



booz&co.

Port of Cork Rail Connection

Draft Final Report

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Booz & Co were asked to assess the case for rail freight to/from the Port of Cork to inform both its planning and Government policy

Brief

- The overall aim of the assessment was to establish under what circumstances, if any, a rail connection to the Port of Cork would be feasible. Specifically, the objectives of the study were to:
 - Establish which of the port's existing market segments or individual customers could be served by rail, and under what scenarios
 - Taking a long term view, establish if there are new (existing or future) markets which could be attracted to rail, and under what scenarios
 - Establish the benefit that would accrue from these markets being served by rail
 - Set out options for serving the Ringaskiddy and Marino Point container terminal sites by rail
 - Set out the impact of the rail options on the wider rail network (infrastructure, rolling stock, operations, etc.)
 - Establish the life cycle costs of the rail transport options, including costs incurred elsewhere on the rail network
 - Complete a cost/benefit analysis for the scheme

Approach

- Bottom-up assessment:
 - A set of conditions were developed which would contribute to a rail freight operation being feasible
 - Individual freight flows were examined to assess their suitability towards rail freight
 - Supply side factors were examined to determine what infrastructure gaps exist and their impact on a case for rail freight
- Top-down assessment:
 - A "best possible" demand scenario and three infrastructure options were devised to test feasibility
 - Socio-economic analysis was used to determine feasibility of each option
 - Interviews and site visits were conducted to strengthen confidence in findings

“Business as usual” would not support a rail link, so we developed a Best Possible Scenario involving a Distribution Centre

Existing Rail Freight Baseline

- Rail freight in Ireland is negligible, it has been in decline for some time and now serves only niche markets
- Nationally there is a lack of rail freight facilities and none of the port’s customers are connected to the railway
- The Loop Line at Kent Station would need to be retained if the Cork suburban line were to be used by freight
- Using existing wagons, 9 ft 6 in containers cannot pass through the Cork Rail tunnel but this can be overcome with new rolling stock
- By comparison with rail, the road haulage industry itself is highly competitive: there is a large supply of trucks mainly owner-operated. Road and traffic conditions regionally are reasonably good
- While distance need not be a limiting factor, lengths of haul to and from the Port of Cork are generally on the low side for rail freight operations
- Customers are dispersed. Individual businesses generally do not generate sufficient volumes to form full trainloads
- In summary, many factors can contribute to the attractiveness of cargoes being moved by rail, but the current situation in Cork is unpromising.

Our hypothesis for a “Best Possible Scenario”

- A Distribution Centre concept was developed as the Best Possible Scenario to overcome market and infrastructure difficulties
- Containers for export would be taken from the customer by road to a Distribution Centre where they would be assembled into full train loads to be taken to the port by rail. Imported containers would travel from the port to the Distribution Centre by rail and onward from there by road. This overcomes the lack of customer railheads and relatively small volumes generated by individual customers
- The Distribution Centre would be located in the Mallow area (no site identified) as most of the Port’s customers are located to the North and North West of the catchment
- Over time, there would be a socio-economic benefit in removing trucks from the road between the container terminal (whether it were located at Ringaskiddy or Marino Point) and the Distribution Centre

None of the options we developed for Marino Point or Ringaskiddy proved to be feasible under expected circumstances

Marino Point

- Option 1: build a rail terminal at Marino Point and connect to Cork - Cobh Line. Operate a shuttle service between it and a Distribution Centre in the Mallow area
- Loop Line at Kent Station must be retained
- Capital Cost c. €25 million (excluding rolling stock)
- Leasing of new rolling stock means that height clearance for 9ft 6inch containers is not a problem at rail tunnel
- Investment also needed in additional operations and maintenance staff
- Cost / benefit ratio: 60% over 30 years under our central estimate.
- The Marino Option is not feasible under expected circumstances

Ringaskiddy Options

- Option 2: build a rail terminal at Ringaskiddy and a new link between it and the Cork - Cobh Line, requiring some 10km of new railway and a major bridge over the West Passage
 - Operate a shuttle service between Ringaskiddy and a Distribution Centre in the Mallow area
 - Capital Cost €500m +/- 50%
 - Cost / benefit ratio: 10% over 30 years under central estimate
- Option 3: build a rail terminal at Ringaskiddy and a new link between it and the Cork - Dublin Line, requiring some 30km of new railway
 - Operate a shuttle between Ringaskiddy and a Distribution Centre in the Mallow Area
 - Capital cost €250m +/- 50%
 - Cost/benefit ratio: 20% over 30 years under the central estimate
- For both options, investment is also needed in rolling stock and additional operations and maintenance staff
- The Ringaskiddy options are not feasible under any reasonable circumstances due to high cost

The case for the Marino Point - Distribution Centre option is not robust but there are circumstances where it may be worthwhile

Prerequisites for a rail connection to Marino Point

- The Kent Station Loop Line must be retained or an alternative provided when site developed. Discussions with Iarnród Éireann indicated that this would not be a problem as there is no longer a plan to remove it
- The potential line from Marino Point must then be mothballed until one of two viable scenarios for rail freight materialises:
- Scenario A:
 - Niche customer(s) emerge along the lines of Lisheen Mines, with sufficient scale to warrant a rail service to and from the Port, and the provision of infrastructure at either end of the route
- Scenario B:
 - The scale of growth of the Port occurs broadly in line with the forecasts made for the Oysterbank Proposal
 - An inland port operation is established with a distribution centre and rail shuttle, run by a commercial logistics provider and subsidised by government
 - Rail competes better against road, for example, with increased congestion, so that is a reasonable proposition for the distribution centre to handle at least 25% of all the port's containers.
 - Government meets capital and operating expenditure funding gaps

Stakeholder Engagement

- The findings of the study were discussed with the main stakeholders, including Iarnród Éireann, Cork City Council, Cork County Council and Department of Transport's Maritime Transport, Public Transport, Sustainability and Freight & Logistics Divisions
- The stakeholders accepted the findings of the study and recognised the need for regional, county and local planning policies to support the Port's strategic development plan

For optimal future sustainability, local and regional policies need to support the Port's future development

Conclusions

- The Kent Station Loop Line must be retained or an alternative provided when site developed. Discussions with Iamród Éireann indicated that this would not be a problem as there is no longer a plan to remove it. The City Council are aware of this and recognise it will be taken into account in plans to redevelop the station to turn to face the river
- If the Port is not allowed to develop its container handling capability, it will become increasingly uncompetitive. More goods will be taken to and from the Port of Cork's catchment via other ports. The result will be longer truck trips than at present with a subsequent increase in negative impacts
- Having a competitive regional port will therefore provide for a sustainable future for the region. It follows that the port should relocate to the site which best meets its business needs, providing the best competitive advantage
- This study shows that there is no socio-economic case for a rail operation to the Port of Cork under expected circumstances. Even at the Marino Point site, which is close to the railway, there is no robust case for a rail operation for transporting containers. The circumstances under which the railway opportunity might be taken up are unlikely
- Given these findings, whether or not the site for a future container terminal is near to a railway should not be given undue weighting in decision making. It would be undesirable and ultimately unsustainable to encourage the port to select a railway-oriented site if it does not make business, operations, economic or environmental sense and if the limitations of that site constrained the port's potential competitive advantage
- The Regional Planning Guidelines, in expressing objectives in relation to the region's port, should clarify the strategic regional development, competitiveness and sustainability issues
- The Local Area Plans that cover the Ringaskiddy and Marino Point sites should support the Port's Strategic Development Plan

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Socio Economic Evaluation

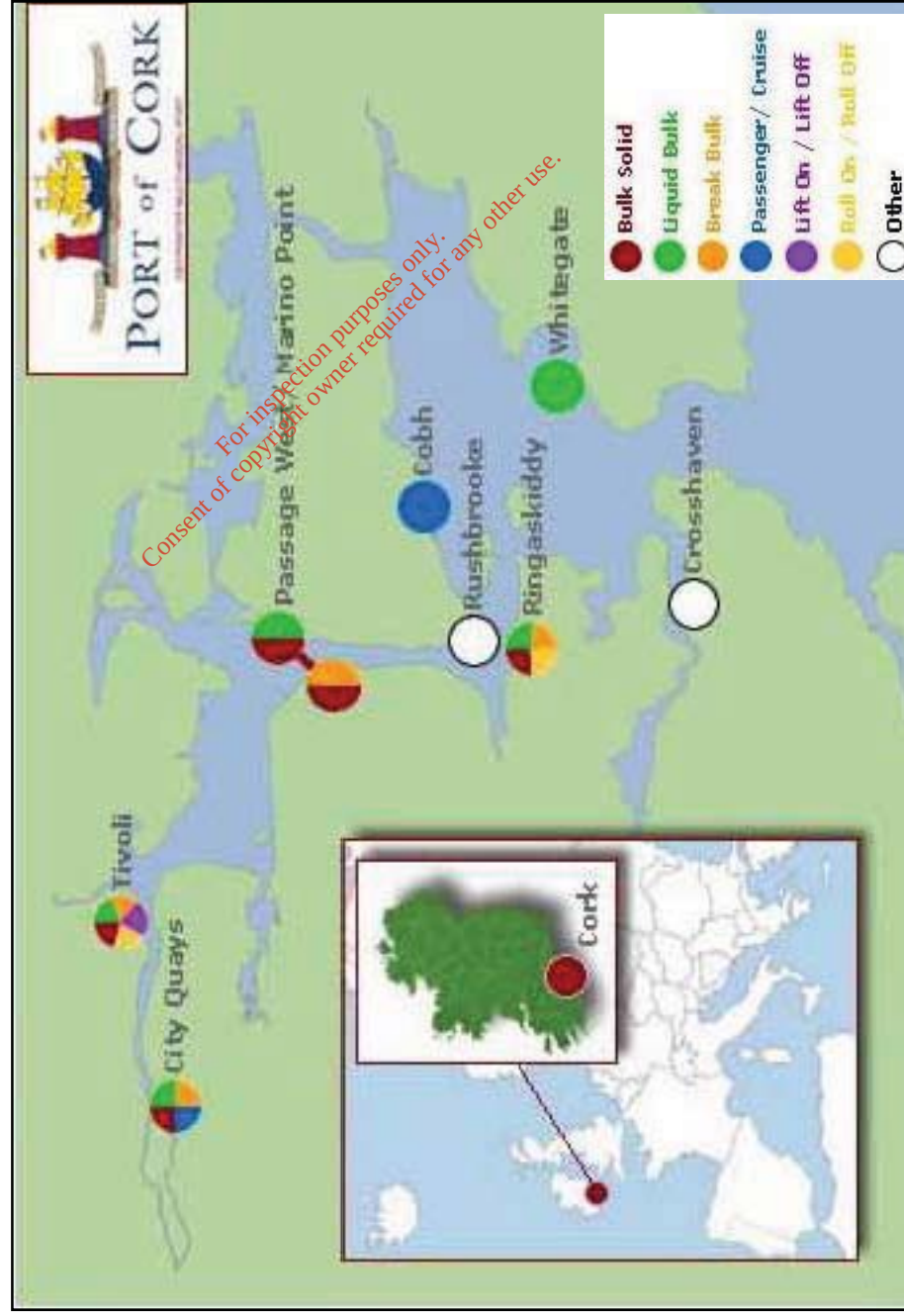
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Conclusions and Next Steps

In June 2008, Port of Cork was refused permission to relocate its container terminal from Tivoli to Oysterbank, Ringaskiddy



Decision
▪ The decision is final ▪ It cannot be appealed ▪ It will affect all future port development applications

The reasons for the decision were the perceived negative impact on the road network and the lack of rail access to Ringaskiddy

An Bord Pleanála's Reasons and Considerations

- The proposed development entails the relocation of commercial freight activities of the Port of Cork from its existing location at Tivoli Docks, which is served by a railway line and has reasonably direct access to the national road network, to a location to the south-east of Cork city at Ringaskiddy which is not connected to the national rail system and would be totally reliant on road-based transport.
- While the Board accepts that there is a need to move port activities from Tivoli Docks and expand at other location(s) within the Cork Harbour area, it is considered that the proposed development would:
 - (a) result in much of the port related traffic traversing the city road network which would adversely impact on the carrying capacity of the strategic road network in and around Cork city and in particular the carrying capacity of the strategic interchanges at Bloomfield, Dunkettle and Kinsale Road and the Jack Lynch Tunnel which it is necessary to preserve. The proposed development would exacerbate serious traffic congestion at these strategic interchanges, and
 - (b) be unable to make use of rail freight carrying facilities in the future and would, therefore, represent a retrograde step in terms of sustainable transport planning having regard to the policies in the RPG and CASP.
- The proposed development would, therefore, be contrary to the proper planning and sustainable development of the area.

Source: Board Direction, 24th June, 2008

While Inspector accepted the poor viability of a rail service in the short term he thought this would change in the longer term

- The Inspector:

- Stated that *“The applicants in my view have demonstrated adequately that current Government commitment to promoting unitised freight is low”*
- Took the view that *“in the medium to long term the need for more sustainable transport requirements will force the State to prioritise (rail) freight transport”*
- Acknowledged that the applicants had demonstrated:

The decline in rail freight in Ireland

The low priority given to freight by Iarnród Éireann

The difference between Cork and the major Northern European ports

That there is “little evidence of government policy actively pursuing or supporting major expansion in rail freight services”

- Considered that *“there is a firm policy commitment to rail freight transport particularly in relation to the Port of Cork”,* shown in

The National Spatial Strategy

Cork Area Strategic Plan (CASP)

Regional Planning Guidelines for the South West Region

- Argued that *“in the medium to long term the viability of transporting goods by rail freight will improve and become more competitive as costs associated with road-based transport will increase”*

Source: Planning Inspector's Report

Booz & Co were asked to assess the case for rail freight to/from the port to inform both its planning and Government policy

- The overall aim of the assessment was to establish under what circumstances, if any, a rail connection to the Port of Cork would be feasible.
- Specifically, the objectives of the study were to:
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 - Taking a long term view, establish if there are new (existing or future) markets which could be attracted which would be served by rail, and under what scenarios
 - Establish the benefit that would accrue from these markets being served by rail
 - Set out options for serving the Ringaskiddy and Marino Point container terminal sites by rail – be it a direct link or a barge and rail combination
 - Set out the impact of the rail options on the wider rail network (need for new infrastructure, rolling stock, operational considerations, etc.)
 - Establish the life cycle costs of the rail transport options, including costs incurred elsewhere on the rail network
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Essentially, what was needed was an analysis of the gap between the existing situation and aspirations for a future rail link

Existing Situation
- Road freight is a highly competitive industry - Although the existing container terminal at Tivoli Docks is adjacent to the railway, no goods have been transported by rail to/from Cork for many years. - Elsewhere in Ireland, some bulk and containerised commodities continue to be transported by rail to port, but some key customers have exited rail freight in recent years (e.g. sugar beet, kegged beer) - IE's freight infrastructure has been reduced - Since 2005, IE only offers container transport on the basis of a full train load (18 containers) - The only intermodal container service now operating is between Ballina, Co. Mayo and Waterford Port 65% of trips to/from the existing container terminal are to/from counties Cork and Kerry i.e. local in nature and generally not served by the rail network



External Views and Expectations
- EU policy encourages for modal transfer from road to rail - both for passengers and rail - National and local policy for modal transfer from road to rail implicit in some policy documents (at the time of the planning inquiry - specific policy has been developing rapidly since then) - Planning Inspector's acceptance that economic viability of rail freight is questionable but <i>"Notwithstanding the above arguments, the advantage of rail freight cannot be underestimated in my opinion"</i> - ABP view that it is unsustainable to plan for a new port facility without rail access - Well organised objectors have already succeeded in intervening in the port development process

- **The assessment should therefore be regarded as a "Gap Analysis" rather than a "Feasibility Study"**

The assessment was undertaken in the spirit of the Inspector's view that, in the long term, a rail connection will become desirable

- The reasons why the container terminal is no longer served by rail, the lack of a market or any larndó Éireann or Government support to develop the market, and the particular difficulties of serving the Ringaskiddy site by rail were all adequately demonstrated during the planning process
- The situation the port finds itself in called for a fresh approach with every effort made to determine how a rail operation might work and the circumstances under which that might be enabled
- The aim is to help answer the key questions that have been raised since the planning decision:
 - Our initial hypothesis is that a rail connection would not be financially viable and it would need government support to fund capital and running costs, in order for it to be financially attractive to users.
 - Our assumption is that government might consider funding if there were a socio-economic case for the rail connection based on the benefits of removing trucks that would otherwise be on the roads. If there were, it might be worth examining the commercial proposition.
 - Even with a weak socio-economic case, if the scheme were affordable, there may be a case for its prioritisation if it were strongly supported by other policies. This is addressed in the next chapter.

Is there a financial reason?

Is there a socio-economic reason?

Is there another policy reason?

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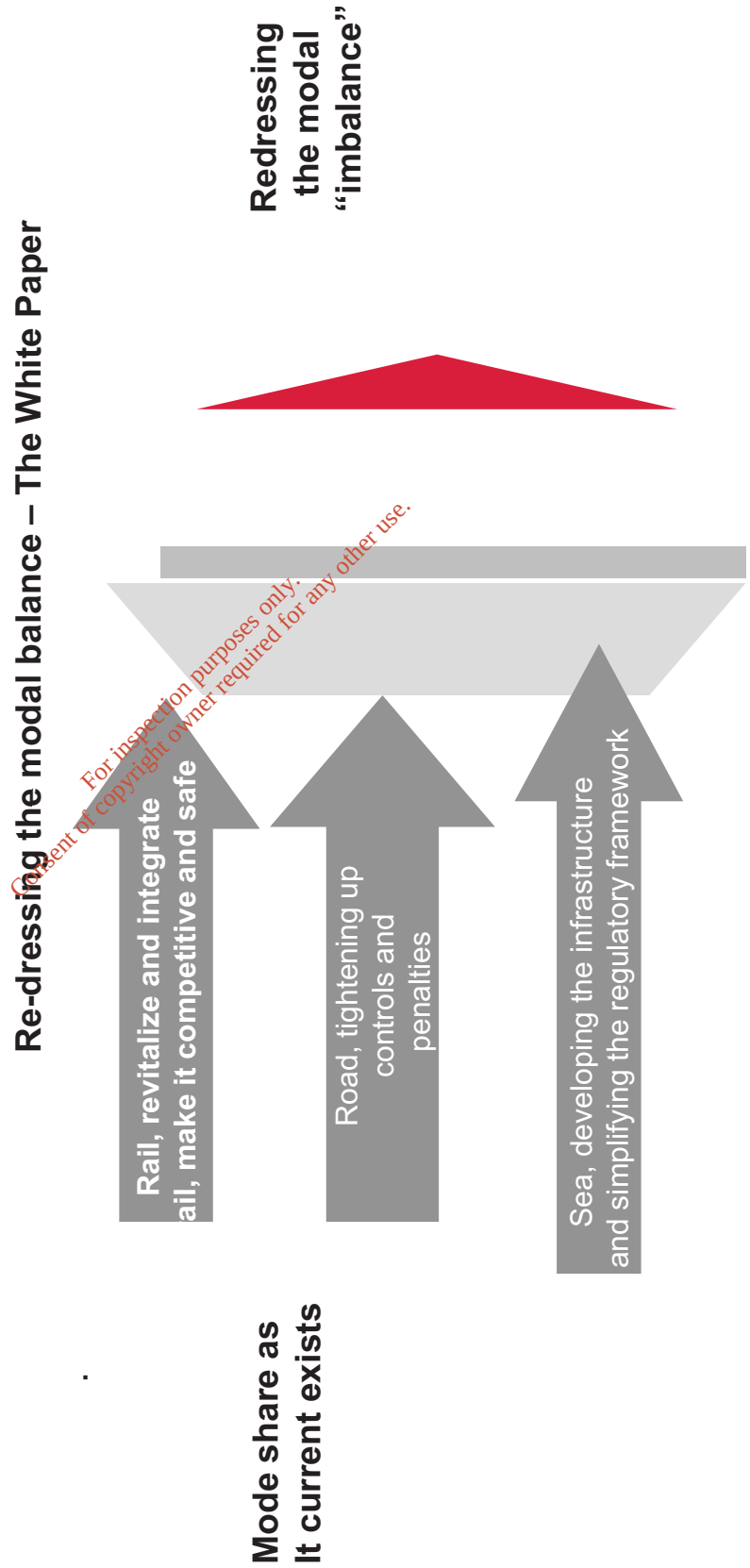
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The assessment has been informed by the latest rail freight policy at European through to local level

Policy Levels	Summary of Current Situation
European	▪ 2001 White Paper: European Transport Policy to 2010 ▪ 2006 Transport Policy Review ▪ 2007 Logistics: Keeping Freight Moving ▪ 2009: The Future of Transport
National	▪ National Spatial Strategy 2002 - 2020 (2002) ▪ Smarter Travel - A Sustainable Transport Future: A New Transport Policy for Ireland 2009 - 2020 (2009) ▪ "Assessment of Port Services Issues for Enterprise, Forfas, January 2009
Regional	▪ Revision of the Regional Planning Guideline for the South West (2004) is currently well underway and will culminate in the <i>Regional Planning Guidelines for the South West 2010-2022</i>
Local	▪ Cork Area Strategic Plan Update 2008 ▪ Cork City Development Plan 2009-2014 ▪ Cork County Development Plan 2009 - 2014

European Commission White Paper of 2001 – ‘European transport policy for 2010: time to decide’, still provides the EU policy context



The White Paper's approach was to incentivise sustainable modes and discourage the reliance on road*

Rail- revitalize and integrate rail, make it competitive and safe

Road - tighten up controls and penalties

- Removing barriers to rail freight market entry

- Engaging the ERA (European Rail Agency) and OTIF (Intergovernmental Organisation for International Carriage by Rail)

- Marco Polo Intermodality “open to appropriate proposals to shift freight from road to more environmentally friendly modes”

- Proposed road user charging for road freight related to:

- axle loadings
- impact on congestion
- distance travelled

- Attempt to “tighten up” on road freight practices e.g. safe driving time

*The EU's goal was not only modal shift for environmental reasons but from a societal perspective - Improve road safety and halve the number of road deaths by 2010

The White Paper had a mid term review in 2006 which reinforced policies to try to shift freight from road to rail

- Although rail freight volumes were growing, rail's share of the freight market was not
- However, there were several relevant success stories, including:
 - Opening up of rail freight transport to competition
 - Definition of 30 TEN priority projects
 - New road charging directive
 - Promotion of intermodal transport via Marco Polo
- It was decided that policy should continue along the lines set by the 2001 White Paper
- Specific actions were set relating to freight:
 - Road transport: internal market review (2006), review of legislation on working conditions (2007)
 - Rail transport: remove technical barriers to interoperability (2006), promote rail freight corridors – (2006), rail market monitoring (2007)
- The concept of “Co-Modality” was introduced to recognise the lack of success to the extent expected in implementing modal shift policies. “.....therefore, the future policy will have to optimise each mode's own potential to meet the objectives of clean and efficient transport systems”

There were subsequent moves to ensure logistics was considered in transport policy, making it a factor in decision making

- EU Communication (2006) 336 The “key to sustainable mobility” recommended modernizing logistics to boost efficiency of individual modes of transport and their combinations.
- This communication in particular recommends initiatives which may “lead” to changes in mode choice towards “more environmentally friendly, safer and more energy efficient modes of transport”.

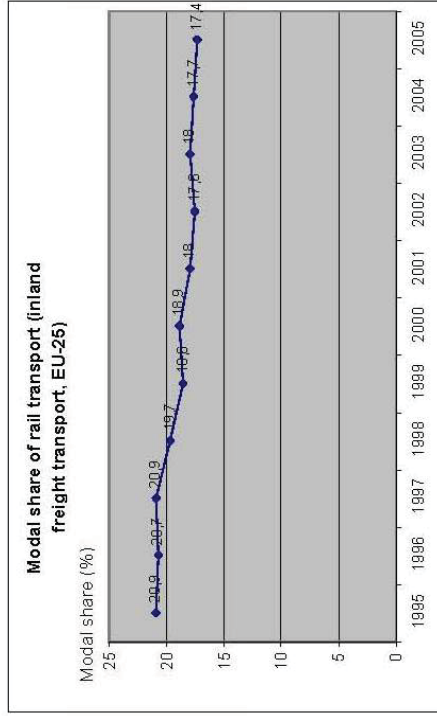
Initiatives from EU with regard to logistics



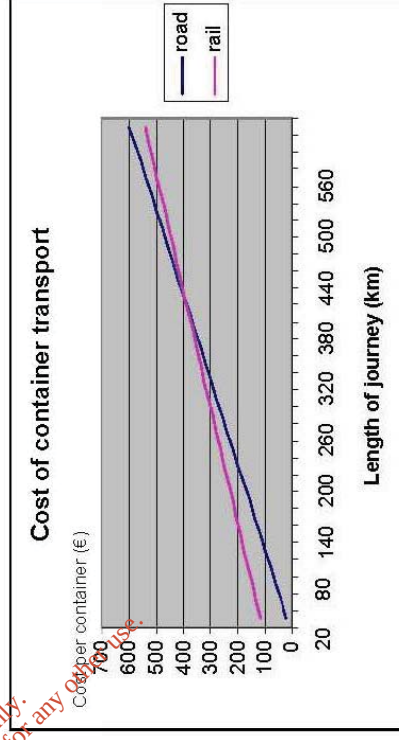
European research showed rail freight to be more cost effective over very long distances (over 400 km)...

Memo “Towards a more competitive rail freight sector”

- Predicted goods transport will grow by a further 50% between 2000 and 2020
- Noted that the initiatives aimed at revitalising rail freight transport which were launched over the last 15 years or so, by the European Community have produced satisfactory results, but concluded that they do not go far enough.
- Reported that, in the first half of 2007, rail freight increased by 7%, However rail's modal share of freight transport was scarcely increasing.
- Reported on research that indicated that it would cost less to transport a container by road than by rail unless the distance was over 400km or so.



Source : Eurostat



Source : Impact assessment, Atkins

Source: EC Com 2007Logistics: Keeping Freight Moving, Memo “Towards a more competitive rail freight sector

... but other European research ¹ suggested that the distance where rail can compete with road on cost is lower, at around 150 km

- The Communication cites “A pilot study on rail freight performance by distance conducted in 2006 by the Community of European Railways (CER) and the International Union of Railways (UIC) on a group of railway undertakings holding 20% of the rail freight market showed that:
 - the market share of rail compared with road is significantly higher for longer distances (> 150 km = 22%, > 300/325 km = 26% and > 500 km = 30% compared with 19% of the total traffic).
 - On distances exceeding 150 km the average costs of moving goods by rail are usually lower than for transporting them by road .

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Are the distances in the Port of Cork case too short for rail?

- There are no “hard and fast” rules about whether it costs more to transport a container by road or rail - a lot will depend on the local infrastructure and service providers, and their charges
- It is, however, safe to say that the Port of Cork’s hinterland does not cover the distances normally considered for rail freight (leaving aside the fact that little of the area is covered by the rail network).
- Despite the fact that rail transport may cost more than road, many European governments chose to fund the cost differential on the basis that there are environmental and other socio-economic benefits associated with removing trucks from the road.
- While we are confident that there would be no commercial case for transferring freight from road to rail in the Cork area at present, we have to establish if there may be a socio-economic case to do so in future.

¹ Monitoring Development of the Rail Network - COM(2007) 609

The European Commission is currently looking at “The Future of Transport” which will input to the next 10-year White Paper

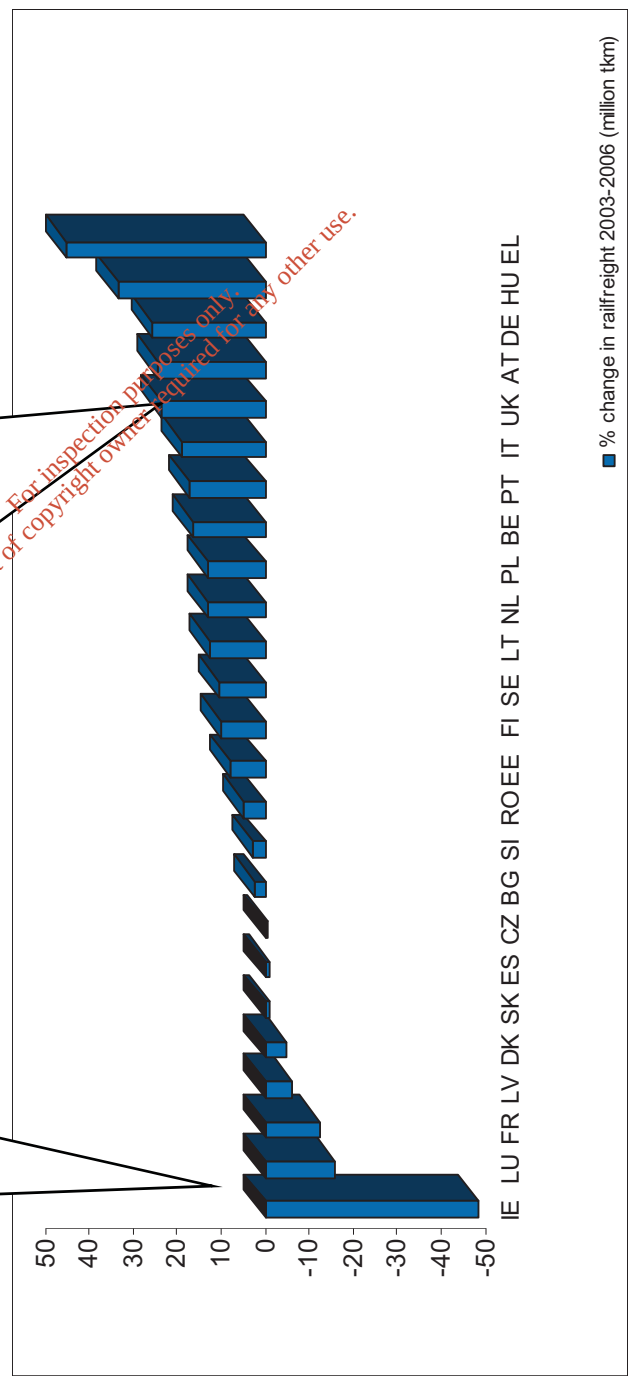
The Future of Transport (2009) - emerging themes relating to rail freight

- The trend of increasing demand for long distance freight transport is unlikely to reverse
- The logistics sector would be creating more flexible, but complex networks
- Large intercontinental ports might reach high congestion levels smaller ports may present spare capacities if not integrated in the established circuits.
- European network of rail freight corridors and increased competition in the railway markets would facilitate enlarging the share of rail
- Rail freight vehicles would very likely become longer, bigger and more energy efficient.
- Trucks, ships and aircrafts would increasingly rely on alternative fuels

The result of EU directives and initiatives has been varied

• There was a 48.5% decline in rail freight in Ireland between 2003 and 2006

• Railfreight in the other island economy, UK, grew by 23.4% between 2003 and 2006
• UK Government has taken measures, including financial incentives, to encourage freight to shift from road to rail



Source: Eurostat, Booz Analysis

Limitations of European Examples

- Compared with Ireland, in continental Europe:
 - distances are long; and
 - port opportunities are few
- In the case of Netherlands, for example, data include freight travelling between Dutch ports and other countries.
- International traffic accounts for 44% of all rail freight in Europe and is the fastest growing sector
- In UK, the only other island economy in the EU, rail freight is growing
- Beyond Europe, in New Zealand, for example, there are many examples of freight going by rail over short distances

Rail freight in Ireland has now declined to the point where it has nearly ceased, carrying only 0.7% of trade in 2007



Milestones in the Decline
2009: IE discontinues Fastrack, its parcels business 2006: cessation of sugar refining in Ireland and loss of beet trains 2006: Diageo decide to transfer beer kegs from rail to road 2003: Closure of North Wall Freight Depot 2002: closure of IFI at Marino Point - Growth of a highly competitive road freight sector - Gradual closure of freight lines (e.g. to Tivoli, to Foynes) and of freight yards

According to the Strategic Rail Review (2003), many of the underlying causes for the decline were institutional

The Strategic Rail Review (2003) forecast this decline in rail freight in the absence of a national Government policy to halt it

- Much of the freight traffic carried in 2001 was loss-making and most of the freight rolling stock was nearly life-expired. Since then, IÉ has exited the loss-making traffics and now concentrates on more profitable niche businesses
- There were no direct support schemes to rail freight in Ireland similar to those operating in many European countries which explicitly aim to recognise rail's social benefits in the haulage task. There has been no change since them.
- Four strategic options were considered by the SRR. The outturn situation has been Option 1, but with elements of Option 4.

Criterion		Freight Option 1 Continue current policy		Freight Option 2 Stimulate IÉ to improve position		Freight Option 3 Active Government involvement		Freight Option 4 Limit IÉ role; New logistics partnerships	
Exploit rail strengths for high quality competitive service	0	- Service quality is inconsistent - Reliability of service is poor (over 20% of services cancelled) - Asset renewal unlikely	1	- Improvement in rail competitiveness - Sustainable traffic growth - Potential nevertheless may be limited	3	Greatest likelihood of modal shift from road to rail, through operating or capital support and incentives	2	- Creates opportunities for innovative and efficient services, resulting in growth - Nevertheless, degree of partner interest and viability still uncertain	
Support land use, social and economic policy	0	Rail traffic lost to road will increase	1	Some shift of traffic to rail	3	Greatest shift of traffic to rail	2	Also greater shift to rail, but uncertain degree of partner interest	
Improve environmental quality	0	Further decline of rail traffic will have a negative impact on the environment	1	Some shift of traffic to rail will reduce external costs to society	3	- Greatest shift to rail - Allows government to target services with greatest environmental benefit	2	Also greater shift to rail, but uncertain degree of partner interest	
Promote sound project selection	2	- No approvals or policy changes required - May not fulfil pragmatic political objectives	3	- Minimal policy changes required - Should be a win-win for all involved	2	- Potential political cost of increased public funding - Increased public consultation on investment/service targets	1	Possible stakeholder resistance to changed IÉ activity and private participation in market	
Legend:									
4	Best or fully meets	3	Substantially meets	2	Partially meets	1	Remotely meets	0	No or negative effect

Source: Strategic Rail Review, 2003

Although the National Spatial Strategy (2002) called for the future role of rail freight in the Irish economy to be developed in the light of the SRR, commitment to action has been very recent

- *Smarter Travel - A Sustainable Transport Future: A New Transport Policy for Ireland 2009 - 2020* was published by the Department of Transport in February 2009. It commits to specific actions to address the national deficit in freight policy
- The Oyster Bank planning decision has focused attention on the need for policy guidance in relation to rail freight.
- *Smarter Travel* notes that little is known about the potential for rail freight.
- The Department of Transport intends that the proposed freight forum will be established in Autumn 2009
- The Port of Cork Rail Connection Analysis will be of significant interest to the proposed Forum

Smarter Travel - A Sustainable Transport Future (2009)

Action 10

We will:

- Ensure that the Department of Transport deals with freight policy issues in a more integrated manner and prepares a specific strategy for the freight sector. We will set a target aimed at reducing the environmental impact of freight while at the same time improving efficiency in the movement of goods and promoting economic competitiveness
- Organise a forum to bring all interested parties together, including industrial development agencies and industry representative bodies, to explore in greater depth the issues relating to the movement of goods, including:
 - **The realistic potential for rail freight**
 - Priority freight routes allowing access to vehicles with greater load factors and capacity
 - Developing key logistics centres to transfer goods to more sustainable forms of transport for final delivery in urban areas
 - Scheduling of deliveries from the ports and in urban areas to avoid peak use of networks as far as possible
 - The incentives and disincentives needed to move to more fuel-efficient vehicles
 - The need to have more rigorous testing of goods vehicles to reduce emissions
 - The potential of Intelligent Transport Systems and Services to improve efficiency.

Action 29

- We will also review ports policy and the 2005 Ports Policy Statement with a view to maximising efficiency in the movement of goods and in the light of the review of the freight sector referred to in Action 10, Chapter 4.

The Forfás policy priorities for ports in 2009 include the development of a deep water container terminal at Ringaskiddy

- In January 2009, Forfás published “**Assessment of Port Services Issues for Enterprise**” which identified the following key policy priorities:
 - *Improving internal access:* The timely upgrade of the N28 (Cork to Ringaskiddy)..... is required. A recent An Bord Pleanála decision refusing an application for a significant port capacity project at Ringaskiddy cited the absence of a rail link as one of the main reasons for refusal. This highlights the need for an integrated approach to transport policy across all modes (road, rail, seaports and airports).
 - *Improving the use of ICT:* While by and large the quality of service offered to enterprise today
 - *Provision of deeper water facilities:* the proposed development by the Port of Cork at Ringaskiddy has the type of deeper water levels that will be required to accommodate larger ships; and
 - *Certainty regarding future of the Port of Dublin*

Implications
▪ Forfás appears to take the view that: – The proposed container terminal at Ringaskiddy is a national priority – Ringaskiddy would be adequately served by road – The planning refusal was due to unclear, fragmented and/or disconnected transport policies across modes. ▪ Elsewhere in the paper, Forfás comments that rail cannot be expected to play more than a limited role in transporting freight in Ireland¹

¹ quotes EC Com 2007 609 as saying that rail freight is only viable over distances of over 150km. In fact, as discussed on page 14, the research reported that “ On distances exceeding 150 km the average costs of moving goods by rail are usually lower than for transporting them by road “ - which amounts to the same point for the purposes of the Forfás analysis

The Regional Planning Guidelines 2004 - 2009 assumed and supported further port development at Ringaskiddy, while seeking to promote rail generally, but these are now being revised

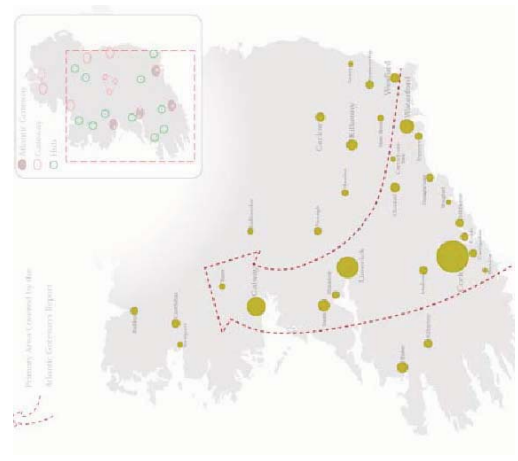
Regional Policy

- The Regional Planning Guidelines for the South West 2004 recommend that the local and port authorities:
 - Identify and reserve key strategic sites for the further development of the Port at downstream locations, replacing the loss of the City quays and the demand for extra capacity.
 - Prioritise the upgrading of the N28, Cork to Ringaskiddy, to facilitate ease of access to the Port. This will also facilitate industrial development in Ringaskiddy. Provision for public transport priorities should be built into this scheme.
 - Work together with Iamród Éireann to promote expansion of rail freight connections to port facilities. Access exists at Tivoli and Marino Point, which should be considered as strategic access points and protected in development plan policies. Use of rail reduces the need for HGVs, increases the sustainability of development and reduces environmental pollution.
 - Work together to implement the Cork Docklands Strategy, which is critical to the regeneration of the City.
 - Promote the development of a lower harbour, wastewater treatment scheme, to facilitate the development of lands at Ringaskiddy.

- The 2004 RPG support for port development at Ringaskiddy and raise no expectation of a rail freight while also expressing a desire for the existing line to be used for rail freight.
- There is more clarity expressed in the issues for the revised guidelines - see next page.

The port's relocation from the City Quays and Tivoli is one of the issues for the revised Regional Planning Guidelines 2010-2022

Atlantic Gateways



PoC related Issues

- “...there is an urgent need for the Port to move its operations out of the Docklands area of the Gateway to a new location in lower Cork Harbour. Public investment will be required primarily in the upgrading particularly of roads to facilitate this development.”
- “Cork is the principal conurbation on the Atlantic Gateways and has a population, which exceeds that of Limerick Galway and Waterford combined. The Cork Gateway is very significant contributor to national output.
- “...if the Atlantic Gateways are to provide a viable counter-pole to the Dublin and the Mid East,,, the Cork Gateway will provide the greatest levels of population, employment, productive outputs and wealth creation and is the key engine of growth of the Atlantic Gateways. Therefore, it is logical that investment in Cork on specific drivers of growth within the Gateway is prioritised,... These include.... the relocation of the Port of Cork, to free up space in the heart of the gateway for new developments”

- There is no mention of freight in the issues paper - road or rail
- The removal of the Port from the City Quays and Tivoli is clearly an objective
- No specific guidance is provided on where to the port should relocate
- Road upgrading to facilitate port development is supported, rail is not mentioned
- The revised Guidelines are expected to be aligned with the City and County Development Plans

Source: Issues Paper On the Review of the Regional Planning Guidelines 2010-2022, South West Regional Authority

Cork Area Strategic Plan (CASP), at sub-regional level, influences both regional and local policy

CASP (2001)
▪ The Regional Planning Guidelines were strongly influenced by the Cork Area Strategic Plan (2001) (CASP) and reflect CASP policies ▪ CASP assumed the relocation of port activities from the City Quays and Tivoli to Ringaskiddy while also seeking to maximise use of the railway and protect its alignment and access arrangements

CASP Update (2008)
▪ An update of CASP to take account of the outturn population and employment growth and the role envisaged for the City Region under the National Spatial Strategy was published in July 2008. ▪ The Draft CASP Update aims to refocus growth in line with CASP objectives as well as identifying locations for expanded growth. Its main findings have been included in the City and County Draft Development Plans (see next page). ▪ The City Council Development Plan is currently at Draft Consultation stage. ▪ The County Development Plan was adopted in February 2009.

The Cork City (Draft) and County Development Plans support the move to Ringaskiddy and ...

- **City Draft Development Plan**

- The Port of Cork proposes to relocate container traffic downstream to the Oyster bank and to relocate bulk and other trade from the city quays to Ringaskiddy. This will provide for major regeneration and development opportunities at the Docklands, and Tivoli areas. - It is the policy of Cork City Council to support the Port of Cork in its strategically important operations and future plans for expansion and relocation. (Policy 5.20 Port of Cork)

- **County Development Plan**

- The Strategy

.....Other important elements of the strategy for the area concern the critical need to relocate land uses from the port/industrial areas on the eastern approaches to the City so that these areas can be redeveloped to provide a new focus for population and employment growth close to the City centre. The preferred area for the relocation of many of these uses is in the lower harbour mainly near Ringaskiddy, where deep-water berths exist and are capable of expansion, and modern motorway standard roads are planned to facilitate the movement of freight to and from the new port facilities. (Section 2.3.10)

- Objectives:

....To assist in the redevelopment of the Cork City Docklands by providing for the relocation and development of industrial uses and major port facilities, primarily at Ringaskiddy, where deep-water berths can be developed and modern road infrastructure is planned to facilitate freight transport.

- Marino Point

....there is also potential to redevelop the former IFI site at Marino Point. The review of the Local Area Plan will establish an appropriate development framework for this site. (Section 3.2.38)

- Ringaskiddy

Ringaskiddy, with excellent port facilities, will also play an important role in the redevelopment of the Cork City Docklands by providing for the relocation and development of industrial uses and major port facilities. (Section 3.4.3)

....the new County Development plan specifically deals with An Bord Pleanála's decision

- Port of Cork Strategic Plan was aligned with the CASP goals and the CASP Strategy articulated the key linked benefits of the Port's strategy of relocating the Container Terminal from Tivoli to Ringaskiddy. The Planning Authorities in conjunction with the Port of Cork will carefully assess the issues raised by An Bord Pleanála in relation to future Ringaskiddy developments and if necessary consider possible alternatives.
- CON 3-5 - Locations for Port Related Development
 - It is an objective to ensure that land with the potential to accommodate port related development, particularly at Ringaskiddy, but also at the other ports throughout the County, is, normally, protected from inappropriate development that would prejudice its long term potential to accommodate this form of development
- The Port of Cork
 - It is an objective to support the relocation of port activities and other industry away from the upper harbour on the eastern approaches to the city. Ringaskiddy remains the preferred location for the relocation of these activities. The Council is committed to engage with the Port of Cork and other relevant stakeholders in order to address the issues in relation to Ringaskiddy and, if necessary, give consideration to possible alternative locations.
 - A recent decision by An Bord Pleanála, relating to a proposed container terminal at Ringaskiddy, has identified concerns regarding traffic impact at key locations on the road network and the lack of potential for the future transport of freight by rail in the Ringaskiddy area. The maintenance of modern port facilities and the need to release port related land in the Docklands and at Tivoli for mixed-use development formats are both critical to the overall strategy for the sustainable development of the CASP area and to the achievement of the target populations for the City. (6.4.2)
 - While Ringaskiddy remains the preferred location for the relocation of port activities, Cork County Council is committed to engage with the Port of Cork and other relevant stakeholders, to seek a resolution to the difficulties raised by An Bord Pleanála and, if necessary, give consideration to possible alternative locations. (6.4.3)
 - In order to establish an appropriate land-use strategy for Ringaskiddy, the Carrigaline Electoral Area Local Area Plan will address the land use issues associated with the port relocation, set out a strategy to maximise the regional economic potential of other undeveloped land and to establish infrastructure to support enhanced public transport to serve the area. (6.4.5)

In summary, evaluation of the emerging policies does not show a rail connection for Port of Cork to be an objective

Policy Level	Main Interests
Port customers	- Cost - Speed and reliability
Port Company	- Customer retention and growth, ability to compete with other ports on cost - Environmental and economic sustainability
Local & Regional Authorities	- Viable local/regional port - Efficiently operating road network - Best possible local environment - Specifically, the City and County Development Plans: - Support the redevelopment of Docklands/relocation of port - Support a container terminal at Ringaskiddy - Contain no stated objective to get trucks off the roads in the Cork City area - Forthcoming Regional Planning Guidelines expected to align with Development Plans
National Government	- Sound socio-economic case for State investment (DoT/DoF) - Affordability (DoT/DoF) - Efficient provision of transport services (DoT/DoF) - Despite the recommendations of the Strategic Rail Review and the National Spatial Strategy, no specific rail freight policy has been developed (DoT/DoE) <i>Smarter Travel</i> : A New Transport Policy for Ireland 2009 - 2020 commits to addressing the national deficit in freight policy, has no explicit objective to shift freight from road to rail but commits to exploring the realistic potential for rail freight (DoT) - Support for the container terminal to relocate to Ringaskiddy (Forfas, Jan 2009)
EU	- Shift of freight from road to rail desirable but policy should optimise the potential of each mode. Competitive transport markets are key - Irish Government usually granted derogations in relation to EU rail policy

- Local and National Policy has developed since the ABP decision against the Oysterbank proposal
 - Local policies support the relocation of the container terminal at Ringaskiddy
- Emerging national policies unlikely to support rail freight projects unless they were affordable and supported by a robust case
 - EU policy allows individual countries to determine what suits them best and will not support rail freight where there is no case for it

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Context

Policy Background

Rail Freight Baseline

Existing Rail Freight System

Future Scenario with Rail

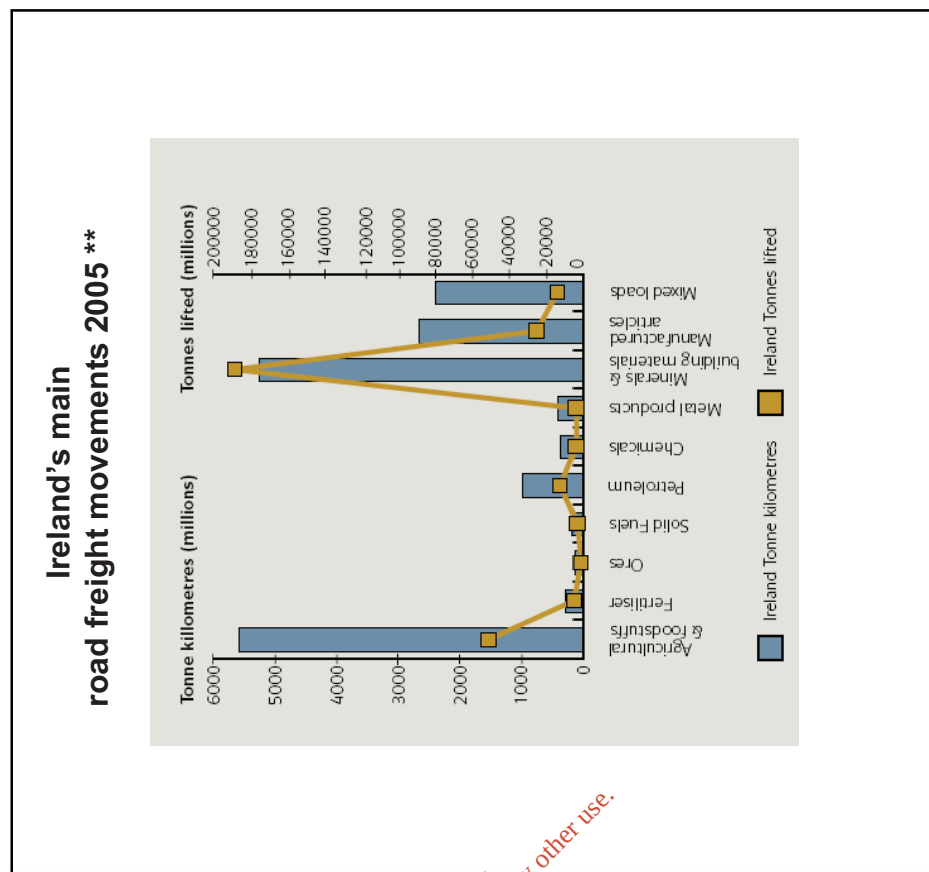
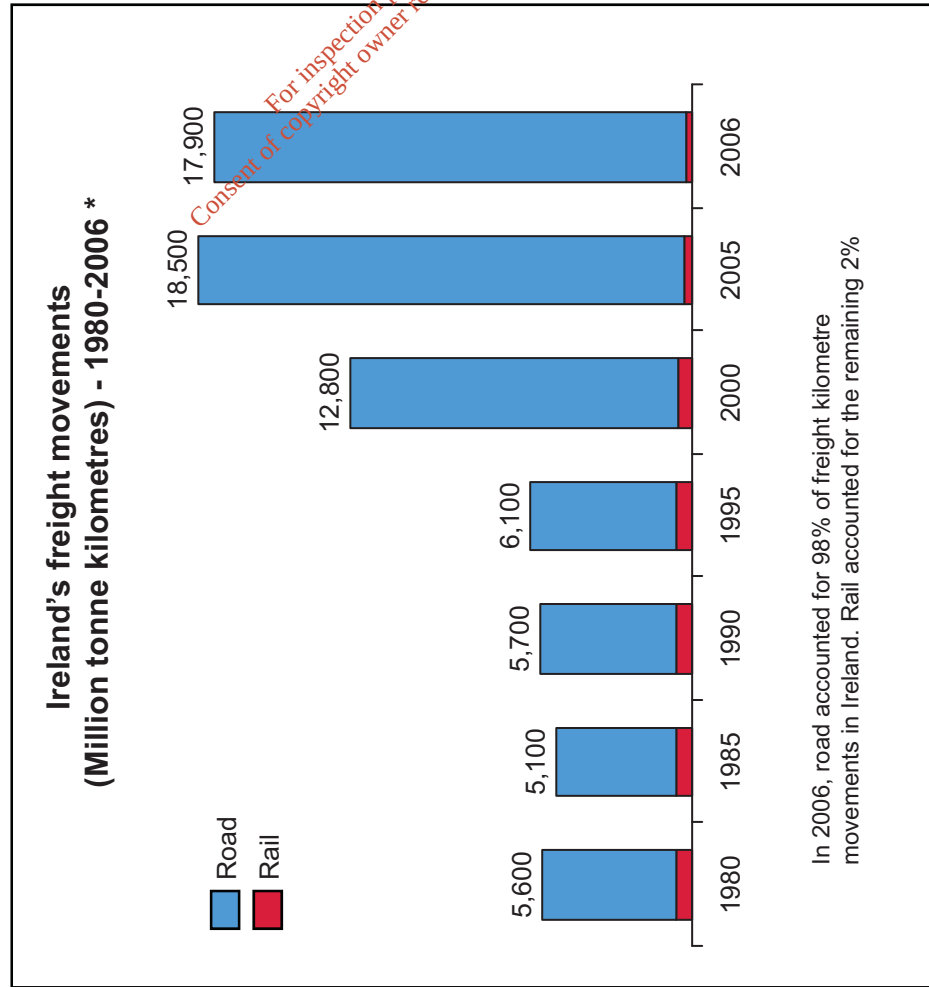
Rail Connection Options

Socio Economic Evaluation

Other Options

Conclusions and Next Steps

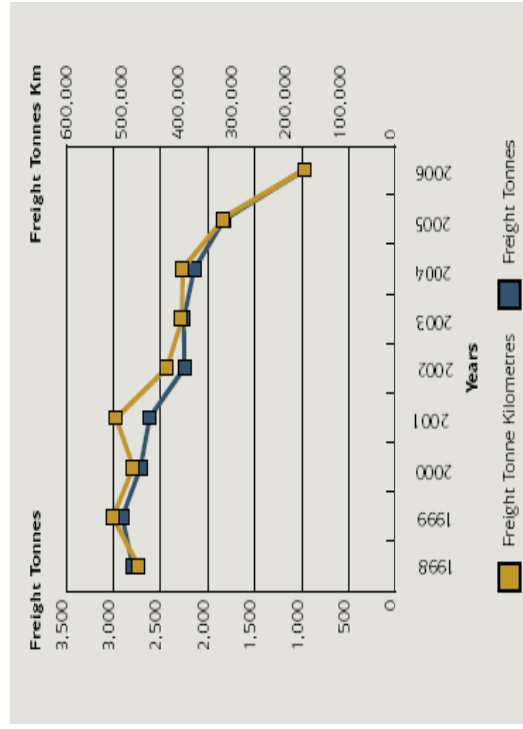
Nearly all of Ireland's freight is carried by road. Main cargoes are agricultural and foodstuffs, and minerals & building materials...



* Source: Booz & Company analysis based on Eurostat data in Evidence by Bernard Feeney, Goodbody Economic Consultants, 2008, p16
** Source: Inter TradeIreland, 2007, Freight Transport Report for the Island of Ireland

...Ireland's relatively small rail freight task is contained to a few niche cargoes, and has been in decline for some time

Ireland's rail freight movements
(tonnes, and tonne kilometres) - 1998-2006 *



Over the past ten years, there has been a rapid decline in Irish rail freight.

The highest declines in cargo types has been in cement, fertiliser, sugar, beer and general freight commodity classes.

* Source: Inter Tradelreland, 2007, Freight Transport Report for the Island of Ireland
** Source: Booz analysis based on railway timetable data

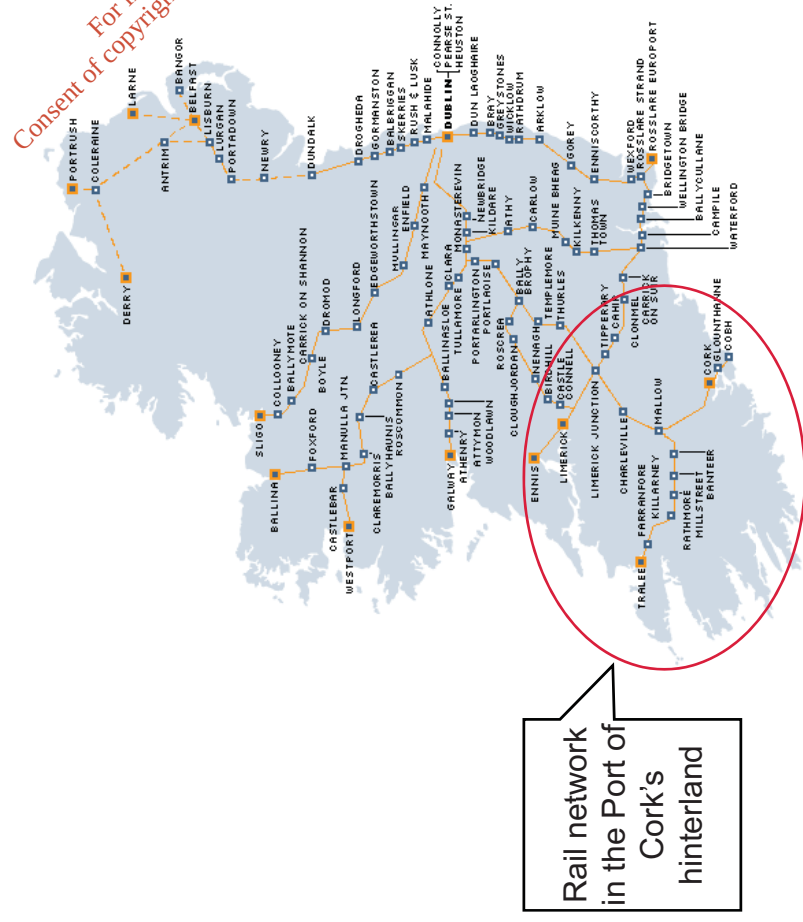
Current Freight Operations in Ireland

From – To	Type of traffic	Miles	Trains per week
Ballina -Waterford	Containers (mainly soft drinks)	215	3-4
Kilmastulla (Bird Hill) – Castelmungret (Limerick)	Bulk (shale)	21	12
Navan – Dublin Port	Bulk (Tara mines)	50	15-20
Drogheda – Tullamore	Bulk (cement)	98	2-3
Ballina – Westport-Waterford	Timber	211	4

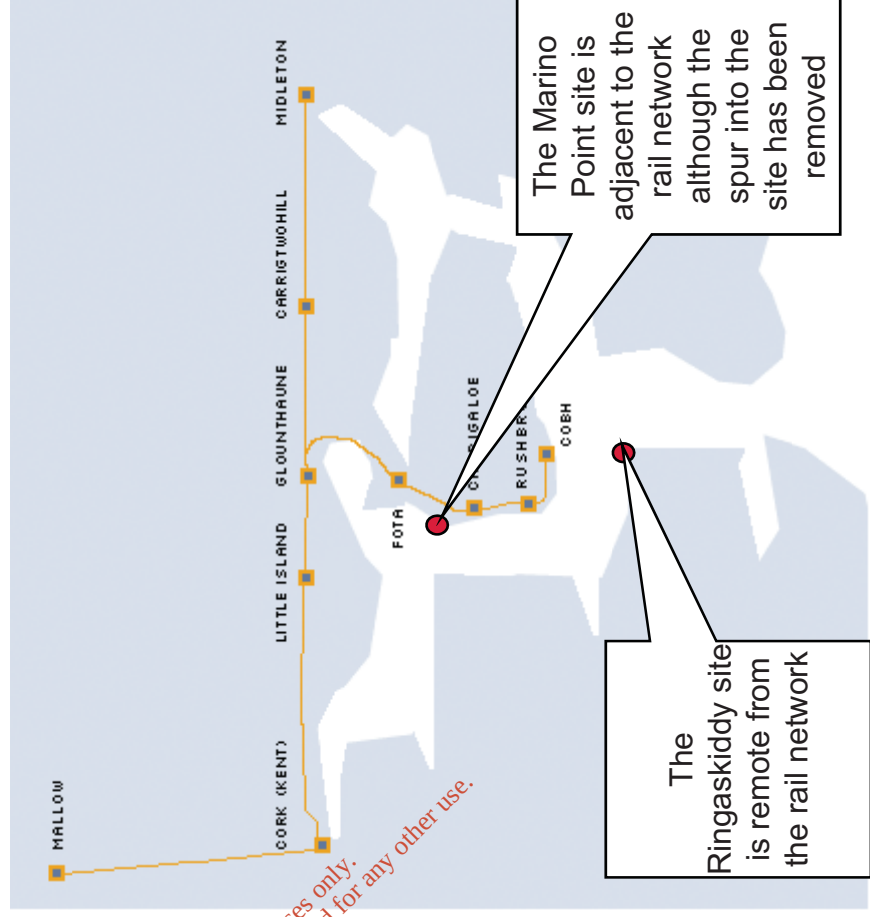
- The only freight trains running are full train loads - IE no longer carries single containers and consolidates them into train loads
- A new freight service between Ballina and Dublin started operation in September 2009:
 - 2 trains per week initially with plans to rise to 3 later
 - 9' high containers initially increasing to 9' 6" later (50/50 split between 9' and 9' 6" needed)
 - Same customer (Atlantic Industries) and operator (DFDS) as Ballina -Waterford service which will not be affected.

The national rail network is mainly radial, centred on Dublin. Locally, there is a local line between the City and Cobh/Midleton

National Rail Network



Local Cork - Cobh /Midleton Line



For many years, passenger operations have been Iarnród Éireann's primary business, and the existing rail infrastructure reflects this

- The Dublin – Cork and Cork – Cobh routes are double tracked:
 - €700m of track renewal work is required on the Dublin-Cork line but this is not yet programmed
 - 4-tracking of the Dublin - Cork line between Dublin and Kildare is underway at present.
 - The remainder of the network is single line, except the DART line and the Dublin-Belfast Line
- The signalling system is Centralized Traffic Control (CTC) for the most part but routes that are not highly used for passenger traffic tend to have mechanical signalling i.e Kilmastulla (Birdhill) – Castlemungret (Limerick), Ballina through to Knockcroghery, Drogheda to Navan.

Cork Rail Tunnel



Source: Iarnród Éireann, Booz & Company analysis

Note: It was reported at the Rail Freight Meeting arranged by Trade Facilitation Ireland on 17th April that Iarnród Éireann was to assess the implications of clearing the Portarlinton - Dublin line

The current height and weight restrictions are also reflective of a primarily passenger network

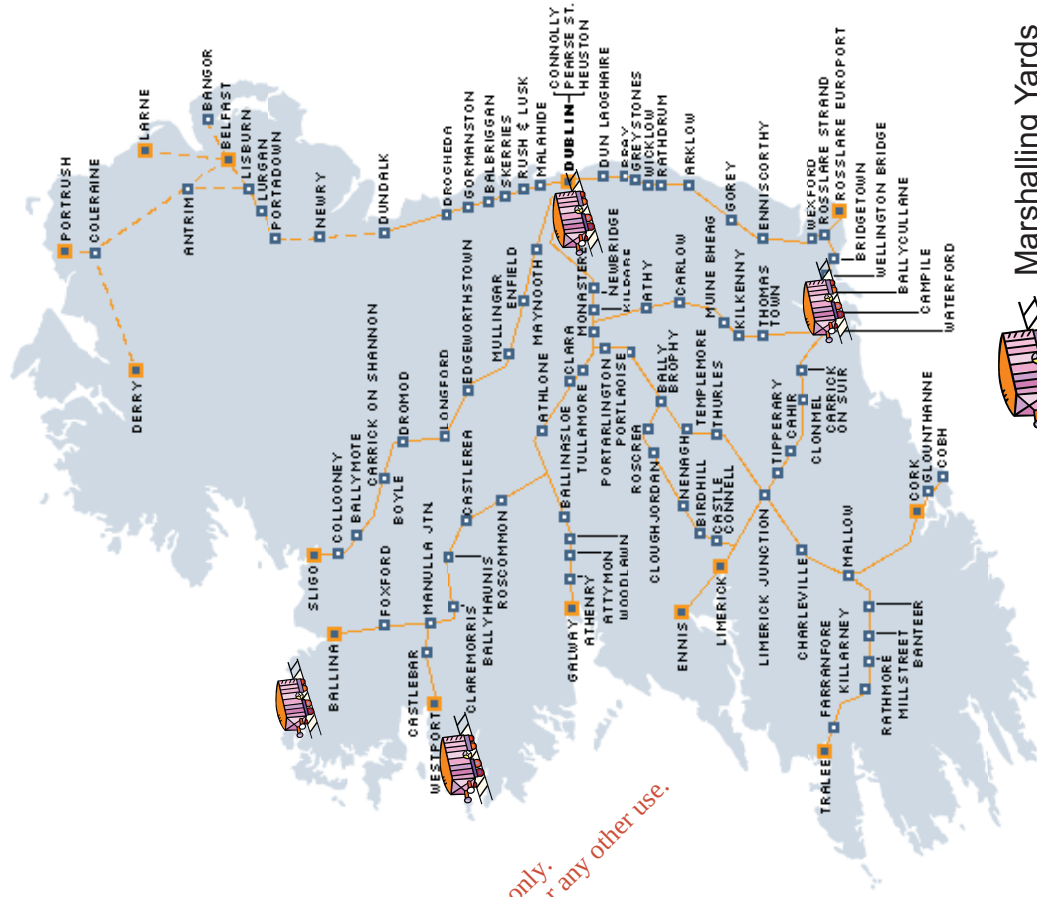
- Weight clearance:
 - The current network is cleared for an axle loading of 15.75 T
 - This axle loading is not a key issue/constraint for passenger traffic; however, internationally, rail freight networks are gradually increasing their axle loadings well past 18T and are stretching to 22T-25T
- Height clearances:
 - The Ballina – Waterford line is cleared for 9’ 6” high containers. The Belfast and Sligo lines are cleared for 8’6” containers and the remainder of the network for 9’ containers.
 - On the Dublin - Cork Line, height clearance is only an issue north of Kildare, except at the Cork Rail Tunnel on the Cork-Dublin Line immediately to the north of Kent Station.

Options for getting clearance

- In discussions, IÉ reported that axle loadings are constrained by the current rolling stock and loadings could be taken past 20T with new rolling stock.
- The height clearance required at the Cork Rail Tunnel is minimal. It can be gained either by:
 - Lowering the level of the tracks - but this would cause major disruption to existing services; or
 - Procuring new rolling stock.
- Iarnród Éireann are currently undertaking an assessment of the Cork Rail Tunnel to understand what might be required to achieve clearance for 9ft 6in containers

Freight traffic is now all in full trains loads, therefore there is little reliance on marshalling yards

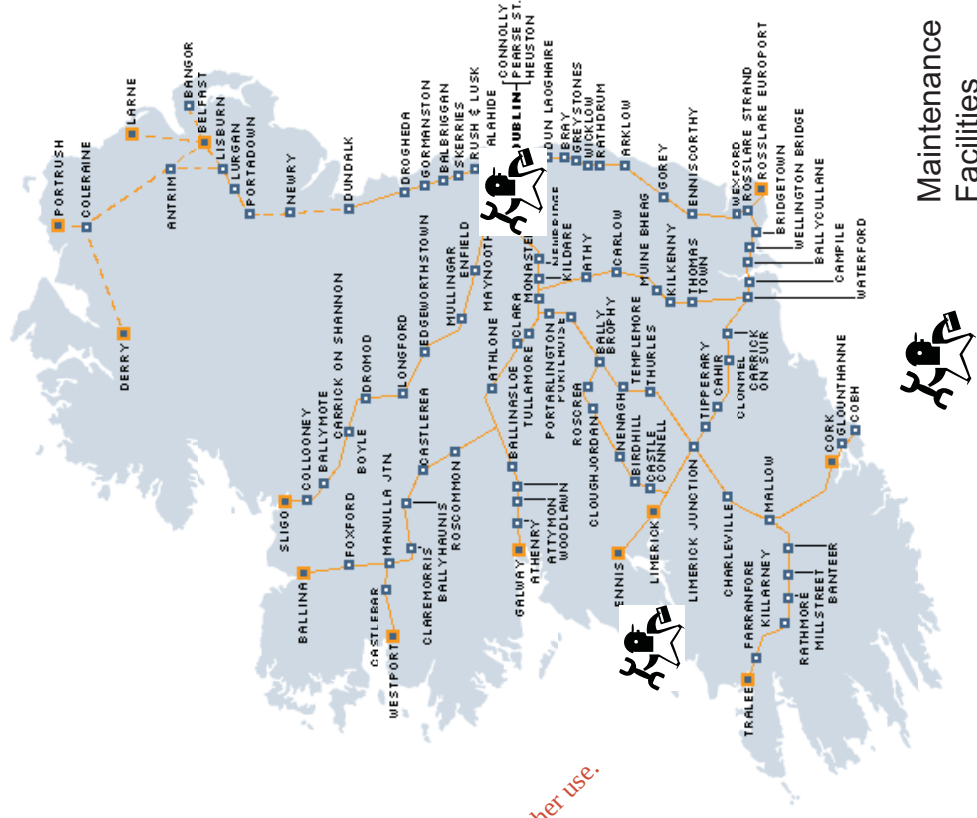
- As most of the freight traffic is in full train loads there has been no need to retain marshalling yards
- Marshalling yards are traditionally retained if operators still shunt wagons and make up trains of (in many cases) single loads of cargo going to multiple areas
- Marshalling yards exist in North Wall (Dublin), Ballina Westport and Waterford
- In the Cork area:
 - Mallow Freight Depot was closed in 2004 but is still in IÉ ownership
 - The rail connection to Cork's existing container terminal at Tivoli Docks has not been used since the 1990s and is no longer intact
 - The North Esk Freight Yard, Little Island, Cork, is no longer used by Iarnród Éireann and was disconnected from the network in November 2008 as part of the recent track and signalling upgrading on the Cork-Cobh line. IÉ confirmed that the depot can be re-connected at any stage in the future if viable rail freight traffic arises.



Marshalling Yards

The ability to maintain freight rolling stock is located primarily in Dublin and in Limerick

- Freight maintenance capabilities are concentrated in Dublin (Inchicore and North Wall) and to a lesser extent in Limerick
- Rolling stock for any future freight services in Cork would need to travel a distance to be maintained, be that planned maintenance or unplanned maintenance. This would have cost and operational implications.
- As the fleet has only about 10 years remaining life, planned regular maintenance will be important and it is likely that unplanned maintenance will need to happen on a more regular basis



Maintenance
Facilities

IE has rolling stock available, but estimates that this fleet has only 10 years remaining life, so new rolling stock would be needed

Overview of current rolling stock use

Current Fleet	Likely demand on current freight services	Remaining fleet availability
12X50T Bulk cement wagons	Cement (Drogheda - Mullamore)	Captive?
27X54T ore wagons	Shale/Tara Mines	Captive?
26X39T ore wagons	Shale/Tara Mines	Captive?
■ 200X42ft 9 in long container flats ■ 60X47ft 9 inch long container flats ■ 40X 60ft long container flats ■ Total 300 wagons	■ Waterford – Ballina container service –18 TEU –Max. required is two rakes of 12 Container flats = 24 Container flats ■ Ballina/ Westport – Waterford timber service –Assume same, 24 Container Flats	Remaining capacity 250 Container flats



Comparing this data with the Strategic Rail Review (2003), there has been a 66% decrease in rolling stock from 2002 to 2009

- IE reported at the recent Rail Freight Meeting on 17th April that investment in new wagons would be needed for the proposed Ballina-Waterford service if the business proved to be sustainable

IE anticipates that existing locomotives will be available for the foreseeable future but that additional drivers would be needed

- IE has a fleet of 32 recently refurbished Class 201 locomotives which were bought in 1994. These should last until at least 2014, although further refitting and refurbishment will be needed in future

- Of these, IE require 10 for passenger operations on the Dublin-Cork service and 3 for the Dublin-Belfast service

- The number of locomotives that would be available and the performance of this fleet would affect the cost of operations

- IE has advised that it would not have sufficient driver resources for a new rail freight service, proposals should allow for driver costs.

- IE's restrictions on Class 201 locomotives do would not appear to prevent their use for freight

Refurbished Class 201 Locomotives

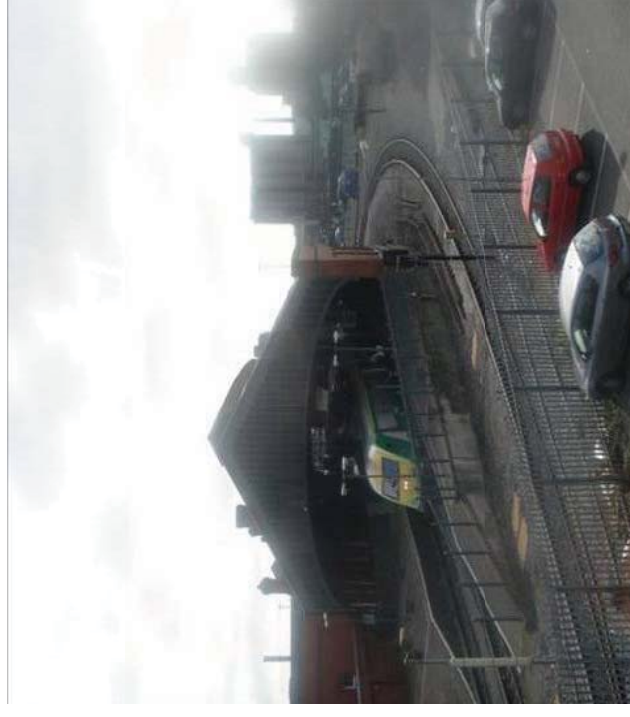
In use on Dublin-Cork Line



IE's proposal to remove the loop line at Kent Station would prevent freight operating through the station in future

- At Kent station, a loop line just outside the south wall of the existing passenger station allows through trains to bypass the passenger platforms, where passenger trains are often standing for substantial periods.
- The loop line also provides access to a number of operational areas which currently lie on the railway land to the south of the station area.
- The development plans for the station involve the transfer of all the land to the south of the loop line to a private developer.
- The development proposals allow for new facilities to be provided for through running of suburban passenger services between Mallow and Cobh.

