Galway Harbour Company

Galway Harbour Extension

Environmental Impact Statement

Volume 2A
Non-Technical Summary

DOCUMENT AMENDMENT RECORD

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TOBIN Consulting Engineers							

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1 INTRODUCTION

Background

Galway Harbour Company has for some years, been developing proposals for a Harbour Extension at Galway to address severe constraints to their operations within the existing harbour, resulting from:-

- severely restricted access,
- tidal and gated harbour,
- uneconomic vessel size capacity,
- channel too shallow,
- port draught and dimensions too limited,
- inadequate quay length and limited berthage.

The proposed Galway Harbour Extension [GHE] development will address all of the above constraints and provide improved infrastructure to consolidate existing business, develop new business and services, provide for the international cruise liner business and facilitate the economic growth of the region.

Over the period 2007-2013, Galway Harbour Company has been in consultation with An Bord Pleanála under Section 37B of the Planning and Development Act, 2000, as amended, on the proposals for the Galway Harbour Extension. An Bord Pleanála decided in October 2013 that the proposed development would be strategic infrastructure within the definition of Section 37A of the Planning and Development Act, 2000, as amended, and that any application for permission for the proposed development must be made directly to An Bord Pleanála under Section 37E of the Act.

Accordingly this application and supporting Environmental Impact Statement [EIS] and Natura Impact Statement [NIS] is now formally submitted to An Bord Pleanála for their consideration.

The proposed development on lands to be reclaimed mainly from foreshore and the sea is in an area designated candidate Special Area of conservation [cSAC], Special Protection Area [SPA] [Natura 2000 sites] and proposed National Heritage Area [pNHA], to the South of the existing Galway Harbour Enterprise Park. It will include the relocation of the majority of the existing Harbour related activities including oil and bitumen discharges and businesses to new Quays, Jetties, Yards and Deepwater berths to be located at the Galway Harbour Extension.

A 10 year planning permission is sought.

2 PLANNING AND POLICY CONTEXT

2.1 PLANNING AND POLICY CONTEXT

The proposed Galway Harbour extension is consistent with the relevant planning policies and objectives, including the National Spatial Strategy, National Development Plan, National Ports Policy, Regional Planning Guidelines and Galway City Development Plan.

In this regard, the proposed development is fully supported by the specific objectives included in the Regional Planning guidelines and the City Development Plan.

In addition, the proposed harbour extension is in the interests of balanced regional development and will further ensure the long-term strategic role of Galway City as a Gateway city.

Overall, it is considered that the proposed development of a new Extension to Galway Harbour is in line with the relevant national, regional and local planning and regional development policies and objectives. It is therefore considered appropriate to apply for planning permission for the proposed development.

2.2 BUSINESS CASE

A failure to extend Galway Harbour would see traffic volumes / tonnages decline, as shown in Table 1 following, and would have major implications for the economic health of the region in terms of the number of jobs that would be put at risk and loss of their spend, as well as the increased transport costs for industry, erosion of regional competitiveness and the further financial injection that would be lost because of the reduced number of cruise vessels that would visit Galway and the failure to develop local marina facilities. The viability of the Harbour facility itself would also be put at risk.

Traffic Projections - Without Development						
	2012	2018	2023	2028	2033	2035
Liquid Products	415,203	525,000	290,000	250,000	250,000	250,000
Dry Products	85,538	315,000	315,000	278,000	278,000	278,000
TOTAL	**500,741**	**840,000**	**605,000**	**528,000**	**528,000**	**528,000**
Cruise Vessels	6	5	3	3	3	3
Marina Berths	40	140	140	140	140	140

Table 1 - Traffic Projections - Without Development

Petroleum products are the principal trade through the port. Galway is the gateway to the west and northwest and is located strategically for the oil companies to allow them to distribute their products north as far as Buncrana, east as far as Athlone and south as far as Ennis. There is one operational tank farm in Galway which is leased to Topaz Energy Ltd who import a range of petroleum products through it.

Bitumen is imported into Galway by Cold Chon Ltd. and is sold to Local Authorities for road works. Cold Chon has secured planning permission for the construction of two new tanks which will only take place if planning permission for the new Port is secured. This will then allow the company to make Galway the transhipment port for Northern Europe exports.

McGrath Quarries of Cong began to export lime stone to Scotland and Sweden in late 2011 for use in glass making. The range of uses and tonnage has grown continuously. Significant exports are projected for 2014 and this is forecast to continue to grow thereafter as new markets open up. The harbour extension that will allow larger vessels access the Port would help that growth in export.

Other existing business at Galway Harbour include importing reinforcement steel, coal and other energy related products, while exports include scrap steel, and other waste / recycled materials.

To date, Galway has failed to capitalise on its unique attributes for the lucrative cruise liner business because of inadequate landing facilities but has commenced an active campaign of attracting the major cruise operators to Galway. In 2013, four cruise vessels visited Galway while eight cruise

vessels are currently scheduled for 2014 with four more in 2015.

The spend from the cruise industry and maritime leisure visitors is significant and there are valuable direct and indirect employment spin-offs as well as being a major boost to the local economy from the purchase of gifts, as well as on eating and drinking in local restaurants and bars, and visiting sites of interest. Cruise vessels often replenish their stores while in port and this spend provides an added economic contribution to the region.

The offshore energy sector is an industry sector that is expected to become a major economic opportunity as Ireland seeks to reduce its carbon footprint. Galway is well suited to be the port of choice to support those facilities to be located off the coast to the west and north west.

At this time, there are limited facilities available for those who wish to visit Galway by boat and use it as a base for maritime tourism. The harbour extension will open up the area for new berths.

Other potential new imports and exports include Agri-Products such as fertilisers and animal feeds, Refuse-Derived Fuel (RDF), Timber, Bio-fuels and Ore.

Traffic projections have been prepared from Extension availability (2018 – Year 1) to 2035 based on historical trends, the current understanding of likely developments in the existing various trades and informed from discussions held with the Galway Harbour Company's principal major customers.

These traffic projections are presented in Table 2 in terms of a liquid bulk, dry bulk, cruise liners and marina berths for a medium, prudent and conservative growth scenario. They exclude any regular and scheduled LoLo traffic.

The Business Case for the harbour extension shows that there are significant economic and financial benefits to be achieved from the proposed development.

An independent Cost Benefit Analysis (CBA) carried out by DKM Economic Consultants confirmed that the project confers significant benefits on the customers of the port, in terms of capacity to handle larger cargoes and to facilitate business development. In addition, DKM noted that the increased capacity to handle cruise business and leisure craft has the potential to confer significant benefits on the City of Galway and the wider tourism sector. Likewise, significant road traffic and related environmental impacts are avoided by virtue of customers being able to access port facilities in the vicinity of their business. The CBA valued the wider economic benefits at €116 million in Net Present Value (NPV) terms over the period to 2035.

As a Gateway City, failure to progress the harbour extension will have a significant impact on the local and regional economy, and the proposed freight projections underline the case for the proposed extension.

Traffic Projections						
	2012	2018	2023	2028	2033	2035
Liquid Products	415,203	586,000	1,200,000	1,200,000	1,200,000	1,200,000
Dry Products	85,538	383,000	732,000	732,000	732,000	732,000
TOTAL	**500,741**	**969,000**	**1,932,000**	**1,932,000**	**1,932,000**	**1,932,000**
Cruise Vessels	6	15	24	29	34	36
Marina Berths	40	40	240	456	456	456

Table 2 - Traffic Projections

3 DESCRIPTION OF PROPOSED DEVELOPMENT

3.1 FACILITIES TO BE PROVIDED

The proposed development will include:-

- quay walls, breakwaters and wave walls to create commercial quays and a deep water docking facility, extending southwards into Galway Bay
- dredging to create a new approach channel to the commercial quays and the deep water docking facility berths
- reclamation of approx 27 ha from the foreshore and sea bed
- development of the reclaimed lands and redevelopment of part of the adjacent Galway Harbour Enterprise Park lands for Harbour related business
- marina on the western side
- fishing quays, slipway for a lifeboat station and a nautical centre on the eastern side
- a twin track freight rail link from the existing Galway to Dublin rail line to the commercial quays, including embankments, rail over-bridge to existing service road and noise abatement screening
- the construction of oil and bitumen transfer pipelines to the existing oil and bitumen tank farms on the Galway Harbour Enterprise Park and the provision of fire water storage facilities. This falls within the remit of EU Directive (96/82 EC) on the control of Major Accident Hazards, known as the SEVESO II Directive
- harbour related buildings, including Port Operations Office (4 storeys); Harbour Management Warehouse (single storey); Marina Office (single storey); Passenger Terminal (single storey); and ancillary car parking and site services, including 3 No. ESB sub-stations, demolition of 1 No. ESB sub-station, 3 No. Control Offices and Oil Terminal Water Pumphouse and a helicopter pad for search and rescue purposes.
- the construction / improvement of access roads including the horizontal and vertical realignment of the road under Lough Atalia Road Rail Bridge [a protected structure] and realignment and improvements including traffic lights at Dock Road / Bóthar na Long / Galway Harbour Enterprise Park Access Road junction (adjacent to Harbour Hotel)
- the provision of landscaping and amenity areas, including replacement of the previously permitted amenity strip from the southern seaward boundary of the Galway Harbour Enterprise Park to form an amenity link from the marina to the nautical centre.
- the proposal includes for all associated temporary and permanent site development [including service roads / realignment of roads and underground works], landscape works [including public lighting and services] and activities to facilitate the construction of the development.

