source of the hazard.

19.2.7 Biodiversity, Flora & Fauna

The assessment of Biodiversity, Flora & Fauna identifies, describes and assesses in an appropriate manner, the direct and indirect significant effects of the proposed development on biodiversity. It contains a description of the terrestrial, marine and avian biodiversity features and designated sites (other than European sites) within and surrounding the site of proposed development, followed by an assessment of the potential and likely significant effects of the proposed development alone and cumulatively with other consented projects on terrestrial, marine and avian biodiversity features and designated sites.

In accordance with the requirements of the EIA Directive 2014/52/EU, particular attention has been given to species and habitats protected under Council Directives 92/43/EEC and 2009/147/EC, Habitats Directive Annex habitats and species and Birds Directive species. A Natura Impact Statement (NIS) has been prepared on behalf of the applicant to document Habitats Directive stage 1 and stage 2 appraisals.

The assessment of terrestrial biodiversity features concludes that there are no significant environmental impacts predicted upon terrestrial biodiversity features as a result of the construction and operation of the proposed MP2 Project. Mitigation is not required.

The assessment of benthic biodiversity and fisheries features concludes that significant environmental impacts are predicted upon benthic habitat features as a result of habitat loss or deterioration and fisheries features as a result of underwater noise arising from the construction of the proposed MP2 Project and in the absence of mitigation. Mitigation has been proposed where necessary and there is no significant residual environmental impact upon benthic biodiversity and fisheries features with effective implementation of the proposed mitigation measures.

The assessment of marine mammal features concludes that significant environmental impacts are predicted upon individuals but not populations of marine mammals as a result of underwater noise as a result of the construction of the proposed MP2 Project and in the absence of mitigation. Mitigation has been proposed where necessary and there is no significant residual environmental impact upon marine mammal features with effective implementation of the proposed mitigation measures.

The assessment of avian features concludes that significant environmental effects are predicted upon breeding and non-breeding avifauna as a result of disturbance and displacement as a result of the construction of the proposed MP2 Project and in the absence of mitigation. Mitigation has been proposed where necessary and there is no significant residual environmental impact upon avian features with mitigation in place.

The assessment of designated sites (other than European sites) concludes that significant environmental effects are predicted upon water quality and marine habitats in coastal zones of North Dublin Bay pNHA and South Dublin Bay pNHA or core areas of the Dublin Bay Biosphere; and that disturbance or displacement effects could occur to waterbird populations of North Dublin Bay pNHA and South Dublin Bay pNHA. Mitigation has been proposed where necessary and there is no significant residual environmental effect upon these designated sites with effective implementation of the proposed mitigation measures.

19.2.8 Soils, Geology & Hydrogeology

The assessment of soils, geology and hydrogeology was based on a desk study of publicly available information such as geological maps, historical borehole logs and maps, a site walkover survey and an intrusive ground investigation.

The investigation identified that the site is underlain by made ground, sands, gravels and clay.

Hydrogeology is the study of groundwater, including its origin, occurrence, movement and quality. The site falls within an area of low groundwater vulnerability. Groundwater was encountered within the made ground deposits and at greater depth within the sand and gravel deposits.

The conceptual site model developed in the assessment has not identified any potential significant relevant pollutant linkages (RPLs) for the site.

The proposed development will not have any substantial, negative impacts on the soils, geology and hydrogeology of the area.

Sediment chemistry sampling and analysis of marine sediments to be dredged were provided to the Marine Institute who examined the results in detail in combination with other relevant data held by the Marine Institute. The Marine Institute confirmed that they would have no objection to the disposal of this sediment at the licensed offshore disposal site located at the approaches to Dublin Bay west of the Burford Bank. The marine sediments can therefore be classified as Class 1 (Uncontaminated: no biological effects likely).

19.2.9 Water Quality & Flood Risk Assessment

Baseline water quality within the receiving environment was established through review of national monitoring data used to establish water quality status in the context of the EU Water Framework Directive (WFD) and supporting environmental standards. Recent high-frequency monitoring data collected during Dublin Port Company's ABR Project was also reviewed.