Existing Loop Line at Kent Station



- Iarnród Éireann has confirmed, while they do not have a property development partner at present, the loop line will be removed to develop the site. This would make freight operations through Kent Station difficult, if not impossible, as the other lines would be busy with passenger operations

In summary, there are many infrastructure and rolling stock constraints for rail freight operations in the Cork area

Summary of Infrastructure and Rolling Stock Issues

	Status/Description	Implications
Railway network coverage at sites being considered	- Marino Point site is adjacent to Cork - Cobh Line, which connects to Cork - Dublin Line at Kent Stn - Ringaskiddy is remote from railway	Connecting Marino Point to the railway would be reasonably straightforward. A Ringaskiddy connection would involve a major infrastructure project
Network connectivity	IE plan to remove the loop line at Kent Station, preventing future through running for freight	The loop line exists at present. There may be a case for its safe-guarding, despite IE's proposals to remove it.
Track and signalling	- Good quality twin track on Cork - Cobh line with recent investment in track and signalling - Cork - Dublin line is due for renewal	- Cobh line is a valuable asset - freight may be an opportunity realise its full potential - Existing track condition may be a constraint on Dublin line
Height clearance	Clearance for 9' containers only at Cork Rail Tunnel	- Potentially expensive to clear for 9'6" containers - Could possibly be resolved with new rolling stock
Weight and length clearance	15.75 tonne axle weight limit - equivalent to 36 TEU maximum train length	It appears that in practice this limit could be increased significantly with new rolling stock.
IE freight yards	- North Esk Freight Depot disused and disconnected - Mallow Freight Yard closed	- Reactivation of North Esk is possible, albeit with investment. There may be a case for its safe-guarding - No other obvious sites for freight depots of any description
Customer connectivity	- Network covers little of the Port's hinterland - No customers have railheads	- Grants to provide railheads for customers near rail - Distribution centre could serve a regional concentration
Rolling stock	- IE's existing freight wagons near life-expired - Locomotives available but no drivers	IE advise that proposals should allow for wagons and drivers but that locomotives are available

There are other obstacles to developing a rail freight business, the most significant being the highly competitive road freight market

Potential Obstacles	Considerations in Overcoming	
▪ Daunting competitive landscape: – Good road network, generally free to use – Highly competitive road haulage sector	▪ A package of incentives and penalties could shift traffic from road to rail but there would be very significant issues about acceptability, practicability and cost ▪ The benefit of shifting from road to rail would depend on the level of congestion on the road network	Difficult to see rail competing with road in the Cork area for the foreseeable future
▪ Fixed ideas which may or may not apply: – Rail freight only suited to large low cost bulk goods carried over long distances – Rail freight costs more than road	▪ Regular, frequent rail operations over short distances can also work ▪ Containerised rail freight has overtaken bulk commodities in the UK ▪ In congested road conditions, rail can be cheaper and more reliable than road transport	Road congestion not expected to the extent that would advantage rail
▪ Current railways arrangements (besides infrastructure and rolling stock): – Iarnród Éireann focus on passenger operations – Whilst the railway market is in theory open to competition, in practice Iarnród Éireann has a monopoly	▪ The Department of Transport confirms that by 2011 it will have a revised legal and institutional framework in place such that private specialist rail freight operators could enter the market ▪ Whether the private operators would be attracted is uncertain as yet - no market testing has been undertaken	Emerging IÉ/Port/Freight Forwarder partnerships may be more likely model

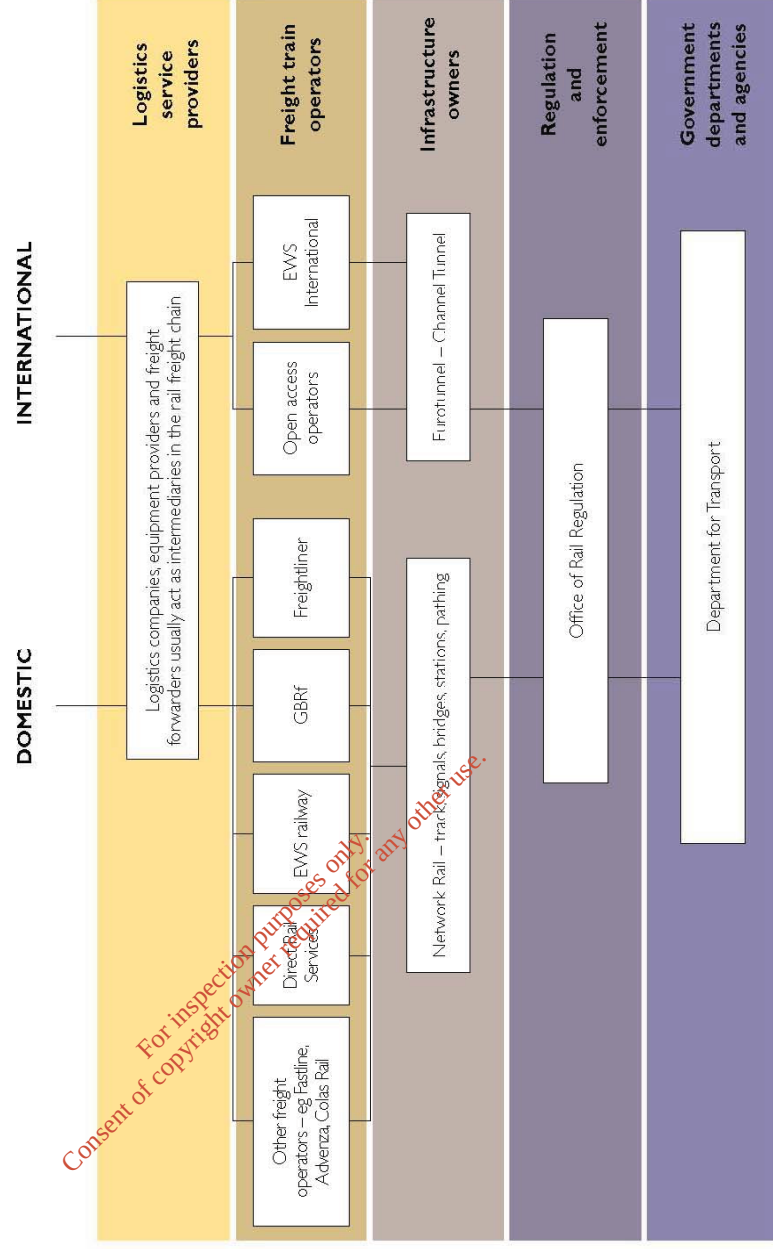
Some of these obstacles have been overcome in recent years in the UK

Recent Growth in UK Rail Freight

- In the UK, rail freight declined in use between the 1950s and the mid-1990s, but since then there has been 66% increase
- FTA/Rail Freight Group are forecasting that rail freight use will double by 2030
- Rail freight is a commercial service operated by private freight train operating companies for private freight customers, sometimes through intermediary logistics services providers
- Government grants exist for:
 - Building infrastructure (Freight Facilities Grant)
 - Ongoing running costs (Rail Benefits Procurement Scheme)

Source: "Marking use of rail - a guide for shippers", Freight Transport Association, February 2009

The structure of the rail freight industry in Great Britain



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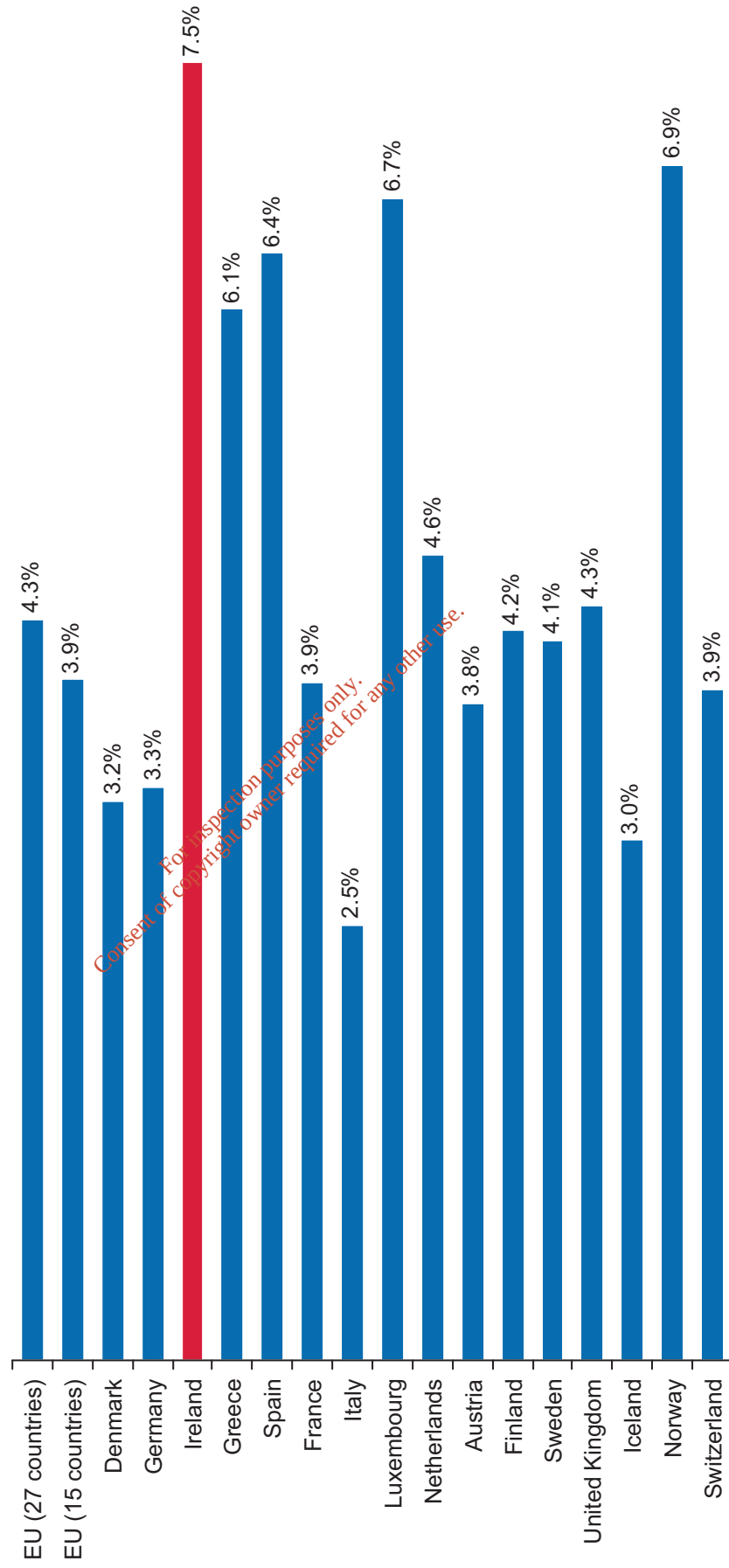
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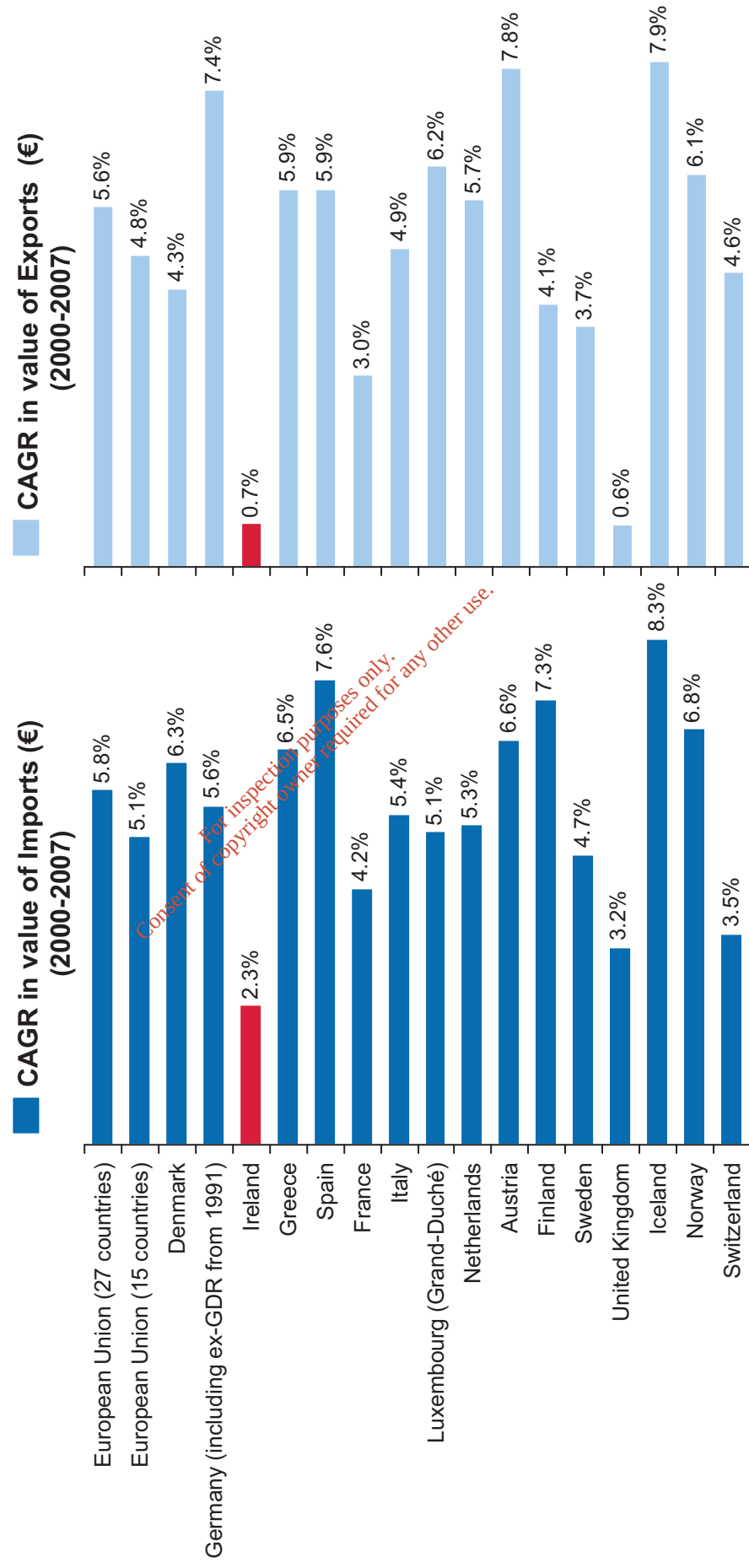
Ireland has experienced one of the highest GDP growth rates of the developed countries in Europe over the past decade

Compound Average Growth Rate in Purchasing Power Standard (1999-2007)



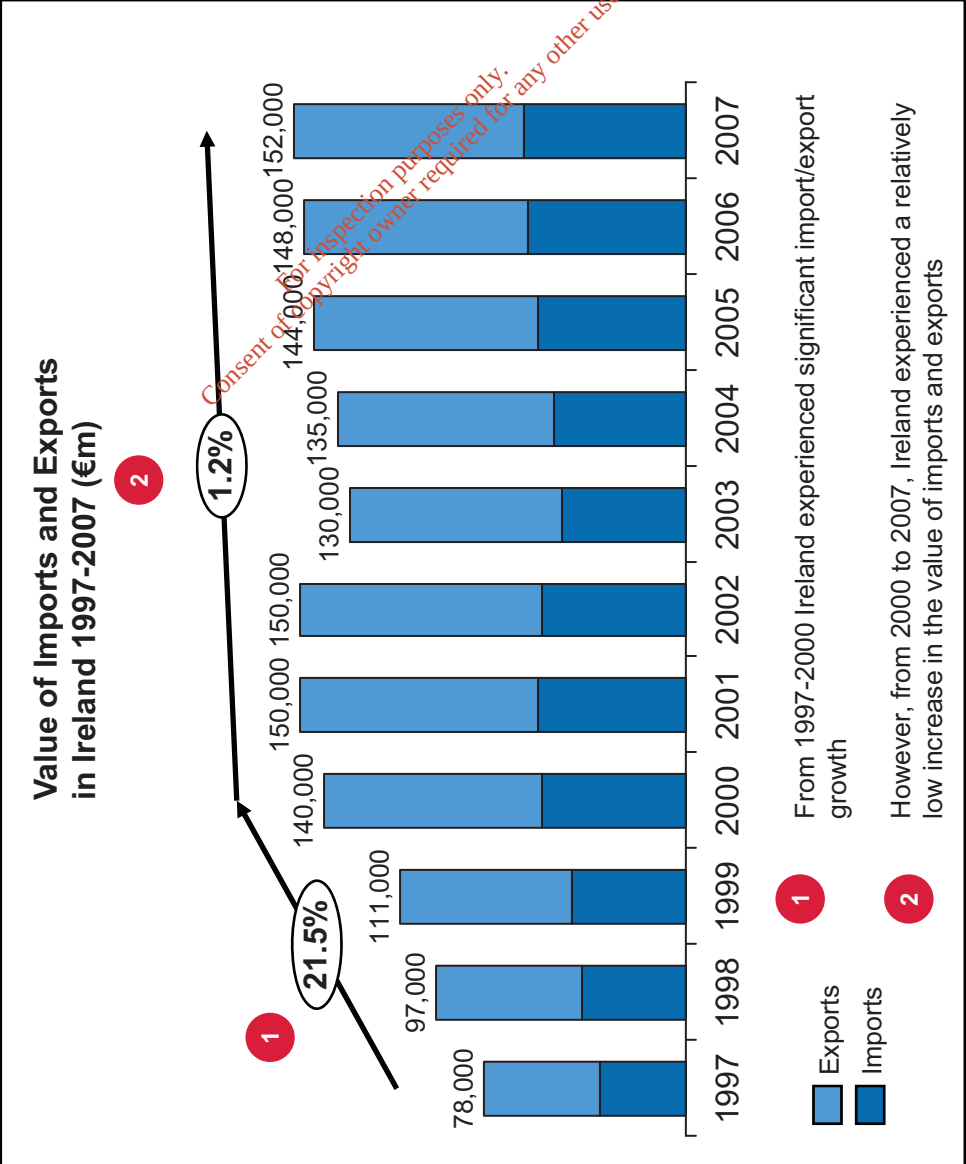
Source: Booz & Company analysis based on Eurostat data. Available online at <http://www.epp.eurostat.ec.europa.eu>

However, the growth in Ireland's import & exported goods, by value, is amongst the lowest of the developed countries in Europe



Source: Booz & Company analysis based on Eurostat data. Available online at <http://www.epp.eurostat.ec.europa.eu>

The value of Irish imports & exports has not increased significantly since 2001

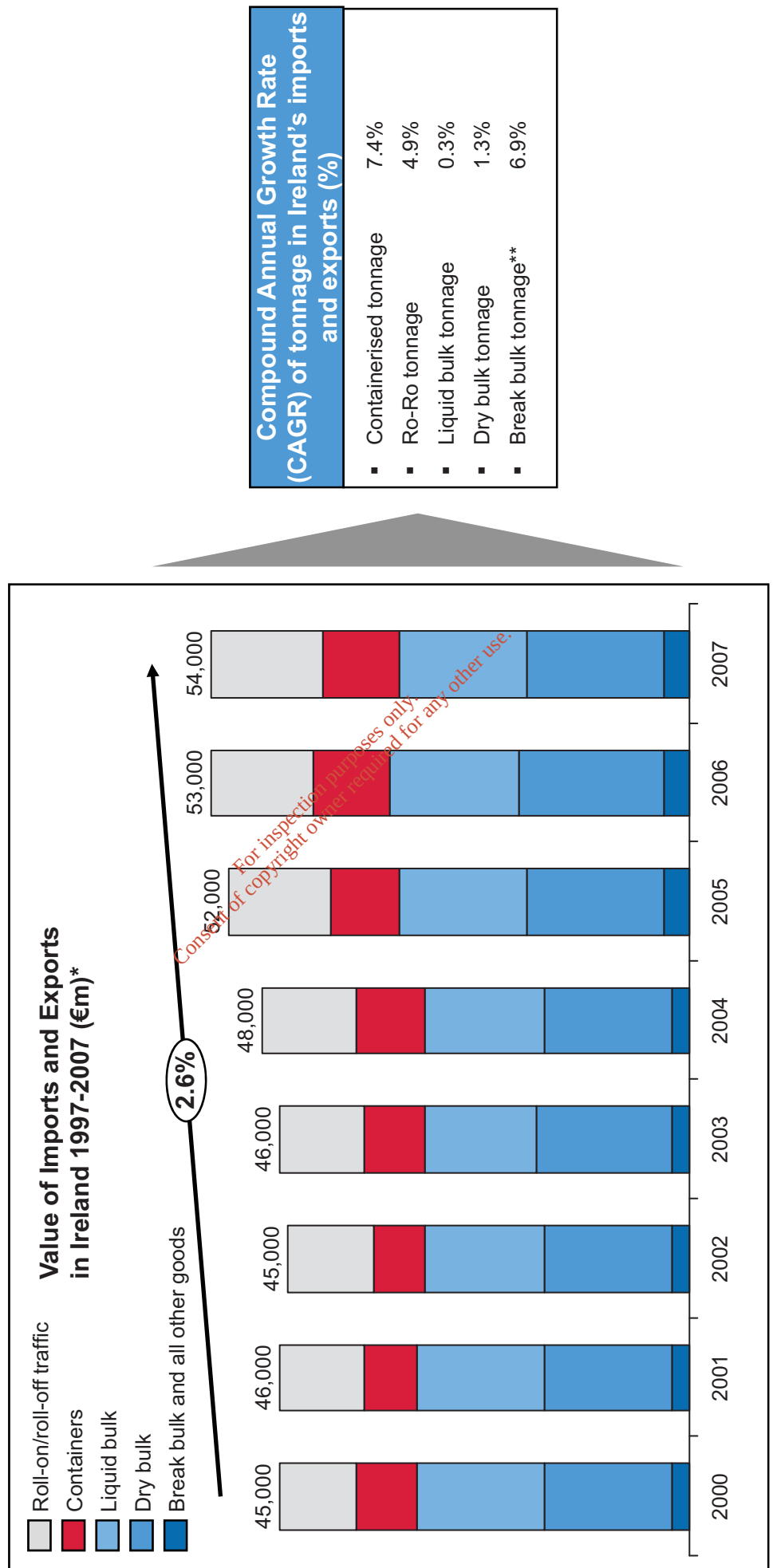


Key Points
▪ In 2007, Ireland had a trade surplus of €26,000m ▪ Which has been in a state of slow decline since 1997 ▪ Total import and export trade in 2007 was €152,000m – Exports accounted for € 89,000m – Imports accounted for € 63,000m

Main Exports (by value)
▪ Chemicals ▪ Machinery ▪ Other manufactured goods
Main Imports (by value)
▪ Machinery ▪ Chemicals ▪ Other manufactured goods

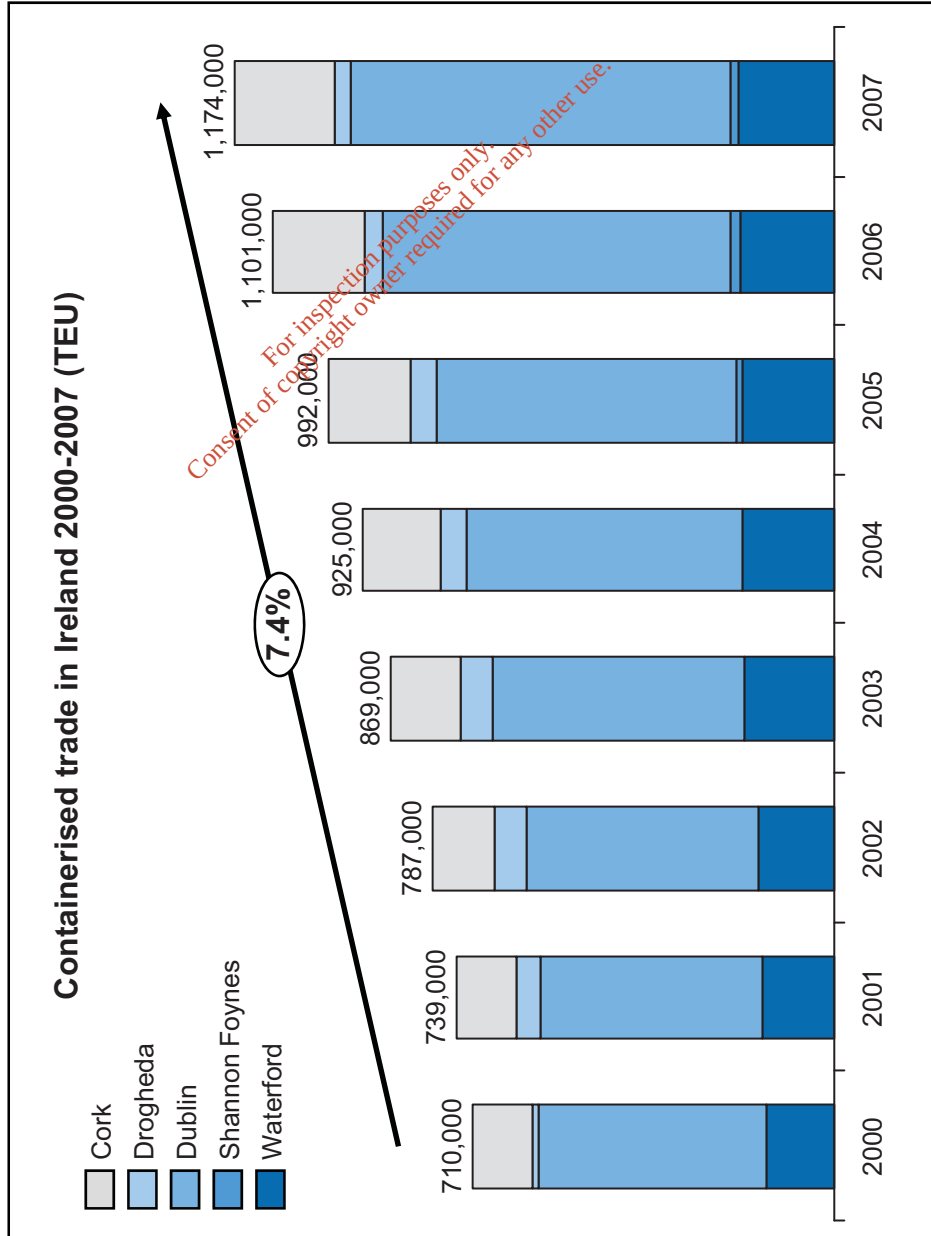
Source: Booz & Company analysis based on <http://www.cso.ie>

Despite the low value growth, in tonnage terms, Ireland's imports & exports grew at 2.6%pa since 2000, driven by containerised cargo



* Source: Booz & Company analysis based on <http://www.cso.ie>
**: Although break bulk tonnage has the highest CAGR of cargo types, its growth is off a low base and comparative to total volume, it remains small.

Containerised trade has grown at 7.4% per annum in Ireland since 2000, driven primarily by growth at the Ports of Dublin & Cork



Cork is Ireland's second largest container port

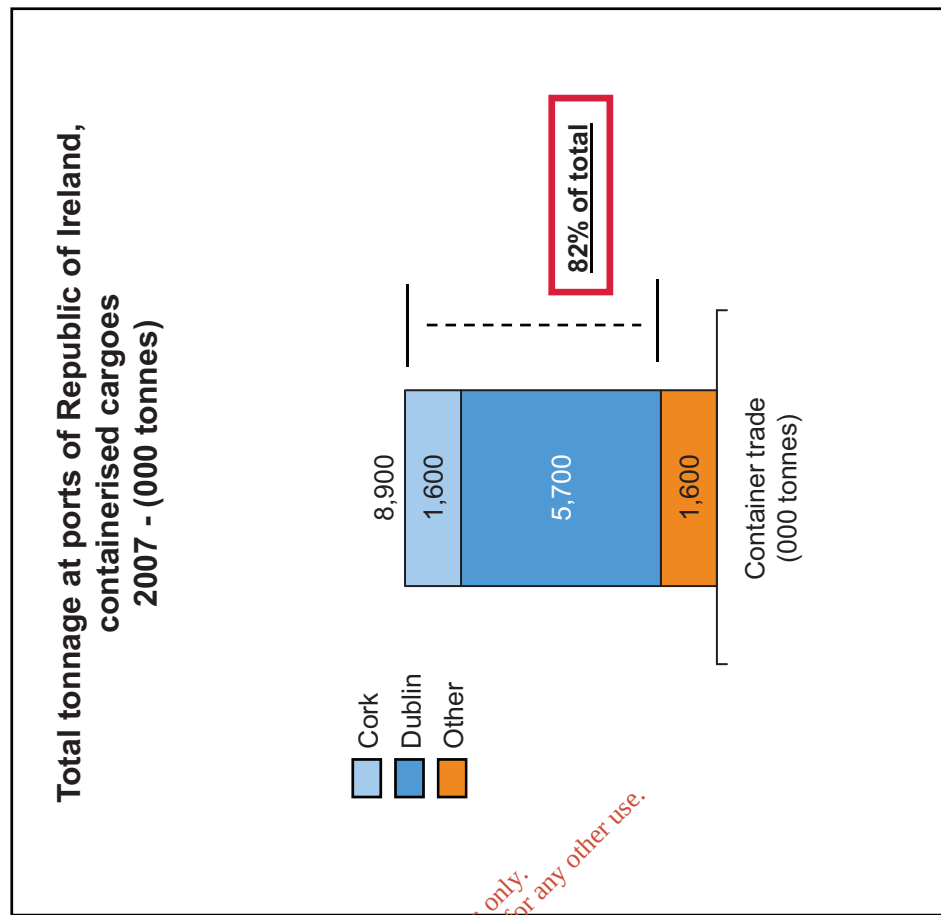
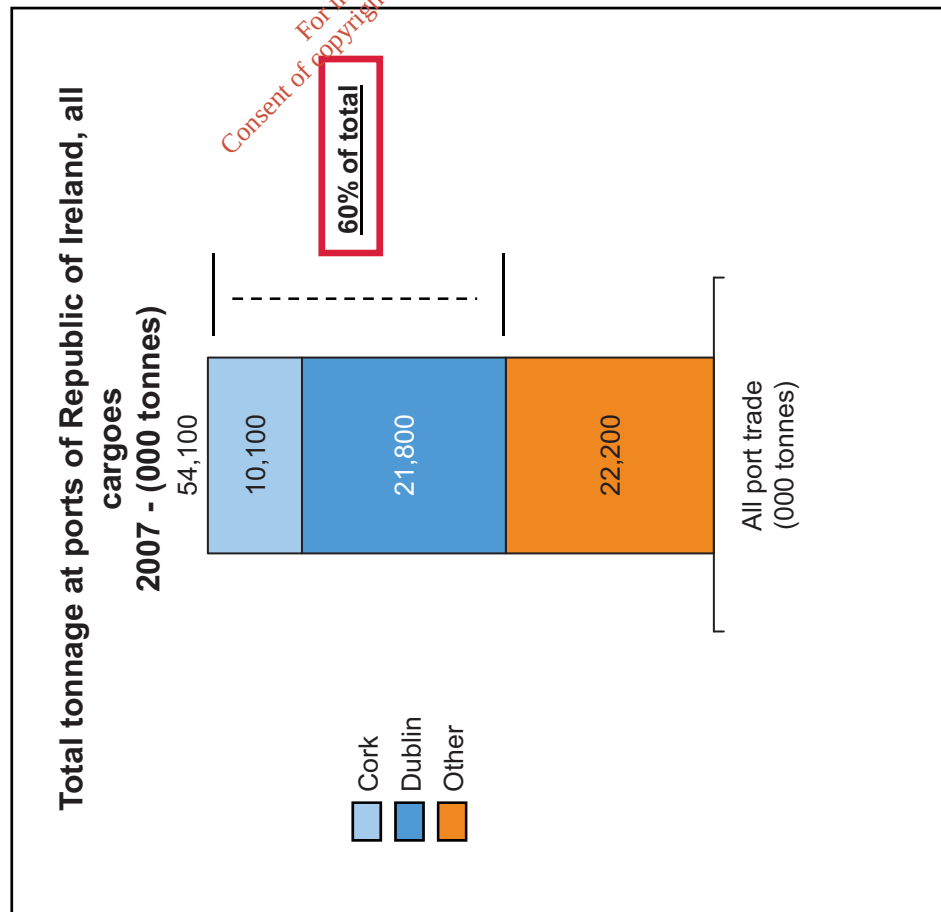
- In 2007, Dublin, Ireland's largest port, shipped 744,000 TEU in containers, Cork shipped 196,000 TEU and Waterford 185,000 TEU
- The CAGR at Dublin over the period 2000-2007 was 7.4% (roughly equal to the average growth)
- The CAGR at Cork over the same period was 7.2% (slightly lower than the average)

Ports have focused on natural growth

- The market share of the major ports has remained relatively static over the period 2000-2007. With less than 1% change in market share between Dublin and Cork over the period 2000-2007

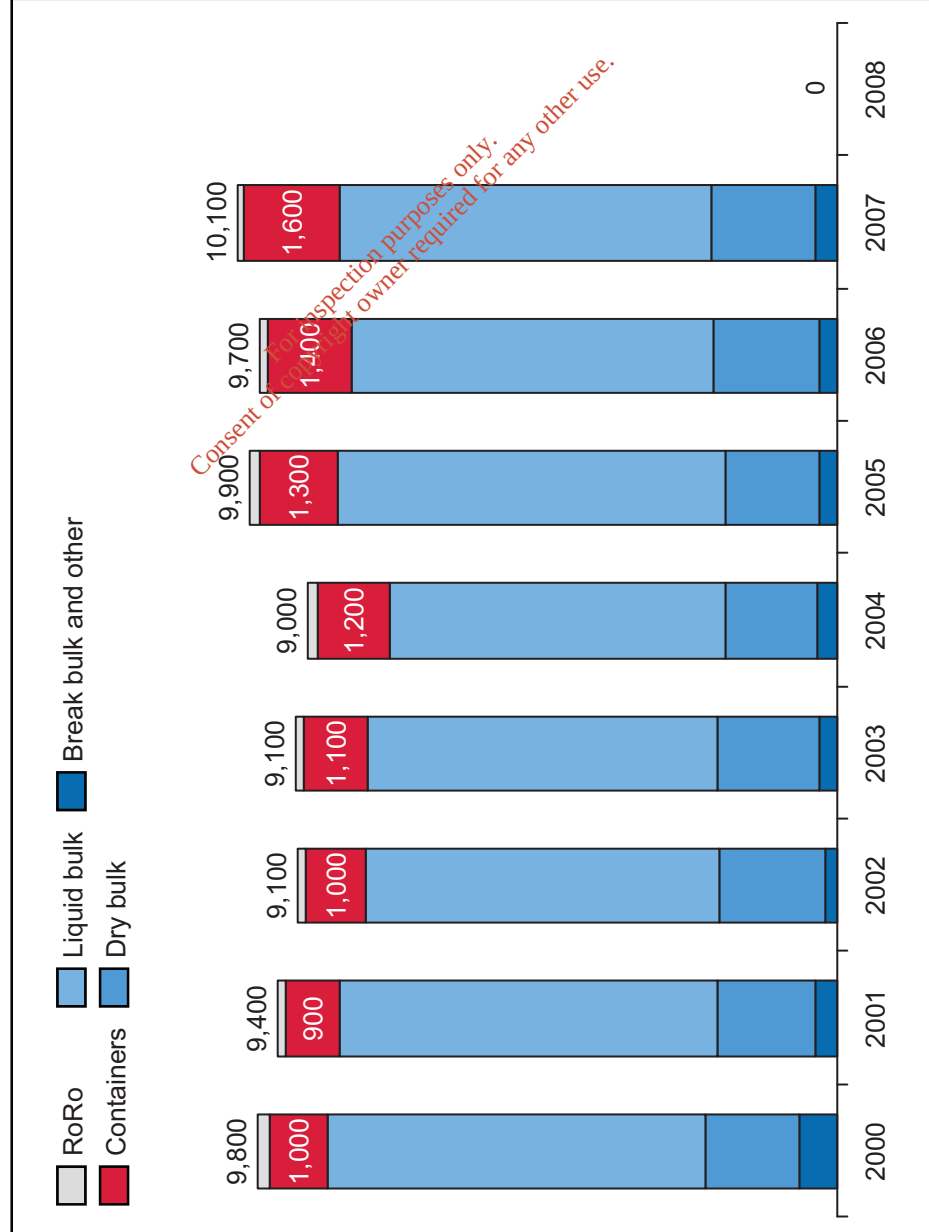
Source: Booz & Company analysis based on <http://www.cso.ie>

Dublin Port and Port of Cork are the largest ports in Ireland, by tonnage. Together, they accounted for 60% of total tonnage in 2007



* Source: Inter TradeIreland, 2007, Freight Transport Report for the Island of Ireland

The Port of Cork's growth has primarily been driven by growth in containers and liquid bulk



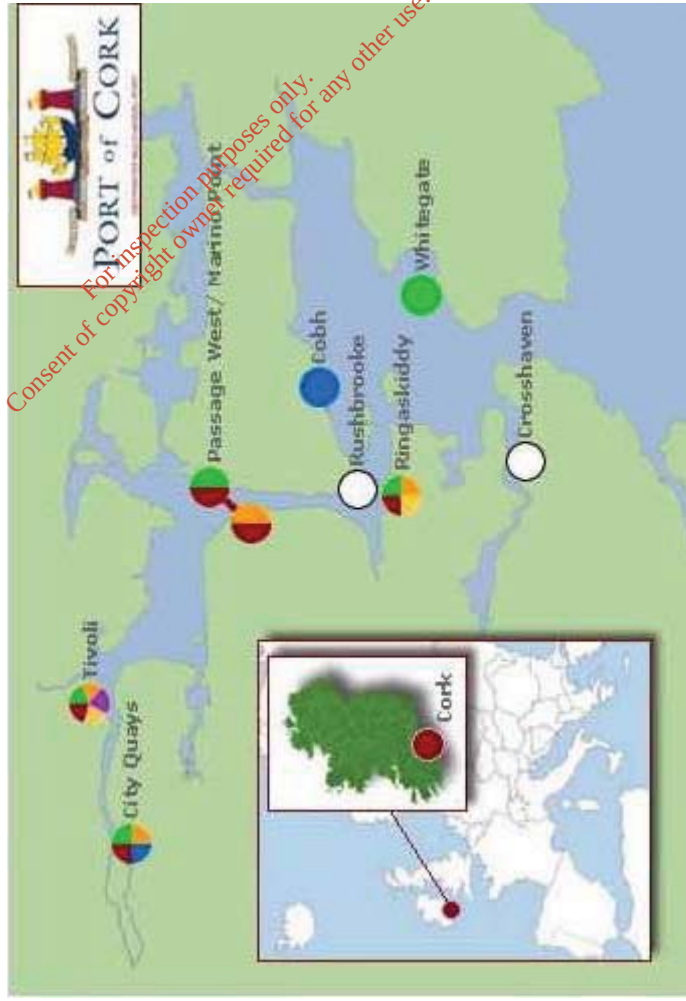
CAGR
- CAGR of Containers over the period (2000-2007) was 6.9% - Liquid bulk declined slightly in volume over the period 200-2007; however, since 2004, it has grown at a rate of 3.2%

Main Cargoes at Cork
Ranked imports by tonnage: - Crude and refined oil, animal feedstuff, fertiliser, and timber Ranked exports by tonnage - Refined oil, containers, milk powder

Source: Booz & Company analysis based on <http://www.cso.ie>

The Port of Cork is made up of a number of terminals/facilities at different locations in the harbour. Each terminal imports and exports a varying amount and type of cargoes

Overview of facilities at Port of Cork, by cargo type

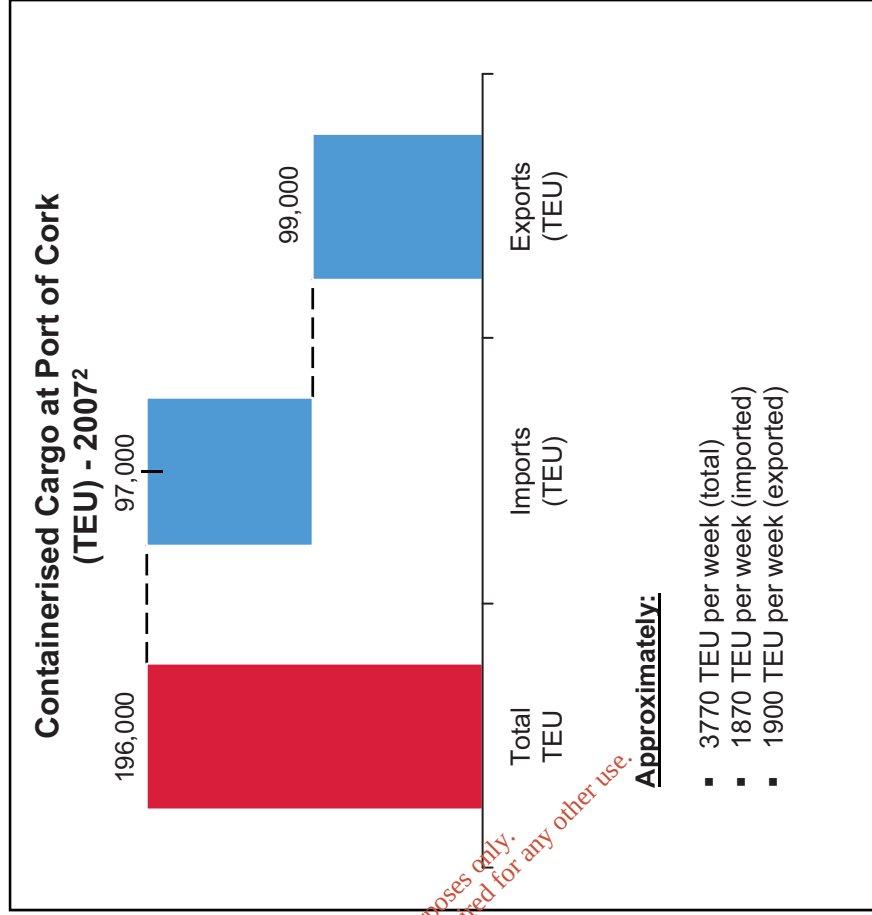
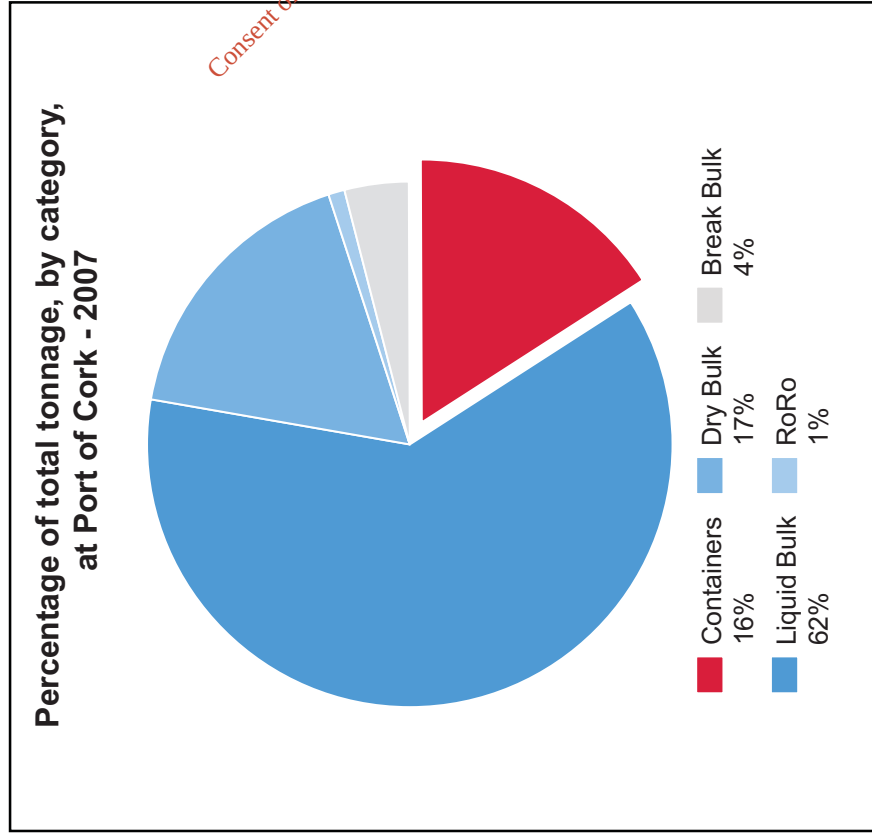


Legend:

- Bulk Solid
- Liquid Bulk
- Break Bulk
- Passenger / Cruise
- Lift On / Lift Off
- Roll On / Roll Off
- Other

Source: Port of Cork website <http://www.portofcork.ie/>

Containerised cargo (2nd largest cargo¹) at Tivoli Docks accounted for 16% of total port tonnage, or 196,000 TEU, in 2007



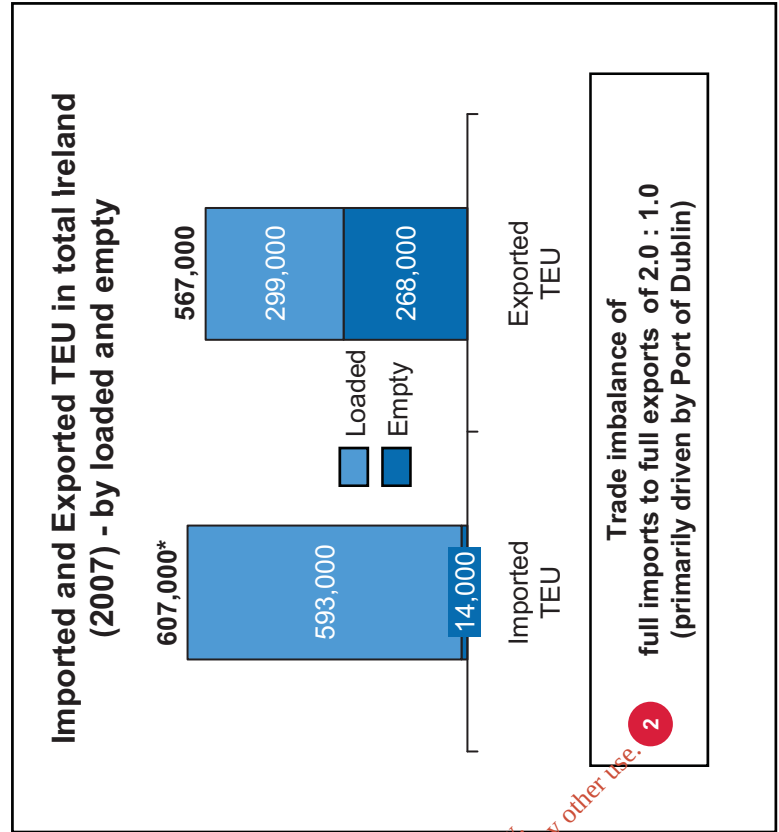
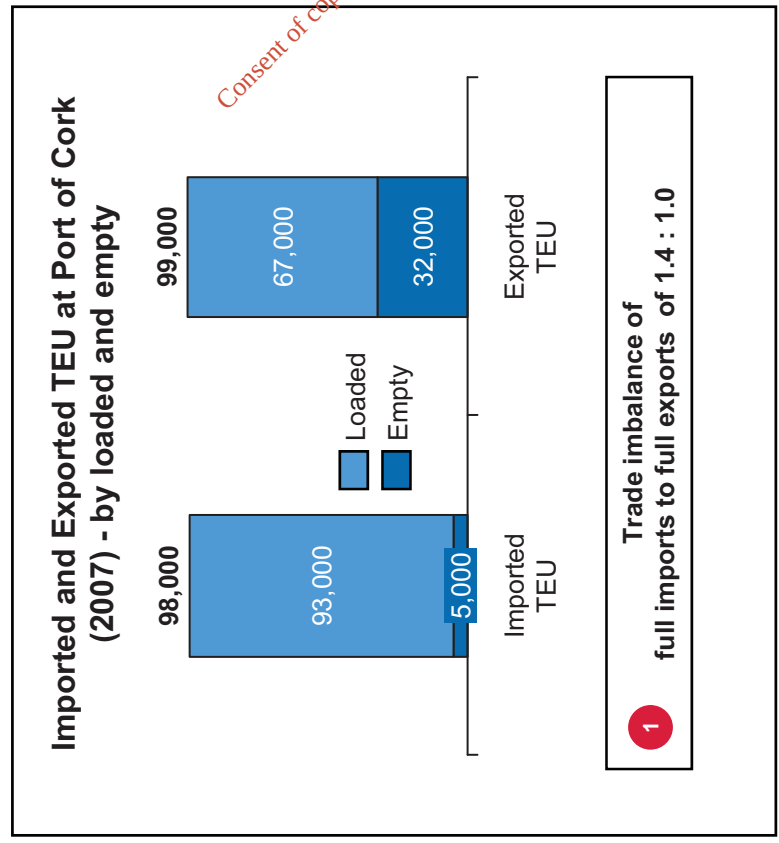
Source: Booz & Company analysis based on <http://www.cso.ie>

** Notes:

1 Liquid bulk to/from Whitegate Refinery accounts for 62% of exports& imports at the Port of Cork and is therefore the largest cargo

2 The number of containers entering and leaving port of cork are roughly matched; however, there is a significant difference in total weight of containers imported/export: due to empty imbalance and type of goods being imported versus type of goods being exported (see overleaf)

The trade imbalance of containers at Cork is lower than the Irish average - an attractive proposition for shipping companies



The lower trade imbalance of full import versus full export containers at Port of Cork presents itself as an attractive commercial proposition for shipping lines, which generally receive higher revenue for loaded containers.

Source: Booz & Company analysis based on <http://www.cso.ie>

In 2007, the main containerised exports were dairy products and waste paper. The main imports were for the building industry

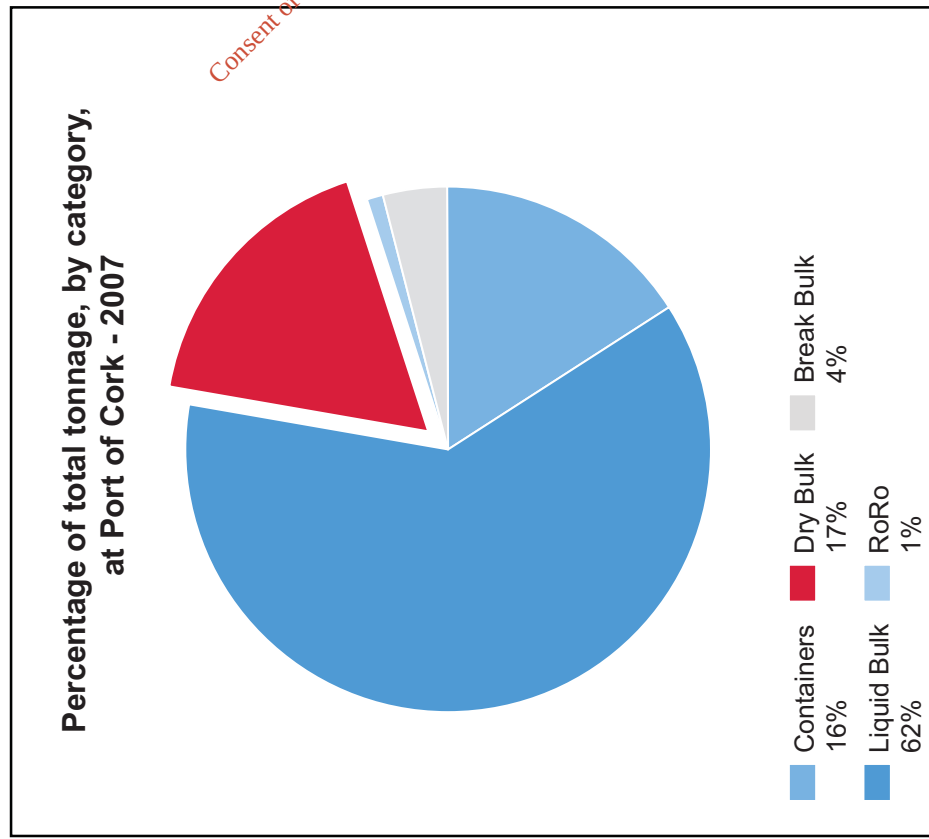
Main Containerised Exports in 2007

	Tonnes
Meat	24,000
Dairy	126,000
Drinks	92,000
Chemicals	53,000
Plastics	23,000
Caesin and other chemicals	29,000
Waste Paper for Recycling	152,000
Refractory Materials, glass bottles	47,000

Main Containerised Imports in 2007

	Tonnes
Sugar	33,000
Drinks	80,000
Computers and machinery	84,000
Chemicals	79,000
Timber and timber products for building	130,000
Salts, minerals, stones etc	37,000
Furniture	33,000
Tiles, etc	76,000
Metal Products	33,000
Plastics	34,000

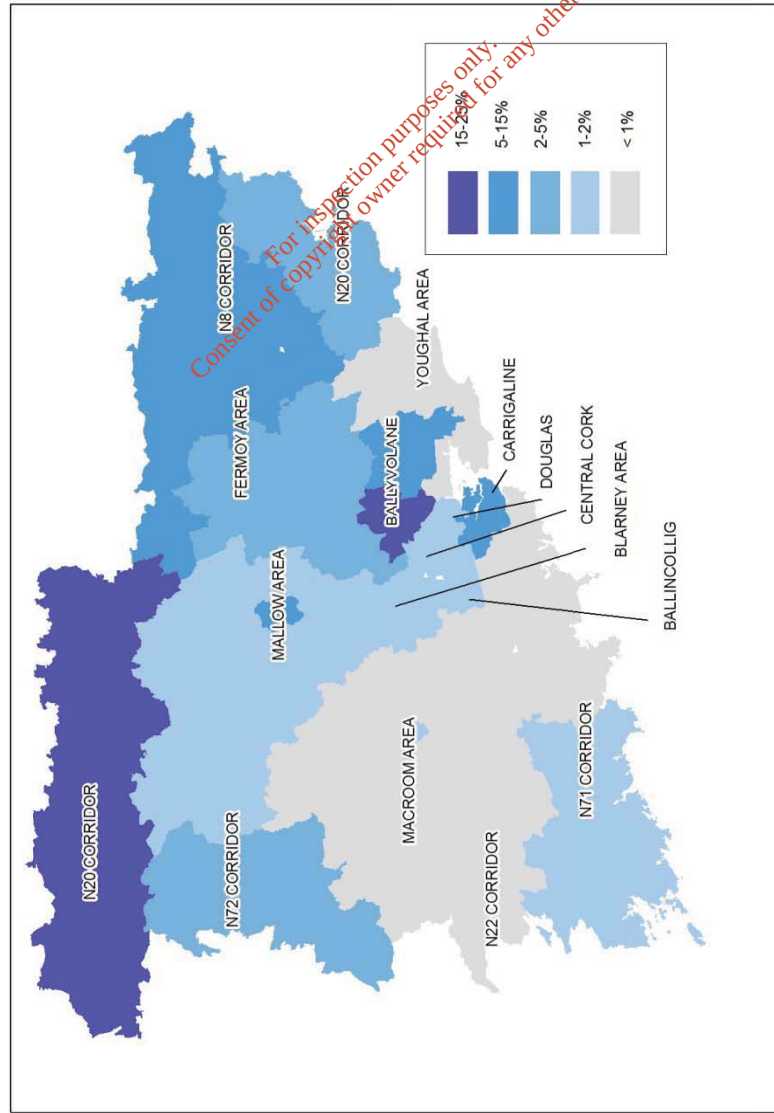
In 2007, dry bulk at Port of Cork accounted for 17% of port tonnage, comprising timber, agricultural products & zinc ores



Main bulk products at Port of Cork	
Imports	Tonnes
▪ Timber	230,000
▪ Agricultural products & supplies	580,000
▪ Coal	58,000
▪ Cereal	170,000
Exports	
▪ Timber	14,000
▪ Ore from Lisheen Mine	370,000
▪ Scrap metal	120,000

Source: Booz & Company analysis based on <http://www.cso.ie>
* Note: 'Other' accounts for more than 50% of total exported tonnage at Port of Cork. However, it is unclear from published data what this category includes.

All imported containers at Cork are carried by road, most of which have destinations in the N20 Corridor and north of the City



Area	% Truck Departures from Tivoli
Cork City	11%
Douglas	2%
Midleton	5%
Carrigaline	8%
Ballincollig	2%
Blarney	2%
Ballyvolane	15%
Youghal	0%
Bandon	1%
Kinsale	1%
Macroom	1%
Mallow	7%
Fermoy	5%
Cork Harbour	0%
N71 Corridor	1%
N22 Corridor	0%
N20 Corridor	23%
N8 Corridor	8%
N25 Corridor	4%
N72 Corridor	4%

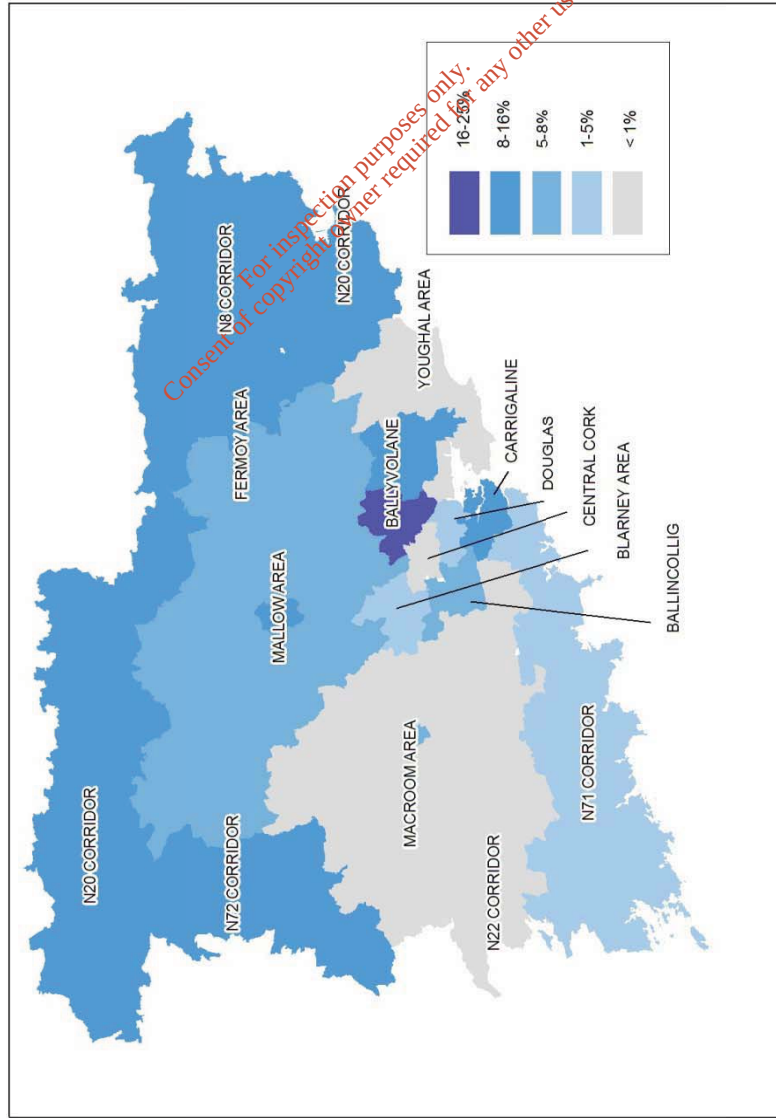
100%

Source: Proposed Development at Oyster Bank Environmental Impact Statement.

Notes:

1. The data presented within the Oyster Bank EIS was compiled from general truck surveys. The data was recorded at a high level and this map is therefore to be used for illustrative purposes only.
2. The Oyster Bank EIS, noted that drivers to/from Kerry and Tivoli or Ringaskiddy favour the N20 and N72 routes, rather than the N22 which is usually regarded as the main route to Kerry. This accounts for the low showings for Macroom and N22 Corridor
3. The destination refers to the first point of deconsolidation

Similar to imports, exported containers at Cork are carried by road, and are primarily sourced from the N20 Corridor/North City



Area	% Arrivals at Tivoli
Cork City	8%
Douglas	1%
Midleton	5%
Carrigaline	7%
Ballincollig	2%
Blarney	1%
Ballyvolane	15%
Youghal	0%
Bandon	0%
Kinsale	1%
Macroon	3%
Mallow	7%
Fermoy	6%
Cork Harbour	0%
N71 Corridor	1%
N22 Corridor	0%
N20 Corridor	22%
N8 Corridor	8%
N25 Corridor	8%
N72 Corridor	5%
	100%

Source: Proposed Development at Oyster Bank Environmental Impact Statement.

Notes:

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2. The Oyster Bank EIS, noted that drivers to/from Kerry and Tivoli or Ringaskiddy favour the N20 and N72 routes, rather than the N22 which is usually regarded as the main route to Kerry. This accounts for the low showings for Macroon and N22 Corridor
3. The destination refers to the first point of consolidation

In summary, the Port of Cork’s role is regional, it does not handle goods coming/going long-distance across the country....

- Some 65% of all trips to or from Port of Cork are from the South West Region
- Nearly 95% of all trips are to or from the South West or Mid-West Region
- In other words, the Port’s trade is drawn from its immediate hinterland and there is very little competition with the Port of Waterford, its nearest competitor
- Although there are no hard and fast rules about the distances over which rail freight is a viable option¹, the distances within the Port of Cork’s hinterland are rather short

Assumed Origin/Destination	Arrivals (%)	Departures (%)	All Trips (%)
South 'West	63.7	65.9	64.8
Mid West Region	29	30.1	29.5
South East Region	7.3	4	5.7
Total	100	100	100

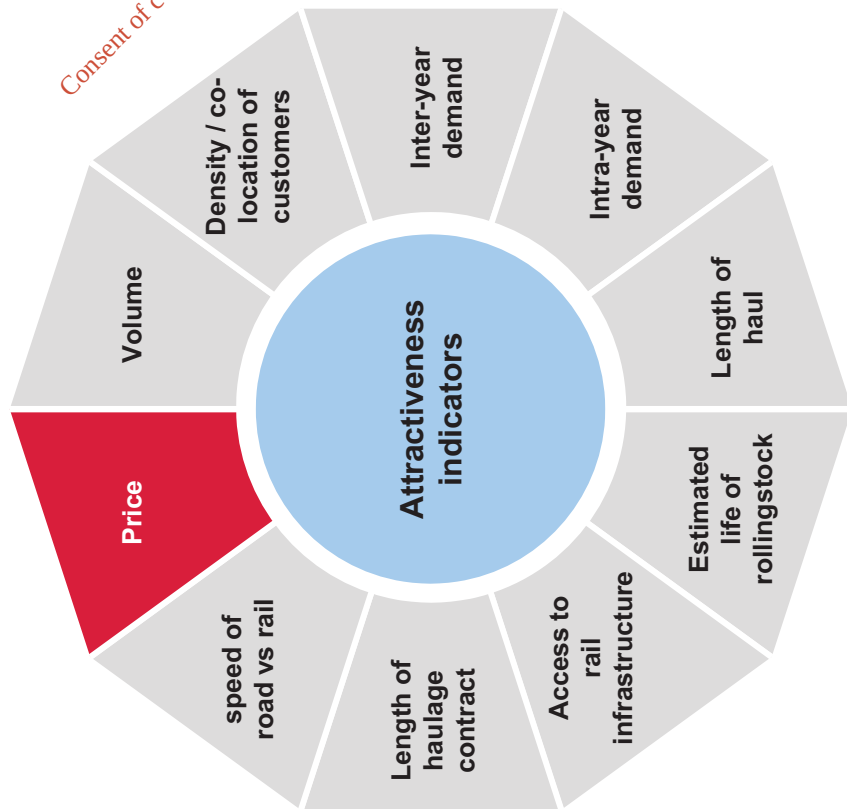
Source: Goodbody Economic Consultants, Statement to Oysterbank Oral Hearing, April 2008

Surveys carried out in 2009 have confirmed that the 2005 findings still apply

¹ Monitoring Development of the Rail Network - COM(2007) 609 suggests rail compete with road on cost grounds at distances over 150k, however, while the financial cost of shipping by rail may be greater than by road, there may still be a socio-economic benefit

.... and, at first sight, transfer of any of the Port's main trades to rail is unlikely

Although price is typically the driver of mode choice decisions, there are a number of key factors that influence a shipper's mode choice decision:



9 factors applied to the Port of Cork

- **Price:** this is always the main determinant. All containerised and dry bulk traffic currently is transported by road to and from the Port of Cork. Road haulage costs are highly competitive in Ireland and the road network is dense and high quality, so rail will not compete on price without government support.
- **Volume:** with a few exceptions, volumes are rather low in the normal context of rail transport
- **Density/co-location of customers:** customers are dispersed but concentrated regionally
- **Inter-year demand:** rail freight needs demand which is stable from year to year, to justify the capital and operational investment
- **Intra-year demand:** Similarly, highly seasonal trades do not provide the steady demand required
- **Length of haul:** no hard rules, but the most of the customers are well within 150km of the port. EC research shows road transport will cost less over these distances (see Page 15 of this report).
- **Estimated life of rolling stock:** IÉ has some locomotives available but wagons are nearly life-expired
- **Access to rail infrastructure:** At present, there is no working rail freight terminal at Tivoli, Ringaskiddy and Cork's other terminals, and none of the customers are rail connected.
- **Length of haulage contract:** because of the level of investment required, the rail operator would need a reasonably long contract - we understand that the road haulage industry does not enjoy this security
- **Speed of road v rail:** rail can be faster and more reliable than road in congested urban networks

However, this does not preclude an analysis of what cargoes are more suited than others to rail transport at the Port of Cork

- A high level analysis of the Port of Cork's larger cargoes was undertaken to assess if any would be suited to rail transport if a working rail terminal were to be constructed at Ringaskiddy or Marino Point.
- The following slides in this section analyse the main containerised and non-liquid bulk cargo flows at the Port of Cork against the criteria on the previous page. This is done in order to determine the attractiveness of rail to transport each cargo to and from the port (compared to road).

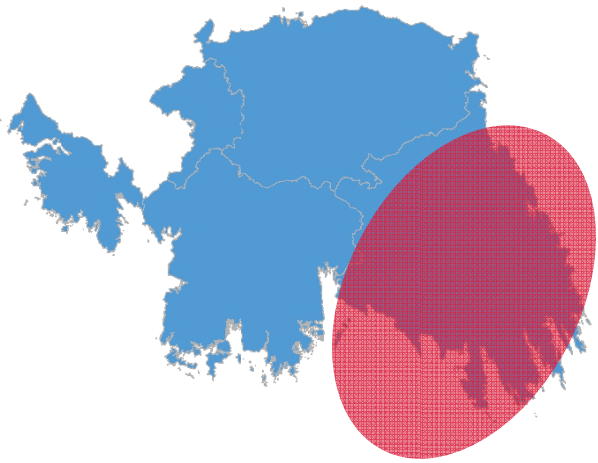
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Imported animal feedstuff is not suited to rail transport given its dispersed customer base and unstable volumes

Cargo type	Animal feed
Haulage type	Bulk
Current mode	Road
Import / export	Imported to locations throughout the South-West region
Main customer	Coops in North, East and West Cork and in Kerry

Indicator	Road	Rail
High volume	M	M
High density	L	H
Inter-year demand	H	L
Intra-year demand	M	M
Length of haul	H	L
Estimated remaining life of rail rollingstock	H	L
Access to current rail infrastructure	H	L
Length of haulage contract	H	L
Road versus rail speed	H	L
Overall	H	L

Illustration of traffic flow:



Comments:

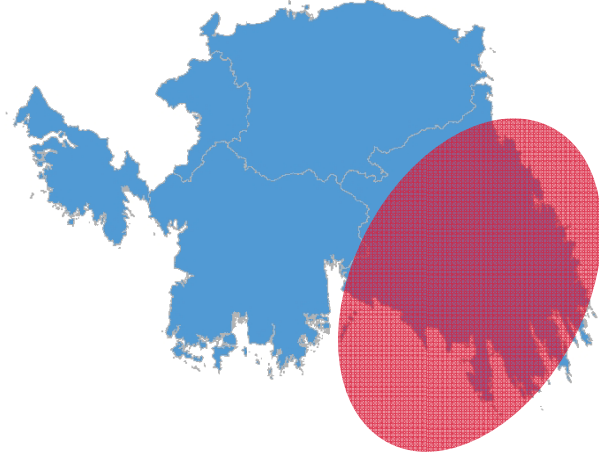
- Given the variability in volume of imported animal feedstuffs over the past few years, and the dispersed customer base, it is unlikely, in the absence of a central distribution facility that animal feedstuff would be suited for rail transport.

Timber is imported in large volumes but is not suited to rail transport given its dispersed customer base and unstable volumes

Cargo type	Timber
Haulage type	Bulk and containers
Current mode	Road
Import / export	Imported to locations throughout the South-West region
Main customer	Builders and builders' suppliers in North, East, West Cork and Kerry

Indicator	Road	Rail
High volume	M	M
High density	L	H
Inter-year demand	H	L
Intra-year demand	M	M
Length of haul	H	L
Estimated remaining life of rail rollingstock	H	L
Access to current rail infrastructure	H	L
Length of haulage contract	H	L
Road versus rail speed	H	L
Overall	H	L

Illustration of traffic flow:



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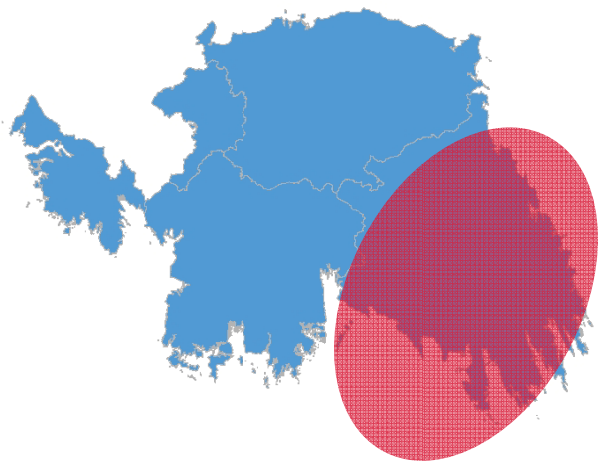
- Given the variability in demand for building materials, and the dispersed customer base, it is unlikely, in the absence of a central distribution facility that timber would be suited for rail transport.

Grain imported in large volumes but is not suited to rail transport given its dispersed customer base and seasonal nature volumes

Cargo type	Grain
Haulage type	Mainly bulk
Current mode	Road
Import / export	Imported to locations throughout the South-West region
Main customer	Oldums, breweries, various mills throughout the region

Indicator	Road	Rail
High volume	M	M
High density	L	H
Inter-year demand	H	L
Intra-year demand	M	M
Length of haul	H	L
Estimated remaining life of rail rollingstock	H	L
Access to current rail infrastructure	H	L
Length of haulage contract	H	L
Road versus rail speed	H	L
Overall	H	L

Illustration of traffic flow:



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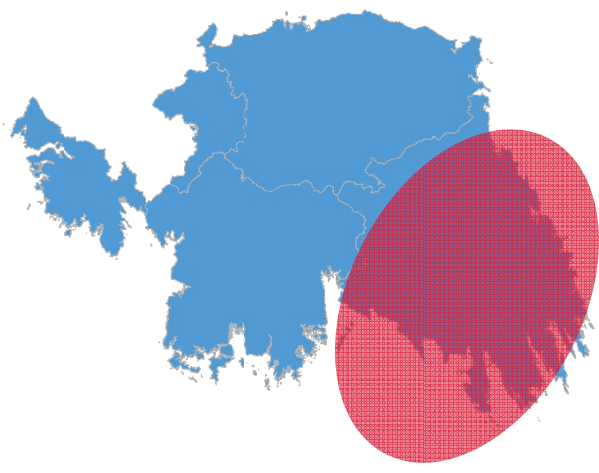
- Demand is not sufficiently well concentrated to suit rail operations

Drinks products are imported and exported in reasonably large volumes but through numerous companies each relatively small

Cargo type	Drinks -
Haulage type	Containers
Current mode	Road
Import / export	Both
Main customer	Numerous exporters and importers

Indicator	Road	Rail
High volume	M	M
High density	L	H
Inter-year demand	H	L
Intra-year demand	M	M
Length of haul	H	L
Estimated remaining life of rail rollingstock	H	L
Access to current rail infrastructure	H	L
Length of haulage contract	H	L
Road versus rail speed	H	L
Overall	H	L

Illustration of traffic flow:



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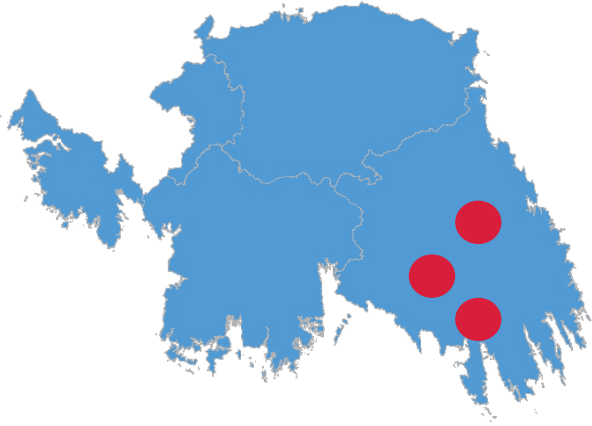
- Although the overall volumes of drinks imported and exported are reasonably large, there are numerous customers. Exporters include the local breweries, Irish Distiller in Midleton, Clonmel drinks producers, spring water producers. Importers are also distributed around the region, dealing in beers, spirits, spring waters, soft drinks etc.

Exported milk powder is suited for rail transport given its stable demand base but the customers are not on the network

Cargo type	Milk Powder
Haulage type	Bulk
Current mode	Road
Import / export	Exported from Limerick (Askeaton), Kerry (Listowel) and North Cork (Mallow/Mitchelstown)
Main customer	Wyeth (Baby food), Kerry Group and Dairygold

Indicator	Road	Rail
High volume	M	M
High density	L	H
Inter-year demand	M/H	L/M
Intra-year demand	L	H
Length of haul	M	M
Estimated remaining life of rail rollingstock	M/H	H
Access to current rail infrastructure	H	L
Length of haulage contract	M/L	M/H
Road versus rail speed	M/H	L/M
Overall	M	M

Illustration of traffic flow:



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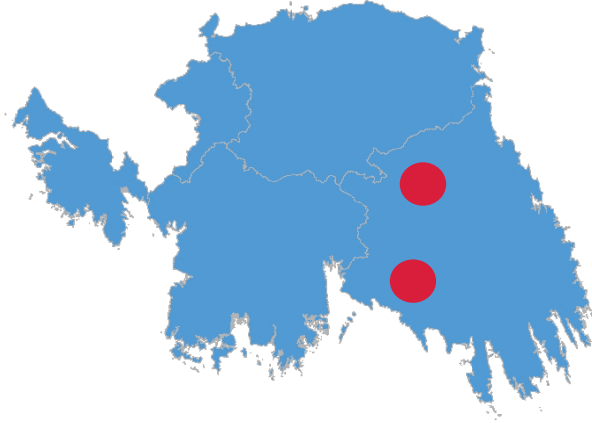
- Milk powder is an ideal candidate for rail transport given its relatively stable intra-year demand, if it could be consolidated into viable train loads. However, currently road is the more attractive option due to the lack of rail facilities at production centres and port and relatively small volumes.

Exported dairy products are not suited to rail transport given the distance of producers from railheads

Cargo type	Butter
Haulage type	Bulk
Current mode	Road
Import / export	Exported from Kerry and Cork
Main customer	Dairygold (Mallow, Mitchelstown), Kerry Group (Listowel)

Indicator	Road	Rail
High volume	H	L
High density	L	L
Inter-year demand	M	M
Intra-year demand	M	M
Length of haul	H	L
Estimated remaining life of rail rollingstock	H	L
Access to current rail infrastructure	H	L
Length of haulage contract	M/H	L/M
Road versus rail speed	H	L
Overall	H	L

Illustration of traffic flow:



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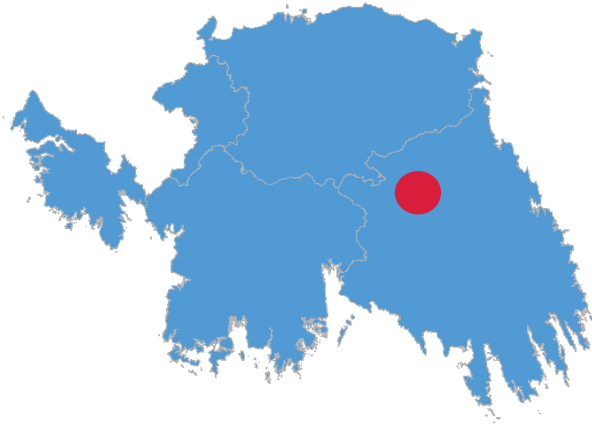
- There are three main butter flows: (1) The Kerry Group are located in Listowel, and are not located near a rail head. Dairygold are located in two places: (2) Mallow (which is on rail) and (3) Mitchelstown (which is not on rail).
- Given the relatively low volumes and close proximity of the exporter in (2), it is unlikely that this freight task is suited to rail. Also, given that (1) + (3) are not located near a railhead, it is unlikely that this product would be suited for rail.

Exported zinc would be an ideal candidate for rail transport if incentives for rail facilities were provided at the mine

Cargo type	Zinc
Haulage type	Bulk
Current mode	Road
Import / export	Exported from Lisheen Mines through Port of Cork
Main customer	Lisheen mines

Indicator	Road	Rail
High volume	L	H
High density	L	H
Inter-year demand	M/H	L/M
Intra-year demand	L/M	M/H
Length of haul	L/M	M
Estimated remaining life of rail rollingstock	H	L
Access to current rail infrastructure	H	L/M
Length of haulage contract	M	M
Road versus rail speed	M	M
Overall	L/M	M/H

Illustration of traffic flow:



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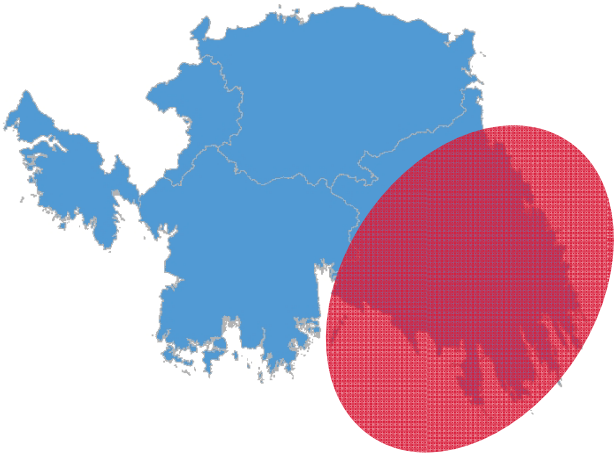
- If rail facilities were operational at both port and mine-site, exported zinc is likely to be a candidate for rail transport given its comparatively high volumes and single point of origin/destination. However, the large variability in year to year demand and the short life left at Lisheen Mines (due to be exhausted by 2014) make investment in rail unattractive at this stage but if a similar opportunity arose at a new mine, for example, Pallas Green, it probably could be served by rail.

Exported waste paper for recycling meets many criteria but the trade is too fragmented to suit rail

Cargo type	Waste paper
Haulage type	container
Current mode	Road
Import / export	Exported from all major towns throughout the South-West Region
Main customer	Various waste disposal companies and shippers

Indicator	Road	Rail
High volume	M/H	L/M
High density	H	L
Inter-year demand	L/M	M/H
Intra-year demand	H	L
Length of haul	H	
Estimated remaining life of rail rollingstock	H	L
Access to current rail infrastructure	H	L
Length of haulage contract	H	L
Road versus rail speed	M	M
Overall	H/M	L

Illustration of traffic flow:



Comments:

- Export of waste paper is a major cargo at Port of Cork, but it is fragmented across the various shipping lines and waste disposal companies, all of which tend to consolidate at the big towns in the region and not centrally.

In conclusion, none of the existing trades are suitable for transfer to rail for various reasons. Above all, they are not rail-connected

Summary of Reasons why the Existing Market is hard to serve by Rail

- None of the customers are rail connected i.e. the do not have rail access into their sites and many of them are remote from the railway network
- Most of the customers do not generate sufficient volumes to run full train loads
- Customers are dispersed throughout the region, not concentrated
- Most of the customers are well within the distance where road is more cost effective than rail
- Road haulage companies provide a competitive service

Any solution will need to overcome these problems

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Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 6

Chapter 7

Chapter 8

Chapter 9

Context

Policy Background

Rail Freight Baseline

Demand to Transport by Rail

Future Scenario with Rail

Rail Connection Options

Socio Economic Evaluation

Other Options

Conclusions and Next Steps

The most obvious possibility for a radical change in the situation would be if Cork took significant business from other ports

Major Growth Scenario
▪ Port of Cork Company pursues an active strategy to take significant volumes of traffic away from competing ports such that its business grows by a factor of two or three (say), giving it the “critical mass” for a rail operation ▪ This could be successful in the case of: – Other ports down-sizing or no longer being competitive for some reason (e.g. rising costs, industrial unrest, traffic congestion, etc.); and/or – Cork is somehow designated a leading national port and receives State support to develop accordingly; and/or – Some other unforeseen situation

Disadvantages of this Scenario
▪ No realistic prospect of the competitive position of the other ports changing to this extent as the State favours a competitive ports regime. This is unlikely to change ▪ No environmental benefit in goods currently going by ship (i.e. straight into Dublin Port) being transferred to rail (although it would be better than road), making the case for this scenario difficult to construct ▪ Does not help identify a specific demand around which to construct a case ▪ Situation remains where customers have no railheads and national rail freight infrastructure is lacking and to assess the national infrastructure needed would be a big task

This does not produce a Best Case Scenario upon which to develop and assess rail connection options

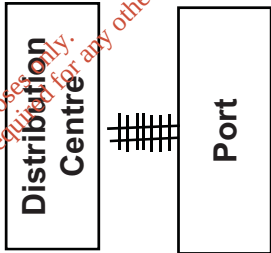
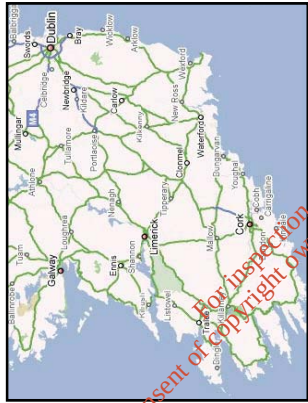
Distribution Centres overcome the need for customer railheads and provide the scale needed to justify rail operations

Distribution Centre - How it could work

- recognises that, except for certain bulk trades, few traffics can complete their entire journey by rail alone
- can serve a twofold purpose when import and export volumes are well balanced, as they are in Cork
- exports from all over the region would be taken by road and then gathered into full train loads before being taken by train to the port.
- imports would be taken from the port to the distribution centre before being taken by truck to individual destinations throughout the region.
- operated by a logistics company who can provide an end to end service for their clients regardless of the mode (i.e. whilst a container may be picked up by a truck, put on rail and then collected by a truck at the other end the customer must not feel this) and other services e.g. container power supply or management of bonded cargoes
- Distribution activities (i.e number of staff, train time arrivals etc.) would be focussed around when customers want their goods, normally between 0700-0900 in the morning

Pros and Cons

- Pros
 - Overcomes argument that customers are small, dispersed and without railheads
 - Provides sufficient density to justify rail operations
 - Contains capital investment requirements locally and to extent which can be roughly quantified
 - Takes significant numbers of trucks of the roads
 - Commonplace and successful internationally
 - Efficient, integrated, operator can transport containers by the most effective mode
- Cons
 - Double-handling, resulting in additional costs
 - Reduced flexibility/speed
 - The level of Government capital and revenue support funding needed to encourage/incentivise its use might be large



Hypothesis

A Distribution Centre located to the North-West of the City with a shuttle rail freight service linking to the port is the Best Possible Scenario upon which to build a case.

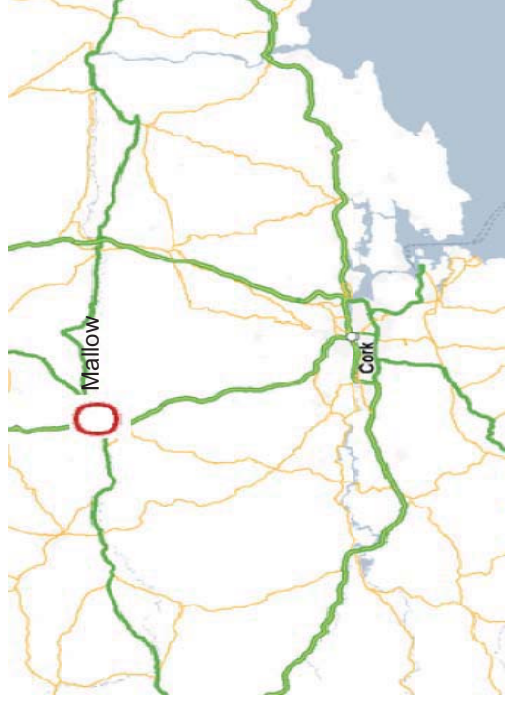
If there is no case under this scenario, there is no point in looking further.