3.2 DESIGN CONSIDERATIONS

The following issues were considered in developing the design of the Harbour extension:-

- Sufficient draft provided to be for all-tide access to each berth area based on proposed use.
- Suffficient land provided to support necessary land-based facilities for a sustainable Galway Harbour Extension.
- Galway Harbour Extension configuration and individual berth locations positioned to minimise rock dredging.
- Port layout, use and activity locations configured to optimise rail connectivity.
- Quays and breakwaters positioned and structured to provide sheltered berthing of cargo, passenger, fishing and amenity vessels.
- Western marina and Promenades, Eastern Slipway and Eastern Promenade configured, positioned and structured for optimal use of natural amenity.
- New Harbour layout configured and elements structured to provide aesthetically pleasing views from surrounding shorelines.
- Maximum efficient separation of commercial from pleasure/sport/leisure craft achieved.
- Maximum amenity access to harbour lands provided while preserving harbour security and meeting health and safety requirements.
- Sustainable / future proofing ecological / environmental considerations including minimizing land take / marine footprint.

3.3 CONSTRUCTION METHODS

The new extension will be constructed south of the existing Galway Harbour Enterprise Park by the reclamation of land from the foreshore and seabed. This will be achieved primarily by the dredging of materials, mainly silts, sands and gravels from the seabed to form the deepened approach channel, turning area and berths and by re-using these materials to create the new reclaimed land.

In the first instance the area to be reclaimed or filled will be subdivided into separate lagoons each contained by robust wall systems. These wall systems will be constructed partly from locally imported rock fill embankments and partly from steel sheet piled walls driven into the bedrock which will act as the permanent quay walls.

The rock embankments will be used as haul routes for dredged materials and other construction activities and will also act as the foundations for the main permanent harbour roads. The lagoons will be lined with geotextile fabric to contain dredged sediments.

A revetment system or breakwater to protect the main commercial quay and the marina will comprise two zones of rock armour which will be delivered to site by sea and unloaded directly into position.

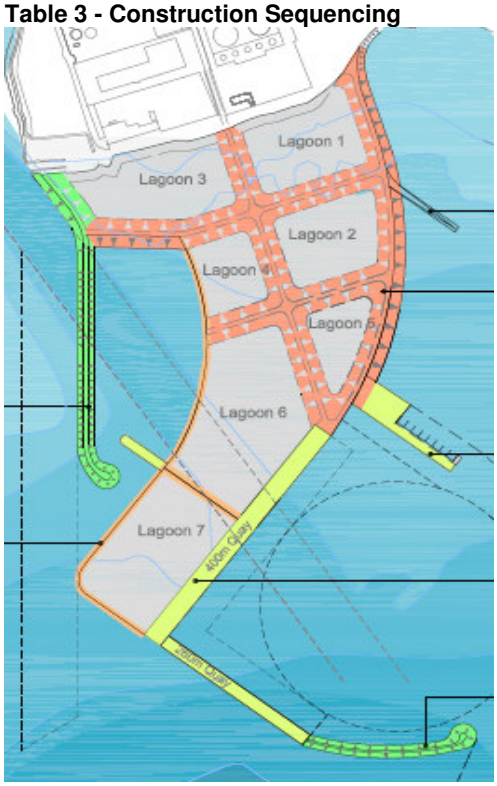
The dredging works involving c. 1.8 million cu.m estimated as 98.7% of silt and 1.3% rock will be carried out by suction dredger and back hoe dredger with all the dredged material reused in the filling of the lagoons in the first instance and in the formation of the yards and working areas following consolidation.

3.4 CONSTRUCTION SEQUENCING

The sequencing of construction and timescales are as follows:-

Stage/Construction Sequencing		
	Elements	Duration
1	- Upgrade Lough Atalia Road and main access.	43 months
	- Channel Dredging, construction of lagoons [1-6] and commencement of land reclamation	[1-43]
	- Commercial Port Dredging and deepwater quays.	
2	- Outer breakwater	12 months
	- Railway embankment	[44-55]
	- Lagoon No. 7	
3	- Capping of lagoons [1-6] to advance land reclamation	26 months
	- Marina breakwater	[56-81]
	- Railway line	
	- Fishery Pier	
	- Slipway	
	- Harbour support buildings, passenger building	
4	- Marina berths	15 months
	- Capping of lagoon No. 7	[82-96]
	- Completion of yards, roads & services	
	- Harbour Office and marina Management Building	

Table 3 - Construction Sequencing



4 ALTERNATIVES CONSIDERED

4.1 ASSESSMENT OF ALTERNATIVES

The assessment of alternative solutions which were considered at each stage, as part of Environmental Impact Assessment [EIA] examines alternative ways of implementing the project that, where possible, avoid any adverse impacts on the integrity of the Natura 2000 sites. Before a project, that either alone or in combination with other project or plans, has adverse impacts on a Natura 2000 site, can proceed, it must be objectively concluded that no other alternative solutions exist.

The assessment of alternative solutions is required when the competent authority i.e. An Bord Pleanála, having carried out Appropriate Assessment, has concluded that adverse impacts are likely and cannot be ruled out. In examining alternative solutions, other assessment criteria such as economic criteria cannot overrule ecological criteria.

Notwithstand that determination, possible Alternative Solutions could include the following:

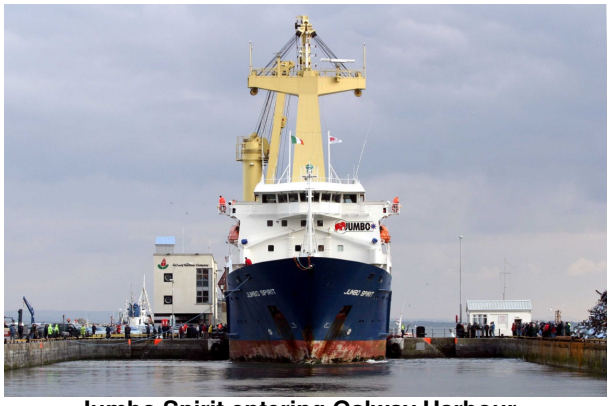
- Location
- Scale or size
- Design and orientation
- Means of meeting objectives (e.g. demand management)
- Methods of construction
- Operational methods
- Decommissioning methods at the end of project's life
- Scheduling and timescale proposals (e.g. seasonal working)

The assessment of alternative solutions must include an assessment of the 'do nothing' alternative.

A crucial step in assessing whether alternative solutions exist is the identification of the objectives of the project concerned. From the start it is possible to examine a range of alternative ways of achieving the objectives of the project and these alternatives can then be assessed against their likely impacts on the conservation objectives of the Natura 2000 site.

The primary requirement for the extension arises from the severe constraints with the existing harbour. The objective for the harbour extension therefore is to provide a facility which will service existing and future long term needs over a minimum 30-year period, building on existing landside infrastructure as follows:

- Sufficient quay length to accommodate freight, cruise and offshore servicing and operational requirements
- Sufficient draft for all tide access to each berth based on proposed use
- Sufficient capacity to accommodate 20,000 tonnes freight capacity vessel size
- Sufficient land to support the necessary land based facilities for a sustainable port
- Addressing existing SEVESO issues through the construction of petroleum and bitumen terminals and transfer pipelines to the existing tank farms, to replace current unloading operations within the existing harbour/city centre area



Jumbo Spirit entering Galway Harbour

Alternative solutions assessed include:

1. 'Do Nothing'
2. Improvements to the existing inner harbour
3. Alternative scale/designs as proposed
4. Alternative locations in the inner Galway Bay (i.e. Tawin & Mutton Island)
5. Alternative ports beyond Galway Bay (i.e. ports of national significance as defined in the National Ports Policy)
6. Alternatives abroad

Demand management is not relevant in the context of the GHE project which is designed to

cater for economically international trade serving the region.

The 'do nothing' scenario and improvements to the existing inner harbour are similar in that existing constraints such as tidal and handling/berthage constraints would persist. Neither alternative would therefore meet the project objectives with fewest / least ecological impacts.

A total of 8 no. alternative scales/designs at the Renmore location were considered over a 7-year period. The proposed GHE evolved from this process as the alternative which best meets the project objectives.

Alternative locations assessed in inner Galway Bay included Tawin and Mutton Island, neither of which have any harbour infrastructure at present and would therefore effectively constitute the development of a new port on a greenfield site together with all of the associated facilities.

The assessment of alternative ports beyond Galway Bay had regard to the National Ports Policy (NPP) which categorises ports into Ports of National Significance [Tier 1 & Tier 2] and Ports of Regional Significance. The function/role of Ports of Regional Significance is to service a particular region while a national port, on the other hand, fulfils both a regional role within its hinterland and a national role. No other regional port can fulfil Galway's role within its region, while a port of national significance could potentially serve the Galway region. An assessment of alternative ports beyond Galway bay therefore, excludes other ports of regional significance but includes ports of national significance Tiers 1 & 2. These ports were assessed against the objectives for the new port which were translated into qualifying criteria as follows:

- Available land
- Vessel draft capacity
- Total available quay length
- Capable of handling a range of commodities
- Links to established transport/distribution network
- Proximity principle
- SEVESO compliant

The ports assessed included Shannon Foynes, Dublin, Cork, Rosslare and Waterford. The only port which satisfied all of the qualifying criteria, including the proximity principle, is Shannon Foynes.

The final step in the assessment of alternative ports beyond Galway Bay was to determine whether Shannon Foynes fulfils national and regional policy in terms of both balanced regional development and sustainable development, and provides a feasible alternative to GHE from a socio-economic and environmental perspective. To assist in this evaluation process, DKM Economic Consultants prepared both a cost benefit analysis of GHE, followed by a report on the feasibility of Shannon Foynes as an alternative port location to serve Galway port's region. The report on the Shannon Foynes alternative concludes that there are compelling reasons why the alternative solution of the port of Shannon Foynes servicing the Galway port region is not feasible from a policy, socio-economic and environmental perspective and that there are overriding reasons of public interest why GHE should proceed at the proposed location.

The assessment of alternative ports abroad concluded that, as an island, alternatives such as road and rail transport alone are not an option and consequently locations abroad do not meet the project objectives.

The assessment of alternative solutions concluded as follows:

- Project objectives cannot be met in a 'do nothing' scenario
- The outcome in the case of improvements to the existing Inner Harbour is similar to the 'do nothing' scenario
- The alternative scales/designs and alternative locations in Inner Galway Bay are more damaging to the Natura 2000 sites
- Alternative solutions beyond Galway Bay do not meet the project objectives
- The project aims cannot be met by locating the facility abroad

The proposed GHE therefore represents the least damaging option environmentally in terms of meeting the project objectives, including compliance with national policy and the socio-economic wellbeing of the region.