Using baseline water quality data and site specific water quality model simulation outputs, an assessment of the proposed MP2 Project was conducted to determine the likelihood of significant impacts on water quality using the criteria for rating significance and magnitude as set out in the National Roads Authority (NRA) publication "*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and*

Hydrogeology for National Road Schemes" (NRA, 2008) and appropriate mitigation measures to reduce impacts were proposed, where necessary.

In circumstances where the appropriate mitigations measures are fully implemented during the construction and operational phases, the impact of the proposed development on the water quality in the area will be imperceptible. The MP2 Project is therefore not expected to have a significant effect on the water quality of the receiving waters.

It can therefore be concluded that the proposed works are compliant with the requirements and environmental objectives of the EU Water Framework Directive and the other relevant water quality objectives for these water bodies.

The flood risk to the proposed site has been assessed and the predominant source of flood risk emanates from tidal flooding.

Under the Planning System and Flood Risk Management Planning Guidelines (2009), the MP2 Project site consists of areas located within Flood Zones A, B and C. The proposed land uses, and the types of developments proposed within the MP2 Project site involves docks or dockside activities that require a waterside location, and so can be classed as 'Water-compatible development'. This means that the development is appropriate for all flood zones and a Justification Test is not required to be completed.

Mitigation measures have been proposed where appropriate to prevent vehicles and people remaining in the areas if an extreme tidal event is predicted. Whilst there will be no damage to the majority of the site if a flood were to occur, mitigation measures have been proposed for the existing terminal building.

The proposed development is compliant with The Planning System and Flood Risk Management Planning Guidelines (2009).

19.2.10 Air Quality & Climate

The current state of the environment in terms of baseline air quality has been determined from the data from the EPA monitoring Zone A (Dublin) network to determine compliance with relevant ambient air legislation. In addition to the EPA monitoring, DPC carry out a series of ambient air quality monitoring tests within the environs of the port. This monitoring is employed in this assessment to demonstrate the spatial variation in the Port and in the wider Dublin area in conjunction with the data from the EPA network.

Results of the baseline monitoring indicates that recent levels in the Greater Dublin Area are well below the statutory limits for the protection of human health and also below the WHO guidelines for the protection of human health. It is noted that monitoring undertaken by DPC within the Port footprint show levels that are higher than the Greater Dublin Area average and, in some cases, levels exceed both the statutory limits and the WHO guidelines.

There are sensitive receptors (houses, commercial operations) located in the area and these receptors vary in distance from the proposed development. There is a potential that receptors may experience a change in air quality and the extent of these changes in air quality is identified in the air quality assessment. The nearest sensitive residential receptors to the south of the proposed development are the residential dwellings on York

Road, Pigeon House Road, Ringsend Park and Pembroke Cottages circa 400 metres to the south of the planning boundary of the development. To the north of the development site there is the extensive residential area of Clontarf with the properties along Clontarf Road closest to the planning boundary of the development at circa 450 metres.

DPC publishes an annual Sustainability Report to track and record progress on the ports environmental responsibilities. As part of the report a carbon footprint inventory of all port emission sources has been developed to track emissions and set ambitious targets to reduce emissions.

Construction dust has the potential to cause local impacts through dust nuisance at the nearest sensitive receptors and also to sensitive ecosystems. Given the nature of the port and the distance to sensitive receptors, there are no properties located within the dust risk impact zone and it is concluded that construction dust from the MP2 Project will be negligible for the duration of the works.

The proposed construction operation will involve the movement of materials and reconfiguration of existing roadways, buildings and lands to create an additional three hectares of usable terminal. Additional infill material may be sourced offsite and transported via the newly configured access to the Port. All dredged material will be barged to the dump site and will not travel by road. As the construction traffic volumes predicted with the MP2 Project are not considered significant relative to existing volumes, the resultant air quality impact from construction traffic is negligible.

The main potential odour from the construction stage relates to the potential for fugitive odours from the dredging operation. Despite the low risk of encountering odours, a series of odour mitigation measures have been presented to minimise the impact of this operation and to prevent any nuisance in the unlikely event that odours are encountered. The residual odour impact of the prosed the dredging operations is considered negligible.