The Distribution Centre concept lends itself well to the Cork situation and will form the basis for our options

- Underlying the concept of shifting containers to rail is the idea that a Distribution Centre will be established somewhere near or slightly north of Mallow (No site has been identified. IE has land at Mallow station, the potential of which would need to be clarified but which is not likely to be sufficient)
- This concept has underpinned our assumptions discussed previously as we have identified all traffic going north from the container terminal (wherever that might be) to be transferred to rail



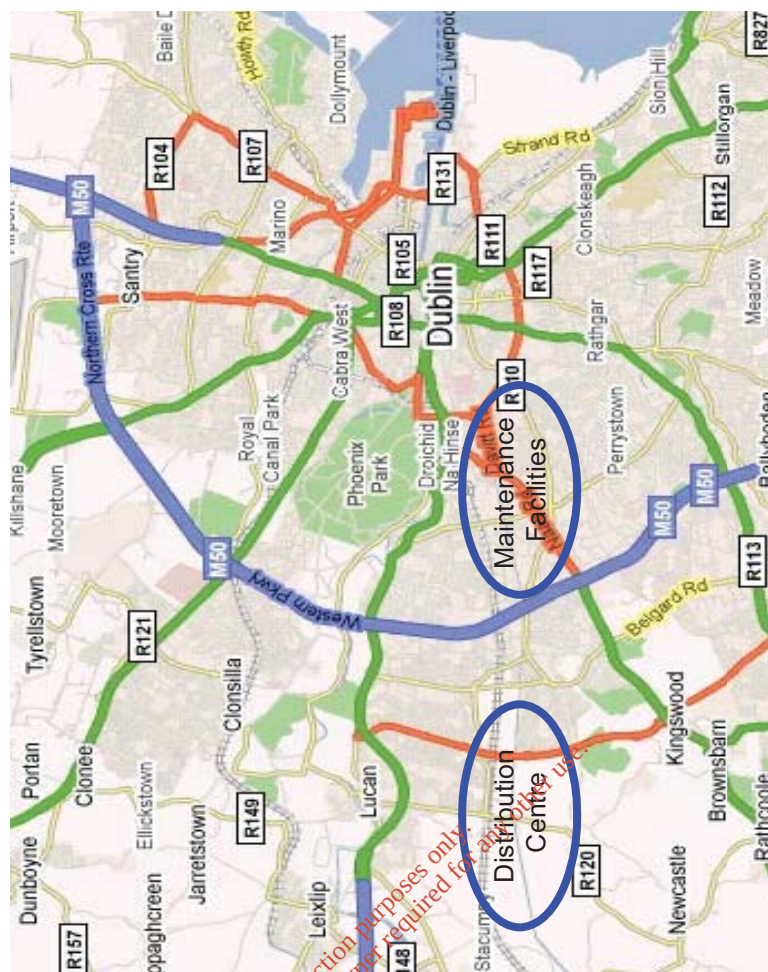
- This Distribution Centre would:
 - Receive all export containers which will be forwarded on rail to the point they are loaded onto a ship
 - Receive all imported containers which will be transferred from rail onto road and distributed to customers.
- Appendix A contains information on how distribution centres work in New Zealand



As a long term aspiration, the Distribution Centre concept could be extended beyond the Cork area/South West Region

- Cork could position themselves to be the “Port of Choice” on the east coast and establish a Distribution Centre near Dublin
- This would allow goods to be distributed in and around Dublin, relying on rail to line-haul the products and road to finish the final leg
- The site would best be located outside of the immediate city area
- Close to the strategic road network and connected into rail, the site would best be in a relatively low density area
- Ideally the site would be located close to the industrial area of Dublin, where large retailers have their own distribution centres
- There is no such site currently in railway ownership
- It would be difficult to identify benefits arising from the situation where If freight currently taken into Dublin by ship were to be taken to Cork instead and taken by rail to Dublin

Indicative Distribution Centre location



There would be no financial reason to transport via a Distribution Centre at present or in the foreseeable future - subsidy required

Direct Road v. Distribution Centre
- We examined the cost of transporting containers by rail to three locations where the port has customers of a reasonable size¹ - Askeaton, Co. Limerick - Listowel, Co. Kerry - Mitchelstown, Co. Cork - Trucks to Listowel were assumed to route on the N20, as indicated by the 2005 surveys - Costs by rail to North Kerry/Limerick are 25-30% or around €70/container higher than by road - Costs to Mitchelstown are estimated to be over 70% higher, or €100/container, by rail - Obviously, the customer would not choose to transport via the Distribution Centre (DC) unless the costs and overall service were comparable with a direct road service. - It is envisaged that the DC would be run by a private sector operator and part funded by the State on the basis that there is value in doing so. IE or another operator would run the trains. - Chapter 7 evaluates whether there would be sufficient value in the proposition to justify support

¹ These customers do not generate sufficient volumes for full train loads. There could be delays associated with the assembly and disassembly of trainloads, and with waiting for trains to arrive/depart. However, it can be assumed that an integrated logistics provider would send time-critical containers by the most appropriate mode, be it road or rail

	Askeaton	Listowel	Mitchelstown
Distance from Port - Distribution Centre (km)	50	50	50
Distribution Centre - Customer (km)	75	130	30
Customer - Port (km)	130	180	60
Distribution Centre Option			
Lift from ship to rail	729	729	729
Rail fixed cost	2000	2000	2000
Rail variable cost	493	493	493
Lift from rail to truck	324	324	324
Road haulage costs	1755	3042	702
Total per train load (18 x 40ft or 45ft containers)	5301	6588	4248
Cost per container	295	366	236
Direct Road Option			
Lift from ship to quayside	729	729	729
Lift from quayside to truck	324	324	324
Road haulage costs	3042	4212	1404
Total per train load (18 x 40ft or 45ft containers)	4095	5265	2457
Cost per container	228	293	137
Increase in cost	67	74	100
% increase in cost	29%	25%	73%

Source: Cost data from Goodbody Economic Consultants, June 09 (not validated against Booz cost model)

Booz & Company analysis

To understand how much traffic could go by rail from any site, the existing container terminal traffic distribution was examined

- Existing Container Terminal Traffic Distribution

Source: Origin destination surveys undertaken by Port of Cork in November 2005 and presented in Oysterbank EIS. Surveys undertaken in 2009, subsequent to this analysis, indicated that the distribution remains the same as in 2005.

Note that imports and exports appear well balanced

Area	% HGV Arrivals	% HGV Departures	% HGV Total
Cork City	8%	11%	9%
Douglas	1%	2%	1%
Midleton	5%	5%	5%
Carrigaline	7%	8%	8%
Ballincollig	2%	2%	2%
Blarney	1%	2%	2%
Ballyvolane	15%	15%	15%
Youghal	0%	0%	0%
Bandon	0%	1%	0%
Kinsale	1%	1%	1%
Macroon	3%	1%	2%
Mallow	7%	7%	7%
Fermoy	6%	5%	6%
Cork Harbour	0%	0%	0%
N71 Corridor	1%	1%	1%
N22 Corridor	0%	0%	0%
N20 Corridor	22%	23%	22%
N8 Corridor	8%	8%	8%
N25 Corridor	8%	4%	6%
N72 Corridor	5%	4%	5%

Source: RPS O-D Surveys, November 2005

100%

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Distribution of Trucks to/from Tivoli
Detailed zones aggregated

Area	% Total HGV
Cork City	9%
Ballyvolane	15%
Blarney	2%
Ballincollig	2%
South	11%
East	11%
West	2%
North West	34%
North	14%

- Assumes imports and exports balanced 100%

Assumptions were then made about which traffic is best suited for possible transfer to rail

Assumptions

- Containers to/from Cork City and areas to the east and south would not use a distribution centre in the Mallow area
- Some traffic from the Ballyvolane, Blarney and Ballincollig areas may use it
- A Distribution Centre in the Mallow area would be most attractive for traffic to/from the west, northwest and, at the margins, to/from the north
- In keeping with our agreed approach to consider the best possible scenario under which Port of Cork could be rail connected, an assessment was made based on the maximum possible transfer of 50%
- An assessment was also undertaken assuming 25% of the port's traffic went via the DC. Although more realistic, this would still mean a major change in behaviour and it would be a challenging target.

Area		% Total HGV	Use DC at Mallow?	What proportion?
Cork City		9%	No	0%
Ballyvolane		15%	Maybe	25%
Blarney		2%	Maybe	50%
Ballincollig		2%	Maybe	25%
South	Douglas, Carrigaline, Bandon, N71, Kinsale	11%	No	0%
East	Midleton, Youghal, N25	11%	No	0%
West	Macroom, N22	2%	Yes	90%
North West	Mallow, N20, N72	34%	Yes	90%
North	Fermoy, N8	14%	Yes	90%
Absolute maximum to use Distribution Centre				50%
Target to use Distribution Centre				25%

Source: RPS O-D Surveys, November 2005, Booz Analysis. Surveys undertaken in 2009, subsequent to this analysis, indicated that the distribution remains the same as in 2005.

As proposed, the Distribution Centre implies an inherently efficient railway operation

- The railway operation would be a shuttle service operating continuously between the port and the Distribution Centre, 6 days a week, during business hours, roughly
- Drivers, locomotives and freight wagons would therefore be fully utilised and never idle
- Full train lengths are assumed i.e. the Distribution Centre operator would charter 18-wagon trains from IÉ (or possibly another train operator in future, if that is an option) and take the risk for filling them
- Additional trainsets (locomotive and wagons) would not be purchased unless worthwhile, even if that meant some freight had to go by road
- As the trips are short and local, there is no need for trains and drivers to spend nights away from their base, which removes the need for accommodation elsewhere which is a feature of long haul freight operations
- Our assessment captures these efficiencies. If the Distribution Centre does not have sufficient “critical mass”, these would be lost. We estimate that around 25% of total port traffic (see page 78) is required to go through the DC for a single trainset and crew to operate efficiently.

Potential TEUs to be carried by rail were then calculated for each phase of the container terminal development

Container Flat Wagon



- Containers would be carried on Container Flat Wagons (CFT) similar to that shown above.
- Each CFT can accommodate two 20ft containers or one 40ft or 45ft containers
- IE currently only operate full train loads of 18 container flat wagons and have a limit of 36 TEU per train.
- IE have advised that the weight limit could be increased with new rolling stock

Potential TEUs to be carried by Rail

	Phase 1	Phase 2	Phase 3	Longer Term
Capacity (TEU per annum)	250,000	300,000	400,000	600,000
Load factor	85%			
Total TEU per annum	212,500	255,000	340,000	510,000
Total TEU by rail	106,250	127,500	170,000	255,000
	53,125	63,750	85,000	127,500

Notes

- 1) TEU for each phase as described in Oysterbank Financial and Economic Appraisal, Goodbody, 2007
- 2) Booz & Co. have not adjusted capacity requirements in line with recent economic downturn
- 3) 85% load factor Booz & Co. assumption

Understanding the container carrying capacity of rolling stock and the length of trains is another important consideration

Considerations in Rail Freight Operations

- One of the biggest considerations in a rail freight environment is the capacity of a single train
- That capacity defines the:
 - number of TEU that can be transported in one trip
 - infrastructure needed i.e. signalling and passing loops
 - horsepower of the locomotives needed for each train.
- Our assumed container size split is based on conversations with shipping companies.
- IE's theoretical limit is 36 TEU/18 CFT per train. In discussions, they noted that 40ft and 45ft containers are both treated as 2 TEU, so our figure of 38.25 TEU is not a problem. Furthermore, the limits are set by the existing rolling stock and would not apply if new rolling stock were bought, which would be the case.

Train Makeup

Container flat wagons and carrying capability

Container size split	No. CFT per train carrying each size container	TEU for each container size	Containers on each CFT	TEU per train	Containers per train
45ft containers	50%	9	2.25	1	20.25
40ft containers	30%	5	2	1	10.80
20ft Containers	20%	4	1	2	7.20

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Total CFT per train (IE limit)	18
Total TEU per train	38.25
Total Containers per train	22

Train frequency then is defined by the number of CFTs and subsequent containers the train can carry

50% to rail

Train frequency
For a 18 CFT Train

	Phase 1	Phase 2	Phase 3	Long term
TEU to rail	106250	127500	170000	255000
TEU each train	38	38	38	38
Trains per annum	2778	3333	4444	6667
Trains per week (48 weeks)	58	69	93	139
Trains per day (6 days)	10	12	15	23

25% to rail

TEU to rail	53125	63750	85000	127500
TEU each train	38	38	38	38
Trains per annum	1389	1667	2222	3333
Trains per week (48 weeks)	29	35	46	69
Trains per day (6 days)	5	6	8	12

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Rail Freight Baseline

Demand to Transport by Rail

Future Scenario with Rail

Rail Connection Options

Socio Economic Evaluation

Other Options

Conclusions and Next Steps

A container terminal at Ringaskiddy or Marino Point could be directly or indirectly connected to the rail network

Direct and Indirect Connections from Marino Point* and Ringaskiddy* to Rail Network

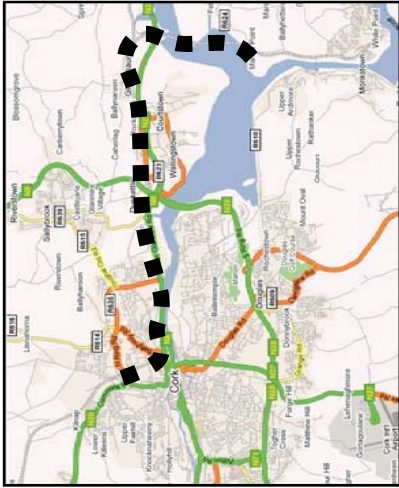
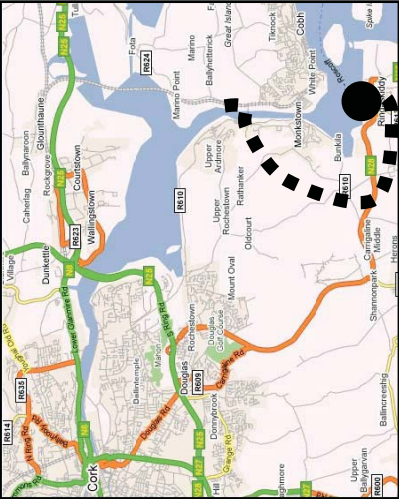
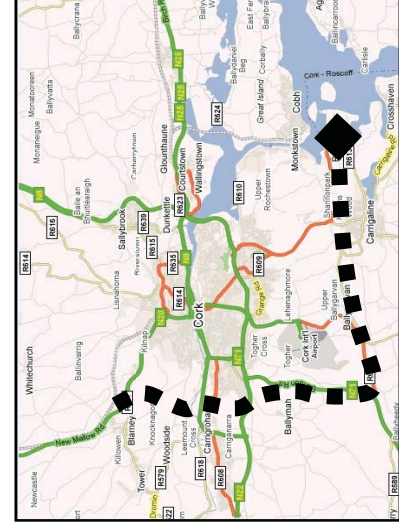
	Site	Option for Connection	Initial Assessment
Direct	Marino Point	Spur to adjacent Cork-Cobh line	- Although not the preferred location for a container terminal, it has a direct connection - Worth investigation
	Ringaskiddy	Bridge to Cork-Cobh line	- The shortest link to the network but difficult given the gradients and the need to cross the West Passage - Highly unlikely but needs to be scoped out and assessed
		New link to Cork - Dublin line	- A considerably longer link but over easier terrain and avoiding issues at Kent station - Highly unlikely but needs to be scoped out and assessed
		New link to Kent Station	- Would have to be in tunnel and therefore even more difficult than the above options. - Not worth further consideration at this stage.
Indirect	Marino Point	By road to an existing railhead (North Esk)	- Short distance, minimal investment - Suitable option for niche customers that can provide railheads and full trainloads - A useful option if Marino Point is developed by Port of Cork, whether for a container terminal or another facility
	Ringaskiddy	By road/ferry/barge to an existing railhead	- Long distance from Ringaskiddy to any railhead, say in the Rathpeacon area, makes this unattractive but not impossible if a customer materialised with large volumes - Not worth further consideration
		By ferry/barge to a new spur at Marino Point	- Major barging operation between Ringaskiddy/Oysterbank and Marino Point would interfere with port operations, so suited for a small or occasional operation - Worth considering if Marino Point is developed

* This analysis is considering these two sites only

Three Distribution Centre-based options for a direct connection to the railway network were evaluated

Summary of the Three Infrastructure Options Evaluated

Considered at a conceptual level appropriate for a high level socio-economic evaluation, each would require substantial feasibility work

Option 1	Option 2	Option 3
- Containers are unloaded from ships at Marino Point - A railhead at Marino Point is constructed - A distribution centre is built near Mallow. - Height clearance at Cork Rail Tunnel is obtained. - Kent Stn bypass retained. 	- Containers are unloaded from ships at Ringaskiddy. - A railhead is built at Ringaskiddy 10.5km of new railway is built to Marino Point to connect to the existing railway, via a substantial bridge over the estuary. - A distribution centre is built near Mallow. - Height clearance at Cork Rail Tunnel is obtained. - Kent Station Bypass is retained. 	- Containers are unloaded from ships at Ringaskiddy. - A railhead is built at Ringaskiddy 30km of new railway is built by-passing the Cork metropolitan area to the south and west, joining the existing railway to the NW of Cork City. - A distribution centre is built near Mallow. - Height clearance on the existing railway between the connection point and the distribution centre is not an issue. 

All the direct options involve some significant “end of the line assumptions”

- The underlying premise is that all container traffic goes to a Distribution Centre (DC) and is distributed from there.
- The DC would require a site:
 - capable of handling up to 500,000 TEU
 - located around or north of Mallow
 - approximately 40 hectares in area to accommodate growth
- The DC would need to operate 24 hours a day, 6 days a week
- At Kent Station:
 - The Loop Line would need to be retained
 - Height clearance gained at the tunnel either through infrastructure work or investment in new freight wagons
- With the increase in traffic on this line there may also be a need for increased signalling
- Maintenance activities may also need to change because increased train frequency will increase the wear and tear on the infrastructure and also reduce opportunities to take track possession for maintenance purposes

Rail Tunnel North of Kent Station
Line cleared for 9' at present



Kent Station

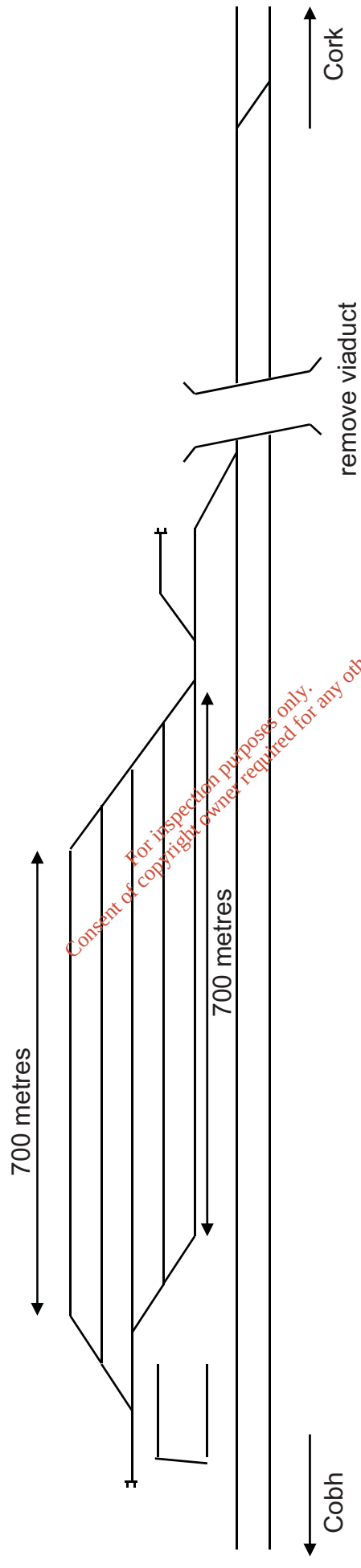
Through running is essential for the DC operation



A rail spur and freight yard would be needed at the container terminal and the Distribution Centre

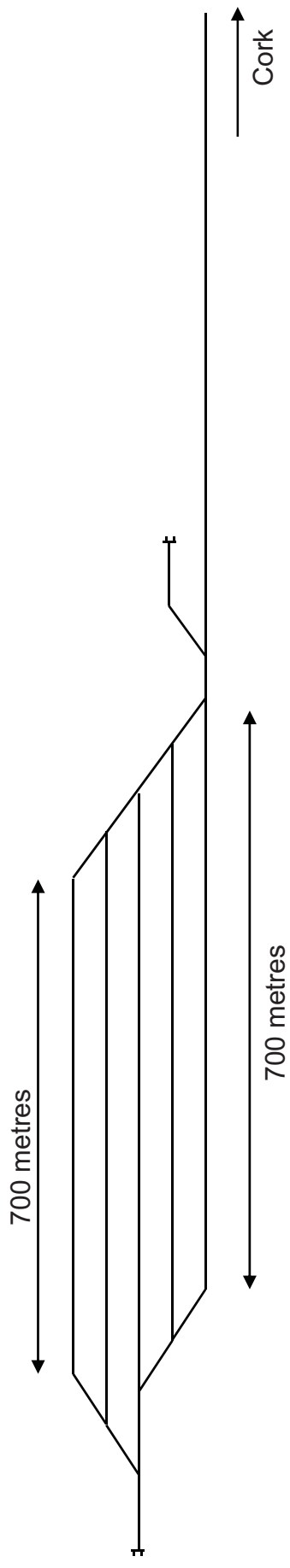
Yard at Marino Point (Option 1)

five tracks (track width 8.12m) with an effective length of 700 m plus two loco tracks



Yard at Ringaskiddy (Option 2 and 3)

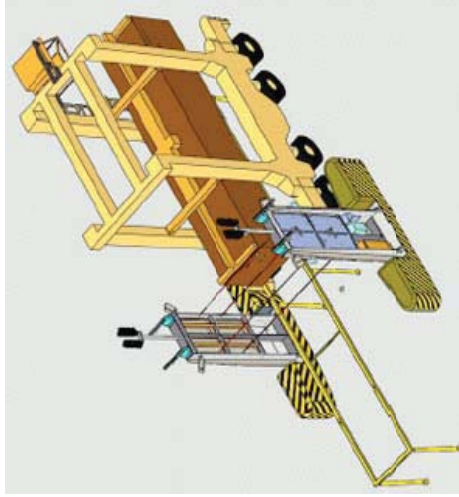
five tracks (track width 8.12m) with an effective length of 700 m plus two loco tracks



Managing trains into and out of container yards would largely be controlled by technology

- Signaling should allow trains off and onto the mainline from and within the Container Yard
- If there are likely to be any movements (i.e push backs) within the Container Yard a pilot will be necessary (i.e someone who can guide the train)
- The train berths on the line
- The loco is uncoupled and is run round onto another rake of wagons (if one is ready)
- The rake of wagons is unloaded, containers are grounded and gridded
- Loading is a more complex operation, because train assembly needs to take into account where the containers are going, even if they are all going to the same Distribution Centre. Cargo assembly is therefore a key aspect of yard planning

How the terminal operates will depend on the moveable infrastructure adopted



- If straddle carriers are adopted consideration will need to be given to the vertical spacing on the railway lines so the straddle carriers can run over a rake of wagons.

The rail terminal would need to have a loading/unloading rate for rail comparable to a road setup so as not to compromise terminal efficiency. It must be competitive against road.

The space required between and around the rail will depend on method of operation and the moveable infrastructure



- Conversely, something like a reachstaker will run parallel to a rake of wagons, reachstackers can typically pick containers up to two rakes deep (i.e reach over a container on a railway line and get the one behind it)

Container storage would not differ greatly for a rail based rather than road based transport system

- Typically a freight train comes into a container terminal and containers are grounded and gridded according to shipping schedules
- Once the ship is in the harbour the containers are transferred to the ship
- In some cases rail can go wharfside i.e. onto the wharf allowing more direct rail ship loading
- While rail unloading occurs in generally the same manner as truck unloading, loading is more complex as it involves assembling a train full of containers, rather than just 1 truck.
- Train assembly needs to consider where the cargo goes (does it all end up at the same place in one Distribution Centre?).

Or perhaps the planned container terminal is envisaged to be loading much more directly onto the vessel e.g. with trucks coming with exports and unloading directly onto a vessel and coming to pick up import containers being loaded directly from the vessel onto the truck.

How operations are envisaged at the new container terminal is still an open question

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1

Use existing line from
Marino Point to Cork
(Cobh Line)

There is an double track line adjacent to
Marino Point, but the spur is now gone

Rail Line at Marino Point
Looking north from Overbridge



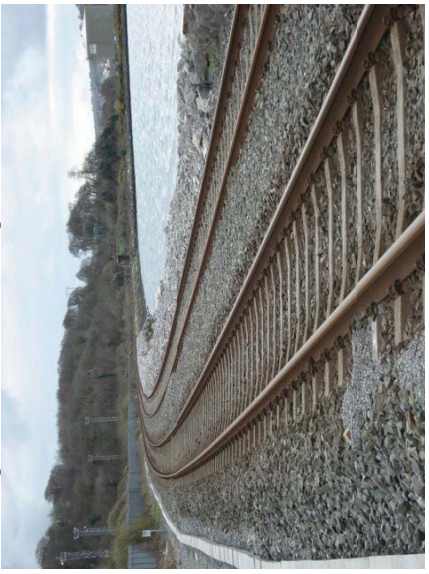
Rail line at Marino Point
Looking north from old Marshalling Yard



Rail Line at Marino Point
Looking South from Overbridge



Rail Line at Marino Point
Looking South from old Freight Yard



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1

Use existing line from
Marino Point to Cork
(Cobh Line)

Port of Cork envisage Marino Point as a general cargo facility but use as a container terminal is being re-examined

Existing Jetty at Marino Point

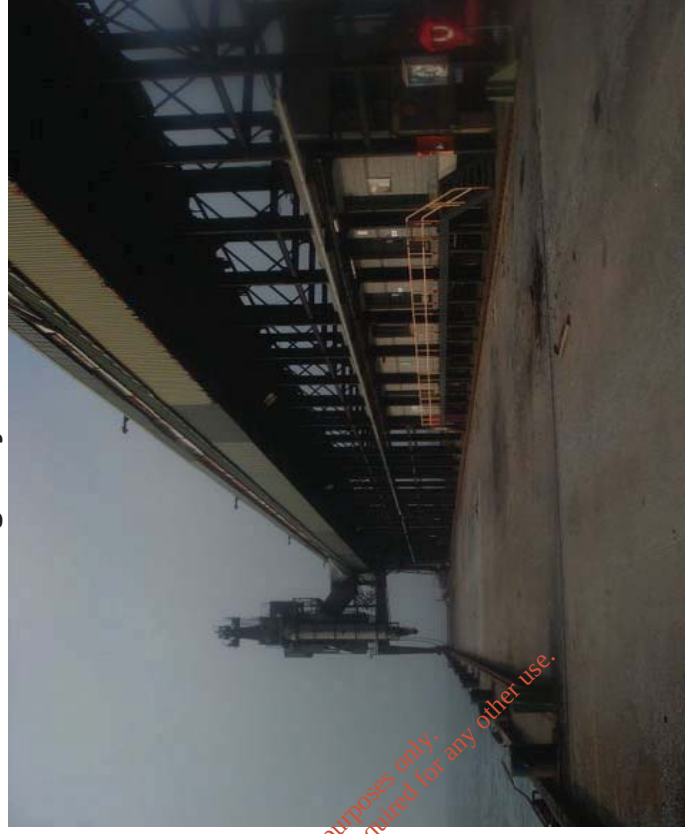
- Port of Cork envisage the City Quays functions being relocated to a new general cargo facility at Marino Point.

- Under this vision, the Marino Point facility would be capable of handling occasional container ships.

- Since the planning decision, Port of Cork is reviewing the suitability of Marino Point for a container terminal.

- As reported in PoC's previous site selection process, Marino Point has many other disadvantages which suggest that gaining planning approval for a container terminal would not be straightforward.

- Road access to Marino Point is currently poor. It would be improved by the County Council plan's for a new road to Great Island and Cobh. These plans are as yet uncommitted.



- The analysis of Option 1 assumes that the container terminal is located at Marino Point. The aim is to assess if there is a case for a rail operation under this scenario. Bulk operations have not been considered.

1

Use existing line from Marino Point to Cork (Cobh Line)

Although Marino Point was rail connected until recently, capital investment would be needed

Overview of Option 1 Capital Investment

Rail Infrastructure	
Capital investment necessary to establish a rail link between the existing Cobh – Cork line and the terminal at Marino Point The location of the previous spur is not optimal	
Existing tunnel will need to be cleared for 9'6" containers either by infrastructure work or investment in new freight wagons	
Additional signalling will need to be added to the new rail spur and the current rail infrastructure between Marino Point and Cork	
Additional signalling on the Cork – Cobh line will be required and this is discussed later	

Rolling stock and terminal facilities	
Marino Point will require terminal facilities necessary for the handling of containers and possibly break bulk. There may be opportunities to relocate terminal equipment from Tivoli.	
Given the short remaining life of IE's fleet, there will need to be investment in more CFT's. this may enable the tunnel problem to be overcome without infrastructure work	
There may be an opportunity to use some of the Class 201 locomotives from IE's fleet. However it is likely there will need to be further locomotive expenditure. Between 3-4 Locomotives will be required. In a push-pull operation between 6-8 would be necessary.	

1

Use existing line from
Marino Point to Cork
(Cobh Line)

The rail operation itself will require significant operating and maintenance resources

Overview of Option 1 Operating and Maintenance Costs

Operations and Maintenance
Maintenance activities will need to be increased on the existing rail network due to the increased frequency of traffic
Additional staff will be required to drive and shunt trains.
Additional staff will be required to maintain the rolling stock (locomotives and wagons). Given the volume of traffic it may be necessary to have some form of maintenance depot close to Cork.
It may be foreseeable that Terminal staff would simply relocate from Tivoli where they are currently located

*25 additional CFT with stanchions capable of carrying timber if this import traffic is transferred to rail

2

Bridge from Ringaskiddy to Marino Point

Option 2 requires some 10km of new track, including a bridge over the West Passage

Option 2 - Rail Connection

- Option 2 assumes the container terminal is located at Ringaskiddy
- Freight would be put on rail at Ringaskiddy
- Operationally, Option 2 is similar to Option 1
- The rail line would include a bridge over the West Passage
- The rail line would join the Cork-Cobh line at some point near to Marino Point
- The site at Marino Point would not necessarily be required, but land in the area would be needed
- If Option 2 were to be examined in detail in future, use of the new rail link for passenger services and/or the inclusion of a road crossing with the railway bridge may be worth consideration



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2

Bridge from Ringaskiddy to Marino Point

A high level assessment of the capital works required was undertaken

Substantial feasibility work would be needed in event of this scheme being promoted

Overview of Option 2 Capital investment

Rail Infrastructure
Capital investment necessary to build 10.5km of new rail line to the east of the West Passage linking the new line as close as is practical to Marino Point
The new line would include a bridge, which would allow for navigation.
Derailment provision will need to be considered for the bridge.
Existing tunnel will need to be cleared for 9'6" containers either by infrastructure work or investment in new freight wagons
Crossings will need to be established over the Mavian Tce, N28, R610, near Ballymot, between Monkstown and Rathanker and possibly at the R624 once the bridge gets to the other side of the passage

Rolling stock and terminal facilities
Assuming Ringaskiddy's current terminal facilities are a given, the trains would be fully loaded and would simply join to Cobh – Cork line.
Given the short remaining life of IE's fleet, there will need to be investment in more CFT's. this may enable the tunnel problem to be overcome without infrastructure work
There may be an opportunity to use some of the Class 201 locomotives from IE's fleet. However it is likely there will need to be further locomotive expenditure.

*25 additional CFT with stanchions capable of carrying timber if this import traffic is transferred to rail

2

Bridge from Ringaskiddy to Marino Point

Rail operations for Option 2 would be similar to Option 1

Overview of Option 1 Operations

Operations and Maintenance
As this is a new railway line it may be that IE will need additional staff to maintain it. Maintenance activities will need to be increased on the existing rail network due to the increased frequency of traffic
Additional staff will be required to drive and shunt trains.
Additional staff will be required to maintain the rolling stock (locomotives and wagons). Given the volume of traffic it may be necessary to have some form of maintenance depot close to Cork.

*25 additional CFT with stanchions capable of carrying timber if this import traffic is transferred to rail

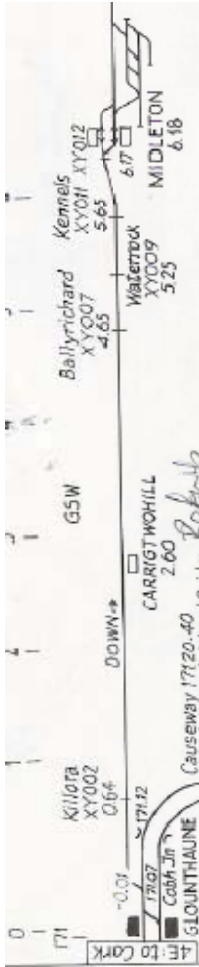
Signalling opportunities need to be considered for any options which use the rail line at Marino Point (Options 1 and 2)

Cork - Cobh	Cobh - Cork
05:20	05:50
06:30	07:00
07:00	07:30
07:30 x Mallow	08:00
07:55 x Mallow	08:25
08:30	09:00
09:00 x Mallow	09:30
10:00	10:30
11:00	11:30
12:00	12:30
13:00	13:30
14:00	14:30
15:00	15:30
16:00	16:30
16:30	17:00
17:00 x Mallow	17:30
17:30	18:00
18:00 X Mallow	18:30
18:30	19:00
20:00	20:30
21:30	22:00
22:30	23:00

This is the current timetable. Our analysis allows for the future Cork - Midleton service

Source: IE timetables

- The Cork – Cobh is double line, but the section from Glounthaune Junction to Cobh is a single block section (i.e one train at a time). This will need to be signaled to allow for freight trains from Marino Point
- With regard to the Glounthane Junction – Cork section of the railway line, signalling spacing should reflect the Cobh – Cork and planned Midleton – Cork service
- The timetable between Cobh and Glounthaune with the appropriate signalling certainly suggests capacity for freight trains although consideration may need to be given to keeping them out of the peak hours



For Options 1 and 2, safety considerations need to be taken into account when mixing passenger and freight traffic on Cork-Cobh

- Current arrangements allow for mixed passenger and freight operations, but given that there is very little mixed traffic on the existing network, the Railway Safety Commission and/or Iarnród Éireann and/or a third party operator might need to consider some of the issues which are often raised in mixed traffic operations, if rail freight volumes increased substantially
- The Railway Safety Act 2005 obliges any railway undertaking to submit a safety case, this is typically required for new lines and/or changes to the method of operation on existing lines. Introducing new rolling stock and new signalling technology are two examples of how an operation has changed and that their must be a supporting safety assessment of the change.
- Typically a major effort is needed to re-write rules and regulations for a new line or changed method of operation, and to gather evidence on safety targets such as mean time between failure of the new system or sub-systems.

3

New Line from Ringaskiddy to
Cork-Dublin Line

Although longer than the bridge, a
completely new freight line may cost less

Substantial
feasibility work
would be needed
in event of this
scheme being
promoted

Rail Infrastructure
Capital investment necessary to build 30km of new rail line which will link it into the network north of Cork. This line should be single track with at least two passing loops.
The new line will be designed for 9'6" containers
10 crossings will need to be established over the N28, N27, N71, N22, N20, R617, R608, besides minor roads
Where the N22 and the River Lee meet there will need to be a substantial bridge.

Rolling stock and terminal facilities
Ringaskiddy will need terminal facilities, lifting cranes, establishment of an area which can hold containers etc - these are assumed to be existing or included in future proposals
Given the short remaining life of IE's fleet, there will need to be investment in more CFT's.
There may be an opportunity to use some of the Class 201 locomotives from IE's fleet. However it is likely there will need to be further locomotive expenditure.

*25 additional CFT with stanchions capable of carrying timber if this import traffic is transferred to rail

Further considerations for this new line offer challenges and opportunities

- In the safety case guidelines The Railway Safety Act 2005 states that “ . With some railway operations, very simple forms of train operation and signalling systems may be satisfactory. Where the railway operates at a relatively low speed and safety of operation can be ensured by a system of driving on-sight, no signalling system, as such, may be required”^{*} This means that if the line is initially constructed as freight only then the signalling system can be fairly basic.
- Passing loops should be designed to optimum length, typically 1500m is considered the minimum length. The total length of the train under the much less than this, but passing loops must be long enough to enable trains to keep as close as possible to line-speed at exit and entry.

^{*} RSC-G-005 4.1.1.4

Capital cost estimates were calculated for the three options

Capital Cost Assumptions	
- Options were costed using unit costs from the Booz railway cost database and uplifted to allow for design costs, detailed design costs, project management costs, contingency, provision of work sites, client organisation costs and contractor profit. - The total costs estimated were validated against the cost of IE projects underway or planned, and shown to be within range. - Cost includes, for the new railway sections and the freight yards, trackwork, structures, signalling, CTC, land, height clearance on existing track. - Costs do not allow for lifting equipment and other non-railway infrastructure at the freight yards in the container terminal - Rolling stock costs have been included as lease costs within the railway operations costs, not as capital costs	

Note: All costs in € million, 2009 prices
Source: Booz & Company analysis

Central Cost Estimate
€m, 2009 prices

Option	Infrastructure	Distribution Centre	Total
1	15	10	25
2	510	10	510
3	250	10	260

Capital Cost Range
€m, 2009 prices

Option	Capital Cost Range
1	€ 25m to €40m*
2	€250 to €750**
3	€150 to €400**

* Allows for work to Cork Rail Tunnel
** +/- 50% on Central Cost Estimate

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Best Possible Scenario Rail

Connection Options

Socio Economic Evaluation

Other Options

Conclusions and Next Steps

A socio-economic evaluation of the 3 options under the Best Possible Scenario was undertaken

Benefits
▪ Benefits of removing trucks from the road network: – Reduction in accidents – Reduction in noise – Reduction in air pollution – Reduction in road wear and tear – Reduction in traffic congestion – Improved reliability and reduced journey times – Better conditions for walking and cycling ▪ Truck operating cost savings

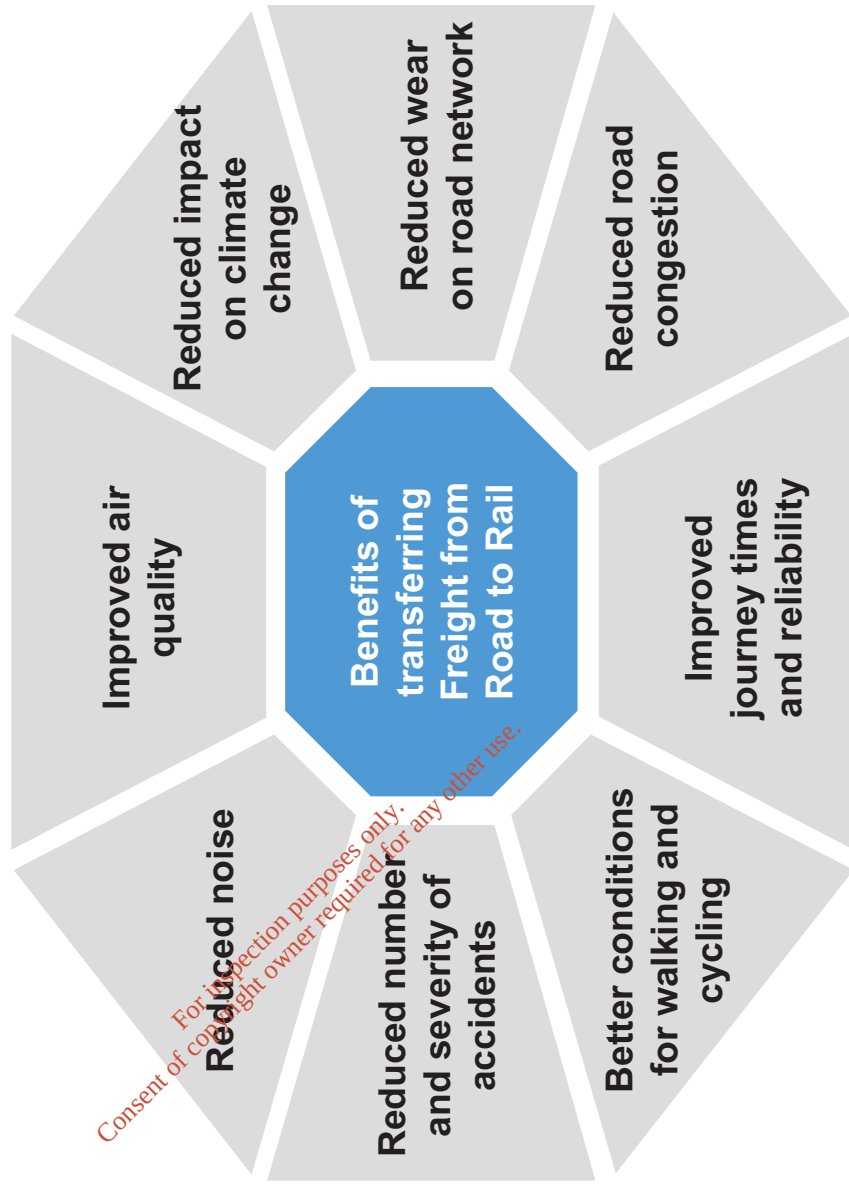
Capital Costs
▪ Trackwork ▪ Structures ▪ Signalling

On-going Costs
▪ Railway operating costs ▪ Infrastructure maintenance costs ▪ Rolling Stock Costs

▪ Benefit / Cost Ratio

The benefits associated with rail freight result from the removal of trucks from the road network

Benefits of Rail Freight



- There is global benefit in reducing vehicle-km irrespective of local problems
- Some benefits may only be locally significant in networks where one or more of the following problems exist:
 - HGV-related accidents are a problem
 - Air quality is poor
 - Noise is a problem
 - The road network is congested
 - Businesses/hauliers are seeking to improve the speed and reliability of deliveries
 - The environment for walking and cycling is poor due to the presence of HGVs
- The UK “Sensitive Lorry Miles” approach addresses this issue and is the basis for the evaluation of proposals for rail freight schemes, to assess eligibility for the Freight Facilities Grant (capital costs) and/or the Rail Benefits Procurement Scheme (running costs)

Benefits were calculated using the Sensitive Lorry Miles approach which is used to evaluate rail freight proposals in the UK¹

Sensitive Lorry Miles Values

Category	p/mile ²
Accidents	3.8
Noise	2
Pollution	3.9
Climate Change	2.4
Infrastructure costs	11.2
Road Congestion	45.8
Unquantified ³	21.5
Taxation ⁴	-29
Rail costs ⁵	-8.8
Total	52.8



Socio-Economic Benefits of Removal of Lorries from Roads between Port and Distribution Centre € m per annum (2009 prices)

	Phase 1	Phase 2	Phase 3	Longer Term
50% on rail	3.0	3.6	4.8	7.2
25% on rail	1.5	1.8	2.4	3.6

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1) Sensitive Lorry Miles, Strategic Rail Authority, 2003, <http://www.dft.gov.uk/bgr/freight/railfreight/slmp>
2) Values are available for several categories of road. Some categories such as motorways and roads in major conurbations have sub-categories for different levels of congestion. The "Rural and Urban Truck and Principle Road category is the most appropriate for the Cork Area network Values are given in GBP 2003, and were converted to Euros 2003 and rolled forward to 2009 at Irish GDP
3) Represents benefits such as reduction in driver frustration/stress, fear of accidents, restrictions on cycling and walking, upstream and downstream effects, community severance and visual intrusion
4) Fuel and vehicle excise duty are subtracted from the benefits (this is UK Appraisal practice)
5) Rail freight also has negative impacts on society including noise, pollution and climate change. These are lower per unit of freight than road, hence the social benefits of the modal transfer.

The evaluation was based on the container terminal demand forecasts/phasing proposals for the Oysterbank scheme

Container Terminal Phasing and Capacity Assumptions

	Phase 1	Phase 2	Phase 3	Longer Term
Timing under low economic growth	2011 to 2014	2014 to 2019	2019 to 2029	Post 2029
Timing under medium economic growth	2011 to 2013	2013 to 2017	2017 to 2024	Post 2024
Capacity in terms of Total TEU per annum (import + export)	250,000	300,000	400,000	600,000
For purpose of this study, assume on average over each Phase, port operating at 85% of capacity	212,500	255,000	340,000	510,000
Total TEU per annum				

The cost benefit analysis has assumed low economic growth, nevertheless the 2007 projections will be optimistic given the economic downturn. Port of Cork will revise its capacity projections in due course

Note: Appendix A contains more detailed information on the cost benefit analyses assumptions
Source: Oysterbank Financial and Economic Appraisal, Goodbody, 2007, Booz & Company analysis

All options are based on a “best-case” operational and demand concept of a railway shuttle to and from a Distribution Centre

Operational Assumptions

	Phase 1	Phase 2	Phase 3	Longer Term
50% of Containers to rail (TEU)	106,250	127,500	170,000	255,000
Optimum trains per day	10	12	15	23
Train-sets required	2	3	4	6
25% of Containers to rail (TEU)	53,125	63,750	85,000	127,500
Optimum trains per day	5	6	8	12
Train-sets required	1	1	2	3

- To provide a rationale for moving container traffic by rail, and sufficient density to justify operation, our base assumption is that part of the container traffic of the port will be moved by rail to and from a new container distribution centre, which can be located on the existing railway line near Mallow, with good road access. This will be a suitable location for the majority of container traffic that travels beyond the Cork city area.
 - It will be served by a shuttle service. Shuttle trains will comprise a locomotive and 18 CFT wagons carrying either one 40ft or 45ft container or two 20ft containers.
- The port is assumed to operate at 85% load factor across each of the growth phases. Rail is assumed to take a 50% share of the container freight market, the rest either being local, or else delivered to a direction not suited to the distribution centre.
- Volumes of containers going to rail are assumed to be balanced, with equal quantities going to the depot and returning to the port. We assume a train has 6 days of operation and 48 weeks of operation, the remaining time being allowed for maintenance. No spare trains are kept. A train can do 4 trips per day. The table shows the number of trainsets that would be used. In some cases, an additional train is not worth purchasing and some trips will be shed (this happens in Phase 1 in the described scenario).

Annual operating and maintenance costs were estimated for each option for each year of the appraisal period

Phase 1 Annual Costs
€ million per annum, 2009 prices

	Railway Operating Costs ^{1,2}	Rolling Stock Hire Costs ³	Infrastructure Maintenance Costs ⁴	Truck Operating Costs Saved ⁵	Total	
50% by Rail	Option 1	7.1	0.8	1.9	-4.1	5.6
	Option 2	7.5	0.8	2.1	-4.1	6.2
	Option 3	7.8	0.8	2.3	-4.1	6.7
25% by Rail	Option 1	4.4	0.4	0.9	-2.0	3.7
	Option 2	4.5	0.4	1.1	-2.0	4.0
	Option 3	4.7	0.4	1.2	-2.0	4.2

- 1) Based on Booz IE Freight Operating Cost Model, derived for Strategic Rail Review, 2003, updated to 2009
- 2) Distribution Centre and port rail freight operations estimated at €1.5 million per annum
- 3) Although Iarnród Éireann buys rolling stock and does not hire it, use of rolling stock hire costs most accurately captures the rolling stock life-cycle costs for the purpose of this appraisal
- 4) Based on IE infrastructure maintenance cost model derived for Strategic Rail Review in 2003 and updated to 2009
- 5) Truck operating costs (fuel and non-fuel) derived from DoT Capital Appraisal Guidelines (May 2007)

Source: Booz & Company models, Strategic Rail Review, Project Appraisal Guidelines (DoT May 2007)

A cost benefit analysis was undertaken for several scenarios

List of Tests Undertaken

	Title	Comments
1	Central Case	Most likely cost estimates "Realistic" but ambitious target for rail use (25%)
2	50% by rail	Most likely cost estimates. Best possible rail demand scenario
3	+50% in capital costs	Cork Rail Tunnel is a risk - height clearance should be achieved through new rolling stock but infrastructure work may be needed. For Options 2 and 3, +/- 50% applies to the capital cost.
4	+25% in rail running costs	A 25% increase in forecast operating costs would not be unreasonable
5	- 25% in rail running costs	With greater involvement of private logistics operators and possibly train operators, cost efficiencies would be expected; however the envisaged operation as modelled is already a highly efficient one
6	+25% in road operating costs	Road operating costs will increase as congestion grows, which is likely in the long term.
7	-15% in road operating costs	Road operating costs are already very competitive and it is difficult to envisage further reductions; however a sensitivity test with a 15% reduction was considered.
8	Best operating scenario	-25% rail operating costs, +25% road operating costs
9	Best demand and operating scenario	50% by rail, -25% rail operating costs, +25% road operating costs

Comparing the present value of costs and benefits over 30 years and 60 years under the Central Case shows no case for any option

Test 1: Central Case
Central Estimates, 25% by Rail via Distribution Centre

Option	1			2			3		
Economic Scenario	Low			Low			Low		
Appraisal Period (years)	30			30			30		
Capital Cost	(13)	(295)	(153)	(13)	(295)	(153)	(14)	(330)	(172)
Rail Operating Costs	(58)	(60)	(62)	(61)	(63)	(65)	(79)	(82)	(85)
Rolling Stock Hire	(10)	(10)	(10)	(11)	(11)	(11)	(13)	(13)	(13)
Infrastructure Maintenance	(13)	(15)	(16)	(14)	(16)	(17)	(18)	(20)	(22)
Truck Operating Costs Avoided	34	34	34	37	37	37	47	47	47
Present Value of Costs	(60)	(346)	(208)	(60)	(347)	(209)	(76)	(398)	(244)
Present value of Benefits	36	36	36	40	40	40	61	61	61
BCR	60%	10%	17%	66%	11%	19%	79%	15%	25%

PV Costs exc. Capital	(47)	(51)	(55)	(48)	(52)	(56)	(62)	(68)	(73)
BCR exc. Capital	77%	70%	66%	83%	76%	71%	97%	90%	84%

- Even over a 60 year appraisal period, no option has a BCR greater than one, so there is no case for any option
- With medium growth, Option 1 might cover its running costs over a 60 year period

If 50% of containers went via the Distribution Centre, there is a weak case for Option 1 over a 60 year period

Test 2: 50% by Rail

Central Estimates, 50% by Rail

Option	1		2		3		1		2		3	
Economic Scenario	Low		Low		Low		Medium		Medium		Medium	
Appraisal Period (years)	30		30		30		30		30		60	
Capital Cost	(13)		(295)		(153)		(13)		(295)		(14)	
Rail Operating Costs	(97)		(102)		(106)		(103)		(108)		(139)	
Rolling Stock Hire	(16)		(16)		(16)		(18)		(18)		(23)	
Infrastructure Maintenance	(26)		(29)		(32)		(28)		(31)		(37)	
Truck Operating Costs Avoided	68		68		68		75		75		101	
Present Value of Costs	(84)		(374)		(240)		(86)		(377)		(112)	
Present value of Benefits	72		72		72		80		80		129	
BCR	86%		19%		30%		92%		21%		115%	

PV Costs exc. Capital	(71)	(80)	(87)	(73)	(82)	(90)	(96)	(107)	(116)	(98)	(109)	(119)
BCR exc. Capital	101%	91%	83%	108%	97%	89%	127%	114%	104%	132%	118%	108%

- Over 60 years, Option 1 has a BCR slightly greater than one, so there would be a weak case, if 50% to rail were achieved
- Over 60 years, all Options would cover their running costs, and Option 1 might over 30 years.

A 50% increase in capital costs only slightly further weakens the case, suggesting the case is not highly sensitive to capital cost

Test 3: +50% on Capital Costs
Central Estimates, +50% on Capital, 25% by Rail

Option	1			2			3			1			2			3																				
Economic Scenario	Low			Low			Low			Low			Low			Low																				
Appraisal Period (years)	30			30			30			60			60			60																				
Increase in capital costs																50%																				
Present Value of Costs	-66			-493			-285			-67			-494			-286			-84			-563			-330			-84			-564			-331		
Present Value of Benefits	36			36			36			40			40			40			61			61			61			64			64			64		
Benefit Cost Ratio (BCR)	55%			7%			13%			60%			8%			14%			73%			11%			18%			76%			11%			19%		

- There is no case for any of the Options if capital costs increase.

The case is sensitive to changes in rail operating costs - if they were 25% less, Option 1 appears viable in the long term

Tests 4 & 5: +/- 25% on Rail Operating Costs
Central Estimates, +/- 25% on Rail Operating Costs, 25% by Rail

Option	1	2	3	1	2	3	1	2	3
Economic Scenario	Low	Low	Low	Medium	Medium	Medium	Low	Low	Low
Appraisal Period (years)	30	30	30	30	30	30	60	60	60

Increase in rail current costs.

25%

Present Value of Costs	-80	-367	-230	-82	-369	-233	-104	-427	-274	-105	-429	-276
Present value of Benefits	36	36	36	40	40	40	61	61	61	64	64	64
BCR	45%	10%	16%	49%	11%	17%	59%	14%	22%	61%	15%	23%

Decrease in rail current costs

-25%

Present Value of Costs	-40	-325	-186	-39	-325	-186	-49	-369	-214	-49	-369	-214
Present value of Benefits	36	36	36	40	40	40	61	61	61	64	64	64
BCR	91%	11%	19%	102%	12%	21%	123%	16%	28%	132%	17%	30%

- If operating costs increase by 25%, which is reasonably likely situation, the BCR for all options is significantly reduced.
- If operating costs were 25% lower, perhaps by finding greater efficiencies, Option 1 appears viable over a 60 year period.

A 25% increase in truck operating costs would bring Option 1 close to having a case in the long term

Tests 6 & 7: + 25%/ -15% on Road Operating Costs
Central Estimates, + 25%/ - 15% on Truck Operating Costs, 25% by Rail

Option	1	2	3	1	2	3	1	2	3
Economic Scenario	Low	Low	Low	Medium	Medium	Medium	Low	Low	Low
Appraisal Period (years)	30	30	30	30	30	30	60	60	60

Increase in truck operating costs.

25%

Present Value of Costs	-51	-338	-200	-51	-338	-200	-65	-386	-233
Present value of Benefits	36	36	36	40	40	40	61	61	61
BCR	70%	11%	18%	78%	12%	20%	94%	16%	26%

Decrease in truck operating costs

-15%

Present Value of Costs	-65	-351	-213	-66	-353	-215	-84	-405	-251
Present value of Benefits	36	36	36	40	40	40	61	61	61
BCR	56%	10%	17%	60%	11%	19%	73%	15%	24%

- If truck operating costs increase by 25%, perhaps through congestion or taxes, the BCR for all options is significantly improved.
- If operating costs were 15% lower, although they are already very competitive, BCR is significantly reduced for all options.

If rail operating costs came down and road costs increased, the case for Option 1 begins to look robust, at least in the longer term

Test 8: -25% on Rail Operating Costs and +25% on Road Operating Costs
Central Estimates, -25% on Rail Operations, +25% on Road Operations, 25% by Rail

Option	1	2	3	1	2	3	1	2	3
Economic Scenario	Low	Low	Low	Medium	Medium	Medium	Low	Low	Low
Appraisal Period (years)	30	30	30	30	30	30	60	60	60
Best operating cost scenario:									
Decrease in rail current costs	-25%								
Increase in truck costs	25%								
Present Value of Costs	-31	-316	-178	-30	-315	-177	-37	-358	-203
Present value of Benefits	36	36	36	40	40	40	61	61	61
BCR	116%	11%	20%	134%	13%	23%	162%	17%	30%
							178%	18%	32%

- It is not inconceivable that, in the long term, road congestion would increase such that the costs of road operations increase significantly.
- It is also possible that, in the long term, road user charges would be placed upon trucks to encourage modal shift and recover costs
- It is also possible that, with a bigger and more competitive rail freight industry, efficiencies would be realised, despite the fact that whoever operates the service will need to buy/lease rolling stock.

In the Best Possible Scenario with 50% by rail, reduced rail costs and increased truck costs, there is a robust case for Option 1 only

Test 9: Best Possible Demand and Operating Scenario

Central Estimates, -25% on Rail Operations, +25% on Road Operations, 50% by Rail

Option	1	2	3	1	2	3	1	2	3
Economic Scenario	Low	Low	Low	Medium	Medium	Medium	Low	Low	Low
Appraisal Period (years)	30	30	30	30	30	30	60	60	60
Best possible demand and operating scenario:									
Decrease in rail current costs	-25%								
Increase in truck costs	25%								
50% by rail									
Present Value of Costs	-32	-321	-184	-30	-319	-183	-39	-364	-212
Present value of Benefits	72	72	72	80	80	80	121	121	121
BCR	223%	23%	39%	263%	25%	43%	310%	33%	57%
							347%	36%	61%

- It is difficult to imagine the circumstances where the Distribution Centre would be so heavily used

In summary, under expected circumstances there is no socio-economic case for any of the three options

- Options 2 and 3 are too costly to build. Costs would far exceed benefits.
- The capital costs for Option 1 are modest by comparison but the total costs of Option 1 outweigh its benefits in the Central Case. There is no socio-economic case for its development under our central estimates or nearly all of the sensitivity tests undertaken. There is a set of circumstances under which there could be a socio-economic case to develop Option 1, as follows:
 - The growth of the Port took place broadly in line with the forecasts made for the Oysterbank proposal. New port forecasts are beyond the scope of this assessment; however, given the economic downturn, the pace of growth might be slower than previously forecast
 - The container terminal were located at Marino Point.

While Port of Cork is reassessing the suitability of this site, previous work has shown this is not the preferred location for a container terminal, for numerous reasons beyond the scope of this assessment.
 - At least 25% of containers travelled by rail between the port and a distribution centre in the Mallow area
 - Incentives would be required to make this happen
 - Significant cost efficiencies in rail freight operations occur, beyond which are currently envisaged
 - The distribution centre concept envisaged is already efficient, operating costs are as likely to rise as to reduce
 - Truck operating costs increase significantly, through congestion and/or pricing interventions
 - Significant road congestion in the Cork Area is not currently forecast. There are no plans to introduce charges on trucks or other traffic in the Cork Area or elsewhere in Ireland. In the long term, this might change but policies which may disadvantage one region against another are unlikely to be introduced.
 - The Loop Line at Kent Station is retained
 - IE currently plan to dispose of this facility when it sells part of the site for redevelopment

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It may be possible for a container terminal located at either Marino Point or Ringaskiddy to be indirectly connected to the railway

Indirect compared with Direct Options

- Options 1 to 3 all assume that rail freight is actively promoted by the provision of a Distribution Centre and associated policies
 - These assumptions enable a rail freight operation to be designed at a high level for the purpose of identifying issues and costing
 - The Distribution Centre model overcomes the inherent problems with the port's market (small dispersed customer base with no rail connections) and uses its opportunities (customers are all within the region, mainly to the north west)
- The indirect options consider a passive provision for rail where goods can get to and from a railway and thereafter the issues lie with the customer or operator
 - they cannot be assessed in the same way as the direct options which are based on an entirely new vision
 - They are valuable options nevertheless
- There is an existing example at Waterford where timber is taken by rail from Coillte at Ballina to Sally Park (a distance of over 200km) and onward by truck to Belview, a distance of some 4 km

Site	Option for Connection	Initial Assessment
Marino Point	▪ By road to an existing railhead (North Esk)	▪ Short distance, minimal investment ▪ Suitable option for niche customers that can provide railhead and full trainloads ▪ A useful option if Marino Point is developed by Port of Cork, whether for a container terminal or another facility
Ringaskiddy	▪ By road/ferry/barge to a railhead ▪ By ferry/barge to a new spur at Marino Point	▪ Long distance from Ringaskiddy to any railhead makes this unattractive but not impossible if a customer materialised with large volumes ▪ Major barging operation between Ringaskiddy/Oysterbank and Marino Point would interfere with port operations, so suited for a small or occasional operation ▪ Worth considering if Marino Point is developed

In the case of Ringaskiddy, Rathpeacon may be a suitable location for a rail head for containers

Indirect Concept for Ringaskiddy	- Import containers are put on trucks at Ringaskiddy and taken to a railhead at Rathpeacon and then put on a train in full trainloads to go to a customer railhead. - Export containers are taken from a customer railhead by rail in full trainloads to Rathpeacon where they are put on trucks and taken to Ringaskiddy. - Customer meets IE's requirements for 18 CFT minimum train load/length; and has a railhead

Advantages	- Provides an option for containers to be taken by rail; - No need to build any new railway line; - Avoids any possible issues with the Cork Rail Tunnel; - Avoids the need to retain the Bypass Loop at Kent Station; - Avoids the Distribution Centre concept – it is based on assumption that customer would have a rail connection; and - Could provide a easier entry into the rail market, providing a basis for further investment in future if it were successful.
Disadvantages	- Does not remove trucks from the road network in the vicinity of the port ; - Does not alter the port's dependency on road; - There is currently no customer or concentration of customers that has a railhead and sufficient demand. Without a specific customer, this concept is difficult to scope and assess; and - Capital investment to establish railhead at Rathpeacon (and at the customer end).

Evaluation of the indirect option via Rathpeacon for a hypothetical customer in the outer parts of the Port's catchment showed no case

Assumptions

- For purpose of concept testing, the customer, or concentration of customers, is based in the Tralee area which is reasonably near rail and a reasonable distance from the Port. (There is no evidence that such a customer or concentration of customers exists in this area).
- Freight trains can be operated between the Cork and Tralee lines through Mallow. (There is no chord for this movement, so this will involve some operations which are less than ideal. The existing track, switches and signalling have not been assessed and we cannot judge what work may be required. No cost has been assumed for work at Mallow).
- Railhead and yard will be provided at Rathpeacon and similarly at the customer. It is assumed both are feasible, although no locations are identified. A cost has been allowed, similar to the cost for the railworks at the port and distribution centre in the other options examined.
- Work may be required to obtain height clearance for 9ft 6inch containers. There are around 42 bridges crossing the line between Rathpeacon and Tralee. It has been assumed that these need no work, but this would need confirmation.
- One train in each direction would operate per day, 5 days a week, 46 weeks a year. In the longer term (Phase 4), this would rise to two trains per day, per direction.
- Rail operating costs, maintenance costs and infrastructure maintenance costs have been assessed as for the other options.
- Truck operating costs saved and the benefits of removal of trucks from the roads have been assessed as for the other options.

Outcome of Evaluation

- Costs exceed benefits with benefit/cost ratios in the region of 50%-75%
- Sensitivity tests around costs do not change the outcome
- North Esk option would not perform any better (see next page)

In the case of Marino Point, North Esk may be a suitable location for a rail head for containers

Indirect Concept for Marino Point

- Import containers are put on trucks at Marino Point and taken to a railhead at North Esk and then put on a train in full trainloads to go to a customer railhead.
- Export containers are taken from a customer railhead in full trainloads by rail to North Esk where they are put on trucks and taken to Marino Point.
- Customer meets IE's requirements for 18 CFT minimum train load/length; and has a railhead

Advantages

- Provides an option for containers to be taken by rail
- IE report that North Esk could readily be reconnected to the rail network
- North Esk is very close to Marino Point, so trucks would be removed from parts of the strategic network where traffic congestion may be an issue.
- Goes some way towards reducing the port's dependency on road
- Avoids the Distribution Centre concept – it is based on assumption that customer would have a rail connection; and
- Could provide a easier entry into the rail market, providing a basis for further investment in future if it were successful.

Disadvantages

- Does not remove trucks from the road network in the immediate vicinity of the port
- There is currently no customer or concentration of customers that has a railhead and sufficient demand. Without a specific customer, this concept is difficult to scope and assess; and
- New rolling stock would be required to the necessary height clearance through the Cork Rail Tunnel
- The Kent Station Bypass Loop would need to be retained.

A barge could provide indirect access between the deep water facilities at Ringaskiddy and Marino Point

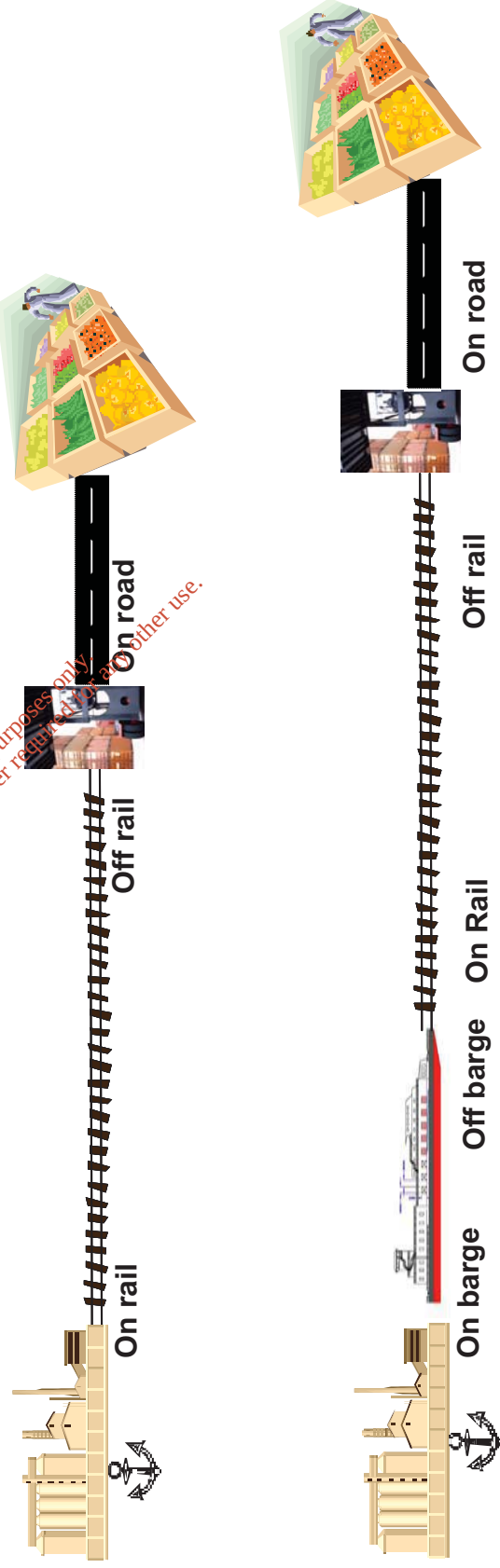
- Containers would be barged from the container terminal at Ringaskiddy to a rail facility at Marino Point
- The rail capital investment and operations would be the same as direct option Option 1
- Additional investment in the barging operation would be required
- Barging sub-options are:
 - Load on/load off the barge at each end
 - Roll on/roll off using Mafi type carriers which can take 2 containers at a time
 - Roll on/roll off using regular trucks (which could then drive to any rail head, but only Marino Point is being considered for the purpose of this exercise)
- The Port of Cork would not favour any barging activity that was big enough to interfere with operations

Barge route from Ringaskiddy to Marino Point



The extra handling associated with the barging option and possible impact on port operations makes it unappealing

- The risk lies in potential delays and handling damage due to the increased complexity and number of times the product is handled
- Road/rail transfers clearly introduce risks too which are only countered if the overall multi-modal trip is less risky than a trip solely on the road, which may be the case in heavily congested road networks or those with measures to restrict HGV movement
- The barging option is unattractive as a strategy, but a helpful fall-back option for occasional use



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The proposed rail options are high cost, which outweigh any benefits. Circumstances where it may be feasible are unlikely

Market

- Poor market conditions: none of the customers are rail-connected and they are dispersed throughout the region. The volumes shipped are generally low and the distances relatively short for a rail operation.
- A distribution centre or “inland port” located to the northwest of the City, connected by a rail shuttle to the container terminal, would provide sufficient density to justify rail operations and allow containers to travel by road between it and the customers.

Best Possible Market Scenario for Rail

Rail connection options

- Marino Point would require a spur off the existing Cork-Cobh line, signalling, rolling stock and the retention of the existing Loop Line. Estimated capital cost €25m - €40m (excluding rolling stock).
- Ringaskiddy would be best served by a new freight only line connecting to the Dublin - Cork line in the Blarney area. Estimated capital cost €260m ± 50%

Evaluation

- A socio-economic evaluation and series of sensitivity tests show that, for both options, the life-cycle costs of the scheme outweigh the benefits, even over 60 years
- The emerging policy landscape suggests no policy objectives that would justify curtailment of the port's development on the basis of not having the ability to connect to rail

Under what circumstances would a rail connection be feasible?

- Rail to a container terminal at Marino Point would be viable, in socio-economic terms, if an inland port operation was established with a distribution centre and rail shuttle, run by a commercial logistics provider and subsidised by government. The distribution centre would need to handle at least 25% of all the port's containers, preferably more. The rail operating costs would need to be significantly lower than forecast while road haulage costs would need to rise above forecasts. At Kent Station, a height clearance issue at the tunnel would need to be solved without capital works and the Loop Line would need to be retained.
- One option is to take containers by road to a railhead at North Esk or elsewhere and onwards by rail.

Other options

- Costs would include height clearance, railheads, other infrastructure and operating costs. Assessment of costs for a hypothetical customer in the Tralee area showed they would outweigh benefits.
- If Marino Point were to operate as a general cargo terminal, and the right bulk customer emerged, for example, one like the current Lisheen Mines, it might be worth serving it by rail.

Polices are developing to support the Port of Cork's relocation to Ringskiddy and to close out the rail issue

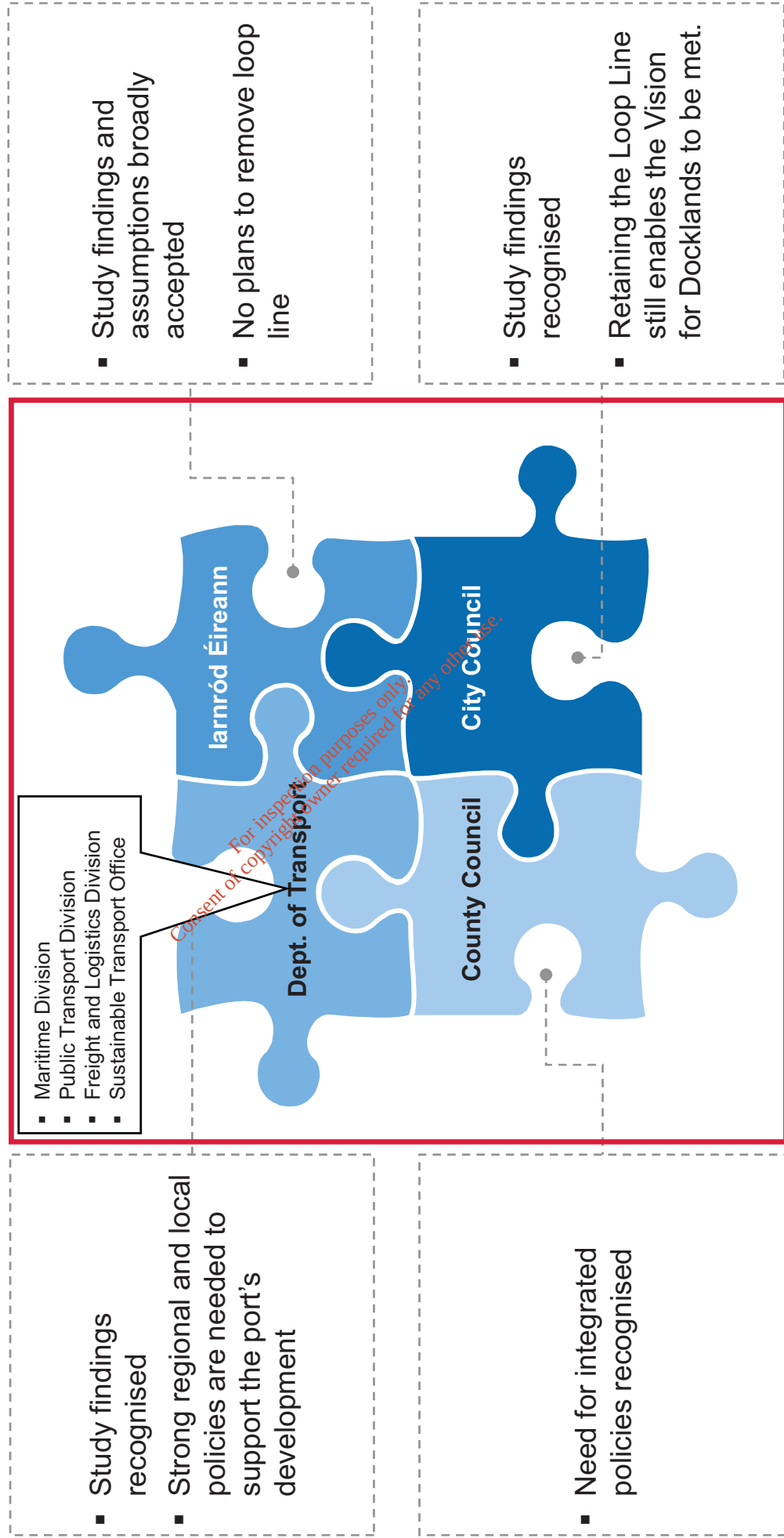
- Many of the parties have already moved to express a more definitive position on the relocation of the Port of Cork's container terminal, and others are in the process of doing so. So far, none have a priority policy that looks for the Port of Cork's container terminal to have a rail connection.
- In most urban areas, if there were a push for a rail connection, it would probably come from the local authorities wishing to reduce the amount of lorries on the roads, but in this case their priorities are around retaining a viable and competitive port in Cork and relocating the port from the City Quays and Tivoli to release land for redevelopment. Issues with excessive truck movement resulting from the port are not being articulated in local policies.
- National sustainable transport policy prioritises reducing the demand for passenger travel, which accounts for most of transport-related emissions. Freight-related emissions are less and there is much to be done to reduce them through management measures before there would be investment in rail. Although there is no sign of it now, it is not unreasonable to conjecture that at some future point, Government may consider moving from the current position of not funding rail freight to a policy to part-fund rail freight proposals that have a justifying socio-economic case; however, affordability and prioritisation with respect to other proposals would also need to be taken into account. In this case, there is no socio-economic case. Even if there were, affordability is a major issue at present. Also, a new rail scheme would not be prioritised ahead of those already in planning.

In summary, an evaluation of latest policies does not show any policy objective to support a rail connection to the Port of Cork

Policy Level	Main Interests
Local & Regional Authorities	•Viable local/regional port •Efficiently operating road network •Best possible local environment •Specifically, the City and County Development Plans: •Support the redevelopment of Docklands/relocation of port •Support a container terminal at Ringaskiddy •Contain no stated objective to get trucks off the roads in the Cork City area •Forthcoming Regional Planning Guidelines expected to align with Development Plans •Forthcoming local area plans provide an opportunity to state specific policies for the two sites under consideration
National Government	•Sound socio-economic case for State investment (DoT/DoF) •Affordability (DoT/DoF) •Efficient provision of transport services (DoT/DoF) •Despite the recommendations of the Strategic Rail Review and the National Spatial Strategy, no specific rail freight policy has been developed (DoT/DoE) •<i>Smarter Travel : A New Transport Policy for Ireland 2009 - 2020</i> commits to addressing the national deficit in freight policy, has no explicit objective to shift freight from road to rail but commits to exploring the realistic potential for rail freight (DoT) •Support for the container terminal to relocate to Ringaskiddy (Forfas, Jan 2009)
EU	•Shift of freight from road to rail desirable but policy should optimise the potential of each mode. Competitive transport markets are key •Irish Government usually granted derogations in relation to EU rail policy

- Local and National Policy has developed since the ABP decision against the Oysterbank proposal
- Local policies support the relocation of the container terminal at Ringaskiddy
- National policies support the relocation to Ringaskiddy
- Explicit support for rail freight has yet to emerge nationally or regionally

A round of stakeholder engagement showed no disagreement with the study findings



In conclusion, for optimal future sustainability, local and regional policies need to support the Port's future development

- The Kent Station Loop Line must be retained or an alternative provided when site developed. Discussions with Iarnród Éireann indicated that this would not be a problem as there is no longer a plan to remove it. The City Council are aware of this and recognise it will be taken into account in plans to redevelop the station to turn to face the river
- If the Port is not allowed to develop its container handling capability, it will become increasingly uncompetitive. More goods will be taken to and from the Port of Cork's catchment via other ports. The result will be longer truck trips than at present with a subsequent increase in negative impacts
- Having a competitive regional port will therefore provide for a sustainable future for the region. It follows that the port should relocate to the site which best meets its business needs, providing the best competitive advantage
- This study shows that there is no socio-economic case for a rail operation to the Port of Cork under expected circumstances. Even at the Marino Point site, which is close to the railway, there is no robust case for a rail operation for transporting containers. The circumstances under which the railway opportunity might be taken up are unlikely
- Given these findings, whether or not the site for a future container terminal is near to a railway should not be given undue weighting in decision making. It would be undesirable and ultimately unsustainable to encourage the port to select a railway-oriented site if it does not make business, operations, economic or environmental sense and if the limitations of that site constrained the port's potential competitive advantage
- The Regional Planning Guidelines, in expressing objectives in relation to the region's port, should clarify the strategic regional development, competitiveness and sustainability issues
- The Local Area Plans that cover the Ringaskiddy and Marino Point sites should support the Port's Strategic Development Plan

Appendix 1

Distribution Centres in New Zealand

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Distribution Centres overcome the need for customer railheads, recognising that few freight journeys can be by rail alone

- Distribution Centres
 - recognise that, except for certain bulk trades, few traffics can complete their entire journey by rail alone
 - are widely used in New Zealand and can serve a twofold purpose when import and export volumes are well balanced
 - work best when services can provide an end to end service for their clients regardless of the mode (i.e. whilst a container may be picked up by a truck, put on rail and then collected by a truck at the other end the customer must not feel this)

Port of Christchurch Example

Well balanced import and export volumes

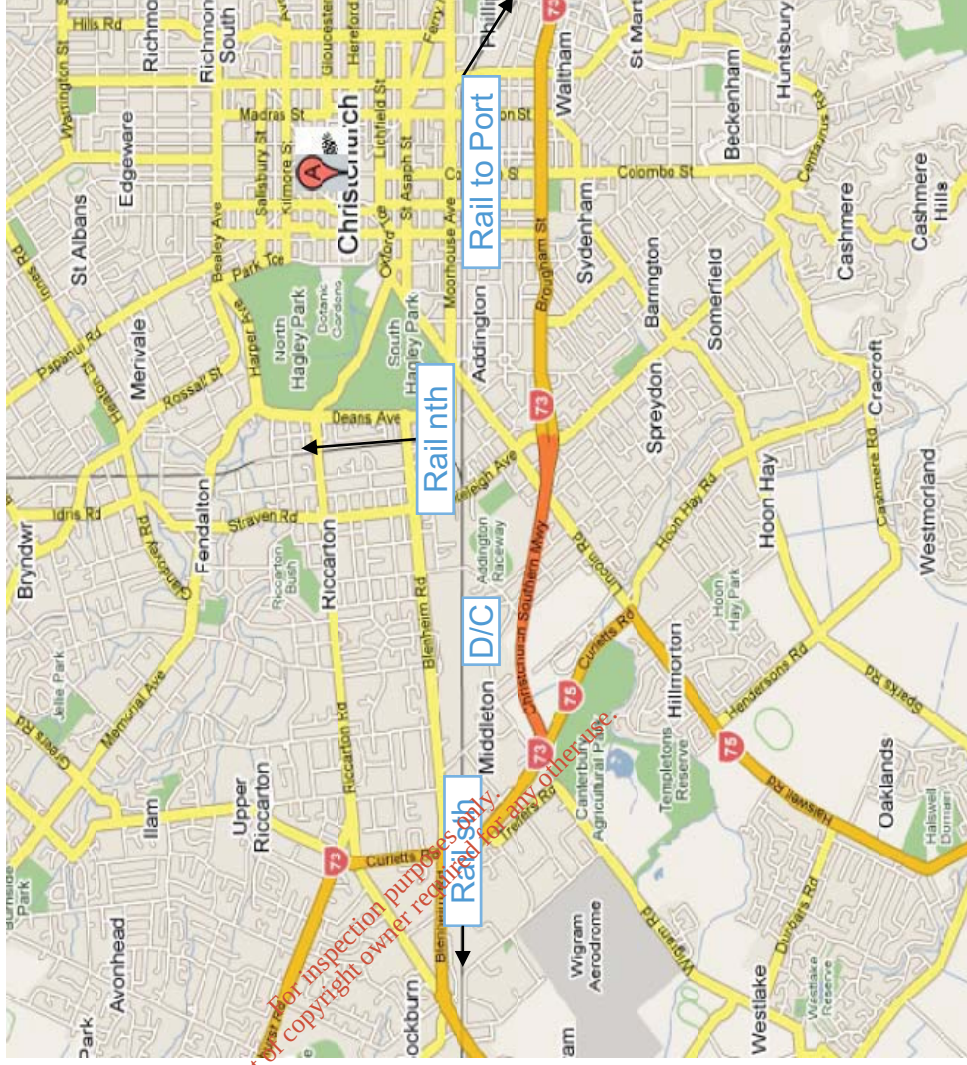
Imports	Exports
▪ Imports are taken by rail into Christchurch Distribution centre from Ports (in Christchurch) and further south and north ▪ Imports are be grounded before being picked up by road to be taken on their final leg of the journey to the customer ▪ Distribution Centre activities (i.e number of staff, train time arrivals etc.) are focussed around when customers want their goods, normally between 0700-0900 in the morning	▪ Export traffic (mainly dairy and meat) is taken by rail into the Christchurch Distribution Centre from a factory or abattoir ⁽¹⁾ ▪ From here these containers are forwarded by rail to Ports further north or to the Port in Christchurch ▪ Other value services are offered such as under-bond cargo management and power supply for containers ▪ Return trips from the Port of Christchurch bring empty containers which are then taken to container parks for repositioning

1) Refrigerated containers that need to be on power are powered by a generator attached to the train. This traffic is generally long distance i.e between the South and North Island where exports are being taken to a different Port apart from Christchurch. Christchurch serves a rich export hinterland and most frozen product does not need to be on power whilst it is in transit. They can then be powered up again before being railed to the Port, railed directly to the Port to go on power there.