4.2 CONSULTATIONS AND SCOPING

Over a seven year period from 2006, an extensive consultation process was undertaken with the Planning Authority, An Bord Pleanála and with many local and national interest groups. A public consultation seminar was also held in January 2011.

A series of eight pre-application consultations were held with An Bord Pleanála who then decided that the proposed development would be strategic infrastructure and accordingly any application for planning permission must be made directly to the Board under section 37E of the Planning and Development Act, 2000, as amended.

A scoping request "on the information to be included in an EIS" to support the proposed Port development was made to An Bord Pleanála who responded with their written opinion.

5 SOCIO-ECONOMICS

5.1 INTRODUCTION

One of the principal concerns in the development process is that people, as individuals or communities, should experience minimal disruption in their quality of life from the direct or indirect impacts arising from the construction and operation of a development.

5.2 EXISTING ENVIRONMENT

Notwithstanding the changed economic conditions prevailing in the State since late 2007, continued growth in population is anticipated in Ireland and indeed in Galway City. As the administrative capital of the West, Galway City has witnessed significant increases in employment in the technology, services, industry and commercial sectors. Tourism continues to be a very significant contributor to the socio-economic well being of the area, with Galway Bay seen as the only viable location for accommodating cruise liners in the West Region.

5.3 POTENTIAL IMPACTS

The proposed development will likely have a positive impact on employment during construction and operation phases, on tourism with the provision of cruise liner facilities and on fishing with the provision of a new fishing pier.

The proposed development will have a significant positive community benefit and amenities impact for the following reasons.

- **Economic Development and Employment**
  The Galway Harbour Extension will address the current limitations at the Inner Harbour, which, if not addressed, will ultimately result in the decline and demise of harbour-related activities in Galway city and in consequential negative socio-economic impacts.

- **Public Amenities at the Galway Harbour Extension**
  The proposed development incorporates public amenities and facilities, including landscaped open space, promenades/bayside walkways, public access and marina and, in addition, it

creates a sheltered and safe area for water-based leisure activities, including beach access at Renmore.

- **Regeneration of Inner Harbour Area**
  The relocation of the majority of the commercial/industrial harbour-related activities from the Inner Harbour, facilitates the regeneration and environmental improvement of this inner city area as a new urban neighbourhood and visitor destination, as well as addressing the Seveso II issues associated with oil handling, at the existing city quays.

If the proposed development were not to go ahead, the economic development of the region would continue to be frustrated by poor and restricted harbour facilities, ultimately resulting in a decline in harbour related business and commerce.

5.4 MITIGATION

There will be no significant negative socio-economic impacts as a result of the proposed development; therefore no socio-economic mitigation measures are required. Whilst the footprint of the Galway Harbour Extension may encroach marginally on areas that may currently be fished, the level of encroachment is negligible. Disruption during construction will be minimal and will be controlled by mitigation. The new fishing facilities proposed will impact positively on the fishing activities in the Inner Bay. Only positive impacts are anticipated in relation to tourism and therefore no mitigation measures are considered to be required. The economic development and employment, the public amenities at the Galway Harbour Extension and the potential provided to allow the regeneration of the Inner Harbour area are all positive socio-economic benefits.

6 SOILS

6.1 INTRODUCTION

The development of the Galway Harbour Extension will involve significant volumes of dredging, land reclamation by the re-use of the dredged materials and the construction of permanent quay walls. Marine drilling investigations and geophysical surveys were carried out in order to obtain an understanding of the engineering geological conditions.

6.2 EXISTING ENVIRONMENT

The existing Galway Harbour Enterprise Park was constructed partly on foreshore which had been reclaimed using imported rockfill, recycled construction demolition material and selected excavated, glacial till materials.

The new development will be partly on the existing Enterprise Park lands, but for the most part will be reclaimed from the foreshore and the sea to the south of it.

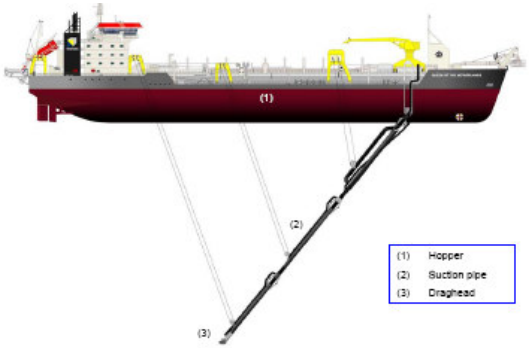
The foreshore and seabed soils immediately south of the Enterprise Park comprise alluvium which consists of sands and gravels, inter-layered silts and sands with some gravel layers and with localised clusters of large angular boulders. The alluvium is underlain by Glacial Till and Fluvioglacial deposits.

Bedrock occurs at between 2.3m to 14.0m below seabed level and slopes gently from north to south. The rock is intact and strong and will be difficult to remove. However only a minor fraction [1.3%] of the dredging required will be in rock.

The Galway Harbour Extension facility will be formed by dredging out of materials to form a deepened approach channel, ship turning area and berths alongside the quays.

Soft silts will be dredged by suction dredger, while the stronger glacial till material will be removed by back hoe dredger. Blasting will only be required to remove rock in the landward end of the 12m deep commercial berth and to provide for bottom anchoring of the sheet piled walls.

Backhoe Dredger loading to a barge



Typical Trailer Suction Hopper Dredger

6.3 POTENTIAL IMPACTS

During construction potential impacts can arise from release of suspended solids into the water during dredging operations with associated siltation of the seabed and increased suspended solids concentration of the water column. Similarly, issues with odours could arise from release of H_2S from the existing sediments during dredging and from dust emissions from the lagoons during the filling or consolidation phases.

In the operational phase, sediment suspension by propeller wash may arise, as well as sediment re-suspension by maintenance dredging operations. In addition there may be a change in existing erosion and deposition sites due to alterations in current directions.

6.4 MITIGATION MEASURES

The specialist dredging equipment to be used and the construction methodology proposed involving the provision of lagoon walls lined with a filtering membrane will control dispersion of suspended sediments. Odour release and dust emission will be managed by discharging the dredged material under water where possible, alternating between different lagoons and by damping down of surfaces.

The larger commercial vessels which will be operating in the deeper dredged channel and berths, are not expected to re-suspend sea floor sediments while re-suspension due to future maintenance dredging will be of low impact severity.

Maintenance dredging in the future is expected to be similar in time interval and quantity of material as at present *i.e.* 10 yr. intervals, due to a slower build up of material because of somewhat higher river flow velocities.

All construction activities will be carried out in accordance with a construction management plan which will be implemented prior to construction.

7 FLORA AND FAUNA

7.1 INTRODUCTION

The site of the proposed development is located within the Galway Bay Complex candidate Special Area of Conservation (cSAC) and proposed Natural Heritage Area (pNHA). The site also falls within the Inner Galway Bay Special Protection Area (SPA).

The conservation objectives of the Galway Bay Complex cSAC are:
"to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or Annex II species for which the SAC has been selected".

The conservation objectives of Inner Galway Bay SPA are:-

"to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA".

The development will cause the permanent loss of *ca* 27 ha of cSAC and SPA and the temporary loss of a further *ca* 46.5 ha. This will also represent a loss of feeding and foraging area to seals, otters, some bird species, lamprey and salmon which are listed as Qualifying Interests for the cSAC and SPA.

7.2 EXISTING ENVIRONMENT

7.2.1 Habitats

With regard to the EU Habitats Directive, two Annex I habitats *(Mud Flats and Sandflats not covered by Seawater at Low Tide and Reefs)* are present within the site of the proposed development and one priority habitat [Lough Atalia, a Lagoon] is adjacent to it. None of the habitats are exclusive to the area and are

present at many other locations within the cSAC. The area of habitat lost within the cSAC would represent *ca.* 0.3% of the total Galway Bay cSAC.

The diversity of terrestrial habitats within the site is poor and much of the area has been or is still subject to human disturbance 9shipping, channel etc). There are no annexed terrestrial habitats within the site of the proposed development.

7.2.2 Flora

All marine flora recorded at the proposed development site are common species throughout Ireland and NW Europe. None are regarded as rare or sensitive. None are listed in the EU Habitats Directive.

None of the terrestrial plants that are found in this area are of particular conservation significance, some of them being introduced or escaped alien species.

7.2.3 Fauna

All marine benthic faunal species recorded at the proposed development site are common throughout Ireland and NW European intertidal habitats. None are regarded as rare or sensitive. None are listed in the EU Habitats Directive.

Due to the naturally high physical and chemical variations in the area where the proposed development is to take place, there are no sensitive invertebrate species present and the habitat type can be found throughout Irish inshore waters.

Otter is listed in Annexes II and IV of the EU Habitats Directive and is a qualifying interest of the Galway Bay Complex cSAC. Otter was recorded on several occasions within the site of the proposed development. No sign of any otter holt was recorded during a dedicated survey of the area and it is considered that the conditions on-site mean that its potential as a site for a regularly used holt (particularly a natal holt) is low.

Common seal is listed in Annexes II and V of the EU Habitats Directive and is a Qualifying Interest of the Galway Bay Complex cSAC. Common seal was recorded foraging in the subtidal portion of the development site and using small haul-out sites in the wider area. There are no colonies of seals within the larger development site. There are a number of seal haul outs within Inner Galway Bay, most notably at Tawin Island and Oranmore Bay.

Harbour porpoise was recorded once in the wider area around the site of the proposed development during watches from the Mutton Island lighthouse. Additionally, a CPOD static acoustic monitoring device (moored underwater close to the site of the proposed development, near to the tip of Mutton Island) was deployed for eight extended survey periods between June 2011 and October 2013. Cetaceans were recorded on the majority of deployment days. A large majority of the recordings were of Harbour porpoise, while there were also recordings made of unidentified dolphin species (probably Bottle-nosed and/or Short-beaked Common dolphin).