The construction phase climate assessment was carried out to identify sources and quantify total greenhouse gas emissions generated from the construction activities associated with the proposed development. The total estimated greenhouse gas emissions associated with the proposed construction of the development will result in a permanent slight adverse impact.

A prediction of the local impact of traffic-derived pollution during the operation phase was carried out and the results of the analysis of the proposed development and wider Masterplan traffic indicates that all levels of pollutants are predicted to remain within the limits for the protection of human health at residential areas along transport routes even with the full predicted growth in traffic by 2040. While the levels remain below the relevant limits these increases and air quality impact from this traffic are classed as negligible. This includes for the wider masterplan traffic and hence the cumulative traffic impact on air quality is also considered negligible.

Shipping emissions associated with the proposed development have been quantified based on the projected increases in shipping numbers at the port in 2040 both as a result of the MP2 Project and cumulatively for the Masterplan. Shipping emissions are predicted to generate a long term and permanent slight adverse impact for climate and air quality.

Greenhouse gas emissions from energy use at the port, as documented in the carbon footprint, are assessed through a review of the proposed changes to operations at the site to determine the potential for significant impact. The results of the assessment indicate that the total carbon emissions will increase with the proposed development in operation. These impacts are considered as permanent slight adverse impact.

19.2.11 Noise & Vibration

Terrestrial Noise & Vibration

A detailed baseline noise monitoring survey was completed at a representative number of properties to determine the noise environment in the vicinity of the proposed redevelopment. This baseline noise monitoring survey was used as a basis for determining the likely noise impact associated with the MP2 Project

The Noise and Vibration Assessment was completed with reference to a range of relevant Irish and international noise and vibration guidance documents.

Worst-case construction noise levels from the proposed redevelopment will be well below the standard noise threshold limits outlined in the relevant noise guidance documents and are below the existing ambient noise levels at all of the nearest noise sensitive properties to the MP2 Project. Noise mitigation measures are included in the EIAR to ensure that construction noise impacts are reduced to the lowest possible levels.

There will be no significant noise impacts associated with traffic flow changes as a result of the construction or operational phases of the MP2 Project. The traffic flow increases associated with the MP2 Project will result in neutral change to traffic noise levels.

There will be construction phase activities associated with the MP2 Project that have the potential to generate vibration impacts, most prominently the piling works required as part of the construction phase. The distance of the piling activities from the nearest sensitive properties will ensure that there is no significant vibration impact at these properties.

During the operational phase, there will be no significant operational phase plant/equipment noise impacts from the MP2 Project at the nearest noise sensitive properties.

Underwater Noise

Site specific underwater noise levels have been established whilst piling and dredging operations have been taking place.

The principal underwater noise impacts will arise from the following activities: ground investigation works to assess the nature of the seabed, demolition and excavation close to the Liffey channel, piling during installation of quay walls and jetties, dredging works including the disposal of the dredged material to the west of the Burford Bank and increased shipping traffic.

The receiving environment during the construction phase is an enclosed section of a busy port. Existing underwater noise levels in the area are elevated in the presence of shipping traffic but noise attenuates quickly due to absorption by the mud on the seabed. From an underwater noise perspective any sources of additional noise during construction will be confined to an area in the inner port and attenuate rapidly.

The site is noise sensitive due to the proximity of marine species including fish in the Liffey channel. The outer part of Dublin Bay is a popular recreational diving location, with scenic dives at Scotsman's Bay, Sandycove, Muglins Rock, Dalkey Island and Irelands Eye. The closest of these sites (Scotsman's Bay) is located some six kilometres from the end of the Great South Wall, and more than eight kilometres from the nearest piling activity. The outer bay is also home to marine mammals, primarily the resident seal population and Harbour Porpoise associated with the nearby Special Area of Conservation.

The construction of the quay walls and berths will involve some marine traffic transporting materials but the most significant underwater noise element of the construction phase will be the piling requirement.