Christchurch Distribution Centre is well suited in terms of location to rail and road and its proximity to the Port

Key Facts about Christchurch

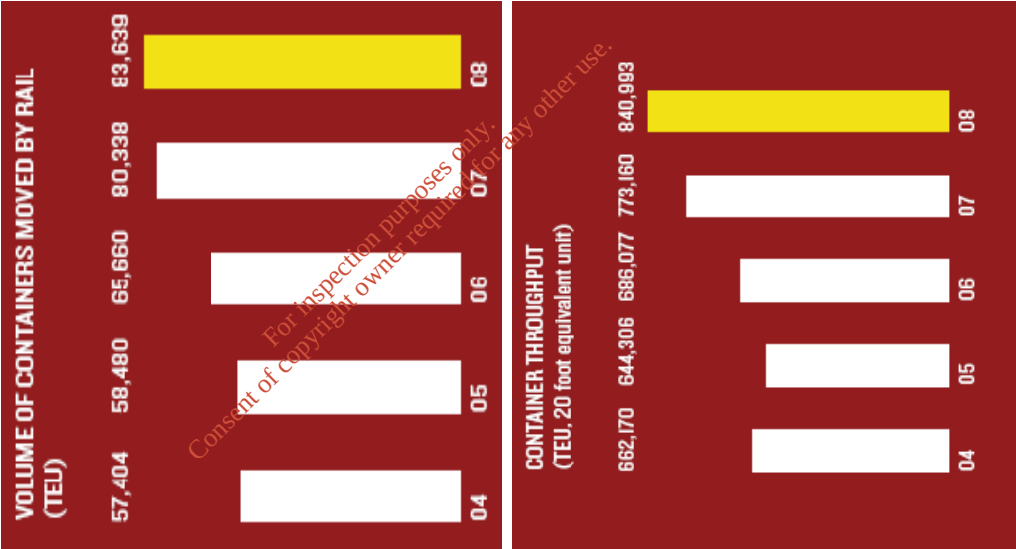
- Christchurch population 331,400
- Distribution Centre located close to the industrial area of Christchurch and within a few km of Christchurch centre
- Distribution centre well located in terms of rail (north, south and east) and road access
- The distance from the Distribution Centre to the Port is 15km
- The benefits of the Distribution Centre are:
 - Improved journey times and reliability as a result of avoiding road congestion
 - Reduced HGV traffic on roads and associated environmental benefits
 - Reduced case for road building



Recognizing the benefits of rail, Ports of Auckland are developing a new inland port at Wiri, 25 km from Auckland Central

Ports of Auckland recognizes that efficiency is just as important outside the Port gates as it is inside. The development of a short-haul rail service between the Auckland seaport and Wiri Inland Port in South Auckland is one mechanism the Company is pursuing to improve Auckland's supply chain. The solution is a prime example of an integrated, multi-modal approach to transport planning, where road, rail and sea transport all work together to create a leaner and greener supply chain. The project includes an upgrade of the rail sidings and the construction of a hardstand adjacent to the Company's Wiri Inland Port, which borders the North Island Main Trunk Line. The resulting service will enable a large portion of Auckland's import containers to be moved by rail to Wiri, and then trucked to local businesses. We plan to have the rail service up and running midway through 2009. Once up to speed it is forecast to save 100,000 truck trips in and out of Auckland's CBD per annum – or up to 2.5 million truck kilometers per year.

Taken from the Ports Of Auckland 2008 annual review



Policy to shift from Road to Rail
- Auckland (pop 1.2m) has two competing international seaports: Auckland and Tauranga - The Port of Tauranga and KiwiRail jointly operate an inland “metroport” where businesses deliver and collect their freight as if it were the actual port - Wiri is Port of Auckland’s response to the Tauranga challenge - The Ports of Auckland only have about 10% of their total TEU moved by rail at present - establishing the inland ports is a way of addressing that - The environmental benefit is widely accepted - an unpopular proposed urban motorway became harder to justify once traffic congestion was eased by the rail freight link

This approach demonstrates that freight for local distribution can be sent a short distance via rail to a point to be distributed from

DESTINATION AUCKLAND

NEARLY 80% OF AUCKLAND-BASED EXPORTS AND IMPORTS COME FROM, OR GO TO, PREMISES LOCATED SOUTH OF THE CBD, INCLUDING WIRI AND EAST TAMAKI. AXIS INTERMODAL FACILITATES THE BEST CONTAINER FREIGHT SUPPLY CHAIN FOR THESE GOODS.

THE AUCKLAND AXIS CONTAINER TERMINALS ARE:

- In the best location to access the Auckland market. The Seaport is all-weather, connected 24/7 to business by motorway and rail.
- Highly efficient. Container shipping lines say Auckland is the top port in Australasia and up with the best in the world.
- Future proofing. A deepened shipping lane, extended main container terminal and investment in new equipment ensures the Seaport has the capacity and capability to handle the next generation larger container ships.

AXIS WIRI INLAND PORT IS:

- A 16-hectare site in a great location. It's bounded by rail and within kilometres of SH1 and the new SH20.
- A 24-hour extension of the Seaport, with all the road, yard (including empties), e-commerce, MAF/Customs functions of the Seaport.

AXIS EAST TAMAKI INLAND PORT IS:

- A successful small-site Inland Port, in operation since 2002.
- An essential part of the Auckland container freight supply chain for customers Fisher & Paykell and Panasonic, streamlining their logistics and delivering to their bottom line.



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Taken from the axis intermodal inland Port website

APPENDIX 5.1 PLANNING HISTORY 2008 – 2013

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APPENDIX 5.1: PLANNING HISTORY 2008-2013

Introduction

Appendix 5.1 provides details of planning applications permitted or applied for within the past 5 years (2008-2013), to allow an assessment of potential cumulative impacts with the proposed port development. This assessment has focused on townlands within the vicinity of the port lands; falling within the boundary of lands zoned within Ringaskiddy; and townlands between the Ringaskiddy and the Shannonpark roundabout, as detailed on figure A.5.1.

There have been a total of 88 permitted or undecided planning applications within the past 5 years. Of these 30 related to one off housing, extensions or minor amendments to existing residential units. The remaining 58 applications fall within the following categories; Industrial; Institutional; Residential; Commercial; Infrastructural; and Amenity. Each category is discussed in turn.

Industrial:

There have been 33 industrial planning applications. Of these 16 related to ancillary works, such as extensions to car-parking; yard compounds etc; 7 were for minor extensions or alterations to existing facilities. The most significant application in relation to cumulative impacts relate to:-

- **Wind Turbines:** 3 Applications for wind turbines, resulting in permission for a total of 5 wind turbines in the vicinity.
- **Novartis:** Novartis has made a number of planning application for the extension of the production facilities at Barnahely, Ringaskiddy. The most recent 13/5727 was granted in November 2013. This application, which did not require an EIS, summarised the status existing and proposed facilities at the site. It noted that there is a total constructed area of 68,567 sq m; a further 6,165 sq m has now been permitted. In the environmental report accompanying the most recent application, Novartis noted that the projected increase in staff number at full operation would be 28; and that it was anticipated that the construction phase would last 15 months, with a peak of 110 construction staff and an average of 90.
- **DePuy (Ireland):** DePuy (Ireland) has made a number of planning applications for the extension of production facilities at their plant, at Loughbeg, Ringaskiddy. The combined impact of the applications amounted to an increase in production floor area of 3,756 sq m, but it was not envisaged that any additional employees would be required. The company's most recent application if for the development of associated car parking spaces (202), a decision on this application is pending.

Institutional

There have been 3 institutional planning applications within the past 5 years. Two of these related to temporary classrooms at Shanbally School.

University College Cork received permission for the development of a new Maritime Research and Testing Centre on lands adjacent to the National Marine College. This building (the Beaufort Building) is currently under construction.

Residential

There have been 6 residential applications (excluding single residential dwellings) in the area within the past 5 years. At Shanbally there have been 2 applications for the development of residential schemes (1 for 15 dwellings and 1 for 8 dwellings); also at Barnahely there have been 2 applications of the development of residential schemes (1 for 3 dwellings and 1 for 43 dwellings).

In addition to the applications for housing there has been 1 application to continue the use of demountable residential units at Ringport; and 1 application has been extended for the development of 23 student apartments at Loughbeg.

Commercial

There have been 4 commercial planning applications in the area within the past 5 years. Two applications related to the development of 10 warehousing units at Raffeen; 1 relates to a golf driving range at Raffeen and 2 relate to the storage of bulk goods at Ballybricken.

Infrastructural

There have been 7 planning applications in the area within the past 5 years for minor infrastructural works. Three relate to masts / antennae; 2 to community alarms; and 2 to electrical substations.

Amenity

There have been 3 amenity planning applications in the area within the past 5 years. One relates to the development of an all weather playing pitch linked to the National Maritime College. The other applications are:

- **Haulbowline Remediation:** Cork County Council has made a planning application for the remediation of contaminated lands at the east tip of Haulbowline Island and to develop a public park on the lands. A decision on the application is due in April 2014.
- **Community Playground:** Ringaskiddy and District Residents Association was granted permission in January 2014 for the development of a community playground at Loughbeg, on lands adjacent to the Port's proposed development.

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List of Significant Planning Applications

Haulbowline:

Applicant	Planning Ref:	Address	Description	Type of Development	Grant Date
University College Cork	11/5487	Haulbowline Rd.(adjacent to NMCI)	Development of UCC Maritime Research& Testing Centre	Institutional	02/02/2012
Cork County Council	ABP MT0001	Haulbowline Island	Remediation of East Tip of Haulbowline Island	Amenity	Pending (decision due 24/4/14)

Ringaskiddy:

Applicant	Planning Ref:	Address	Description	Type of Development	Grant Date
Cork Institute of Technology	11/5889	National Maritime College of Ireland	Construction all weather playing pitch	Amenity	30/11/2011

Loughbeg:

Applicant	Planning Ref:	Address	Description	Type of Development	Grant Date
Depuy (Ireland) Limited	08/7927	Depuy Ltd. Loughbeg	Modification of extension to manufacturing facility	Industrial	09/10/2008
Pfizer Ireland Pharmaceuticals Drug Product Plant	08/8270	Pfizer Loughbeg	Extension to product facility	Industrial	30/10/2008
Depuy (Ireland) Ltd	09/7065	Depuy Ltd Loughbeg	Construction of biomass boiler facility	Industrial	10/12/2010
Depuy (Ireland) Ltd	10/5142	Depuy Ltd Loughbeg	New transformer building and ESB infrastructure	Industrial	03/08/2010
Depuy (Ireland)	10/5662	Depuy Ltd Loughbeg	Construction large extension product & plant area etc	Industrial	21/09/2010
Depuy (Ireland)	11/4944	Depuy Ltd Loughbeg	Erect two wind turbines and works	Industrial	29/11/2012 (appeal split decision)
Depuy (Ireland) Ltd	11/6485	Depuy Ltd Loughbeg	Retention of 70 car park spaces	Industrial	31/05/2012
Depuy (Ireland) Ltd	11/6484	Loughbeg	Permission to waive condition no. 5 of planning ref 06/8591	Industrial	31/05/2012
Depuy (Ireland) Ltd	11/6482	Loughbeg	Construction of small recycling facility	Industrial	28/02/2012
Depuy (Ireland)	11/6527	Depuy Ltd Loughbeg	Extension to waste storage compound	Industrial	29/02/2012

Loughbeg (continued):

Applicant	Planning Ref:	Address	Description	Type of Development	Grant Date
Depuy (Ireland) Ltd	11/6525	Depuy Ltd Loughbeg	Retention of part of inner service road	Industrial	31/05/2012
Depuy (Ireland) Ltd	11/6617	Loughbeg	Retention of single storey structure	Industrial	16/03/2012
Depuy (Ireland)	11/6669	Depuy Ltd Loughbeg	Construction of extension reconfiguration of car park	Industrial	29/03/2012
Fleming Developments(In Receivership)	12/5462(See 03/6582)	Ringport Business Park	Continuation of use of demountable residential units	Residential	28/09/2012
The Hammond Lane Metal Company Ltd	12/5863	Loughbeg	Demolition existing building, reconstruction & extension concrete yard, new admin building. Change of use of workshop	Industrial	28/03/2013
Maritime Halls Ltd	13/4983	Rose Lodge, Loughbeg	Demolition of no. 2 ruined dwelling houses & construction 23 no. student apartments	Residential	n/a (extension of duration)
Ringaskiddy and District Residents Association	13/6054	Loughbeg	Construction community children's playground	Institutional	n/a
Depuy (Ireland)	13/6262	Loughbeg	Construction security building & car park 202 spaces	Industrial	n/a

- A further 7 applications within Loughbeg related to minor extensions or alterations to existing residential properties.

Shanbally:

Applicant	Planning Ref:	Address	Description	Type of Development	Grant Date
Ken Murphy	08/9156	Shanbally	Site development for 15 dwellings	Residential	06/05/2009
Eddie Hanley	09/6653	Shanbally	Construction of 8 dwellings	Residential	26/02/2010
Meteor Mobile Communications Ltd	09/6929	O'Briens Land	Erection of communication antennae etc.	Infrastructural	28/01/2010
The Board of Management Shanbally National School	11/5146	Shanbally	Erection of temporary classroom	Institutional	24/08/2011
The Board of Management Shanbally National School	12/6094	Shanbally	Erection of temporary prefabricated building	Institutional	27/02/2013

- A further 2 applications with Shanbally related to minor extensions to existing residential properties.

Raffeen:

Applicant	Planning Ref:	Address	Description	Type of Development	Grant Date
John & Hillary Loftus	08/4372	Raffeen Industrial Estate	Development of 10 warehouse units etc	Commercial	11/11/2008
ESB	09/4136	220kV Electrical Transformer Station Raffeen	Alterations to existing station	Infrastructure	09/04/2009
Fernhill Golf Club	11/5740	Fernhill, Raffeen	Construction of 8 bay driving range	Commercial	06/02/2012
John & Hillary Loftus	13/5833	Raffeen Industrial Estate, Raffeen	Develop 10 warehouse units etc	Commercial	n/a (extension of duration)

- A further 1 application with Raffeen was for the construction of a single house; 9 applications related to extensions / amendments to existing residential units; and 5 applications related to residential waste water systems.

Barnahely:

Applicant	Planning Ref:	Address	Description	Type of Development	Grant Date
Port of Cork Company	08/4115	Barnahely	Subdivision existing office & change of use	Industrial	27/11/2008
Centocor Biologics (Ireland) Ltd	08/4863	Barnaheky	Construction boiler room & container storage space	Industrial	15/05/2008
William O'Brien	08/10019	Barnahely	3 no. dwelling houses & ancillary works	Residential	12/03/2009
Centocor Biologics Ireland	10/4237	Barnahely	Retention data collection mast	Infrastructural	23/04/2010
Janssen Biologics Ireland Ltd	11/4821	Barnahely, Ballybricken	Extension to car park	Industrial	18/07/2011
Janssen Biologics (Ireland) Ltd	11/4890	Barnahely	Completion of extensions (extension of duration)	Industrial	n/a
Novartis Ringaskiddy Limited	11/4946	Raheens, Barnahely	Erection of 2 wind turbines	Industrial	29/11/2012 (appeal split decision)
Janssen Biologics (Ireland)	11/4945	Barnahely	Erection 1 wind turbine	Industrial	29/11/2012 (on appeal)
Port of Cork Company	12/6528	Loughbeg, Barnahely	Erection of signage	Industrial	19/03/2013
William O'Brien	13/4049	Barnahely	Demolition existing dwelling & construction of 43 no. dwellings	Residential	n/a
Novartis Ringaskiddy Ltd	13/4764	Barnahely	10 year permission for construction small production facility	Industrial	12/07/2013
Port of Cork Company	13/5735	Barnahely	Construction of workshop	Industrial	20/11/2013
Novartis Ringaskiddy Limited	13/5759	Raheens/Barahely/Shanbally	Construction of extension	Industrial	26/11/2013
Janssen Biologics (Ireland)	13/6217	Barnahely	Single storey extension	Industrial	n/a

- A further 1 application within Raffeen related to the construction of a single residential unit; and 4 related to extensions / amendments to existing residential units.

Raheens:

Applicant	Planning Ref:	Address	Description	Type of Development	Grant Date
Novartis Ringaskiddy Ltd	08/6844	Raheens	Extension to car park	Industrial	1/08/2008
Novartis Ringaskiddy Ltd	08/7340	Raheens	Retention of community sounder	Infrastructure	28/08/2008
Novartis Ringaskiddy Ltd	11/6053	Raheens Barnahely	Construction of extension	Industrial	23/12/2011
Novartis Ringaskiddy Ltd	13/5727	Raheens/Barnahely/Shanbally	3 storey extension	Industrial	20/11/2013
Novartis Ringaskiddy Limited	13/5759	Raheens/Barnahely/Shanbally	Construction of extension	Industrial	26/11/2013

- A further 2 application related extensions / amendments to existing residential units.

Ballintaggart:

Applicant	Planning Ref:	Address	Description	Type of Development	Grant Date
Pfizer Ireland Pharmaceuticals	08/4083	Ballintaggart	Installation community alert siren	Infrastructure	04/04/2008
Pfizer Ireland Pharmaceuticals	10/4483	Ballintaggart	Retention of 60m high steel mast	Infrastructure	28/05/2010
Pfizer Ireland Pharmaceuticals	12/5768	Ballintaggart/Ballybricken	Demolition of workshop & stores	Industrial	30/10/2012
Pfizer Ireland Pharmaceuticals	12/6573	Ballintaggart/Ballybricken	Construction small scale production unit	Industrial	12/03/2013
BioMarin Manufacturing Ireland Ltd	13/5400	Ballintaggart/Ballybricken	Construction electrical substation building	Infrastructure	16/10/2013
Pfizer Ireland Pharmaceuticals	13/6121	Ballintaggart/Ballybricken	Construction of extension	Industrial	n/a

Ballybricken:

Applicant	Planning Ref:	Address	Description	Type of Development	Grant Date
Cemex Ireland Ltd	08/10021	Ballybricken (Deep Water Terminal)	Development of 2 silos, substation etc.	Commercial	23/04/2009
Arkady Feed Ltd	10/8815	Ballybricken	Construction of bulk grain store	Commercial	13/09/2011

APPENDIX 6.1 GAZETTEER OF ARCHAEOLOGICAL DATA RELEVANT TO RINGASKIDDY

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Appendix 6.1: Gazetteer of Archaeological data relevant to Ringaskiddy

Known information that occurs within the proposed development area is highlighted in blue,

National Museum of Ireland Topographical Files

There are no artefacts registered in the National Museum of Ireland's Topographic Files to the townlands that touch on the present developments areas, namely: Ballybricken; Barnahely; Ringaskiddy.

Department of Arts, Heritage, and Local Government, Sites and Monuments Record.

Locations in Irish National Grid. Descriptions based on record files.

Reference No.	Classification	Townland	Description	Easting	Northing	Distance to development
CO087-026	Lime Kiln	Monkstown		176270	65330	700m
CO087-048	Ringfort	Barnahely	Roughly circular area, 45m E-W; 38m N-S) enclosed by earthen bank.	176920	63800	800m
CO087-049	Church	Ballybricken	Captain Hayes remembers the walls standing'. Site now occupied by Pfizer Chemicals.	177050	64490	220m
CO087-050001-2	Non antiquity	Barnahely	None	177180	64010	500m
CO087-051001-2	Graveyard	Barnahely	Rectangular graveyard (c.100m N-E-SW; c. 30m NW-SE) enclosed by stone wall; still in use, many headstones, the earliest dating from 1720. Contained parish church of Barnahely, marked 'site of' on all editions of OS map; no visible trace of church.	177370	63900	500m
CO087-052001-2	Tower House	Barnahely	Overlooking Lough Beg and Cork Harbour. Complex of ruined buildings around courtyard which still functions as farmyard. Oldest structure near SW corner where 2-storey rectangular building (10.5m N-S; 6.6m E-W) appears to be remains tower house, showing much evidence of rebuilding. Built by de Cogan family, reputedly by Richard de Cogan, lord of the manorin 1536; de Cogans occupied site until 1642 when garrison surrendered to Lord Inchiquin. Also known as Castle Warren. Limited test excavation in 1999 did not reveal anything of interest, 99D079.	177380	63730	600m
CO087-053	Ringaskiddy		On highest point of Ringaskiddy promontory, overlooking	178710	63990	1km

Reference No.	Classification	Townland	Description	Easting	Northing	Distance to development
CO087-054	Midden	Ringaskiddy	Cork Harbour. Circular tower (diam. 15.5m E-W; 10.9m N-S; H 12.1m) with flattened profile to N and S; enclosed by dry fosse (Wth 4.6m; D 3.1m); within circular enclosure (diam. 100m) marked by ordnance stones. Built of coursed limestone ashlar. Largest of Cork Harbour Martellos; it was under construction 1813-15. Also registered in the NIAH as 20908747.	179063	63447	1.6km
CO087-059001-3	Martello Tower and Barracks	Haulbowline	Martello Tower and Barracks complex on high ground at N edge of Haulbowline Island, overlooking entrance to Upper harbour; formerly part of 'Ordnance Ground' (CO087-05902-), now occupied by Naval Service. Constructed 1813-15. Built of coursed limestone blocks. Restored wooden floor; tower is being converted into museum by Naval Service. Earlier reference to possible Viking occupation of the island, while the earliest known fortification here began in 1602. Also described in the Archaeological Inventory of Co. Cork. Vol. 2. (Power, 1994), entries 5881, 5865.	178880	65480	1.1km
CO087-061	Church, site of	Ballintaggart	The site of Rosbeg church was noted by Bishop Dive Downes in October 1700. The 1842 OS map shows a walled garden NW of Ballybricken House, but in Ballintaggart townland which may be the location referred to above. This is likely to be the site of the 'early Irish church' and graveyard. Area now occupied by industrial complex; no visible surface trace.	176620	64760	500m
CO087-105	Magazine	Rocky Island	Built 1808-18 to stone gun powder for the naval base on Haulbowline. Also described in the Archaeological Inventory of Co. Cork. Vol. 2. (Power, 1994), entry 5873.	179248	64981	1.4 km
CO087-106	Enclosure	Ballintaggart	INV_NOTES Crop mark (CUCAP, AIE 62) shows bivallate circular enclosure (int. diam. c.54m; ext. diam. c. 75m).	176290	64470	800m
CO087-111	House, Prospect Villa	Ringaskiddy	House demolished in 1981. Old photograph shows house as 2-storey, weather slated with hipped roof; of late 18th century appearance. Entrance front of 6-bays; central round-headed door ope; classical surround with broken pediment. Remains of ornate gate lodge (overgrown) survive to S on either side of entrance gate; one storey, appears to be hexagonal in plan; built of cut stone.	177660	64320	200m
CO087-155	Enclosure	Barnahealy	Complex of features comprising interlocking enclosures,	177605	63809	500m

Reference No.	Classification	Townland	Description	Easting	Northing	Distance to development
			identified in geophysical survey, possibly Bronze Age/Iron Age in date.			
CO087-161	Midden	Ringaskiddy	Not available	179370	63748	1.7km

National Inventory of Architectural Heritage.

Based on www.buildingsofireland.ie

Reference No.	Name	Description	Easting	Northing	Distance to development
20908747	Ringaskiddy	Martello tower, same as SMR CO087-053.	178880	65480	1.1km
20908747	Haulbowline	Martello tower, same as SMR CO087-059	178880	65480	1.1km
CO-87-W-774641	Barnahely	Prospect Villa was lived in by Lieutenant-Colonel Burke, and has since become the site of a modern factory. However a length of the boundary wall survives along its east side, where it forms one side of the R613 road. The wall is substantial in construction, measuring over 4m in height, and comprises of a mixture of dressed-, semi-dressed, and rough-cut stone of sandstone composition. A section has been removed from the northern end of the walls structure, approximately 10m+ section, as part of the development of the existing road network. Frequent repairs, both modern and old, are visible along its extent. The originally capping is obscured by heavy ivy growth. Impact: The boundary wall will be directly impacted in part. Mitigation: The area of impact will be recorded archaeologically in advance of its destruction, which will be monitored archaeologically.	177515 to 177420	64190 to 64037	Within, at tie-in of road network to N28/R613.

Department of the Environment, Heritage and Local Government, Historic Shipwreck Inventory.

The listing is restricted to those inventory entries that appear to be adjacent to or lie in the general vicinity of Ringaskiddy.

Locational data where available converted to Irish National Grid

Name	Date of Loss	Location	Easting	Northing	Description	Distance to development
<i>Luvius</i>	2/5 November 1845	Near Haulbowline	n/a	n/a	Ship en route to Cork from Cardiff which it collided with a steamer and sank. The crew was rescued.	Unknown but not less than 1.5km.

<i>Maria</i>	1900	Rocky Island	n/a	n/a	n/a	Unknown but Rocky Island is 1.5km E of main development, and c. 300m N of Paddy's Point
<i>Shannon Lass</i>	1 February 1935	Haulbowline wharf	n/a	n/a	n/a	Unknown but not less than 1.5km.
Unknown	20 October 1898	Off Haulbowline	n/a	n/a	n/a	Unknown.

Department of the Environment, Heritage and Local Government, Licensed archaeological intervention.

Source: *Excavations Bulletin*, annual publication edited by Isabel Bennett and published on behalf of the DAHG by Wordwell, Bray, and partially available online at www.excavations.ie

Licence No.	Name	Description	Easting	Northing	Distance to development
96E086	Barnahely	Archaeological monitoring and trial excavation on the Merfin factory site observed a single small area of burning in an shallow fire-redened pit, 75cm in diameter and filled with charcoal and ash. A millstone and two millstone fragments were also recovered, but nothing of archaeological significance was revealed.	177200	63700	c. 800m S of development.
99E0279	Barnahely	Castle Warren tower house, SMR CO87:5201, was subject to five test trenches in advance of a perimeter fence. No features of archaeological significance were observed.	177200	63700	c. 800m S of development.
01E552	Ringaskiddy	Archaeological trial excavation of a grassy mound revealed it to be of modern date and not of archaeological significance.	178710	63990	c. 900m S of development.
03E1158	Ringaskiddy	Monitoring was undertaken of marine dredging for the construction of a jetty and pontoon in connection with the National Maritime College Development. The area was excavated to an overall depth of ±4.183m, with a deeper area of 90m ² excavated to ±6.1m. The excavated sediment was dark-grey silt, which became sandier in composition at its lower levels. Three non-archaeological timber fragments were recovered during the course of sieving. Two relatively modern glass bottles and a number of non-archaeological metal artefacts were also recovered. No archaeological features or artefacts were identified within the area of proposed development.	17896	64600	c. 400m E of development.

04E0774	Barnahely	Road realignment close to Castle Warren (Barnahely Castle) and Barnahely graveyard (SMR CO87:51). Test trenching revealed the greater part of a partially extant early 19th-century walled garden located to the west of Castle Warren; an isolated stake-hole and shallow pit of suspected prehistoric date; clusters of recent parallel furrows criss-crossing the study area, a single charcoal-flecked pit, and a stray find of medieval green-glazed pottery from the topsoil	177306	636940	c. 1.2km S of development.
04E1246	Barnahely	Test-trenching in advance of the construction of a road network and ancillary trenching on a land bank at Barnahely, Ringaskiddy did not uncover any archaeological feature or find	176290	64470	c. 1.6km W of development.
04E1441	Haulbowline	Archaeological monitoring of dredging activity within the naval base did not reveal any material of archaeological significance.	179000	65590	> 1km N of development.
04E1685	Barnahely	Test-trenches in the vicinity of a ringfort revealed the remains of a keyhole-shaped kiln, located c. 10m to the west of the ringfort, and a levelled fulacht fiadh, located c. 20m to the north-west of the ringfort. Both of these sites were recorded and left in situ.	176920	63800	1.5km W of development.
06D026	ADM jetty site and Oyster Bank site, Ringaskiddy	Marine geophysical survey conducted under license 05R133 as part of the Port of Cork's Strategic Development Plan identified 33 anomalies. Underwater inspection of the anomalies conducted under license 06D026 revealed no archaeologically significant material. Mitigation: Archaeological monitoring.	Various	Various	Within.
06D064	Ringaskiddy and Cork Harbour	Non-disturbance visual inspection was employed to assess the archaeological potential of the seabed along two cable-lay routes identified for the Aghada to Cuskenny Cable Lay Project. In addition, a number of side-scan sonar and magnetometer anomalies, located within the vicinity of each cable route, were investigated, and the shoreline at each location was inspected. No material/deposits of archaeological significance were observed exposed on the seabed as part of the survey. The seabed was largely clear of man-made surface debris, with only occasional fragments of metal being encountered (jetsam from fishing vessels).	185527 to 183140	675611 to 652600	4km E of development.
06D072	Rocky Island, Ringaskiddy	Intertidal and metal-detector survey carried out on the north-western foreshore area of Rocky Island in Cork Harbour in advance of the proposed construction of an outfall pipe revealed no features or finds of archaeological significance.	17938	65100	1km E of development
06E0809	Rocky Island, Ringaskiddy	Disarticulated human remains were identified during the redevelopment of the magazine (CO87-105) as a crematorium. It is likely the remains pre-date construction of the magazine, which was built between 1808 and 1818.	179380	65100	1km E of development.
07E0711	Ringaskiddy	A programme of testing adjacent to the Pfizer facility on a circular crop-mark feature did not reveal anything of archaeological significance.	176050	65020	1km W of development

09D053	Ringaskiddy to Corkbeg	Underwater assessment of marine geophysical anomalies located along the proposed route of a 220kV submarine cable between Corkbeg Island and Ringaskiddy, Cork Harbour included examination of a new shipwreck location identified in the side-scan sonar data, at 180660E 63784N. Inspection suggests the wreckage is from a composite vessel of late 19th century date.	179315 to 182749	64226 to 63456	1km E of development.
12D016, 12R073	Barnahely	Non-disturbance intertidal and underwater assessment of the Ramp area in the East Basin, Monkstown creek, and the extension of the DWB in the West Basin, and the seabed at No. 2 Dolphin Ramps was conducted. The seabed is characterised by sand and silt which would provide a good holding content for buried material if it exists. No features or objects of archaeological significance were observed lying on the seabed surface or protruding from it. Mitigation: Archaeological monitoring.	Various	Various	Within.
12D034	Haulbowline	An archaeological study has included intertidal and sub-tidal assessment of the eastern tip of the island. The work has confirmed the survival of footings associated with a former stone-built causeway that connected Haulbowline with Spike Island.	179862	65170	1.5km E of development.
14D004, 14R003	Paddy's Point	Systematic intertidal and sub-tidal inspection and metal-detection was carried out and did not reveal material of archaeological significance. Mitigation: Subject to granting of permission, inspection of seabed area that lay outside the survey footprint but is now within the development area; Archaeological monitoring during construction activity.	179148	64678	Within

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APPENDIX 6.2 DIVER TRUTHING OF MARINE GEOPHYSICAL ANOMALIES DETECTED ON OYSTER BANK AND AT THE ADM JETTY

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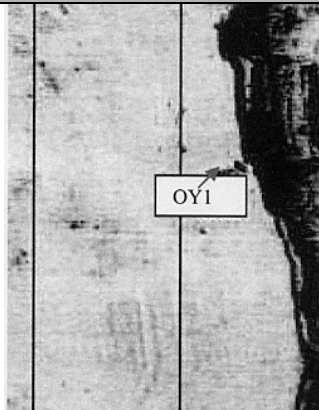
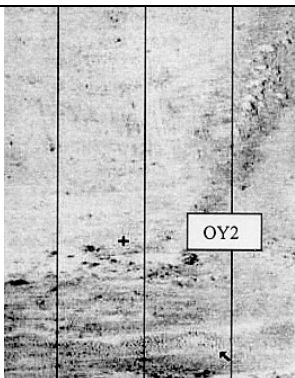
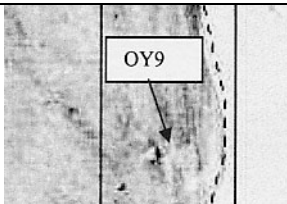
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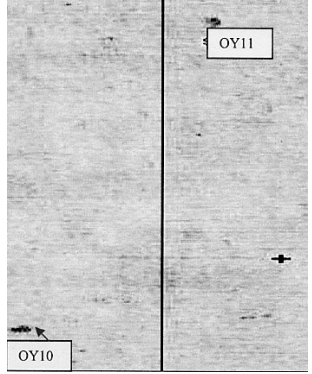
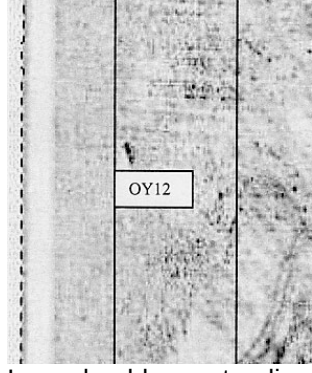
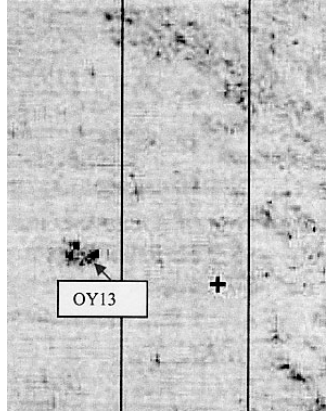
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Appendix 6.2: Diver-truthing of Marine Geophysical Survey anomalies detected on Oyster Bank and at the ADM Jetty

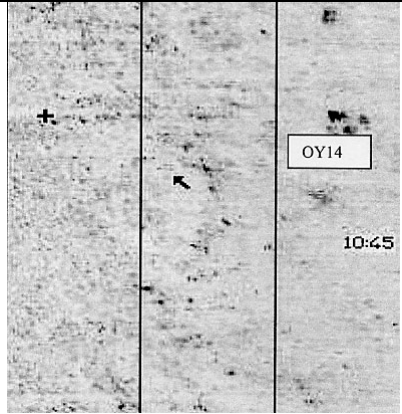
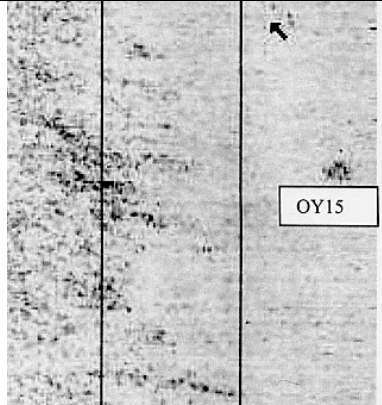
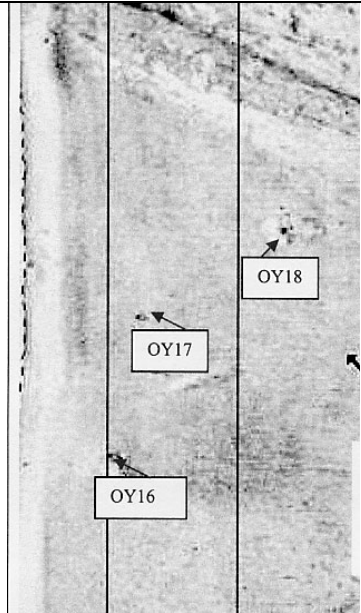
Refer to Figure 6.7 for the distribution of the anomalies
Coordinates in Irish National Grid and WGS84 Lat/Long.

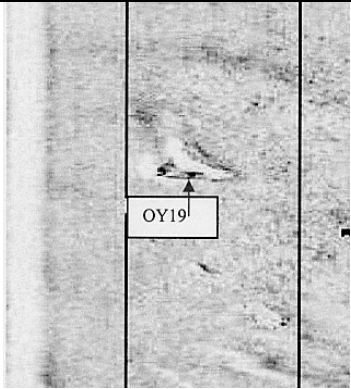
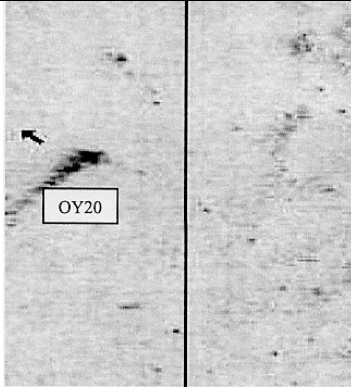
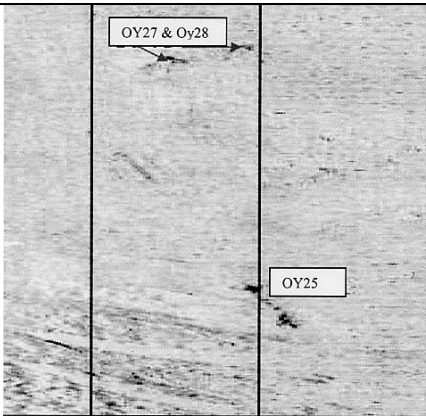
6.3.1 Oyster Bank

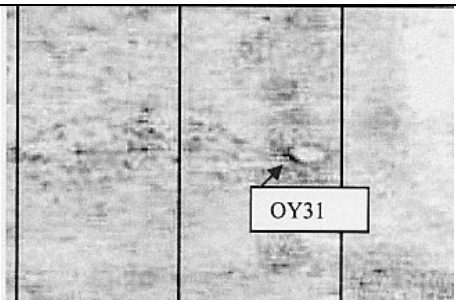
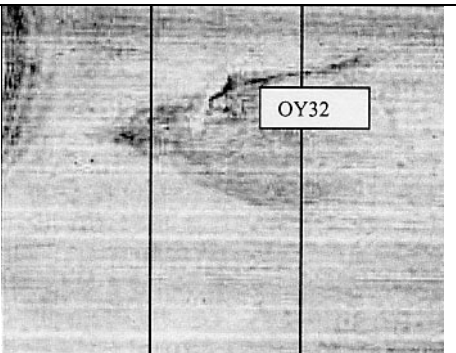
Target	Easting	Northing	Long (W) D-M-S:	Lat (N) D-M-S:	Image/ Diver Identification
OY1	178376	65157	8-18-51.976	51-50-19.826	 Half shell of life raft container lying on seabed.
OY2	17884	65122	8-18-25.438	51-50-18.764	 Linear ridge composed of gravel and small rocks with some marine growth. Sterile seabed surrounding feature.
OY9	178368	65134	8-18-52.389	51-50-19.081	 Small pile of rocks, upstanding c.0.30m from seabed.

OY10	178785	64998	8-18-30.58	51-50-14.738	 No target visible. OY10 either buried by a shifting seabed or target represents portable object that has moved with the tide.
OY11	178725	65012	8-18-33.716	51-50-15.183	Wire rope hawser ($\frac{3}{4}$ inch diameter). See OY10.
OY12	178742	65061	8-18-32.839	51-50-16.77	 Large boulder upstanding from the seabed by 0.30-0.40m.
OY13	178671	65007	8-18-36.535	51-50-15.013	 No target visible. Sterile sand/silt bottom visible surrounding target location.

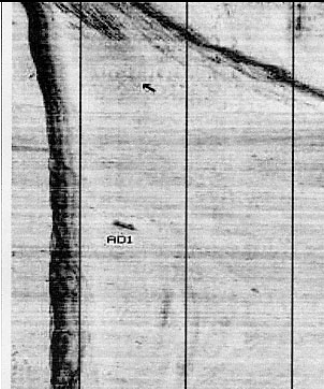
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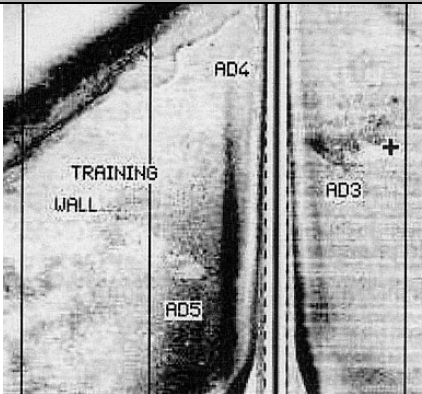
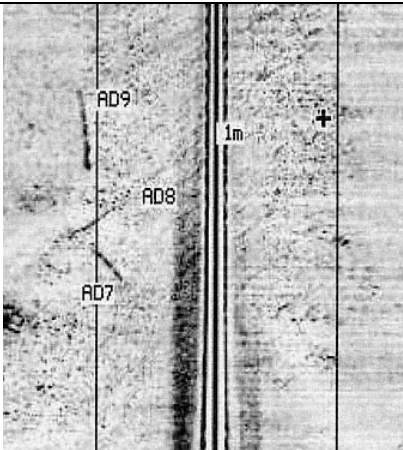
OY14	178630	64956	8-18-38.664	51-50-13.353	 Debris from construction of survival training jetty.
OY15	178916	64898	8-18-23.715	51-50-11.52	 Two medium sized boulders lying adjacent to each other; upstanding c.0.15m from seabed.
OY16	17177	6490	8-19-2.284	51-50-7.924	 Pile of hand sized rocks upstanding between 0.10 and 0.20m from seabed.
OY17	178200	64790	8-19-1.083	51-50-7.927	Large tyre lying approximately 2m from target OY18. Tyre upstanding from seabed by 0.30m (See OY16).

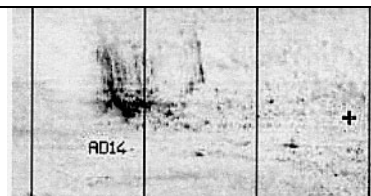
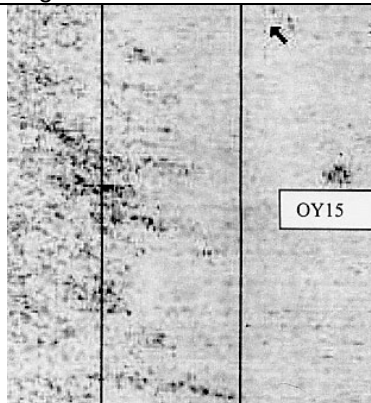
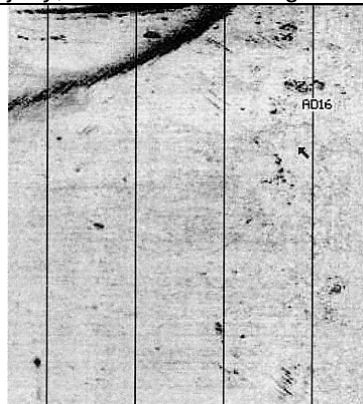
OY18	178215	64780	8-19-0.297	51-50-7.915	Large Tyre upstanding from seabed, c.0.20-0.30m (See OY16).
OY19	178346	64789	8-18-53.457	51-50-7.915	 Large rock armour boulder; some scouring evident.
OY20	178617	64846	8-18-39.317	51-50-9.797	 Debris from Training wall. Targets OY20-OY28 all located along the Low Water mark.
OY23	178259	64717	8-18-57.984	51-50-5.573	See OY20
OY24	178236	64707	8-18-59.182	51-50-5.246	See OY20
OY25	178219	64782	8-19-0.086	51-50-7.67	 Debris from Training wall. Targets OY20-OY28 all located along the Low Water mark.
OY26	178196	64723	8-19-1.274	51-50-5.758	See OY25
OY27	178156	64775	8-19-3.374	51-50-7.435	See OY25
OY28	178153	64780	8-19-3.532	51-50-7.596	See OY25

OY31	177854	65034	8-19-19.206	51-50-15.771	 Pile of small to medium sized rocks with scour hole to one side. Upstanding 0.10 from seabed and 0.40m from bottom of scour hole.
OY32	178351	65137	8-18-53.272	51-50-19.174	 A distinctive ridge of stones and gravel with marine growth attached. Dead mans fingers secured to some of the larger stones.

6.3.2 ADM Jetty

Target	Easting	Northing	Long (W) D-M-S:	Lat (N) D-M-S:	Image/ Diver Identification
AD1	177277	64939	8-19-49.326	51-5-12.618	 Linear deposit of rocks upstanding c.0.40m from seabed. Deposit measures 2.25m length x 0.50m width. Deposit located along base of 45° slope.

Target	Easting	Northing	Long (W) D-M-S:	Lat (N) D-M-S:	Image/ Diver Identification
AD3	177218	65247	8-19-52.48	51-50-22.573	 Gently undulating seabed with small ridge located above large hole measuring 2.5-3m in circumference and 1.5m in depth. Probably from dredging or prop-wash.
AD4	177266	65213	8-19-52.054	51-50-21.475	Gently undulating seabed with frequent plough marks; linear rake marks measuring 0.40m in width and 0.30m in depth.
AD5	177261	65254	8-19-50.233	51-50-22.515	Large, linear, dredge scar with newly exposed dredge face measuring 2.5m in height. Almost vertical in profile. Dredge-scar 2m+ in width.
AD7	177255	65125	8-19-50.518	51-50-18.631	Targets AD7-AD9 represent the mooring chain from Navigation buoy no. 2. These targets appear to have been pinged during different tidal states; when the mooring chain was leaning in different directions due to the tide (see image AD8)
AD8	177249	65111	8-19-50.827	51-50-18.177	 Same as AD7
AD9	177233	65105	8-19-51.602	51-50-17.981	Same as AD7

Target	Easting	Northing	Long (W) D-M-S:	Lat (N) D-M-S:	Image/ Diver Identification
AD10	177634	65150	8-19-30.729	51-50-19.495	 Large rock armour boulder that has fallen away from the training wall.
AD14	177220	65253	8-19-52.375	51-50-22.767	 Dredge scar/hole; may form part of target AD3.
AD15	177069	65180	8-20-0.244	51-50-20.283	 Rock armour spit located along side jetty, c.10m from training wall.
AD16	176981	65107	8-20-4.822	51-50-18.008	 Large rock armour boulder that has fallen away from the training wall.

APPENDIX 9.1 24-HOUR AMBIENT NOISE SURVEY RESULTS

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APPENDIX 9.1
24-HOUR AMBIENT NOISE SURVEY RESULTS

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Location N1: Summary Results 5th – 6th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	17:48	45.9	47.6	36.4
	18:00	47.6	48.6	37.7
	19:00	48.6	49.2	36.6
	20:00	45.5	38.4	34.9
	21:00	45.3	46.0	34.7
	22:00	41.1	42.2	34.2
	23:00	39.6	40.0	35.6
	00:00	41.3	39.8	34.9
	01:00	39.1	38.2	33.6
	02:00	40.1	34.8	32.6
	03:00	43.5	42.6	37.3
	04:00	45.2	37.2	35.1
	05:00	48.9	55.2	36.6

Location N1: Summary Results 5th – 6th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	06:00	45.8	40.6	37.0
	07:00	50.2	45.4	38.9
	08:00	54.4	58.8	39.8
	09:00	53.2	57.2	39.6
	10:00	63.8	61.2	40.2
	11:00	63.9	61.0	40.3
	12:00	59.2	60.8	40.2
	13:00	51.3	53.8	38.4
	14:00	51.5	56.8	38.2
	15:00	51.0	56.8	39.1
	16:00	52.4	52.6	40.6
	17:00	54.8	59.8	37.2
Mean		54.8		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N2: Summary Results 4th – 5th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	16:31:52	38.2	37.0	34.2
	17:15:00	41.5	37.0	31.8
	18:15:00	38.1	43.2	29.4
	19:15:00	41.4	41.6	30.0
	20:15:00	42.1	43.8	29.8
	21:15:00	37.7	34.0	29.2
	22:15:00	33.5	34.8	29.2
	23:15:00	31.3	34.0	28.6
	00:15:00	34.2	31.6	28.6
	01:15:00	31.3	32.8	29.0
	02:15:00	31.5	34.2	27.4
	03:15:00	36.5	30.4	28.2
	04:15:00	34.2	35.4	29.6

Location N2: Summary Results 4th – 5th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	05:15:00	40.0	48.4	29.4
	06:15:00	38.3	41.2	29.8
	07:15:00	38.9	41.8	31.0
	08:15:00	43.1	45.4	37.4
	09:15:00	50.2	54.8	52.6
	10:15:00	46.8	49.4	38.8
	11:15:00	47.3	51.2	38.8
	12:15:00	45.9	53.2	37.6
	13:15:00	55.2	56.6	54.4
	14:15:00	55.9	58.2	51.0
	15:15:00	50.9	51.8	50.2
	16:15:00	46.6	46.0	34.8
Mean		47.0		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N3: Summary Results 5th – 6th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	18:05	53.8	53.0	30.6
	19:05	45.9	48.8	30.4
	20:05	45.9	45.6	29.0
	21:05	45.5	43.8	30.5
	22:05	45.1	49.2	41.9
	23:05	45.2	42.3	31.6
	00:05	38.0	35.3	32.2
	01:05	37.2	35.4	29.3
	02:05	37.9	31.5	29.6
	03:05	39.2	38.2	31.6
	04:05	37.1	37.3	32.0
	05:05	44.3	44.8	33.6
	06:05	41.1	39.0	31.2

Location N3: Summary Results 5th – 6th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	07:05	53.2	48.5	36.1
	08:05	55.8	59.3	38.6
	09:05	50.8	54.8	38.2
	10:05	49.7	51.6	34.5
	11:05	52.0	53.8	38.0
	12:05	52.9	56.6	39.8
	13:05	50.7	55.1	38.7
	14:05	51.0	54.8	38.6
	15:05	51.3	53.7	40.9
	16:05	51.1	53.5	38.2
	17:05	52.8	57.0	48.3
	18:05	55.8	64.3	47.5
Mean		50.4		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N4: Summary Results 9th – 10th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	11:00	54.3	56.7	45.1
	12:00	55.2	60.1	44.3
	13:00	54.8	59.7	41.3
	14:00	54.2	58.5	42.2
	15:00	55.9	53.8	40.1
	16:00	56.8	59.5	44.3
	17:00	59.3	64.0	43.7
	18:00	59.9	64.3	44.0
	19:00	57.4	66.1	41.8
	20:00	50.1	52.7	43.5
	21:00	49.9	50.5	40.1
	22:00	49.0	50.1	42.2
	23:00	46.7	48.7	40.8

Location N4: Summary Results 9th – 10th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	00:00	49.9	52.0	44.3
	01:00	45.2	43.7	36.7
	02:00	44.1	40.1	31.2
	03:00	45.5	37.6	30.7
	04:00	48.6	48.0	35.3
	05:00	47.6	40.8	32.0
	06:00	57.0	50.4	33.2
	07:00	60.3	65.5	42.9
	08:00	58.2	63.4	44.5
	09:00	54.2	59.3	41.9
	10:00	51.2	54.9	41.6
	11:00	51.2	52.0	41.4
Mean		55.0		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N5: Summary Results 5th – 6th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	18:46	59.3	61.2	46.0
	19:01	52.4	56.8	38.5
	20:01	48.1	53.1	33.2
	21:01	47.7	49.6	35.0
	22:01	44.8	46.8	32.6
	23:01	45.7	46.9	33.9
	00:01	44.0	46.8	29.2
	01:01	39.7	40.6	28.0
	02:01	40.4	38.3	32.3
	03:01	40.9	42.8	30.9
	04:01	41.1	34.4	32.7
	05:01	46.2	45.1	36.0
	06:01	51.5	45.5	40.3

Location N5: Summary Results 5th – 6th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	07:01	54.2	58.9	44.8
	08:01	54.5	57.4	47.0
	09:01	51.3	56.6	41.7
	10:01	50.8	54.7	42.7
	11:01	55.2	58.6	44.5
	12:01	53.1	54.9	46.5
	13:01	54.2	57.9	47.9
	14:01	54.4	56.6	47.7
	15:01	55.3	55.6	45.8
	16:01	55.1	58.2	45.9
	17:01	56.0	58.7	46.8
	18:01	56.4	65.3	47.3
Mean		52.9		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N6: Summary Results 9th – 10th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	10:42	53.3	56.1	47.4
	10:57	54.2	56.7	50.2
	11:57	55.8	58.1	51.6
	12:57	54.1	56.1	51.4
	13:57	55.3	56.5	52.2
	14:57	55.5	56.9	52.3
	15:57	57.7	58.0	53.5
	16:57	56.8	58.2	53.6
	17:57	56.9	57.8	52.7
	18:57	55.0	59.4	51.4
	19:57	54.1	55.9	50.7
	20:57	53.1	55.3	50.0
	21:57	52.9	55.6	50.0

Location N6: Summary Results 9th – 10th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	22:57	52.2	53.3	49.9
	23:57	52.6	54.0	50.6
	00:57	51.0	52.4	47.8
	01:57	42.2	42.4	37.3
	02:57	44.1	44.2	37.1
	03:57	44.0	48.6	38.4
	04:57	45.5	50.4	38.9
	05:57	51.3	50.8	42.3
	06:57	55.4	57.8	51.3
	07:57	55.5	57.0	52.1
	08:57	53.9	56.1	50.0
	09:57	53.8	56.7	49.6
Mean		53.9		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N7: Summary Results 3rd – 4th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	16:01	53.0	55.8	50.2
	17:00	44.2	44.8	41.6
	18:00	42.8	42.6	39.4
	19:00	42.0	43.0	39.6
	20:00	41.3	44.2	38.6
	21:00	42.6	42.0	38.0
	22:00	40.5	43.8	39.2
	23:00	41.2	41.2	37.6
	00:00	40.1	42.4	38.8
	01:00	39.0	41.0	37.0
	02:00	38.4	38.6	36.0
	03:00	40.5	39.4	36.8
	04:00	39.0	38.2	35.6

Location N7: Summary Results 3rd – 4th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	05:00	41.3	46.6	35.6
	06:00	43.7	42.8	36.8
	07:00	43.9	45.0	40.0
	08:00	48.2	50.0	42.2
	09:00	52.5	50.6	40.6
	10:00	53.4	47.4	39.2
	11:00	49.3	47.6	41.2
	12:00	48.1	50.0	42.6
	13:00	46.9	48.8	45.4
	14:00	49.0	53.8	48.0
	15:00	47.3	48.6	42.2
	16:00	42.8	44.0	40.8
Mean		47.0		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N8: Summary Results 9th – 10th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	12:26:10	46.9	46.0	41.4
	13:15:00	46.3	48.0	41.6
	14:15:00	44.8	47.8	42.0
	15:15:00	46.4	48.0	42.2
	16:15:00	46.1	48.6	43.6
	17:15:00	49.5	53.2	42.8
	18:15:00	48.1	50.6	43.4
	19:15:00	46.8	46.4	41.8
	20:15:00	49.6	54.2	45.0
	21:15:00	49.1	49.6	44.0
	22:15:00	51.1	53.8	47.2
	23:15:00	51.8	52.6	44.8
	00:15:00	55.2	57.6	50.4

Location N8: Summary Results 9th – 10th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	01:15:00	49.1	53.8	44.8
	02:15:00	41.6	43.8	37.2
	03:15:00	40.8	43.8	37.4
	04:15:00	45.5	46.4	38.2
	05:15:00	42.7	43.8	37.0
	06:15:00	42.3	40.2	37.0
	07:15:00	46.7	48.4	42.4
	08:15:00	45.8	47.0	43.8
	09:15:00	49.3	51.6	44.4
	10:15:00	48.4	51.2	44.6
	11:15:00	47.1	48.6	43.0
	12:15:00	48.9	52.2	44.8
Mean		48.4		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N9: Summary Results 11th – 12th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	13:58	55.7	59.0	43.0
	14:00	53.0	57.6	40.5
	15:00	55.1	57.4	41.1
	16:00	54.0	58.4	39.9
	17:00	54.3	58.0	39.9
	18:00	54.1	58.0	40.0
	19:00	54.0	57.6	38.3
	20:00	52.1	56.8	37.9
	21:00	51.4	56.0	36.1
	22:00	49.4	55.4	35.1
	23:00	49.1	47.0	34.0
	00:00	44.5	42.8	38.3
	01:00	44.3	43.0	40.3

Location N9: Summary Results 11th – 12th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	02:00	42.8	41.4	38.6
	03:00	44.5	41.2	41.7
	04:00	47.5	44.2	43.6
	05:00	52.8	49.2	48.6
	06:00	56.2	49.4	50.9
	07:00	58.6	60.2	49.6
	08:00	60.0	64.4	50.3
	09:00	59.6	63.8	52.7
	10:00	58.3	62.0	51.1
	11:00	58.3	61.8	51.0
	12:00	57.7	62.0	49.7
	13:00	56.2	61.0	34.8
Mean		55.1		
Survey Details:				
Survey Personnel: Darragh Kingston, RPS.				
L _{Aeq} Time-averaged noise level.				
L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level).				
L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N10:Summary Results 10th – 11th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	13:45	51.8	55.8	38.9
	14:45	52.2	56.5	39.4
	15:45	54.2	56.7	41.1
	16:45	53.2	57.7	43.8
	17:45	52.7	56.7	39.8
	18:45	52.8	57.3	39.5
	19:45	52.4	56.7	40.8
	20:45	51.0	56.1	37.0
	21:45	50.7	53.0	33.2
	22:45	48.3	50.8	30.1
	23:45	44.2	41.5	29.4
	00:45	42.1	36.4	31.7
	01:45	38.3	36.0	32.0

Location N10: Summary Results 10th – 11th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	02:45	38.9	44.9	31.2
	03:45	39.1	36.7	33.0
	04:45	39.2	40.7	31.8
	05:45	43.8	48.5	32.7
	06:45	46.8	51.2	34.8
	07:45	52.7	58.2	36.8
	08:45	53.5	58.4	39.0
	09:45	53.5	56.6	34.7
	10:45	53.1	57.9	41.4
	11:45	52.6	56.5	43.3
	12:45	54.2	57.2	39.1
	13:45	67.9	56.5	40.1
Mean		55.7		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N11: Summary Results 11th – 12th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	14:47	40.2	42.7	36.4
	15:47	42.3	44.8	35.1
	16:47	44.7	44.0	36.4
	17:47	52.3	43.9	37.5
	18:47	41.4	44.3	35.3
	19:47	59.4	42.7	34.5
	20:47	36.3	38.0	31.5
	21:47	44.8	53.2	29.0
	22:47	46.6	30.0	25.8
	23:47	51.0	32.9	27.3
	00:47	29.4	33.3	27.5
	01:47	31.1	32.2	30.3
	02:47	39.6	32.1	28.5

Location N11: Summary Results 11th – 12th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	03:47	38.7	37.0	34.3
	04:47	43.5	51.1	41.0
	05:47	49.7	50.2	43.5
	06:47	52.0	54.3	49.5
	07:47	47.9	50.4	46.8
	08:47	46.7	50.8	46.8
	09:47	51.4	54.4	46.6
	10:47	49.3	51.1	45.9
	11:47	47.4	49.8	45.4
	12:47	44.4	45.5	39.3
	13:47	49.1	42.6	35.4
	14:47	49.6	50.6	39.4
Mean		49.4		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N12:Summary Results 10th – 11th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	13:29	53.1	58.4	42.4
	14:00	54.5	59.2	41.0
	15:00	55.8	58.2	42.2
	16:00	55.1	58.4	44.4
	17:00	54.9	59.2	41.6
	18:00	54.3	59.0	41.8
	19:00	54.8	58.4	43.0
	20:00	52.9	57.8	41.0
	21:00	53.0	57.0	40.0
	22:00	50.3	54.0	38.6
	23:00	46.7	49.6	37.8
	00:00	44.4	45.8	36.8
	01:00	42.5	39.6	37.6

Location N12: Summary Results 10th – 11th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	02:00	42.3	43.0	39.4
	03:00	41.8	40.8	37.6
	04:00	41.5	40.6	38.4
	05:00	45.0	42.2	38.4
	06:00	48.7	44.6	37.2
	07:00	55.0	59.0	38.6
	08:00	55.8	60.8	41.0
	09:00	55.7	60.2	40.4
	10:00	54.6	58.4	39.4
	11:00	53.5	57.2	41.0
	12:00	54.8	58.6	43.6
	13:00	53.3	58.6	40.4
Mean		52.9		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N13: Summary Results 10th – 11th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	14:09	51.8	55.4	44.1
	15:09	54.6	56.1	45.6
	16:09	51.9	55.2	45.4
	17:09	52.0	55.3	43.8
	18:09	50.8	54.5	43.7
	19:09	51.7	54.4	44.6
	20:09	50.3	52.5	43.7
	21:09	49.3	54.4	42.7
	22:09	47.2	53.1	39.8
	23:09	44.5	48.1	39.3
	00:09	41.9	43.2	38.2
	01:09	40.7	42.3	37.9
	02:09	42.4	44.3	38.0

Location N13: Summary Results 10th – 11th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	03:09	40.1	38.6	37.8
	04:09	39.0	38.5	37.8
	05:09	41.9	40.7	38.0
	06:09	47.2	45.9	38.3
	07:09	51.1	54.3	39.0
	08:09	52.7	57.3	41.1
	09:09	52.5	56.7	41.1
	10:09	52.4	55.0	47.1
	11:09	51.1	54.4	44.0
	12:09	51.5	54.1	46.3
	13:09	52.5	54.6	44.3
	14:09	54.3	58.0	46.6
Mean		50.5		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N14: Summary Results 11th – 12th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	14:42	55.7	59.7	41.1
	14:57	55.2	58.1	41.0
	15:57	61.0	61.3	45.3
	16:57	56.9	61.3	42.8
	17:57	55.4	59.3	41.4
	18:57	54.0	58.9	39.8
	19:57	53.7	58.5	39.7
	20:57	52.9	57.8	36.3
	21:57	50.5	56.1	35.5
	22:57	49.4	49.1	27.7
	23:57	46.6	42.4	31.3
	00:57	43.6	41.8	32.8
	01:57	42.8	37.9	32.9

Location N14: Summary Results 11th – 12th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	02:57	44.6	38.6	35.4
	03:57	43.8	39.0	38.0
	04:57	50.6	45.8	44.5
	05:57	55.3	46.9	47.3
	06:57	59.7	63.5	45.6
	07:57	60.3	65.0	47.7
	08:57	59.2	64.6	50.1
	09:57	58.2	62.8	47.5
	10:57	58.4	63.2	47.5
	11:57	57.8	62.7	45.6
	12:57	56.1	60.4	44.5
	13:57	55.6	59.1	47.8
Mean		56.0		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N15: Summary Results 30th – 31st July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	09:53	45.8	48.4	41.8
	10:00	47.3	44.6	40.7
	11:00	45.1	45.6	40.8
	12:00	44.6	45.4	41.3
	13:00	44.6	48.2	40.9
	14:00	45.9	49.6	42.7
	15:00	46.7	47.4	44.1
	16:00	47.1	47.0	44.2
	17:00	46.5	50.8	43.4
	18:00	47.6	53.2	41.0
	19:00	43.5	39.2	33.8
	20:00	46.5	47.0	42.3
	21:00	40.6	45.0	35.7

Location N15: Summary Results 30th – 31st July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	22:00	38.3	36.0	32.2
	23:00	35.9	38.8	33.5
	00:00	41.2	35.6	33.5
	01:00	38.5	40.2	36.6
	02:00	36.3	38.6	34.9
	03:00	43.6	42.6	41.9
	04:00	43.4	42.0	40.9
	05:00	48.5	46.6	43.8
	06:00	47.8	47.8	44.2
	07:00	48.5	48.6	46.8
	08:00	49.4	48.8	47.5
	09:00	47.5	48.4	33.8
Mean		45.7		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N16: Summary Results 16th – 17th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	09:55	52.6	56.1	43.3
	10:55	53.2	55.3	44.9
	11:55	52.4	55.7	43.1
	12:55	52.3	56.4	44.3
	13:55	53.1	55.8	44.4
	14:55	53.3	56.6	48.7
	15:55	53.0	56.1	45.2
	16:55	52.1	55.8	45.9
	17:55	51.7	56.0	42.6
	18:55	50.7	54.6	40.1
	19:55	49.4	54.4	40.2
	20:55	49.3	55.0	38.3
	21:55	45.8	50.3	31.9

Location N16: Summary Results 16th – 17th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	22:55	44.6	49.3	31.5
	23:55	42.2	42.4	30.3
	00:55	38.8	39.5	29.6
	01:55	37.7	34.2	31.1
	02:55	33.2	33.1	30.6
	03:55	34.9	33.3	29.1
	04:55	45.6	37.4	27.6
	05:55	45.3	41.7	29.0
	06:55	49.2	50.5	33.0
	07:55	51.0	56.7	38.8
	08:55	51.3	55.6	37.8
	09:55	50.1	54.6	38.8
Mean		50.1		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N17: Summary Results 27th - 28th January 2013 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	14:30	49.2	50.8	46.6
	15:30	49.6	48.8	45.5
	16:30	52.4	53.9	48.9
	17:30	52.3	53.2	48.2
	18:30	50.9	49.5	45.2
	19:30	48.9	48.0	44.3
	20:30	45.7	46.5	42.8
	21:30	42.3	41.3	39.2
	22:30	41.5	41.5	39.5
	23:30	41.0	40.9	39.1
	00:30	41.0	41.0	39.1
	01:30	41.8	41.9	39.2
	02:30	39.8	39.0	36.8

Location N17: Summary Results 27th - 28th January 2013 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	03:30	38.4	37.7	35.6
	04:30	37.6	37.3	35.1
	05:30	39.0	39.5	36.6
	06:30	44.0	45.2	41.6
	07:30	46.2	47.4	41.5
	08:30	46.2	46.9	42.8
	09:30	45.9	46.2	42.5
	10:30	49.3	49.5	43.5
	11:30	50.8	52.0	46.7
	12:30	50.0	50.4	46.8
	13:30	49.1	52.0	47.7
Mean		47.6		

Survey Details:
 Survey Personnel: Ronan Murphy, RPS.
 L_{Aeq} Time-averaged noise level.
 L_{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level).
 L_{A10} Noise level exceeded for 10 % of measurement period.

Location N18: Summary Results 16th – 17th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	10:44	49.1	51.3	46.4
	11:44	50.2	51.6	46.8
	12:44	47.3	47.8	43.3
	13:44	47.7	47.1	43.5
	14:44	49.4	53.2	48.7
	15:44	50.0	50.6	43.3
	16:44	49.7	52.2	46.5
	17:44	46.8	49.2	41.5
	18:44	45.1	47.9	41.6
	19:44	44.1	43.1	37.8
	20:44	61.4	45.0	38.5
	21:44	38.8	38.6	33.7
	22:44	35.0	37.9	33.5

Location N18: Summary Results 16th – 17th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	23:44	35.3	35.3	33.2
	00:44	39.4	35.4	32.6
	01:44	37.9	37.2	33.5
	02:44	42.2	36.9	33.9
	03:44	34.8	35.8	33.0
	04:44	32.7	32.8	29.9
	05:44	42.0	37.6	31.9
	06:44	38.0	42.9	34.8
	07:44	42.7	42.5	37.7
	08:44	41.9	42.6	38.1
	09:44	43.9	46.8	39.9
	10:44	45.8	46.3	40.2
Mean		49.5		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

Location N19: Summary Results 16th – 17th July 2012 (Sheet 1 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq, 1-hour}	L _{A10}	L _{A90}
	10:34:04	53.0	55.4	47.6
	11:15:00	52.0	54.2	45.0
	12:15:00	51.7	56.0	44.2
	13:15:00	50.8	51.2	42.2
	14:15:00	52.7	56.0	45.6
	15:15:00	53.0	57.4	47.6
	16:15:00	53.0	56.2	46.0
	17:15:00	51.1	54.8	43.6
	18:15:00	52.6	55.6	43.6
	19:15:00	51.5	55.0	42.4
	20:15:00	50.4	54.6	40.4
	21:15:00	48.8	53.4	37.6
	22:15:00	45.9	47.4	35.4

Location N19: Summary Results 16th – 17th July 2012 (Sheet 2 of 2)

Monitoring Location	Time	Measured Noise Level dB(A)		
		L _{Aeq} , 1-hour	L _{A10}	L _{A90}
	23:15:00	45.7	45.4	32.6
	00:15:00	41.7	49.2	32.4
	01:15:00	41.1	39.0	32.2
	02:15:00	34.0	33.6	31.0
	03:15:00	34.0	34.8	32.2
	04:15:00	40.1	35.2	32.6
	05:15:00	40.4	35.2	31.2
	06:15:00	45.3	40.6	33.6
	07:15:00	47.5	47.8	36.8
	08:15:00	48.4	51.8	38.8
	09:15:00	50.0	53.6	39.4
	10:15:00	51.6	55.0	41.8
Mean		49.8		
Survey Details: Survey Personnel: Darragh Kingston, RPS. L _{Aeq} Time-averaged noise level. L _{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level). L _{A10} Noise level exceeded for 10 % of measurement period.				