Two species of bat (Common pipistrelle and Soprano pipistrelle) were recorded during a dusk-dawn survey covering the foreshore at the site of the proposed development and adjacent areas of the Galway Harbour Park. Only six bat passes were recorded during the course of a full night. Given the small number of registrations of bats made, the behaviour observed and the species involved, indications are that the site is not of significance for bats, only for small-scale foraging during calm weather.

A total of 31 bird species were recorded using the shoreline and marine area in the site of the proposed development. This list includes 13 of the 20 bird species listed as Special Conservation Interests of the Inner Galway Bay SPA. In addition, five of the species recorded (Common Tern, Great Northern Diver, Little Egret, Red-throated Diver and Sandwich Tern) are listed in Annex I of the EU Birds Directive. An additional thirteen species of mainly terrestrial birds were recorded within the existing harbour park close to the site of the proposed development.

7.3 IMPACTS

7.3.1 Impacts on Designated Natura 2000 Sites

Impacts to habitats, flora and fauna can arise from:

- loss of terrestrial and marine habitats due to the reclamation and dredging work
- physical damage to species from noise and vibration from underwater activities of dredging, rock blasting and pile driving
- physical damage to species *e.g.* seals from vessels' propellers
- siltation of sea bed by release of suspended solids into the sea
- alteration to current directions and possible shift in erosion and deposition sites
- release of cement, sewage, grey water or oil during construction stage
- sediment suspension due to propeller wash
- alteration to salinity levels at the mouth of the Corrib and in Lough Atalia and Renmore Lough
- introduction of non-native species from commercial and/or pleasure craft.

The permanent loss of 26.93 ha of cSAC and SPA and the associated loss of feeding and foraging area to seals, otters, some bird species, lamprey and salmon which are listed as Qualifying Interests for the cSAC and SPA is regarded as a significant negative impact on the conservation objectives for both Natura 2000 sites.

While there is potential for minor short term disturbance impacts on fish, birds and aquatic mammals during the construction phase, best practice and specific mitigation measures will avoid permanent significant negative impacts on migratory fish, seals and birds.

There is potential for some injury or disturbance to Atlantic salmon, sea lamprey, Common seal, otter and small cetaceans during construction but this will be mitigated by the timing of the works and by precautionary monitoring before and during works.

Modelling exercises carried out indicate that while there will be changes in current velocities and directions, these changes are considered to be insignificant. Salinity levels on the Renmore side of the harbour extension will increase, leading to a positive impact on species. Although salinity levels in Lough Atalia and Renmore Lagoon will decrease marginally, this will not impact the species of plant and animal that occur there. This is because these species have evolved to live under highly variable salinity conditions. Short term impacts in suspended solids loading will be localised around the dredgers and will be lower than naturally occurring disturbed sea levels.

The impact of the development will only affect an area in the immediate vicinity of the new structure, an area that is already significantly impacted. The designated habitats within the marine footprint of the development correspond to only ca. 0.3% of the overall cSAC and would not be considered of high quality relative to other areas within the cSAC site boundary.
With regard to the Inner Galway Bay SPA, no significant impacts are anticipated on bird species that are Special Conservation Interests for this SPA. In particular, no impacts are predicted on nearby nesting colonies of Cormorant and Common Tern.

There is some potential for disturbance to Atlantic Salmon and Sea Lamprey migrating past the site to the Lough Corrib cSAC but this will be mitigated by prohibiting working in water during April – July i.e. no drilling, blasting, pile driving or dredging in those months.

7.4 MITIGATION MEASURES

The project design includes for various mitigation measures as follows:-

- habitat creation in rock walls
- restricting underwater construction works during months April to July.
- provision of walled-in lagoons with filter blankets to capture dredging sediments
- adoption of good construction practice including maximising use of precasting to minimise risk from cement spillages
- Implementation of Oil Spill Contingency Plan and Environmental Management Plan to control potential for release of oil or other products.

Despite the mitigation as outlined above, permanent loss of habitat within the cSAC and SPA will arise, which is considered a significant negative impact on the conservation objectives for both Natura 2000 sites.

8 WATER

8.1 INTRODUCTION

The aquatic section of the EIS describes the existing marine water environment in respect to water quality and hydrodynamics, it quantifies the potential operational and constructional impacts to this environment from the proposed development, it develops appropriate mitigation measures to prevent or reduce impact and quantifies post mitigation, any residual, cumulative or in combination impacts.

The hydrodynamic assessment examined tidal and fluvial flow regime, tidal storm surges, wave climate and flood risk assessment. The water quality assessment examined general water quality, sedimentation and salinity changes. Mathematical modelling techniques comprising hydrodynamic, pollutant transport and dispersion, sediment transport and wave climate models were used to quantify and predict potential impact and to develop appropriate mitigation and assess residual impacts. Survey information regarding tidal heights and velocities, bathymetric survey, sediment characteristics and wave climate were carried out to support and develop these models.

The proposed harbour extension development will involve encroachment into Galway Bay immediately to the east and south of the mouth to the existing Galway Harbour resulting in the reclamation from the sea of approx. 27 ha of land and also the dredging of approach channels, berths and turning circle and construction of harbour walls and breakwaters. Such an encroachment of the marine environment has the potential to alter the tidal circulation, morphology of the sea bed and the wave climate with potential impacts on turbidity and general water quality, salinity distribution, sedimentology, wave environment and flood risk.

The TELEMAC package was the software of choice for modelling the complicated hydrodynamics of the Galway Bay area and particularly the varying refinement of the computation required (*i.e.* inner harbour and proposed extension area requiring high resolution and the open sea requiring less resolution). TELEMAC is a software system designed to study environmental processes in free surface transient flows. It is therefore applicable to seas and coastal domains, estuaries, rivers and lakes. Its main fields of application are in hydrodynamics, water quality, sedimentology and water waves. A three-dimensional hydrodynamic model was developed to firstly examine the potential impact to turbidity levels, salinity and hydrodynamics.

8.2 HYDRODYNAMICS

The hydrodynamic modelling predicts a deflection to the west of the flood and ebb flows of both tidal and freshwater stratified surface flow to and from the Corrib estuary. These deflected flows follow the new north-south orientated Galway Docks dredge channel and Marina Breakwater. The impact on flow velocities and water depths upstream of Nimmo's pier, in the approaches to the existing Dock Gates, Claddagh Basin and entrance to Lough Atalia is shown to be negligible under the full range ot tidal and freshwater flows. Immediately to the east of the Harbour Extension in the Ballyloughaun and Renmore area a shelter effect with reduced hydrodynamic environment is predicted. Slight increases in flow velocity are predicted past the head of the proposed Harbour southern beakwater between Hare Island and the development. Hydrodynamic modelling indicates that the overall impact on tidal circulation within the Inner Galway Bay area will be negligible.

8.2.1 Sedimentology

The implications of the development on sedimentation are shown to be minor in respect of impacts from erosion and deposition. The main changes in shear stresses were found to occur along the proposed new dredge channel to Galway Docks and past the head of the southern breakwater. These changes will be beneficial in respect to maintaining the dredged channel and reducing the deposition of silt within the channel. The results show that the proposed development produces shear stresses during spring tides sufficient to erode silt and fine sands in these areas. This is considered desirable in respect to maintaining the dredge channels. The simulation shows no erosive impact elsewhere.

The neap tides are sufficiently slack not to result in erosive shear stresses outside of the

Corrib estuary for both proposed and existing cases and therefore no erosive impact is predicted under Neap tide conditions.

Under River Corrib flood conditions, the proposed development restricts the area of the erosive flow to the proposed dredged channel immediately to its west. This is considered beneficial in respect to reducing the dredging maintenance requirement which is currently not very excessive (500 mm depth removed at approximately a 10-year interval). Similar shear stresses sufficient to erode fine sand are generated in the vicinity of the southern breakwater head. This is also considered beneficial as this is the location of proposed dredge channel to the New commercial Port. No significant impacts are predicted elsewhere.

The overall conclusion is that the proposed harbour extension configuration confines the high flows and critical bed shear to the approach channels and will not result in any erosive impact elsewhere over the existing situation. This will reduce deposition in the new approach channel to Galway Docks while avoiding scour elsewhere.

The upstream characteristics of the River Corrib, with its very large lake (Lough Corrib) for settlement, results in the sediment content comprising primarily of the finer silt and sand fractions (even under flood conditions). Simulation of the fine sediment from the River Corrib showed the proposed development pushing the river and suspended sediment plume southwards out to sea past Mutton Island on the ebbing tide and away from the Renmore area only returning in a much more dilute plume on the flooding tide. The simulation results indicate a reduction generally of between 40 and 60% in fine sediment load east of the proposed development.

The impact of capital and maintenance dredging activity by a trailing suction hopper dredger or back hoe dredger on suspended solids and sediment deposition was assessed using a three dimensional sediment plume model. The modelling showed the sediment deposition to be generally localised close to the dredging location. The simulations demonstrated that the suspended sediment concentrations are only significantly elevated above background in the vicinity of the dredging point with the plume enjoying reasonable dispersal thereafter. The suspended solids concentrations of less than 1 mg/l above ambient that may enter Lough Atalia are extremely low compared to naturally occurring background levels and will have no effect on the functioning of this lagoonal ecosystem. Under larger river flows, the sediment plume will have greater dispersal out to sea resulting in lower sediment plume concentrations within the study area. The critical hydrodynamic conditions for sediment entering Lough Atalia are Spring tides and low Corrib Flow conditions.

Mitigation to protect Lough Atalia will involve confining dredging activities to the outgoing ebbing flow for the channel to the Docks and Marina. No mitigation measures will be required for the main commercial harbour approach channel, turning circle and berths as the suspended sediment disperses quickly due to the large depths and the dredging methods proposed. Monitoring at the entrance to the Lough Atalia channel will be undertaken during capital and maintenance dredging to ensure that dredging during ebbing flow is controlled and ceases sufficiently in time before rising flow discharges into Lough Atalia.