An underwater noise propagation model was used to predict the potential underwater noise impacts of the MP2 Project. The propagation and sound exposure levels were calculated in order to determine the likely range for injury and disturbance using well established modelling and injury criteria. Due to the confined shallow space and the narrow channel width, the worst case impact zone is quite small in extent. The potential injury zones are summarised as follows:

- Potential discomfort to recreational divers limited to 1 km with clear line of sight;
- Potential injury to fish species is limited to 12 m from the source;
- Permanent Threshold Shift injury to marine mammals is limited to 1m from the source; and
- Disturbance to marine mammals is limited to 120 m from the source.

No recognised dive sites will be impacted by underwater noise from the MP2 Project. No piling will be carried out along the riverside of the Liffey in the March to May period to protect migrating fish. Specific marine mammal mitigation measures will be undertaken including compliance with NPWS (2014) guidelines.

It is proposed that underwater noise levels will be monitored during the construction period at a minimum of two locations upriver and two locations downstream of the works when works are being carried out in the navigation channel. Monitoring will be carried out at the commencement of the piling activity. Any increase in underwater noise levels during construction can be considered as a not significant short-term adverse impact with no residual impact.

Monitoring noise during the operational phase will be undertaken. The Dublin Bay area is subject to commercial traffic from Dublin Port, Dun Laoghaire Port, Howth Port and leisure and commercial traffic from numerous marinas around the bay. In order to monitor Dublin Port traffic related noise it is proposed to install a hydrophone at the eastern end of the port linked to a vessel identification system. Monitoring will provide information on background (absence of shipping) and ambient (shipping noise included) noise levels along with linking noise events to specific vessels. This approach ensures that particularly noisy vessels can be identified and appropriate measures outlined in the IMO (2014) guidelines are taken to control noise emissions from those vessels.

19.2.12 Material Assets – Coastal Processes

The assessment of coastal processes was based on an extensive numerical modelling programme which was undertaken using RPS' in-house suite of MIKE coastal process modelling software developed by the Danish

Hydraulic Institute (DHI). Baseline models were calibrated and verified against a range of project specific hydrographic data and subsequently used to assess the construction and operational impacts of the MP2 Project.

The assessment concluded that dredging operations required for the MP2 project will not result in any significant impact to either water quality in terms of suspend sediments, or the nearby environmentally designated areas in terms of sediment deposition with proposed mitigation measures in place.

In respect to the power station intakes and Ringsend WwTW outfall, any increase in the suspended sediment concentrations was generally very small by comparison with background levels in the Liffey Estuary. The dredging operations are therefore unlikely to have any effect on the quality of intake waters in terms of suspended solids content. However, as customary, DPC will continue to notify the power station operators in advance of each dredging campaign. This will allow operators to temporarily stop abstracting water from the Liffey for a short duration in the event that dredging is required within the immediate vicinity of their intake works.

The assessment of disposal of dredge spoil arising from the MP2 Project at the licenced offshore disposal site located to the west of the Burford Bank at the approaches to Dublin Bay concluded that the disposal operations will not result in any significant increases to the background level of suspended sediments and will not, therefore, impact the existing water quality in the greater Dublin Bay area.

The tidal regime is predicted to remain substantially unchanged post MP2 Project. The risk of impact to the existing tidal regime is therefore determined to be negligible and no mitigation is required.

The assessment of potential changes to the inshore wave climate found that the maximum change in wave heights in Dublin Port during storm events from the north east, east and south east did not exceed ±0.10m. These changes were confined primarily to Berth 50A and Berth 50; and there was no discernible change in the wave climate due to the MP2 Project in relevant proximate areas such as Clontarf, Fairview and Ballybough bordering the Tolka Estuary.

These changes to the wave climate are not considered significant and will not impact operations within the Port. Furthermore, the change in risk of potential coastal flooding due to the MP2 Project at neighbouring sites is considered to be negligible and no mitigation is required.

