8 THE WATER ENVIRONMENT (WATER QUALITY, FLOOD RISK AND DRAINAGE)

8.1 Introduction

This chapter assesses the potential impact from the proposed Greencastle to Greenore Vehicular Ferry on the water environment. The assessment of impacts is based on the analysis and interpretation of data acquired during the baseline assessment. Potential impacts related to the construction and operational phases of the proposed development are assessed and mitigation measures proposed to reduce significant environmental impacts on the receiving water environment.

The elements of the water environment that are assessed in this section include water quality, flood risk and drainage.

A full project description is provided in Chapter 3 however the main aspects of the development that have the potential to impact on Water Quality are the construction of two slipways, pier and jetty to enable berthing of a vehicular ferry at both Greencastle, Co. Down and Greenore, Co. Louth. The footprint of the proposed development is relatively small (as indicated by Figure 8.3); however, due to construction works taking place both within and immediately adjacent to Carlingford Lough there is an inherent risk of having a direct impact on water quality within the Lough. In addition part of the development footprint encroaches on a Special Protection Area (SPA) at Greencastle and a Special Area of Conservation (SAC) at Greenore.

The environmental baseline is outlined within this chapter along with an assessment of how the existing environment may be affected by the proposals. Where impacts are expected suitable mitigation measures are detailed.

8.2 Water Quality

8.2.1 Methodology

8.2.1.1 Study Area

Carlingford Lough (code UKGBNIIE6NB030) is cross-border coastal water body located within the Neagh-Bann International River Basin District (IRBD) and within the Carlingford and Newry LMA. For the purposes of this assessment the completed water body has been considered as the study area.

Although it is a cross-border water body, monitoring for the purposes of the Water Framework Directive (WFD) is carried out solely by agencies in Northern Ireland. This monitoring approach brings together the efforts of the Agri-Food and Biosciences Institute (AFBI), the Loughs Agency and the Northern Ireland Environment Agency (NIEA), with agreement with the Environmental Protection Agency (EPA).

In terms of the impact assessment the Carlingford Lough water body is considered to be of extremely high importance as the Lough is protected by EU legislation, i.e. a Natura 2000 site designated under the Habitats and Birds Directives. This is relevant to the assessment of environmental impacts as outlined in Table 8.2 below.

8.2.1.2 Consultations

Due to the nature of the proposals which will take place immediately within or adjacent to Carlingford Lough, the potential impacts of the developments are limited to the Carlingford Lough water body only (water body code: UKGBNIIE6NB030). As a result consultations were undertaken with relevant stakeholders in order to determine the existing water quality status in the context of the WFD, and to establish a scope for the assessment of water quality impacts thereby enabling an appropriate assessment of the impact of the development to be made. Consultations were undertaken with NIEA (Water Management Unit and the Marine Strategy and Licensing Team) with respect to the proposed development within the context of the WFD, the Marine Strategy, status classification of the water body, the WFD objectives and the overarching RBMPs and associated programme of measures. Consultations were undertaken with the Loughs Agency and AFBI in order to determine any additional

water quality information that may be relevant to this assessment. Consultations were also undertaken with the Department of Arts, Heritage and the Gaeltacht and Louth County Council.

8.2.1.3 Compliance with the Water Framework Directive Objectives

The potential for the proposals to impact upon water quality are assessed in the context of the EU Water Framework Directive (WFD) (Directive 2000/60/EC). The WFD was adopted in 2000 and transposed into law in Northern Ireland through the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003. Similarly, the WFD was transposed into Irish Legislation by the European Communities (Water Policy) Regulations 2003, (Statutory Instrument No. 722 of 2003 subsequently amended by SI 413 of 2005, SI 219 of 2008 and SI 93 of 2010) on 22nd December 2003. The WFD requires all Member States to manage and improve the quality of their surface and groundwaters.

For the purposes of monitoring and assessing the quality of surface waters, all rivers, lakes, coastal interbasins, estuaries, and coastal waters (within 1 nautical mile of the shoreline) have been divided into management units called “water bodies”. The condition of each water body must be reported to the European Commission in the form of Ecological Status and chemical status. The fundamental objectives of the WFD are to maintain “high status” of waters where it exists, prevent deterioration in the existing status of waters and achieve at least “good status” in relation to all waters by 2015. Northern Ireland Environment Agency (NIEA) is the competent authority tasked with implementation of the WFD in Northern Ireland, and the Environmental Protection Agency (EPA) and Local Authorities are the competent authorities in the Republic of Ireland with the Department of the Environment Community and Local Government providing a coordinating role.

To facilitate implementation, the island of Ireland was divided into eight RBDs, in cooperation with authorities both in Ireland and Northern Ireland. Three of the eight RBDs are cross-border river basin districts and as such are designated as International River Basin Districts. Each RBD contains several water bodies which must be assessed and managed to meet WFD objectives. The WFD requires the preparation of a Programme of Measures (POMs) outlining the steps that will be taken to meet WFD objectives as applicable to each water body. This Programme is contained within an overarching River Basin Management Plan (RBMP). One RBMP is prepared for each RBD and also contains information on water body status, objectives and timescales. The final RBMPs were published in December 2009 (Northern Ireland) and July 2010 (Republic of Ireland). In the case of International RBDs, a separate RBMP has been published by each jurisdiction but with harmonised status, objectives, and programmes of measures for cross border water bodies.

In Northern Ireland the River Basin Management Plans are being implemented through Local Management Area (LMA) Action Plans during the planning cycle 2010 to 2015. These LMA Action Plans detail the status, objectives and measures required to manage a specific group of water bodies within each RBD, therefore several LMAs have been produced for each RBD. The LMAs will be kept 'live' during the planning cycle and will be updated as more measures are developed and implemented. In Ireland RBMPs are supplemented by Water Management Unit (WMU) Action Plans. These Action Plans have been developed for WMUs which are at a smaller geographical scale than river basin districts, and allow for more focussed planning and implementation. These action plans will be developed further to become implementation programmes and will be revised to reflect any updates (for example in relation to status) as implementation of the plan proceeds.

8.2.1.4 WFD Assessment

A desk study was undertaken to determine the current water quality status of Carlingford Lough in the context of WFD via request for available information from NIEA and a review of available data. Assessment of the development proposals in terms of current status and the WFD objectives for Carlingford Lough was undertaken, including an assessment of potential impact. This assessment is based on the guidelines published by the NIEA Water Management Unit: “Carrying out a Water Framework Directive (WFD) Assessment on EIA Development” (NIEA, 2012).

This has led to the development of recommendations in order to ensure that the project does not impact on the relevant WFD classification elements, the WFD objectives and the RBMP

implementation including mitigation measures during construction and operation of the development to address potential pollution impacts.

Impacts are assessed for the construction and operational phases of the project. Construction impacts are considered to be short term and cover potential impact on WFD status and objectives, sediment transport, water quality, and the release of other polluting materials. Impacts during the operational phase are viewed as long term and include a WFD status and objectives, morphological and coastal processes, the release of polluting materials.

8.2.1.5 Criteria for Rating Impact Significance

In order to estimate the magnitude of the impact on the water environment in the vicinity of the scheme the rating recommended in the NRA publication "Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes" (NRA 2008) has been used for the most part. However additional criteria in relation to hydromorphological impact have also been assessed.

This rating is based on a series of criteria which determines both negative and positive impacts associated with the scheme. Table 8.1 provides a summary of the criteria as presented in the NRA Guidelines.

Table 8.1: Criteria for Rating Impact Significance

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Loss or extensive change to a water body or water dependent habitat.
		Increase in predicted peak flood level >100mm. Extensive loss of fishery
		Calculated risk of serious pollution incident >2% annually.
		Extensive reduction in amenity value
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Increase in predicted peak flood level >50mm
		Partial loss of fishery Calculated risk of serious pollution incident >1% annually
		Partial reduction in amenity value
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Increase in predicted peak flood level >10mm
		Minor loss of fishery Calculated risk of serious pollution incident >0.5% annually
		Slight reduction in amenity value
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Negligible change in predicted peak flood level Calculated risk of serious pollution incident <0.5% annually
Minor Beneficial	Results in minor improvement of attribute quality	Reduction in predicted peak flood level >10mm Calculated reduction in pollution risk of 50% or more where existing risk is <1% annually
Moderate Beneficial	Results in moderate improvement of attribute quality	Reduction in predicted peak flood level >50mm Calculated reduction in pollution risk of 50% or more where existing risk is >1% annually
Major Beneficial	Results in major improvement of attribute quality	Reduction in predicted peak flood level >100mm

8.2.1.6 Rating of Significance of Environmental Impacts

Based on the importance of the receiving hydrological attribute/water body and the impact significance an assessment of the potential environmental impact of the scheme has been made based on the matrix presented in Table 8.3 below.

Table 8.2: Rating of Environmental Impacts

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

The conclusions of the water quality assessment will inform the overall Natura Impact Assessment (ES/EIS Appendix 5.1).

8.2.2 Existing Environment

Northern Ireland Environment Agency (NIEA) Water Management Unit were consulted in relation to the proposals and asked to provide any relevant water quality information. The response from NIEA details the most up-to-date assessment available, which was undertaken in 2011. This is an update of the 2009 assessment which was reported within the Neagh-Bann International River Basin Management Plan (2009). NIEA also indicated that although Carlingford Lough is a cross-border water body, monitoring for the requirements of the WFD is undertaken solely by NIEA with agreement from the Environmental Protection Agency (EPA). It was therefore not necessary to undertake consultations with the EPA since all monitoring is carried out by NIEA and provided to EPA for the purposes of reporting to the European Commission.

8.2.2.1 WFD Classification

Carlingford Lough is a relatively large coastal water body and therefore NIEA undertake extensive monitoring within the Lough. A summary of the relevant water quality information is provided below, with the full NIEA response provided in Appendix 8.1.

Water body Information

- River Basin District: NBIRBD
- Water body type: CW8
- Water body code : UKGBNIIE6NB030
- Water body characteristics: Euhaline, mesotidal, sheltered
- Water body area: 48.66 km^2
- Heavily Modified Water Body: No

Table 8.3: Carlingford Lough WFD Classification

Overall waterbody classification		Status	Pass/fail WFD Objective
First Round of Classification -	December 2009	Moderate	Fail
Annual Review of Classification -	May 2011	Moderate	Fail
Local Management Area Objectives			
Date		Objective Status	
2015 Objective 2021 Objective 2027 Objective		Moderate Good Good	

The cause of moderate status is due to physico-chemical elements, specifically moderate status due to nutrients (Winter Dissolved Inorganic Nitrogen (DIN)) and presence of specific pollutants (Annex VIII). These elements result in ecological status being classified as moderate, which combines with good chemical status to give moderate overall status for Carlingford Lough water body. While the overall status has remained moderate since the 2009 assessment, the only element classified as moderate during the 2009 assessment was nutrient levels. However, since this assessment, monitoring has identified the presence of specific Annex VIII pollutants at concentrations above the environmental quality standards for good status.

8.2.2.2 WFD Objectives

In its simplest terms, the overall objective of the Water Framework Directive is to ensure 'Good Status' by 2015. However, Member States were permitted to apply for an extended deadline in achieving this objective for water bodies where the necessary improvements in the status cannot reasonably be achieved within the required timescales. This may be for reasons such as technical feasibility, disproportionate cost or natural conditions within the water body.