The potential impact of suspended solid concentrations from the proposed dredging activity will, except immediately local to the dredger, achieve salmonid water standards for suspended solids.

8.3 SALINITY

8.3.1 Salinity at the extension site

The tide simulations for various freshwater inflows from the Corrib show the deflection of the Corrib freshwater plume westward due to the proposed harbour extension with that freshwater only arriving into Renmore Bay and Ballyloughan area on the subsequent flooding tide. In the undeveloped existing case there is a wider area for the freshwater plume to disperse with no physical structure to prevent the plume migrating east and southeast on the ebbing tide. That allows it to avail of a greater area for dispersion. With the proposed development, the Corrib plume is directed more southwards with reduced opportunity for the freshwater plume to directly disperse into the Renmore Bay area on the returning flood tide. The modelling demonstrates significant increases in salinity to the east of development with greatest changes occurring to the northeast of the proposed harbour extension

showing an average rise in salinity of 2.4 to 5.4ppt. This area will receive less freshwater, it will also receive less suspended sediments and debris that are carried by the River Corrib. These changes will bring about improved bathing water conditions at Renmore Beach and at Ballyloughan. These increases in salinity may bring about a change in benthic fauna whereby lower salinity-intolerant species such as echinoderms may colonise the muddy sands/sands in this area.

Changes in salinities levels (reduction in salinity) are predicted to take place to the west of the structure and very minor changes predicted for Lough Atalia and the waters beyond Mutton Island. In the approaches to Galway Docks, south of Nimmo's Pier reduction in average salinity concentrations of 1.5 to 2ppt are predicted.

8.3.2 Salinity in Lough Atalia & Renmore Lough

Lough Atalia and Renmore Lough fall under the definition of "coastal lagoons" [1150] under the EU Habitats Directive and are categorised as a priority habitat, described as being in danger of disappearing and therefore requiring protection. However conservation objectives recently published by NPWS describe the conservation status of Lough Atalia and Renmore Lough as of no conservation value as coastal lagoons.

The modelled impact of the Harbour Extension Development on salinity concentrations within Lough Atalia will be to reduce salinities on average by 1.29ppt over the complete range of flow and tide conditions. Given the existing relative range of salinities within the Lough from *ca* 30ppt to nil ppt, this reduction of 1.29ppt in salinity, which is only 10% of the mean salinity, is not considered significant. The model analysis also demonstrates that the range of salinities (maximum to minimum) within Lough Atalia will not alter as a result of the harbour extension; only the frequency of occurrence will change.

Periodic large and extreme flood flows in the Corrib will reduce salinities to practically nil in Lough Atalia for both the existing and proposed cases, principally during neap tides but also on spring tides for a less frequent more extreme flood flow. Over the full tidal range the probability of nil Salinity in a given year occurring within Lough Atalia will increase from 0.08% to 0.21% (7 to 18hours in an average year).

The overall impact on salinity within Renmore Lough by the proposed Harbour extension will be to decrease the median salinity within the Lough by 1.22ppt. The overall water balance and inflows to and from Renmore Lough will not be affected by the proposed development as the tidal elevations in Lough Atalia will not be altered by the development and thus the inflow rates to Renmore Lough will remain unchanged.

8.4 OUTFALL DISPERSION SIMULATIONS

8.4.1 Introduction

The potential impact on transport and dispersion of the Existing Mutton Island outfall and the proposed Galway East outfalls was examined using the TELEMAC2D Hydrodynamic model for the existing and proposed development cases.

The Mutton Island outfall and the proposed Galway East outfall were specified.

8.4.2 Discussion

The modelling concluded that the Galway East proposed outfall location will not be impacted by the proposed port development.

The outfall dispersion results for the existing Mutton Island outfall show some variation in the plume characteristics to the east of Mutton Island. The overall impact is considered to be local and minor, and importantly the simulations show no impact along the Salthill/Silverstrand, South Park and Renmore shoreline areas or upstream at the existing Galway Harbour where amenity and bathing standards are important. There are no perceptible impacts to bathing waters of Silver Strand, Barna and Furbo and no impact to the designated shellfishery waters located in the south inner Galway Bay area.

8.5 IN COMBINATION EFFECT OF THE MUTTON ISLAND CAUSEWAY ON HYDRODYNAMICS AND SALINITIES

In order to assess the cumulative impact of the proposed harbour extension development on the hydrodynamics of Inner Galway Bay, an understanding of the hydrodynamics of Galway Bay prior to recent major developments is required. The most significant recent change to the coastline of the Galway City is the Mutton Island causeway which was completed in 2002.

The causeway is shown to essentially partition the shallow shoreline area to the west of the causeway (Grattan Road and Whitestrand Beach area) from the estuarine waters of the Corrib estuary to the east. The effect of this is to increase salinity along the shoreline to the west of the causeway. The impact of the causeway on velocities, tide levels at the entrance to the docks and Lough Atalia and more remote at Renmore is shown to be negligible.

The combined effect of the causeway and the proposed harbour extension will be to concentrate the plume of Corrib freshwater flow southwards between the proposed harbour and the causeway and thereby reduce salinities within the new approach channel to the docks area and increase salinities along the shoreline to the east of the new harbour towards Renmore Beach.

8.6 WAVE CLIMATE

A detailed wave climate analysis was carried out to examine the exposure of the site and proposed development and assist in designing the required breakwater protection for the Commercial Port and proposed marina. A model of the existing environment shows the principal area of exposure is from offshore waves propagating inshore from west to southwest directions, diffracting around Mutton Island and impacting on the southern breakwater. These wave heights have been used to design the new port wave walls.

Modelling work on wave propagation within the greater Bay area shows that the maximum value of the significant wave height that reaches inner Galway Bay, just to the southwest of Mutton island was found to be slightly less than 4 m (3.77 m on Southwest and 3.3 m for a west southwest wind and offshore condition). For westerly winds the significant wave height at this location is 2.9 m. Southerly and north-westerly offshore waves have very limited effect on the Inner Galway Bay area. It is clear that the Aran Islands and the reducing sea depth east of the islands provide crucial protection to the Inner Galway Bay area. This is primarily due to the position of the Aran Islands at the entrance to Galway Bay which act as a very effective breakwater for deepwater waves entering Galway Bay.

The modelling was also run for storm waves generated by local fetch from the east, southeast and south sectors respectively. These runs were specifically aimed at assessing the potential impact on the local wave climate on the Claddagh Basin, Corrib Estuary, existing Harbour, Lough Atalia and South Park shore and the protection afforded by the proposed breakwaters in respect to conditions within the mooring areas of the Commercial Harbour and Fisherman's pier and within the proposed marina area and any other operational areas. The southerly and southwesterly sector was considered the critical direction for storm waves acting on the proposed Harbour and on the South Park shoreline area (inside the Mutton Island Causeway) on the mouth of the Corrib Estuary and on the existing docks entrance adjacent to Nimmo's Pier.

The breakwater protection is not designed to protect the commercial harbour against storm waves propagating locally from the east and southeast with model results predicting 0.25 to 0.8 m waves within the commercial harbour for the easterly design storm waves, being afforded protection by Hare Island. The simulations for the south to west sectors show the breakwaters protecting well the harbour and marina areas against wave climate.

The breakwater protection varies in height depending on the location and exposure to wave climate with the southerly breakwater having a crest elevation of 9.1 to 10.1 m O.D. which provides 4.45 to 5.45 m above the design tide level (4.635 m O.D.) for wave climate and wave run-up effects. This level of protection will minimise the risk of overtopping of the breakwater structure by extreme waves. The westerly breakwater located in the more

sheltered waters has a top elevation 6.35 to 6.65 m O.D. which based on wave climate analysis will protect this area from overtopping by the extreme waves predicted for these locations.

A simulation was also carried out assuming the Mutton Island causeway to be completely submerged by 200-year Tide with Sea level Rise (4.635 m O.D. Malin). It would then be covered by over 1m of water depth. A westerly deepwater design wave of 4 m significant wave height was applied to the model. The simulation shows that the Mutton Island Causeway would under these submerged conditions break the storm waves and dissipate much of its energy and thus provide protection to the westerly face of the proposed development even under submerged conditions.

The wave climate simulations show that the proposed harbour development impacts the local wave climate environment through a combination of sheltering via dissipation and reflection off its breakwaters and diffraction and refraction of the wave field around the development over the dredged channels. The development generally shelters the eastern section of the adjacent Renmore shoreline against storms from the south to southwesterly sector. It protects the Galway Docks entrance and much of the Southpark shoreline against south easterly and easterly storms. The simulations show, under south and south westerly storms, increased wave activity along the south face of Nimmo's Pier and the entrance to Galway Docks and the Corrib channel. These are not the most significant waves which presently occur at this location and these waves are directed across the Corrib channel as opposed to running up along it.

The wave simulations show that this increased wave activity at Nimmo's pier entrance does not appreciably impact wave heights within the inner Claddagh Basin area and such impacts are less than those which presently arise from the southeast direction which will now be blocked by the proposed development.

8.7 FLOOD RISK

The critical flood level for the harbour and surrounding areas is produced by a tidal storm surge event of 4.146 m O.D. Malin (200year tide) plus a climate change allowance (sea level rise) of 0.5m over the next 100 years giving a flood design level of 4.635 m. Such an event would inundate a large portion of the city centre.

The proposed development site is located within the High Flood Risk Zone (*i.e.* Zone A of the Planning Guidelines). Flood Zone A is the high flood risk zone and represents lands that are below the 100year fluvial Flood level or the 200-year tidal or combined (tidal and fluvial) flood level. The Flood Risk Assessment shows the critical condition for the harbour is the 200-year tidal storm surge event. The proposed development [a Commercial Harbour and Marina with associated dockside activities] is classified as a *"water compatible development"* and recognised as appropriate development for Flood Zone A in the Flood Risk Management Planning Guidelines (Nov 2009).