The assessment of potential changes to the morphology of the Tolka Estuary due to the construction and operation of Berth 53 concluded that the open=piled design of the jetty and the incorporation of a wash protection structure to reduce propeller and thruster jet velocities successfully mitigated the potential impact on waterbird foraging areas within the Tolka Estuary. No significant change to the position of the Lowest Astronomical Tide mark would arise as a result of the construction and operation of the MP2 Project.

In circumstances where the proposed mitigation measures are fully implemented during the construction and operational phases, the impact of the proposed MP2 Project on the coastal processes within Dublin Port and Dublin Bay will consist of small scale, low magnitude changes in the tidal regime and wave climate.

On the basis of that the appropriate mitigations measures are fully implemented during the construction and operational phases, the impact of the proposed MP2 Project on coastal processes will be imperceptible.

19.2.13 Material Assets – Traffic & Transportation

The Traffic and Transportation Assessment considers several schemes and transportation infrastructure improvements, both within the Port and its environs, which are of particular relevance to the MP2 Project. They are:

- Consented road upgrade scheme within the Dublin Port Estate. This scheme is of vital importance to the vehicular and sustainable transport connectivity to the MP2 Project and it is therefore confirmed that this scheme will be complete and operational prior to the completion of the construction of the MP2 Project;
- The ABR Project and committed closure of the Port accesses along the East Wall Road;
- The opening-up of the Port Centre public realm scheme, currently complete and operational.

The consented road upgrade scheme also provides high quality cycle and walking connections to the MP2 Project including:

- 4km Greenway along the northern shoreline overlooking the Tolka Estuary leading to a two-tier linear park at the east of the Unified Ferry Terminal connecting the NTA's Dublin's Proposed National Cycle Network to the MP2 Project.
- Landmark cycle and pedestrian bridge across the Promenade Road Access;
- Enlarged Promenade Road Roundabout with segregated cycle/walkway.

An accessibility assessment was undertaken to establish the density of existing, consented and proposed sustainable travel and active transport provision serving the MP2 Project. The main components that provide a high level of accessibility for the MP2 Project are the:

- Consented active travel measures incorporated within the internal roads scheme to connect the MP2 Project to the City;
- Existing density of active travel facilities available in Dublin City Centre;
- Existing density of sustainable travel facilities in Dublin City Centre including bus, rail, DART and Luas;
- Existing provision of cycle locker facilities of the Port Centre public realm scheme to facilitate multi-modal journeys by sustainable travel;
- Proposal for DPC to subsidise the provision of a shuttle bus service to the MP2 Project;
- Proposed connectivity on foot and by cycle to the Unified Ferry Terminal footprint.

To ensure a high quality public transport service between the UFT and the density of sustainable transport services located at the perimeter of the Port, DPC is prepared to provide finance, of up to €100,000 for a period of five years (€500,000 total) to a shuttle service operating to create a connection between the Unified Ferry Terminal, the DART in Clontarf and the LUAS at the 3 Arena. It would link into East Point Business Park, have multiple stops throughout the Dublin Port Estate and connect with the ferry terminal 1 building.

The MP2 Project will not impact on the potential extension of the Luas as currently included in NTAs Transport Strategy for the Greater Dublin Area for 2016-2035.

The MP2 Project does not affect the existing operations of the freight trains within the Port Estate. The proposed land elements of the works will not impede on the existing railway lines present within the MP2 site boundary.

An outline Mobility Management Plan (MMP) sets out the type of measures which will be adopted by the operator(s) to ensure that the sustainable transport facilities are made available and are utilised by the users of the MP2 Project. It is envisaged that the MMP will, in the fullness of time, fall under the hierarchy of a Port wide Transport/Travel Plan as the Masterplan continues to be implemented over the next 21 years.