APPENDIX 9.2 GRAPHICAL SUMMARY OF 24HR AMBIENT NOISE SURVEY RESULTS

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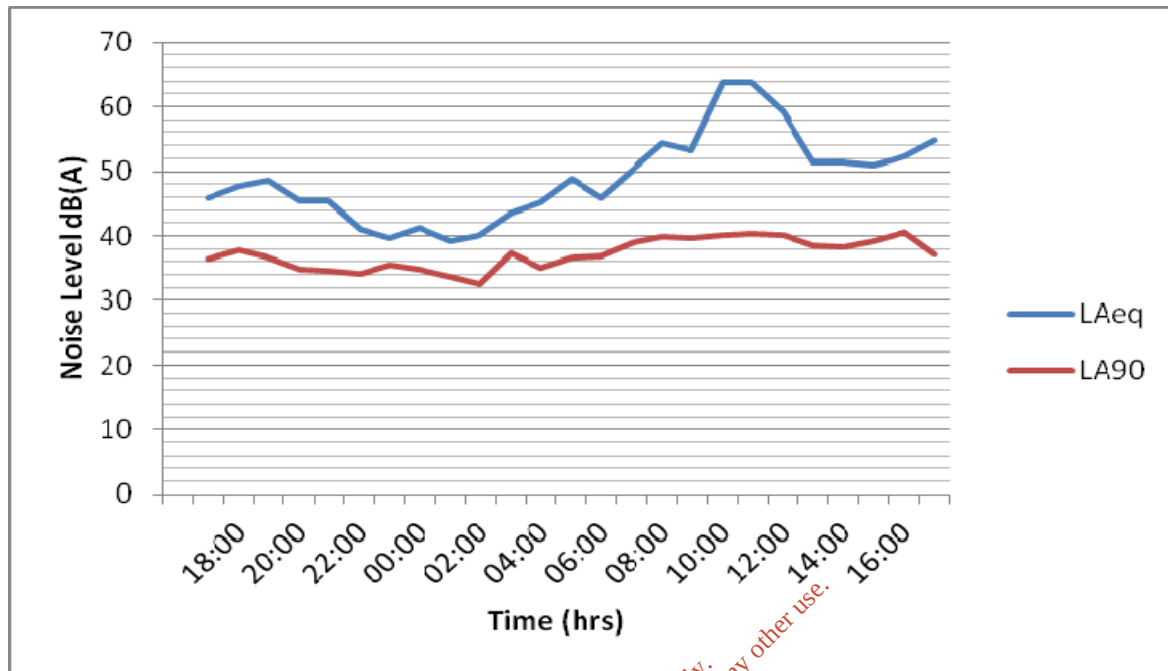
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APPENDIX 9.2

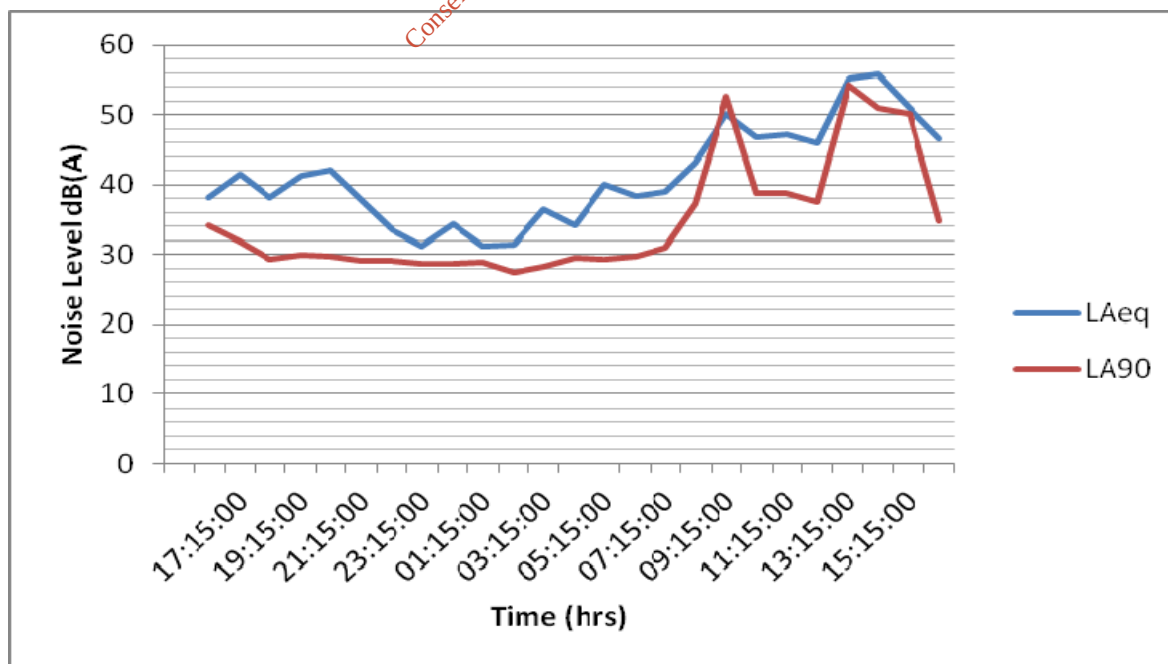
GRAPHICAL SUMMARY OF 24-HOUR AMBIENT NOISE SURVEY RESULTS

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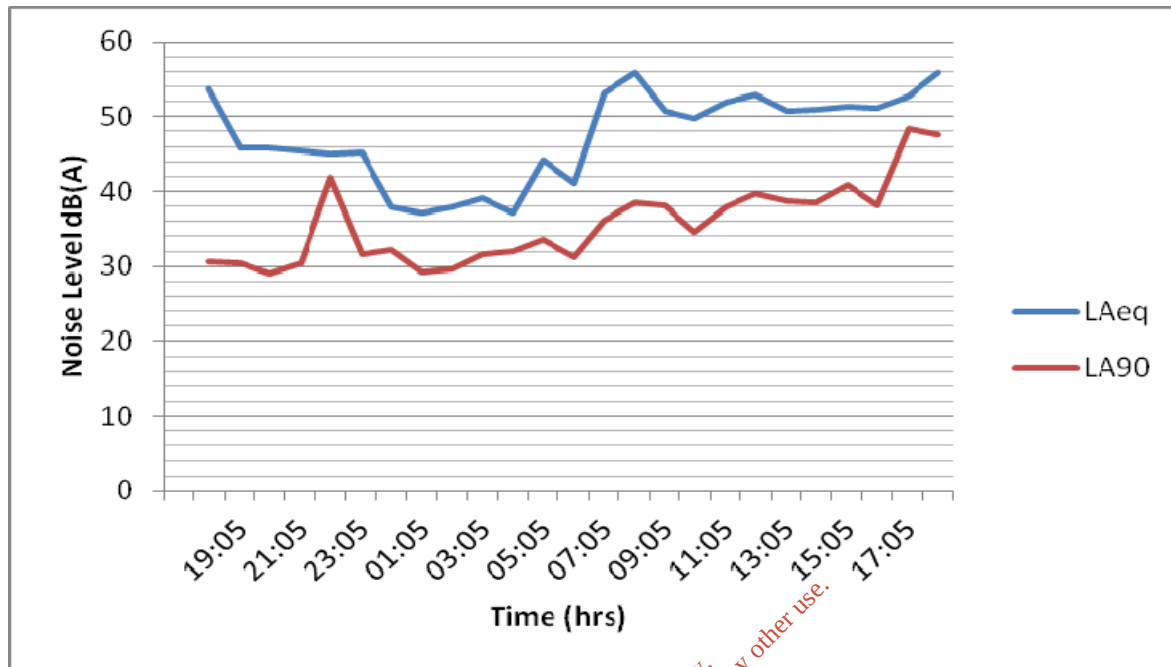
Graphical Summary of 24-hour Unattended Noise Measurements at Location N1



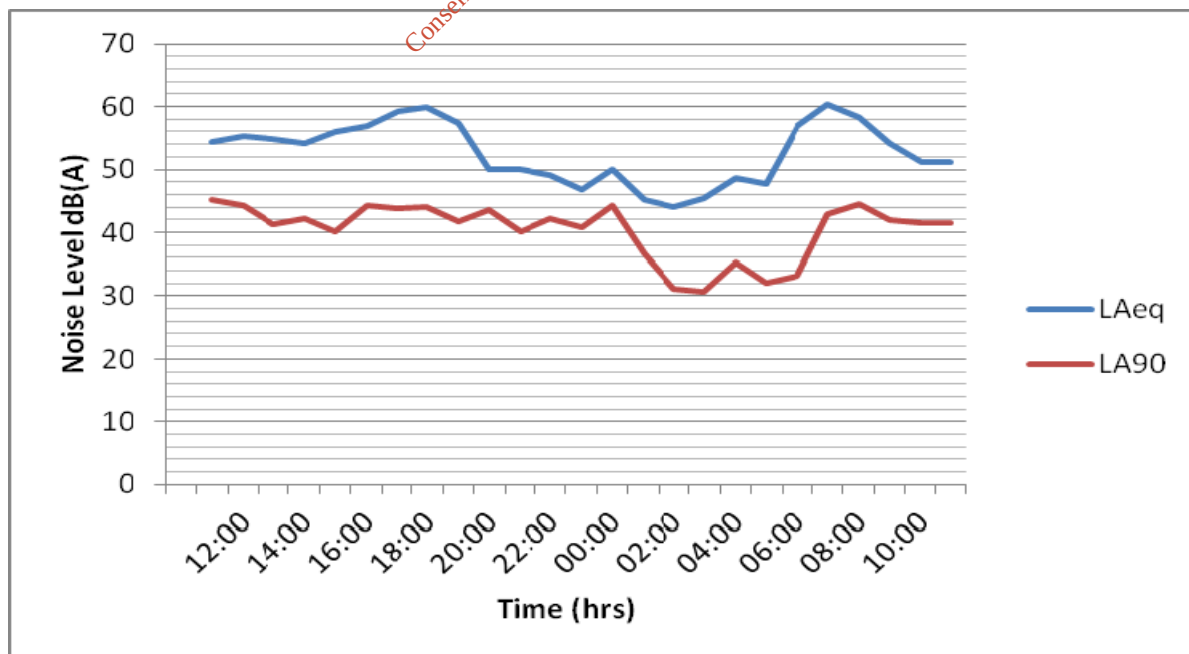
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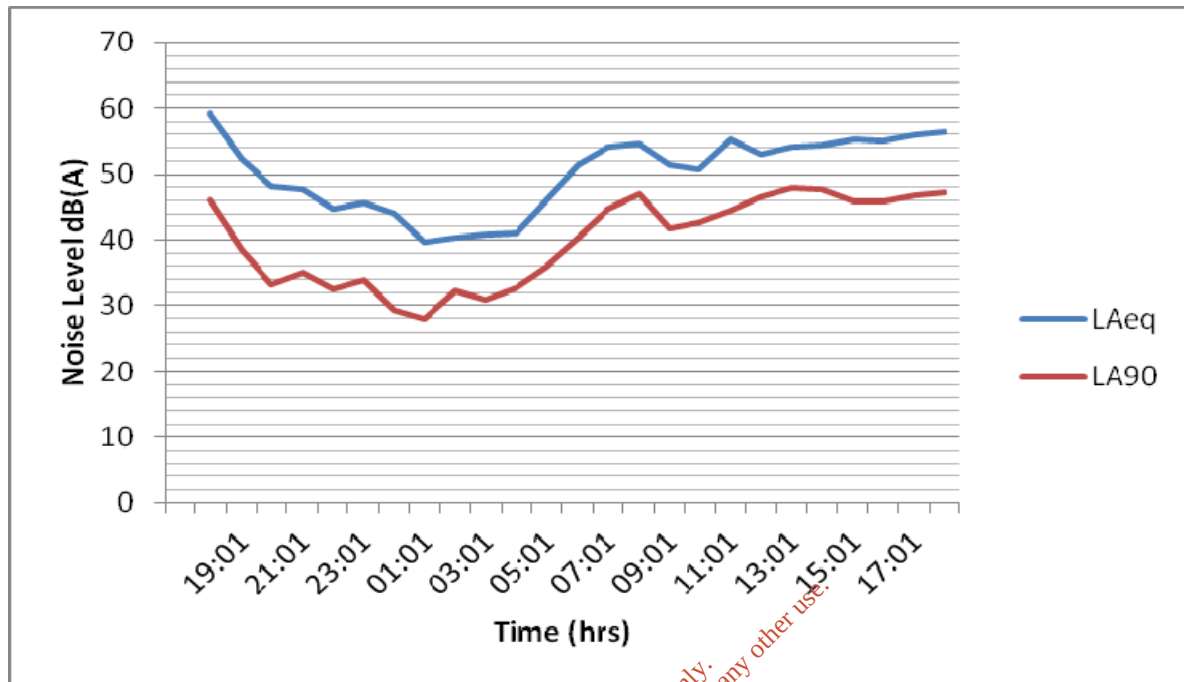
Graphical Summary of 24-hour Unattended Noise Measurements at Location N3



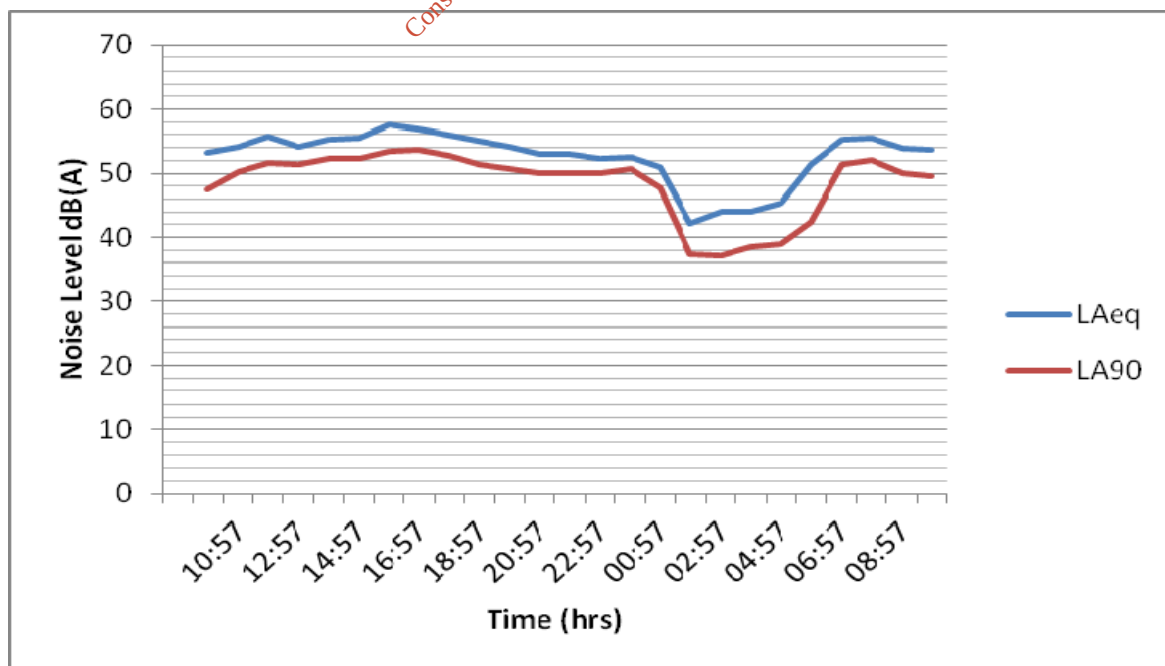
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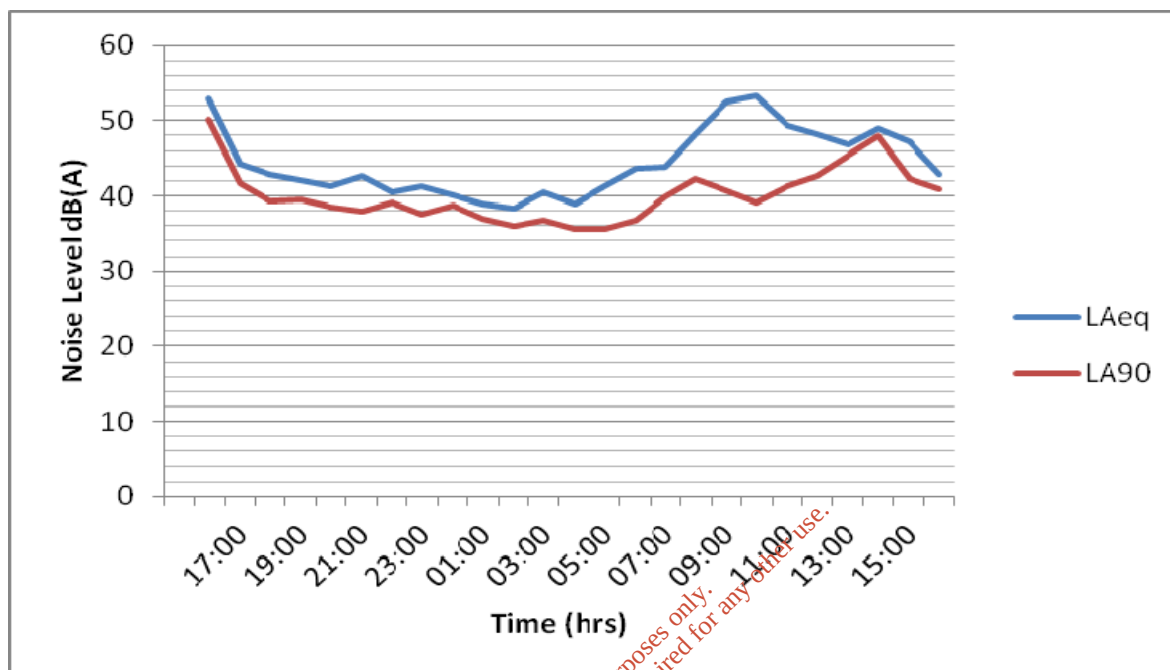
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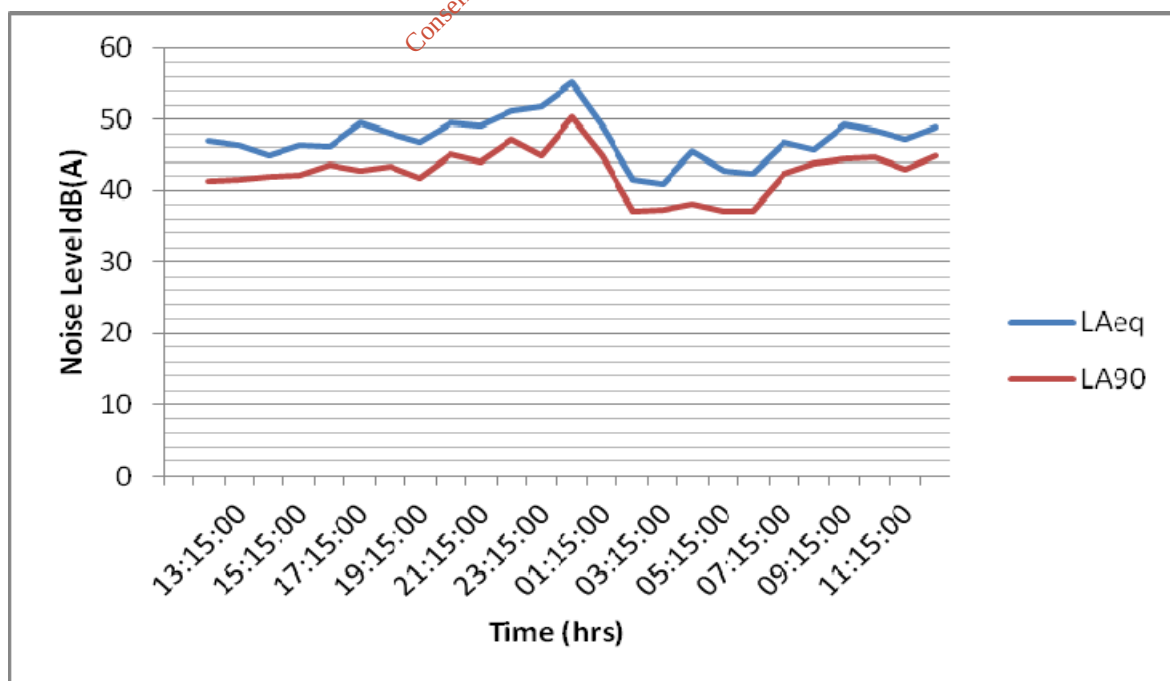
Graphical Summary of 24-hour Unattended Noise Measurements at Location N6



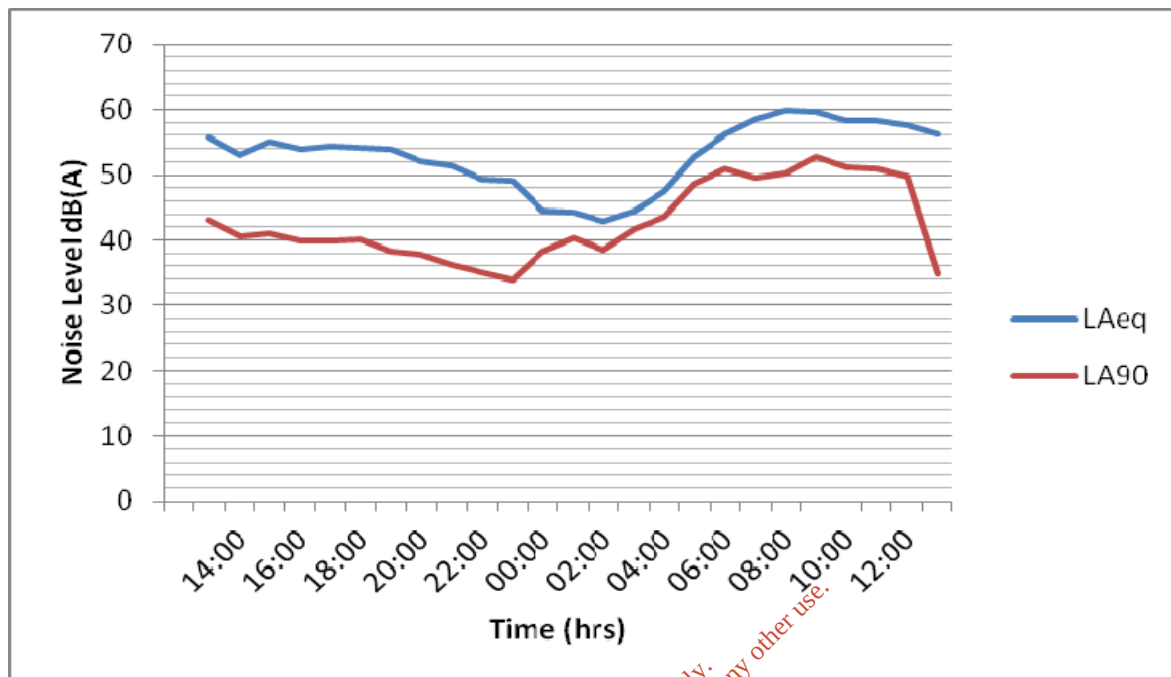
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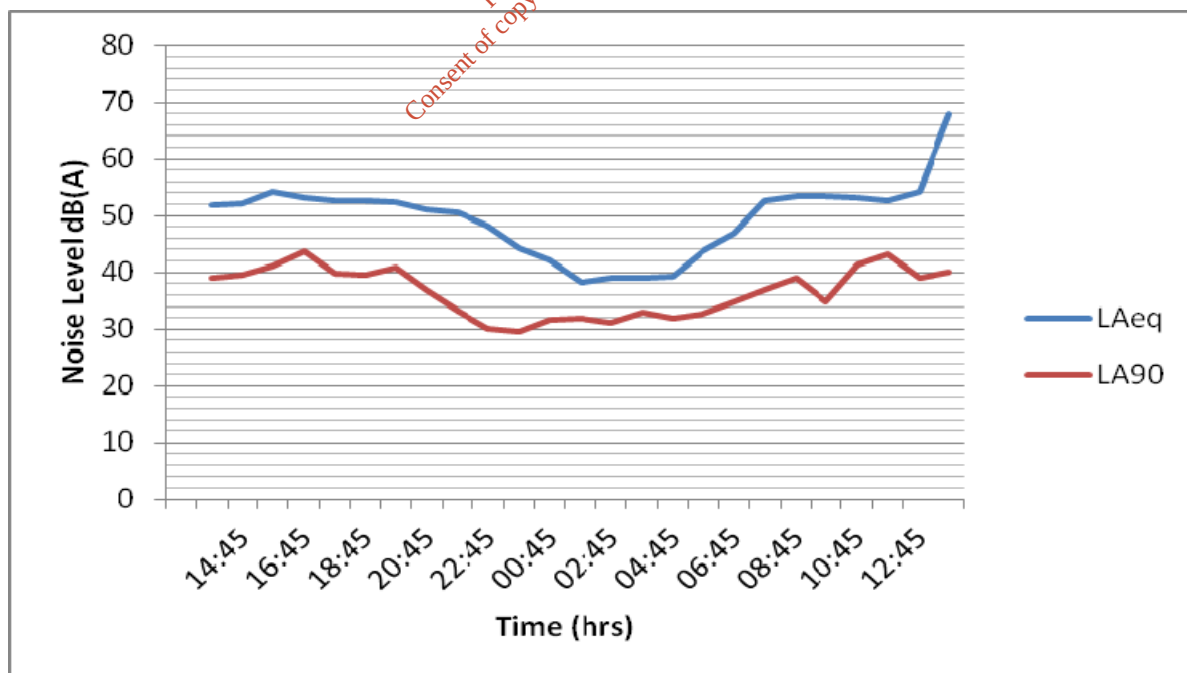
Graphical Summary of 24-hour Unattended Noise Measurements at Location N8



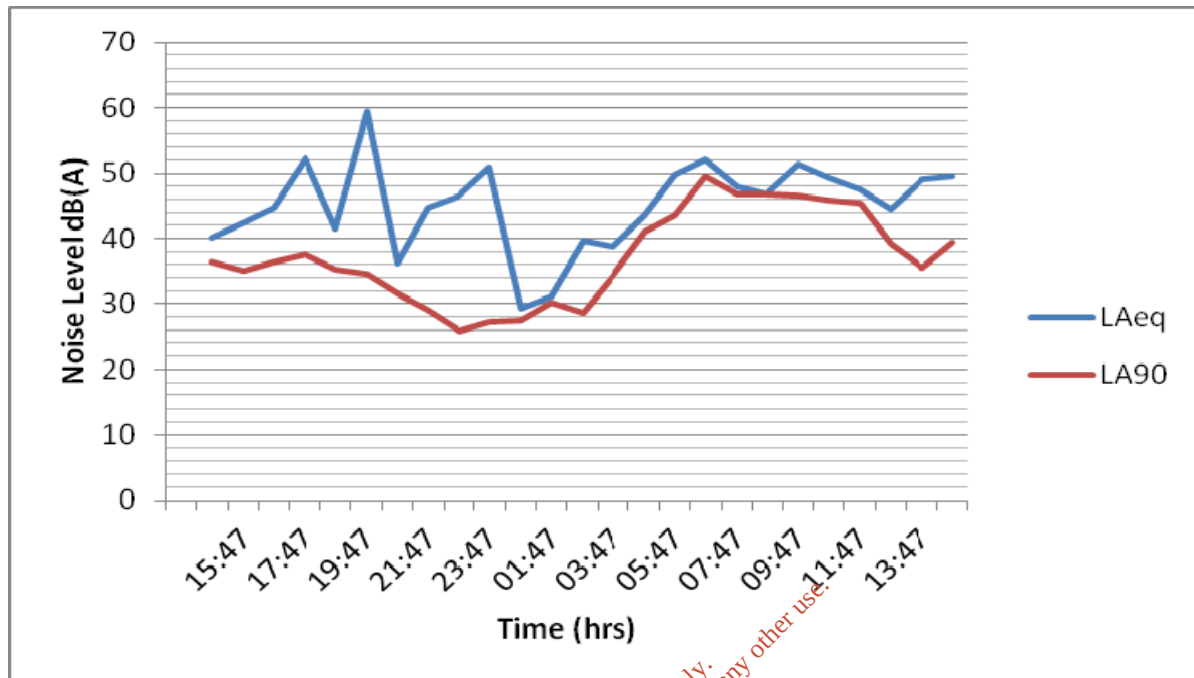
Graphical Summary of 24-hour Unattended Noise Measurements at Location N9



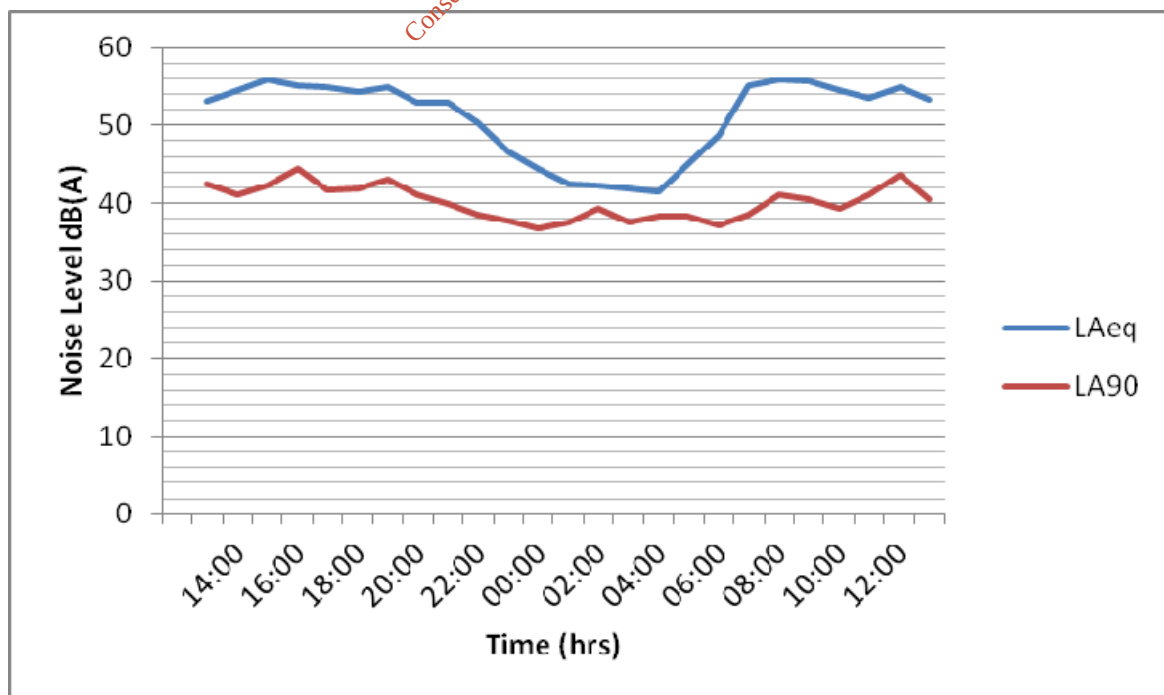
Graphical Summary of 24-hour Unattended Noise Measurements at Location N10



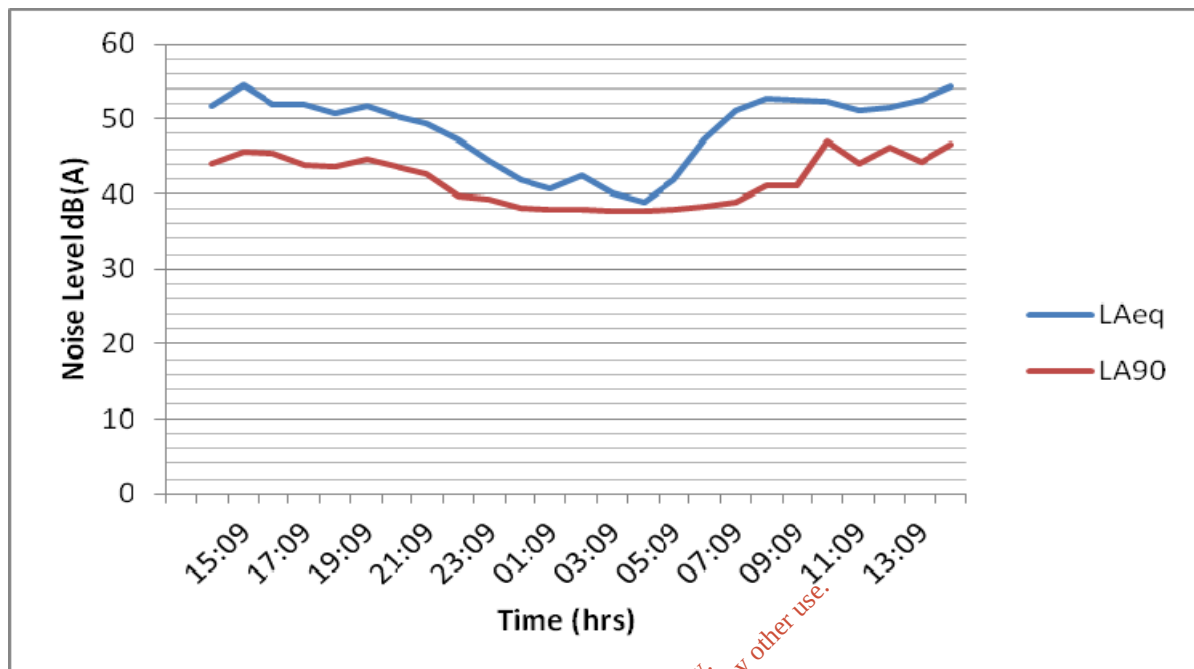
Graphical Summary of 24-hour Unattended Noise Measurements at Location N11



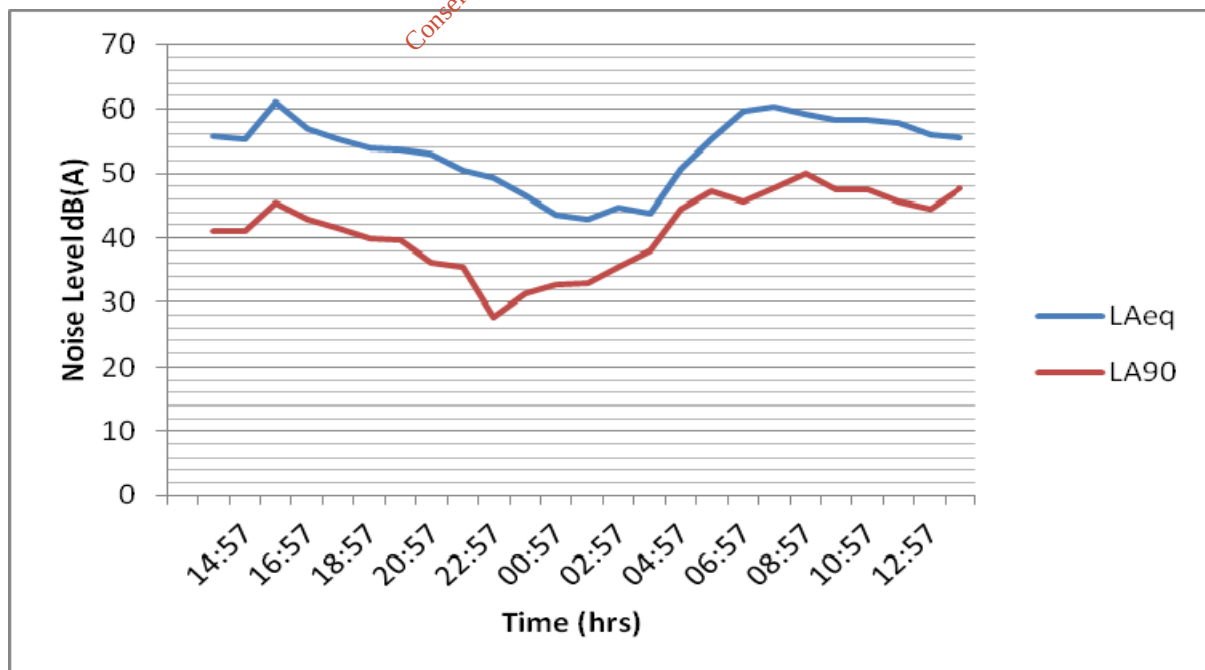
Graphical Summary of 24-hour Unattended Noise Measurements at Location N12



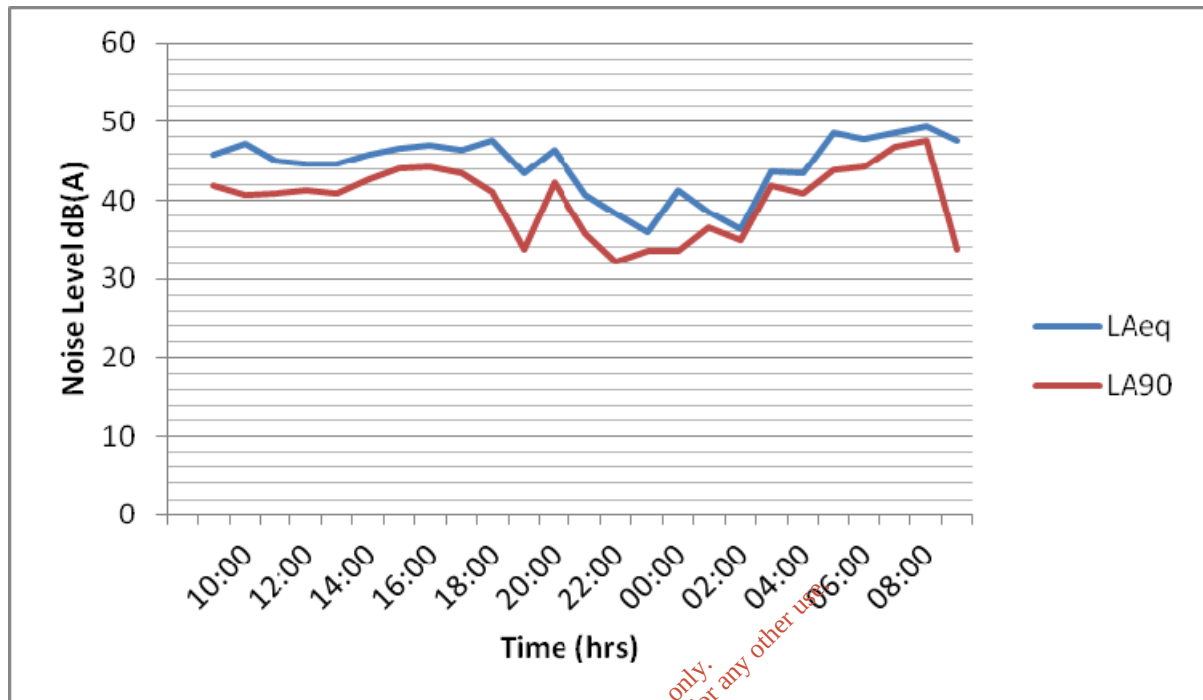
Graphical Summary of 24-hour Unattended Noise Measurements at Location N13



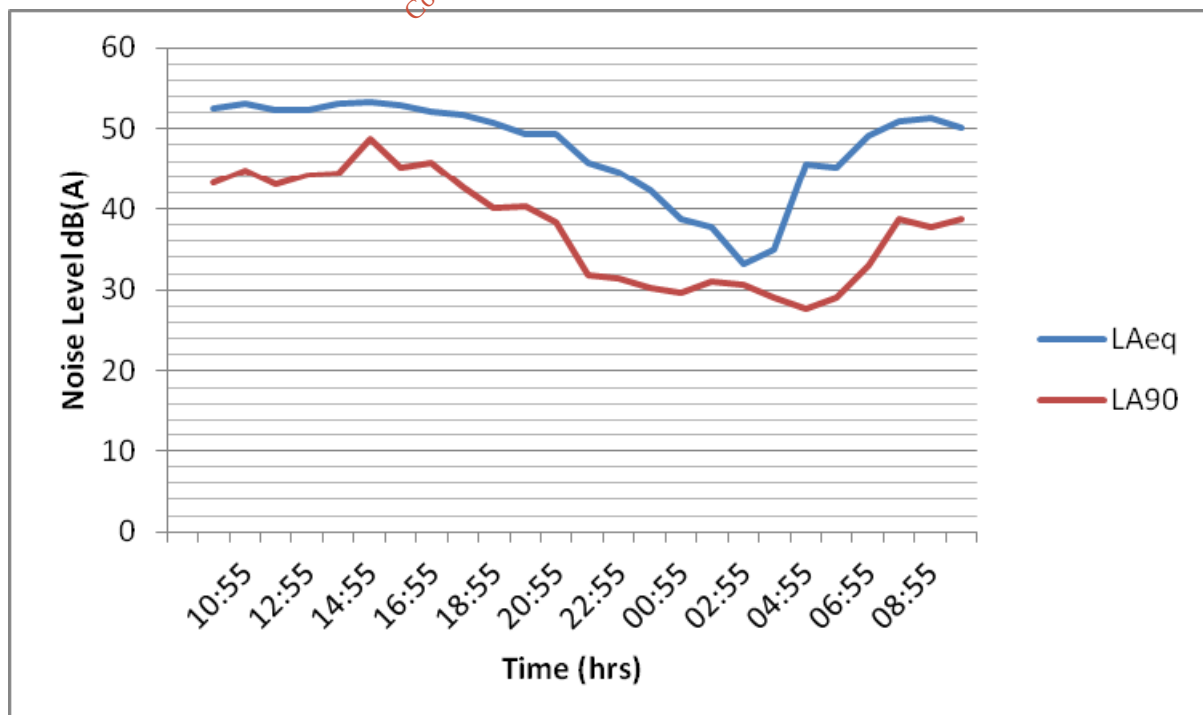
Graphical Summary of 24-hour Unattended Noise Measurements at Location N14



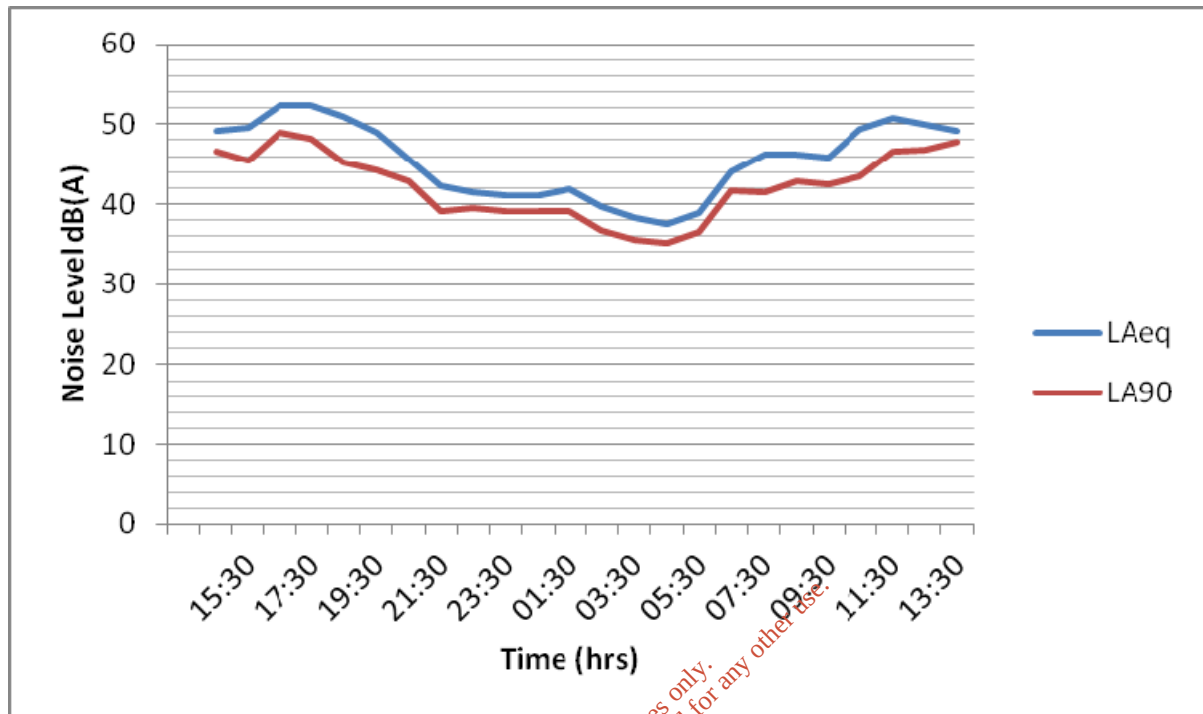
Graphical Summary of 24-hour Unattended Noise Measurements at Location N15



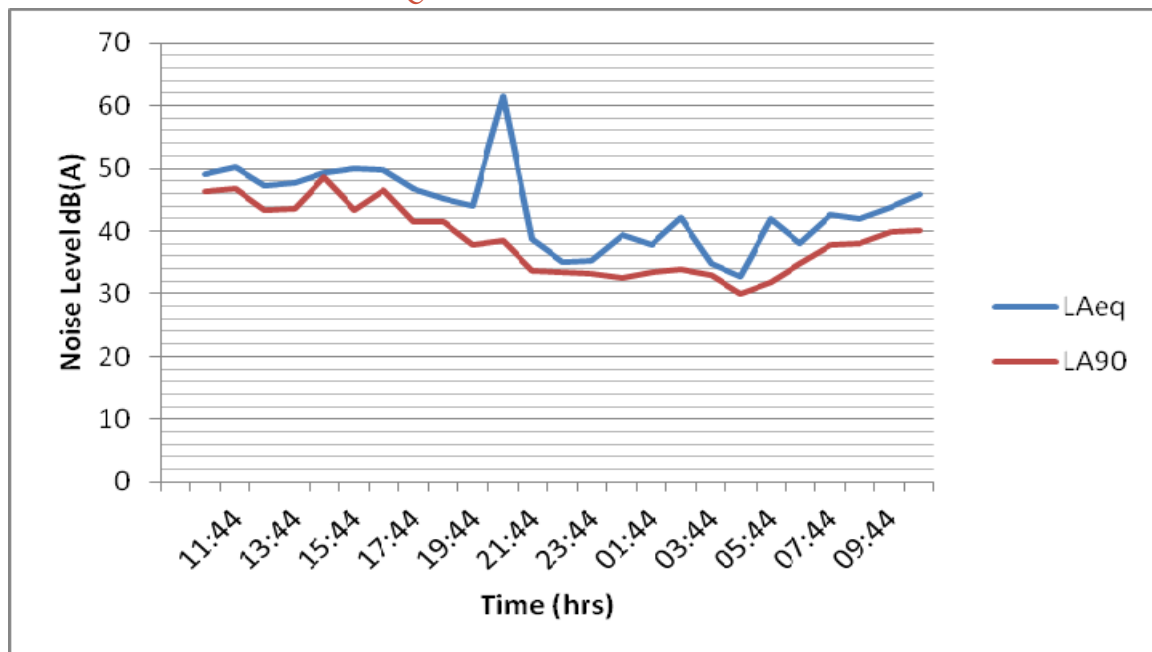
Graphical Summary of 24-hour Unattended Noise Measurements at Location N16



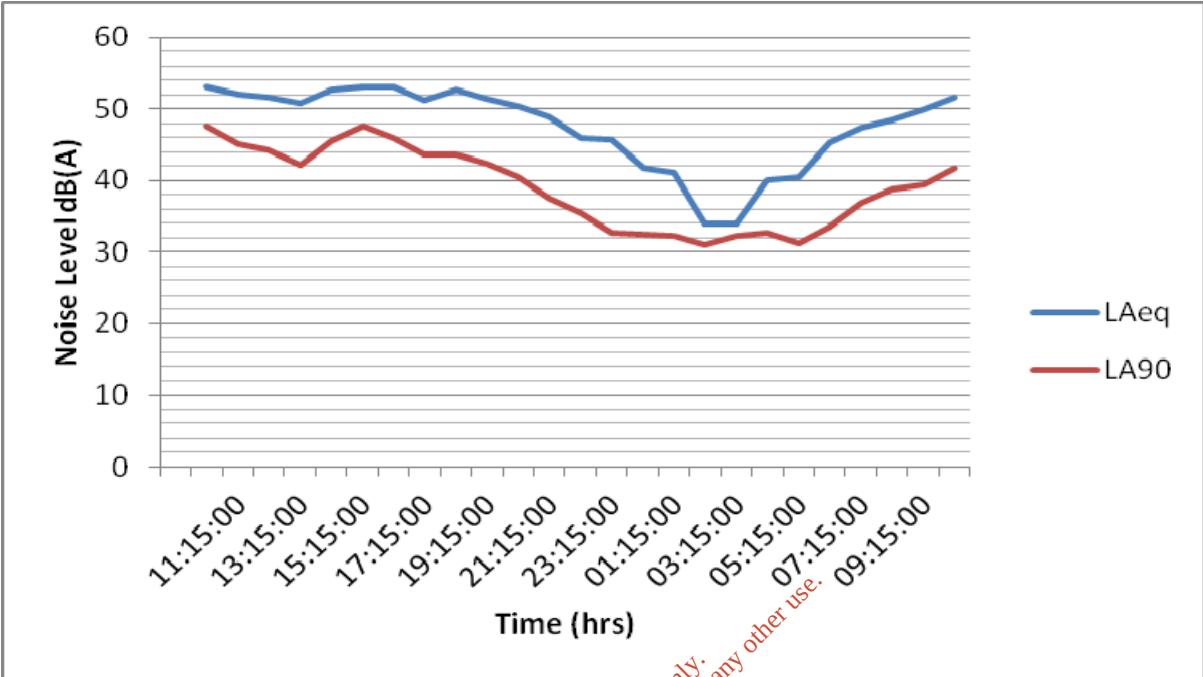
Graphical Summary of 24-hour Unattended Noise Measurements at Location N17



Graphical Summary of 24-hour Unattended Noise Measurements at Location N18



Graphical Summary of 24-hour Unattended Noise Measurements at Location N19



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APPENDIX 9.3 SUMMARY OF ATTENDED SHORT-TERM BASELINE NOISE MONITORING SURVEYS

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APPENDIX 9.3

SUMMARY OF ATTENDED SHORT-TERM MEASUREMENTS

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Attended Short-Term Measurements at Locations N1

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
06/07/12 Day	14:45	50.7	53.6	37.1	71.3	35.5	Dominant noise source was intermittent traffic passing within the naval base including mini bus and also cars entering and leaving the base. Noise from Naval Ship berthed at the quay (same as during the night) was influential source also. Some noise from birds in the area noted.
06/07/12 Day	15:36	49.9	53.8	38.6	68.9	36.7	Dominant source overall was traffic travelling to and from the base Wastewater tank pump was coming on and off during measurement also, same as during night-time surveys and was dominant when no traffic noise. Noise from ship berthed at quay was noted during their survey also.
06/07/12 Day	16:31	52.4	55.2	42.1	77.1	39.0	Dominant source was traffic entering and leaving the base same as earlier survey. Noise from inshore fishing boat passing up harbour Southside of bridge was influential also. Noise from ship berthed on north side of island still audible during this survey also. Occasional noise from birds in the area.
06/07/12 – 07/07/12	23:15	39.9	39.0	32.9	68.8	31.6	Dominant noise source initially sounded like an engine noise coming from area to the north possibly noise from a boat. Two cars passed during the survey. After 10 minutes noise from what sounded like a discharge of water from a pipe and subsequently noise from a pump or motor was dominant for a few minutes.
06/07/12 – 07/07/12 Night	00:20	36.5	37.6	35.0	46.7	33.5	Dominant noise source was pump in wastewater treatment tank which came on and off every few minutes. Engine noise from boat (possibly) tug on north-western jetty was notable source and was operating (i.e. engine running) throughout survey.
06/07/12 – 07/07/12 Night	01:24	35.1	35.8	34.1	49.0	32.4	Dominant source was pump coming on and going off same as earlier. Engine noise from boat/tug on jetty noted throughout this survey also.

Attended Short-Term Measurements at Locations N2

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15m} ins	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
04/07/12 Day	17:21	34.8	36.7	31.3	50.3	29.4	Very quiet location and no significant noise sources evident during survey other than noise from birds in the area to west of monitoring position. Occasional cars on Haulbowline bridge but traffic on N28 not really noticeable (only slightly influential) No activities at Maritime College during survey.
04/07/12 Day	17:43	38.7	37.8	30.5	59.8	28.7	Noise sources same as during earlier survey. One car passed in yard near monitoring position during survey. Also plane passing at high altitude influential briefly.
04/07/12 Day	18:07	35.9	38.0	29.5	53.3	27.6	Noise sources similar to sources noted during previous surveys.
04/07/12 – 05/07/12 Night	21:20	33.8	36.3	30.1	53.9	28.3	Very quiet at this location again. Only notable noise source were birds in the area, some turbulence due to breezy conditions. Occasional cars passing on Haulbowline bridge. Background noise due to low level of noise from doors of plant room midway along western side of NMCI building.
04/07/12 – 05/07/12 Night	21:37	37.2	38.8	31.4	64.4	28.8	Noise levels same as above. Steady background noise from plant room but overall fairly quiet.
04/07/12 – 05/07/12 Night	21:54	42.5	42.5	31.7	60.5	29.2	Noise levels same as above. Slightly more breezy conditions. Plane flying overhead influential briefly. Additional noise from fan / generator? Influential for 4 minutes towards the end of survey.

Attended Short-Term Measurements at Locations N3

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
04/07/12 Day	14:05	52.0	55.6	42.4	66.6	37.6	Dominant noise source was traffic passing on N28. Steady background noise audible from machinery working in metal recycling site noted throughout. Occasional noise from birds in the area around the house.
04/07/12 Day	14:44	48.4	51.9	33.7	65.0	30.5	Dominant source was traffic passing on N28. Max. noise due to helicopter flying past to the south. Noise evident from Metal recyclers during earlier survey was not as noticeable during this survey (i.e. less activity). Noise from birds in the area was noted at times. Noise from activities in the car storage area and within large shed at the yard was also noted at times.
04/07/12 Day	16:54	49.2	53.2	33.0	68.2	29.3	Dominant source was traffic on N28. Noise from birds in the area was influential source also. Noise from car transporters trucks in car storage compound on other side of road was noted briefly.
04/07/12 – 05/07/12 Night	23:18	47.7	44.4	33.4	69.5	31.5	Dominant source was occasional passing traffic on M28. In absence of traffic buzzing electrical noise from street lamp at end of garden of property was dominant. Occasional banging noise in far distance to North / Northwest was noted twice during measurement also. Max noise due to cars passing relatively fast.
04/07/12 – 05/07/12 Night	23:35	37.0	36.4	32.4	69.0	30.2	Dominant noise source was buzzing on street lamp. Noise from birds noted at times. No cars passed on N28 during this survey. Distant bangs were noted around five times during this survey. Generally fairly quiet.
04/07/12 – 05/07/12 Night	23:52	40.0	44.2	32.7	57.3	30.8	Dominant noise source was buzzing on street lamp. Slight noise from breeze in trees. Occasional distant banging noise towards north / northeast. Low level of plant noise in distance towards south / southwest was audible but not significant.

Attended Short-Term Measurements at Locations N4

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
09/07/12 Day	13:50	53.8	56.8	40.7	75.0	38.1	Dominant source was traffic passing on hill near monitoring position. Max noise due to HGV passing up the hill. Traffic passing also but traffic on hill dominant. In absence of traffic noise from the Deepwater Berth (Cargo / Grain Ship being unloaded) and Grimaldi ship being unloaded also influential.
09/07/12 Day	14:34	55.0	59.3	41.8	70.7	37.6	Dominant source was traffic on hill and in village same as earlier survey. Very little noise from birds at this monitoring location, only occasional. Noise from Port activities noted during periods in absence of traffic noise. No significant noise sources from RingPort Industrial Estate other than traffic.
09/07/12 Day	15:20	56.0	59.4	41.7	73.7	39.2	Dominant source traffic same as other surveys. In absence of traffic for brief periods, noise from Port Operations was audible. Noise from birds in the area noted as contributory source but not significant. Max noise due to HGV travelling up the hill.
09/07/12 – 10/07/12 Night	01:32	46.5	47.6	40.2	64.9	37.1	Dominant source overall was engine noise from Grimaldi ship. Max noise was due to occasional traffic passing on road/hill adjacent to house. Noise from breeze/wind blowing in the trees near house was significant also.
09/07/12 – 10/07/12 Night	02:21	33.8	36.1	30.7	55.0	29.2	Dominant source was wind blowing in tree near monitoring position and occasional noise from birds towards the Port of Cork lands. Occasional traffic noise passing the village.
09/07/12 – 10/07/12 Night	03:12	43.4	38.2	30.5	69.7	28.6	Dominant source was engine noise from Cargo ship at deep water berth for first 10 minutes of survey. Then two cars passed on hill and these were dominant. Noises from birds near Port of Cork lands were influential also.

Attended Short-Term Measurements at Locations N5

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15m} ins	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
06/07/12 Day	15:12	55.2	56.7	44.0	72.6	38.9	Dominant noise source was traffic both on the N28 and full adjacent to property. Possible low frequency tonal component. Container ship passing down the harbour and two tugs (Alex & Gerry O'Sullivan) were audible for a few minutes of the survey. Noise from birds in the area was noted also. Industrial noise that was audible last night was not noticeable due to the level of traffic noise.
06/07/12 Day	16:07	54.6	57.1	44.3	71.8	39.1	Dominant noise source was traffic both on the N28 and full adjacent to property. Noise from birds in the area was significant at times, more bird noise than earlier. Possible low frequency noise from ride-on lawnmower cutting grass at the end of the road during the survey also. Airplane passing overhead briefly. Max noise due to truck passing up hill, also car with boat on trailer passing.
06/07/12 Day	17:01	53.9	57.1	46.0	69.5	43.2	Dominant source was traffic on N28 and hill past house. Another truck passed up hill during this measurement also. Airplane flying overhead was influential briefly. Noise from birds in the area significant during this survey.
05/07/12 – 06/07/12 Night	23:52	40.6	40.5	34.4	60.2	32.2	Dominant noise source was occasional traffic on N28. Generally very quiet but low level of steady plant noise from Bio was audible and dominant noise when no traffic passing.
05/07/12 – 06/07/12 Night	00:52	43.8	41.9	27.5	65.6	25.9	Dominant noise source was occasional traffic same as earlier measurement. Max noise due to Jeep passing on road outside house / monitoring position. Background noise of plant noise became dominant when no traffic but generally very quiet during survey.
05/07/12 – 06/07/12 Night	01:52	39.5	36.4	28.8	61.6	27.3	Dominant source was occasional traffic similar to earlier measurements. Noise from birds around the Port area to the north was influential also. Steady plant noise from Bio noted throughout also.

Attended Short-Term Measurements at Locations N6

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
09/07/12 Day	14:11	54.3	56.1	51.8	61.5	49.5	Dominant noise source was a combination of traffic on the N28 at western side of Ringaskiddy and operations at the deep water berth. Grimaldi ship was being unloaded and also cargo ship with grain was being unloaded. Noise from birds in the area around the house was significant throughout the survey also.
09/07/12 Day	14:58	55.3	55.7	50.6	73.8	47.6	Dominant source was traffic on the N28. Traffic entering and leaving deep water berth was significant also. Grain/cargo ship and Grimaldi ship were still being unloaded – associated noise was significant also. Noise from birds was additional influential source noted throughout also. Dog barking influential briefly also.
09/07/12 Day	15:41	54.9	56.7	52.7	66.9	50.5	Dominant source was traffic on main road, similar to earlier surveys. Operations at deep-water berth, unloading cars from Grimaldi Ship were influential also. Almost constant noise from birds noted.
09/07/12 – 10/07/12 Night	01:08	49.9	51.8	46.6	60.9	43.6	Dominant source overall was engine noise from Grimaldi Ship Grande Ellade. Traffic noise passing through Ringaskiddy on occasional basis was dominant when present but ship was steady continuous. Noise from birds on water near mooring dolphins of ferry terminal was significant also.
09/07/12 – 10/07/12 Night	01:54	47.3	50.9	39.4	60.0	36.5	Dominant noise source for first approximately 8 minutes of survey was Grimaldi ship leaving Port and being assisted by tugboat. Possible low frequency tonal component due to the Grimaldi ship noise. Dominant source after ship was going was noise from birds near the ferry terminal and noise from other cargo ships. Road traffic was significant at times.
09/07/12 – 10/07/12 Night	03:35	43.6	46.7	36.1	60.3	33.8	Noise from birds on the water near ferry terminal was dominant source overall as birds were continuous noise during survey. Five cars passed through Ringaskiddy on overall during survey also. Background noises was audible during survey also but not clear whether engine noise from cargo ship at deep water berth or plant noise from Pfizer site.

Attended Short-Term Measurements at Locations N7

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
03/07/12 Day	16:12	56.6	59.3	53.8	62.7	51.9	Dominant source was Amorina Cargo ship preparing to leave quay of Deep Water berth and Gerry O'Sullivan and Alex Tug boats arriving to remove ship. Occasional noise from birds and trucks moving within the Port. Some noise from take farm area and warehouse near monitoring position also.
03/07/12 Day	16:38	47.0	48.8	43.2	63.0	41.2	Dominant noise source was a forklift loading timber onto Lorry at the other end of deep water berth. Noise from activity within the grain storage warehouse near monitoring position was significant at times. Noise was influential also.
03/07/12 Day	17:32	42.1	43.6	39.8	56.7	37.7	Dominant noise source overall was birds in the area and on the water. No trucks or other activity at the Port. Noise from the area to rear (South West) of tank farm, possibly plant noise at Pfizer was influential also. Also tannoy announcement at Pfizer. Sound of water tapping against supports of old ADM jetty was noted also.
03/07/12 – 04/07/12 Night	23:26	39.7	41.2	37.3	52.8	35.4	Dominant source was plant noise from Pfizer site. Noise from birds on the water in the area was other notable source. No activity at the deepwater berth during survey. Noise from reefer containers not audible due to plant noise.
03/07/12 – 04/07/12 Night	23:50	39.8	41.3	37.7	53.8	35.8	Noise sources were same as during measurement above Pfizer Plant noise dominant. Tannoy noise from Pfizer also noted very briefly at 23:58 Reefer containers generally screened by large grain warehouse building also.
03/07/12 – 04/07/12 Night	00:14	40.1	41.8	38.1	55.0	36.3	Dominant source was plant noise from Pfizer similar to other measurements. Slightly more noise from birds on the water during this survey.

Attended Short-Term Measurements at Locations N8

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
09/07/12 Day	12:31	43.4	45.2	40.8	60.4	38.4	Dominant source was breeze blowing in trees and bushes near monitoring point. Noise from water lapping on shore was significant also. Additional sources noted were birds in the area and traffic on the Monkstown road on opposite side of the Creek/Harbour. Airplane flow over during survey also.
09/07/12 Day	12:50	45.6	47.6	42.4	59.5	39.7	Dominant source was breeze similar to first survey. Breeze was blowing little stronger but tide was going out. Birds in the area and traffic noise on Monkstown Road significant also. Cargo ship and Grimaldi lines ship were berthed at the Deepwater Quay but were not really visible.
09/07/12 Day	13:10	47.2	50.5	41.4	59.2	38.6	Dominant source was breeze and birds in the area and on mid/foreshore near monitoring position. Tide now out further and more birds along shoreline near monitoring position. Traffic on Monkstown road influential also.
09/07/12 – 10/07/12 Night	23:42	53.2	55.3	47.4	69.1	43.2	Dominant source was wind blowing in trees in the area. Noise from wave's leaping on shore was influential also. Grimaldi Ship Grand Ellade and Cargo ship were still at Deepwater berth (Grimaldi ship being actively loaded but no noise audible from port (Northwest wind))
09/07/12 – 10/07/12 Night	00:02	53.1	55.6	48.4	64.9	44.7	Dominant source was wind blowing in trees. Noise from seabirds on the water and also on the far end of the breath water was significant also. Traffic on Monkstown road was clearly visible but not audible due to level of noise from wind blowing in the trees.
09/07/12 – 10/07/12 Night	00:24	54.4	57.0	49.5	65.4	46.0	Dominant source was wind blowing in trees, same as previous surveys. Noise from water washing against shore and noise from birds on the water were significant sources also. Again occasional traffic on Monkstown road was visible but not audible due to wind noise.

Attended Short-Term Measurements at Locations N9

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
11/07/12 Day	17:11	53.5	58.2	38.7	65.3	34.9	Dominant source was traffic passing on Monkstown road. Property has a clear view of Deep Water berth and cargo ship was being unloaded during survey but no noise was audible from Ringaskiddy. Noise from birds in the area around the house was influential at times. People in the house and children outside were influential briefly also. Plant noise from Pfizer was not audible during survey.
11/07/12 Day	13:55	55.4	60.2	44.3	71.5	41.2	Dominant source was traffic passing on Monkstown road during brief periods in absence of passing traffic, noise from operations at deep water berth were dominant. Grain was being unloaded from large cargo ship. Noise from birds in the area was also noted at times.
11/07/12 Day	14:32	54.1	57.9	45.4	72.2	42.1	Dominant source again was traffic on Monkstown road. Noise from Cargo ship being unloaded was noted during this survey also. Noise from van arriving at home next door to monitoring position and stationary for a few minutes with engine running influential for a few minutes. Tannoy announcement at Pfizer also noted briefly. Noise from birds influential at times.
11/07/12 – 12/07/12 Night	23:13	47.2	45.8	31.9	70.7	30.4	Dominant source overall was intermittent traffic passing on Monkstown road. Max noise due to passing motorbike. During periods in absence of traffic noise, plant noise from Pfizer was dominant noise source.
11/07/12 – 12/07/12 Night	00:31	42.6	40.8	36.4	64.8	34.8	Dominant noise source was intermittent traffic similar to first survey although frequency of traffic was less during first survey. Plant noise from Pfizer dominant during periods in absence of traffic noise.
11/07/12 – 12/07/12 Night	02:00	39.9	39.9	37.2	59.1	35.8	Dominant source overall was plant noise from Pfizer. Two cars passed on Monkstown road during survey – significant when passing but steady state noise from Pfizer dominant over full duration of survey.

Attended Short-Term Measurements at Locations N10

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
10/07/12 Day	15:26	54.2	56.1	40.4	74.5	37.0	Dominant source was traffic passing on Monkstown Road. Max noise due to passing JCB. Noise from birds in the area was influential also. Noise from children sailing in the area was noted too.
10/07/12 Day	16:34	52.2	56.4	40.8	68.3	37.2	Dominant noise source was traffic passing on Monkstown Road. Children were no longer sailing so there was no noise from them during this survey. Sound of breeze blowing in trees near monitoring position was influential at times. Occasional noise from birds in the area noted. No noise audible from Marco Polo ship or scrap metal cargo ship at the port.
10/07/12 Day	17:53	51.7	56.3	40.2	63.2	34.5	Dominant noise source was again traffic on Monkstown road. Noise from birds in the area, particularly to rear of house was significant source also. Smoke visible from funnel of Marco Polo ship but not audible (north-easterly breeze) Noise from breeze blowing in trees around property was additional noted source. Airplane flying overhead also.
10/07/12 – 11/07/12 Night	23:14	43.9	46.8	32.6	59.9	30.5	Dominant source was intermittent traffic passing on Monkstown road. Steady background noise was from Marco Polo ship which was just departing from deep water berth during survey. Plant noise from Pfizer site was audible too but not significant. Noise from ship leaving was dominant during periods without traffic.
10/07/12 – 11/07/12 Night	00:28	40.3	35.0	29.7	61.5	28.2	Dominant source overall was plant noise from Pfizer site. Only 3 cars passed during survey. Noise from birds in Monkstown Creek was noted as an influential source also. Traffic significant when passing but overall, the steady-state nature of plant noise made it dominant overall.
10/07/12 – 11/07/12 Night	01:43	35.1	34.1	30.8	56.0	29.0	Dominant source was plant noise from Pfizer. Only one car passed on Monkstown Road during survey. Very little noise from birds in Monkstown Creek. No breeze at all.

Attended Short-Term Measurements at Locations N11

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15m} ins	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
11/07/12 Day	15:32	40.6	43.3	37.1	53.1	34.5	Dominant source generally was sound of breeze blowing in taller trees near the property. People on the golf course were a contributory noise source also. Not a lot of noise from birds in the area during the survey. No traffic passed within the demesne during the survey.
11/07/12 Day	16:25	40.3	42.4	35.9	57.3	32.9	Dominant source was a combination breeze blowing in taller trees near monitoring position and noise from birds in the area. Noise from a lawnmower towards the north was influential source also. People on the golf course were influential briefly and intermittently. No traffic passed within the demesne during this survey either.
11/07/12 Day	17:36	41.7	43.9	36.4	58.8	33.8	Dominant source generally was breeze blowing in trees in the area. Airplane flying overhead was influential briefly. People on the golf course to rear of property were influential again during this survey also. Sound of radio on within house was noted during this survey – had not been on or near the back door of the property during earlier surveys. Noise from birds influential at times. One car passed during the survey. Lawnmower towards the north was noted as contributory source also.
11/07/12 – 12/07/12 Night	23:29	28.8	30.3	25.7	45.2	24.5	No dominant source as such, very quiet location. Occasional sound of rustling leaves in hedge at boundary of property, slight breeze. Intermittent dog barking in distance to northeast. What sounded like a boiler coming on and off at nearby property twice during survey was noted also. Distant traffic noise audible to northeast but not significant.
11/07/12 – 12/07/12 Night	01:07	31.9	33.2	30.2	39.6	28.0	Dominant noise source generally was low level of plant noise from Pfizer. Noise from "bark/call" of fox in distance towards northeast was significant and dominant for approximately 5 minutes. Fox call also set off distant dog barking for a few minutes. Tannoy from Pfizer was audible also. Occasional noise from birds noted but not significant.
11/07/12 – 12/07/12 Night	02:36	30.6	31.7	29.2	41.2	27.7	Dominant noise source was plant noise from Pfizer. Distant traffic noise to northeast was again noted at times but was not significant. Again, very quiet conditions noted during this survey also. No breeze, hence no rustling foliage.

Attended Short-Term Measurements at Locations N12

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
10/07/12 Day	14:35	52.0	56.3	43.0	66.2	39.7	Dominant source was a lawnmower at a nearby house in the demesne. Traffic noise on Monkstown Road was significant source also. Noise from birds in the area was influential at times but was not significant. Noise from children out in sailing dinghies in the harbour was also noted.
10/07/12 Day	15:49	52.9	57.5	42.5	65.8	38.8	Dominant source was traffic on Monkstown Road. Noise from children sailing in area and on pontoon in water to southeast of property was significant source. Noise from ship passing in harbour was influential briefly also. Cargo ship (scrap metal) was being loaded at deepwater berth but no noise was audible. Marco Polo cruise ship berthed at DWB but not audible either.
10/07/12 Day	17:06	53.0	57.7	40.0	64.0	37.6	Dominant source was traffic on Monkstown Road. Noise from lawnmower was significant source also for around first five minutes but stopped thereafter. Noise from two boats near the Marina was noted also. Additional noise from birds in the area at times.
10/07/12 – 11/07/12 Night	00:01	43.8	45.0	35.6	61.0	34.3	Dominant source overall was intermittent traffic passing on Monkstown Road. Steady background noise audible from Pfizer (Plant noise). Sound of water flowing in drain a little to northeast of monitoring position was noted also. An Airplane flew overhead during survey also.
10/07/12 – 11/07/12 Night	01:16	44.1	39.2	35.8	69.9	34.7	Dominant source overall was plant noise from Pfizer. Steady noise from water flowing in drain was contributory source throughout survey also. Occasional traffic passing on Monkstown road significant at times but only a few vehicles passed during survey hence plant noise dominant overall. Occasional noise from birds in Monkstown creek road also.
10/07/12 – 11/07/12 Night	02:29	37.9	38.8	36.9	51.7	35.9	Dominant source during the survey was again plant noise from Pfizer. Steady noise from water flowing in stream also influential. No noise from traffic as no vehicles passed on Monkstown road during survey.

Attended Short-Term Measurements at Locations N13

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
10/07/12 Day	14:55	51.3	55.1	42.8	68.4	39.8	Dominant source was traffic passing through Monkstown. Max noise due to motorbike. Noise from people sailing near sand quay was influential in addition to flapping sails and tattling lanyards. Boat passing down harbour and airplane overhead were notable sources briefly. Only occasional noise from birds in the area.
10/07/12 Day	16:10	50.3	53.9	44.4	63.9	42.0	Dominant source was traffic passing on both main road in Monkstown village and road adjacent to Northern side of property boundary. Noise from children coming in from and going out sailing, flapping sails etc was also significant. Low level of noise from breeze blowing in trees in garden of property and water blowing in stream/drain was just about audible.
10/07/12 Day	17:28	51.8	54.8	44.1	69.8	41.0	Dominant source was traffic passing through Monkstown. Noise from people talking in the area around sand quay was influential for around five minutes during survey. Max noise due to HGV passing. Noise from birds in the area was influential also and rattling lanyards noted during this survey too in addition to breeze blowing in trees in garden of property.
10/07/12 – 11/07/12 Night	23:38	43.9	44.5	37.5	62.0	36.2	Dominant source overall was sound of water flowing in stream/drain along northern end of garden of property. Traffic when passing was dominant but very few cars passed during survey. Low level humming noise was audible from street lamp outside property but was not significant.
10/07/12 – 11/07/12 Night	00:51	41.0	42.1	36.8	61.4	35.6	Dominant source overall was water flowing in stream/drain again. Occasional traffic passed through Monkstown and was dominant briefly but noise from drain was constant noise during survey. Hammering/buzzing noise evident from street lamp during earlier survey was not buzzing at all during this survey.
10/07/12 – 11/07/12 Night	02:08	39.0	40.4	37.2	53.6	35.1	Dominant source overall again was water flowing in stream/drain along boundary of property. Only one car passed during survey. Teenagers began arriving and gathering at sand quay from around 2:15am (appeared to be arriving to prepare to go sailing). Noise from some of them talking was influential source also.

Attended Short-Term Measurements at Locations N14

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15m} ins	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
11/07/12 Day	15:55	58.0	59.7	41.4	78.7	36.6	Dominant source was traffic passing on Monkstown road. Children playing in the garden were influential briefly. Children sailing in the harbour were noted also. Noise from the birds in the area influential at times. Rattling lanyards on yachts moored along the harbour near Monkstown was noted also.
11/07/12 Day	16:48	55.7	57.8	45.1	76.6	39.6	Dominant source was traffic passing on Monkstown road. Children were playing in garden during survey and were a contributory source also. Also lots of children passing on opposite side of road coming in from sailing. Very little noise from birds in the area during this survey.
11/07/12 Day	18:00	53.4	57.9	40.3	64.9	35.3	Dominant source was traffic on Monkstown Road, similar to earlier surveys. Noise from motorboats (four) passing up and down in the harbour was notable source also. Occasional noise from birds in the area. Some noise from children talking outside but not as much as when playing in the garden earlier.
11/07/12 – 12/07/12 Night	00:26	45.8	43.0	28.7	68.1	25.9	Dominant source was occasional passing cars through Monkstown. In absence of traffic low level of background noise associated with Pfizer Plant noise was just audible. Very calm conditions, hence no lapping water, rustling hedges or rattling lanyards etc.
11/07/12 – 12/07/12 Night	01:33	43.3	41.0	31.3	67.7	29.5	Dominant noise source overall was two chiller units on side of De Vesce Place (Monkstown Bay Sailing Club) House/Building Noise from three cars passing and a van in the car park nearby were significant briefly. Max noise due to vat in car park which left again after a few minutes. Pfizer plant noise audible too but chillers on side of Monkstown Sailing building more dominant.
11/07/12 – 12/07/12 Night	03:02	45.0	37.9	33.3	69.4	31.6	Dominant noise source was chillers/compressors on side of De Vesce Place house/building. Noise from two cars passing through Monkstown significant while present. Max noise due to one of the cars which passed quiet fast. Chillers stopped after 12minutes of survey. Plant noise from Pfizer's was noted as dominant source thereafter.

Attended Short-Term Measurements at Locations N15

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
30/07/12 Day	09:48	44.4	47.6	40.3	59.4	37.7	Dominant noise source overall was cranes unloading ship at deep water berth at Ringaskiddy. Noise from birds in the area around house was significant also. Boat passing in harbour influential briefly. Water flowing out from pier at Cork Dockyard notable but not significant. Occasional noise from machinery at Cork Dockyard dominant when working but only operating intermittent.
30/07/12 Day	10:11	42.9	44.8	40.6	54.3	38.8	Dominant noise source was a combination of cranes working at deep water berth at Ringaskiddy and on occasion, machinery working at Cork Dockyard. Tide was out during survey and noise from birds on the mud below property was influential at times. Activity at deep water berth at Ringaskiddy dominant overall. Water draining from pipe background noise.
30/07/12 Day	10:31	48.7	48.1	40.3	65.5	37.2	Dominant source was cranes working at deep water berth. Noise from tug passing in harbour significant source briefly. Jet passing overhead was also influential for a few minutes and was noted as a source of max noise level. Noise from birds significant at times during this survey also. Noise from work at Cork Dockyard dominant on occasion.
30/07/12 – 31/07/12 Night	23:21	35.0	36.3	33.0	50.8	31.1	Generally very quiet. Dominant noise source at times was traffic noise on road passing through Monkstown. Occasional noise from birds on the water noted. Low level of plant noise from Ringaskiddy direction was available (possibly Pfizer) but not significant. Distant traffic noise on Cobh road noted at times also.
30/07/12 – 31/07/12 Night	23:40	33.9	35.8	31.7	47.6	30.2	Dominant source generally was birds on the water. Very little traffic on Monkstown road during this survey. Airplane passing at high altitude noted briefly. Water draining from pipe in pier at Cork Dockyard influential throughout. Low level of plant noise audible towards Ringaskiddy.
30/07/12 – 31/07/12 Night	00:00	32.6	33.9	31.1	43.0	29.5	Very quiet location again. Dominant source was birds on the water. Sound of water flowing from drain pipe on pier of Cork Dockyard noted throughout this survey also. Occasional traffic in Monkstown. Low level of plant noise from Ringaskiddy direction audible.

Attended Short-Term Measurements at Locations N16

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
16/07/12 Day	11:38	51.6	55.3	43.7	64.9	40.7	Dominant noise source was traffic passing on main road. Max noise due to passing coach. Noise from men working in a house to southeast was noted intermittently. Steady noise from birds in the area was influential also. Noise from cranes at deep water berth was audible during brief periods in absence of traffic but was not significant. Sheltered location some noise at times from breeze in trees.
16/07/12 Day	13:04	51.8	55.8	43.3	62.6	39.3	Dominant source was traffic similar to earlier survey. Noise from breeze blowing in trees and birds in the area were significant at times. No noise from men working on house to southeast during this survey. Noise from Cranes at deep water berth only just audible during brief periods in absence of traffic and breeze (rustling leaves) noise.
16/07/12 Day	14:13	52.0	55.6	45.6	63.5	40.6	Dominant source was traffic. Noise from breeze blowing in trees was influential throughout and significant at times. Max noise due to passing motorbike. No noise from men working on house during survey either. Noise from cranes at deep water berth only just audible not significant, during brief periods in absence of traffic noise.
16/07/12 – 17/07/12 Night	00:11	40.8	42.0	29.7	58.4	27.7	Dominant noise source was intermittent traffic on main road generally very quiet location in absence of passing cars. No breeze so no turbulence or rustling foliage. No noise from birds in the area. Possible tonal noise from car beeping. Noise from what sounded like a ship passing down the harbour was noted for approximately 5 minutes during survey.
16/07/12 – 17/07/12 Night	01:20	39.2	37.0	29.6	58.5	28.2	Very quiet location. Dominant source was occasional passing cars on main road. Noise from birds in trees on opposite side of road noted at times. Low level of plant noise from Ringaskiddy just audible.
16/07/12 – 17/07/12 Night	02:32	32.6	33.8	29.4	48.7	27.2	Again very quiet location. Dominant noise source was noise from birds in trees on opposite side of the road. Occasional sound of breeze and rustling leaves in tall sycamore tree near monitoring position. Low level of plant noise audible from Ringaskiddy area (possibly plant noise from Pfizer site audible but not significant) Only one car passed during this survey. Tannoy announcement noted very briefly also.

Attended Short-Term Measurements at Locations N18

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15mins}	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
16/07/12 Day	11:13	49.3	51.0	47.3	58.1	45.4	Dominant noise source was two cranes unloading two separate grain cargo ships at deep water berth. Noise from breeze blowing in trees and flax tree of garden significant and dominant at times. Noise from birds and seagulls significant at times also. No traffic within estate during survey.
16/07/12 Day	12:26	45.9	47.6	43.6	56.0	41.0	Dominant source generally was Cranes unloading ships at deep water berth. No car passed during survey. Noise from birds in the area noted at times but not as significant as during earlier survey. Noise from breeze blowing in hedge influential during this survey again also,
16/07/12 Day	13:49	45.0	46.4	43.1	52.5	41.7	Dominant source was cranes unloading ships at deep water berth. Noise from plane flying overhead at high altitude influential briefly. Noise from flax leaves rustling in breeze influential also. Tannoy on ship at deep water berth noted on occasion during this survey. No traffic passed during the survey.
16/07/12 – 17/07/12 Night	23:45	35.2	35.5	32.6	61.6	31.2	General low level “plant noise” audible from Ringaskiddy direction. Possibly plant noise from Pfizer site. Did not appear to be any ships on berth at deep water berth. Noise from birds near house and foreshore was significant at times and gave rise to the max. level. No cars moving within estate during survey. Otherwise, quiet location.
16/07/12 – 17/07/12 Night	00:55	33.9	35.4	32.2	42.4	30.2	Plant noise from Ringaskiddy noted during this survey again also but noted as low-level noise. Occasional noise from birds near the water (time coming in) No other notable noise sources during the survey.
16/07/12 – 17/07/12 Night	02:06	34.2	35.5	32.6	40.3	31.1	Very quiet location again. Plant noise from Ringaskiddy noted as dominant noise source but still a low-level noise. Tannoy announcement noted very briefly also. Distant traffic also not significant. No noise from birds on/near the water noted during this survey.

Attended Short-Term Measurements at Locations N19

Monitoring Locations	Time	Measured Noise Level dB(A)					Comments
		L _{Aeq,15m} ins	L _{A10}	L _{A90}	L _{AMax}	L _{AMin}	
16/07/12 Day	10:50	50.3	53.4	45.5	63.7	43.1	Dominant source was traffic on lower road overall. Noise from boats in the harbour was significant also. Naval boat (P41) berthed on quay on north side of Haulbowline with engine running was clearly audible. Sound of cranes unloading ship at deep water berth at Ringaskiddy was also noted. Turbulence due to breezy conditions influential throughout also.
16/07/12 Day	12:00	49.8	53.5	43.1	61.6	40.1	Dominant source again was traffic noise. Navy ship P41 no longer at Haulbowline. Noise from people in playground to south of property were influential at times. Breeze blowing in trees and hedges around garden was also influential sound of cranes at Haulbowline just audible at times in absence of traffic noise and when breeze calmed. Airplane flying overhead noted briefly also.
16/07/12 Day	13:27	50.0	52.7	42.1	67.3	39.1	Dominant source was traffic on lower road. Noise from people in the playground was influential also. Train passed towards Cobh at around 13:29. Noise from boats passing in harbour was noted at times also. Noise from breeze blowing in trees in the area dominant at times in absence of traffic for brief periods. Noise from cranes unloading ships at Ringaskiddy only just audible at times when no traffic noise and breeze was occasionally calm. Train passed towards Cork at around 13:38
16/07/12 – 17/07/12 Night	23:22	42.6	41.9	31.8	61.4	29.3	Dominant noise source was intermittent traffic on lower road. Occasional dog barking towards west was significant at times. Traffic passing on upper road was also influential. Noise from people walking and talking on lower road was noted for a few minutes. Noise from what sounded like a ship was noted to the east (ferry?) to Haulbowline.
16/07/12 – 17/07/12 Night	00:33	37.3	36.8	29.5	58.7	28.1	Very quiet during this survey. Ship had just passed down harbour at start of survey, hence was not significant. Only two cars passed during survey and very little noise from birds on the water. Low level of plant noise from Ringaskiddy direction audible but not significant.

16/07/12 – 17/07/12 Night	01:41	37.5	41.5	33.9	52.4	32.1	Dominant noise source initially was a cargo ship passing up river/harbour for first approximately five minutes of survey. After ship had passed sound of wash against sea wall was influential but not significant. No traffic noise during this survey. Low level of plant noise audible from Ringaskiddy direction.

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APPENDIX 10.1 METHODOLOGY, LEGISLATION & BACKGROUND INFORMATION

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Appendix 10.1 Methodology, Legislation & Background Information

Assessment Techniques/Methodology

Irish Ambient Air Standards

The relevant Irish ambient air standards have been adopted from the European Commission Directives 1996/62/EC, 1999/30/EC and 2000/69/EC and are cited as the Air Quality Standards Regulations, which came into force on 17th June 2002 (Irish Legislation S.I. No. 271 of 2002). In May 2008, these European Directives on air quality were replaced with a new Directive on ambient air quality and cleaner air for Europe (2008/50/EC). The Clean Air for Europe Directive (2008/50/EC) (now transposed into Irish Law) and the Fourth Daughter Directive (2004/107/EC) set limits and target values for ambient concentrations of air pollutants harmful to human health and the environment.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). It replaces the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and S.I. No. 33 of 1999. The 4th Daughter Directive was transposed by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009).

The Air Quality Standards Regulations specify limit values in ambient air for sulphur dioxide (SO₂), lead, benzene, particulate matter (PM₁₀ and PM_{2.5}) and carbon monoxide (CO), nitrogen dioxide (NO₂) and oxides of nitrogen (NO_x). These limits are for the protection of human health and are largely based on review of epidemiological studies on the health impacts of these pollutants.

Table A10.1 Air Quality Standards Regulations 2011

Pollutant	Criteria	Value
Nitrogen Dioxide	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m ³ NO ₂
	Annual limit for protection of human health	40 µg/m ³ NO ₂
	Annual limit for protection of vegetation	30 µg/m ³ NO + NO ₂
Benzene	Annual limit for protection of human health	5 µg/m ³
Carbon Monoxide	Maximum daily 8-hour running mean	10 mg/m ³
Lead	Annual limit for protection of human health	0.5 µg/m ³
Sulphur dioxide	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	350 µg/m ³
	Daily limit for protection of human health - not to be exceeded more than 3 times/year	125 µg/m ³
	Annual limit for protection of vegetation	20 µg/m ³
Particulate Matter PM ₁₀	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m ³ PM ₁₀
	Annual limit for protection of human health	40 µg/m ³ PM ₁₀
Particulate Matter PM _{2.5}	Annual target value for the protection of human health	25 µg/m ³ PM _{2.5}

The limits presented in the EU Directives on Air Quality consider people with respiratory illness and the limits include a margin of tolerance for such conditions, as well as children and the elderly. The limits mimic those based on World Health Organisation (WHO) review of epidemiological studies on health impacts around the world. For example, oxides of nitrogen (NO, NO₂ and NO_x) are known to affect the pulmonary function of the lungs in short term doses. Of all of the medical literature reviewed by the WHO, the lowest adverse affect of exposure was recorded at about 560ug/m³ which showed a reduced lung function in asthmatics. The WHO uses this lowest adverse impact and apply a margin of tolerance (usually 50%) to generate a limit of 200ug/m³ for 1-hour human exposure to oxides of nitrogen. This approach is then replicated for all pollutants.

The IAQM Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites document provides updated guidance on air quality monitoring in the vicinity of demolition and construction sites. It should be read and applied in conjunction with the Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance that was published by the IAQM in January 2012. Constructing buildings, roads and other infrastructure can have a substantial, temporary impact on local air quality. The most common of these impacts are augmented particulate matter (PM) concentrations and dust soiling. Depending on the possibility of dust effects occurring, monitoring may need to be undertaken during both demolition and construction activities to make sure that the applied mitigation measures are effectual in controlling dust emissions, and that there are no significant impacts on the surrounding environment.