The quay height and operational ground level are set at 4.7 m O.D. Malin which is above the design flood level of 4.635 m O.D. and therefore considered safe from inundation from storm surge tides. The minimum finish floor level for all buildings on the port site is to be 5.5 m O.D. which is well above the design flood level providing a freeboard of 850 mm and thus not considered at risk of flooding from tidal/combined fluvial flood inundation.

The proposed port development has been shown not to impact on flood risk for the adjoining areas. It has no impact on peak combined tide and river levels within the Claddagh Basin, Spanish Arch and Galway Docks area upstream of Nimmo's Pier. The development does not adversely impact on wave climate and tidal hydrodynamics in respect to flooding and flood risk. The harbour development generally shelters the shoreline areas along South Park, Nimmo's Pier, the existing docks and the Renmore shoreline area against local and offshore generated waves.

In conclusion, the Flood Risk Assessment shows that the proposed development is appropriate development for Flood Zone A. It also concludes that the development will not increase flood risk to adjacent lands and developments as a result of any changes to sea levels, wave climate and river flows.

9 AIR QUALITY

9.1 INTRODUCTION

The impact of the proposed development on air quality including airborne pollutants and dust emissions during Construction and in the Operational Phase has been examined.

9.2 EXISTING ENVIRONMENT

Ambient dust and particulate levels in Galway City and dust and odour monitoring carried out at the existing Galway Harbour Enterprise Park have been established. Galway City has historically had good air quality due to the low level of industrial activity close to the City and to the prevailing wind direction. Dust deposition levels in the vicinity of the site have been measured since 2005 and are consistently within acceptable limits. Air quality tests for Sulphur Dioxide and Nitrogen Dioxide indicated that the levels of these pollutants are within air quality standard limits. Results of odour monitoring surveys carried out from 2005 indicate that there are no significant odour problems arising from the Harbour / Enterprise Park area.

9.3 POTENTIAL IMPACTS

The project has the potential to generate both dust/particulate and odours during the construction phase and air emissions from vessels in port during the operational phase.
The dredging activity is likely to generate a certain level of odour, primarily from hydrogen sulphide [H_2S] and methane [CH_4]. Odours from dredging will be localised and confined to dredging of the top layers of material.

Normal construction dust emissions will arise during construction including dust from haul routes and dust raised from dredged material drying out.

Construction emissions likely to arise during construction have been modelled. The models indicate that such emissions will be within acceptable levels. Dust and odour emissions will nonetheless be subject to measurement and control during the construction phase.

The operation of the harbour requires the operation of an environmental management system and this requirement is increased in a sensitive area such as a cSAC and SPA. Existing codes of conduct and safety procedures will be incorporated into the Harbour's environmental management system including certification of the environmental management system to International standards such as ISO 1400.

Operational and accidental spills and releases of dusts during the handling of dry bulk cargo (for example coal or limestone) may cause a temporary local deterioration in air quality. Operational procedures to contain and remediate such spillages are in place. The levels of dry-bulk cargo dusts or odours likely to arise will have no environmental impact.

Accidental release of hazardous substances during the handling of cargoes, such as oil, pesticides or industrial chemicals, may cause the pollution or contamination of marine habitats and disturbance or damage to marine communities. The impacts depend on the types of quantities of dusts entering the marine environment. The levels of dry-bulk cargo dusts generated will have no environmental impact, with the possible exception of high levels of organic dusts, which may cause the localised removal of oxygen from the water.

Air emissions from port activity are modelled and compared against equivalent emissions that would arise under alternative modes of freight transport.

9.4 MITIGATION MEASURES

Mitigation measures during the Construction phase are set out as follows:

- use of a wheel wash facility,
- discharge of dredged material underwater or onto wetted surface,
- dust monitoring stations at a minimum of 4 locations on the site perimeter and
- a dust management and odour management plan for the duration of the construction period.

During the operational phase of the Galway Harbour Extension best practice will be employed in all unloading operations, with all operators undergoing training on spillage reduction measures and emergency spill contaminant and clean up measures.

9.5 AIR QUALITY CONCLUSION

Air quality in the Galway Harbour area is generally good and remains 'Good' air quality status. The use of larger vessels and 24 hour access to port facilities will combine to reduce air quality emissions for every Tonne of material transported through the port. Shipping is a lower air polluter than its alternatives.

Air Pollutant levels are within European Air Quality limits and will remain so during both construction and operation phases.

There will be no significant air quality impact resulting from the project.

10 NOISE AND VIBRATION

10.1 INTRODUCTION

The potential noise and vibration impacts of the proposed development during Construction and in the Operational Phase has considered both airborne and underwater noise emissions that may arise due to the proposed development.

There are significant differences between airborne noise and underwater noise measurement scales. Noise is measured in decibels but in order to avoid confusion, it is important to remember that decibel levels in air are significantly lower than 'equivalent' noise levels underwater.

Relevant airborne noise level standards are considered in both the construction and operation phases. For the construction phase, noise levels at any noise sensitive location will conform to the National Roads Authority Guidelines for construction noise. The Environmental Noise Directive does not set limits on transport infrastructure pending recommendations from Member States. In the interim the Environmental Protection Agency guideline levels will be applied.

The impact of underwater noise on marine fauna is assessed, including an outline of the possible impacts on fish, marine mammals such as seals, porpoises, dolphins and otters in addition to diving birds. Porpoises and dolphins use sound to locate food and if their hearing was to be effected it could have potentially serious consequences. Seals, otters and fish all use sound to detect the sound of prey and noise can deter these animals from using foraging or breeding areas, which could also impact on them.

10.2 EXISTING ENVIRONMENT

Airborne noise levels in the harbour area have been reported since 2005. Additional noise surveys were carried out in 2004, 2007, 2011 and 2013. Noise levels near the existing Docks area can be regarded as being relatively noisy, being typical urban values, with shipping noise contributing to these levels, depending on activity.

Noise in the existing docks area is dominated by traffic noise during the day and early evening. At night however, traffic levels die down and port related activity begins to dominate the then reduced noise climate. Port related noise comprises ship manoeuvring and cargo unloading which can be on a 24 hr. basis due to the tidal nature of the existing harbour. Noise levels at noise sensitive locations have been measured over a number of years and have been used in the noise prediction modelling for the proposed development.

Underwater noise levels in Galway Bay are relatively low, with peaks occurring related to vessel traffic. Weather also plays an important part in underwater noise levels, as in shallow water, wave action generates a significant level of noise in its own right.

Underwater noise criteria are discussed below including an explanation on underwater noise behaviour. Underwater noise in shallow water, as is the case in Galway Bay, does not spread efficiently, due to the soft sediment bottom. A series of underwater noise propagation tests were carried out in Galway Bay. The results indicate a rapid drop in noise levels at short distances from the source.

10.3 POTENTIAL IMPACTS

The proposed development will give rise to airborne noise, primarily affecting humans and underwater noise affecting fish and marine mammals. Vibrations could arise from two sources, underwater blasting and construction equipment. Noise and vibration impacts are assessed for both the construction stage and operational stage.

The airborne noise levels associated with the project will be highest during the construction phase.

Construction airborne noise levels are assessed for each of the principal construction activities. These activities include pile driving, dredging and material placement. An airborne noise model was constructed and was used to create a series of noise impact maps.

Operational airborne noise will arise due to road traffic, rail traffic and shipping using the port. These noise sources were also modelled.

The level of impact of noise on marine animals differs depending on the type and intensity of the noise and the sensitivity of that species to noise. The level of impact of underwater noise on marine animals has been broken down into three categories depending on impact: noise capable of causing permanent injury, noise capable of causing temporary recoverable injury and noise capable of causing disturbance.

An underwater noise model was created using data on the various construction and operational activities. The noise model is conservative as the spreading loss used in the model was considerably less than that measured during the noise propagation tests.

The underwater noise propagation model result is a series of plots of noise level against distance from the source for each category of marine animal. These plots are used to create a series of maps, for each stage of construction and operation, which clearly indicate the zones in which different levels of impact may occur.

Airborne Noise

During lagoon construction, the principal activity will be the transport and placement of material, including rock armour. While noise levels on the site can vary depending on where the clusters of machinery are working, the received noise levels at any of the noise sensitive locations will be below daytime background levels so the potential impact will be negligible. Impacts from suction dredging even at night are negligible, while night time back hoe dredging noise at Frenchville and Mellows Park is classed as moderate. Noise impact from pile driving activity, particularly at night would be major. Road traffic noise during construction stage has little impact except at the Radisson Hotel where the change can be considered moderate.

The proposed rail link has some potential for noise generation from slow moving freight traffic which has been modelled with and without a noise abatement barrier.

During the operational phase there will be negligible impact at Frenchville and Mellows Park during the day and at night. The impact from the helipad will be minor and short term.

Underwater Noise

The principal underwater noise generating elements of the construction are dredging works, quay wall construction including pile driving and underwater blasting noise. International research has set down guidance on the establishment of exclusion zones to ensure the protection of sensitive species of fish and marine mammals from underwater noise. The underwater noise impact maps illustrate the appropriate exclusion zones for each activity.

Vibration

The development has potential to cause vibration from underwater blasting, pile driving and construction equipment. The potential levels from construction equipment will be low and will be in close proximity to the equipment while that from pile driving will be localised and confined within the site. Restrictions on permitted peak particle velocity, having regard to frequency of blasting, will ensure the protection of sensitive structures.

10.4 MITIGATION MEASURES

A marine mammal watch plan, including the provision of Marine Mammal Observers will be established to ensure that an appropriate exclusion/clearance zone is established prior to any blasting. A test programme to determine the most suitable blasting procedures will be established at the outset and blasting will be confined to daylight hours, a sea state of 0 to 3 and where possible at low tide conditions. Noise levels both airborne and underwater will be monitored and blasting operations will be modified as required.

Blasting or pile driving will not be permitted at night time 23:00 hrs to 07:00 hours.

Blasting and pile driving will not be permitted during the months of April to July, inclusive.