Carlingford Lough has an extended deadline to achieve good status by 2021, a delay of one river basin management cycle. The reason for this delay is that the specific source of the adverse pressures, causing the deterioration in status, has yet to be determined. Consequently, a solution cannot feasibly be identified and further investigation is necessary. However, an important aspect of this extended deadline is that the condition of the water body does not deteriorate further than the current conditions.

As indicated previously River Basin Management Plans are implemented in Northern Ireland through Local Management Areas (LMAs). Action plans have been developed for all LMAs in Northern Ireland and Carlingford Lough is located within the Carlingford and Newry LMA, for which an action plan has been developed by NIEA. A number of catchment-wide actions are included within this action plan, as well as specific actions for each water body. The actions outlined for Carlingford Lough water body are highlighted in Table 8.4 below.

Table 8.4: Actions for Carlingford Lough Water Body

UKGBNI6NB030	Carlingford Lough	2009 Status: Moderate
Action to be taken	*Action to be taken by*	*Target Date*
Develop a profile of the designated bathing water at Cranfield Bay.	NIEA	Completed
Liaise with ROI organisations to develop specific actions to deliver objectives for this cross-border water body.	NIEA, EPA, Loughs Agency, Louth CC	Mar 2013
Carry out monitoring and assessment to confirm evidence of trophic status.	DOE NIEA	Dec 2015

In Ireland River Basin Management Plans are implemented through Water Management Unit (WMU) Action Plans for rivers and lakes. In addition a Transitional and Coastal action programme and a groundwater action programme have been prepared for the Neagh Bann IRBD. Details of the status and pressures associated with Carlingford Lough are included within this Transitional and Coastal Action Programme. The Action Programme highlights that Pressure Based Risk Assessment results from 2008 identify Carlingford Lough at risk of point source pollution from WWTPs. The Carlingford WMU Action Plan which includes river water bodies in Ireland discharging to Carlingford Lough identifies three wastewater treatment works (Carlingford, Greenore, Omeath) as a risk to Carlingford Lough. The actions outlined to deal with the risk from wastewater treatment works include investigating the need for increased capacity and implementation of recommendations of Pollution Reduction Programmes produced for shellfish waters.

8.2.2.3 Protected Areas

A significant proportion of waters in the Neagh Bann IRBD are protected under existing EU legislation requiring special protection due to their sensitivity to pollution or their particular economic, social or environmental importance. All of the areas requiring special protection in the Neagh Bann IRBD have been identified by the NIEA and EPA, then mapped and listed in a register of protected areas (required under Article 5 of the WFD Directive). The register of protected areas includes:

- Drinking Water Areas;
- Economically Significant Waters;
- Recreational Waters;
- Nutrient Sensitive Areas;
- Special Protection Areas (SPAs); and
- Special Areas of Conservation (SACs).

A number of protected areas, listed on the register are located within Carlingford Lough. These protected areas have their own monitoring and assessment requirements to determine their condition. They are often assessed for additional pollutants or requirements relevant to their designation. For example, faecal coliform levels are assessed within shellfish and bathing waters. Therefore it is important that the standards required for these protected areas are also met, otherwise a water body which otherwise meets the requirements of the WFD, may have the status reduced to “less than good” as it is not meeting the protected area objectives.

8.2.2.4 Economically Significant Waters

The Carlingford Lough water body is designated as a protected area due to the economic significance as a result of shellfish waters. There are two designations which cover the portion of the water body in Ireland and Northern Ireland. This includes a large area which stretches along the coastline in Ireland and extends to the centre of the Lough. As of 2009 the entire Northern Ireland shore of Carlingford Lough extending to the centre of the Lough has been designated. This incorporates two smaller waters (Ballyedmond and Cassy Water), which were previously designated as shellfish waters. Maps of the extents of Shellfish Waters in Northern Ireland have not yet been produced; however, there are plans to derive maps and boundary layers for public availability in the future.

These waters are designated under the Shellfish Waters Directive (SWD) 2006/113/EC, which replaced the previous Shellfish Waters Directive 79/923/EEC. This directive aims to protect and where necessary improve the quality of coastal and brackish water bodies in which shellfish live and grow in order to contribute to the quality of edible shellfish products. Designated waters are afforded greater protection and their water quality is monitored by the Northern Ireland Environment Agency (NIEA) in Northern Ireland and the Department of the Environment, Heritage and Local Government in Ireland according to the requirements of the directive. The following parameters are assessed as part of the shellfish waters monitoring programme:

Table 8.5: Shellfish Waters Monitoring Programme

Parameters measured	***Frequency of Sampling***
pH	Quarterly
Temperature	Quarterly
Coloration	Quarterly
Suspended solids	Quarterly
Salinity	Monthly
Dissolved Oxygen	Monthly
Petroleum hydrocarbons	Quarterly
Organohalogenated substances	Half-yearly
Metals • Silver • Arsenic • Cadmium • Chromium • Copper • Mercury • Nickel • Lead • Zinc	Half-yearly
Faecal coliforms	Quarterly

The current SWD will be repealed in 2013 and subsumed by the Water Framework Directive (WFD), with requirements for shellfish waters considered within the next River Basin Management Planning cycle. It is intended that the level of protection afforded under the WFD to these water bodies is at a minimum the same level of protection provided under the SWD.

Pollution Reduction Programmes
A Pollution Reduction Programme (PRP) has been finalised for the portion of Carlingford Lough designated as shellfish waters in Ireland (DECLG, 2010). The Marine Institute in Ireland undertakes monitoring of designated shellfish waters in Ireland. Results of monitoring indicate that there are unsatisfactory levels of zinc within or in the vicinity of this shellfish area. Monitoring of shellfish flesh for food hygiene purposes indicates faecal contamination in this shellfish area. The bivalve mollusc production areas in Carlingford Lough are classified as 'Class A' for razor clams, oysters and mussels and in the outer section of the licensed area and as 'Class B' for mussels in the middle section of the licensed area for the purposes of EC Regulation 854/2004.

Pressures/Risks
The PRP also identifies the three wastewater treatment works identified within the WMU action plan as a risk to the shellfish water. In addition the PRP identifies 1,074 on-site wastewater treatment systems at a relatively high density in comparison to the national average. Based on the location of these systems and the hydrological conditions within the catchment there is a risk to surface water and groundwater throughout much of the portion of the catchment within Ireland. Higher than national average use of fertilisers along with port activities at Greenore have also been identified as potential secondary pressures.

Action Programme
An action programme is included within the PRP which provides an overview of the actions required to achieve the requirements of the SWD. The action programme outlines the requirements for licensing

or certification by the EPA of waste water discharges. The following license/certification applications are outlined within the PRP:

Carlingford – secondary treatment WWTP in place.
A licence application was made by Louth County Council in March 2009 pursuant to the requirements of the Waste Water Discharge (Authorisation) Regulations, 2007.

Greenore – no treatment in place.
An application for a certificate of authorisation will be made by Louth County Council in December 2009 pursuant to the requirements of the Waste Water Discharge (Authorisation) Regulations, 2007.

Omeath – no treatment in place.
An application for a certificate of authorisation will be made by Louth County Council in December 2009 pursuant to the requirements of the Waste Water Discharge (Authorisation) Regulations, 2007.

In the cases above, compliance with any EPA Wastewater Discharge Authorisation will require detailed actions including infrastructural works, if required, by the licensee within specified time-frames if the discharge does not comply with the above Regulations. Each licence granted will be subject to enforcement by the EPA. The financial investments to ensure compliance with any EPA licence conditions requiring additional urban waste water collection or treatment can be made under the Water Services Investment Programme.

The actions for on-site waste water treatment works are for Louth County Council to identify systems directly adjacent to estuarine and coastal waters and water courses as well as systems serving large populations. Louth County Council to undertake investigation of the likely extent of microbial contamination of Designated Shellfish Waters from adjoining dwellings and Section 4 licensed activities under the Water Pollution Acts (e.g. caravan parks).

For agricultural pressures the implementation of the Good Agricultural Practice Regulations is deemed sufficient to address this pressure. Louth County Council to undertake inspection and assessment of farming activities in the vicinity of the shellfish growing waters.

For port activities existing regulations are outlined as protective mechanisms for the shellfish waters. No ship is allowed to discharge within 3 miles of Carlingford Lough. The disposal of ship generated waste (including sewage and bilge water) is covered by the European Communities (Port Reception Facilities for Ship Generated Waste and Cargo Residues) Regulations 2003 (S.I 117/2003) (as amended). The disposal of ship generated waste is facilitated by the making of an application to the Competent Authority, disposal is arranged by the ships agent and conformity checking is carried out by the competent authority. Dredging activities are controlled by the Foreshore Act and the Dumping at Sea Act.

8.2.2.5 Recreational Waters

Cranfield Bay, located at the mouth of Carlingford Lough is designated as a bathing water. The beach is approximately 1.5 km in length and the area is popular for water based activities and is zoned to accommodate bathers and boat users. The area includes a popular caravan park and amenity area.

Cranfield Bay Bathing Water was identified in 1993 and is monitored and reported by Northern Ireland Environment Agency (NIEA). Since 2006 the Bathing Water Quality has been rated as 'Excellent' with the exception of 2010 when it was rated as 'Good'. The potential sources of pollution to Cranfield Bay bathing water have been split into three main categories:

- Wastewater treatment works discharges,
- Wastewater systems in urban areas, and;
- Rural source pollution, including agriculture.

A wastewater treatment works is located inland from the caravan parks and amenity area, which serves the Cranfield area discharges to 300m offshore outside the bathing area. This minimises the impact of the discharge on the bathing water, however, the wider water body has the potential to be affected by this discharges.

Due to the urbanisation of the caravan park during the summer season there is a risk associated with wastewater collection systems overflowing if heavy rain occurs. However, general advice is in place for people not to bathe for 2 days following such rainfall events to mitigate against such an incident. Monitoring undertaken by NIEA constitutes microbiological sampling along a transect through the middle of the bathing water on 20 different occasions between June through to mid-September. Results for monitoring undertaken since 2006 are included in Appendix 8.2.

In order to achieve excellent water quality the following quality conditions must be met:

- Total coliforms no greater than 500 per 100ml of water, and;
- Faecal coliforms no more than 100 per 100ml of water, and;
- Faecal streptococci no more than 100 per 100 ml of water.

Annually 80% (16 out of 20 sampling occasions) must meet the coliform standards, and;
Annually 90% (18 out of 20 sampling occasions) must meet the faecal streptococci standards. The location of Cranfield Bay Bathing Water is outlined in Figure 8.1 below.