The Local Air Quality Management Policy Guidance - LAQM.PGNI(09) (UK Guidance, no Irish equivalent) sets out those circumstances under which air quality may be a material issue for planning applications and provides guidance to planning authorities on making these decisions. *Section B3, Chapter 5 Page 24* sets out guidance on the assessment of shipping.

Dust

There is no legislative limit for total suspended particles so the guidelines presented by the German Government TA Luft guidance are employed. Under this guidance the construction contractor would be required to maintain monthly dust levels below the guideline of 350mg/m²/day as an annual average at sensitive receptors. The EPA have adopted this standard for all licensable activities and the DoECLG Department of Environment, Community and Local Government have proposed its adoption by local authorities for planning applications with reference to quarries and aggregate extraction. The standard method of measurement of dust deposition is outlined in VDI 2119 – *Measurement of Particulate Precipitations. Determination of Dust Precipitation with collecting pots made of glass (Bergerhoff Method) or Plastic*. This standard measures total dust deposition i.e. all particle sizes, including soluble, insoluble and respirable (PM₁₀) dusts.

Climate

Ireland signed up to the Kyoto Protocol in March 1998, along with the other EU member states. The EU countries used a “burden sharing” approach to Kyoto and have agreed to cut greenhouse gas emissions as a whole by 8% in 2012 from the 1990 level with individual commitments set for each country. Ireland’s commitment under the Kyoto Protocol and this “burden sharing” is to reduce the main greenhouse gas (carbon dioxide) emissions to a 13% increase on 1990 levels in 2012. The actual situation in relation to compliance with the Kyoto protocol will not be apparent until after this five year period (2008-2012). As part of Ireland’s commitment to climate change the “National Climate Change Strategy” was published in 2000.

Currently the transport sector in Ireland contributes over 18% of national carbon dioxide emissions. In the National Climate Change Strategy of 2000, the main approach for the reduction of transport carbon dioxide from the transport sector is through fuel efficiency measures, modal shift and demand management. In the subsequent “Review of the National Climate Change Strategy” published in 2006. These three main objectives were re-emphasised and among the policies and measures outlined within includes for the removal of bottlenecks and congestion in the road network to improve journey times, improve the efficiency of the network and reduce greenhouse gas emissions.

A Review of National Climate Policy was produced in November 2011, the report concluded that the Kyoto Protocol is being delivered through a range of national policies including fiscal methods and

subsequent efficiency gains in the agricultural sector. The report does however highlight the major challenges ahead after 2012 with the potential need for much more stringent mitigation.

Baseline Conditions

EPA Air Quality Zones

The Air Framework Directive deals with each EU member state in terms of "Zones" and "Agglomerations". For Ireland, four zones are defined in the Air Quality Regulations (2011). The zones are defined according to pollution concentration levels:

Zone A: Dublin Conurbation,

Zone B: Cork Conurbation,

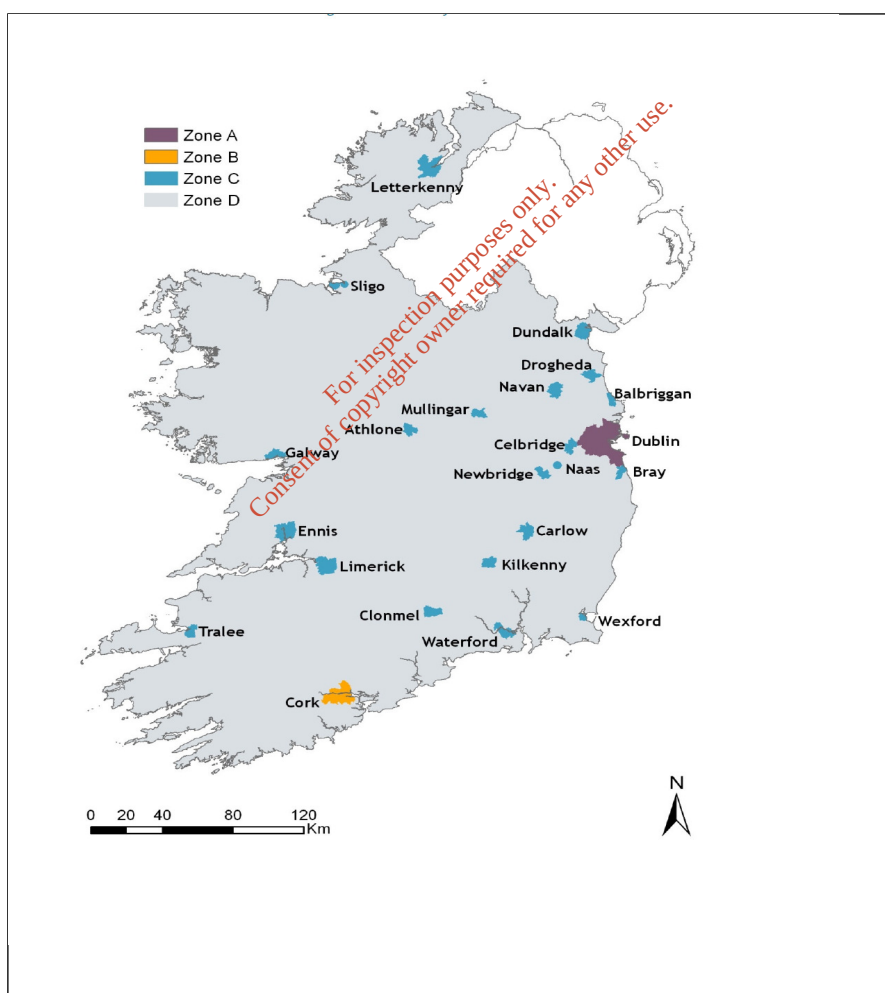
Zone C: Other cities and large towns comprising Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Dundalk, Navan, Letterkenny, Celbridge, Newbridge, Mullingar and Balbriggan,

Zone D: Rural Ireland, i.e. the remainder of the State excluding Zones A, B and C.

The proposed development is located in Zone B (bordering Zone B & Zone C).

The Zones are shown in Figure 10.3 below.

Figure 10.3: The Air Framework Directive deals with each EU member state in terms of "Zones" and "Agglomerations".



For Ireland, four zones are defined in the Air Quality Regulations (2011), amended by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations (2009).

Cork County Council Monitoring Results

Cork County Council carried out ambient air quality monitoring at Old Station Road and Heatherton Park. The Old Station Road site is located on the South side of the river Lee near City Hall, about 500m from the Cork city centre. The site is operated by Cork City Council. Monitoring is done using continuous monitors for sulphur dioxide, nitrogen oxides, carbon monoxide and ozone. Continuous samples are also taken for particulates (PM₁₀), benzene and lead. For measurements recorded in 2012 at this site the NO₂ hourly limit of 200 ug m⁻³ is deemed breached if more than 18 exceedances have occurred. There has been 1 exceedance at this site to date in 2012. The SO₂ hourly limit of 350 ug m⁻³ is deemed breached if more than 24 exceedances have occurred. There have been no exceedances at this site to date in 2012. The O₃ information threshold is 180 ug m⁻³. There have been no exceedances at this site to date in 2012. Particulate Matter is also recorded at this monitoring site. The measurement method measures both PM₁₀ and PM_{2.5}. While sampling is continuous, weights are measured later; therefore the results are not available immediately. The PM₁₀ daily limit of 50 ug m⁻³ is deemed breached if more than 35 exceedances have occurred. There have been 4 exceedances at this site to date in 2012. There is no daily limit for PM_{2.5}. The annual target value for PM_{2.5} is 25 ug m⁻³.

An air quality assessment by the EPA was conducted at Monkstown, Cork Harbour from 31st August 2007 until 15th March 2008. During this measurement period; no limit values were exceeded. Concentrations of carbon monoxide, nitrogen dioxide, sulphur dioxide, benzene, and lead were all found to be below their respective lower assessment thresholds PM₁₀ concentrations, however, exceeded the upper assessment threshold for this pollutant. Cork is situated within Zone B of the country. The following apply to the Cork area;

- Levels of PM₁₀ will need to be monitored continuously
- Levels of SO₂, CO, NO₂, benzene and lead can be assessed using modelling or objective estimation techniques.

Ambient air quality can also be assessed using modelling or objective estimation techniques if levels of that particular pollutant in that zone are below the lower assessment threshold. Measurement and modelling are both required should levels exceed the lower assessment thresholds whilst continuous monitoring is required if levels exceed the upper assessment threshold.

A site at Heatherton Park in Cork City centre records data for PM₁₀, Heavy Metals and Benzo (a) Pyrene. The PM₁₀ monitor is located in a suburban housing estate 1 mile south of the City Centre. It is operated by Cork City Council. The PM₁₀ limit of 50 ug m⁻³ is deemed breached if more than 35 exceedances have occurred. There has been 2 exceedances to date at this site in 2013.

Four heavy metals measured as part of the PM₁₀ sampling. Particulate filters are digested and analysed in the lab. The latest available results for Heavy Metals are:

Nickel

Average Concentration: 2.90 ng m⁻³

Averaging Period: April 2012 - April 2013

This is below the lower assessment threshold of 10.0 ng m⁻³

Arsenic

Average Concentration: 0.46 ng m⁻³

Averaging Period: April 2012 - April 2013

This is below the lower assessment threshold of 2.4 ng m⁻³

Cadmium

Average Concentration: 0.45 ng m⁻³

Averaging Period: April 2012 - April 2013

This is below the lower assessment threshold of 2.0 ng m⁻³

Lead

Average Concentration: 0.012 ug m⁻³

Averaging Period: April 2012 - April 2013

This is below the lower assessment threshold of $0.25 \mu\text{g m}^{-3}$

RPS Site Specific Monitoring Results

A total of 10 monitoring locations were selected in close proximity to the proposed development areas in order to ascertain baseline air quality. Benzene, NO_2 and SO_2 tubes were placed at each location to record each type of atmospheric pollutant evident at each site. The sample tubes were analysed for pollutants at a UKAS accredited laboratory (Gradko International, Hampshire) The locations of the monitoring tubes are shown in Figure 10.1. Monitoring took place over three months in May, June and July 2012.

The sources associated with individual volatile organic compounds (VOCs) tend to be dependent on the nature of industries in the sample region. **Benzene** and other aromatic compounds and alkanes are most likely derived from petrol driven vehicle exhausts. Benzene is a known carcinogen, poisonous by inhalation and a severe eye and moderate skin irritant. Due to the coastal nature of the site, levels are not likely to be at a concentration that would be in breach of any threshold level. In general, levels of Benzene are low in Ireland. Table A10.4 shows average Benzene concentrations as measured by passive tubes.

Table A10.4 Average Benzene Concentrations as measured by passive diffusion tubes

Location	Average Benzene ($\mu\text{g m}^3$)
1	0.24
2	0.26
3	0.12
4	0.40
5	0.36
6	0.39
7	0.36
8	0.37
9	Tube missing on return
10	0.13
Limit Value	$5 \mu\text{g/m}^3$

The recorded data at all locations indicated measurements of Benzene below the limit value. The lowest value was found at the elevated location in Cobh and the highest was found at the car park location off the N28 road. The results are typical of an urban area with frequent heavy traffic volumes. The results are similar to the annual mean concentrations recorded by Cork County Council in 2006 at Old Station Road ($0.5 \mu\text{g/m}^3$).

Nitrogen dioxide is classed as both a primary pollutant and a secondary pollutant. As a primary pollutant NO_2 is emitted from all combustion processes (such as a gas/oil fired boiler or a car engine). As a secondary pollutant NO_2 is derived from atmospheric reactions of pollutants that are themselves, derived mainly from traffic sources (e.g. volatile organic compounds). Secondary pollution is usually derived from regional sources and may be used as an indicator of general air quality in a region. Nitrogen Dioxide has been shown to reduce the pulmonary function of the lungs. Long-term exposure to high concentrations of NO_2 can cause a range of effects, primarily in the lungs, but also in the liver and blood. The Air Quality Limit Values for NO_2 is $40 \mu\text{g/m}^3$. Table A10.5 shows average Nitrogen Dioxide concentrations as measured by passive tubes.

Table A10.5 Average Nitrogen Dioxide Concentrations as measured by passive diffusion tubes

Location	Average NO_2 ($\mu\text{g m}^3$)
1	5.87
2	4.69
3	7.85
4	5.33
5	10.48
6	13.83

7	8.44
8	6.67
9	12.83
10	10.11
Limit Value	40 µg/m ³

The baseline monitoring results for NO₂ indicate that all areas are below the AQS annual limit value. The lowest levels are recorded at the rural cross roads southwest of Ringaskiddy and the highest value is recorded alongside the N28 road.

Sulphur dioxide is classed as a primary pollutant principally emitted from the combustion of fossil fuels (diesel, coal, oil, etc.). As a traffic based pollutant, SO₂ is mainly emitted from vehicles running on diesel fuel, which will include most light goods vehicles (LGVs) and heavy goods vehicles (HGVs). SO₂ emissions from domestic heating may be significant as SO₂ is a major constituent of sulphurous smog. However, in recent years the government has significantly reduced the importance of SO₂ as an air pollutant with the introduction of smokeless fuel. Consequently, concentrations of SO₂ in major urban areas are typically low and this is likely to decrease in future years with the broadening of the ban on non-smokeless fuels. Sulphur Dioxide is a known contributor to respiratory illness and respiratory symptoms. People with asthma are the most susceptible in the community to elevated SO₂ levels. The Air Quality Limit Values for SO₂ is 20 µg/m³ for annual mean. Table 10.4 shows average Sulphur Dioxide concentrations as measured by passive tubes.

Table A10.6 Average Sulphur Dioxide Concentrations as measured by passive diffusion tubes

Location	Average Sulphur Dioxide (µg m ³)
1	1.73
2	2.03
3	2.15
4	1.91
5	2.43
6	2.8
7	2.24
8	2.24
9	2.06
10	3.38
Limit Value	20 µg/m ³

All sulphur dioxide levels recorded are below the limit value. Lower levels are found at location 1 in Haulbowline Island and highest levels are found in Cobh beside a main residential road. The higher results are most likely due to space heating devices and/or diesel vehicles. The results determined are typical of a suburban area and are generally lower than typical Zone B concentrations. Results indicate typical urban background concentration derived from diesel vehicles and domestic heating systems.

Air Quality in Ireland 2012 Key Indicators of Ambient Air Quality

The EPA produced a report in 2013 – “Air Quality in Ireland 2012 Key Indicators of Ambient Air Quality”, which provides an overview of ambient air quality trends in Ireland in 2012 based on monitoring data from 28 stations in operation during the year. The air quality analysis presented in the report is based on concentration measurements of the following pollutants:

- Sulphur dioxide,
- Nitrogen dioxide and oxides of nitrogen,
- Particulate matter,
- Lead,
- Arsenic,
- Cadmium,

- Nickel,
- Mercury,
- Benzene,
- Carbon monoxide, and;
- Ozone.

The pollutants of most concern are fine particulate matter, expressed as PM₁₀, nitrogen dioxide and, not the same extent although still a concern, ozone.

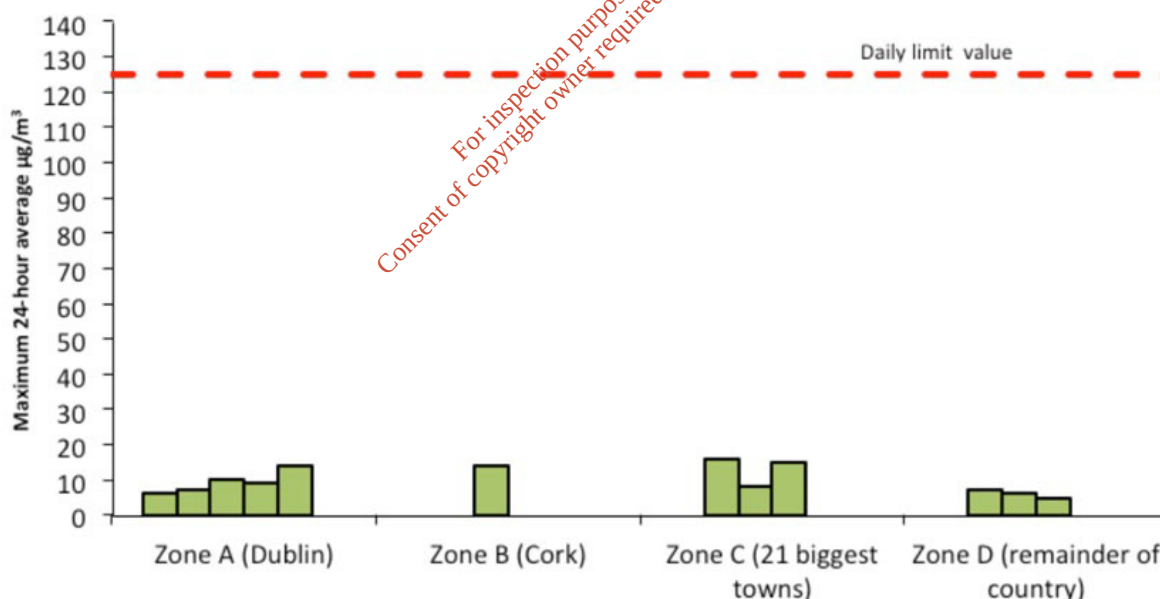
Sulphur Dioxide (SO₂)

2012 SO₂ Results: The results from the 12 monitoring stations indicate that concentrations in 2012 overall are very low when compared to the hourly and daily limits of 350 ug/m³ and 125 ug/m³ respectively as defined in Directive 1999/30/EC. No exceedences of the hourly limit were recorded in 2012.

Trends in SO₂ concentrations: Concentrations of SO₂ have fallen considerably since the early 1990s and are now at a consistent low level. The reduction is connected with a number of issues including the ban on bituminous coal (urban areas), a lower sulphur content of fuel, and changing from solid fossil fuel use to oil and gas. The use of coal as home heating fuel has increased due to financial implications of the global economic downturn. Levels of atmospheric pollution associated with the burning of coal for domestic heating may increase due to this reason.

Currently, levels of SO₂ in all zones across Ireland are below European threshold limits.

Figure 10.4 Daily Maximum Concentrations For SO₂ At Individual Stations Across Ireland In 2012 (EPA, 2012)

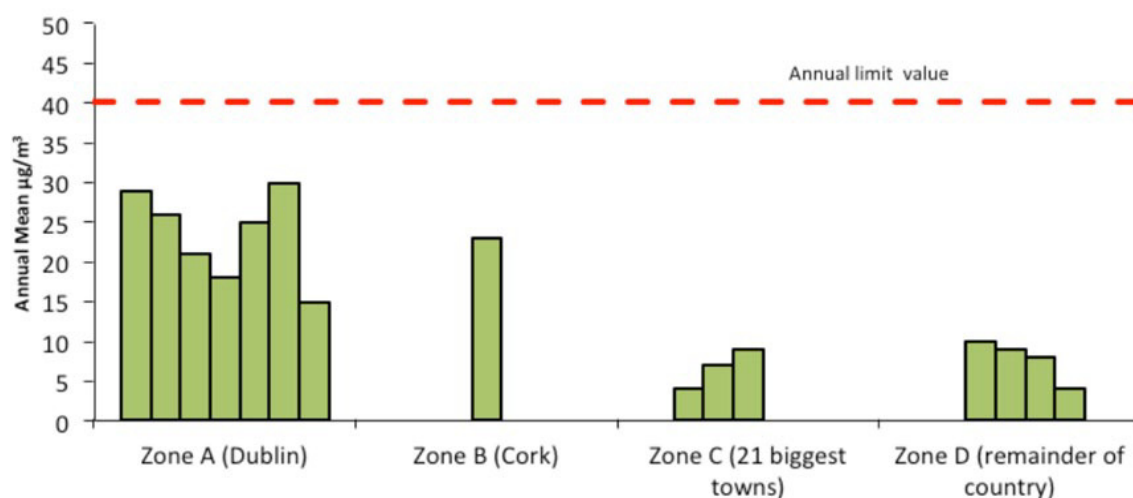


Nitrogen Dioxide (NO₂) and Oxides of Nitrogen (NO_x)

2012 NO₂ Results: Annual NO₂ concentrations measured at suburban and rural sites are lower than those measured at urban stations. NO₂ concentrations were monitored at 15 locations across Ireland in 2012. NO₂ values for all monitoring sites in Ireland were below the annual limit value in 2012. The annual mean NO_x for the protection of vegetation were recorded at rural locations and are well below the limit of 30ug/m³.

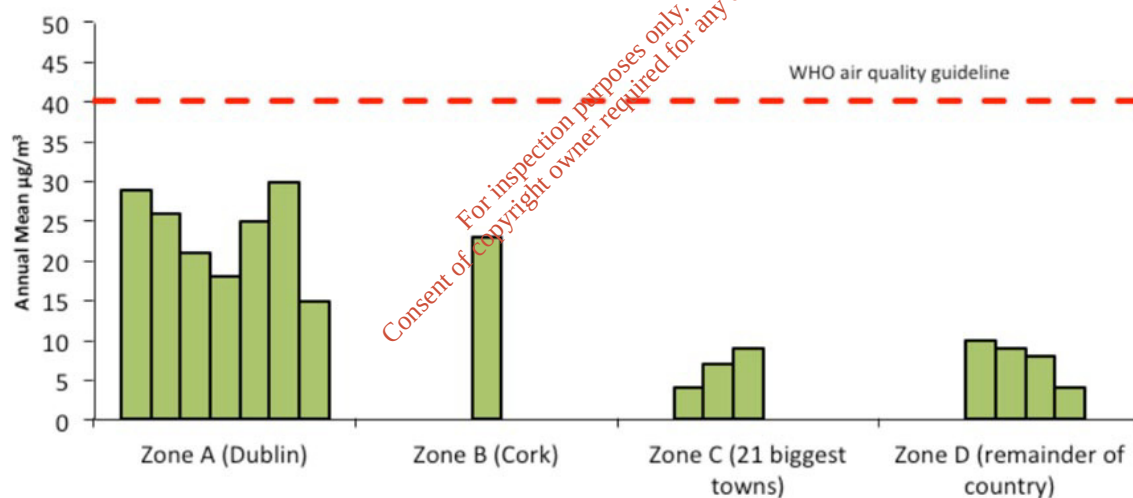
Trends in NO₂ concentrations: There is no distinctive fluctuation in levels of NO₂ concentrations in all Zones from 2002-2010. NO₂ levels across all zones of Ireland have remained relatively static since 2002, with signs of a slight increasing trend in the years 2008 - 2010.

Figure 10.5 Annual Mean NO₂ Concentrations at Individual Stations Across Ireland in 2012 (EPA, 2012)

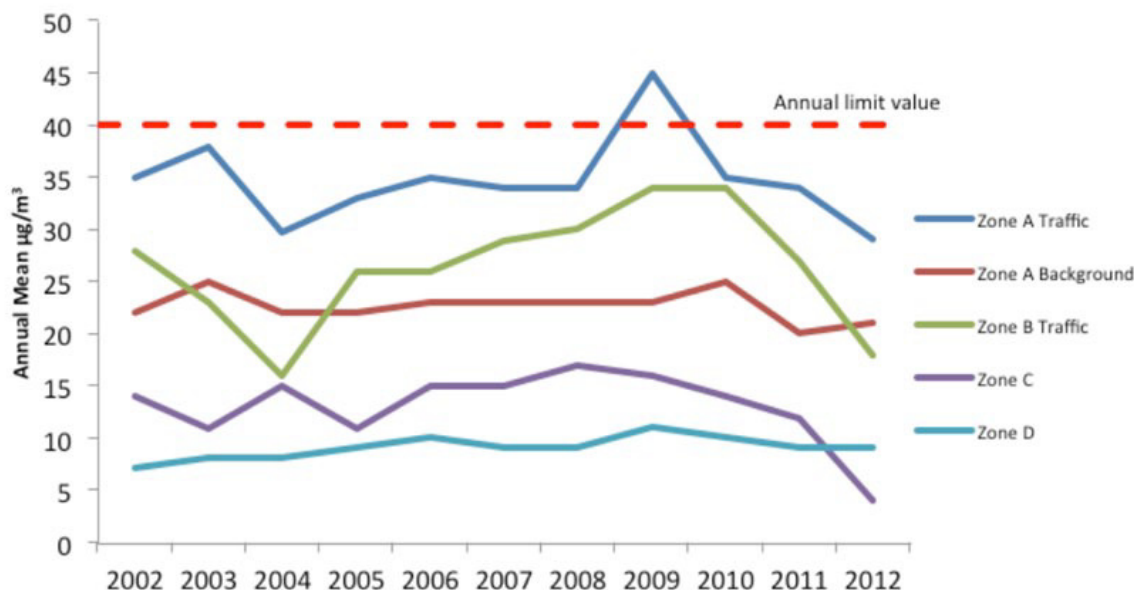


Identifiable from the graph above, Cork in Zone B is well within the Annual Limit Values for NO₂.

Figure 10.6 Annual Mean NO₂ Concentrations at Individual Stations Across Ireland in 2012 with reference to WHO Air Quality Guidance Value (EPA, 2012)



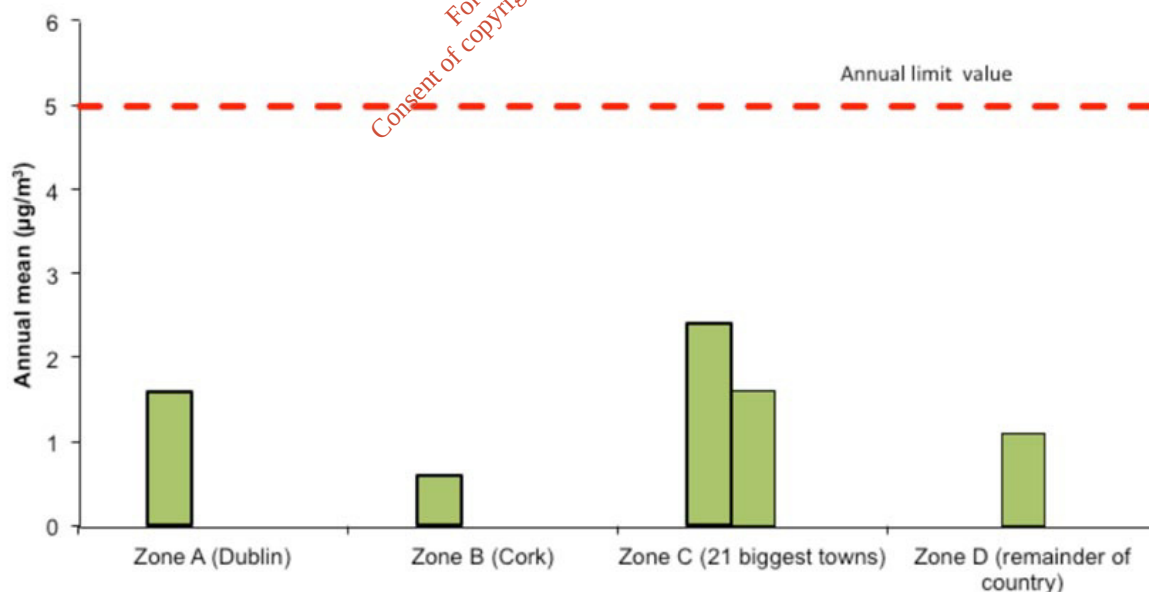
Identifiable from the graph above, Cork in Zone B is well within the WHO Air Quality Guidance Value for NO₂.

Figure 10.7 Trend In NO₂ Concentrations For Zones In Ireland 2002 - 2012 (EPA, 2012)

Significant drop offs in Zone B traffic annual mean concentrations can be located on the graph from 2010 - 2012. The only breach of the NO₂ Annual Limit Value was in 2009 for Zone A Traffic.

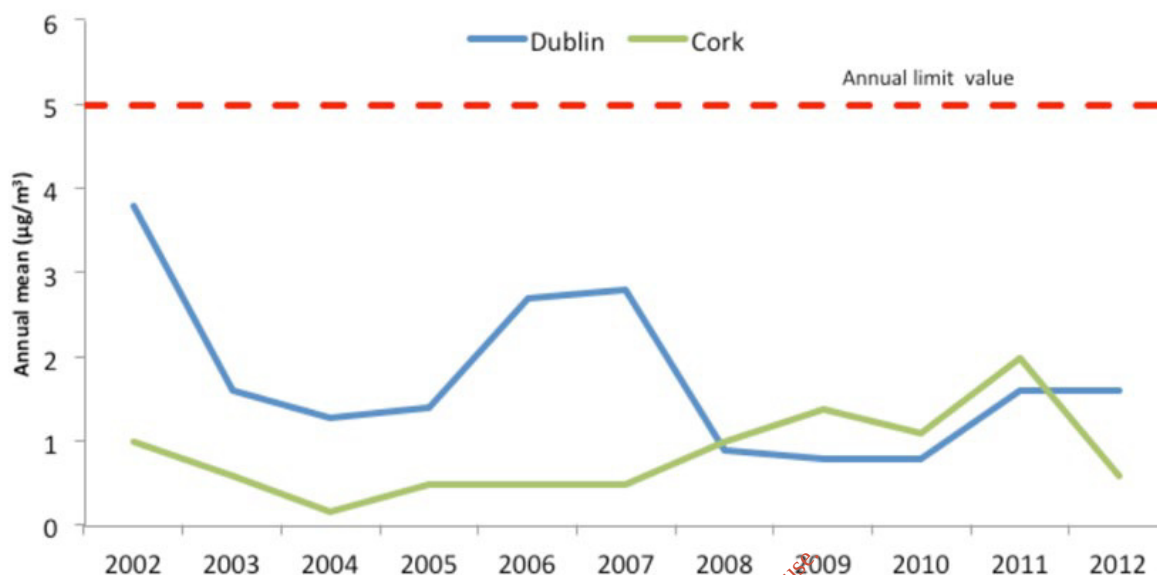
Benzene & VOCs

2011 benzene results: Benzene concentrations were measured at five locations in 2012. The annual mean limit of 5 µg/m³, which came into force in 2010, was not exceeded at any station.

Figure 10.8: Benzene concentrations for individual stations in Ireland in 2012 (EPA, 2012)

Trends in benzene concentrations: The levels recorded have decreased significantly since 2001 when the mean level recorded in Dublin was close to the 5 µg/m³ limit value. Current trends appear to be stable and well below the limit values.

Figure 10.9 Annual Mean Concentrations Of Benzene In Cork And Dublin, 2002 - 2012 (EPA, 2012)

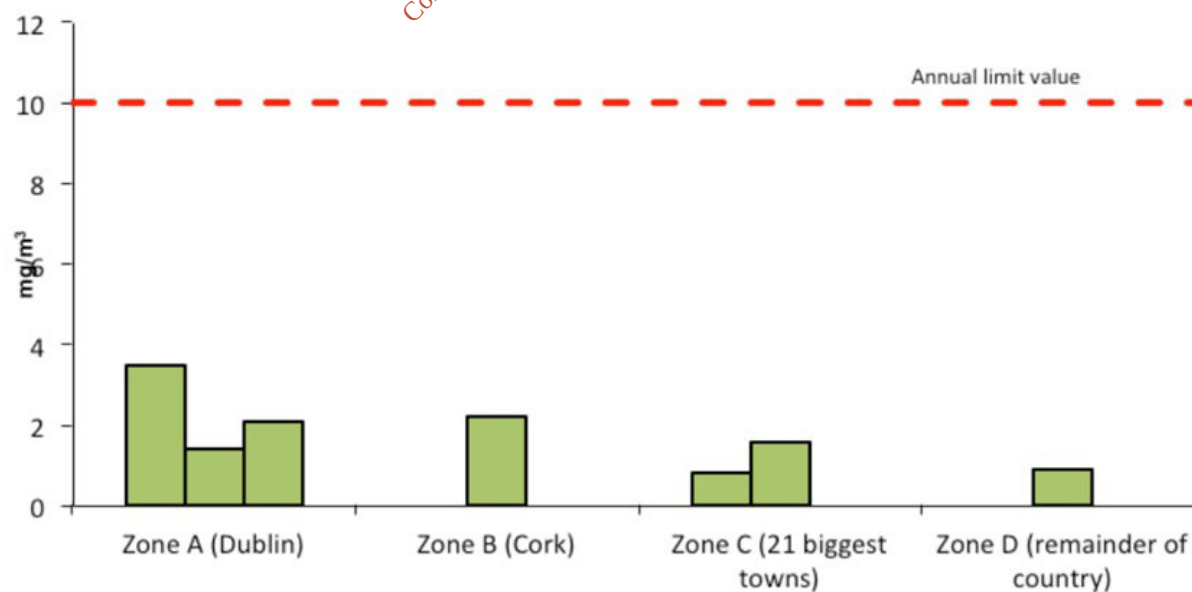


The trend lines in the above graphic indicate fluctuations in benzene levels in Dublin & Cork from 2002 - 2012 with an overall gradual reduction in levels. Levels in Cork briefly rise above recorded levels in Dublin for the 2008 - 2011 period.

Carbon Monoxide (CO)

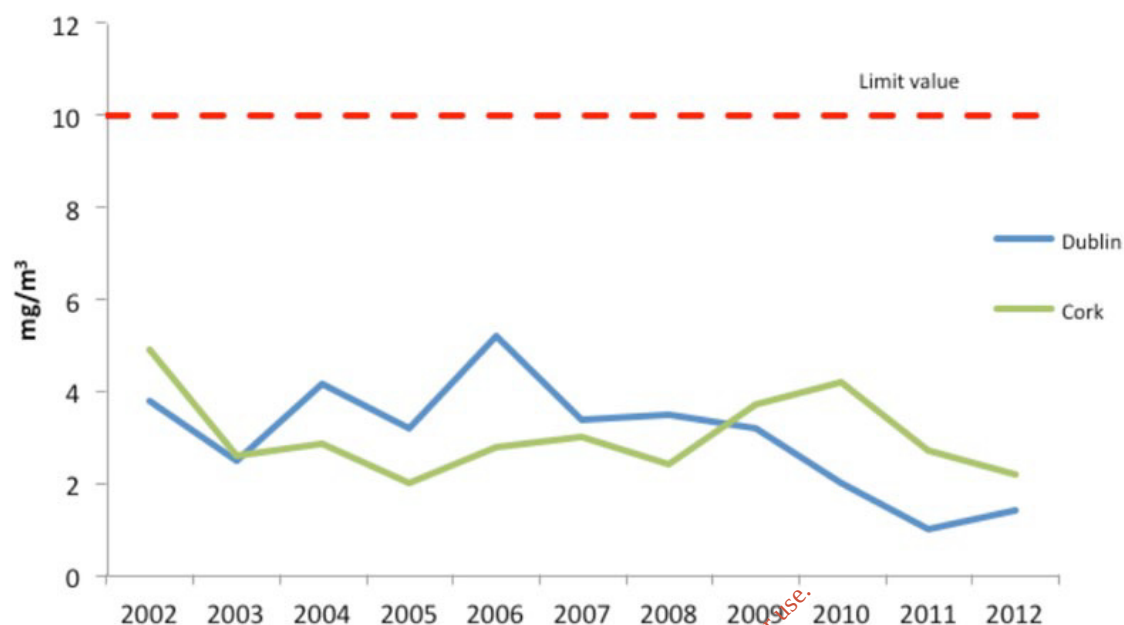
Carbon Monoxide Results: CO was monitored in 2012 at seven locations and revealed very similar levels of concentrations to previous years results and are below the limit value.

Figure 10.10: Max 8-hr mean CO Concentrations at individual stations in 2012 (EPA, 2012)



Trends in Carbon Monoxide: Levels of CO have remained consistently low in recent years and this is predicted to remain the case for the foreseeable future. All levels recorded in this since 2002 have remained below the limit value set out in the CAFE Directive and WHO guideline.

Figure 10.11: Maximum CO Concentrations In Cork And Dublin, 2002 - 2012 (EPA, 2012)

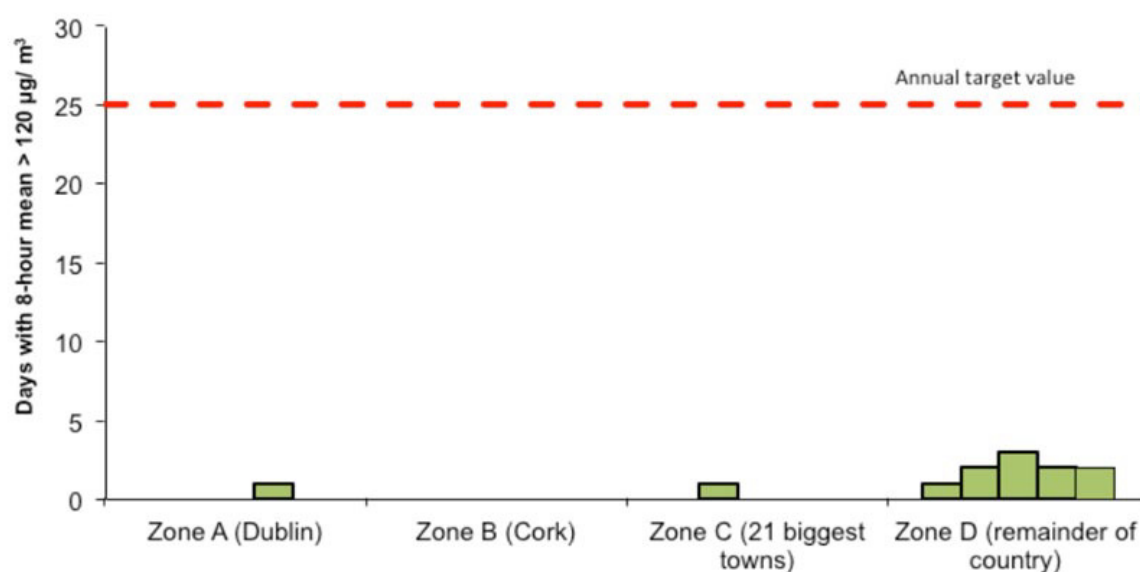


Visible fluctuations in Maximum CO concentrations are apparent in both Dublin & Cork. Again, Cork peaks slightly above Dublin for the years 2009 - 2012.

Ozone

2011 Ozone concentrations results: Ozone concentrations recorded in 2012 were below the EU limit value for human health. However ozone concentrations measured, exceeded the LTO for health at seven monitoring stations and were also above the WHO guideline value at ten monitoring stations.

Figure 10.12: Number of days with maximum 8-hr O₃ concentrations > 120 µg/m³ at individual stations in 2011 (EPA, 2012)



Trends in Ozone concentrations: Results for Ozone levels have been identified as being higher along the western seaboard. Ozone concentrations, like NO₂ levels, are strongly influenced by weather

conditions; warm sunny weather coupled with stable anticyclones are likely to produce higher levels of Ozone. This can be due to local emissions or transboundary sources. Short acute ozone episodes whilst rare in Ireland have occurred and are more than likely to happen again.

Heavy Metals

Heavy Metals 2012 Results: Lead, arsenic, cadmium and nickel in PM_{10} were measured at five stations in 2012. All results were found to be significantly below their respective targets values.

Mercury was measured at one site in 2012 and deposition of lead, arsenic, cadmium and nickel were measured at three stations in 2012. There is no target value for mercury or metal deposition specified in Directive 2004/107/EC.

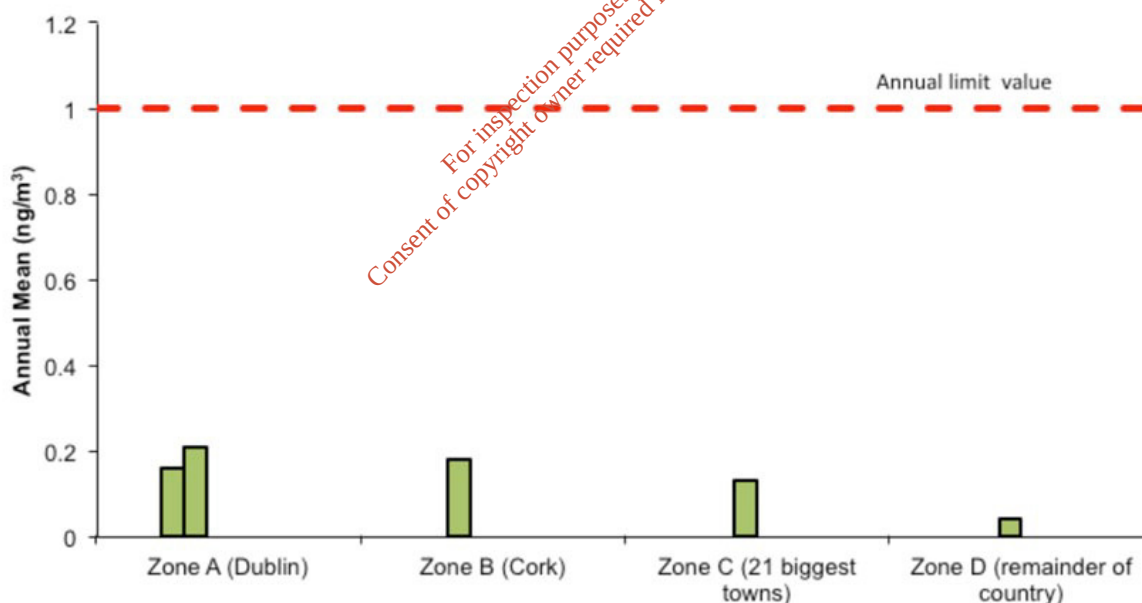
Trends in Heavy Metals: Lead has been measured in Ireland for a long time and recent trends in concentration levels are significantly lower recently than years before which has been largely contributed to the phasing out of leaded petrol. Levels of heavy metal concentrations are likely to be higher in regions with high industrial activity; Ireland has a relatively small heavy industry sector and as such concentration levels of heavy metals are predicted to remain low.

Polycyclic Aromatic Hydrocarbons (PAH)

PAH results: PAH was monitored at five stations across Ireland in 2012. Levels at all five of the sites were below the target value of 1 ng/m^3 .

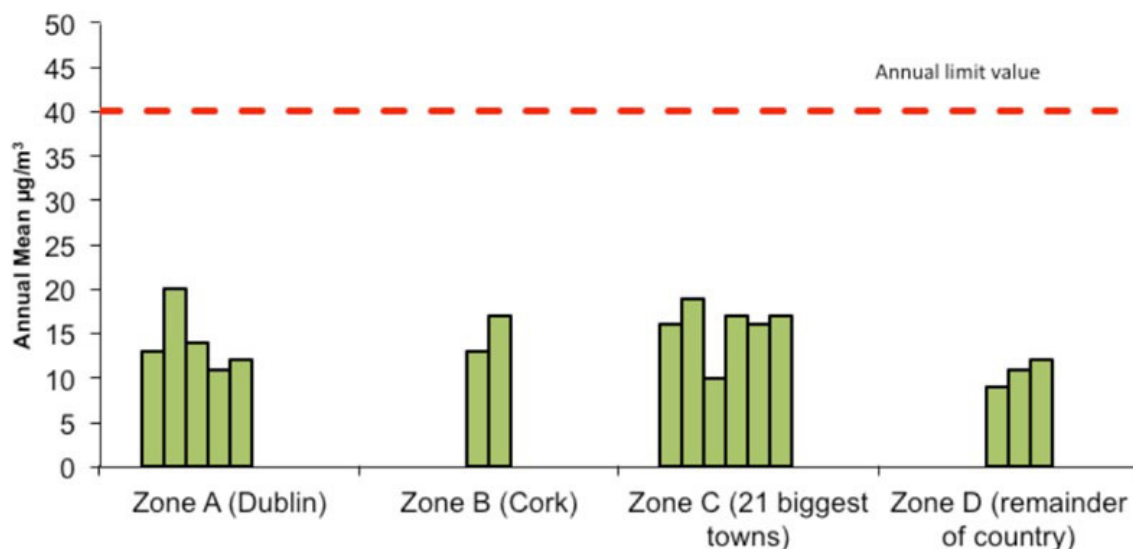
Trends in PAH: The 2012 monitoring results are only the third set of results obtained for PAH. Future concentrations of PAH in Ireland are going to depend upon usage of heating fuel for residential purposes. Wood and Biomass installations produce high levels of PAH in addition to coal whilst gas is recognised as a relatively clean alternative.

Figure 10.13 Annual Mean Values For PAH (B(a)P) At Individual Stations Across Ireland In 2012 (EPA, 2012)

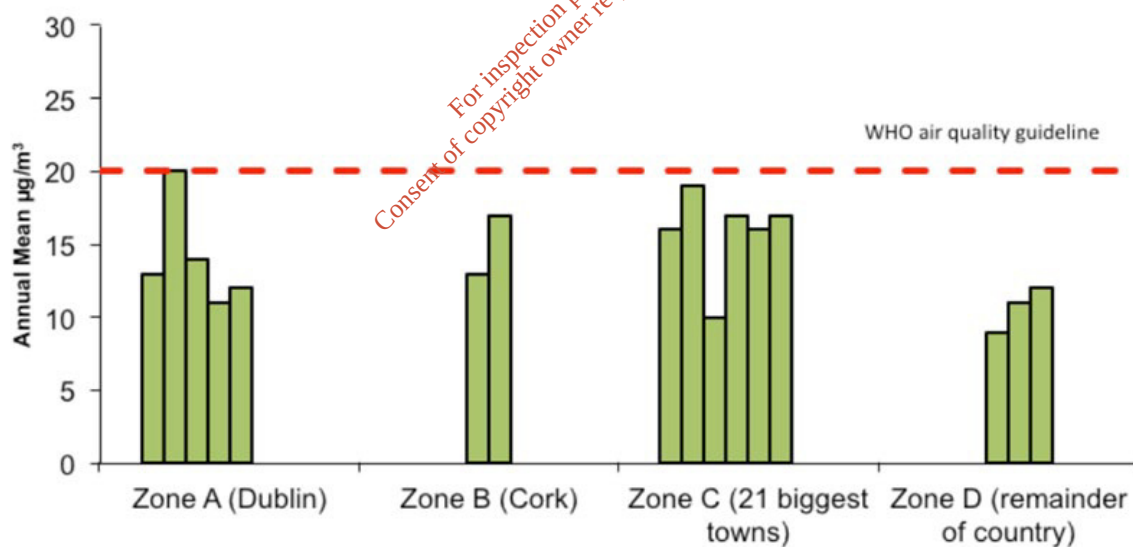


Particulate Matter (PM₁₀)

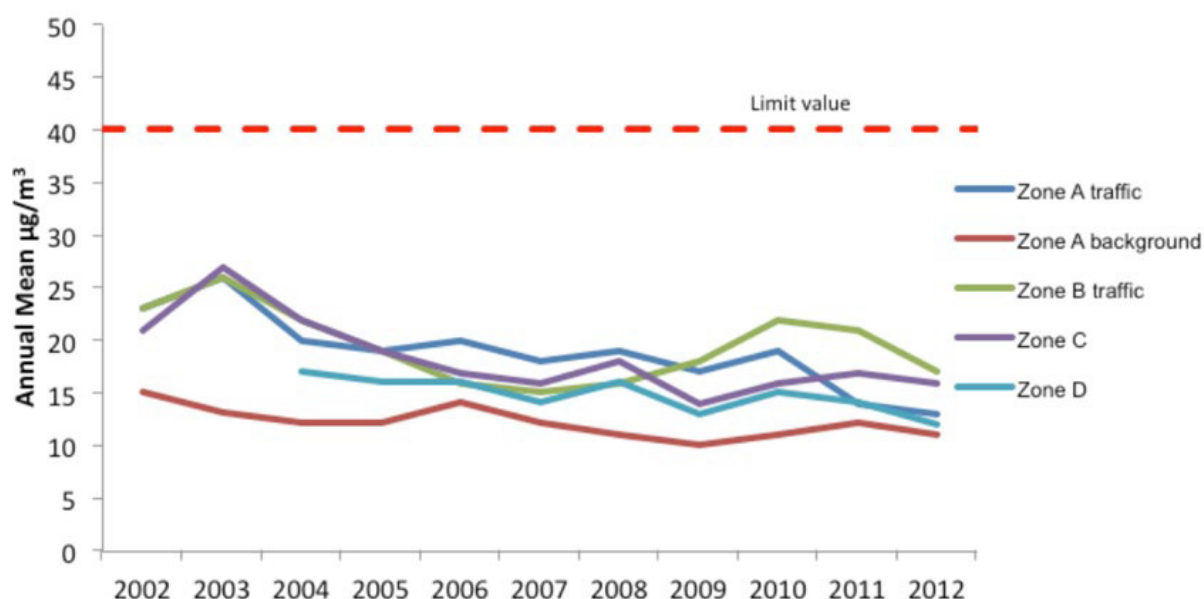
2012 PM_{10} Results: PM_{10} was monitored at 16 stations across Ireland in 2012. All stations were compliant with the $40 \text{ } \mu\text{g/m}^3$ limit value. Levels were highest at traffic-influenced sites in cities and in large Zone D towns due to burning of coal and other solid fuel in addition to emissions from traffic.

Figure 10.14 Annual Mean PM10 Concentrations At Individual Stations In 2012 (EPA, 2012)

Levels of annual mean PM10 are significantly below Irish and EU recommended threshold levels across all zones in Ireland.

Figure 10.15 Annual Mean PM10 Concentrations At Individual Stations In 2012 With Reference To WHO Air Quality Guideline Value For PM10 (EPA, 2012)

Levels of annual mean PM10 are below WHO recommended threshold levels across all zones in Ireland with the exception of one station in Dublin - Zone A which just meets the threshold level.

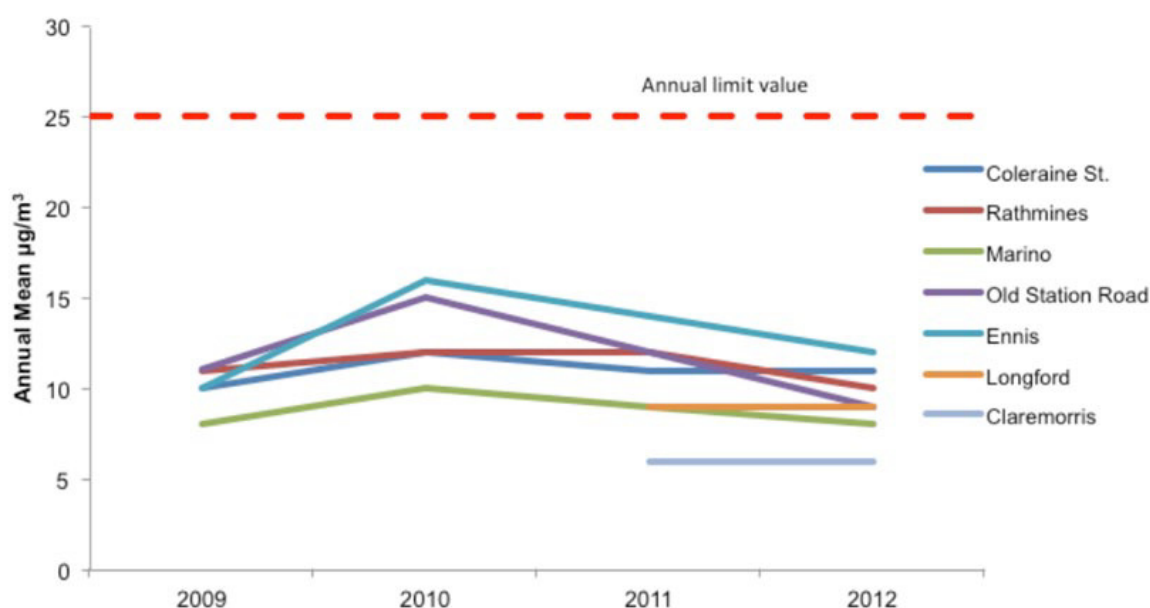
Figure 10.16 Annual Mean PM₁₀ Concentrations 2002-2012 (EPA, 2012)

Trends in PM₁₀ concentrations: There is a decreasing trend in Zones A, B & C. The reason for this may be associated with the decrease in emissions from traffic due to cleaner fuels and more efficient/cleaner traffic engines. Some areas within Zone D did not indicate an overall decrease possibly due to a greater variety of sources including residential fuel use, industry, and agriculture.

Currently, levels of PM₁₀ in all zones across Ireland are below European threshold limits.

Particulate Matter (PM_{2.5})

2012 PM_{2.5} results: The CAFE directive introduced obligatory monitoring of OM2.5. Levels in Ireland are below both the stage one and stage two limit values of 25 & 20 µg/m³.

Table 10.17 Annual Mean PM_{2.5} Concentrations 2009-2012 (EPA, 2012)

Trends in PM_{2.5}: PM_{2.5} levels in Ireland are below the EU limit value, however, due to the calculation of the average exposure indicator (AEI) and the national exposure reduction target (NERT) Ireland is obliged to decrease its average PM_{2.5} concentrations by 10% by 2020.

Dust

Dust is a generic term used to describe a wide range of particulate materials that are generated from the disintegration of solids. Dust in the air is a natural occurrence. The action of wind moving across the ground will make small particles airborne if relevant conditions persist (i.e. dry ground, sufficient wind speed). Large emissions of dust occur naturally; such as wind-blown dust from a shoreline (sand). The anthropogenic sources of dust originate from earthworks, mineral extractions, cargo handling and road use.

The sizes of the particles are generally in the range 1-100 μm (1 μm = 1 micrometre = 10^{-6} metres). Particle size is important because it determines the settling velocity of the dust. In order to assess the potential for a dust nuisance problem to be caused during any potentially dust-generating activity, there is a need to consider both the likely particle size of the material and the effects of wind dispersion. Nuisance caused by the deposition of dust from excavation and loading is likely to be the most significant issue in relation to air quality impacts from the proposed development.

The environmental effects of particles depend on their deposition rate and their concentration in air. Deposition rate is expressed in terms of mass per unit area per unit time, e.g. $\text{g.m}^{-2}.\text{month}^{-1}$. Concentration is expressed in terms of mass per unit volume, e.g. $\mu\text{g.m}^{-3}$.

The effect of dust arising from on-site soil stripping & HGV movement is principally one of nuisance caused to the local community, although deposition on vegetation can disrupt sensitive plant communities if it occurs at a sufficient rate. Dust nuisance is experienced usually as a result of dust deposition upon clean surfaces such as windows, cars, furniture or laundry.

Guidance states that most non-toxic dusts will begin to be perceived as a nuisance when deposition reaches $200 \text{ mg.m}^{-2}.\text{day}^{-1}$. This figure is based on an annual deposition rate and represents the threshold for significant nuisance, although a range of criteria from 133 to $350 \text{ mg.m}^{-2}.\text{day}^{-1}$ is found in various examples from other countries. Examples of dust deposition standards are shown in Table A10.7:

Table A10.7: Examples of dust deposition standards

Country	Averaging period	$\text{mg m}^{-2} \text{ day}^{-1}$
UK	Annual average	200
Germany	Annual average	200
Spain	Annual average	200
Finland	Annual average	333
Australia	Annual average – Loss of amenity first perceived – Unacceptable reduction in air quality	133
		333
Canada	Annual average – Maximum desirable – Maximum acceptable	200
		266
United States	Annual average	333

The level and distribution of dust emissions will vary according to factors such as type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression measures. It is therefore difficult to predict emissions and conventional modelling tools are of limited use.

The assessment of dust is normally confined to an evaluation of the likelihood that emissions may give rise to some perceptible nuisance. This is defined on the basis of the distance from site works of sensitive receptors such as residential properties. It is normally possible, by proper control, to ensure that dust deposition does not give rise to nuisance effects. It is common practice to use a distance of 100m as the radius within which impacts may occur. Figure 10.2 shows distance bandings and proximity of sensitive receptors. Routine dust control measures would normally ensure that the risk of

long-term impacts is insignificant but short-term events may occur, for example, technical failure or exceptional weather conditions.

With respect to emissions from traffic, construction of the project would generate vehicle movements on the local road network, which would include contractors' vehicles and Heavy Goods Vehicles (HGVs), diggers, and other diesel-powered vehicles. This would result in emissions of particulates and in addition to this ground surface & tyre interaction can create dust plumes.

As part of the Port Of Cork Environmental Management System dust monitoring was carried out at three site boundary locations as part of an on-going monitoring programme. Dust deposition was measured in accordance with VDI 2119: Measurement of Dust Using a Bergerhoff Dust Deposition Gauge. The gauges consist of a collecting jar positioned at 1.5m above ground level with a bird guard around the collecting jar. The gauges were erected to measure total dust for a period of one month. Three gauges were erected on the southern boundary of the site from 5th March 2013 to the 3rd April 2013. The monitoring results are presented in the Tables A10.8 & A10.9 below. Figure 10.1 shows the location of the dust monitoring gauges.

Table A10.8 Dust deposition monitoring results 5th March 2013 - 3rd April 2013

Reference	Total Dust (mg/m ² /day)	Comment	Limit
1	84	No comment	350 mg/m ² /day
2	70	No comment	
3	254	No comment	

Table A10.9 Dust deposition monitoring results 16th August 2013 - 13th September 2013

Reference	Total Dust (mg/m ² /day)	Comment	Limit
1	55	No comment	350 mg/m ² /day
2	27	No comment	
3	28	No comment	

All levels recorded are within the recommended limit for dust deposition of 350 mg/m²/day.

Odours

Odour is the attribute detectable by the nose on sniffing certain volatile substances. The characteristics of the odours substance make them perceptible to the human sense of smell. The term odour relates to the stimuli from a chemical compound that is made more volatile in the air. Odour is a person's perception of that sensation and an interpretation may be made what the odour means. Resulting from this assessment of an odour, it may be determined as being pleasant or unpleasant. The main issue with certain odours is its ability to cause a response in a person that they consider the odour objectionable or offensive.

Odours have important characteristics when examining the potential for environmental impact and undesirable effects on sensitive receptors. The bullet points below indicate the basic sensory properties of odour:

- Detection – Concentration of an odour when first detectable;
- Recognition – Human ability to differentiate between odours;
- Intensity – Perceived strength at differing concentrations;
- Hedonic Tone – Pleasantness/Offensiveness; and,
- Odour Quality – Association & Complexity.

The concentration at which an odour is just detectable to a "typical" human nose is referred to as the threshold concentration. This concept of a threshold concentration is the basis of olfactometry in which a quantitative sensory measurement is used to define the concentration of an odour. Standardised methods for measuring and reporting the concentration of an odour sample have been defined by a European standard (BS EN 13725:2003). The concentration at which an odour is detectable is defined as the detection threshold and has an odour concentration of 1 European odour unit per cubic metre (1 ou_E/m³).

An odour at this strength would not normally be detectable outside the controlled laboratory environment. As an odour becomes more concentrated it becomes more apparent. At a concentration of $5 \text{ ou}_E/\text{m}^3$, this would be a faint odour and a concentration of $10 \text{ ou}_E/\text{m}^3$ would be a distinct odour.

Intensity of the odour is another important attribute. Intensity refers to the perceived strength of an odour. Low concentrations of some substances in a sample are capable of being perceived as having a high intensity even when close to threshold concentrations. An odour intensity scale is widely used to indicate strengths of odour ranging from 0 – No Odour to 6 – Extremely Strong Odour. The hedonic tone, the pleasantness or offensiveness, of the odour is important when analysing the potential for complaints. Odour quality, hedonic tone and concentration influence the potential for annoyance, although the response to a particular odour will alter depending on the individual.

Existing odours at the Port of Cork range from fish related odours, hydrocarbon related odours, and odours from bulk grains. Odour may also be an environmental concern during the operational phase due to fumes from construction traffic and potential odours emanating from disturbance to the harbour floor during construction dredging. Fugitive odour may originate from dredged material from the port during the construction phase, this material would then potentially be transported from the site by boat for disposal.

Climate

Macro-Climate of Ireland

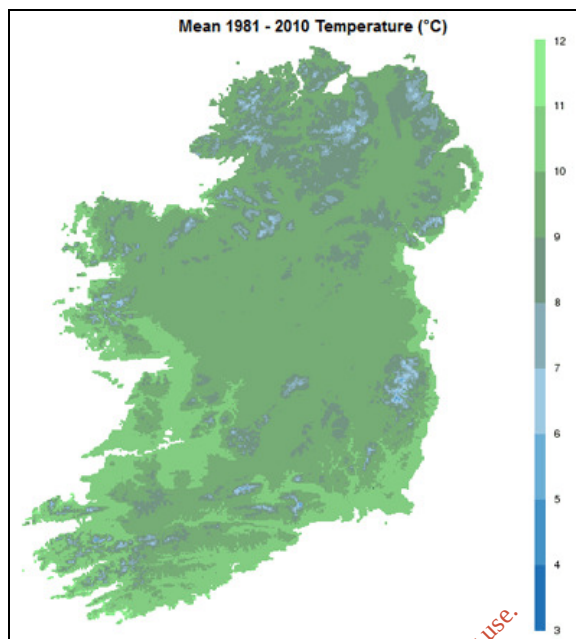
On a macro scale the dominant feature on Irelands climate is the Atlantic Ocean. Generally speaking, winters tend to be cool and windy, whilst summers are mostly mild and less windy. The Atlantic low-pressure systems are well established in December, and depressions tend to move quickly eastward in December and January, conveying strong winds with substantial frontal rainfall to Ireland. Occasionally, cold anticyclones over Europe extends its influence westwards to Ireland, giving dry cold periods lasting several days.

Approaching late June or early July the rise in pressure over Atlantic and an associated fall in pressure over Europe results in a general wind flow at the surface becoming westerly. This brings air with a long ocean track over Ireland, so that cloud cover, humidity and rainfall all increase. From mid July, clear nights tend to be accompanied by heavy dew. Warm air masses of high humidity and daytime heating sufficient to cause thunderstorms and may be a regular feature of mid to late summer weather. Towards the start of August there are infrequent incursions into the Atlantic of cold northerly air masses. These produce active depressions in late August and September. In September the humid air is readily influenced to increasing periods of cooling by night and fog is frequent around dawn in low-lying districts.

From late summer through Autumn there is a risk of former tropical depressions mixing in with the North Atlantic weather pattern depressions to produce severe storms. These are quite rare but are very significant weather events. (Met Eireann, 2014).

Air Temperature

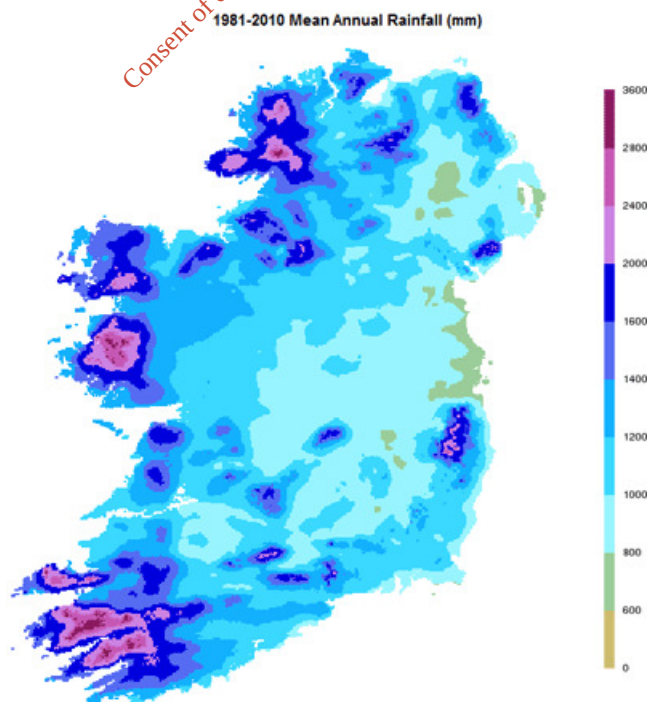
Figure 10.18 Mean 1981 - 2010 Temperature (°C) (Met Eireann 2014)



The above figure shows the mean air temperature at the study area. Coastal regions in general see less of a temperature range and air temperature for the mean period at the proposed development site is 11 - 12 °C.

Rainfall

Figure 10.19 Mean 1981 - 2010 Annual Rainfall (mm) (Met Eireann 2014)

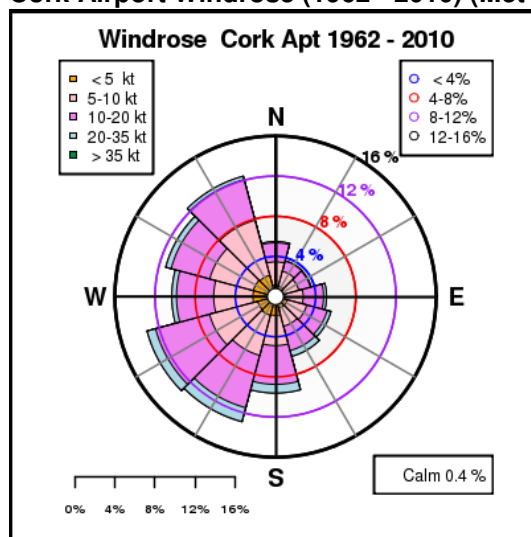


Most of the eastern half of the country gets between 750 and 1000 (mm) of rainfall in the year. Rainfall in the west generally averages between 1000 and 1400 mm. In many mountainous districts

rainfall exceeds 2000mm per year. The wettest months, in almost all areas are December and January. The proposed development area has an annual mean 1981 - 2010 of 1000 - 1200 mm.

Wind

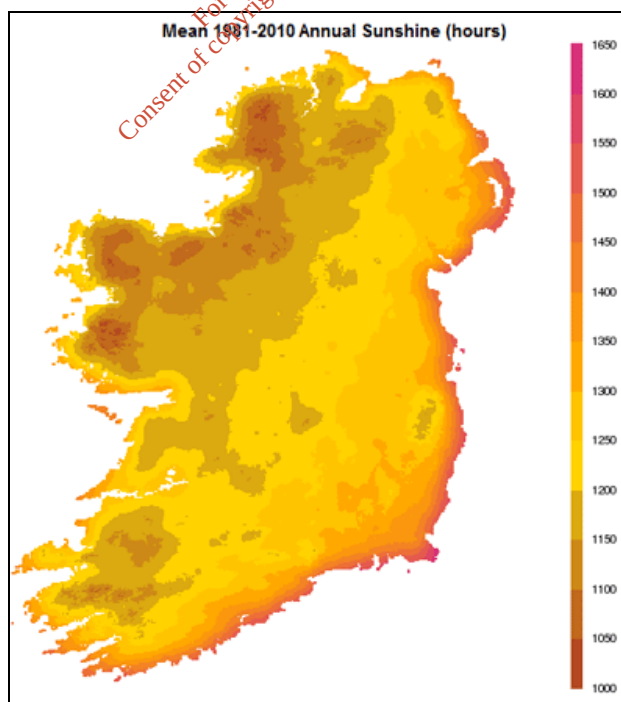
Figure 10.20 Cork Airport Windrose (1962 - 2010) (Met Eireann 2014)



Wind blows most frequently from the southwest and northwest for open sites while winds from the northeast or north occur least often. In January the southerly and south-easterly winds are more prominent than in July, which has a high frequency of westerly winds. Easterly winds occur most often between February and May and are commonly accompanied by dry weather. The dominant wind direction recorded for Cork Airport are south westerly.

Sunshine

Figure 10.21 Mean 1981 - 2010 Annual Sunshine (hours) (Met Eireann 2014)



Ireland usually gets between 1100 and 1600 hours of sunshine each year. The sunniest months are May & June. During May & June, sunshine duration averages between 5 and 6.5 hours per day over

most of the country. The extreme southeast receives the most sunshine, averaging over 7 hours a day in early summer. December is the duller month, with an average daily sunshine ranging from about 1 hour in the north to almost 2 hours in the extreme southeast. Over the year as a whole, most areas get an average of between 3 1/4 and 3 3/4 hours of sunshine each day.

Micro-Climate of Ringaskiddy

The topography of the site is flat reaching sea level at the harbour's edge. Further inland to the southwest, beyond the N28 and Ringaskiddy village, the landscape becomes increasingly rural. The topography also rises steadily to a crest over 50m OD. The even and level nature of the proposed development site is contrasted by the steep, rising elevations of lands that surround the inner Cork Harbour at Ringaskiddy, Monkstown, Cobh, Western Great Island, Aghada, Whitegate, and Crosshaven.

The Port of Cork at Ringaskiddy has a weather station that records detailed information every 30 minutes. The information recorded includes; date, time, Temperature, High Temperature, Low Temperature, Humidity, Dew Point, Wind Speed, Wind Direction, High Wind Speed, High Wind Direction, Wind Chill, Heat Index, Pressure, Rainfall and Rainfall Rate. All this data, most importantly wind speed and wind direction can lend to an understanding of fugitive dust behaviour and can aid in addressing potential dust dispersion episode on sensitive receptors on the peripheries of the working site.

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APPENDIX 10.2 MODEL & CALCULATION INPUTS

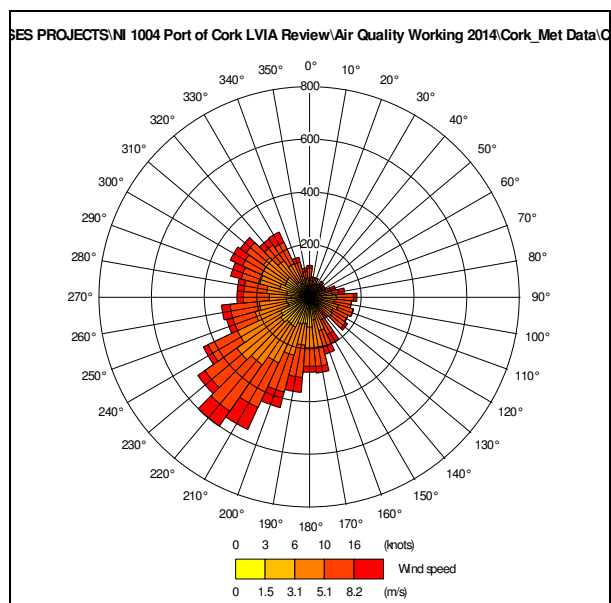
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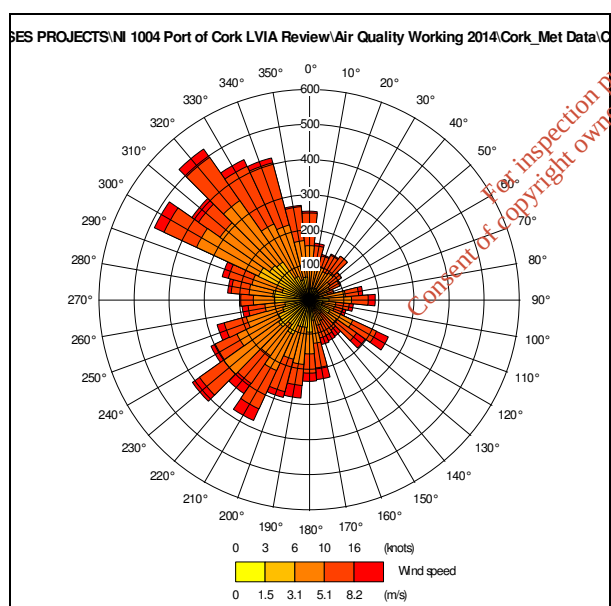
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Appendix 10.2 Model & Calculation Inputs

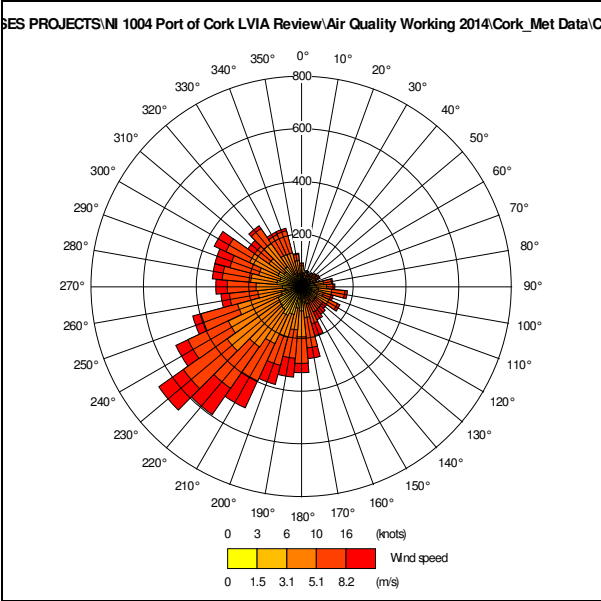
Met Data Used in ADMS CERC Roads 3.2 Dispersion Model



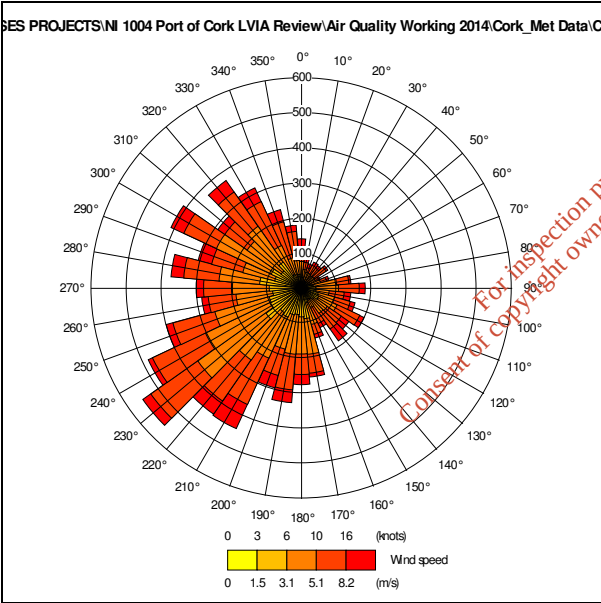
2009 Cork Airport Met Data Windrose



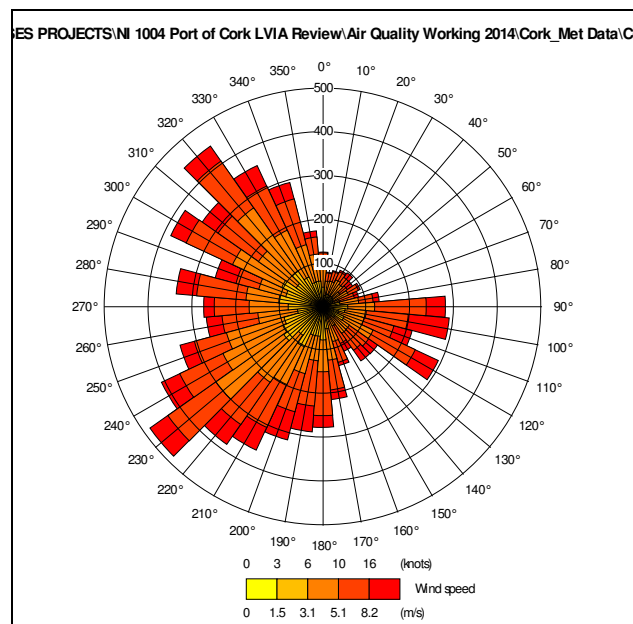
2010 Cork Airport Met Data Windrose



2011 Cork Airport Met Data Windrose



2012 Cork Airport Met Data Windrose



2013 Cork Airport Met Data Windrose

Representative Sensitive Receptors in ADMS CERC Roads 3.2 Dispersion Model

Ref	Location	X	Y	Z (Height m)
1	1.Ringaskiddy Main St	177675	64219	1.5
2	2.4 Riverview Ringaskiddy	177706	64219	1.5
3	3.Ringaskiddy Main St 2	177755	64221	1.5
4	4.Ringaskiddy Footpath	177832	64242	1.5
5	5.Ringaskiddy Main St 3	177852	64218	1.5
6	6.Ringaskiddy Main St 4	177864	64218	1.5
7	7.Ringaskiddy Main St 5	177970	64205	1.5
8	8.Ringaskiddy Main St 6	178192	64202	1.5
9	9.Ringaskiddy Main St 7	178253	64210	1.5
10	10.Marello Pk Ringaskiddy	178313	64199	1.5
11	11.Harbour 1 Ecological Designation	178010	64803	0
12	12.Harbour 2 Ecological Designation	177615	64791	0
13	13.Off Main N28	177611	64052	1.5
14	14.Layby N28	177327	64336	1.5
15	15.Shanbally Cross 1	175756	64457	1.5
16	16.Shanbally Cross 2	175715	64376	1.5
17	17.Shanbally Cross School	175670	64363	1.5
18	18.Shanbally Cross 3	175635	64439	1.5
19	19.Shanbally Cross 4	175608	64436	1.5
20	20.Shanbally Cross 5	175481	64392	1.5

Model Parameters in ADMS CERC Roads 3.2 Dispersion Model

1. Surface roughness of 0.5m for all scenarios.
2. Meteorological data from Cork Airport have been considered. Hourly sequential data have been used to predict dispersion. Years 2009, 2010, 2011, 2012, 2013.
3. Atmospheric chemistry, plume sedimentation, photo-lytic reactions, washout and other removal effects have been ignored.
4. Predictions have been made at 20 fixed point receptor locations. These receptor locations are shown in Figure 10.1.
5. Monin – Obukhov Length 30m (Mixed Urban & Industrial).
6. Surface Albedo 0.23.
7. Cumulative impacts have been taken into account with regard to traffic volumes and increases in levels associated with other future known proposed developments.
8. Dispersion Model Traffic Speeds are given below:

Links Modelled	Traffic Speed (Kilometres per hour) set in model	
	Cars and Non HGVs	HGVs
98 - Internal Road	10	10
10 - Ringaskiddy Main Street	20	15
59 - Road to Port Access	30	20
29 - R613	30	20
9 - N28 Main	50	40
8 - N28 East Shanbally	20	15
28 - Shanbally South Marian Terrace	20	15
65 - Shanbally Mews	20	15
7 - Shanbally West	20	15

Full traffic volumes details are in Chapter 8 Traffic and Transportation of this EIS.

Construction Phase Model Parameters in ADMS CERC Roads 3.2 Dispersion Model

Non exhaust particulate matter can include brake and tyre wear, road wear and resuspension. For construction sites, the road-wear/resuspension component can be particularly significant due to the unpaved 'roads'.

The emissions can be treated in different levels of complexity, depending on the site, a case of using the number of vehicles and the distance they travel together with appropriate emission factors to calculate an emission rate. There are a number of sources of emission factors for non-road particulates, including:

Brake and tyre wear emissions calculated using the Defra EFT:

http://laqm.defra.gov.uk/documents/EFT_Version_4_2_2.zip

Road wear and resuspension:

http://www.airquality.co.uk/reports/cat15/0706061626_Report3_Modelling_Development.pdf

There are emission factors for unpaved roads:

<http://www.epa.gov/oms/ap42.htm>

Brake Wear factor – 0.028

Tyre Wear factor – 0.017

Speed – 5kph for construction site only

The construction phase will have a slight additional impact to receptors during the actual construction period. Traffic flows incorporating HGVs were used in all model runs. This specific model run incorporated site activity and high 2017 background pollution concentrations to represent worst case. Mitigation measures are set out in the Chapter 10 of this EIS in relation to construction phase activity.