The impact on fish migrating to and from Lough Corrib will be adequately mitigated, by the avoidance of work in water during April to July.

A low height noise barrier on the rail embankment will reduce wheel noise on the turning section of the rail track, in particular at Mellows Park.

10.5 NOISE AND VIBRATION CONCLUSION

Airborne noise levels in the existing Docks area due to shipping will reduce.

There will be some short term minor impacts during construction as airborne noise during the operational phase of the project will be negligible. There will be no significant environmental impacts due to airborne noise as a result of the proposed development.

Underwater noise levels during construction have the potential to disturb sensitive marine species. Activities giving rise to high underwater noise levels will not take place during the fish migration season to minimise any potential impacts. When being carried out, exclusion zones will operate to protect sensitive species.

With appropriate mitigation there will be no significant environmental impacts due to underwater noise during either the construction or operation phases of this project.

There will be no significant environmental impacts due to vibration.

11 CLIMATIC FACTORS

11.1 INTRODUCTION

While the proposed development is not of a scale to impact global climate, the impact of changes in CO_2 (Carbon Dioxide) and CH_4 Methane emissions associated with the construction and operational phases needs to be considered.

11.2 EXISTING ENVIRONMENT

Data obtained from the Irish Meteorological Service and from NUI Galway over a thirty year period have established average figures as follows:-

Air temperature	10.1°C
Sunshine Hours	1,272 hrs.
Rainfall	1,168 mm
Windspeed	9.8 m/sec

11.3 POTENTIAL IMPACTS

While the use of concrete aggregates and steel materials will result in significant “embedded” greenhouse gas emissions, the design of the development, including the passive re-use of all of the dredged materials and the use of rock breakwaters minimizes the use of the high embedded energy materials.

The quantity of machinery proposed is of a modest scale for an infrastructural development such as this and the equipment itself are subject to several EU Directives on fuel usage and emissions. H_2S and CH_4 are released naturally from sediments with only a small fraction to be expected from disturbance during dredging.

During the operational phase and when aligned with having a regional port with 24 hour marine access and both rail and road links to the region, the overall proposal will significantly reduce CO_2 emissions from current levels.

The design, scale and location of the development is an opportunity to create a significantly positive microclimate for over water flora and fauna close to the city, facilitated by the landscaping and amenity features.

11.4 MITIGATION MEASURES

The project has been carefully designed to minimize the importation of materials and maximise the use of dredged materials within the site boundary.

The Galway Harbour Extension location and facilities will permit the more efficient and greater use of coastal shipping with consequent reductions in carbon footprint of the goods and materials involved.

11.5 CLIMATE CONCLUSION

There will be no significant climate impacts due to this project.

12 LANDSCAPE AND VISUAL

12.1 INTRODUCTION

This section assesses the existing environment, examines and evaluates the implications of the proposed scheme in terms of subsequent landscape character and visual alterations to the local environs. The study area includes the lands around the proposed site which include the entirety of the visual envelope for the proposed scheme.

12.2 EXISTING ENVIRONMENT

The proposed development site is a reclaimed man made peninsula immediately south of the Galway Harbour Enterprise Park and general Galway Harbour Area. This area is generally maritime and industrial in character. It is adjacent to the railway embankment to the north and in close proximity to Galway City Centre to the north west. The general area is defined by water, forming part of the seashore of Galway Bay and adjacent to the mouth of the River Corrib, Lough Atalia channel and existing harbour Dock basin. The nearest land boundaries to the west consist of South Park and to the east, Renmore beach and Renmore Barrack lands. The site is located in a relatively open landscape and seascape forming part of the general foreshore edge to the city. Its open nature is characterised by its extensive coastal sea element and the expanse of green space to both sides of the site extending from Mutton Island causeway to the west and the railway line to the east with the built structure of the City centre to its north. Features of the visual composition around the proposed site is the established significant industrial block element of the existing Enterprise Park and the general absence of vegetation cover in the coastal western environs in contrast to the existence of vegetation cover in the coastal eastern environs.

The development also includes work to Lough Atalia Road rail underbridge to improve access for modern high sided vehicles and to address safety issues there.

12.3 POTENTIAL IMPACTS

The proposed port development consists of a reclaimed peninsula protruding from the existing Enterprise Park out into the bay waters to provide fixed infrastructural elements such as quay piers, buildings, storage areas, roads and rail link to cater for the variable operational elements of ships, boats, cargo, cranes, trucks and freight train. The proposal is located in an open land and seascape of a maritime and industrial nature.

Five distinct landscape character areas were identified within the study area of which the proposed development will have a permanent, slightly negative impact on three areas:

- the Harbour industrial maritime landscape,
- the Urban waterfront landscape and
- the Coastal foreshore with undulating residential landscape.

The open nature of the environment makes the site visible from viewpoints around the site, in particular its western and eastern environs. The main visual impact will be caused by the linear horizontal reclamation and particular elements such as ships, cargo and crane.

The day time impacts vary from neutral to moderately negative and night time impacts from neutral to slightly negative within the study area. Views form particular receptors (South Park, Long Walk area, Mellows Park and Renmore/Murrough) will be impacted in a moderately negative way.

12.4 MITIGATION MEASURES

The nature of the proposed development provides limited scope for visual mitigation. Mitigation measures such as the implementation of screening planting, light spill reduction and colour recommendations are proposed. For particular receptors such as the South Park, river estuary area, Mellows Park and Renmore/Murrough the impact will be reduced but will remain slightly negative. For a limited number of visual receptors the mitigation measures will result in a reduction of impact from slightly negative to neutral.

In summary, the range of mitigated visual impacts vary from neutral to slightly negative. Consequently, all of the changes to the views as impacted by the proposal, can be absorbed and will not be detrimental or jeopardize the experience or enjoyment of the impacted landscape or views.

13 MATERIAL ASSETS

13.1 ARCHITECTURAL / CULTURAL

13.1.1 Introduction

The impact study under this heading assesses and evaluates the physical and cultural impact of the Galway Harbour Extension on the City and its environment.

13.1.2 Existing Environment

Galway is a city with a very definite sense of place and a strong cultural image. It is a city defined by both its unique natural and built heritage characterised by its medieval core and inner city straddling the mouth of the River Corrib as it enters Galway Bay. Its setting and myriad of water bodies from sea to lakes, river to canals is the dominant informant of “place”. Galway’s high quality of life factor derives from this fusion of natural and urban landscape combined with its social and cultural attractions and the diverse range of services, amenities and facilities it offers. It is against this backdrop that the impact of the Galway Harbour Extension is studied. Given the scale of the project, the impact is not just concerned with the immediate environment around the proposed site but encapsulates the whole city and beyond in order to provide an overall and comprehensive study of its impact.

13.1.3 Potential Impacts

The impact study concludes that the Galway Harbour Extension will not impact negatively on the city’s strong cultural image or its associated historical and social landscape. The impact study finds that the Galway Harbour Extension will result in the gradual rebranding of the city and will not adversely affect its prime image and one of its main economic sectors – tourism. Finally the study shows the physical impact of the Galway Harbour Extension varying from neutral to positive on Galway’s urban waterfront.

13.1.4 Mitigation Measures

The proposed harbour development has been significantly changed and reduced in scale from earlier design proposals over the past six years. These measures have helped to reduce the scale of the design in what is a sensitive and prominent seascape and have assisted in assimilating the Harbour into the city’s cultural and built heritage.

The proposed relocation of the majority of the existing harbour operations and activities to the Galway Harbour Extension will result in a cultural loss to the existing harbour, general environs, city centre and city in general. However the loss is insignificant in comparison to the potential loss of the overall shipping industry to Galway, which the relocated harbour is designed to prevent.

13.2 ARCHAEOLOGY

13.2.1 Introduction

The archaeological review employed a range of methodologies to assess the potential impact of the proposed development including research study, field walking, geophysical and dive survey and a review of documentary sources, particularly related to maritime archaeology.

13.2.2 Existing Environment

The study area is encompassed within an extremely rich, diverse archaeological area, terrestrial and underwater. Geophysically the proposed development site abuts the south-

easternmost limits of Galway city in the littoral zone.

The vast majority of the site for the Galway Harbour Extension is currently covered by the sea and consequently the study focussed mainly on the maritime archaeology.

A geophysical survey of the sea bed area did not discover any definitive archaeological shipwrecks, features or artefacts. A number of anomalies identified in that survey were subsequently examined in a follow up dive truthing survey but no archaeological features or artefacts were discovered.

13.2.3 Potential Impacts

While the geophysical and dive surveys did not encounter any artefacts it is possible that coherent wreck sections of known recorded or unknown potential components, artefacts or cargoes of vessels may be contained within the underlying seabed sediments and would, if present, be directly impacted upon by the dredging works.

Impacts from carriageway reconstruction / realignment adjacent to Forthill cemetery and from the lowering of the roadway and footpath at Lough Atalia Road Bridge are deemed to be imperceptible from an archaeological view point.

13.2.4 Mitigation Measures

All groundwork related to roadworks adjacent to Forthill Cemetry and Lough Atalia Road Bridge will be archaeologically monitored under licence. All underwater dredging work and material re-located from lagoons will be archaeologically monitored by experienced maritime licensed archaeologists.

In the event that a dredger encounters any archaeological artefacts the work will be suspended temporarily at that location and the dredger moved to a new position.

13.3 RAIL

13.3.1 Introduction

An analysis has been undertaken of the existing infrastructure and rail lines and it has been shown that a new rail link can be readily formed by way of sloped embankment from the existing line into the Galway Harbour Extension land area and on to the level at the quayside. In order to future proof the Galway Harbour Extension this rail link from the existing and adjacent Galway to Dublin Rail line has been included as early as possible in the scheme.

13.3.2 Existing Environment

The existing Galway to Dublin rail line runs adjacent to the existing GHEP and is therefore immediately accessible to the Galway Harbour Extension Development.