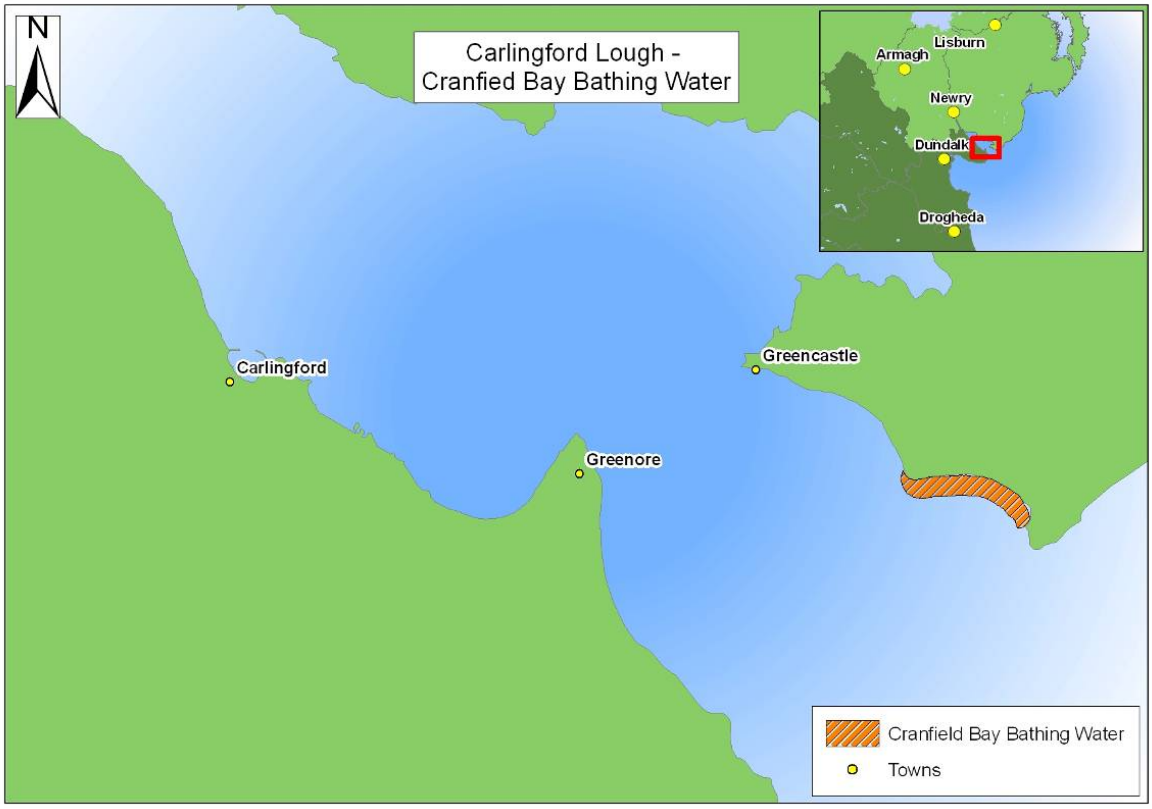

Figure 8.1: Cranfield Bay Bathing water

8.2.2.6 Special Protection Areas (SPAs) and Special Areas of Conservation (SACs)

There are two SPAs within Carlingford Lough, one on each side of the Lough. There is also one SAC located within the water body.

Carlingford Lough SPA (Ireland) – IE004078
Carlingford Lough SPA (Ireland) forms part of the southern sector of Carlingford Lough, Co. Louth, extending from the harbour at Carlingford to Greenore Point. It includes all of the intertidal sand and mud flats to the low tide mark. Much of the shoreline is artificially embanked. The site supports part of a nationally important population of wintering Cormorant. A range of other waterfowl species occurs, notably Brent Goose, Oystercatcher, Dunlin, Bar-tailed Godwit, Redshank and Turnstone. The intertidal flats provide feeding areas for the wintering birds. While the numbers of wintering birds are

relatively low, the site does support a good range of species. The presence of Bar-tailed Godwit is of particular note as this species is listed on Annex I of the E.U. Birds Directive.

Carlingford Lough SPA (NI) - UK9020161
This Special Protection Area (SPA) lies between Killowen Point and Soldiers Point on the northern shores of Carlingford Lough. The SPA includes all lands and intertidal areas seawards to the limits of territorial waters. This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of Common Tern (*Sterna hirundo)* and Sandwich Tern (*Sterna sandvicensis)* during the breeding season. This site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of Light-bellied Brent Goose (*Branta bernicla hrota)* over winter. The proposed slipway at Greencastle is partially located within this SPA.

Carlingford Shore SAC - IE002306
Carlingford Shore stretches for approximately 15 km along the shoreline. The site is a candidate SAC selected for perennial vegetation of stony banks and drift lines, both habitats listed on Annex I of the E.U. Habitats Directive. The proposed development at Greenore is located within this SAC, however, the area of the SAC encroached on by this development is located at the northern tip of the SAC boundary which is already a developed area as it is within the existing Greenore harbour.

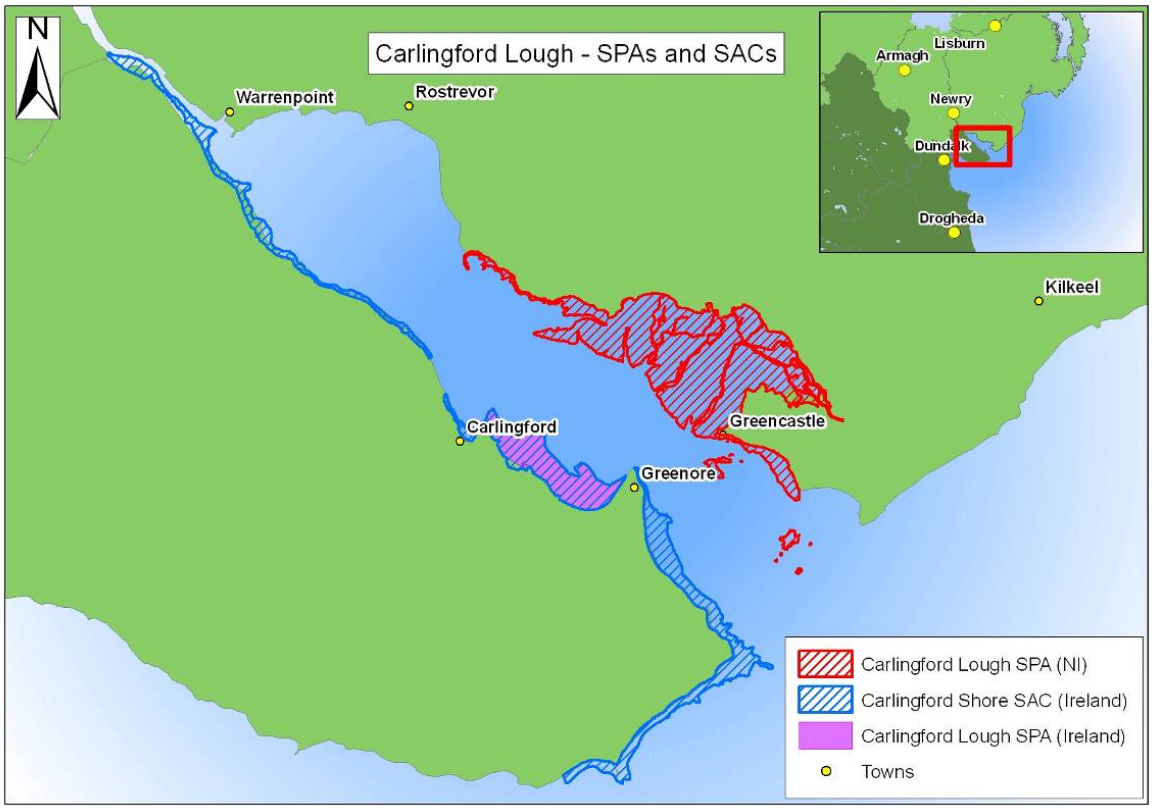

Figure 8.2: SPAs and SACs Carlingford Lough

Figure 8.3 below indicates the extent of the proposed developments at both Greenore and Greencastle.

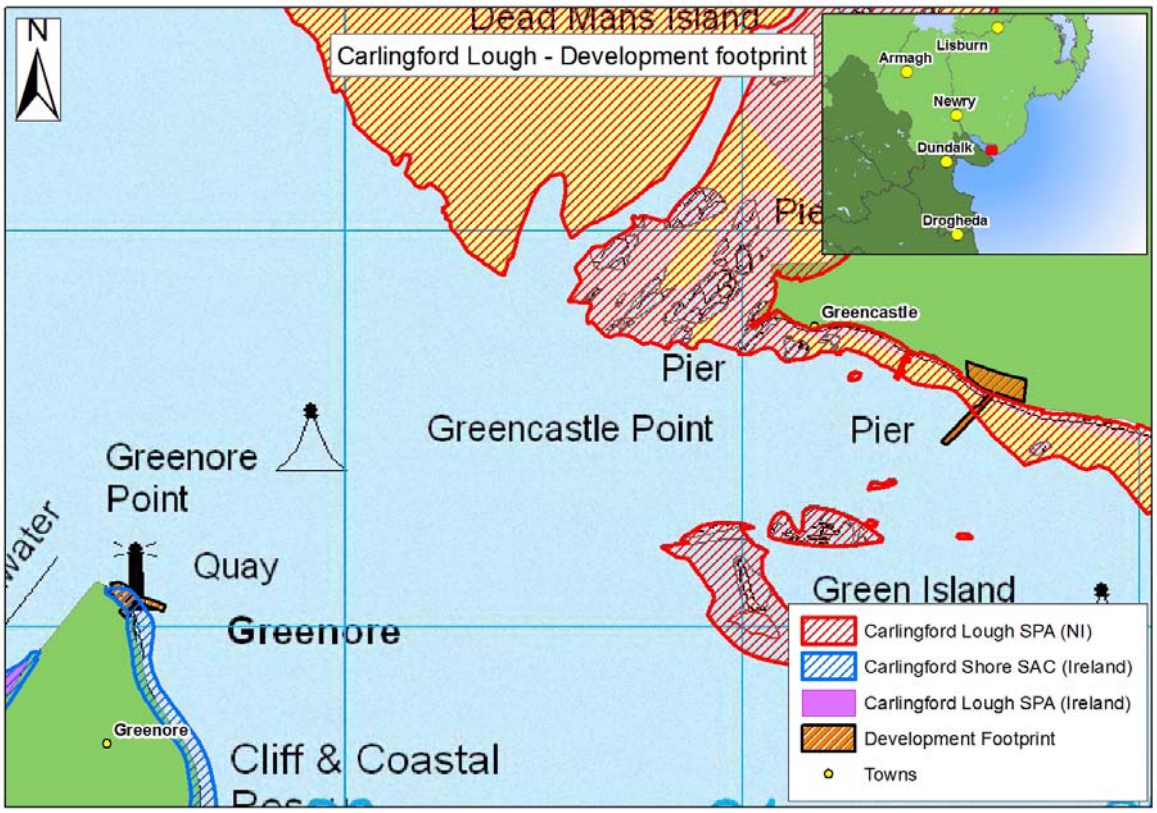

Figure 8.3: Approximate Footprint Of Proposed Development

8.2.2.7 AFBI Monitoring Data

The Agri-Food and Biosciences Institute undertake water quality monitoring within Carlingford Lough as part of the multi-agency approach to water quality monitoring around the Northern Ireland coastline. Consultation with AFBI was therefore undertaken in order to determine any relevant water quality information which may assist in the assessment. A summary of the information obtained from AFBI is provided below, in order to provide an indication of the baseline water quality.

Historic Monitoring Data
AFBI have been involved in monitoring water quality within Carlingford Lough for a long time. In 1999 the Queen's University of Belfast in partnership with AFBI (then part of the Department of Agriculture for Northern Ireland), published a report outlining the Nutrient Inputs and Trophic Status of Carlingford Lough (Taylor et al, 1999). This report was based on water quality monitoring undertaken between 1997 -1998 and aimed to determine whether eutrophic conditions currently exist within Carlingford Lough. Overall this study concluded that although there were some instances where the critical chlorophyll concentration of 10ug/l was exceeded, these were isolated instances and there is no other evidence to suggest that the Lough is detrimentally affected by anthropogenic discharges or activities and therefore cannot be considered eutrophic. A more detailed summary of the supporting physical data from the report is outlined in Appendix 8.3; however, the key findings are outlined below.