Emission factors for calculations of shipping emissions EMEP/EEA Emission Inventory Guidebook 2013, Section 1.A.3.d.i international water borne navigation - Tier 1 (Appendices in the following tables refer to appendices in Emissions Inventory Guidebook)

Tier 1 Default Emission Factors for ships using bunker fuel oil

Tier 1 default emission factors					
NFR Source Category	Code	Name			
Fuel	1.A.3.d.i	International navigation			
Not applicable		Bunker Fuel Oil			
Not estimated		Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, NH ₃ , Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs			
Pollutant	Value	Unit	95% confidence interval		Reference
			Lower	Upper	
NO _x	79.3	kg/tonne fuel	0	0	Entec (2007). See also note (2)
CO	7.4	kg/tonne fuel	0	0	Lloyd's Register (1995)
NM VOC	2.7	kg/tonne fuel	0	0	Entec (2007). See also note (2)
SO _x	20	kg/tonne fuel	0	0	Note value of 20 should read
TSP	6.2	kg/tonne fuel	0	0	Entec (2007)
PM ₁₀	6.2	kg/tonne fuel	0	0	Entec (2007)
PM _{2.5}	5.6	kg/tonne fuel	0	0	Entec (2007)
Pb	0.18	g/tonne fuel	0	0	average value
Cd	0.02	g/tonne fuel	0	0	average value
Hg	0.02	g/tonne fuel	0	0	average value
As	0.68	g/tonne fuel	0	0	average value
Cr	0.72	g/tonne fuel	0	0	average value
Cu	1.25	g/tonne fuel	0	0	average value
Ni	32	g/tonne fuel	0	0	average value
Se	0.21	g/tonne fuel	0	0	average value
Zn	1.2	g/tonne fuel	0	0	average value
PCB	0.57	mg/tonne fuel	0	0	Cooper (2005)
PCDD/F	0.47	ug I-TEQ/tonne fuel	0	0	Cooper (2005)
HCB	0.14	mg/tonne fuel	0	0	Cooper (2005)

Notes

1. S = percentage sulphur content in fuel; pre-2006: 2.7 % wt. [source: Lloyd's Register, 1995]. For European Union as specified in the Directive 2005/33/EC:
 - a. 1.5 % wt. from 11 August 2006 for Baltic sea and from 11 August 2007 for the North Sea for all ships;
 - b. 1.5 % wt. from 11 August 2006 in EU territorial seas, exclusive economic zones and pollution control zones by passenger ships operating on regular services to or from any Community port at least in respect of vessels flying their flag and vessels of all flags while in their ports;
 - c. 0.1 % by wt. from 1 January 2010 for inland waterway vessels and ships at berth in Community ports.
2. Emission factors for NO_x and NM VOC are the 2000 values in cruise for medium speed engines (see Tier 2).
3. Reference: 'average value' is between Lloyd's Register (1995) and Cooper and Gustafsson (2004).
4. BC fraction of PM (f-BC) = 0.12. Source: for further information see Appendix A

Tier 1 Default Emission Factors for ships using diesel oil/marine gas oil

Tier 1 default emission factors					
	Code	Name			
NFR Source Category	1.A.3.d.i	International navigation			
Fuel		Marine diesel oil/marine gas oil (MDO/MGO)			
Not applicable		Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex,			
Not estimated		NH ₃ , Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs			
Pollutant	Value	Unit	95% confidence interval		Reference
			Lower	Upper	
NO _x	78.5	kg/tonne fuel	0	0	Entec (2007). See also note (2)
CO	7.4	kg/tonne fuel	0	0	Lloyd's Register (1995)
NM/VO	2.8	kg/tonne fuel	0	0	Entec (2007). See also note (2)
SO _x	20	kg/tonne fuel	0	0	Note value of 20 should read
TSP	1.5	kg/tonne fuel	0	0	Entec (2007)
PM ₁₀	1.5	kg/tonne fuel	0	0	Entec (2007)
PM _{2.5}	1.4	kg/tonne fuel	0	0	Entec (2007)
Pb	0.13	g/tonne fuel	0	0	average value
Cd	0.01	g/tonne fuel	0	0	average value
Hg	0.03	g/tonne fuel	0	0	average value
As	0.04	g/tonne fuel	0	0	average value
Cr	0.05	g/tonne fuel	0	0	average value
Cu	0.88	g/tonne fuel	0	0	average value
Ni	1	g/tonne fuel	0	0	average value
Se	0.1	g/tonne fuel	0	0	average value
Zn	1.2	g/tonne fuel	0	0	average value
PCB	0.038	mg/tonne fuel	0	0	Cooper (2005)
PCDD/F	0.13	ug I-TEQ/tonne	0	0	Cooper (2005)
HCB	0.08	mg/tonne fuel	0	0	Cooper (2005)

Notes

- S = percentage sulphur content in fuel; pre-2000 fuels: 0.5 % wt. [source: Lloyd's Register, 1995]. For European Union as specified in the Directive 2005/33/EC:
 - 0.2 % wt. from 1 July 2000 and 0.1 % wt. from 1 January 2008 for marine diesel oil/marine gas oil used by seagoing ships (except if used for ships crossing a frontier between a third country and a Member State);
 - 0.1% wt. from 1 January 2010 for inland waterway vessels and ships at berth in Community ports.
- Emission factor for NO_x and NM/VO are the 2000 values in cruise for medium speed engines (see Tier 2).
- Reference: 'average value' is between Lloyd's Register (1995) and Cooper and Gustafsson (2004)
- BC fraction of PM (f-BC) = 0.31. Source: for further information see Appendix A

Tier 1 Emission Factors for ships using gasoline

Tier 1 default emission factors					
	Code	Name			
NFR Source Category	1.A.3.d.ii	National navigation			
Fuel		Gasoline			
Not applicable		Aldrin, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, Heptabromo-biphenyl, Mirex, Toxaphene, HCH, DDT, PCB, HCB, PCP, SCCP			
Not estimated		NH ₃ , Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Total 4 PAHs			
Pollutant	Value	Unit	95% confidence interval		Reference
			Lower	Upper	
NO _x	9.4	kg/tonne fuel	0	0	Winther & Nielsen (2006)
CO	573.9	kg/tonne fuel	0	0	Winther & Nielsen (2006)
NM/VO	181.5	kg/tonne fuel	0	0	Winther & Nielsen (2006)
SO _x	20	kg/tonne fuel	0	0	Winther & Nielsen (2006)
TSP	9.5	kg/tonne fuel	0	0	Winther & Nielsen (2006)
PM ₁₀	9.5	kg/tonne fuel	0	0	Winther & Nielsen (2006)
PM _{2.5}	9.5	kg/tonne fuel	0	0	Winther & Nielsen (2006)

Notes: The table contains averaged figures between 2-stroke and 4-stroke engines, assuming a share of 75% 2-stroke and 25% 4-stroke ones. If more detailed data are available the Tier 2 method should be used.

BC fraction of PM (f-BC) = 0.05. Source: for further information see Appendix A

APPENDIX 10.3 MODEL RESULTS & CALCULATIONS

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APPENDIX 10.3 MODEL RESULTS & CALCULATIONS

ADMS CERC ROADS 3.2 DETAILS DISPERSION MODEL

Table (i) Model Results – 2013 Model Calibration Annual Mean Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$) {Threshold Level - 40 $\mu\text{g}/\text{m}^3$ }

Ref	Location	Annual mean NO2 concentrations ($\mu\text{g}/\text{m}^3$) 2009 Met Data	Annual mean NO2 concentrations ($\mu\text{g}/\text{m}^3$) 2010 Met Data	Annual mean NO2 concentrations ($\mu\text{g}/\text{m}^3$) 2011 Met Data	Annual mean NO2 concentrations ($\mu\text{g}/\text{m}^3$) 2012 Met Data	Annual mean NO2 concentrations ($\mu\text{g}/\text{m}^3$) 2013 Met Data
1	Ringaskiddy Main Street	12.45	12.92	12.44	12.56	12.59
2	4 Riverview Ringaskiddy	12.29	12.74	12.29	12.39	12.43
3	Ringaskiddy Main Street 2	12.39	12.91	12.40	12.50	12.57
4	Ringaskiddy Footpath	16.55	15.38	16.31	16.23	15.68
5	Ringaskiddy Main Street 3	12.53	13.12	12.55	12.65	12.75
6	Ringaskiddy Main Street 4	12.61	13.22	12.63	12.73	12.83
7	Ringaskiddy Main Street 5	12.57	13.24	12.60	12.69	12.82
8	Ringaskiddy Main Street 6	13.64	14.55	13.67	13.85	13.94
9	Ringaskiddy Main Street 7	13.02	13.69	13.04	13.19	13.23
10	Marello Park Ringaskiddy	11.58	11.92	11.59	11.67	11.69
11	Harbour 1 - Ecological Designation	10.71	10.65	10.69	10.69	10.66
12	Harbour 2 - Ecological Designation	10.84	10.75	10.82	10.81	10.77
13	Off Main N28	11.02	11.21	11.00	11.05	11.07
14	Layby N28 (Calibration Point)	17.73	15.17	16.73	16.93	15.17
15	Shanbally Cross 1	20.25	18.14	19.82	19.48	18.68
16	Shanbally Cross 2	14.78	15.75	14.70	14.89	14.93
17	Shanbally Cross School	12.75	13.52	12.78	12.86	13.00
18	Shanbally Cross 3	20.30	18.41	19.91	19.58	18.92
19	Shanbally Cross 4	19.80	17.92	19.41	19.09	18.43
20	Shanbally Cross 5	19.22	21.28	19.30	19.72	19.86

The detailed dispersion model constructed for 2013 baseline using 2013 Met data predicted a level of 15.17 ($\mu\text{g}/\text{m}^3$) location 14. Comparing this to the actual monitored data of 13.83 ($\mu\text{g}/\text{m}^3$) it suggests that the model is accurate and only slightly over predicting.

Table (ii) Model Results – 2012 Base, 2018 Without & With, 2023 & 2033 Without (Do Minimum (DM)) & With (Do Something (DS)) - Predicted Annual Mean Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$) {Threshold Level - 40 $\mu\text{g}/\text{m}^3$ }

Ref	Location	Annual mean NO ₂ concentrations 2012 BASE ($\mu\text{g}/\text{m}^3$)	Annual mean NO ₂ concentrations 2018 WITHOUT (DM) ($\mu\text{g}/\text{m}^3$)	Annual mean NO ₂ concentrations 2018 WITH (DS) ($\mu\text{g}/\text{m}^3$)	Annual mean NO ₂ concentrations 2023 WITHOUT (DM) ($\mu\text{g}/\text{m}^3$)	Annual mean NO ₂ concentrations 2023 WITH (DS) ($\mu\text{g}/\text{m}^3$)	Annual mean NO ₂ concentrations 2033 WITHOUT (DM) ($\mu\text{g}/\text{m}^3$)	Annual mean NO ₂ concentrations 2033 WITH (DS) ($\mu\text{g}/\text{m}^3$)
1	Ringaskiddy Main Street	12.59	11.88	12.44	11.41	11.85	11.27	12.19
2	4 Riverview Ringaskiddy	12.43	11.83	12.50	11.37	11.89	11.23	12.32
3	Ringaskiddy Main Street 2	12.57	11.98	12.74	11.47	12.07	11.31	12.56
4	Ringaskiddy Footpath	15.68	14.42	16.06	13.10	14.43	12.68	15.50
5	Ringaskiddy Main Street 3	12.75	12.13	12.80	11.58	12.12	11.40	12.55
6	Ringaskiddy Main Street 4	12.83	12.19	12.84	11.62	12.15	11.44	12.56
7	Ringaskiddy Main Street 5	12.82	11.96	12.38	11.46	11.82	11.30	12.09
8	Ringaskiddy Main Street 6	13.94	12.51	12.67	11.83	12.02	11.63	12.11
9	Ringaskiddy Main Street 7	13.23	12.11	12.33	11.56	11.78	11.40	11.92
10	Marello Park Ringaskiddy	11.69	11.21	11.45	10.96	11.16	10.88	11.32
11	Harbour 1 - Ecological Designation	10.66	10.57	10.67	10.54	10.61	10.53	10.67
12	Harbour 2 - Ecological Designation	10.77	10.58	10.65	10.54	10.58	10.53	10.61
13	Off Main N28	11.07	10.73	10.82	10.65	10.71	10.63	10.74
14	Layby N28 (Calibration Point)	15.17	14.12	15.55	12.76	13.36	12.44	13.46
15	Shanbally Cross 1	18.68	15.00	16.95	13.40	14.52	12.99	15.06
16	Shanbally Cross 2	14.93	13.14	13.78	12.23	12.57	11.98	12.70
17	Shanbally Cross School	13.00	12.02	12.48	11.49	11.74	11.34	11.84
18	Shanbally Cross 3	18.92	15.87	17.78	13.97	15.07	13.48	15.55
19	Shanbally Cross 4	18.43	15.63	17.45	13.82	14.87	13.34	15.32
20	Shanbally Cross 5	19.86	16.66	18.85	14.50	15.75	13.91	16.29

ADMS CERC ROADS 3.2 DETAILS DISPERSION MODEL - CONTOURED PLOT NOx Baseline (2012)

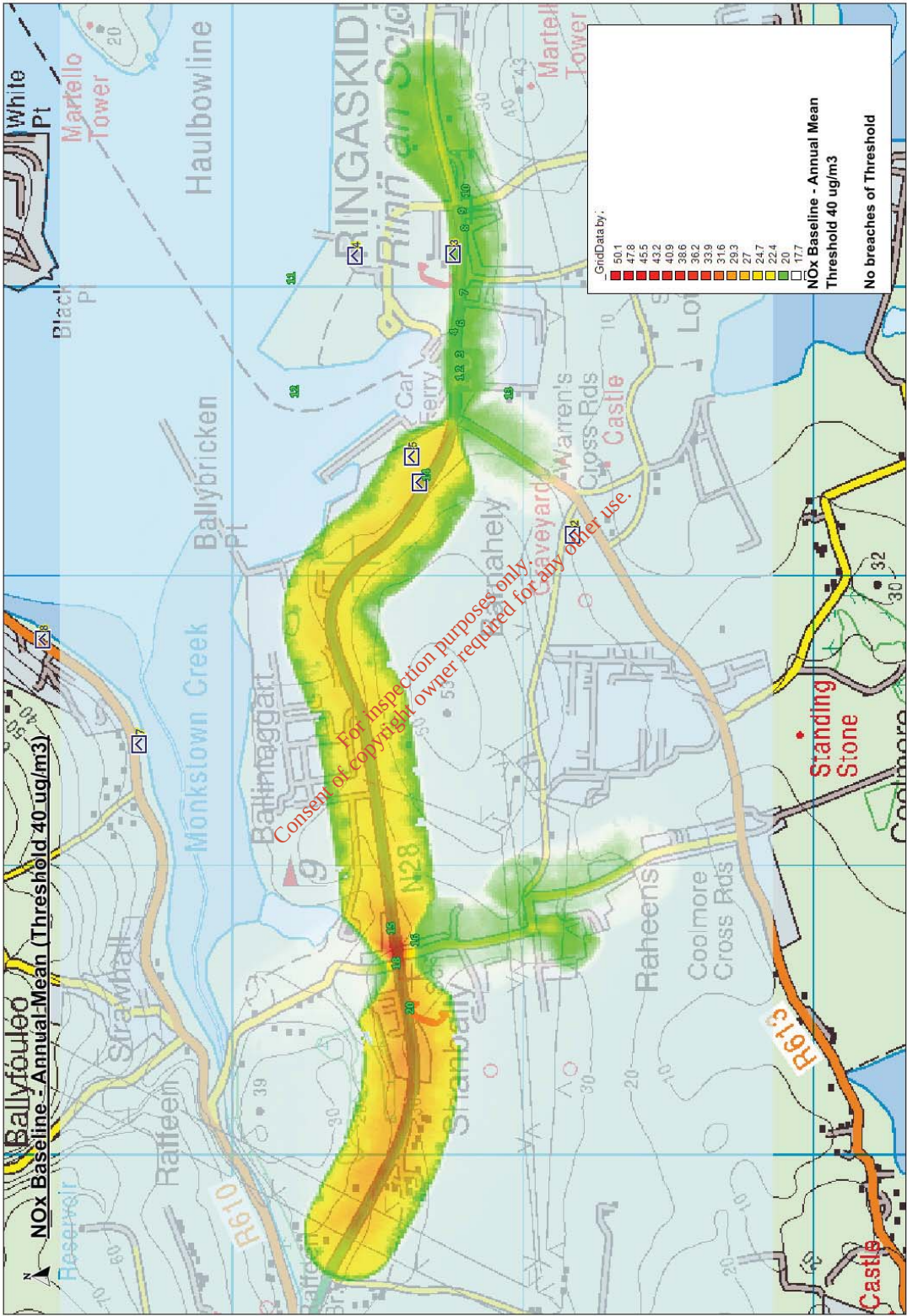


Table (iii) Model Results – Percentage Change in Annual Mean Nitrogen Dioxide for 2016 Without (DM) & With (DS) and 2023 & 2033 Without (DM) & With (DS)

Ref	Location	2016 PERCENTAGE CHANGE (%)	Magnitude of Change*	2023 PERCENTAGE CHANGE (%)	Magnitude of Change*	2031 PERCENTAGE CHANGE (%)	Magnitude of Change*
1	Ringaskiddy Main Street	4.71	Small	3.86	Small	8.16	Small
2	4 Riverview Ringaskiddy	5.66	Small	4.57	Small	9.71	Small
3	Ringaskiddy Main Street 2	6.34	Small	5.23	Small	11.05	Small
4	Ringaskiddy Footpath	11.37	Small	10.15	Small	22.24	Medium
5	Ringaskiddy Main Street 3	5.52	Small	4.66	Small	10.09	Small
6	Ringaskiddy Main Street 4	5.33	Small	4.56	Small	9.79	Small
7	Ringaskiddy Main Street 5	3.51	Small	3.14	Small	6.99	Small
8	Ringaskiddy Main Street 6	1.28	Imperceptible	1.61	Small	4.13	Small
9	Ringaskiddy Main Street 7	1.82	Imperceptible	1.90	Small	4.56	Small
10	Mareello Park Ringaskiddy	2.14	Imperceptible	1.82	Small	4.04	Small
11	Harbour 1 - Ecological Designation	0.95	Imperceptible	0.66	Small	1.33	Small
12	Harbour 2 - Ecological Designation	0.66	Imperceptible	0.38	Small	0.76	Small
13	Off Main N28	0.84	Imperceptible	0.56	Small	1.03	Small
14	Layby N28 (Calibration Point)	10.13	Small	4.70	Small	8.20	Small
15	Shanbally Cross 1	13.00	Small	8.36	Small	15.94	Medium
16	Shanbally Cross 2	4.87	Small	2.78	Small	6.01	Small
17	Shanbally Cross School	3.83	Small	2.18	Small	4.41	Small
18	Shanbally Cross 3	12.04	Small	7.87	Small	15.36	Medium
19	Shanbally Cross 4	11.64	Small	7.60	Small	14.84	Small
20	Shanbally Cross 5	13.15	Medium	8.62	Small	17.11	Medium

All increase in terms of air quality are negligible.

**Taken from the NRA Guidelines for the treatment of air quality.*

Table (iv) Model Results – 2012 Base, 2018 Without (DM) & With (DS) and 2023 & 2033 Without (DM) & With (DS), Predicted 1 hour Mean Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$) {Threshold Level - 200 $\mu\text{g}/\text{m}^3$ }

Ref	Location	1-Hour mean NO ₂ concentrations ($\mu\text{g}/\text{m}^3$) 2012 BASE	1-Hour mean NO ₂ concentrations ($\mu\text{g}/\text{m}^3$) 2018 WITHOUT	1-Hour mean NO ₂ concentrations ($\mu\text{g}/\text{m}^3$) 2018 WITH	1-Hour mean NO ₂ concentrations ($\mu\text{g}/\text{m}^3$) 2023 WITHOUT	1-Hour mean NO ₂ concentrations ($\mu\text{g}/\text{m}^3$) 2023 WITH	1-Hour mean NO ₂ concentrations ($\mu\text{g}/\text{m}^3$) 2033 WITHOUT	1-Hour mean NO ₂ concentrations ($\mu\text{g}/\text{m}^3$) 2033 WITH
1	Ringaskiddy Main Street	26.72	20.30	25.10	18.47	22.84	15.99	24.76
2	4 Riverview Ringaskiddy	25.66	19.94	25.31	18.15	23.03	15.67	25.01
3	Ringaskiddy Main Street 2	25.84	20.73	27.32	18.86	24.86	16.09	26.30
4	Ringaskiddy Footpath	39.58	31.10	39.21	28.30	35.68	22.36	37.36
5	Ringaskiddy Main Street 3	26.59	21.69	27.39	19.74	24.92	16.64	25.96
6	Ringaskiddy Main Street 4	27.06	22.02	27.55	20.04	25.07	16.87	26.11
7	Ringaskiddy Main Street 5	26.60	20.77	24.63	18.90	22.41	16.17	23.26
8	Ringaskiddy Main Street 6	35.85	24.99	26.85	22.74	24.43	18.64	22.76
9	Ringaskiddy Main Street 7	31.76	22.53	24.53	20.50	22.32	17.25	21.92
10	Mareello Park Ringaskiddy	21.55	16.92	19.09	15.40	17.37	14.03	18.53
11	Harbour 1 - Ecological Designation	12.60	11.44	12.81	10.41	11.66	11.01	13.21
12	Harbour 2 - Ecological Designation	13.46	11.77	12.39	10.71	11.27	11.19	12.29
13	Off Main N28	16.05	12.78	13.71	11.63	12.48	11.80	13.91
14	Layby N28 (Calibration Point)	64.59	28.88	35.89	26.28	32.66	20.38	25.15
15	Shanbally Cross 1	60.23	38.58	50.22	35.11	45.70	26.00	37.96
16	Shanbally Cross 2	42.88	29.17	35.67	26.54	32.46	20.94	27.76
17	Shanbally Cross School	35.15	24.61	29.51	22.40	26.85	18.34	23.58
18	Shanbally Cross 3	61.74	41.66	53.07	37.91	48.29	27.79	39.78
19	Shanbally Cross 4	57.41	39.78	50.08	36.20	45.57	26.71	37.61
20	Shanbally Cross 5	70.51	50.01	63.79	45.51	58.05	32.40	47.09

Dispersion models are inevitably poorer at predicting short-term peaks than they are at predicting annual mean concentrations and the process of model verification is extremely challenging. These predicted levels are representative concentrations at each sensitive receptor and are all below the relevant threshold levels.

Table (v) Model Results – 2012 Base, 2018 Without (DM) & With (DS) and 2023 & 2033 Without (DM) & With (DS), Predicted Annual Mean Particulate Matter (PM₁₀) (Threshold Level - 40 µg/m³)

Ref	Location	Annual mean PM ₁₀ concentration (µg/m ³) 2012 BASE	Annual mean PM ₁₀ concentration (µg/m ³) 2018 WITHOUT	Annual mean PM ₁₀ concentration (µg/m ³) 2018 WITH	Annual mean PM ₁₀ concentration (µg/m ³) 2023 WITHOUT	Annual mean PM ₁₀ concentration (µg/m ³) 2023 WITH	Annual mean PM ₁₀ concentration (µg/m ³) 2033 WITHOUT	Annual mean PM ₁₀ concentration (µg/m ³) 2033 WITH
1	Ringaskiddy Main Street	16.82	16.82	16.83	16.81	16.85	16.81	16.85
2	4 Riverview Ringaskiddy	16.82	16.81	16.83	16.80	16.85	16.80	16.85
3	Ringaskiddy Main Street 2	16.83	16.82	16.84	16.81	16.87	16.82	16.87
4	Ringaskiddy Footpath	17.04	17.02	17.06	17.00	17.11	17.01	17.11
5	Ringaskiddy Main Street 3	16.84	16.83	16.85	16.83	16.87	16.83	16.87
6	Ringaskiddy Main Street 4	16.85	16.84	16.85	16.83	16.88	16.83	16.88
7	Ringaskiddy Main Street 5	16.83	16.82	16.83	16.81	16.84	16.81	16.84
8	Ringaskiddy Main Street 6	16.90	16.87	16.87	16.86	16.88	16.86	16.88
9	Ringaskiddy Main Street 7	16.86	16.84	16.84	16.83	16.85	16.83	16.85
10	Marelo Park Ringaskiddy	16.77	16.76	16.76	16.76	16.77	16.76	16.77
11	Harbour 1 - Ecological Designation	16.71	16.71	16.71	16.71	16.71	16.71	16.71
12	Harbour 2 - Ecological Designation	16.71	16.71	16.71	16.71	16.72	16.71	16.72
13	Off Main N28	16.72	16.72	16.73	16.72	16.73	16.72	16.73
14	Layby N28 (Calibration Point)	17.12	17.10	17.22	17.08	17.37	17.09	17.37
15	Shanbally Cross 1	17.07	17.00	17.07	16.98	17.15	16.98	17.15
16	Shanbally Cross 2	16.93	16.89	16.91	16.87	16.93	16.87	16.93
17	Shanbally Cross School	16.83	16.81	16.82	16.80	16.84	16.80	16.84
18	Shanbally Cross 3	17.12	17.07	17.13	17.03	17.20	17.04	17.20
19	Shanbally Cross 4	17.10	17.05	17.11	17.02	17.18	17.03	17.18
20	Shanbally Cross 5	17.18	17.12	17.19	17.08	17.27	17.09	17.27

Table (vi) Model Results – Percentage Change in Annual Mean Particulate Matter (PM₁₀) 2018 Without (DM) & With (DS) and 2023 & 2033 Without (DM) & With (DS).

Ref	Location	2018 PERCENTAGE CHANGE	Magnitude of Change*	2023 PERCENTAGE CHANGE	Magnitude of Change*	2033 PERCENTAGE CHANGE	Magnitude of Change*
1	Ringaskiddy Main Street	0.01	Negligible	0.03	Negligible	0.04	Negligible
2	4 Riverview Ringaskiddy	0.02	Negligible	0.05	Negligible	0.05	Negligible
3	Ringaskiddy Main Street 2	0.02	Negligible	0.04	Negligible	0.05	Negligible
4	Ringaskiddy Footpath	0.04	Negligible	0.04	Negligible	0.1	Negligible
5	Ringaskiddy Main Street 3	0.02	Negligible	0.04	Negligible	0.04	Negligible
6	Ringaskiddy Main Street 4	0.01	Negligible	0.05	Negligible	0.05	Negligible
7	Ringaskiddy Main Street 5	0.01	Negligible	0.03	Negligible	0.03	Negligible
8	Ringaskiddy Main Street 6	0.01	Negligible	0.02	Negligible	0.02	Negligible
9	Ringaskiddy Main Street 7	0.02	Negligible	0.02	Negligible	0.02	Negligible
10	Marello Park Ringaskiddy	0.02	Negligible	0.01	Negligible	0.01	Negligible
11	Harbour 1 - Ecological Designation	0.01	Negligible	0	Negligible	0	Negligible
12	Harbour 2 - Ecological Designation	0.01	Negligible	0.02	Negligible	0.01	Negligible
13	Off Main N28	0.01	Negligible	0.01	Negligible	0.01	Negligible
14	Layby N28 (Calibration Point)	0.12	Negligible	0.28	Negligible	0.28	Negligible
15	Shanbally Cross 1	0.07	Negligible	0.5	Negligible	0.17	Negligible
16	Shanbally Cross 2	0.02	Negligible	0.06	Negligible	0.06	Negligible
17	Shanbally Cross School	0.01	Negligible	0.04	Negligible	0.04	Negligible
18	Shanbally Cross 3	0.06	Negligible	0.14	Negligible	0.16	Negligible
19	Shanbally Cross 4	0.06	Negligible	0.11	Negligible	0.15	Negligible
20	Shanbally Cross 5	0.07	Negligible	0.18	Negligible	0.18	Negligible

All increase in terms of air quality are negligible.

**Taken from the NRA Guidelines for the treatment of air quality.*

Table (vii) Model Results – Percentage Change in 24 hour mean Particulate Matter (PM₁₀) 2018 Without (DM) & With (DS) and 2023 & 2033 Without (DM) & With (DS).

Ref	Location	2018 PERCENTAGE CHANGE	Magnitude of Change*	2023 PERCENTAGE CHANGE	Magnitude of Change*	2033 PERCENTAGE CHANGE	Magnitude of Change*
1	Ringaskiddy Main Street	0.01	Negligible	0.03	Negligible	0.04	Negligible
2	4 Riverview Ringaskiddy	0.02	Negligible	0.05	Negligible	0.05	Negligible
3	Ringaskiddy Main Street 2	0.02	Negligible	0.05	Negligible	0.05	Negligible
4	Ringaskiddy Footpath	0.04	Negligible	0.1	Negligible	0.1	Negligible
5	Ringaskiddy Main Street 3	0.02	Negligible	0.04	Negligible	0.04	Negligible
6	Ringaskiddy Main Street 4	0.01	Negligible	0.05	Negligible	0.05	Negligible
7	Ringaskiddy Main Street 5	0.01	Negligible	0.02	Negligible	0.03	Negligible
8	Ringaskiddy Main Street 6	0.01	Negligible	0.02	Negligible	0.02	Negligible
9	Ringaskiddy Main Street 7	0.02	Negligible	0.01	Negligible	0.02	Negligible
10	Marello Park Ringaskiddy	0.02	Negligible	0.01	Negligible	0.01	Negligible
11	Harbour 1 - Ecological Designation	0.01	Negligible	0	Negligible	0	Negligible
12	Harbour 2 - Ecological Designation	0.01	Negligible	0.01	Negligible	0.01	Negligible
13	Off Main N28	0.01	Negligible	0.01	Negligible	0.01	Negligible
14	Layby N28 (Calibration Point)	0.12	Negligible	0.25	Negligible	0.28	Negligible
15	Shanbally Cross 1	0.07	Negligible	0.14	Negligible	0.17	Negligible
16	Shanbally Cross 2	0.02	Negligible	0.04	Negligible	0.06	Negligible
17	Shanbally Cross School	0.01	Negligible	0.04	Negligible	0.04	Negligible
18	Shanbally Cross 3	0.06	Negligible	0.16	Negligible	0.16	Negligible
19	Shanbally Cross 4	0.06	Negligible	0.13	Negligible	0.15	Negligible
20	Shanbally Cross 5	0.07	Negligible	0.15	Negligible	0.18	Negligible

All increase in terms of air quality are negligible.

*Taken from the NRA Guidelines for the treatment of air quality.

Table (viii) Model Results – 2012 Base, 2018 Without & With and 2033 Without & With - 24 hour Mean Particulate Matter (PM₁₀) Number of times a year 50 (µg/m³) exceeded. (24-hour limit for protection of human health - not to be exceeded more than 35 times/year)

Ref	Location	No. of times a year 50 (µg/m ³) exceeded 2012 BASE	No. of times a year 50 (µg/m ³) exceeded 2018 WITHOUT	No. of times a year 50 (µg/m ³) exceeded 2018 WITH	No. of times a year 50 (µg/m ³) exceeded 2023 & 2033 WITHOUT	No. of times a year 50 (µg/m ³) exceeded 2023 & 2033 WITH
1	Ringaskiddy Main Street	1	1	1	1	1
2	4 Riverview Ringaskiddy	1	1	1	1	1
3	Ringaskiddy Main Street 2	1	1	1	1	1
4	Ringaskiddy Footpath	1	1	1	1	1
5	Ringaskiddy Main Street 3	1	1	1	1	1
6	Ringaskiddy Main Street 4	1	1	1	1	1
7	Ringaskiddy Main Street 5	1	1	1	1	1
8	Ringaskiddy Main Street 6	1	1	1	1	1
9	Ringaskiddy Main Street 7	1	1	1	1	1
10	Marello Park Ringaskiddy	1	1	1	1	1
11	Harbour 1 - Ecological Designation	1	1	1	1	1
12	Harbour 2 - Ecological Designation	1	1	1	1	1
13	Off Main N28	1	1	1	1	1
14	Layby N28 (Calibration Point)	1	1	1	1	1
15	Shanbally Cross 1	1	1	1	1	1
16	Shanbally Cross 2	1	1	1	1	1
17	Shanbally Cross School	1	1	1	1	1
18	Shanbally Cross 3	1	1	1	1	1
19	Shanbally Cross 4	1	1	1	1	1
20	Shanbally Cross 5	1	1	1	1	1

Dispersion models are inherently less accurate at predicting the number of exceedences of the 24-hour mean PM10 objective than for the annual mean objective. There are also occasions where current year monitoring data need to be adjusted forwards to a year in the future, taking into account the likely number of 24-hour exceedences of 50 µg/m³. A relationship between the annual mean and the number of 24-hour mean exceedences of has been devised. It is unchanged at the time of writing from that used in the previous guidance and takes the form:

$$\text{No. 24-hour mean exceedences} = -18.5 + 0.00145 \times \text{annual mean} + (206/\text{annual mean})$$

Table (ix) Model Results – 2012 Base, 2018 Without & With and 2033 Without & With - 8 Hours Rolling CO Matter (PM₁₀). {Threshold 10 mg/m³}

Ref	Location	CO Maximum daily 8-hour running mean 2012 BASE	CO Maximum daily 8-hour running mean 2018 WITHOUT	CO Maximum daily 8-hour running mean 2018 WITH	CO Maximum daily 8-hour running mean 2023 WITHOUT	CO Maximum daily 8-hour running mean 2023 WITH	CO Maximum daily 8-hour running mean 2033 WITHOUT	CO Maximum daily 8-hour running mean 2033 WITH
1	Ringaskiddy Main Street	1.03	1.03	1.03	1.03	1.03	1.03	1.04
2	4 Riverview Ringaskiddy	1.03	1.03	1.03	1.03	1.03	1.03	1.04
3	Ringaskiddy Main Street 2	1.04	1.03	1.04	1.03	1.04	1.03	1.05
4	Ringaskiddy Footpath	1.09	1.07	1.06	1.07	1.07	1.07	1.08
5	Ringaskiddy Main Street 3	1.04	1.03	1.04	1.03	1.04	1.04	1.05
6	Ringaskiddy Main Street 4	1.04	1.03	1.04	1.04	1.04	1.04	1.05
7	Ringaskiddy Main Street 5	1.04	1.03	1.03	1.03	1.03	1.03	1.04
8	Ringaskiddy Main Street 6	1.05	1.04	1.04	1.04	1.04	1.04	1.05
9	Ringaskiddy Main Street 7	1.04	1.03	1.03	1.03	1.04	1.04	1.04
10	Marello Park Ringaskiddy	1.02	1.02	1.02	1.02	1.02	1.02	1.02
11	Harbour 1 - Ecological Designation	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	Harbour 2 - Ecological Designation	1.00	1.00	1.00	1.00	1.00	1.00	1.00
13	Off Main N28	1.01	1.01	1.01	1.01	1.01	1.01	1.01
14	Layby N28 (Calibration Point)	1.04	1.05	1.06	1.05	1.06	1.05	1.07
15	Shanbally Cross 1	1.09	1.09	1.09	1.09	1.09	1.09	1.11
16	Shanbally Cross 2	1.06	1.06	1.06	1.06	1.06	1.06	1.07
17	Shanbally Cross School	1.04	1.04	1.04	1.04	1.04	1.04	1.04
18	Shanbally Cross 3	1.10	1.11	1.11	1.11	1.11	1.11	1.12
19	Shanbally Cross 4	1.10	1.10	1.10	1.10	1.10	1.11	1.12
20	Shanbally Cross 5	1.11	1.12	1.12	1.12	1.12	1.13	1.14

All predicted increase are imperceptible and remain well below the CO 8 - hour Rolling Limit Value of 10 mg/m³

DMRB SCREENING MODEL - REGIONAL ASSESSMENT ROADS - GREENHOUSE GASES (GHGs)**Table (x) Regional Assessment Results**

Ref	Pollutant	2012 Baseline	2018 Without (DM)	2018 With (DS)	2023 Without (DM)	2023 With (DS)	2033 Without (DM)	2033 With (DS)
1	Carbon Monoxide (kg/year)	15,007	15,721	16,340	16,033	16,875	16,882	17,224
2	Total Hydrocarbons (kg/year)	2,099	2,188	2,269	2,237	2,348	2,359	2,425
3	Nitrogen Oxides (kg/year)	9,297	7,648	7,883	7,411	7,723	7,783	7,999
4	Particulate Matter (PM10) (kg/year)	257	212	219	212	221	225	232
5	Carbon Dioxide (tonnes/year)	1,003	1,039	1,072	1,051	1,097	1,111	1,139

Showing Results for DMRB Regional Assessment. All percentage changes are below 5% and based on Worst Case Traffic Levels.

Under the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC), Ireland's total emissions are limited to an average of 62.84 million tonnes of CO₂ equivalents per annum (13 per cent above the baseline estimate) in the period 2008-2012. The actual situation in relation to compliance with the Kyoto protocol will not be known until after this five year period. However, it can be estimated that after the first four years the level currently sits at a total of 1.9 million tonnes above the target when the impact of the EU Emissions Trading Scheme and Forest Sinks are taken into account. Agriculture is the largest source of emissions, representing 32 per cent of total national emissions in 2011. The energy industries represented 20.8 per cent of total national greenhouse gas emissions in 2011. The transport sector, responsible for 19.6 per cent of total national emissions. The industry and commercial sector is responsible for 14.3 per cent of total national emissions.

The six common greenhouse gases are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydro fluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

POTENTIAL OPERATIONAL IMPACTS - SHIPPING EMISSIONS (RINGASKIDDY HIGHER GROWTH)

Table (xi) 2012 Baseline Estimates

2012 BASELINE ESTIMATES			
Vessel Type	Total NOx per annum (tonnes)	Total VOCs per annum (tonnes)	Total TSP per annum (tonnes)
Ro-Ro	980	58	133
Lo-Lo	380	13	30
Bulk Liquid	400	12	28
Bulk Solid	300	12	28
Break Bulk	18	1	3
Cruise	30	2	3
Total	2108	98	225

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Table (xii) 2033 Operational Estimates

2033 OPERATIONAL ESTIMATES (WITH - Do Something)			
Vessel Type	Total NOx per annum (tonnes)	Total VOCs per annum (tonnes)	Total TSP per annum (tonnes)
Ro-Ro	2640	84	150
Lo-Lo	383	14	31
Bulk Liquid	416	14	31
Bulk Solid	380	17	38
Break Bulk	28	1	2
Cruise	32	2	3
Total	3879	132	255

Given the existing legal requirements around fuel and emissions for shipping, the extent of emissions are gradually reducing and will continue to reduce in future years. This increase is considered conservative as it does not factor in the Tier III emissions reductions or any other legislation implemented before 2033. This calculation does not incorporate benefits in savings made on road travel and reduction in trips up-river due to the existence of the redeveloped Ringaskiddy Port.

APPENDIX 13.1 SEDIMENT ANALYSIS REPORT

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Appendix 13.1 Sediment Analysis Report

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Marine Institute Dredge Sampling Programme

Sampling Programme

The Marine Institute (MI) were consulted in regards to the requirements for a dredge sampling programme both in terms of sample location and parameters for analysis. A Sampling Analysis Plan was provided by the Marine Institute which was issued as part of the tender specification documents to all interested parties for the *Grab Sampling & Contamination Testing* contract in order to ensure compliance with the MI requirements.

The MI advised on the particular substances which should be analysed for. They recommended substances that are considered of most concern for the marine environment, those which have combined properties of persistence, toxicity and liability to bio accumulate. Typically, the most important contaminants associated with dredged material include organotin compounds, heavy metals, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and oils (OSPAR, 2004).

Sample location and analysis

Twelve separate sample locations in and around the deepwater berth were selected for monitoring in consultation with Marine Institute Figure 1. Table 1 outlines the recommendations from the Marine Institute on the number of sites and the particular parameters which needed to be analysed for at each site.

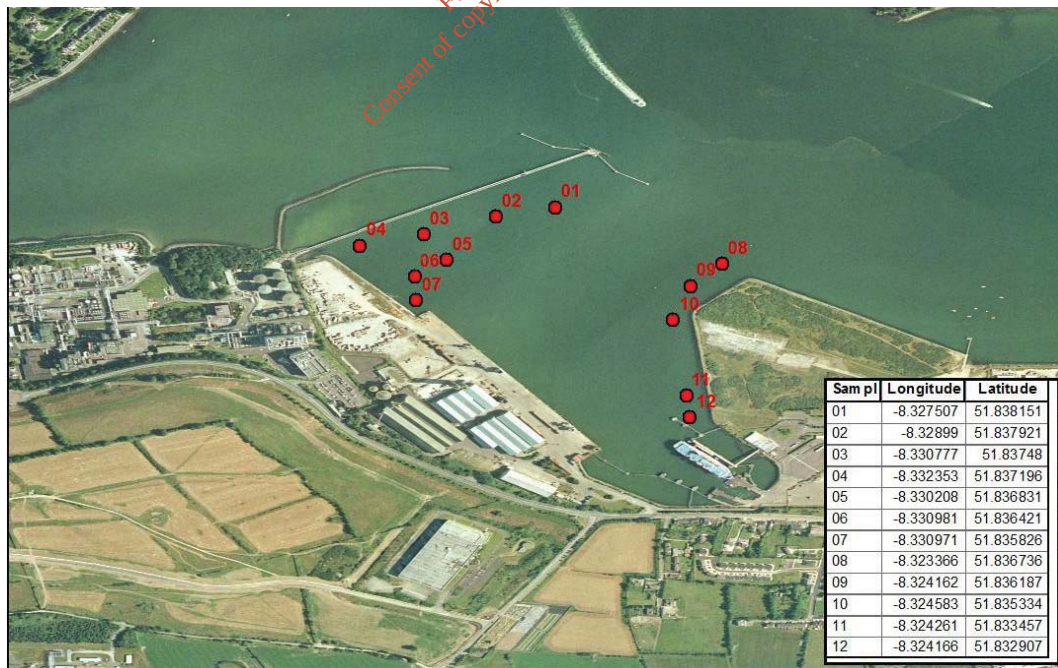


Figure 1 Sediment Sample locations at Cork Harbour

Table 1 Recommendations from Marine Institute on particular parameters for each sample

Sample No.	Sample depth	Longitude (°W)*	Latitude (°N)*	Parameters for analysis
1	Surface	-8.32751	51.83815	1, 2, 3, 4a, 4b, 4c, 4d, 4e, 4f, 4g.
2	Surface	-8.32899	51.83792	1, 2, 3, 4a, 4b, 4c, 4d.
3	Surface	-8.33078	51.83748	1, 2, 3, 4a, 4b, 4c, 4d.
4	Surface	-8.33235	51.83720	1, 2, 3, 4a, 4b, 4c, 4d, 4e, 4f, 4g.
5	Surface	-8.33021	51.83683	1, 2, 3, 4a, 4b, 4c, 4d, 4e, 4f, 4g.
6	Surface	-8.33098	51.83642	1, 2, 3, 4a, 4b, 4c, 4d.
7	Surface	-8.33097	51.83583	1, 2, 3, 4a, 4b, 4c, 4d, 4e, 4f, 4g.
8	Surface	-8.32337	51.83674	1, 2, 3, 4a, 4b, 4c, 4d.
9	Surface	-8.32416	51.83619	1, 2, 3, 4a, 4b, 4c, 4d, 4e, 4f, 4g.
10	Surface	-8.32458	51.83533	1, 2, 3, 4a, 4b, 4c, 4d.
11	Surface	-8.32426	51.83346	1, 2, 3, 4a, 4b, 4c, 4d.
12	Surface	-8.32417	51.83291	1, 2, 3, 4a, 4b, 4c, 4d, 4e, 4f, 4g.

Parameter code:

1. Visual inspection, to include colour, texture, odour, presence of animals etc
2. Water content, density (taking into account sample collection and handling)
3. Granulometry including % gravel (> 2mm fraction), % sand (< 2mm fraction) and % mud (< 63µm fraction).
4. The following determinants in the sand-mud (< 2mm) fraction * :
 - a) total organic carbon
 - b) carbonate
 - c) mercury, arsenic, cadmium, copper, lead, zinc, chromium, nickel, lithium, aluminium.
 - d) organochlorines including α -HCH (Lindane), and PCBs (to be reported as the 7 individual CB congeners: 28, 52, 101, 118, 138, 153, 180).
 - e) total extractable hydrocarbons.
 - f) tributyltin (TBT) and dibutyltin (DBT)
 - g) Polycyclic aromatic hydrocarbons (PAH) - Acenaphthene, Acenaphthylene, Anthracene, Benzo (a) anthracene, Benzo (a) pyrene, Benzo (b) fluoranthene, Benzo (ghi) perylene, Benzo (k) fluoranthene, Chrysene, Dibenzo (a,h) anthracene, Fluorene, Fluoranthene, Indeno 1,2,3 – cd pyrene, Naphthalene, Phenanthrene, Pyrene.
 - h) Toxicity tests (Microtox or whole sediment bioassay) using appropriate representative aquatic species. (This requirement will depend on the results of the chemical analyses.)

As part of the sediment sampling plan the MI also recommended the following:

- Where the gravel fraction (> 2mm) constitutes a significant part of the total sediment, this should be taken into account in the calculation of the concentrations.
- Collection of sufficient samples to allow all the toxicity testing to be carried out on the material.
- Brief details of the methodologies should be supplied with the results. This should include sampling, sub sampling and analytical methods used for each determinant.
- Appropriate marine Certified References Materials (CRM) are to be analysed during each batch of analyses and the results to be reported along with sample results.

Minimum Detection Limits

The MI also outlined the required minimum detection limits for the various determinants. These are given in Table 2 below.

Table 2 Required Minimum Detection Limits for the various determinants

Contaminant	Concentration	Units (dry wt)
Mercury	0.05	mg kg ⁻¹
Arsenic	1.0	mg kg ⁻¹
Cadmium	0.1	mg kg ⁻¹
Copper	5.0	mg kg ⁻¹
Lead	5.0	mg kg ⁻¹
Zinc	10	mg kg ⁻¹
Chromium	5.0	mg kg ⁻¹
Nickel	15	mg kg ⁻¹
Total extractable hydrocarbons	10.0	mg kg ⁻¹
TBT and DBT (not organotin)	0.01	mg kg ⁻¹
PCB - individual congener	1.0	µg kg ⁻¹
OCP - individual compound	1.0	µg kg ⁻¹
PAH - individual compound	20	µg kg ⁻¹

Reporting Format

The Marine Institute require that the reports be submitted in a pre supplied excel file which includes the following information:

- ⇒ Date of sampling
- ⇒ Location of samples e.g. ING or lat/long
- ⇒ Treatment of samples and indication of sub-sampling, compositing etc.

- ⇒ Tabulated geophysical and chemical test results
- ⇒ Completed excel spreadsheet for results
- ⇒ Summary method details
- ⇒ Method performance specifications: Limit of detection, Precision, Bias
- ⇒ Blanks and in-house references to be run with each sample batch, and reported with sample results.
- ⇒ Clear expression of units and indication of wet weight or dry weight basis
- ⇒ Appropriate marine Certified Reference Materials (CRM) to be run with each sample batch, and reported in full with sample results. The measured results as well as the certified results should be reported along with the sample results.
- ⇒ If determinant is not detected, report less than values, and indicate LoD/ LoQ used.
- ⇒ Other quality assurance information (e.g. accreditation status)

Certification and Quality Assurance

The MI stated that the analysing laboratory should be experienced in analysing marine sediments, and should participate in recognised proficiency testing schemes. The laboratory should also have submitted a completed QA questionnaire to the MI in order to ensure that quality standards can be met. All of the Sampling Analysis Plan requirements were met by Aquatic Services Unit together with National Laboratory Service (NLS) whom were sub-contracted by Aquatic Services Unit.

Sediment Sampling Methodology

Aquatic Services Unit was appointed to carry out the sediment sampling and analysis in Ringaskiddy with sample collection carried out on 28 January 2014.

The taking of, recovery and submission of marine samples was carried out using the Port of Cork Company survey launch, at a suitable high tide to enable access to all the locations specified by the Marine Institute in Table 1.3.

Prior to the recovery exercise the launch was fitted with a differential Global Positioning System (GPS), positioned directly above the on board recovery point. The launch was then easily navigated to the various points as specified in Table 1.3. At each point a stainless steel grab was lowered onto the river bed. Once the grab made contact with the bed, the recovery line was tightened and the grab sealed the sample. The actual co-ordinated recovery position was then recorded and logged.

The grab was then recovered on board and the sample transferred to suitable prepared containers, sealed, annotated and packed in preparation for shipping. The grab was then cleaned prior to the taking of the next sample; this procedure was continued until a sample was recovered from all of the required locations. The samples were then couriered to the National Laboratory Service in the UK for analysis.

Guideline Values for the Assessment of Dredge Material

All samples which were analysed by the National Laboratory Service were compared against the proposed guidance values for sediment quality guidelines from the “*Guidelines for the Assessment of Dredge Material for Disposal in Irish Waters*” (Marine Institute, 2006).

There are two sets of guidance values (upper and lower) used in these guidelines. According to the guidance the lower level values correspond to contaminant concentrations below which the sediment, if disposed of at sea, is assumed to have a physical impact only. The upper level guidance values are set at concentrations above which adverse effects might be expected.

Lower level guidance values represent concentrations that are either a) at the upper end of the no-effect range or, b) at background concentrations.

Upper level guidance values are set at the lower end of the known range of effective concentrations i.e. lowest concentrations shown to have adverse effects on marine organisms. The proposed parameter guidelines as given the guidance are listed in Table 3.

Table 3 Parameters and Proposed Guidelines for Sediment Quality

Parameters Units	Units (dry wta)	Lower level	Upper Level ^b
Arsenic	mg kg ⁻¹	9 ^c	70*
Cadmium	mg kg ⁻¹	0.7	4.2
Chromium	mg kg ⁻¹	120	370
Copper	mg kg ⁻¹	40	110 ^d
Lead	mg kg ⁻¹	60	218
Mercury	mg kg ⁻¹	0.2	0.7
Nickel	mg kg ⁻¹	21	60
Zinc	mg kg ⁻¹	160	410
Σ TBT & DBT	mg kg ⁻¹	0.1	0.5
γ – HCH (Lindane)	µg kg ⁻¹	0.1	0.5

Parameters Units	Units (dry wta)	Lower level	Upper Level ^b
HCb µg kg ⁻¹ 0.3 1	µg kg ⁻¹	0.3	1
PCB (individual congeners of ICES 7)	µg kg ⁻¹	1	180
PCB (Σ ICES 7) µg kg ⁻¹ 7 1260	µg kg ⁻¹	7	1260
PAH (Σ 16)	µg kg ⁻¹	4000	
Total extractable hydrocarbons	g kg ⁻¹	1	

a- total sediment <2mm

b- ERM (rounded up)

c- ERL (rounded up) – No background Irish data available

d PEL as ERM considered high

* In some locations natural levels of arsenic will exceed this value and in such instances this guidance value will not be appropriate

Sediment Sampling Results

The analysis of the samples was sub-contracted to National Laboratory Service (NLS) laboratories in the UK, and included the following determinants for each sample:

- Ecotoxicology (30 minute EC50)
- Carbon Content
- Grain Size fractions
- Hydrocarbons
- Metals
- PAHs
- TBT and DBT
- Dry Solids

The detailed results and analytical reports from NLS laboratories are outlined below with summary results discussed in Chapter 13 of the EIA. All sample results were below the upper level guideline concentration and, with the exception of all the nickel samples and two of the arsenic samples, were also below the lower level guideline.

Sheet 3. Results

51d 50.196	-08d 19.864
51d 50.197	-08d 19.885
51d 50.208	-08d 19.414
51d 50.168	-08d 19.457
51d 50.132	-08d 19.478
51d 50.023	-08d 19.476
51d 49.977	-08d 19.465

Sheet 3. Results

0.0767	27.3	97	0.141
0.0767	27.3	97	0.141
0.0534	23.1	95	0.144
0.0534	23.1	95	0.144
0.0782	23.3	102	0.155
0.0782	23.3	102	0.155

Sheet 3. Results

2	0.2	0.2	0.2	<0.1	0
2	0.16	0.2	0.2	<0.1	0
1	0.12	<0.1	<0.1	<0.1	0
5	0.12	0.16	0.16	<0.1	<
2	0.12	<0.1	<0.1	<0.1	0
5	0.16	0.2	0.2	<0.1	0
5	0.16	<0.1	<0.1	<0.1	0

EPA Dumping at Sea Permit Application - Material Analysis Reporting Form (Version 1.0)

[illegible]

EPA Dumping at Sea Permit Application - Material Analysis Reporting Form (Version 1.0)

[illegible]

EPA Dumping at Sea Permit Application - Material Analysis Reporting Form (Version 1.0)

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APPENDIX 13.2 WATER FRAMEWORK DIRECTIVE ASSESSMENT

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Appendix 13.2 Water Framework Directive Assessment

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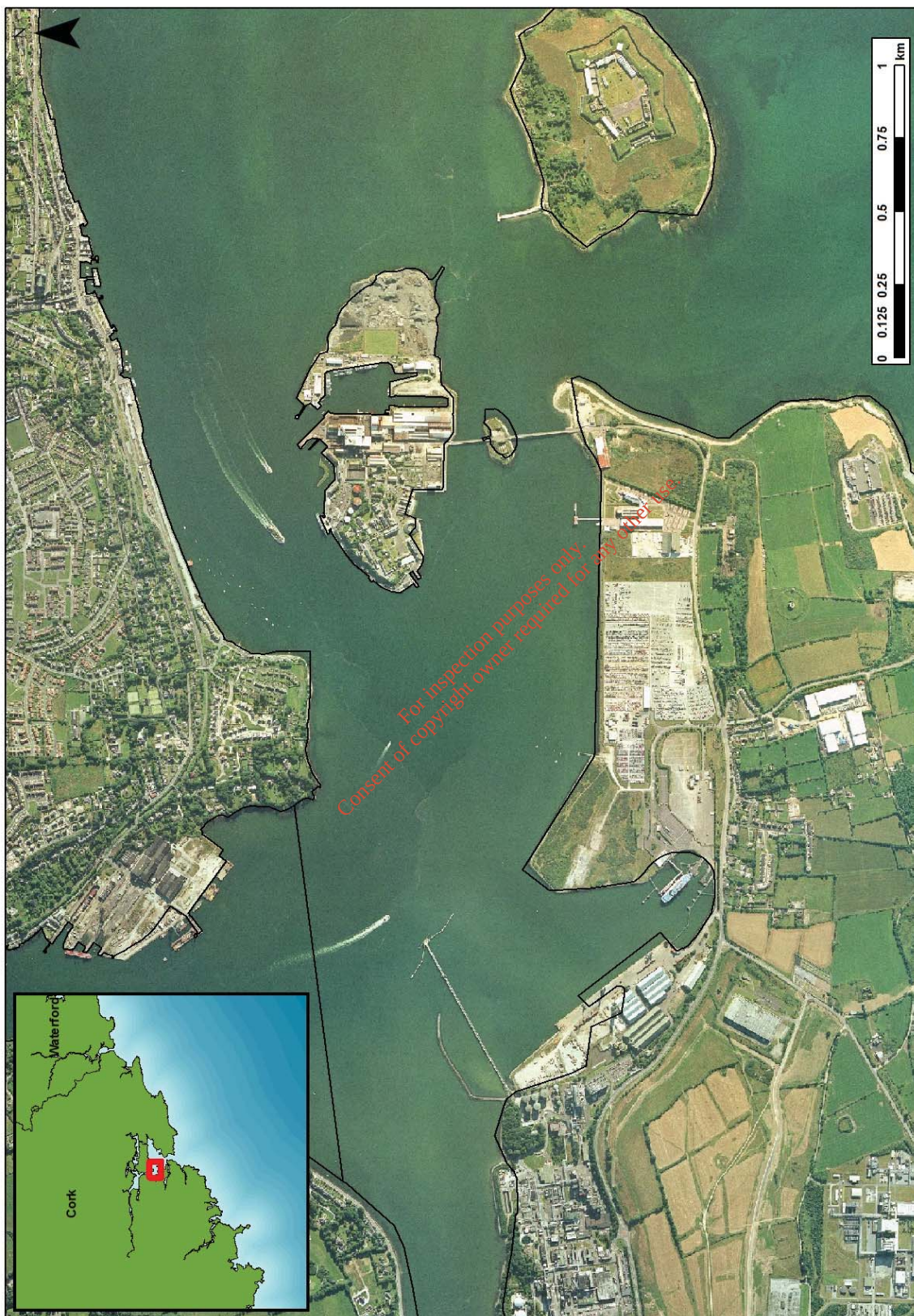
SCHEDULE A: Water Framework Directive (WFD) Assessment - Surface Water Impact Scoping

Project Component Data	
LOCATION	Grid Reference
	177726, 064637
	Map Reference
	50k raster – Tile OS1606
Waterbody Name	
Cork Harbour	
WFD Waterbody ID	
SW_060_0000	

WATER COURSE	Designations (within 1 km of component)
	Cork harbour SPA
	WFD Status (Objective)
	Moderate (Restore 2021)
FFD Class. (Salmonid/Cyprinid)	
N/A	
Abstractions in vicinity	
Yes	

WFD ASSESSMENT		Current Status	Assessed Post Works Status
	Morphology	Good	Good
	Specific Pollutants	Pass	Pass
	Protected Area	Less than good	Less than good
	Ecological Status	Moderate	Moderate
		Fail (failure due to other monitoring stations in Cork Harbour, Ringaskiddy East monitoring station currently compliant)	
Chemical Status		Fail	
Phytoplankton		Good	Good
Oxygen		Good	Good

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AERIAL VIEW SITE PHOTOGRAPH

WFD ASSESSMENT		Does the component comply with WFD Objectives 1, 2, 3 & 4?		
COMPONENT TYPE				
Component ID:	Ringaskiddy_1	No		Do not proceed or complete Article 4.7 assessment.
Component Type:	Multi-purpose berth	Yes (Justification provided)		Proceed if justification accepted
Component Description,	314m quay wall and deck	Yes, with mitigation	X	Complete schedule B.
Component ID:	Ringaskiddy_2	No		Do not proceed or complete Article 4.7 assessment.
Component Type:	Container terminal	Yes (Justification provided)		Proceed if justification accepted
Component Description,	200m long berth	Yes, with mitigation	X	Complete schedule B.
Component ID:	Ringaskiddy_3	No		Do not proceed or complete Article 4.7 assessment.
Component Type:	Deepwater Berth extension	Yes (Justification provided)		Proceed if justification accepted
Component Description,	182m extension to existing deepwater berth	Yes, with mitigation	X	Complete schedule B.
Component ID:	Ringaskiddy_4	No		Do not proceed or complete Article 4.7 assessment.
Component Type:	Road improvements	Yes (Justification provided)		Proceed if justification accepted
Component Description,	Works to upgrade surfaces and access points	Yes, with mitigation	X	Complete schedule B.
Component ID:	Ringaskiddy_5	No		Do not proceed or complete Article 4.7 assessment.
Component Type:	Paddy's Point Amenity area	Yes (Justification provided)		Proceed if justification accepted
Component Description,	Public slipway, landscaping and pedestrian routes	Yes, with mitigation	X	Complete schedule B.

SCHEDULE B: Details of Mitigation Required to Comply with Water Framework Directive (WFD) Objectives

Scheme Component	Objective 1: To prevent deterioration in the ecological status/potential of the water body.	Objective 2: To prevent the introduction of impediments to the attainment of Good WFD status for the water body.	Objective 3: To ensure that the attainment of the WFD objectives for the water body are not compromised.	Objective 4: To ensure the achievement of the WFD objectives in other water bodies within the same catchment are not permanently excluded or compromised.
	Describe mitigation required to meet Objective 1:	Describe mitigation required to meet Objective 2:	Describe mitigation required to meet Objective 3:	Describe mitigation required to meet Objective 4:
Multi-purpose berth at Ringaskiddy East (Ringaskiddy_1)	Mitigation has already been undertaken during the design phase of the scheme to minimise the potential impact of the project on the water environment. Design of MPB has been undertaken to result in least possible loss of habitat on landward side of quay wall, and disruption to the coastal processes has been minimised. The reclamation for the MPB coincides with an already modified section of the coastline where historical land reclamation has already been undertaken and the coastal processes modelling has demonstrated that this will not have a significant impact on the morphological status. Mitigation to address the construction impact associated with suspended solids (particularly from dredging), oil, fuel, chemicals, concrete, will ensure that the biological and physico-chemical elements will not be impacted by the proposal.	Elevated DIN concentration and unfavourable conservation status for the Cork Harbour SPA are the key issues currently preventing Cork Harbour from reaching good ecological potential. Lead and TBT are the reasons for chemical status failures within Cork Harbour water body however Ringaskiddy East monitoring data is compliant with the TBT ecological quality objectives and therefore does not contribute to the failing chemical status. Furthermore TBT levels in the sediment analysed during the production of the EIS are all below the lower guideline levels for dredged sediment (Marine Institute 2006). The proposed development will not introduce impediments to achieving good ecological potential as the key failing elements of the ecological status are DIN and the SPA unfavourable conservation status.	The mitigation measures outlined in the EIS and referred to under objective 1 will ensure that the achievement of the objectives for the Cork Harbour Coastal Water Body will not be compromised. Sewage from the development will be generated from the maintenance building and the portacabin offices and will not represent a significant nutrient load to the Harbour. The sewage will be subject to appropriate treatment prior to discharge and will not prevent recovery from the high DIN levels currently experienced. The chemical pollution failure in Cork Harbour is due to lead pollution and TBT levels (Marine Institute, 2010). The main source of lead is from aerial deposition and existing port activities are unlikely to be a source of this pollution. TBT levels in Ringaskiddy Basin are within acceptable quality objectives and are recovering as reported by Marine Institute.	Mitigation measures implemented throughout the design, construction and operational phase of this project will ensure negligible residual impact from the proposal on this water body, and furthermore will prevent any knock-on detriment to the water bodies discharging to Cork Harbour.

Scheme Component	Objective 1: To prevent deterioration in the ecological status/potential of the water body.	Objective 2: To prevent the introduction of impediments to the attainment of Good WFD status for the water body.	Objective 3: To ensure that the attainment of the WFD objectives for the water body are not compromised.	Objective 4: To ensure the achievement of the WFD objectives in other water bodies within the same catchment are not permanently excluded or compromised.
	Describe mitigation required to meet Objective 1:	Describe mitigation required to meet Objective 2:	Describe mitigation required to meet Objective 3:	Describe mitigation required to meet Objective 4:
	Mitigation includes the employment of best practice techniques and adherence to Pollution Prevention Guidelines (PPGs), and CIRIA guidance on the control of water pollution on construction sites. The use of suction dredging where feasible was a mitigation measure recommended for Cork Harbour during the HMWB designation process. In addition the HMWB designation process recommended the deepening of the channel at Ringaskiddy to minimise bed scouring impacts associated with large vessels. These mitigation measures have been included within the mitigation strategy for the proposed development where feasible. Mitigation to address operation impacts from maintenance, oil and chemical use and storage and discharges from vessels are detailed in the EIS and will ensure no deterioration in status.	The development will not increase the DIN levels as appropriate treatment of the sewage arising from the development will be undertaken either through connection to the proposed Lower Cork Harbour Main Drainage Scheme or dedicated package plant. In terms of the SPA the coastal modelling has demonstrated that suspended solids and deposition of sediment in Monkstown Creek are not considered to be significant and will not affect the conservation status of the SPA. On the basis of the minimal direct impact (through loss of habitat) and limited indirect impact (through negligible changes in the coastal process) the need for mitigation in terms of the morphology is not required and the development will not result in a deterioration in the morphological status of the Cork Harbour water body.	Other stations within the Cork Harbour water body are the cause of the chemical status failure. Given the phasing out of the use of TBT and the recovering status of the levels of TBT the existing Port activities in Ringaskiddy East are not a cause for the chemical status failures. The protected area objectives for the SPA and the designated shellfish areas in Cork Harbour will remain unaffected by the proposed works. This has been demonstrated through the coastal modelling which concludes that the deposition of sediment from the dredging will be negligible within the SPA and the concentrations of suspended solids will be at background levels in the shellfish areas during construction works. In addition the impact of the physical structures on the coastal processes and the marine morphology is negligible.	
Container terminal (Ringaskiddy_2)	See Ringaskiddy_1 component for mitigation measures which are applicable in this instance also.	See Ringaskiddy_1 component for mitigation measures which are applicable to this objective also.	See Ringaskiddy_1 component for mitigation measures which are applicable to this objective also.	See Ringaskiddy_1 component for mitigation measures which are applicable to this objective also.

Scheme Component	Objective 1: To prevent deterioration in the ecological status/potential of the water body.	Objective 2: To prevent the introduction of impediments to the attainment of Good WFD status for the water body.	Objective 3: To ensure that the attainment of the WFD objectives for the water body are not compromised.	Objective 4: To ensure the achievement of the WFD objectives in other water bodies within the same catchment are not permanently excluded or compromised.
	Describe mitigation required to meet Objective 1:	Describe mitigation required to meet Objective 2:	Describe mitigation required to meet Objective 3:	Describe mitigation required to meet Objective 4:
<i>Deepwater Berth (DWB) extension (Ringaskiddy_3)</i>	See Ringaskiddy_1 component for mitigation measures which are applicable in this instance also.	See Ringaskiddy_1 component for mitigation measures which are applicable to this objective also.	See Ringaskiddy_1 component for mitigation measures which are applicable to this objective also.	See Ringaskiddy_1 component for mitigation measures which are applicable to this objective also.
<i>Road Improvements (Ringaskiddy_4)</i>	Mitigation to address the construction impact associated with the construction of the new roads including suspended solids, oil, fuel, chemicals, concrete, as detailed in the EIS will ensure that the biological and physico-chemical elements will not be impacted by the proposal. Operational road drainage from the new internal roads will be treated through an oil and sediment interceptor prior to discharge to Cork Harbour. This represents an improvement when compared to the existing situation.	Mitigation to address the construction impact associated with the construction of the new roads including suspended solids, oil, fuel, chemicals, concrete, as detailed in the EIS will ensure that the biological and physico-chemical elements will not be impacted by the proposal.	See Ringaskiddy_1 component for mitigation measures which are applicable to this objective also.	See Ringaskiddy_1 component for mitigation measures which are applicable to this objective also.
<i>Amenity Area at Paddy's Point (Ringaskiddy_5)</i>	See Ringaskiddy_1 component for mitigation measures which are applicable in this instance also.	See Ringaskiddy_1 component for mitigation measures which are applicable to this objective also.	See Ringaskiddy_1 component for mitigation measures which are applicable to this objective also.	See Ringaskiddy_1 component for mitigation measures which are applicable to this objective also.

APPENDIX 14.1 SHORE ANGLING IN CORK HARBOUR

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Appendix 14.1 Shore Angling in Cork Harbour

This information is based on an telephone Interview with Micheal Hennessey IFI (Sea Angling Officer for the South & South West) Feb 8th 2014-02-08. See Figure A1 below for the locations of the marks mentioned in the text.

Mark Number (see Map below for positions)

- 1 Ram Point Strand - Bass with lures (in fact, all out the harbour seaward of this point in the direction of Kinsale is good bass territory.
- 2 Camden shore- Summer Mackerel, Dabs, occ. ray (maybe Blondes at night) winter, cod, and whiting.
- 3 Crosshaven – Owenaboy Estuary Mullet mainly, occ bass and flounder
- 4 Lough Beg Point (point opposite # on the map) Bass & Mullett (May-October)
- 5 Golden Rock – no good
- 6 Paddy's Point Bass, Flounder and Thornbacks – Fished from the Ringaskiddy end on the harbour side, where there's a small beach. Fished the last 3 hrs of the ebb and 1st 3 hrs of the flood tides. At this time the fish are active and they are not so spread out and therefore more easily caught. At low tide the fish tend to be concentrated in the centre of the channels and be less active but as the tide rise they start to hunt again and this is the best time to catch them; too close to high tide they are too spread out to be able to get them. (Bass May- October – Harvest ban 15th of May to 15th of June in case pregnant females are taken).
- 7 No fishing
- 8 Monkstown Pier Cod, Whiting- Winter, Mackerel- Summer
- 9 Monkstown Wall Summer: Mackerel, winter: dabs, conger, Cod, whiting (winter = October to February)
- 10 11 & 12 Conger, 3-bearded rockling (close in by rocks and quays) cod, whiting, dogfish, dab (winter) farther off, mackerel – summer
- 13 Small bay east of Cobh (farther east from the Pilot Station which cannot be accessed any more. Mullet, Bass, Flounder (the latter from March to November – they go to sea to spawn in November and the spent females return in March). They are usually left to fatten up till later in the season when they tend to be more targeted. They are sometimes retained for the pan and tend to taste better after being left in the fridge for a day.
- 14 East Ferry Mouth: Thornback ray, Bass and flounder.
- 15 Browns Island (North Channel) Mullet (in particular), flounder, small bass and occasional thornback.

Back of Fota: Mullet at high water

Blackrock; Mullet, occ seatrout, flounder

- 16 East Ferry _ Gold Point : Bass, seatrout occ flounder
- 17 Lower Aghada: Mullet, bass, flounder, occ seatrout
- 18 Whitegate Bay: Golden grey mullet, Thick-lipped, Bass, Flounder, gilt-head bream
- 19 Corkbeg Strand: Dabs, dogfish, ray, occ bass
- 20 & 21 Carlisle Pier Winter codling, summer dabs, thornback, occ bass.
- 22 Carlisle Head (SW tip) Bass (lots), Pollack, mackerel in the summer
- 23 Whitebay: Bass, flounder, plaice, dab, dogfish, rays.
- 24 Canavan's Point (we called this Weavers Point as kids) Bass, wrasse, Pollack, mackerel
- 25 Roches Point - Wrasse, conger, bass, Pollack, mackerel

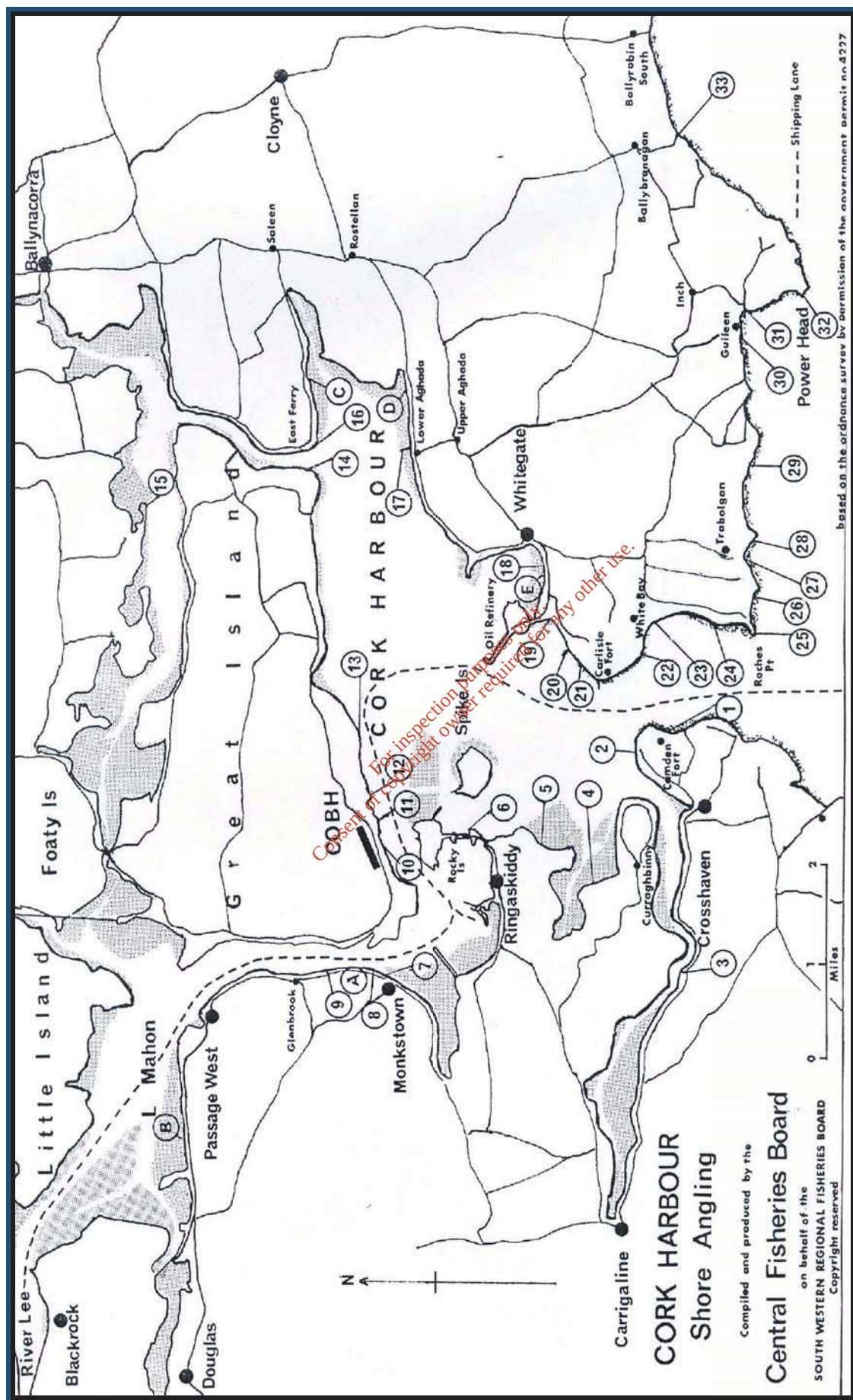


Figure A1 Map of Cork Harbour showing locations of angling marks referred to in the text (14.2.3.5) Vol I

APPENDIX 15.1 NATURA IMPACT STATEMENT

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Port of Cork

Ringaskiddy Port Redevelopment

Natura Impact Statement

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1.0 INTRODUCTION

This report has been prepared by RPS on behalf of the Port of Cork (POC). The purpose of the report is to document the assessment that POC has undertaken to determine the potential effects that the redevelopment of Ringaskiddy Port may have on the Qualifying Interests of European Sites within the zone of influence of the project.

The report is supported by field surveys, numerical modelling and literature review compiled during the preparation of an Environmental Impact Statement associated with the Ringaskiddy Port Redevelopment planning application to An Bord Pleanála as Strategic Infrastructure. The assessment has been informed by close consultation with National Parks and Wildlife Service (NPWS) between May 2011 and April 2014.

1.1 REGULATORY CONTEXT

The European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna, better known as “The Habitats Directive”, provides the framework for legal protection of habitats and species of European importance. Articles (3) to (9) provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of an EU-wide network of sites known as Natura 2000. This network of sites designated for nature conservation are comprised of Special Areas of Conservation (SACs) as designated under the EU Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/EEC) (better known as “The Birds Directive”).

Article 6 sets out provisions which govern the conservation and management of European Sites (Natura 2000 sites). Article 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to affect European Sites. Article 6(3) establishes the requirement for Appropriate Assessment (AA):

“Any plan or project not directly connected with or necessary to the management of the [Natura 2000] site but likely to have a significant effect thereon, either individually or in combination with other plans and projects, shall be subjected to appropriate assessment of its implications for the site in view of the site’s conservation objectives. In light of the conclusions of the assessment of the implication for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public”

Applications for Strategic Infrastructure made to An Bord Pleanála under section 37E of the Planning and Development Act, 2000, as amended must be accompanied by a Natura Impact Statement where applicable as required under Part XAB of the Planning and Development Act, 2000 as amended. This report is a Natura Impact Statement prepared by Port of Cork Company to accompany the Ringaskiddy Port Redevelopment applications for Strategic Infrastructure.

1.2 GUIDANCE FOLLOWED IN THE PREPARATION OF THIS STATEMENT

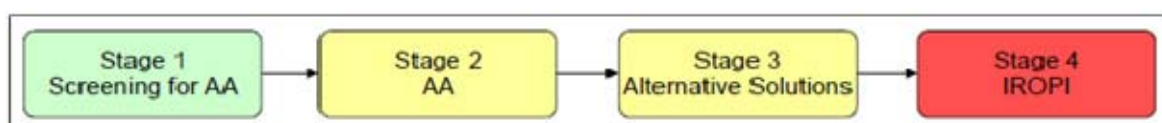
Appropriate Assessment Guidelines for Planning Authorities were published by the Department of the Environment Heritage and Local Government in February 2010 (DoEHLG, 2010). In addition to the advice available from the Department, the European Commission has published a number of documents which provide significant guidance on the requirements of Appropriate Assessment, including, *Assessment of Plans and Projects Significantly Affecting Natura 2000 sites - Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*, (EC, 2001), which sets out the principles of how to approach decision making during the process and these have been followed as closely as possible.

The assessment is prepared having due regard to the following guidelines:

- European Commission, 2000a. Communication from the Commission on the Precautionary Principle., Office for Official Publications of the European Communities, Luxembourg (EC, 2000a);
- Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg (EC, 2000b);
- European Commission, 2001. Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC. Office for Official Publications of the European Communities, Brussels (EC, 2001);
- European Commission. 2006. Nature and biodiversity cases: Ruling of the European Court of Justice. Office for Official Publications of the European Communities, Luxembourg (EC, 2006);
- Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission; (EC, 2007);
- Estuaries and Coastal Zones within the Context of the Birds and Habitats Directives - Technical Supporting Document on their Dual Roles as Natura 2000 Sites and as Waterways and Locations for Ports. European Commission (EC, 2009);
- Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government, Dublin (DEHLG, 2010a);
- Department of Environment Heritage and Local Government Circular NPW 1/10 and PSSP 2/10 on *Appropriate Assessment under Article 6 of the Habitats Directive – Guidance for Planning Authorities* (DEHLG, 2010b);
- Guidance document on the implementation of the birds and habitats directive in estuaries and coastal zones with particular attention to port development and dredging. European Commission (EC, 2011a);
- European Commission Staff Working Document 'Integrating biodiversity and nature protection into port development' (EC, 2011b);
- Marine Natura Impact Statements in Irish Special Areas of Conservation: A working document, National Parks and Wildlife Service, Dublin (NPWS, 2012);
- Interpretation Manual of European Union Habitats. Version EUR 28. European Commission (EC, 2013); and
- Applications for approval for Local Authority Developments made to An Bord Pleanála under 177AE of the Planning and Development Act, 2000, as amended (Appropriate Assessment): Guidelines for Local Authorities. An Bord Pleanála, Dublin (ABP, 2013).

Based on these guidelines, the assessment process is a four-staged approach. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

The four stages are summarised diagrammatically below. Stages 1-2 deal with the main requirements for assessment under Article 6(3). Stage 3 may be part of the Article 6(3) Assessment or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).



2.0 SCREENING FOR APPROPRIATE ASSESSMENT

Screening determines whether appropriate assessment is necessary by examining:

- 1 Whether a plan or project can be excluded from AA requirements because it is directly connected with or necessary to the management of a Natura 2000 site; and
- 2 Whether the project will have a potentially significant effect on a Natura 2000 site, either alone or in combination with other projects or plans, in view of the site's conservation objectives.

Screening involves the following:

- Description of plan or project;
- Identification of relevant Natura 2000 sites, and compilation of information on their qualifying interests and conservation objectives;
- Assessment of likely effects – direct, indirect and cumulative – undertaken on the basis of available information as a desk study or field survey or primary research as necessary; and
- A Screening Statement with conclusions.

The assessment of likely significant effects is based on the likelihood and significance of any effects from the Ringaskiddy Port Redevelopment works on each of the Qualifying Interests of the European Sites being considered. In this context the likelihood depends on whether there is the opportunity and pathway for an effect to occur. If the predicted effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA).

Clearly a key variable that will determine whether or not a particular European Site is likely to be affected by the proposed works is its physical distance from the project site, and it will generally, but not necessarily, be the case that the greater the distance the smaller the possibility of impacts. The Guidelines for Planning Authorities (DEHLG, 2010) recommend that the AA process should include the following European Sites –

- Any European Sites within or adjacent to the plan or project area; or
- Any European Sites within the likely zone of impact of the plan or project.