Three Linked LinSig models were built to assess the impact of the traffic generated by the MP2 Project on the existing and committed road network. The assessment concluded:

- The UFT access barriers have sufficient capacity, with no accumulative queueing occurring over the 14 barriers at 2040.
- External junctions show additional capacity and planning gain due to the closure of the Port Estate accesses along East Wall Road, and though the South Port Access Road (SPAR) is not part of the MP2 Project, should it be delivered in future years it will provide further capacity benefits along East Wall Road;
- The Dublin Port Tunnel and Toll Plaza have sufficient capacity at 2040.
- The consented internal junctions have sufficient capacity at 2040, which the exception of the consented Promenade Road Roundabout which exceeds capacity at 2031 when a 3.3% per annum growth rate is assessed. The Promenade Road Roundabout forms part of the SPAR and the upgrade of the roundabout junction will be considered as the Masterplan continues to be implemented. The SPAR is due to be operational by 2031, which coincides with the consented roundabout coming to the end of its design life. The situation is self-regulating. In any case, the consented roundabout will have adequate capacity until at least 2031, which is comfortably within the 5 future year mitigation requirement as per the Chartered Institution for Highways and Transportation Guidelines for Traffic Impact Assessments. Additionally, there are a suite of measures available to the Port to control and manage the pattern of traffic arriving to the Port that can utilised in future years as the current Masterplan comes towards the end of its lifespan.

19.2.14 Cultural Heritage (Including Industrial & Archaeological)

The EIAR has identified, recorded and assessed the cultural heritage assets and potential impacts associated with the MP2 Project. Existing records and newly-commissioned work present a robust baseline of information above and below the waterline.

The principal cultural heritage constraint identified is the demolition of the Eastern Breakwater Pier Head, which was built in the nineteenth century to mark the original entrance to the Port's deepwater basin. DPC has adopted a best practice approach to conservation on the site to preserve the cultural significance of Dublin Port as a Deep Water Port. The Pier Head will be removed and this work will be archaeologically monitored. The stonework will be salvaged and incorporated into a new public realm element that celebrates the heritage of the Port. The former location of the Pier Head will be recorded on the adjacent section of new quay at Berth

50A. It is expected that elements of the original Eastern Breakwater exist under Breakwater Road, and that these elements will survive in situ beneath Berth 50A.

Archaeological monitoring of ground and seabed disturbance activities will take place across the MP2 Project area, ensuring that a robust record is maintained and that any new archaeological observations are resolved fully.

19.2.15 Landscape & Visual

The MP2 Project is located within a landscape character area identified as Harbour Based Industrial Landscape. This landscape character area has been identified as having a low sensitivity to change. The magnitude of landscape resource change will be negligible and the significance of landscape impact will be negligible to minor negative and not significant.

The Zone of Theoretical Visibility (ZTV) has been established for the MP2 Project to allow any potential areas of significant visual impact to be identified. Actual visual impacts from within the ZTV have been predicted by site survey and assessment during the construction and operational phase on potential views from sensitive visual receptors including residential properties.

There are large areas of Dublin and the adjacent settled coastline that will not have views of the proposal due to intervening vegetation and buildings and it is only in close proximity to the site that there will be potential direct views at Ringsend to the southwest and the Clontarf to Howth coast road to the north. The existing port facilities including ships and cranes and traffic are all features of the existing views and there will be few new features visible from the wider ZTV.

During the construction stage due to distance and the broad scale of the landscape within which the works are located, the change in landscape and visual resource will be negligible and, therefore, the significance of landscape and visual impacts during the construction stage will be minor. There are limited residential dwellings in close proximity to the construction works, construction traffic will blend with existing busy traffic on adjacent roads and no significant visual impacts are predicted at the construction stage as a result.

During the operational stage of the MP2 Project it will be fully read in the context of same existing features at the site and with its urban surroundings with negligible change in landscape character.

For residential properties with potential views in the direction of the MP2 Project the predicted significance of visual impact will be minor negative and not significant.

A total of 15 viewpoints have been assessed and no viewpoints have been predicted to have significant visual impacts. No significant cumulative landscape and visual effects have been predicted.

Overall the MP2 Project will be difficult to discern from the existing activities and features at Dublin Port.

As no significant landscape or visual impacts have been predicted there is no requirement for specific landscape mitigation measures.

19.2.16 Population & Human Health

The population and health construction and operational phase assessments looks at the potential impact on health from: changes in emissions to air; changes in exposure to noise; changes to transport nature and flow rate; and changes to socio-economic factors (such as employment and the economy).