Temperature and Stratification
There were limited temperature variations within Carlingford Lough as the salinity gradient within Carlingford Lough is narrow. Furthermore it was determined that although Carlingford Lough may experience some degree of stratification, this would be confined to the inner and mid sites, with the outer sites being vertically homogenous.

Secchi Depth and Suspended Particulate Matter
Secchi depth was also measured as part of this study. Secchi depth measurements are indicative of the depth of light penetration. Within Carlingford Lough, secchi depth increased in the direction of the Irish Sea, from a minimum of 0.20 m at the station furthest upstream to a maximum of 7.25 m at the outer-most station. Low secchi depth measurements at the innermost stations were expected to

reflects the high suspended matter loading from Newry River and resuspension of bed sediments in the shallower water depths from wind, wave and tidal actions. Concentrations of Suspended Particulate Matter (SPM) within Carlingford Lough were shown to decrease on moving seawards, from an average level of 46.76 mg L-1 at the station closest to Newry River to an average of 26.02 mg L-1 at the outer-most station.

Suspended particulate carbon and nitrogen (SPC and SPN)
The ratio of carbon to nitrogen in the suspended particulate matter can give an indication of the origin of the material. Phytoplankton have C/N ratios of between 3 and 6 approximately, and lithogenic material has a ratio of approximately 10 (Parsons et. al. 1984). The C/N ratio varied temporally, with higher ratios of between 7 and 10 during the winter and lower ratios which were generally in the 6 – 8 range during the summer. This pattern reflects the higher contribution of lithogenic material in the winter due to higher SPM loads and resuspension of bed sediments arising from storm events and the higher contribution of phytoplankton biomass during the summer. Phytoplankton biomass is the predominant contributor to the SPM in the spring and summer and is probably the main source of food for the shellfisheries within the Lough at these times.

8.2.2.8 Continuous Monitoring Data

Since 2004 AFBI in conjunction with the Loughs Agency and NIEA have operated continuous monitoring buoys in the Lough (http://www.afbini.gov.uk/index/services/services-specialist-advice/coastal-science/coastal-monitoring/monitored-sites.htm). Two moored instrument packages are located within the Lough – one inside the northern basin around Killowen (Carlingford Lough, North) and the other at the seaward entrance to the Lough (Carlingford Lough, South). These instruments have sensors for the measurement of salinity, temperature and chlorophyll, turbidity and dissolved oxygen. Many of these parameters are used in the classification of Carlingford Lough under the WFD. The standards for classification of coastal water bodies in the UK have been developed by the United Kingdom Technical Advisory Group (UKTAG). In Ireland Environmental Quality Standards (EQS) have been developed and are included within the European Communities Environmental Objectives (Surface Waters) Regulations 2009. Details of the UKTAG standards and EQS in Ireland are outlined in Appendix 8.3. It is not possible to directly compare some of these results to the UKTAG Standards and Irish EQSs due to the method by which the parameters are assessed; however the following data provides an indication of water quality within the Lough.

Chlorophyll a
Figure 8.4 and Figure 8.5 highlight chlorophyll *a* concentrations at Carlingford Lough between 2005 and 2010. It is clear that there are a number of instances where there have been elevated concentrations of chlorophyll a, most notable at the Carlingford Lough North monitoring site. This parameter is considered in determining ecological status under the Water Framework Directive. Although there are a number of instances of elevated concentrations, the status is determined from samples collected during the growing season (March – September), therefore the overall the results were within the standards for good ecological status for this aspect of the assessment.

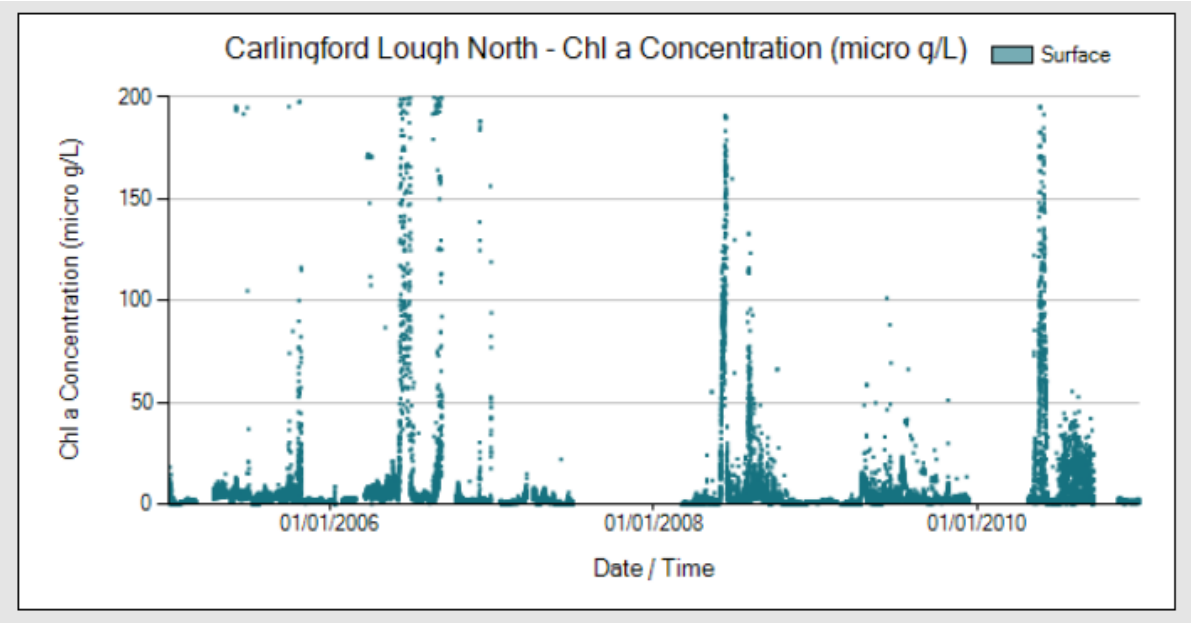

Figure 8.4: Chlorophyll a Concentration (µg/l) – Carlingford Lough North

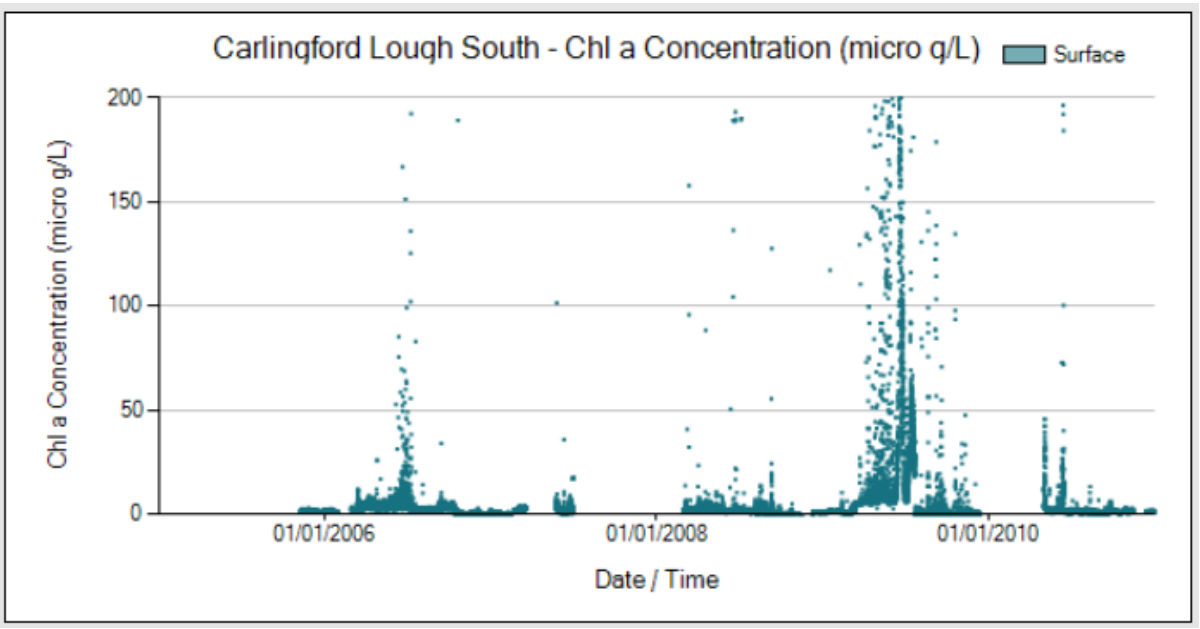

Figure 8.5: Chlorophyll a Concentration (µg/l) – Carlingford Lough South

Dissolved Oxygen (%)

Figure 8.6 and Figure 8.7 highlights dissolved oxygen concentrations between 2005 and 2010. There have been several instances of significant deviation from optimum dissolved oxygen values; however, overall dissolved oxygen is classified as high ecological status for Carlingford Lough.