A distance of 15km is currently recommended in the case of plans, and derives from UK guidance (Scott Wilson *et. al.*, 2006). For projects, the distance could be much less than 15km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects.

2.1 EUROPEAN SITES INCLUDED IN THE SCREENING ASSESSMENT

Two European Sites are located within 15km of Ringaskiddy Port as described in Table 1 and illustrated in Figure 1.

Table 1: European Sites located within 15km Buffer zone

Code	Site	Distance
SPA Code 004030	Cork Harbour SPA	Monkstown Creek component of SPA is 60m NW of proposed works
SAC Code 001058	Great Island Channel SAC	4.8km to the north of Ringaskiddy Port

The proposed works are located 60m from Cork Harbour SPA by straight line distance. Great Island Channel SAC is 5.0km upstream (4.8km by straight line distance) of Ringaskiddy Port (at Marino Point).

Details in relation to the qualifying features of the Cork Harbour SPA and Great Island Channel SAC are described in Tables 2 and 3 respectively. The information contained in these tables is based on publicly available data on these European Sites, sourced from NPWS. This information is further supplemented for Great Island Channel SAC by the findings in Ireland's Article 17 Report to the European Commissions 'The Status of EU Protected Habitats and Species in Ireland' (NPWS, 2013) as presented in Table 4. As of April 2014, site specific Conservation Objectives and Conservation Management Plans for these two European Sites were not yet available (NPWS, *pers.comm*).

In the absence of site specific management and objectives, the Conservation Objectives for the Great Channel Island SAC and the Cork Harbour SPA which are available for public viewing on the NPWS website were used. Coupled with this the NPWS Natura 2000 Standard Data Forms were also utilised all of which can be found in Appendix 1.

2.1.1 Cork Harbour SPA (Site Code 004030)

The site has twenty-four features of interest¹:

Table 2: Cork Harbour SPA Qualifying Features

Cork Harbour SPA [IE0004030] SCIs		Season	Qualifying Population ¹
[A004]	Little Grebe <i>Tachybaptus ruficollis</i>	Wintering	68 individuals
[A005]	Great Crested Grebe <i>Podiceps cristatus</i>	Wintering	218 individuals
[A017]	Cormorant <i>Phalacrocorax carbo</i>	Wintering	620 individuals
[A028]	Grey Heron <i>Ardea cinerea</i>	Wintering	47 individuals
[A048]	Shelduck <i>Tadorna tadorna</i>	Wintering	1426 individuals
[A050]	Wigeon <i>Anas penelope</i>	Wintering	1750 individuals
[A052]	Teal <i>Anas crecca</i>	Wintering	807 individuals
[A056]	Pintail <i>Anas acuta</i>	Wintering	84 individuals
[A065]	Shoveler <i>Anas clypeata</i>	Wintering	135 individuals
[A069]	Red-breasted Merganser <i>Mergus serrator</i>	Wintering	90 individuals
[A130]	Oystercatcher <i>Haematopus ostralegus</i>	Wintering	791 individuals
[A140]*	Golden Plover <i>Pluvialis apricaria</i>	Wintering	805 individuals
[A141]	Grey Plover <i>Pluvialis squatarola</i>	Wintering	66 individuals
[A142]	Lapwing <i>Vanellus vanellus</i>	Wintering	3614 individuals
[A149]	Dunlin <i>Calidris alpina</i>	Wintering	4936 individuals
[A156]	Black-tailed Godwit <i>Limosa limosa</i>	Wintering	412 individuals
[A157]*	Bar-tailed Godwit <i>Limosa lapponica</i>	Wintering	45 individuals
[A160]	Curlew <i>Numenius arquata</i>	Wintering	1345 individuals
[A162]	Redshank <i>Tringa totanus</i>	Wintering	1614 individuals
[A179]	Black-headed Gull <i>Larus ridibundus</i>	Wintering	948 individuals
[A182]	Common Gull <i>Larus canus</i>	Wintering	2630 individuals
[A183]	Lesser Black-backed Gull <i>Larus fuscus</i>	Wintering	261 individuals
[A193]*	Common Tern <i>Sterna hirundo</i>	Breeding	69 pairs
[A999]	Wetlands & Waterbirds		
Key to Table ¹ As obtained from Standard Natura Data Form. *Species listed on Annex I of The Birds Directive.			

Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Douglas, Owenboy and Owennacurra. The SPA site comprises most of the main intertidal areas of Cork Harbour, including all of the North Channel, the Douglas River Estuary, inner Lough

¹ NPWS (2011) Conservation objectives for Cork Harbour SPA [004030]. Generic Version 4.0. Department of Arts, Heritage & the Gaeltacht.

Mahon, Monkstown Creek, Lough Beg, the Owenboy River Estuary, Whitegate Bay and the Rostellan and Poulhabibe inlets.

2.1.2 Great Island Channel SAC (Site Code 001058)

The site has four Features of Interest² as noted in Table 3.

Table 3: Features of Interest within the Great Island Channel SAC

Code	Feature
[1130]	Estuaries
[1140]	Mudflats and sandflats not covered by seawater at low tide
[1320]	Spartina swards (<i>Spartinion maritima</i>)
[1330]	Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)

2.2 DESCRIPTION OF THE PROJECT

The proposed redevelopment works comprise the following main construction elements as illustrated in Figure 2.

2.2.1 Ringaskiddy East (Container Berths and Multi-purpose Berth (CB/MPB))

- A new 314m Container Berth 1/ Multipurpose Berth that will be capable of accommodating vessels carrying a range of different cargoes including containers, freight and general cargoes
- An additional 200m Container Berth 2
- Surfacing of existing port lands to provide operational areas
- Dredging of the seabed to a level of -13.0 m Chart Datum (CD)
- Demolition of existing link-span
- Installation of link-span comprising a floating pontoon and access bridge
- Installation of container handling cranes and terminal transport equipment
- Maintenance building, administrative buildings and entrance kiosks
- Ancillary car parking, lighting and fencing

2.2.2 Ringaskiddy West (Deepwater Berth Extension)

- A new 182m extension to the existing Deepwater Berth (DWB) which will comprise a filled quay structure extending no further seaward than the edge of the existing DWB
- Dredging works to varying levels to facilitate navigational access to the new facilities
- Lighting

2.2.3 Road Improvements

- Improvements to the external road entrance into the Ringaskiddy Deepwater Terminal and to Ringaskiddy West
- Improvements to the internal link road between Ringaskiddy East and Ringaskiddy West
- Road improvement works within the existing harbour lands at Ringaskiddy East
- Improvements to internal road network at Ringaskiddy East to facilitate future access to the N28
- Lighting and fencing

² NPWS (2011) Conservation objectives for Great Island Channel SAC [001058]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

2.2.4 Paddy's Point Amenity Area

- Construction of a new public pier, slipway and boarding platform;
- New planting and landscaping to provide public amenity area.
- Boat storage, lighting and fencing

2.2.5 Phased Implementation

The various elements of infrastructure proposed may be implemented in a single construction or alternatively they may be implemented in a number of phases as a result of trade demands, port operational requirements and funding.

It is anticipated that a phased implementation is likely to comprise three main elements as listed below.

Phase 1 – Ringaskiddy East comprising;

- (a) Improvements to existing port entrance adjacent to existing DWB entrance
- (b) Pier, slipway and amenity area at Paddy's Point
- (c) Elements of internal road improvements to facilitate access to Ringaskiddy East
- (d) Construction of the CB/MPB and associated container storage and handling areas
- (e) Additional Internal Roads to facilitate connection to new N28, when constructed, at eastern end of port complex / Ringaskiddy Village

Phase 2 – Ringaskiddy West comprising;

the extension to the existing DWB

Phase 3 – Ringaskiddy East comprising;

additional quay wall and floating linkspan to accommodate RoRo traffic at the CB/MPB.

This facility will not be brought into commission for accompanied RoRo freight traffic until the new N28 is in place and operational.

2.2.6 Construction Activities

The construction of the proposed works may be undertaken in a number of phases. It is estimated that the construction period for Ringaskiddy East will be approximately 2 years.

Construction of the DWB extension at Ringaskiddy West is anticipated to require approximately 11 months. It is not anticipated that this element will be constructed concurrently with Ringaskiddy East.

Temporary Site Compound

An area will be required for the establishment of the Contractor's site compound. The site compound will be used for the Contractor's site office accommodation and facilities and will include an area for temporary storage of construction materials.

Site Access

Existing port operations will continue as normal during the construction period.

Suitable traffic management and other systems will be put in place as required to minimise disruption to existing activities during the construction period. These will include:

- Upgrade of the existing DWB entrance prior to major construction works being undertaken.
- Segregation of entrances
- Suitable restrictions on timing of deliveries to avoid peak traffic periods
- Preparation of a detailed traffic management plan for the construction phase

Site Safety

The works will be subject to the Safety, Health and Welfare at Work Act 2005 and the Safety, Health and Welfare at Work (Construction) Regulations, 2013. All aspects of design construction will be

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

Waste Disposal

Contractors working on site during the works will be responsible for the collection, control and disposal of all wastes generated by the works.

2.2.7 Operational Activities

Maintenance

When construction work has been completed, the quays and revetments will require little by way of maintenance.

Although some siltation may occur in the new dredged areas the water depth is such that this is unlikely to cause any significant problem in the short term. Any maintenance dredging which may be required in the longer term will be carried out as part of the Port of Cork's regular maintenance dredging programme. The material generated would likely be disposed of at sea at a licensed disposal site agreed in accordance with Port of Cork's maintenance dredging licence.

Pollution Control

Surface water from the main quay and working areas will be collected by a system of drainage channels and gullies. The surface water will be discharged to sea via oil and sludge interceptors to ensure that no pollution is released into the harbour or surrounding waters.

Sewage disposal from the proposed buildings will be by connection to the proposed Lower Harbour Drainage Scheme, or if this is not in place by package treatment works and discharge to a soakaway system.

Waste Disposal from Vessels

Port of Cork operates an Environmental Management System (EMS) which includes procedures for the disposal of waste from berthed vessels.

All waste to be disposed of from berthed vessels will be handled and disposed by a licensed waste disposal contractor. Waste awaiting disposal will not be permitted to be stored on the quayside.

Discharges from vessels to the harbour waters will not be permitted.



Note:
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LEGEND

Ringaskiddy Port Redevelopment
(and 15km buffer)

Cork Harbour SPA

Great Island Channel SAC

Issue Details		
Drawn: SL	Project No. NI 1004	
Chkd: JMC	File Ref.	
Appd: RH	N/A	
Date: April 2014	Drawing No.	Rev.
Scale: 1:115,000 at A3	Figure 1	01

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Project:	Ringaskiddy Port Redevelopment Natura Impact Statement
Title:	European Sites within 15km of Ringaskiddy Port Redevelopment
Figure Number:	1

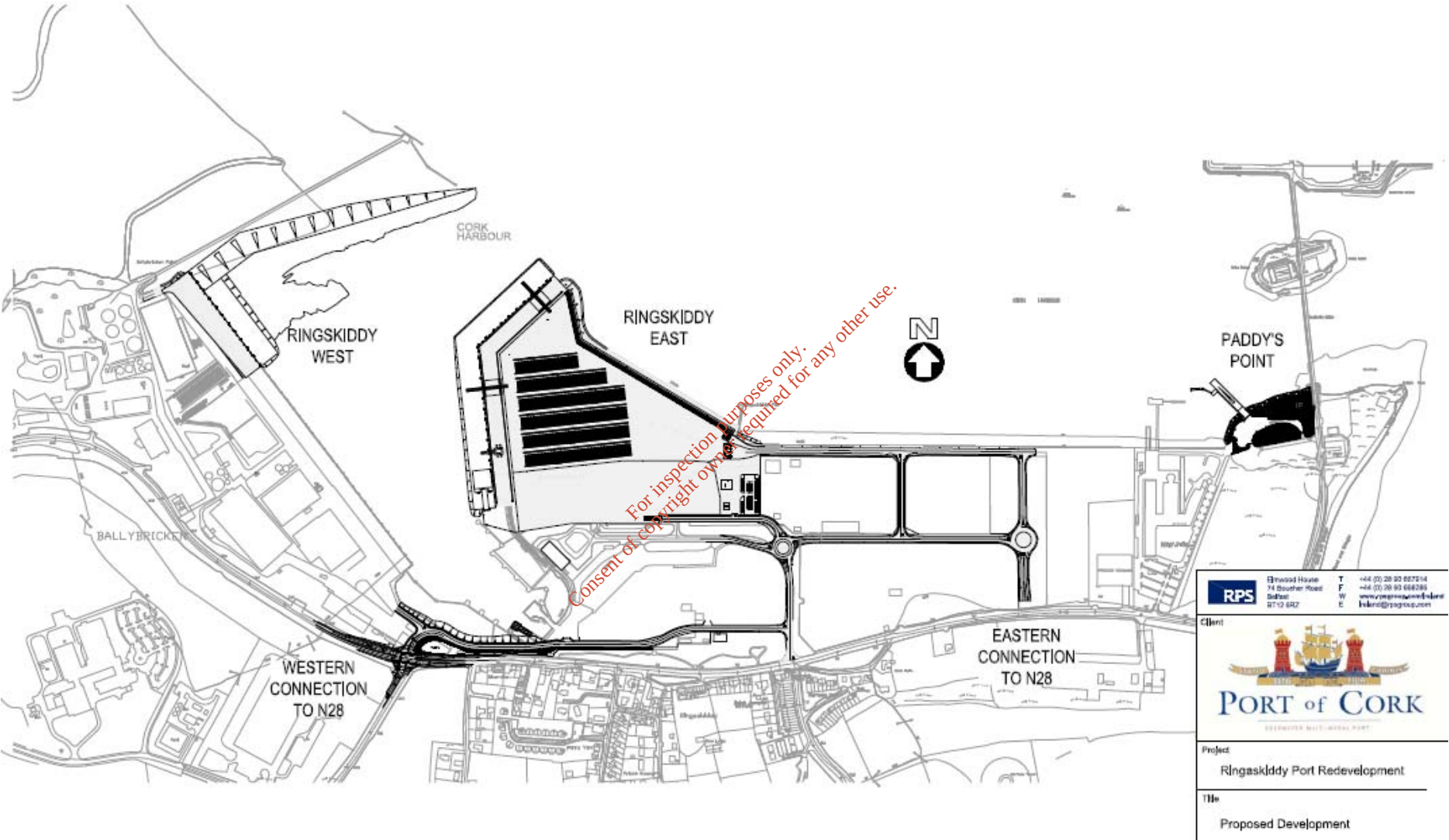


Figure 2: Extent of the proposed Ringaskiddy Port Redevelopment

Table 4: Conservation Status, Sensitivity and Threats to SAC and SPA Qualifying Interests screened in this assessment

Qualifying Interest	Site Sensitivity	Conservation Status, Trend in Conservation Status ³	Threats ⁴
Little Grebe Great Crested Grebe Cormorant Grey Heron Shelduck Wigeon Teal Pintail Shoveler Red-breasted Merganser Oystercatcher Golden Plover Grey Plover Lapwing Dunlin Black-tailed Godwit Bar-tailed Godwit Curlew Redshank Black-headed Gull Common Gull Lesser Black-backed Gull Common Tern Wetlands & Waterbirds	Recreational activities are high in some areas of the harbour, including jet skiing which causes disturbance to roosting birds.	The favourable conservation status of a species is achieved when: • population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats, and • the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and • there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis.	Extensive areas of estuarine habitat have been reclaimed since about the 1950s for industrial, port-related and road projects, and further reclamation remains a threat. As Cork Harbour is adjacent to a major urban centre and a major industrial centre, water quality is variable, with the estuary of the River Lee and parts of the Inner Harbour being somewhat eutrophic. However, the polluted conditions may not be having significant impacts on the bird populations. Oil pollution from shipping in Cork Harbour is a general threat.
Estuaries	Surface and marine water dependent. Moderately sensitive to hydrological change. Moderate sensitivity to pollution. Sensitive to changes in salinity and tidal regime as well as coastal development	Inadequate Improving (+)	Pollution to surface waters (limnic & terrestrial, marine & brackish); nautical sports Fishing and harvesting aquatic resources; estuarine and coastal dredging; other outdoor sports and leisure activities; bottom culture suspension culture; piers

³ <http://www.npws.ie/en/PublicationsLiterature/ConservationStatusReport/>

⁴ <http://www.npws.ie/publications/euconservationstatus/>

Qualifying Interest	Site Sensitivity	Conservation Status, Trend in Conservation Status ³	Threats ⁴
			/ tourist harbours or recreational piers; slipways
Mudflats and sandflats not covered by seawater at low tide	Surface and marine water dependent. Moderately sensitive to hydrological change. Moderate sensitivity to pollution. Sensitive to changes in salinity and tidal regime as well as coastal development.	Inadequate Improving (+)	Pollution to surface waters (limnic & terrestrial, marine & brackish); Fishing and harvesting aquatic resources; Bottom culture; Hand collection; Estuarine and coastal dredging; Nautical sports; Other outdoor sports and leisure activities
Spartina swards (Spartinion maritimae)	Marine water dependent. Medium sensitivity to hydrological changes. As Spartina is considered to be an invasive species in Ireland, it is assessed in a different way to other habitats. Increases in the area and extent of Spartina swards are actually considered to be unfavourable and as future expansion is considered likely, the overall conservation status of this habitat is rated as poor.	Poor	
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	Marine and groundwater dependent. Medium sensitivity to hydrological change. Sensitive to changes in salinity and tidal regime as well as overgrazing, erosion and accretion	Inadequate Stable (=)	Climate Change; Intensive cattle grazing; intensive sheep grazing; paths, tracks, cycling tracks; disposal of household / recreational facility waste; disposal of industrial waste reclamation of land from sea, estuary or marsh; polderisation; Modification of hydrographic functioning, general; Erosion; invasive non-native species

2.3 SCREENING ASSESSMENT

The purpose of this Screening Assessment is to examine the possibility that the proposed works, either individually or in combination with other plans and projects, may result in significant negative effects of on the Conservations Objectives and the integrity of the European Sites discussed previously.

If there is deemed to be potential for significant effects or if this is considered to be a possibility or is uncertain, then the AA process must either proceed to Stage 2 (Appropriate Assessment).

2.3.1 Consideration of Significance

In terms of significance, NPWS Guidance uses the EC definition “any element of a plan or project that has the potential to affect the conservation objectives of a Natura 2000 site, including its structure and function, should be considered significant (EC, 2006)“.

In order to assess the likely impacts, and ascertain whether or not a significant impact on the integrity of the European Sites being screened is likely to occur as a result of the proposed development, it is necessary to consider what constitutes the integrity of a site as referred to in Article 6 (3) of the Habitats Directive. European Commission guidance (EC, 2000b) gives clear guidance on this matter, and states that “*The integrity of the site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site’s conservation objectives.*”

2.3.2 Potential Impacts on Great Island Channel SAC

It is considered that there are three mechanisms by which an adverse effect on the Conservation Objectives of the SPA might potentially occur during construction activity, as follows:

- Smothering of habitats within the SAC by hydrological linkage as a result of deposition of increased suspended sediments arising from dredging operations associated with the proposed works;
- Deterioration of habitats within the SAC by hydrological linkage as a result of pollution incidences arising from construction or operation of the proposed works; and
- Introduction of invasive plant species to Ringaskiddy Port, which could result in their spread to locations within the SAC.

No direct habitat loss or habitat disturbance is predicted 5km up the Cork Harbour main channel (River Lee) from Ringaskiddy Port as a result of the proposed works.

2.3.3 Potential Impacts on Cork Harbour SPA

It is considered that there are five mechanisms by which an adverse effect on the Conservation Objectives of the SPA might potentially occur during construction activity, as follows:

- Smothering of habitats within the SPA by hydrological linkage as a result of deposition of increased suspended sediments arising from dredging operations associated with the proposed works;
- Deterioration of habitats within the SPA by hydrological linkage as a result of pollution incidences arising from construction or operation of the proposed works.
- Long term deterioration of habitats within the SPA as a result of the new built elements within Ringaskiddy Port altering the natural coastal processes and extant sediment transport regime in the area;
- Direct noise and visual disturbance; and
- Unintentional installation of additional perches for predators.

2.3.4 Screening Matrix

Tables 5 and 6 provide a summary of the likely effects of the proposed development on the European Sites identified in Table 1. These effects are predicted having applied the precautionary approach set out in Commission Guidance and as required by the Court of Justice of the European Union in C-127/02 (Waddenzee).

Table 5: Screening Matrix of potential effects of the Port redevelopment on European Sites

Site Code	Site Name	Qualifying Interests	Description of potential effect	Predicted Magnitude of Effect
001058	Great Island Channel SAC	- Estuaries - Mudflats and sandflats not covered by seawater at low tide - Spartina swards (Spartinion maritimae) - Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	- Pollution incident may result in deterioration of habitats within the SAC by hydrological linkage arising from construction or operation of the proposed works. - Suspended sediment transported by dredge plume may result in habitat smothering within the SAC by hydrological linkage arising from construction or operation of the proposed works. - Introduction of invasive plant species to Ringaskiddy Port, which could result in their spread to locations within the SAC.	- Risk of a pollution incident affecting the SAC is very low as the site is 5km up the channel. The predicted magnitude of effect is non-significant. - Risk of elevated suspended sediment reaching the SAC is low, but this prediction lacks certainty as Cork Harbour is a complex system. A hydrodynamic model is required to establish the degree of risk to the SAC. - Port of Cork has strict controls of discharges and waste from vessels, in accordance with Ballast Water Management (BWM) Convention, with ballast water exchange only occurring mid ocean. The predicted magnitude of effect is non-significant.
004030	Cork Harbour SPA	22 species of overwintering birds 1 species of breeding bird - Wetlands & Waterbirds	- Smothering of habitats within the SPA by hydrological linkage as a result of deposition of increased suspended sediments arising from dredging operations associated with the proposed works. - Deterioration of habitats within the SPA by hydrological linkage as a result of pollution incidences arising from construction or operation of the proposed works. - Long term deterioration of habitats within the SPA as a result of the new built elements within Ringaskiddy Port altering the natural coastal processes and extant sediment transport regime in the area.	- Risk of elevated suspended sediment reaching the SPA is uncertain. A hydrodynamic model required to establish degree of risk. - Seabed in Ringaskiddy Basin may contain contaminants currently trapped in the silt which dredging may release into the water column. Linked with (1) above, seabed sampling is required to identify the magnitude of this risk. The risk of polluting substances entering Cork Harbour during construction of the new marine infrastructure is low as the project requires adherence to stringent pollution prevention measures (e.g. CIRIA Technical Guidance C532 / C648). - Risk of long term alteration in the natural coastal processes and extant sediment transport regime is uncertain. A hydrodynamic model is required to establish the degree of risk to the SPA.

Site Code	Site Name	Qualifying Interests	Description of potential effect	Predicted Magnitude of Effect
			4) Direct noise and visual disturbance. 5) Unintentional installation of additional perches for predators.	4) The risk of direct noise and visual disturbance is high, as the project requires a two year construction programme for Ringaskiddy East and almost 1 year to construct Ringaskiddy West. The latter component is located 60m from the SPA at its nearest point. SPA high tide roosts are close to the proposed works. A breeding Common Tern Colony is located 25m of the proposed works, albeit outside of the SPA. An evaluation of avifauna at Ringaskiddy Port is required to add more certainty to the degree of risk. 5) New development to include tall structures (quayside cranes and lighting columns) may introduce more opportunities for predator (raptor or large gull) perching posts. This can lead to an increased perceived risk of predation by nesting terns and wintering waders. An evaluation of avifauna at Ringaskiddy Port is required to add more certainty to the degree of risk.

Table 6: Summary Table of potential direct, indirect and secondary effects of the Port redevelopment on European Sites

Site Name	Direct Impacts	Indirect/ Secondary	Resource Requirements (Drinking Water Abstraction Etc.)	Emissions (Disposal to Land, Water or Air)	Excavation Requirements	Transportation Requirements	Duration of Construction, Operation, Decommissioning
Great Island Channel SAC	No direct loss or impact on qualifying habitats	Potential effects of pollution or contaminant release	No requirement, and no impact on qualifying habitats	Potential effects of suspended sediment depositing in SAC	No requirement, and no impact on qualifying habitats	No requirement, and no impact on qualifying habitats	No impact on qualifying habitats
Cork Harbour SPA	Noise and Visual disturbance	Potential effects of pollution or contaminant release	No requirement, and no impact on qualifying species	Potential effects of suspended sediment depositing in SPA	No requirement, and no impact on qualifying species	No requirement, and no impact on qualifying species	Potential disturbance effects on qualifying species

2.4 IN COMBINATION WITH OTHER PLANS AND PROJECTS

Article 6(3) of the Habitats Directive requires that in-combination effects with other plans or projects are considered. On this basis, other plan and projects were assessed for their potential to have in-combination effects with the Ringaskiddy Port Redevelopment.

2.4.1 Carrigaline Electoral Area Local Area Plan 2011

The Plan provides the planning policy and zoning objectives for Ringaskiddy, with a aim to reaffirm its strategic industrial and port related roles and seek to promote its potential for large scale stand alone industry, which are in line with the strategic objectives for the settlement. The majority of land around Ringaskiddy is zoned for industrial use, although the village core is zoned for town centre / neighbourhood uses and there is some provision made for open space and amenity use. The Natura Impact Report associated with the Plan was reviewed, which took into consideration the development also provided for in the Middleton, Blarney and Bandon Electoral Area Local Area Plans 2011 and the Cork City Development Plan 2009-2015.

2.4.2 IMERC Masterplan

A Masterplan for the Irish Maritime and Energy Resource Cluster (IMERC) adjacent to the National Maritime College of Ireland (NMCI) aims to deliver research and enterprise campus in Ringaskiddy, Cork. The Beaufort Laboratory is currently under construction by UCC. It is proposed to expand the campus and to develop a marine and energy cluster focussing on research, development, commercialisation and innovation. CIT / UCC intend to prepare a masterplan for the layout and design of this future campus development. No significant negative effects upon Cork Harbour SPA are predicted as part of the assessment associated with that application.

2.4.3 Spike Island Masterplan

The Spike Island Masterplan envisages use of Spike Island for public events, concerts etc. In the long-term it is hoped that the island could attract 300,000 visitors per annum. The Masterplan also identifies the subject site at Haulbowline as a possible future ferry access point. Fáilte Ireland has allocated funding for the progression of Spike Island Masterplan, as announced on 23rd October 2013. At the time of writing this EIS, it is expected that the funding will be used for the creation of 3 interpretive centres on Spike Island along with the improvement of marine access facilities to the Island. It is expected that these facilities will be completed in 2015.

2.4.4 Port of Cork Maintenance Dredging

Port of Cork submitted an application to the EPA in February 2014 for a maintenance dredging programme. That application was accompanied by a Natura Impact Statement (NIS) which was reviewed as part of this analysis. The dredging campaign extends from the City Quays and Tivoli Docks in Cork City, out to Roche's Point. Coastal hydrodynamic modelling was undertaken as part of that assessment to help determine the spread of the dredge plume. The NIS concluded that all of the potential impacts identified will be avoided, and that the proposed maintenance dredging would not have a significant negative impact on either European Site being considered here.

2.4.5 Monkstown Marina

Proposals for a new marina at Monkstown were submitted for planning permission and that application included a NIS. The marina comprises car-parking, retail, office and landscaping, with a requirement to dredge part of the seabed in the shallower parts of the marina and in a band paralleling the shore to enable safe access by craft during all states of the tide. The NIS concluded that the marina at Monkstown will not result in the loss of any feeding areas or roosting sites for wintering waterfowl or waders and consequently no impact on the qualifying interests for Cork Harbour SPA.

2.4.6 East Tip Remediation Project, Haulbowline Island

The primary objective of this project is to remediate the East Tip thereby ensuring that potential risks to humans and the wider environment are minimised. It is proposed the waste at the site will be

contained by constructing an engineered capping system on top of the waste and a perimeter engineered structure around the waste body. The project additionally seeks to widen the access road and construct a slipway and floating pontoon. A NIS was prepared for this application. That assessment concluded after screening that two potential pathways of effect upon the qualifying interests of Cork Harbour SPA remained, and Stage 2 assessment was undertaken. It concluded that there was no potential for significant negative impacts upon the integrity of Cork Harbour SPA arising either alone or in combination with any other plans or proposals, from the proposed East Tip Remediation Project at Haulbowline Island.

2.4.7 *Hammond Lane Metal Company*

Planning permission was granted in 2012 for demolition, new build, upgraded facilities, new processing plant etc at the Hammond Lane Metal Company located adjacent to the N28 opposite the proposed eastern entrance to Port lands at Ringaskiddy. The ecological impact assessment prepared for this project was reviewed. No significant negative impacts upon the integrity of Cork Harbour SPA were predicted.

2.4.8 *Cork Lower Harbour Energy Group*

Five large single turbines being developed by the Cork Lower Harbour Energy Group have been given planning permission. Three had been erected by April 2014. The structures are being developed on existing industrial zones land within the facilities of a group of healthcare manufacturing sites in the Ringaskiddy and Currabinny areas. The EIA and NIS documents prepared for these turbine applications were reviewed which included an assessment on avifauna. That analysis concluded that there would be no displacement of any species which is a qualifying interest of the SPA, and no significant impact on the integrity of Cork Harbour SPA was predicted.

2.5 CONCLUSIONS OF SCREENING ASSESSMENT

The Screening Assessment was completed in compliance with the relevant European Commission and national guidelines. The potential impacts during the construction and operation of the associated activities with the Ringaskiddy Port Redevelopment have been considered in the context of the European Sites potentially affected, their Qualifying Interests and conservation objectives. From the findings of the Screening exercise, it is concluded that the proposed project (as described in Section 2.2;

- Is not directly connected with or necessary to the management of any Natura 2000 site; and
- Has the *potential* to give rise to significant adverse effects on the qualifying interests of Great Island Channel and Cork Harbour SPA;

Therefore adopting the precautionary approach, in line with current guidance, a Stage 2 Appropriate Assessment of the proposal is required, and is contained in the next section of this report.

3.0 APPROPRIATE ASSESSMENT

This stage of the assessment process comprises a comprehensive impact assessment arising from the conclusions of the Screening assessment as set out in section 2, which could not rule out the potential for certain significant effects on both Great Island Channel SAC and Cork Harbour SPA.

The preparation of this assessment has progressed in tandem with preparation of an EIS for the project. The Appropriate Assessment has been informed by surveys and specialist analysis commissioned as part of the EIS. Appendix 3 of this NIS contains a schedule of environmental commitments included in the EIS associated with this project. Together, the proposed design of the project components and construction methods (outlined in Appendix 2) and the proposed mitigation (Appendix 3) collectively form the proposed redevelopment.

Specialist reports relied on in this assessment which are located at Volume I of the EIS include the following-

- Noise and Vibration impact assessment presented in EIS Chapter 9
- Air Quality and Climate impact assessment presented in EIS Chapter 10
- Coastal processes including a flow regime, sediment transport and water quality modelling assessment presented in EIS Chapter 12
- Water Quality assessment presented in EIS Chapter 13
- Marine Ecology assessment of habitats and species including marine mammals presented in EIS Chapter 14
- Ornithological impact assessment presented in EIS Chapter 15.

Key qualifying features for each European Site under consideration are detailed in the Screening Assessment. Those effects which were not ruled out at Stage 1 as described in Table 5 are taken forward to Stage 2.

3.1 POTENTIAL SIGNIFICANT EFFECTS

The risk of deterioration of habitats within the Cork Harbour SPA and the Great Island Channel SAC by hydrological linkage arising from a pollution incident related to construction or operation of the proposed works has been further informed by the coastal process, water quality, marine ecology and ornithological assessment in the EIS and is discussed here in more detail.

The potential risk of elevated suspended sediments being transported by a dredge plume to Cork Harbour SPA and the Great Island Channel SAC and settling there resulting in smothering of SPA or SAC habitats has been considered by the coastal process, water quality, marine ecology and ornithological assessments in the EIS and is discussed here in more detail.

The potential risk of long term deterioration of habitats within the SPA as a result of the new built elements within Ringaskiddy Port altering the natural coastal processes and extant sediment transport regime in the area has been considered by the coastal process and ornithological assessments in the EIS and is discussed here in more detail.

The potential risk of direct noise and visual disturbance and the risk of increased predation has been considered by the ornithological assessment as informed by the noise assessment in the EIS and is discussed here in more detail.

3.2 SPECIALIST ASSESSMENTS

3.2.1 Coastal Processes Assessment

The modelling of the coastal processes was undertaken using RPS coupled tide, wave and sediment transport Mike21 flexible mesh model of the Cork Estuary. The modelling was divided into the two main areas of flow regime and sediment transport. The coastal process models were set up and calibrated for the existing Port layout to provide a baseline for comparison with the proposed

redevelopment once constructed. The models were also used to quantify the impact of the proposed development during the construction phase due to dredging.

The model of the estuary extends from Cork City to Roberts Cove in the south and has detailed regions in the vicinity of the redevelopment and also in locations with rapidly varying water depth. This meant the model was entirely adequate for the simulation of the coastal processes and the dredging activity associated with the proposed redevelopment in Ringaskiddy Basin.

The model simulations were undertaken for the existing Ringaskiddy Port layout and then re-run for the Port with the proposed redevelopment. Any changes in the coastal process regime were identified and quantified in order that the extent and nature of the impact of the proposed redevelopment could be clearly identified. The models were verified by comparison of tidal height across the model domain with tide gauge network data and by comparison with recorded current meter readings collected specifically for the EIS by Irish Hydrodata.

The changes in flows are limited to the vicinity of the redevelopment with reduced peak currents in the lee of the structures with localised increases where the flow is redirected further offshore around the structures. The velocities experienced are within the range of those currently seen but are relocated due to the construction. For locations within the main channels surrounding the redevelopment there is no discernible difference in tidal currents.

The average, or residual, tidal currents were also assessed to establish the impacts on sediment transport. In the wider domain the form of the sediment transport processes remain the same with circulatory currents within Ringaskiddy and easterly transport along the port. At Paddy's Point, where a new pier and slipway is proposed, the accretion which is currently experienced to the east of the existing Ringaskiddy Pier is expected to increase marginally. The reduced currents will allow easier access to the amenities site and as a result sediment transport will be reduced either side of the proposed slipway.

There will be very little change in current beyond the development and therefore sediment transport will remain unchanged. The only localised changes are in the immediate vicinity of the pier and slipway at Paddy's Point and maintenance dredging within Ringaskiddy would remain at the current scale and frequency.

Sediment modelling was carried out relating to the dredging plumes and subsequent sedimentation during the capital dredging proposed. The ecology team highlighted the sensitivity of the Monkstown Creek area being part of Cork Harbour SPA. The dredging operations were simulated using the numerical model and implementing the dredging techniques proposed, i.e. the use of a trailing hopper suction dredger at the western site and a backhoe method at the eastern site. The modelling was carried out over the period required to expedite the dredging and included the appropriate sediment releases into the water column in accordance with each dredging means. The sediment was modelled using the grading and settling characteristics of samples collected at each of the dredging sites.

The results of the dredging simulations showed that beyond the immediate vicinity of the operations the resulting sedimentation depths are a fraction of a millimetre, which would not be discernable. The largest proportion of the sediment, mainly sand and coarser material, will be deposited at the dredge site itself and be removed by successive dredging operations. The finer material remains in suspension for longer and is dispersed more widely through the area, however subsequent deposition depths are insubstantial.

As expected the largest suspended sediment concentrations are within the redevelopment site itself as this is where that material is released. The sheltered nature of the site and the presence of the breakwater reduces the excursion into Monkstown Creek and the River Lee. Suspended solids concentration below 20mg/l would have little significance given the background suspended levels which are known to exist, particularly in relation to silt carried into the Estuary. These levels are not expected to be reached at the Great Island Channel SAC.

The suspended sediment concentration will vary over the course of the dredging operations depending on tidal levels, flows and due to the operations themselves. The Monkstown Creek site

experiences maximum values of around 400mg/l but these do not persist for the entire tidal cycle or across the extent of the inlet. Similarly the other sites in the main channel vary; with those north of the dredging experiencing the lowest concentration. The highest concentrations are to the east of the redevelopment – this is in the direction which the residual currents indicated sediment transport would occur. Even at this location, the peak concentrations do not persist for large parts of the tidal cycle.

Examination of the planning history shows that there are only two proposed activities which are not land based. The Monkstown marina consists of floating berths and breakwaters located on the western shore at Monkstown. Modelling of the coastal processes has been undertaken for this development as part of a request for further information by the planning authority. The modelling showed that there would be no effect on the coastal processes with no change in tidal levels and the effect on the tidal currents restricted to the project area with changes of not greater than 0.04m/s. Thus this development will not have a cumulative effect with the proposed Ringaskiddy Redevelopment. Similarly the remedial work proposed at the eastern end of Haulbowline Island will not have a cumulative effect. While the Haulbowline Island scheme will require some dredging activity at this site, the works proposed will mainly be carried out behind retaining structures to reduce the impact within the estuary and therefore the anticipated footprint of these activities will not encroach on the proposed redevelopment even if they are undertaken coincidentally.

In summary, a modelling programme was undertaken to evaluate both the construction and operational phases of the proposed redevelopment at Ringaskiddy; this included tide and sediment transport modelling. The impact of the proposed redevelopment was quantified in terms of the changes in current regime for both the proposed redevelopments at Ringaskiddy and the additional slipway at Paddy's Point. The proposed construction will not impact on tidal current regime beyond the immediate vicinity of the redevelopment. A minor increase in maintenance dredging will be required at Paddy's Point but the general sediment transport regime will remain unchanged.

Sediment plume and deposition modelling was undertaken for dredging during the construction phase of the Ringaskiddy East and West sites showing minimum levels of deposition outside the immediate vicinity of the dredging envelope. Suspended sediment levels associated with the dredging programme showed that the turbidity levels would be increased within the local area but peaks would only persist for short periods of the tide.

There are two proposed marine projects adjacent to the Ringaskiddy redevelopment which have been considered in respect of cumulative impacts. There is a proposed marina at Monkstown which has been shown to have no significant impact on the coastal processes and there is a remedial operation planned for the eastern end of Haulbowline Island. The impact from both projects is not anticipated to cause a cumulative effect in conjunction with the proposed redevelopment.

3.2.2 Water Quality Assessment

An analysis of water quality was undertaken, and an assessment of water quality parameters in accordance with the Water Framework Directive was made. Twelve sample locations in the vicinity of the proposed dredging locations for the project were selected for monitoring in consultation with Marine Institute.

Suspended Sediments

The construction works associated with the proposed redevelopment involve temporary working areas and access to the intertidal area by heavy plant and machinery, impact piling, infilling and physical disturbance to an area within the intertidal area. This will result in a temporary increase in suspended sediment levels and the potential to damage the marine environment. The works involved in the construction of the new Container Berth / Multi-purpose Berth (CB/MPB) and the extension to the existing Deepwater Berth (DWB) will also require dredging works to varying levels in order to facilitate navigational access to the new facilities; which will result in a temporary increase in levels of suspended sediment. Whilst rock material recovered from the proposed dredging works at Ringaskiddy East will be re-used as much as possible for the construction works it is envisaged that there will be the need for imported fill material to be sourced locally to complete the infilling within the port redevelopment. Importation of fill material containing fines has the potential to result in an increase in the suspended solids in the immediate vicinity of the works.

The impact of ongoing maintenance dredging activities associated with the existing Port is one of the reasons for the designation of Cork Harbour coastal water body as a 'heavily modified water body'.

The sediment sampling programme and analysis established that the baseline sediment quality within the Ringaskiddy Port is largely in compliance with the lower level guideline concentrations for all parameters with the exception of nickel which has been attributed to natural background concentrations. The dredging activities will not therefore result in the release of contaminated sediments into the water column.

Chapter 12 in Volume I of the EIS provides an assessment of the impact of the proposal on coastal processes (as summarised previously in section 3.2.1) and includes sediment plume and deposition modelling undertaken for dredging during the construction phase of the DWB and CB/MPB. The modelling has been based on the assumption that either a trailing hopper suction dredger (THSD) or a combination of THSD and backhoe dredger will be employed for the dredging operations. The most likely scenario is the use of a THSD at the western site and a backhoe method at the eastern site as these suit the composition of the material to be removed and the works being undertaken. The modelled dredging applied a spill rate of 2% at each site, with the source being locating at the dredging head or bucket adjacent to the bed to replicate the sediment which is mobilised during operations. A further 2% was released within the water column in accordance with dredging techniques anticipated to be used in the eastern site. This sediment was released throughout the water column as the spill occurs as the backhoe bucket is lifted through the water.

The sediment plume and deposition modelling undertaken for dredging of Ringaskiddy East and West shows the deposition depths are a fraction of a millimetre, which would not be discernable from background levels but have been included on the figures to demonstrate the maximum excursion from the site.

Suspended sediment levels associated with the dredging programme showed that the levels would be increased within the local area but peaks would only persist for short periods of the tide. Time series of the dredging operations at four locations presented in Chapter 12 of the EIS indicate suspended sediment concentration will vary greatly over the course of the dredging operations depending on tidal levels, flows and due to the operations themselves. The concentrations are largest within the redevelopment site itself as this is where that material is released, however the sheltered nature of the site and the presence of the breakwater reduces the excursion into Monkstown Creek and the River Lee.

Given the presence of designated Shellfish Areas in Cork Harbour and the guideline standards required for suspended solids in shellfish waters, it is evaluated that elevated suspended solids would have the potential for significant impacts. However Chapter 12 of the EIS, which has fully considered the mitigation measures proposed for the dredging (i.e. the use of a trailing hopper suction dredger where possible on the western dredge site and no barge overspill permitted), has demonstrated that the dispersion of sediment in the vicinity of the works will not affect the shellfish designations in Cork Harbour, with concentrations in the vicinity of the shellfish areas at acceptable levels above background concentrations. Water quality monitoring will be undertaken in real time to ensure suspended solid limits as required by schedules of the Quality of Shellfish Waters Regulations, 2006 (S.I. No. 268 of 2006).

The impact associated with suspended solids is considered to be negligible due to the temporary nature of the impact, the fact that peaks would only persist for short periods of the tide and the concentrations in the sensitive protected areas are predicted to be within acceptable levels above background.

Oil and Chemicals

The proposed construction works will involve the use of plant and machinery, as well as the associated temporary storage of construction materials, oils, fuels and chemicals in close proximity to Cork Harbour. During construction phase there is the potential for accidental spillage or release of construction materials (e.g. diesel, oil, chemicals) directly into Cork Harbour. It is also possible that residual contaminants post-construction may be mobilised by surface run-off and washed into the harbour. With the mitigation proposed, the risk of accidental spillage of oil and chemicals is low and the potential impact is considered to be negligible.

Cement and Concrete

For the construction of the new quay walls, concrete deck elements of the container terminal area and slipway and pier at Paddy's Point it is possible that concrete could be released into the aquatic environment. Fresh concrete and cement is highly alkaline and therefore will affect water quality if washed into Cork Harbour. With mitigation measures proposed in relation to the use of chemical admixtures and pre cast concrete units for underwater elements of the construction, the impact is considered to be small adverse and with a significance rating of moderate over the short term. The extent of the impact is localised given the sheltered nature of the Ringaskiddy Basin where the residual current is circulatory in nature.

3.2.3 Marine Ecology Assessment

Benthic communities

Sampling was undertaken within the inner Ringaskiddy Basin and along the area of the proposed redevelopment at Paddy's Point to make an assessment of potential impacts from the proposed development in each area. These surveys included an intertidal walkover at Ringaskiddy Basin and Paddy's Point and subtidal video and benthic assessments at Paddy's Point and the Ringaskiddy Basin.

The communities identified within the Ringaskiddy Basin are also common in Irish waters and common throughout Cork Harbour. The subtidal consists of infralittoral sandy muds with kelp communities present adjacent to the hard benthos along the eastern part of the Ringaskiddy Basin. The hard benthos present along the eastern side of the basin consists of communities typical of sheltered estuarine and marine shores. An intertidal mussel bank is located beneath the existing ADM Jetty.

A number of habitats were identified along the intertidal sections of Paddy's Point. These include a small, barren shingle beach immediately adjacent to the roadway near Haulbowline Bridge. The hard benthos in the area consists of habitats typical of sheltered marine shores. A large mussel bank is present along the lower intertidal and subtidal stretches at Paddy's Point. Shallow sub-tidal soft sediment communities consist of infralittoral muddy sands.

The impacts associated with the proposed development will result in the permanent loss of approximately 3 hectares of intertidal and subtidal communities within the Ringaskiddy Basin. These communities are common throughout Cork Harbour and as such, this impact is considered minor negative overall. The dredging of approximately 8.5 hectares of soft sediment within the Ringaskiddy Basin will result in the temporary loss of the benthic communities within the immediate dredge footprint. Due to the nature of the benthic communities identified in the area, recovery to pre-dredge levels is expected within 2 years. Some deposition has been identified for Monkstown Creek, however the levels expected are very small (<0.1mm deposition thickness), and as such no impact is anticipated for the benthic communities present. No impacts are expected on the SPA or SAC sites within Cork Harbour as a result of the dredging activities in Ringaskiddy.

Fisheries, Pinnipeds and Cetaceans

Cork Harbour is the site of a diverse range of resident and migrant estuarine and marine species, numerically dominated by a small range of species both benthic, demersal and pelagic, which are typical for coastal and estuarine sites around Ireland. Prominent species include sprat, gobies, mullet, flounder, plaice, sand smelt, pipefish, cod and five-bearded rockling wrasse etc. The harbour is the site of a flourishing draft net fishery for salmon and also hosts a small inshore commercial fleet targeting a range of fish and crustacean species including green, brown and velvet crab, shrimp, lobster cod, flatfish etc. Within the Ringaskiddy Basin trawling revealed a fish community typical mainly of a soft bottom environment dominated by juvenile flatfish, especially plaice, with gobies also frequent. Mobile invertebrates included green crab, swimming crabs, brown shrimp, and palaemon shrimp among others.

The loss of approximately 3 hectares of subtidal and intertidal habitat will result in a negligible adverse impact on wild fish populations. Migrating salmon smolts will not delay on their outward migration to sea and research by the Marine Institute in Clew Bay has shown that smolts travel at speeds of 1.5km per hour on their way through Clew Bay to the open ocean. Given these additional factors it can be

concluded that it is very unlikely that any salmon smolts migrating through Cork Harbour will be adversely impacted by the pile driving operation in Ringaskiddy.

Cetaceans, in particular harbour porpoise and bottlenose dolphin, as well as harbour seals and grey seals, temporarily using the area will potentially be exposed to the noise produced by pile driving and dredging. Based on existing information and the results of a site visit and survey, it is concluded that the probability of significant numbers of cetaceans using the waters of Ringaskiddy basin is low, however there is a higher probability of individual seals (grey and harbour seals) occasionally using the basin waters. NPWS Guidance on minimising risk to marine mammals from pile driving and dredging operations will be complied with, to include the use of a fully qualified and experienced marine mammal observer (MMO).

3.2.4 Ornithological Assessment

The nature of the proposed redevelopment has the potential to impact upon ornithological interests, both directly and indirectly, during construction and operation. The main potential impacts fall into the following broad categories:

- **Habitat and Food Resource Loss**
 - Direct habitat and food resource loss;
 - Indirect habitat and food resource loss;
 - Decrease in water clarity due to the suspension of sediments inhabiting foraging activity.
- **Disturbance**
 - Direct noise and visual disturbance.
- **Predation Risk**
 - Unintentional installation of additional perches for predators;
- **Pollution Risk**
 - Direct pollution impacts;
 - Indirect pollution impacts as a result of food resource depletion.

3.2.4.1 Construction Stage

There will be no direct land take from within any statutory designated site for nature conservation. The proposed redevelopment footprint is located approx 60m from Cork Harbour SPA at its nearest point, being the base of the ADM Training Wall where it meets the ADM Jetty. The main Training Wall arm is 125m northwest of the proposed DWB extension footprint.

There is potential for the release of oils and chemicals into Cork Harbour during construction, which may impact upon the water environment and subsequently on Cork Harbour SPA via the direct fatalities of waterbirds, the degradation of foraging wetland habitats and a reduction in foraging potential for waterbirds. Potential impacts on water quality are detailed within Chapter 12 (EIS Volume I) and the residual impact is classed of negligible adverse significance.

No significant elevation of suspended solids is predicted to occur during dredging activities associated with the proposed development, to a degree which may inhibit waterbird foraging activities. The inhibition of foraging activities may result from the smothering of intertidal habitats; reduction in the availability of bird food resources; or a decrease in water clarity. Rock Dredging will be required to facilitate the construction of the Container Berth / Multi-purpose Berth (CB/MPB) in order to achieve the required dredge levels. Rock will be extracted by a combination of ripping, drilling and blasting. Chapter 13 of EIS Volume I concludes there will be no significant permanent impact on water quality and Chapter 14 of EIS Volume I concludes no significant permanent impact on benthos or fisheries, with only temporary sediment smothering and avoidance of fish species within the immediate vicinity of the dredge footprint. Suspended sediments in the water column will be localised, be quickly dispersed and have no long-term impact on water quality or clarity.

Direct Habitat Loss

With the exception of Common Terns, a SCI of Cork Harbour SPA, the proposed redevelopment footprint supports a breeding bird assemblage typical of a lowland landscape, with no breeding species of high or very high ecological value recorded during baseline surveys (EIS Volume III a -

Appendix 15.4). Overall the permanent loss of the highly modified semi-natural habitats within the development footprint is predicted to be of negligible adverse significance.

Breeding Common Tern is an SCI of Cork Harbour SPA and is therefore of Very High Ecological Value with between 45-50 pairs (~65-72% of the SPA qualifying population) of birds nesting on the mooring dolphins within the Deepwater Port. The mooring dolphins will not be lost or structurally affected as a result of the proposed redevelopment. The proposed new road to access Ringaskiddy East will be located 25m from the most eastern dolphin at its nearest point.

The intertidal habitats to be lost permanently as a result of the DWB extension are considered to be of relatively little importance to wetland birds. During the wintering period, at high tide, small numbers of Cormorants, Gulls and Shelduck were typically recorded using the reclamation area within Count Section 1 during the wintering season (EIS Volume III a - Appendix 15.5). No important high tide roosts were located within the existing rock armouring within the Ringaskiddy Basin, likely due to the existing high level of disturbance along the DWB quay wall and use of the shoreline for amenity within Ringaskiddy East. Favoured Common Tern feeding areas within the sub-tidal areas of Count Area B (refer EIS Volume II - Figure 15.3c), were typically concentrated around the mooring dolphins and the main navigation channel (EIS Volume III a - Appendix 15.6). Based on observations in 2011, 2012, and 2013 it is considered that Common Tern foraging activity within Cork Harbour is widespread and a large proportion of activity occurs beyond the intertidal and marine areas adjacent to the proposed redevelopment footprint.

At low tidal conditions the footprint of the DWB extension is of some local importance to a small number of waterbirds namely Dunlin, Lapwing, Oystercatcher, Shelduck and Black-headed Gulls, which are SCIs of Cork Harbour SPA. The soft sediment habitat (LS.LMus.MEst) and mussel bank (LS.LBR.LMus.Myt.Mu) recorded within the DWB extension footprint are likely to be of value to waterbird species, which primarily feed on polychaetes, oligochaetes and mussels, due to their dominance within the substrate (Chapter 14). Such species include the SCIs recorded during wintering wetland bird surveys, albeit in relatively negligible numbers (EIS Volume III a - Appendix 15.5). The existing level of disturbance and limited exposure of the inter-tidal habitat during low tide is likely to be a factor already inhibiting any significant use by foraging waders. The overall direct and permanent loss of inter-tidal habitats as a result of the DWB extension and associated dredging is considered to be of negligible magnitude and subsequently of minor adverse significance due to the habitats extensive nature of the intertidal habitats within Cork Harbour and the small numbers of birds which use the area.

Chapter 14 of EIS Volume I concludes that the direct loss of soft sediment intertidal and subtidal habitats within the footprints of the DWB extension and CB/MPB construction will result in a negligible adverse impact in terms of the loss in fisheries habitat. As outlined in that Chapter, the soft sediment habitats to be lost are used principally by gobies, juvenile flat fish, crab and shrimp species, all potential prey items of Common Terns. Chapter 14 concluded that such fish populations will be unaffected in the long term by the relatively small changes in the context of Cork Harbour. Flat fish are also a dominant prey species taken by Cormorant however, Cormorant foraging activity within the intertidal and marine habitats adjacent to the proposed development footprint was minimal (EIS Volume III a - Appendix 15.5).

During both high and low tide conditions the portion of Count Area 16 (refer EIS Volume II, Figure 15.3b) and Count Area F (refer EIS Volume II, Figure 15.3c) to be permanently lost as a result of the new slipway and amenity area creation at Paddy's Point is of limited importance to wintering waterbirds and foraging terns. Only small numbers of Oystercatchers, Herring Gulls were regularly recorded foraging and/or roosting within the intertidal zone. Aside from the extensive mussel bed habitat (LS.LBR.LMus.Myt), the intertidal shoreline supports little sediment infauna (Chapter 14), and therefore provides little foraging potential for waterbirds besides Oystercatcher and opportunistic scavengers such as Herring Gull. The overall direct and permanent loss of intertidal and sub-tidal habitats as a result of the slipway and amenity area at Paddy's Point is therefore considered to be of negligible magnitude and subsequently of minor adverse significance.

Chapter 14 of the EIS outlines that the temporary disturbance of sub-tidal habitats during dredging activities is likely to have a localised and temporary impact on fisheries within the Ringaskiddy Basin. Disturbed habitats will be quickly recolonised following dredging.

Indirect habitat loss and deterioration - Suspended Sediments

Chapter 13 of the EIS concludes that impacts on water quality as a result of sediment loading in the construction phase will be localised and short-lived. The waters within the Ringaskiddy Basin are also subject to a high degree of shipping activity frequently disturbing benthic sediments and Port of Cork operate a periodic maintenance dredging campaign under license which does not allow dredging between May and August because of the commercial salmon draft-netting season.

No significant mass movement of suspended sediments into Monkstown Creek is predicted during dredging activities. Any potential impact of increased sediment loading is predicted to be restricted to the immediate vicinity of the reclamation areas and dredging footprint. The predicted impact is of temporary minor adverse significance.

Disturbance

The extent to which wetland birds are affected by sources of noise and visual disturbance has been the subject of much research and monitoring. This is due to the potential long-term effects on populations caused by the inhibition of foraging and roosting behaviour, leading to decreases in body condition, reductions in reproductive success and individual survival. The magnitude and predictability of impacts as a result of disturbance ranges between species, seasons, weather, source and duration of disturbance, degree of previous exposure of the individuals to disturbance and the occurrence of additional disturbances. Most disturbances to wetland birds result in an interruption to normal activity and the displacement of birds over variable distances, often into sub-optimal habitats. This can be critical during severe winters and can lead to a reduction in the carrying capacities of important wintering wetland sites. However, in general studies show that most bird species have the ability to habituate to regular and continual sources of noise and visual disturbances providing there is no large 'startling' component (e.g. Smit & Visser, 1993; Hockin *et al.*, 1992; Cutts & Allen, 1999; ABP Research, 2001; Burton *et al.*, 2002; Nairn, 2005; Phalan & Nairn, 2007; IECS, 2007; Cutts *et al.*, 2009 & 2013).

The construction phase of proposed redevelopment is outlined in Chapter 3 of the EIS and presented here as Appendix 2 of the NIS. The construction duration for Ringaskiddy East is 24 months; and 11 months for Ringaskiddy West. It is not anticipated that Ringaskiddy East and Ringaskiddy West will run either concurrently or immediately consecutively - i.e. there is likely to be some period of time from completion of Ringaskiddy East and commencement of Ringaskiddy West.

In isolation, Ringaskiddy East construction is not predicted to result in a significant elevation of noise and visual disturbance within close proximity to the mooring dolphins, above what is already experienced. The noise expert has confirmed to the ecology team that worst case scenario noise levels during construction of Ringaskiddy East will be in the region of 55db in the vicinity of the mooring dolphins. It is evident that the Common Tern sub-colony atop the mooring dolphins is highly tolerant of the existing level of noise disturbance arising from the activities within the Ringaskiddy Basin, including startling events, which typically result in the most significant sources to waterbirds (Cutts *et al.*, 2013). Background construction noise in isolation is therefore unlikely to result in a loss of attractiveness of the mooring dolphins, should works be undertaken during the breeding season. Terns are highly likely to habituate to new sources of background noise disturbance.

It is considered that the increased visual presence of machinery and workmen within proximity of the mooring dolphins during improvements to the existing port entrance during construction may potentially result in a loss of attractiveness of the mooring dolphins as a nesting site. Construction works associated with the remaining elements of Ringaskiddy East including the CB/MPB are considered to be sufficiently screened from the mooring dolphins by existing infrastructure e.g. the existing ferry terminal and passenger gangway, which lies to the north east of the mooring dolphins restricting views into Ringaskiddy East.

Site clearance activities to facilitate improvements to the existing port entrance to the south east of the mooring dolphins, will result in the loss of the existing screening in place along the shoreline perimeter of the Port adjacent to the mooring dolphins. This will lead to increased visibility of existing activities within the Port from the mooring dolphins and also act in combination with the presence of construction plant and workmen on the adjacent shoreline during works required for road widening in this area. Where construction in the vicinity of the mooring dolphins occurs during the breeding

season, it is predicted that this will result in a potentially significant source of disturbance to nesting terns, due to the increased and sustained perceived risk of predation by the colony. If this were to occur, it may hinder colony establishment or result in egg/chick abandonment. Improvements to the existing port entrance therefore has the potential to negatively impact on the productivity of the sub-colony, particularly if the most intrusive works are commenced or undertaken during the breeding season unmitigated. Mitigation is proposed and the predicted effect is temporary minor adverse.

No significant disturbance impact on wintering wetland birds is predicted during construction of Ringaskiddy East even if works are undertaken between the months of September to March. In general construction works associated with Ringaskiddy East are not predicted to be audible or visible to the point of significant disturbance within Monkstown Creek, largely due to screening from the Training Wall and attenuation with distance. Monkstown Creek is located 700m from the Ringaskiddy East development footprint at its nearest point. Similarly background construction works are not predicted to be visible or audible to the point of significant disturbance from the stone breakwater, due to screening from the ADM Jetty and attenuation with distance. A generic threshold response to a visual disturbance of c.300m to waterbird roost sites, has been derived around the approach distance for sensitive species including Shelduck (Cutts *et al.*, 2013). The use of Ringaskiddy West for roosting by overwintering gulls including Black-headed and Lesser Black-backed Gull, SCIs of Cork Harbour SPA, is sporadic and gulls are generally highly tolerant of human disturbance, with the ability to switch to alternative roost sites. The impact on roosting gulls is therefore of temporary minor adverse significance.

The ADM Jetty is considered a roost site for Cormorants and gulls all-year round. Wintering Cormorants, Black-headed and Lesser-black Backed Gulls are SCIs of Cork Harbour SPA and therefore any loss of attractiveness of this roost site as a result of disturbance during construction is potentially a significant negative effect. However, following disturbance during construction of a grain shed located at the edge of the existing DWB in 2013, at the ADM Jetty in 2014 as observed by the authors, birds continued to arrive at the Monkstown Creek roost and pre-roost sites on the stone breakwater as normal. It is therefore unlikely that a significant negative effect would result.

The terminal end of the eastern arm of the ADM Jetty is located 260m from the Ringaskiddy East development footprint, and it is unlikely that construction works would result in any significant loss of attractiveness of the ADM Jetty as a roosting site for Cormorants if undertaken during the wintering season.

Birds are predicted to habituate to background construction works over time and are able to displace onto adjacent roosting structures on the ADM Jetty and the ADM training wall. The Gulls and Cormorants which choose to roost on the terminal arms of the ADM Jetty are also evidently habituated to audible and visual disturbance activities within Ringaskiddy West and also to the movement of both large and small vessels along the navigational channel. Dredging associated with the redevelopment has also been considered, and any potential impact to roosting cormorants will be temporary; the birds are expected to habituate to the new level of noise and visual disturbance. The impact on wintering birds during construction of Ringaskiddy East is therefore assessed as being of Minor Adverse Significance.

Construction works at Paddy's Point is anticipated to last 6 months and is unlikely to have a significant disturbance impact on foraging and roosting waterbirds, even if undertaken during the wintering season. This area was of little importance to foraging and roosting wetland birds, with only small numbers of Oystercatcher and Gulls regularly using the intertidal zone during the wintering season. Negligible numbers of Great Crested Grebe, Great Northern Diver, Cormorant and Shag were recorded foraging within the marine areas in the vicinity of the development footprint. Similarly the marine areas were little used by foraging terns. The accessible shoreline at Paddy's Point either side of the Haulbowline Bridge is already subject to moderate disturbance, primarily from dog walkers, bait diggers and winklers throughout the year, which may be preventing any significant waterbird use however, the habitats present are unfavourable to most waterbirds. During the 2013 wintering wetland bird survey effort, construction works associated with the IMERC/Beaufort Building access road, which included piling, had no discernable impact on the use of the shoreline by foraging Oystercatcher and Herring Gull. It is expected that wetland birds continuing to use the marine areas within the vicinity of the development footprint and intertidal zone to the east of the Haulbowline Bridge. Construction activities will largely be screened from the more extensive intertidal shoreline to the east of the

Haulbowline Bridge, where waterbird foraging activity was higher. In the absence of mitigation the potential disturbance impact on waterbirds during construction of the pier and slipway at Paddy's Point is predicted to be of Minor Adverse Significance.

Construction works associated with Ringaskiddy West are considered to have potential to result in a significant disturbance impact to wintering waterbirds, if undertaken during the wintering and passage season without mitigation due to its proximity to key foraging and roosting areas. It is proposed that Ringaskiddy West will be undertaken in isolation from Ringaskiddy East. As such construction works are not anticipated to act in combination.

Elevated noise levels during Ringaskiddy West construction activities, when modelled under a worst case scenario, will be below existing ambient noise levels in the vicinity of the Strand Road (R610) along the northern boundary of Monkstown Creek as detailed in Chapter 9 of EIS Volume I. Having consulted with the noise expert, resultant noise levels within Monkstown Creek are also predicted to largely fall within the existing ambient noise levels during Ringaskiddy West construction. Noise levels will attenuate with the natural screening effect of the ADM Jetty and Training Wall between the DWB and SPA. Current sources of noise disturbance within vicinity of Monkstown Creek, largely arise from the flow of traffic along the Strand Road and activities from within the Ringaskiddy DWB and Pfizer complex.

Noise levels of 70dB and above are regularly cited within the literature as being the threshold beyond which disturbance to estuarine bird species can be predicted to occur (ABP Research, 2001; Cutts *et al.*, 2009 & 2013). However, the greatest levels of disturbance response typically occur when the difference between ambient noise levels and peak noise levels is greatest, and when combined with visual human presence (Burton *et al.*, 2002; Cutts *et al.*, 2009 & 2013). For example an isolated sudden or startling sound will generally create more of a disturbance response than a constant noise regardless of the actual noise level, e.g. an unexpected drop of scaffolding at 65dB will likely cause a greater disturbance reaction than ongoing vibration piling at 80dB (Cutts *et al.*, 2013). Monkstown Creek is already subject to regular startling sounds, such as loud tannoy announcements from the Pfizer complex, crane warning sirens at the existing DWB and bangs from container onloading/offloading. The construction works associated with Ringaskiddy West will be temporary in nature. Piling is not a constant noise source throughout the working day. It is intermittent.

Whilst construction works will introduce a new low level of background noise disturbance to Monkstown Creek, the Training Wall and ADM Jetty, it is very likely that habituation of waterbirds to general background construction noise will occur rapidly.

Observations of the night-time Cormorant tree-roost in Monkstown Creek during the 2011/2012 winter period, whilst a large grain storage warehouse was being constructed within the western corner of the DWB, showed that the loud pounding and hammering audible from the Strand Road, had no impact on the use of the tree-roost, with birds continuing to use Roost Area A closest to the Ringaskiddy West redevelopment footprint (refer to Volume II, Figure 15.3d) as usual. Whilst construction activities will be restricted to normal working hours there may be some use of temporary lighting, construction noise levels beyond 50-100m of the development site (i.e. within key foraging and roosting areas) are not expected to be elevated beyond 70dB, even during a worst case scenario. No significant disturbance response is predicted.

Observations of disturbance impacts to waterbirds within Monkstown Creek during the 2013/14 wintering wetland bird survey indicate that audible disturbances, including startling tannoy announcements from the working Port and Pfizer Compound trigger no response. Construction works are not expected to be audible or visible to the point of significant disturbance to the Deepwater Port Common Tern sub-colony, and no significant impact as a result of direct disturbance during the construction of Ringaskiddy West is therefore predicted even if carried out during the months of May to August inclusive.

In contrast, visual disturbances in isolation e.g. dog walkers or bait diggers along the intertidal zone of Count Area 7 (refer Volume II, Figure 15.3b) do result in a high disturbance response. It is predicted that the presence of operatives on the existing DWB quay wall, intertidal flats, ADM Jetty and Training Wall will result in a disturbance response from waterbirds using key foraging and roosting sites until the birds to some degree habituate to predictable movements of humans. The impact is however

assessed as being potentially of minor adverse significance as visual disturbance will largely be restricted to Count Area 1 and the receptor(s) being those birds roosting on the most southerly portions of the Training Wall.

The ADM Jetty, although of a piled nature, will provide some degree of natural screening from the construction works. Grey Herons, an SCI of Cork Harbour which are typically present within these parts in the greatest number frequently roost along the southern shoreline of Monkstown Creek and may therefore be easily displaced to alternative roosting locations during the temporary construction works. Mitigation is proposed to visually screen the DWB extension construction from the roost sites.

Whilst the Gulls and Cormorants that choose to roost on the eastern arm of the ADM Jetty are clearly habituated to the passing of both small and large vessels within the main navigational channel, the dredging associated with Ringaskiddy West has potential to result in a disturbance impact to roosting birds in this location due to the prolonged and lingering nature of dredging vessels - where workmen will be clearly visible. This impact is potentially of minor adverse significance, affecting only a small number of birds roosting at high-tide if undertaken during the more sensitive wintering season. Mitigation is not required.

Increased Predation Risk

The use of temporary lighting columns and construction plant (i.e. cranes) during construction has the potential to introduce new opportunities for birds of prey or large gulls to perch in close proximity to the mooring dolphins within the Deepwater Port. This may lead to an increase in the perceived predation risk to nesting terns and wintering waders. This impact is predicted to be temporary and negligible given the continued use of construction plant, which is likely to deter perching birds. The potential impact is considered to be of minor adverse significance.

Pollution

Potential pollution impacts on Marine Ecology and Water Quality are detailed within Chapters 13 and 14 of EIS Volume I respectively. Significant pollution is not predicted as a result of the works. It is considered very improbable as best practice mitigation to protect the water environment as outlined in Chapters 13 and 14 will be adhered to and appropriate and fully screened fill materials will be selected for Ringaskiddy East and West. The displacement of contaminants during dredging and seabed silt release is also considered negligible. Pollution impacts resulting in direct bird fatalities or changes to bird food resources are considered to be non-significant.

3.2.4.2 Operational Stage

The proposed redevelopment has the potential to impact on the natural coastal processes, existing sediment transport regime and water quality within Cork Harbour. This in turn may potentially impact on wetland bird habitat quality in the long-term. Of most significance would be any alteration to the existing sediment transport regime or water quality, which may result in the smothering or changes to the composition and abundance of waterbird food resources. Chapter 12 of EIS Volume I predicts that the proposed redevelopment will not significantly alter the existing sediment transport or hydrodynamic regime away from the immediate vicinity of the project footprint. Chapter 14 of EIS Volume I concludes that this will result in no impact within Monkstown Creek as no mass movement of sediment to these areas or significant alteration of sediment grain size composition is predicted on this area that is a critical intertidal foraging area for wetland birds. There may however, be some small but localised impacts to subtidal communities immediately beyond the footprints of the DWB extension and CB/MPB. Chapter 14 of EIS Volume I concludes that this would have no detrimental impact on the current abundance of potential benthos, fish or crustacean waterbird prey items within the water column in this locality or within the wider Cork Harbour.

Overall the potential impact on waterbird food resources as a result of altered sediment regimes is predicted to be negligible and restricted to the subtidal area in the immediate vicinity of the project footprint. No discernible impact upon intertidal communities within the SPA boundary within Monkstown Creek is predicted.

Disturbance

There are several sources of noise and visual disturbance associated with the operational phase of the proposed redevelopment. The resultant traffic using the proposed new access to Ringaskiddy East

has the potential to cause disturbance to the Common Tern colony nesting on the mooring dolphins. This impact is potentially of significance if it were to result in the abandonment of the sub-colony site.

The proposed internal road will bring freight traffic to a distance of 25m from the mooring dolphins. It is however evident that the terns are already habituated to extraordinarily high levels of anthropogenic disturbance, including the current passing of freight traffic within 30m of the nearest mooring dolphin. It is predicted that because the dolphins are not directly affected and that a screen is being provided along the adjacent shoreline, the closer passing of traffic will not result in the loss of the attractiveness of the mooring dolphins as a nesting location.

Increased Predation Risk

The presence of new and permanent lighting columns has the potential to introduce new opportunities for birds of prey to perch in close proximity to the mooring dolphins or overlooking Monkstown Creek. This has the potential to increase the perceived predation risk to nesting terns and wintering waders in the long term. The general arrangement drawings and lighting plans which are contained in the planning drawings associated with this application were fully reviewed. This impact is predicted to be non-significant as observations over the three years of survey effort has revealed no sustained or significant predation occurring as a result of existing quayside cranes or lighting columns being used as predator perching posts.

Indirect Habitat Loss

The proposed development has the potential to impact on the natural coastal processes, existing sediment transport regime and water quality within Cork Harbour. This in turn may potentially impact on waterbird foraging habitat quality in the long term. Of most significance is any alteration to the existing sediment transport regime or water quality, which may result in the smothering or changes to the composition and abundance of bird food resources.

Chapter 12 of EIS Volume I predicts that the proposed redevelopment will not significantly alter the existing sediment transport or hydrodynamic regime away from the immediate vicinity of the DWB or CB/MPB. Chapter 14 concludes that this will result in no significant impact on any intertidal communities, as no mass movement of sediment to key intertidal foraging habitats within Monkstown Creek, resulting in the alteration of sediment composition is predicted. No significant detrimental impact on the current abundance of potential benthos prey within the intertidal foraging area is therefore predicted. Similarly, availability of fish prey for Common Terns and other piscivorous birds including Cormorant will not be significantly impacted.

3.3 MITIGATION PROPOSED FOR THE PROTECTION OF THE EUROPEAN SITES

A schedule of environmental commitments has been presented to An Bord Pleanála as part of the EIS associated with this application, and is contained within Appendix 3 of this NIS. Many of those environmental commitments provide protection to the coastal areas at Ringaskiddy, and the constituent habitats and species of the SPA, and they are listed below.

- A suitably Qualified Ecological Clerk of Works will be appointed prior to the commencement of any works to ensure the mitigation listed within the EIS is implemented in the manner for which it is intended and to act as a liaison between Port of Cork and NPWS.
- A protocol for regular communication with statutory agencies such as National Parks and Wildlife Service (NPWS) and Cork County Council and other third parties shall be established to ensure all pollution incidents or potential incidents are reported in an efficient and timely manner.
- Management and auditing procedures, including tool box talks to all personnel, shall be put in place to ensure that any works which have the potential to impact on the aquatic environment are being carried out in accordance with required permits, licences, certificates and planning permissions.
- Construction works at the shoreline will be restricted to daytime hours in order to allow otters and other wildlife to forage at dusk, through the night and at dawn.

- Light spill will be minimised during construction and operation through the use of directional lighting and by minimising lighting requirements.
- Vegetation clearance will be undertaken outside of the breeding bird season i.e. it will not take place between 1st March to 31st August.
- Dredging will not be undertaken between May and August.
- A 4m visual screen will be constructed as part of the works along the northern perimeter of the internal road at the location shown in Planning Drawing 0474-PL-0802. This screen will include predator perching post deterrents.
- The construction of the internal road between the existing security hut and the existing RoRo ramp will not take place between April and August inclusive unless the visual screen is in place before construction works commence.
- Construction of the DWB extension shall be screened from the ADM training wall and ADM Jetty.
- Vehicles will not be allowed traverse the mussel bank during construction.
- Refuelling of plant will be undertaken away from the intertidal area to minimise the effects of possible fuel spillage.
- Standing machinery will be placed on drip trays to avoid spillages.
- No overflow from the dredger shall be permitted during dredging.
- The proposed redevelopment will connect to the new Cork Lower Harbour Main Drainage Scheme and therefore will receive appropriate treatment prior to discharge to coastal waters.
- All surface drainage waters, including road drainage, will be presumed to be contaminated and will be routed through highway quality oil interceptors and sediment traps prior to discharge into the sea.
- Water quality monitoring will be carried out by the main contractor with continuous in-situ monitoring carried out in advance of the works to establish a water quality baseline and during the dredging activities to ensure effective response to any incidents that may impact on water quality at sensitive sites.
- Existing and proposed surface water drainage and discharge points shall be mapped on a site plan which shall also include the location of existing and proposed measures such as monitoring points, sediment traps, settlement lagoon and oil interceptors.
- An appropriate dredging regime will be implemented with due regard to best practice and emission limit values for suspended solids; it is proposed that a trailing hopper suction dredger is used in Ringaskiddy West and a backhoe dredger will be employed for the dredging operations in Ringaskiddy East as these suit the composition of the material to be removed. Dredge material will be transported in closed systems to prevent overspill.
- Contractors shall implement best practice and relevant guidance to ensure silt laden or contaminated surface run-off from the entire construction site; i.e. the Container Berth / Multi-purpose Berth, Deepwater Berth, road upgrades, site compound and Paddy's Point slipway and amenity area, does not discharge directly to the Harbour.
- Imported fill material required to complete the infilling behind the quay walls will be clean graded stone sourced from local quarries.
- Concrete use and production shall adhere to control measures outlined in PPG 6 Working at demolition & construction sites (Environment Agency, 2012).

- For the sections of concrete that are under water, pre-cast units shall be used for construction. Where the use of pre-cast units is not possible, where *in situ* stitching is required or where concrete is to be placed under water or in tidal conditions, specific fast-setting mix is required to limit segregation and washout of fine material / cement.
- In relation to fuel and chemical storage the control measures outlined in PPG 26 “*Safe storage – drums and intermediate bulk containers*” (Environment Agency, 2011a) shall be implemented. The safe operation of refuelling activities shall be in accordance with PPG 7 “*Safe Storage – The safe operation of refuelling facilities*” (Environment Agency, 2011b).
- With regard to potential oil spills during dredging operations, an emergency spill kit and oil spill containment equipment will be held on board by the dredging operator;
- A contingency plan for the works shall be prepared in accordance with PPG 21 *Pollution Incident Response Planning* (Environment Agency, 2009). The Plan shall also detail the procedures to be followed if there is a breach in any licence conditions or a non compliance.
- Operations shall be undertaken in cognisance of the existing Port of Cork Oil Spill Contingency Plan.
- The following shall be adhered to with respect to vessels at berth or travelling through the Port of Cork:
 - Bilge water shall be treated in accordance with Marpol standards;
 - De-ballasting shall be undertaken offshore in accordance with International Maritime Organisation guidelines;
 - Vessels shall be equipped with oil-water separation systems in accordance with Marpol requirements;
 - Spills on deck shall be contained and controlled using absorbing materials;
 - Vessels without sewage treatment systems shall have suitable holding tanks and will bring waste onshore for treatment by licensed contractors;
 - Chemicals shall be stored appropriately in suitably bunded areas and with material safety data sheets.

3.4 IN COMBINATION WITH OTHER PLANS AND PROJECTS

The plans and projects listed in Section 2.4 are not considered likely to act in combination with the proposed Ringaskiddy port Redevelopment to give rise to negative effects that have the potential to affect the conservation objectives of a the European Sites considered here, including their structure and function.

4.0 CONCLUSION OF ASSESSMENT

This Natura Impact Statement has considered the potential for significant impacts arising from the proposed Ringaskiddy Port Redevelopment that would have the potential to affect any Natura 2000 site; with regard to their qualifying interests and conservation objectives.

The proposed redevelopment does not lie within any Natura 2000 designation; however, the redevelopment is located 60m from the ADM Training Wall forming the boundary of Monkstown Creek being part of Cork Harbour SPA, and Great Island Channel SAC is located 4.8km to north of Ringaskiddy.

Potential effects and their pathways have been identified and described. An assessment has been made on the potential for direct, indirect and cumulative impacts affecting the European Sites. The assessment undertaken in this NIS has been informed by specialist reports contained in an associated EIS with reference to the ecological communities and habitats potentially affected by the proposal, in order to provide a scientific basis for evaluations.

Measures for impact reduction have been incorporated into the proposed project for the avoidance and reduction of adverse effects on the qualifying interests and conservation objectives of the designated Natura 2000 sites within the study area. When these measures have been taken into consideration the proposal will not result in direct, indirect or cumulative impacts which would have the potential to adversely affect the qualifying interests / special conservation interests of the Natura 2000 sites within the study area with regard to the range, population densities or conservation status of the habitats and species for which these sites are designated (i.e. conservation objectives).

The provisions of Article 6 of the 'Habitats' Directive 92/43/EC (2000) defines 'integrity' as the 'coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and / or population of species for which the site is or will be classified'. It is therefore concluded, beyond reasonable scientific doubt, that the proposed project will not give rise to significant impacts, either individually or in combination with other plans and projects, affecting the integrity of any designated site within the Natura 2000 network.

As confirmed in the checklist in Table 7, significant negative effects on any of the conservation objectives of the European Sites under consideration are not predicted. It is concluded that the proposals will not have a significant negative impact on any Natura 2000 site.

This assessment has therefore stopped at Stage 2 Appropriate Assessment and there should be no further requirement for Stage 3 (*Assessment of Alternative Solutions*) or Stage 4 (*Assessment Where Adverse Impacts Remain*) of the appropriate assessment process.

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Table 7: Integrity of the site in Relation to Residual Impacts

Does the project have the potential to:	Yes/No	Details
Cause delays in progress towards achieving the conservation objectives of the site?	No	No significant residual negative impacts
Interrupt progress towards achieving the conservation objectives of the site?	No	No significant residual negative impacts
Disrupt those factors that help to maintain the favourable conditions of the site?	No	No significant residual negative impacts
Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site?	No	No significant residual negative impacts
Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a	No	No significant residual negative impacts
Change the dynamics of the relationships (between, for example, water with flora and fauna) that define the structure and/or function of the site?	No	No significant residual negative impacts
Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	No	No significant residual negative impacts
Reduce the area of the key habitats?	No	No significant residual negative impacts
Reduce the population of the key species?	No	No significant residual negative impacts
Change the balance between key species?	No	No significant residual negative impacts
Reduce diversity of the site?	No	No significant residual negative impacts
Result in disturbance that could affect population size or density or the balance between key species?	No	No significant residual negative impacts
Result in habitat fragmentation?	No	No significant residual negative impacts
Result in loss or reduction of key features (e.g. inter-tidal/tidal feeding areas, alteration to tidal regime, etc.)	No	No significant residual negative impacts