During construction, population and health effects from changes in emissions to air, noise levels and transport nature and flow rates are not considered to be significant. This is primarily due to negligible changes in magnitude and the intermittent nature of the construction phase, meaning that any changes would not be sufficient to change health outcomes measured on a community-wide level. Regarding changes in socio-economic factors during construction (employment and contribution to the economy), there would be minor to moderate beneficial effects on the basis that labour will be required over a period of 11 years, and because the cost of construction materials would make a considerable contribution to the wider economy.

During operation, the maximum change in air pollution is predicted to be 1.09 $\mu g/m^3$ for nitrogen dioxide and 0.43 $\mu g/m^3$ for particulate matter (10 micrograms or less in diameter). These changes would be negligible as they would remain within air quality objectives and are not of a magnitude to change health outcomes measured on a community-wide level. Impacts on health and wellbeing from changes in noise levels would also be negligible on the basis that the predicted change is not anticipated to be perceptible to the average person.

The capacity of the existing road network is expected to meet the forecasted increase in traffic volumes and therefore no significant adverse effects are anticipated. In addition, part of the MP2 Project would provide and actively promote cycling/pedestrian routes and recreational opportunities in the port area. Overall there would be a net benefit to health and wellbeing through providing opportunity for recreation and physical activity.

Regarding changes in socio-economic factors during operation (employment and contribution to the economy), the growth in cargo capacity associated with the MP2 Project has the potential to generate a significant amount of jobs at the port and within any associated industry beyond the port boundary. In addition, the growth in cargo capacity would contribute substantially to the wider economy not only through the import/export market, but also through increased tax revenue and tourism. The weight of these socio-economic changes would benefit health and wellbeing in the long-term on a national level. As a result, the significance of benefits associated with operation of the MP2 Project can be considered major.

The overall effects on population and health would be positive as the ranging beneficial changes to socio-economic factors and their impact on health and wellbeing outweigh the negligible adverse changes to environmental determinants.

19.2.17 Waste

The MP2 Project will generate construction related waste and once operational the extended capacity at the port will facilitate an increased number of berthing opportunities and the likelihood of increased waste arising associated with the additional port capacity during the operational phase.

In terms of the overall impact of the construction stage, a carefully planned approach to waste management and adherence to the Construction Environmental Management Plan (CEMP) and Construction & Demolition (C&D) Waste Management Plan during the construction phase will ensure that waste arisings are minimised and any waste arisings produced during this phase will be recycled or recovered where possible. DPC and the appointed Main Works Contractor (MWC) will be responsible for the collection, control and disposal of all wastes generated by the works and to meet all legal requirements. All wastes will be managed off site under the principles of the waste management hierarchy. There is available capacity within the existing waste management infrastructure in the Region to manage C&D Waste from the proposed development works. Therefore the effect of the construction phase in relation to waste management is deemed as neutral.

DPC currently operates a port waste management plan ‘Dublin Port Ship’s Waste Management Plan’ 2017. The Waste Management Plan underpins all waste related operations at Dublin Port.

DPC will continue to review and implement any required changes in this Waste Management Plan in order to avoid and minimise the potential effects of vessel generated wastes once operational. DPC will continue to provide adequate reception facilities and remove, as far as is practicable, any disincentives to landing waste in the port. DPC will continue to encourage the responsible management of waste, including minimisation and recycling, at the point of generation on ships, reception in ports/harbours, transportation and disposal, and ensure that port and harbour employees and users dispose of wastes responsibly in facilities provided. While there may be a minor increase in waste arisings due to anticipated increased usage of the Unified Ferry Terminal, there will be no discernible effects to waste management once operational due to recycling and reuse policies, procedures and the implementation of the Waste Management Plan. There is capacity within the existing waste management infrastructure to manage waste arising from the operational phase of the development works. Therefore the effect of the operational phase in relation to waste management is deemed as neutral.