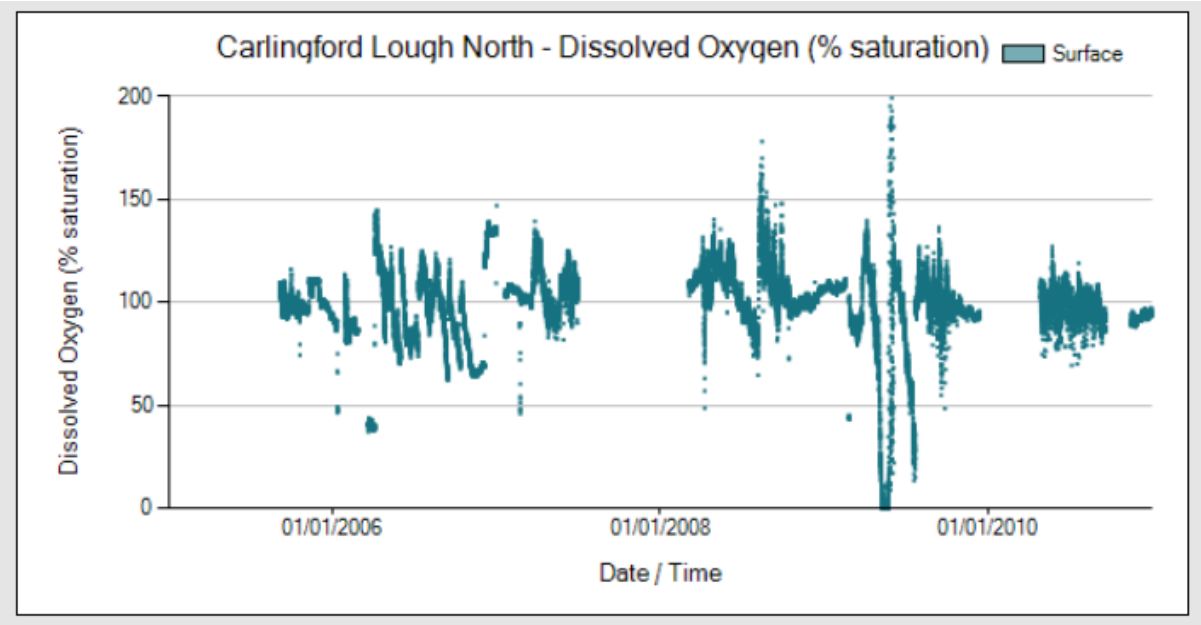

Figure 8.6: Dissolved Oxygen (% Saturation) – Carlingford Lough North

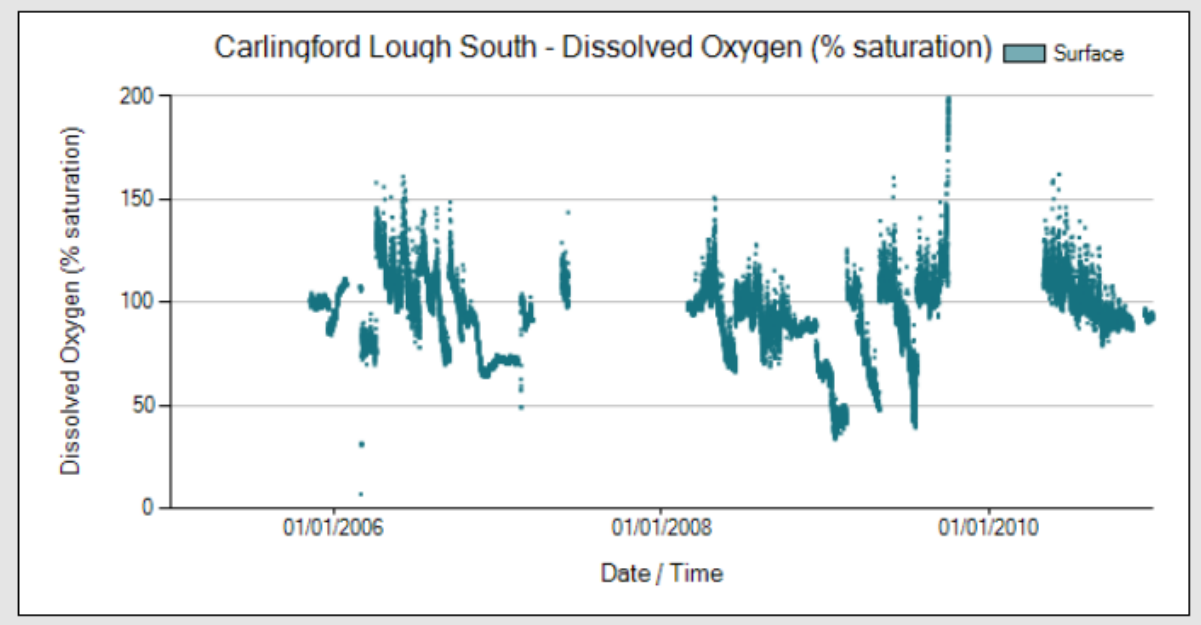

Figure 8.7: Dissolved Oxygen (% Saturation) – Carlingford Lough South

Salinity (Psu)

Figure 8.8 and Figure 8.9 outline the salinity records between 2005 and 2012 for Carlingford Lough. The values show some limited variation, most notably at Carlingford Lough North, most likely due to freshwater inputs. Salinity is an important parameter as it influences the standards for other parameters, e.g. dissolved oxygen standards are lower with increasing salinity.

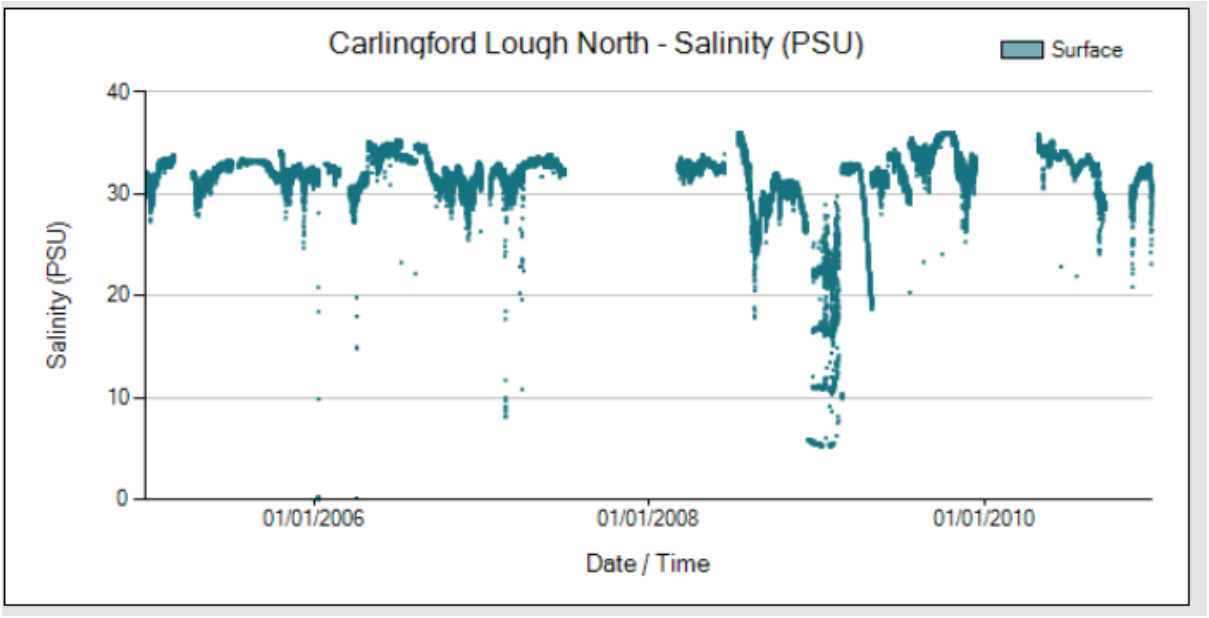

Figure 8.8: Salinity (Psu) – Carlingford Lough North

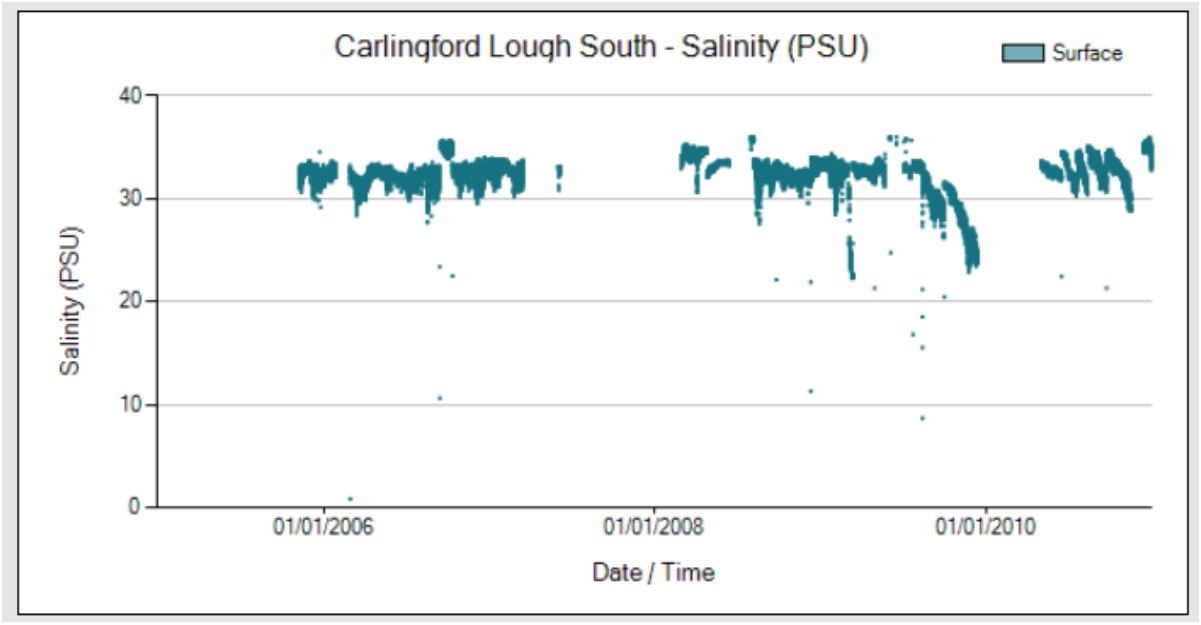

Figure 8.9: Salinity (Psu) – Carlingford Lough South

Temperature

Figure 8.10 and Figure 8.11 highlight the temperature results between 2005 and 2010. Temperature is an important physical parameter as it important in determining other parameters and assessing other parameters against standards.