13.3.3 Potential Impacts

There is potential for additional freight trains into the Galway Harbour Extension, possibly running at night and this will have a noise impact, which has been modelled. When Port freight becomes rail viable there will be a positive impact in taking HGV's from the road onto the rail network thus reducing CO2 emissions.

13.3.4 Mitigation Measures

The embankments and curvature design has been carried out to reduce any impacts on the surrounding areas and increase the possibility for viable freight tonnage entering and exiting the Port.

13.4 ROAD TRAFFIC & INFRASTRUCTURE

13.4.1 Introduction

An analysis of the expected volumes of traffic that will be generated by the proposed development and other major developments, both with planning permission or in an advanced stage of planning, has been carried out to assess the impact on the operational capacity of the road network in the vicinity of the development and in the wider City road network.

13.4.2 Existing Environment

Extensive discussions have been held with Galway City Council on the traffic implications of the proposed development over a number of years. As part of its on-going management of traffic in the City, a 2011 "SATURN" traffic model was developed for the City Council by its Consultants MVA Consultancy and this model has been used in the analysis of traffic flows for this project.

The analyses taken account of recent and proposed works to upgrade the roundabouts along the N6 corridor to traffic signals, and account of the recent upgrade to the Seamus Quirke Road / Bishop O'Donnell Road and installation of an Urban Traffic Management Control System.

In addition the analysis includes for the traffic flows that would be generated from new developments such as the Ceannt Station Quarter Redevelopment, Galway harbour Village Development, Galway Shopping Centre Redevelopment and the Crown Site Development. It also looks at traffic flows arising at a number of principal junctions on the City Network during the construction phase, and in the operational phase for the years 2016, 2021 and 2031.

13.4.3 Potential Impacts

A total of 15 principal junctions, some adjacent to the development and others further out on the network were analysed as to the potential impacts from the Galway Harbour Extension development.

The analysis shows that 12 out of 15 of the junctions are not subject to any significant increase in delay or congestion as a result of the development.

The existing access to the Galway Harbour Enterprise Park is shown to be unsatisfactory, while the Lough Atalia Road / Fairgreen road junction will be affected to a minor degree.

The Moneenageisha junction will experience a maximum of 3.9% additional traffic movements compared to existing volumes; it is within the 5.0% threshold as set down in NRA Traffic and Transportation Assessment Guidelines.

13.4.4 Mitigation Measures

The unsatisfactory junction arrangement at the entrance to the Galway Harbour Extension will be upgraded to a signalised junction at the commencement of the project. Additionally, the improvement works under Lough Atalia Road Rail Bridge will be undertaken as an enabling contract at commencement.

A Mobility Management Framework will be implemented to promote alternative methods of transport to the private car for employees or customers at the Galway Harbour Extension and to promote sustainable haulage related activities and avoid peak traffic. During the construction stage a Construction Traffic Management Plan will be implemented which will aim to reduce the impact of construction traffic on the surrounding road network, and also avoid conflict with peak traffic.

13.5 MOBILITY MANAGEMENT FRAMEWORK

The Mobility Management Framework [MMF] will be implemented by Galway Harbour Company in relation to traffic generated by both the existing Harbour and the Galway Harbour Extension development. This section outlines fully the proposals to promote alternative methods of transport to the private car for employees or customers at the Galway Harbour Extension and to promote sustainable haulage related activities. This MMF will be the mitigation measure in relation to road traffic as outlined above.

13.6 RISK ASSESSMENT

13.6.1 Introduction

The purpose of this section is to provide technical input to the development planning process in relation to the proposed Galway Harbour Extension developments in the vicinity of the Topaz (formerly Enwest) and Leeside petroleum products terminals as well as the new jetty facility and associated pipeline from the jetty to the existing storage facilities.

13.6.2 Existing Environment

Petroleum products are currently discharged to the Topaz and Leeside storage facilities from the existing inner dock at Galway Harbour. Separate oil mains run to each terminal and a separate bitumen line serves the Cold Chon complex.

The Topaz site, which is closest to the Galway Harbour Extension development, qualifies as a top tier Seveso site under the "Control of Major Accident Hazards Involving Dangerous Substances Regulations" which implement the European Communities Seveso 2 EU Directive.

The Leeside site qualifies as a lower tier site under COMAHDS due to the quantity of petroleum products stored on site.

In the new arrangement petroleum products will be pumped from the new commercial quay jetty to the Topaz site. The Leeside facility will not be connected to the new jetty.

New oil and bitumen pipelines in purpose designed and built chambers will be constructed between the new jetty and the existing petroleum and bitumen facilities.

13.6.3 Risk Assessment

The risk assessment investigated the likely risks associated with various accident scenarios from the terminals at Topaz and Leeside as well as those presented by the pipeline and the jetty to the proposed development in Galway harbour. The main conclusions from this assessment are:-

The overall conclusion is that the risks to the land-based developments such as occupied buildings are tolerable when compared to the criteria used by the HSA to assess the level of risk to people.

The societal risks at the jetty are considered to be tolerable. The separation distances between the jetties and occupied building and passenger terminal comply with recognised good practice.

Relocating petroleum unloading to the new jetty will reduce societal risk, even allowing for increased throughput, as there is a much larger surrounding population at the existing facilities at Folan Quay and Dun Aengus docks.

The risks to passengers using the cruise ships has been quantified and found to be broadly acceptable when it is taken into account that gasoline off-loading will be restricted whilst a cruise ship is in port.

The risk of a spill to the environment cannot be ruled out. The risks of such a spill will be managed by use of high integrity unloading arms fitted with emergency release couplings for petroleum liquid transfers. Unloading arms reduce the likelihood of a release that threatens the environment compared to hoses. The design of the jetty and the pipeline route will be such that spills can be contained and recovered as far as is practicable.

Compared to the new jetty the existing harbour is protected by dock gates so it is easier to contain and recover any spillage before it reaches an environmentally sensitive area. The open nature of the Port means that this is not the case and so booms will be deployed during petroleum unloading. An oil spillage response plan will be in place.

From a safety perspective, the risks from the pipeline are low and the main concern would be a spill to the environment. These risks can be reduced by the implementation of appropriate leak monitoring systems as well as unloading procedures which ensure vigilance in monitoring offloading progress. Procedures that empty the pipeline following the unloading also help to reduce the risk of a spill as it reduces the potential exposure time of the pipeline when it contains an inventory. Emergency spill protection procedures and appropriate spill protection equipment will also be provided.

The risks from the Topaz and Leeside terminals to the development have been estimated as being tolerable.

13.7 SAFETY HEALTH & WELFARE

13.7.1 Introduction

Safety Health and Welfare issues may arise during the preparatory stages, various construction phases, periods between various construction phases, operational use, maintenance / repair and removal / replacement of elements of the physical asset comprising the Galway Harbour Extension infrastructure.

13.7.2 Existing Environment

The concept design and planning stage of the project has been underway for a number of years. During this stage, the various statutory requirements from a safety, health and welfare perspective have been observed. The Client, Galway Harbour Company, has appointed a competent Project Supervisor Design Process (PSDP), in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006, and competent designers, including Architect, and Civil, Structural and Transport

(Roads and Rail) Engineers, for the various construction elements within the overall project. These designers are obliged to carry out their designs in accordance with the Safety, Health and Welfare at Work (construction) Regulations 2006 and the Safety, Health and Welfare at Work Act, 2005. This involves these designers, while they are designing the project, to design their elements so that they are capable of being safely constructed and maintained, taking account of the general principles of prevention set out in the Safety, Health and Welfare at Work Act, 2005. The PSDP has organized cooperation between the designers and ensured coordination of the designers' activities in relation to the project concept design and planning, specifically with a view to protecting the safety, health and welfare of persons involved in the construction of the project.

At construction stage Galway Harbour Company will appoint a Project Supervisor for the Construction Stage (PSCS) to co-ordinate safety during the construction phase in accordance with the regulations.

13.7.3 Potential Impacts

The potential health and safety impacts during construction are mainly related to the personnel involved with the construction process itself. These include engulfment in the soft soils being placed in the contained land reclamation areas, drowning associated with all of the marine activities, interfaces between machinery and personnel, installation of heavy pre-fabricated elements, underwater activities during installation of the quay structures, and the use of explosives in trench preparation and berth deepening in rock.

13.7.4 Mitigation Measures

The protection of the safety of construction personnel, and also interface of the works with neighbouring activities (general public or commercial traffic), is provided in a detailed systematic process. Each step in this process involves competent persons taking actions, within their control and area of expertise, to minimise risks to persons arising from the works. This process commenced at the start of the project when Galway Harbour Company appointed competent designers, planners and PSDP, all of whom play an important role in the process of ensuring the preparation for a safe construction project. Later further appointments of competent persons including PSDP (post-tender), construction designers, PSCS and contractors, will see the continuation of this systematic project safety process.

14 INTERACTIONS

The proposed Galway Harbour Extension design, layout, construction, proposals and methods, future maintenance and operational management systems all reflect the interactions of all of the topics.

The evolution was on the basis of the feedback from all the respective subjects and has achieved an appropriate design requirement balance ranging from the Business Case input at Chapter 2 to the best reflection of the Material Assets at Chapter 13.

15 MITIGATION, MONITORING AND REPORTING

The various sections of the EIS set out the mitigation, monitoring and reporting measures proposed. These include design considerations with respect to the beneficial re-use of dredged materials and the minimization of rock removal by orientation, positioning and layout of the proposed development. In addition road works at the commencement of the project will resolve unsatisfactory situations at Lough Atalia Road Rail Bridge and at the main site entrance adjacent to the Harbour Hotel.

As regards the construction stage the principal mitigation measure is the restriction on blasting, pile driving and dredging work during the months April to July in any year to avoid the principal run of Atlantic Salmon and other anadromous species. In addition there is the restriction on dredging close to the entrance to Lough Atalia and restriction on night time drilling, blasting and pile driving.

Extensive monitoring and reporting of parameters related to dust, odour, vibration, noise and suspended solids arising from the various construction operations has been detailed with threshold limits and alert levels set in accordance with best practice.