19.2.18 Cumulative Effects & Environmental Interactions

The potential cumulative effects of consented schemes nearby the MP2 Project were assessed. Relevant projects were selected and the Project team defined significance thresholds and criteria for assessment. These were based on professional judgement, alongside relevant standards and guidelines, to determine whether in-combination effects gives rise to additional levels of significance.

The most significant nearby Project identified was the ABR Project. The three key environmental factors with potential cumulative effects with the MP2 Project were: Biodiversity; Water Quality; Traffic and Transportation.

Construction and operation phase mitigation measures were identified to prevent the potential interaction of cumulative effects on both Biodiversity and Water Quality. For example, the potential cumulative effects resulting from dredging and disposal operations required inclusion of mitigation measures to temporarily separate operations. This means that the dredging element of the MP2 Project will not overlap with ABR capital dredging and/or DPC maintenance dredging campaigns, thus reducing potential impacts to water quality, habitat deterioration, underwater noise and biodiversity. A traffic assessment was undertaken and considered the potential cumulative effects of the consented schemes surrounding the MP2 Project on traffic and transportation. The assessment factored in 3.3% yearly growth of port-related traffic movements, to allow for continued growth in line with Dublin Port's Masterplan. This assessment concluded that the MP2 Project would not result in any cumulative effects on road traffic when considered in combination with consented developments and the future growth of Dublin Port.

Another significant interaction is the MP2 Project in combination with the Dublin Port Internal Road Network (3084/16). The interaction relates to the construction and operation of MP2 in combination with the Dublin Port Greenway. Both projects have the potential to cause disturbance to bird populations using the Tolka estuary during periods of very low spring tides (approximately 40 occasions a year). The following mitigation measures will be applied to reduce the impact of MP2 and therefore reducing the cumulative effects when considered in combination with the Internal Road network:

- Construction of Berth 53 will temporarily cease during periods of low spring tides to avoid disturbance at feeding grounds within the Tolka Estuary.
- Gates will be used at the site of the Greenway to control the movement of people during periods of low spring tides, again, to avoid disturbance at feeding grounds within the Tolka Estuary. This will avoid any effects of human disturbance on the birds.

The potential interactions between environmental aspects arising from within the MP2 Project were assessed. Each technical chapter within the EIAR identifies and analyses the potential for other environmental interactions. These chapters also detail environmental baseline information and identify the significant potential and residual construction and operational effects/impacts of the discrete MP2 Project. The cumulative assessment identified many potential inter-relationships and inter-actions. Additional mitigation measures were included to minimise and/or off-set the potential for significant effects resulting from such inter-actions.

For example, an interaction link exists between Water Quality and Human Beings. Dredging operations has the potential to impact on water quality at water intakes and outfalls. Four power plants within the Dublin Port area abstract water from the Liffey. The water is abstracted as part of the electricity generation process and/or for cooling water components. High levels of suspended solids in cooling water has the potential to impact upon the plants cooling system and may result in an increase in operation and maintenance costs. A review of dredging simulation results showed that that the increased levels of suspended sediment concentrations at the power station intakes are generally very small by comparison with background levels in the Liffey Estuary. It is therefore unlikely to have a significant effect on the quality of intake waters at power stations in terms of suspended solids content. Precautionary mitigation measures have been included as an additional safeguard. If dredging is scheduled to take place within a 500m radius of the intakes, the relevant stakeholders are notified so that additional measures can be taken if deemed necessary.

All potential cumulative effects and environmental interactions of the MP2 Project's construction and operational stages are included in Chapter 18. All mitigation measures for the MP2 Project resulting from the individual assessments, and the cumulative effects and environmental assessment are listed in detail in Chapter 19 and the Project Construction Environmental Management Plan (CEMP). Provided the suggested mitigation measures as listed in the environmental chapters are employed during construction and/or operation the overall impact to the environment, even considered in combination, is considered negligible.

19.2.19 Concluding Remarks

Overall, the authors of the EIAR believe that the MP2 Project complies with the principles of proper planning and sustainable development, and that the EIAR has objectively demonstrated not to adversely affect the environment in all its facets, including the integrity of Natura 2000 sites.

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Chapter 7 Biodiversity, Flora & Fauna

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