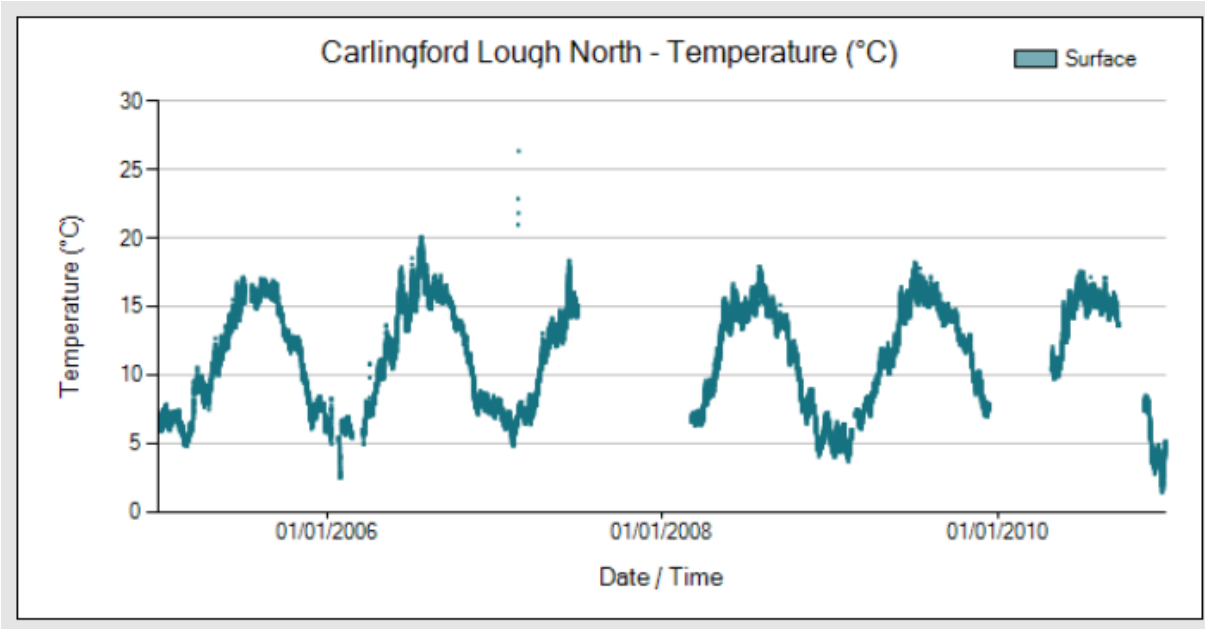

Figure 8.10: Temperature (°C) – Carlingford Lough North

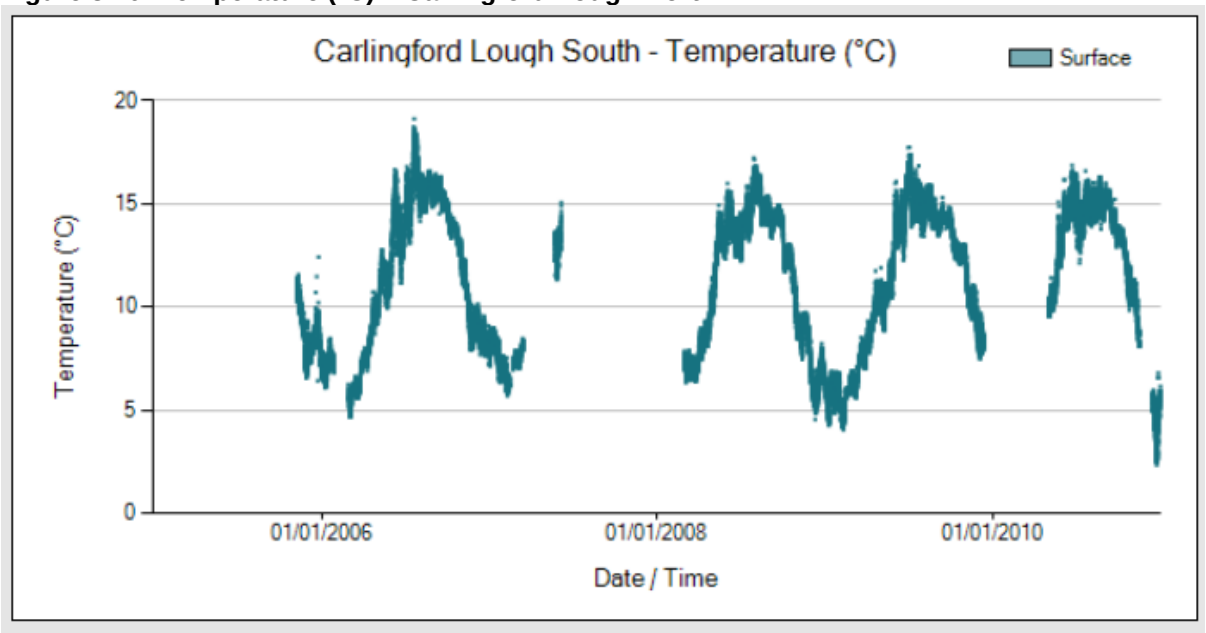

Figure 8.11: Temperature (°C) – Carlingford Lough South

Turbidity

Figure 8.12 and Figure 8.13 highlight the turbidity results between 2005 and 2010. Turbidity is an important water quality parameter as it is usually related to the concentration of suspended sediment within the cater column. Although turbidity is not specified as a parameter within the WFD it is important in assessing dissolved inorganic nitrogen standards, as the turbidity affects the standards which must be met. Carlingford Lough failed to meet standards for DIN and therefore was classified as moderate status. Turbidity is a key factor in determining the DIN standard that must be met.

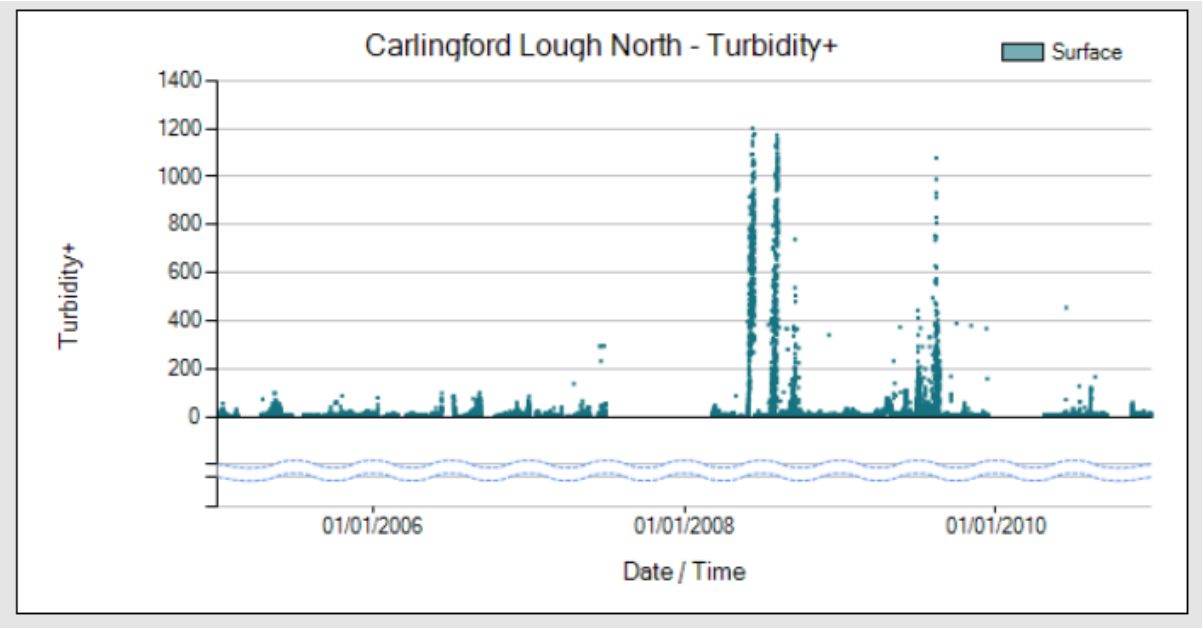

Figure 8.12: Turbidity (NTU) – Carlingford Lough North

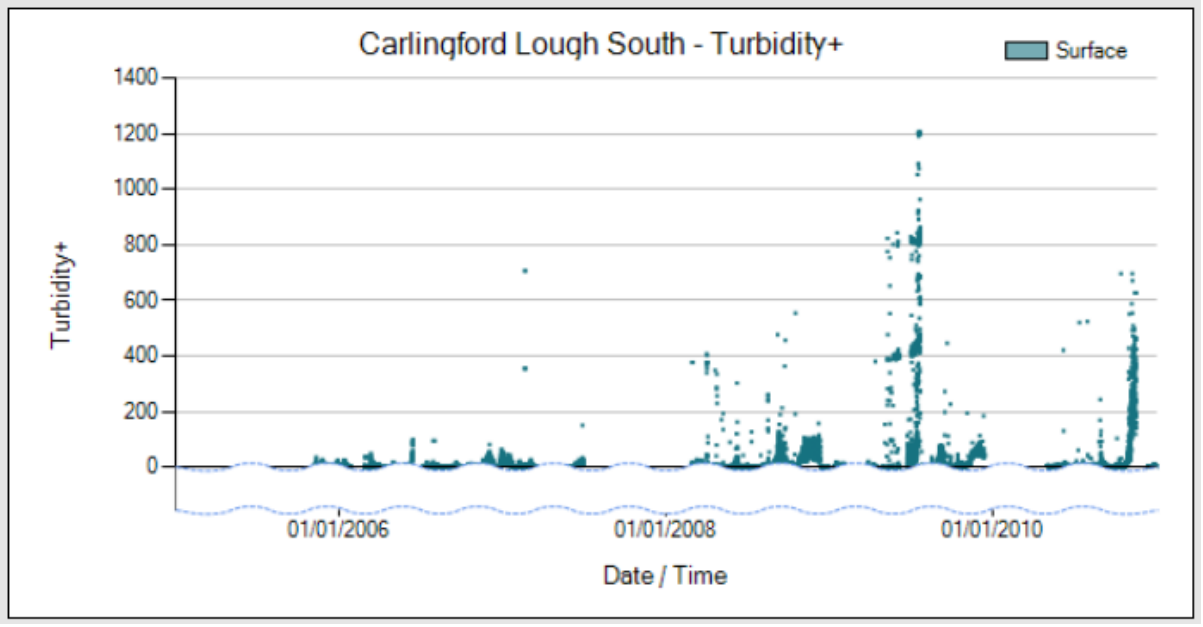

Figure 8.13: Turbidity (NTU) – Carlingford Lough South

8.2.3 Impact Assessment

Based on the proposals to construct two slipways entering into Carlingford Lough and the associated infrastructure on the shoreline the key issues are likely to be associated with the physical disturbance due to construction activities; however, this activity will be limited to an extremely small footprint. The potential impact from the physical disturbance includes sediment, concrete or fuel/chemicals entering Carlingford Lough. During the operational phase the potential impact of the structures on the coastal processes and morphology of Carlingford Lough is considered and the additional pressure associated with sewage, storm water drainage and accidental spillages could have an impact on water quality.

Elevated DIN concentrations and the presence of specific pollutants are the key issues currently preventing Carlingford Lough from reaching good ecological status. Therefore it is important that the proposals do not further contribute to these issues or introduce additional pressures that may deteriorate the condition of the water body. As a result mitigation measures may be required in order to ensure that the residual impacts on water quality are kept to a minimum.

A WFD Assessment has been carried out for the Carlingford Lough coastal waterbody in accordance with the NIEA Guidelines which require a development to comply with the four main objectives of the WFD, i.e.:

- To prevent deterioration in the ecological status of the water body;
- To prevent the introduction of impediments to the attainment of Good WFD status for the water body:
- To ensure that the attainment of the WFD objectives for the water body are not compromised.
- To ensure the achievement of the WFD objectives in other water bodies within the same catchment are not permanently excluded or comprised.

The impacts outlined below and the mitigation measures proposed under the next section have informed this assessment and the relevant schedules from the guidelines are included in Appendix 8.5. The conclusion of this assessment is that the proposed development will comply with the four WFD objectives provided the mitigation measures outlined in the EIA and summarised in the schedules in Appendix 8.5 are implemented in full.

8.2.3.1 Construction phase Impacts

Suspended Sediment
Construction of the slipways and associated infrastructure will involve temporary working areas and access to the intertidal area by heavy plant and machinery. Impact piling, infilling and physical disturbance to a small footprint within the intertidal area will result in a temporary increase in suspended sediment levels and the potential to damage the intertidal habitats.

The coastal process modelling carried out in Chapter 9 has identified that:" *Tidal flows are strongly bi-directional in the proposed construction areas, with flood flows occurring in the north-westerly direction with the largest current speeds being experienced north of Greenore Point."* This means that sediment disturbance during construction whilst limited will be quickly dispersed over the tidal regime. Residual current (being the average current over the tidal cycle) show a circulatory pattern on the east shore of Greenore Point, as flow is deflected around the headland on ebb tide which suggests the potential for net deposition of disturbed sediment would occur in this location. There are international designations at these locations however the potential increase in sediment levels is considered to be negligible given the scale of works and the conclusions of the coastal process modelling. Taking this into consideration and based on the matrix presented in table 8.2 the impact is considered to be **negligible or imperceptible.**

Oil and Chemicals
Construction of the slipways 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 Carlingford Lough water body. There is the potential for spillage or release of construction materials (e.g. cement, diesel or oil) directly into Carlingford Lough. It is also possible that small residue amounts left on site may be mobilised by surface run-off and washed into Carlingford Lough. Given the relatively small scale of the proposal the magnitude of the impact is considered to be moderate adverse however the

sensitivities of the receiving water mean that the environmental impact is potentially **significant to profound** in the absence of mitigation.

Cement and Concrete
It is expected that the concrete elements above high water level will be cast insitu and thus supporting formwork will be required. This temporary support may be trestles on the beach or a temporary steel frame from the piles but its duration at any one location will be approximately 7-10 days before being removed and repositioned for the next pour.

It is expected that the concrete deck elements below water level and in the low tidal zone will be installed as precast concrete slabs with instu stitching pours to tie them together at each pile head.

The use of cement and concrete in the construction of the slipways has the potential to impact upon water quality. Fresh concrete and cement is highly alkaline and therefore is likely to affect water quality if washed into Carlingford Lough. The magnitude of the impact is considered to be moderate adverse and based on the matrix of environmental impact as present in Table 8.2 the impact is considered to be potentially **significant** to **profound** in the absence of mitigation.

8.2.3.2 Operation Phase Impacts

Habitat Loss
One of the contributing elements to the WFD status classification of a water body is the protected area status supported by that water body. Where the conservation status of the habitats and species for which a designation is considered to be unfavourable then the status must be assessed as less than good on the basis that it is failing to achieve the protected area objectives. On this basis the habitat loss assessment has been include in the consideration of the status of the Carlingford Lough Water Body

There will be a small area of habitat loss from development on the bed of Carlingford Lough at both Greencastle and Greenore. At Greencastle the design of the slipway has ensured that it will not impinge on the intertidal habitats in the Carlingford Lough SPA or ASSI; however, the slipway and walkway will be supported by tubular piles which will impinge directly on the SPA/ASSI resulting in loss of habitat as outlined in Figure 8.13.

At Greenore some of the slipway will impinge on the Carlingford Shore SAC boundary. However, almost all of this area has already been developed as part of the developed Greenore Port. Only a very small part of the Carlingford Shore SAC will be impacted by the slipway as outlined in Figure 8.14.

The benthic ecology report states that "*None of the Annex I habitats listed as occurring in the Carlingford Shore SAC nor any of the habitats of interest in the Carlingford Lough Area of Special Scientific Interest (ASSI 103) will be significantly adversely impacted by the construction or operation proposed piers or the operation of the proposed ferry route.*"

Given the relatively small scale of the proposal and the fact that it will not have a significant impact on any qualifying interests of the designations, having been assessed as negligible in the benthic ecology report, the potential impact is considered to be **negligible/imperceptible.**

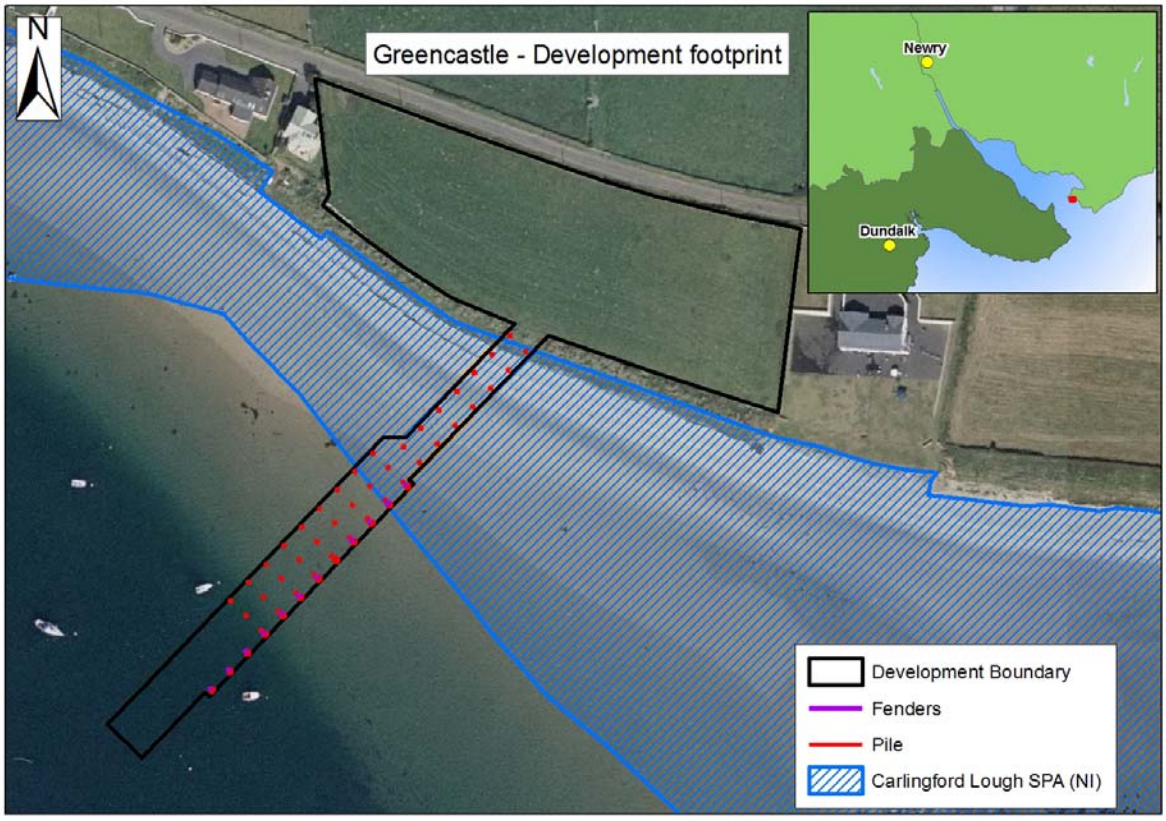

Figure 8.14: Approximate Development Footprint at Greencastle

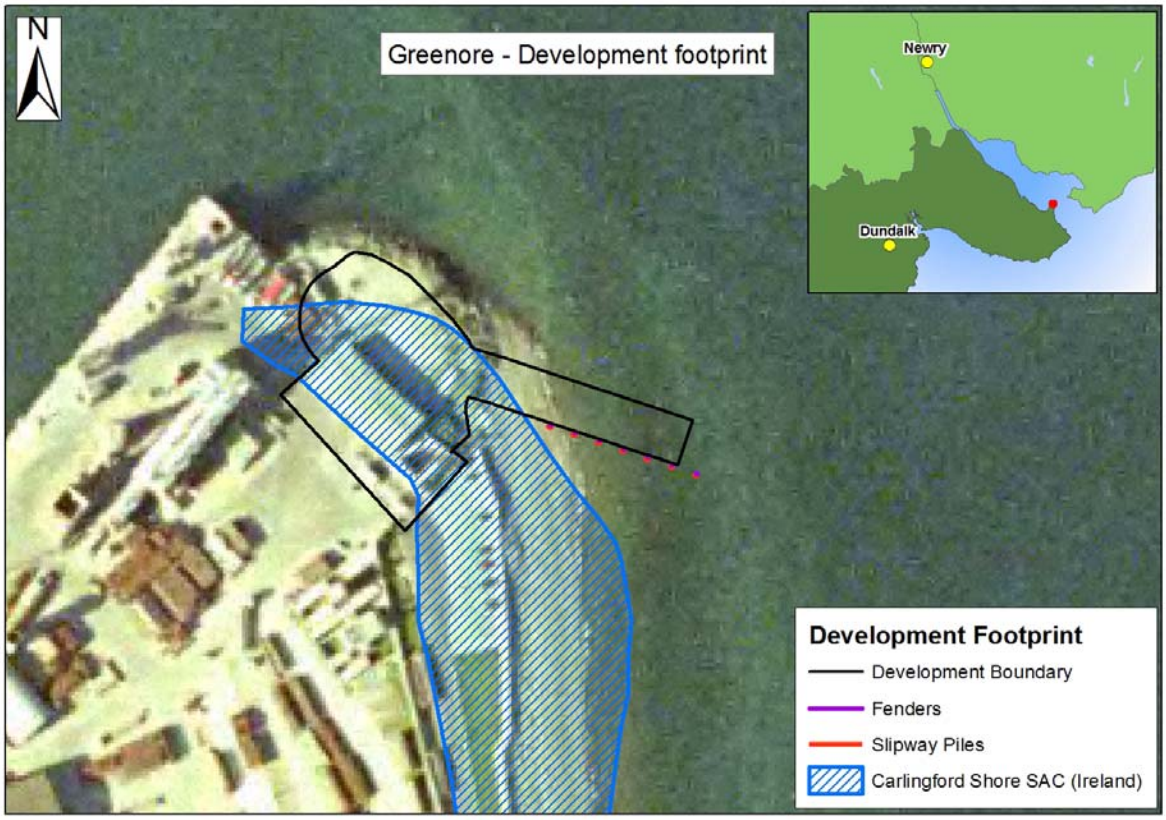

Figure 8.15: Approximate Development Footprint at Greenore

8.2.3.3 Marine morphology

Water bodies can be physically modified to provide beneficial human uses such as water supply, navigation, flood/coastal protection and transport. In the context of this development the slipways and pier structure will modify the coastline albeit over a small length of coastline. Such modifications can reduce the diversity of plant and animal communities either directly by affecting habitats or indirectly by changing natural processes.

In consideration of the impact of the modification of the coastline and intertidal area through the construction of the slipways and associated infrastructure the coastal processing and benthic ecology assessments have been reviewed.

In terms of the coastal processes modelling the conclusions from the tidal model indicate that changes in bathymetry had effects which were limited to the immediate vicinity of the development and did not alter the wider tidal flow pattern. The magnitude of these changes was seen to be typically ±0.07m/s in peak velocities. In the area surrounding the proposed developments very limited reduction in peak velocities are observed. These sites continued to be flushed and the tidal patterns remained largely unaltered. Similar conclusions are drawn for the wave climate and changes to the littoral current are mainly localised on the eastern shore and as such should not have an adverse impact on sediment transport around the ferry slipways due to the open nature of the proposed structures. It can therefore be concluded that the morphological changes resulting from the proposed development will not have a significant impact on the coastal processes and therefore will not indirectly impact the diversity of plant and animal communities.

In terms of direct impact the structure the benthic ecology report has concluded that:
"The loss of habitat associated with the berthing structures will be extremely small on the Greencastle side given that the proposed berth will be suspended on piles forming an open structure not unlike the existing Greencastle pier in broad design concept. This structure will allow free movement of water and sediment in all directions, with only the combined footprint of the piles constituting the loss of intertidal habitat. On the Greenore side while the structure will be significantly constructed between sheet pile walls, the size of the structure (in terms of footprint) is significantly smaller than the Greencastle structure and the habitats over which it is being built are extremely species poor. Taken within the context of the SPAs on both sides of the development, the significance of this amount of habitat loss can be described as negligible."

On this basis the morphological impact of the development in the context of the status of the Carlingford coastal water body can be considered as **negligible/imperceptible.**

8.2.3.4 Oil and Chemicals

There may be an increased the risk of pollution from oils, diesels or chemicals during the operation of the ferry terminals. This may arise from the vehicles using the ferry as well as directly from the ferry. If the vessel is being re-fuelled on site, any fuel spillages would potentially have adverse impacts on marine life in the area depending on the volumes released. Even small leaks and spills may have localised affects on the benthos near the berths.

Storage of chemicals or fuels and oils or on-site or activities such as re-fuelling has the potential to result in leaks or spillages which may reach Carlingford Lough. Given the relatively small scale of the proposal the magnitude of the impact is considered to be moderate adverse however the sensitivities of the receiving water mean that the environmental impact is potentially **significant to profound** in the absence of mitigation.

In terms of anti fouling agents the benthic ecology report concludes that "Given that the proposed ferry will be operating in an open well mixed waterway, with sediments in the area generally low in fines and therefore with a much reduced capacity to accumulate contaminants, the likelihood of significant adverse impacts arising from the vessel's antifouling coatings or local accumulations in sediments is considered to be **negligible**. However, this conclusion would not hold if the ferry were being treated on site with antifouling coatings or if old paint was being stripped from it at one of the births as part of the vessels maintenance.

8.2.3.5 Sewage and Storm Water

The installation of public toilet facilities at both sites will need to be efficiently treated and maintained to ensure minimal risk of sewage pollution to the waterbody. Storm water drainage and the possible discharge of contaminated surface water have also the potential to impact on the water quality of the Lough.

Given the relatively small scale of the proposal the magnitude of the impact is considered to be moderate adverse however the sensitivities of the receiving water mean that the environmental impact is potentially **significant to profound** in the absence of mitigation.

8.2.3.6 Cumulative Impacts

The impacts above have all been addressed both independently and with regards to any potential cumulative impacts resulting from potential interactions between the construction or operational phases of any ongoing developments, recently approved development and pre-application developments outlined in Chapter 3. Due to the small scale of the proposed Carlingford Ferry development and the distance from developments outlined in Chapter 3 no cumulative impacts on (the water environment) are predicted.

8.2.4 Mitigation

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 both slipways has been undertaken to result in least possible loss of habitat, particularly those designated under the Habitats Directive and Birds Directive, and disruption to the coastal processes has been minimised. The pier and slipway at Greencastle has been designed so that it is elevated above the existing beach and intertidal zone within the SPA. This design made use of piles, which result in a much lower loss of habitat and disruption to the coastal processes in comparison to direct construction of a pier and slipway in the intertidal area. At Greenore the design has been optimised to result in the least possible loss of SAC habitat and the slipway has been aligned with the natural beach gradient over the main tidal range resulting in minimal impedance of tidal flows.

8.2.4.1 Mitigation during construction

Construction Stage Environmental Management Plan
Prior to the commencement of construction a Construction Stage Environmental Management Plan (CEMP) will be prepared to assist the main contractor in preventing, managing and/or minimizing significant environmental impacts during the construction phase. In order to achieve this, the CEMP shall comprehensively incorporate all environmental commitments and provide a method of compliance with these.

The following shall be implemented as part of the CEMP:

- Preparation of an Emergency Response Plan detailing actions to be taken in the event of an accidental spillage of fuel, chemicals or other hazardous material. The Plan should also detail the procedures to be followed if there is a breach in any licence conditions or a non compliance. It will be important to ensure that the Environmental Manager is notified of all incidents where there has been a breach in agreement environmental management procedures;
- Works carried out adjacent to or in water pose a high risk of environmental damage. All works proposed Carlingford Lough should be subject to a detailed method statement, prepared under the CEMP;
- Procedures for environmental awareness training and in particular the implementation of the Emergency response Plan and Water Quality Management Plan. The Environmental Manger will generally be responsible for any induction training and environmental tool box talks;
- Preparation of a Water Quality Management Plan to ensure compliance with the relevant environmental quality standards This should include a detailed programme of monitoring;

- A protocol for regular communication with statutory agencies such as NIEA, NPWS, Loughs Agency and Louth County Council;
- A protocol for communication between site personnel, the engineer's representatives and third parties should also be established and managed by the Environmental Manager;
- Procedures should be identified 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.
- Surface water drainage and proposed discharge points should be mapped on a site plan which should also include the location of existing and proposed measures such as monitoring points, sediment traps, settlement lagoon and oil interceptors.

The potential for all types of pollution arising from the construction stage should be managed by implementation of Pollution Prevention Guidelines (PPGs). These should be included within Environmental Management Plans (EMPs) prepared by appropriate Environmental Manager for the project and ultimately, the appointed Main Contractor. They provide practical advice to avoid causing pollution, minimise waste and comply with the requirements of the law.

Within these PPGs a range of measures are applicable to this project. Those relating specifically to the issues raised are highlighted in this statement. In addition, guidelines provided by CIRIA "Control of Water Pollution from Construction Sites – Guide to Good Practice" should also be followed.
PPG 5 Works in, near or liable to affect watercourses is particularly relevant to this project and as such should be fully adhered to and incorporated into a Contractor's Environmental Management Plan.

Sediment Control
Sediment, including all soils, mud, clay, silt, sand etc, is the single main pollutant generated at construction sites and largely arises from the erosion of exposed soils by surface water runoff. The adoption of appropriate erosion and sediment controls during construction is essential to prevent sediment pollution.

Given the sensitivity of the receiving environment a sediment control plan should be prepared well in advance of work commencing on site.

Mitigation and control measures to address the impact from suspended sediments associated with construction activities should follow good work practices and sound design principals. Contractors shall establish contact with the relevant authorities, i.e. Loughs Agency, NPWS, NIEA and Louth County Council before works commence, with ongoing liaison throughout the construction. Contractors shall be familiar with the requirements of best practice and relevant guidelines including:

- Technical Guidance C648: Control of Water Pollution from Linear Construction Projects, (CIRIA, 2006)
- Technical Guidance C532: Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors (CIRIA, 2001);

Based on the guidance documents listed above the following measures will be used to mitigate the impact of suspended sediments to Carlingford Lough together with the associated habitats and species along the proposed scheme:

- Excess material stockpiles will be managed to prevent siltation of water bodies through run-off and overland flow during rainfall events. This will include the establishment of vegetation on exposed soil, and surrounding stockpiles with interception (cut-off) ditches to contain run-off;
- interception, channelling and/or discharge of surface water from sumps, excavations and exposed soil surfaces to silt traps or settlement lagoons;
- construction of silt traps, settlement lagoons / ponds, wetlands or hydrocarbon interceptors (either temporary or permanent) at sensitive outfalls at an early stage in the construction programme;
- construction of cut-off ditches and berms to prevent surface water run-off from entering excavations and the construction area;
- placing of granular materials over bare soil in the vicinity of watercourses in order to prevent erosion of fines and/or rutting by site traffic;
- All water bodies that occur in areas proposed for site compounds and storage facilities will be fenced off to a minimum distance of 5m. Appropriate sediment control measures will be

installed to ensure silt laden or contaminated surface runoff from the compound does not discharge directly to a water body;

- Tool Box talks shall be given by the Environmental Manager nominated under the EMP to all contractor's site personnel to inform them of the mitigation measures required to ensure protection and conservation the aquatic environment.
- Establish vegetation as soon as practical on all areas where soil has been exposed e.g. stockpiles for stripped topsoil;
- Temporary working areas will be required for access by construction plant on the beach on either side of the slipways. These areas will be subject to trafficking but given the likely plant loads, it is expected that timber mats may be required to support crawler tracks or vehicle wheels and reduce physical disturbance. Timber mats will be moved along the beach to suit the location of works as they progress. Upon completion of all works, the adjacent beach areas will be restored to their original condition by careful profiling by excavator and by raking sand to reinstate its surface texture.

Concrete

The use of concrete in close proximity to water bodies requires a great deal of care. Fresh concrete and cement are very alkaline and corrosive and can cause serious pollution in water bodies. It is essential to ensure that the use of wet concrete and cement in or close to any water body is carefully controlled so as to minimise the risk of any material entering the water, particularly from shuttered structures or the washing of equipment.

If on-site concrete production is proposed for those sections of the slipways above the high water mark, careful initial siting of concrete mixing facilities is vital. A settlement and recirculation system for water reuse should be considered. This will minimise the risk of pollution and reduce water usage. Washing out and cleaning of concrete batching plant or ready mix lorries should be carried out in a contained area as far from the water body as practical. Excess material should be left to settle and removed from site after it has set.

For the sections that are under water pre-cast units will be used for construction however the insitu stitching of these will be required. Where concrete is to be placed under water or in tidal conditions it will be designed to provide a cohesive mix to limit segregation and washout of fine material. This will normally be achieved by having either a higher than normal fines content, a higher cement content or the use of chemical admixtures.

Plant operating close to water shall be given special consideration in relation to the transport of concrete from the point of discharge from the truck-mixer to final discharge into the delivery pipe (tremie). Care should be exercised when slewing concrete skips or mobile concrete pump booms over open water.

Oils and Chemicals

The use of oils and chemicals on-site requires significant care and attention. It is important to ensure that the following procedures are followed to reduce the potential risk from oils and chemicals.

- Fuel, oil and chemical storage must be sited on an impervious base within a bund and secured. The base and bund walls must be impermeable to the material stored and of adequate capacity. Detailed guidelines concerning above ground oil storage tanks are available (PPG2 - Reference 5). Leaking or empty drums must be removed from the site immediately and disposed of via a registered waste disposal contractor.

- All valves and trigger guns should be protected from vandalism and unauthorised interference and should be turned off and securely locked when not in use. Any tanks or drums should be stored in a secure container or compound, which should be kept locked when not in use. Bowsers should be stored within site security compounds.

- The risk of spilling fuel is at its greatest during refuelling of plant. Where possible, refuel mobile plant in a designated area, preferably on an impermeable surface well away from any drains or water bodies. Keep a spill kit available and use a bunded bowser. Never leave a vehicle unattended during refuelling or jam open a delivery valve. Check hoses and valves regularly for signs of wear, and ensure that they are turned off and securely locked when not

in use. Diesel pumps and similar equipment should be placed on drip trays to collect minor spillages or leaks. These should be checked regularly and any accumulated oil removed for appropriate disposal

Contingency Planning
It is recommended that a suitable spill kit or absorbent materials are held in the vicinity and that an appropriate temporary bund is put in place. In the event of any spillage, the spilt material should be contained (using absorbents such as sand, soil or commercially available booms or pads) and the relevant Agency notified immediately.

A contingency plan for the works should also be prepared in accordance with *PPG 21 Pollution Incident Response Planning.* The Emergency Response Plan should detail actions to be taken in the event of an accidental spillage of fuel, chemicals or other hazardous material. The Plan should also detail the procedures to be followed if there is a breach in any licence conditions or a non compliance. It will be important to ensure that the Environmental Manager is notified of all incidents where there has been a breach in agreed environmental management procedures. Suitable training should be provided to relevant personnel detailed within the Emergency Response Plan to ensure that appropriate and timely actions will be taken should an incident occur.

In addition, *PPG 6 Working at demolition & construction sites* should be adhered to and incorporated in the Contractor's Environmental Management Plan particularly in relation to safe and secure on site storage and minimising storage time, wheel washing, placing of concrete and dealing with silty water.

Further measures to mitigate against chemical pollution during construction should include:

Fuel and Chemical Storage
Ensure:

- MSDS/COSHH documentation is available for all fuels/chemicals
- All storage containers will be labelled appropriately, including hazardous markings
- All bulk tanks will be of material appropriate for fuel/chemical storage
- All bulk tanks will be double-skinned or bunded to 110% of the maximum tank volume
- All bulk tanks will be located on impervious base
- Bunds will be to standard specified in *PPG 3 Above Ground Oil Storage Tanks*
- Barrels and IBCs will be stored internally where appropriate and always on drip-trays or sump pallets
- Appropriate spill kits will be available at all storage locations
- All fuel/chemical storage facilities will be subject to weekly inspection

Fuel and Chemical Delivery
Ensure:

- All deliveries will be authorised before entering site
- Vehicle drivers will report to designated Main Contractor personnel prior to delivery
- Vehicle driver will check storage container labelling and capacity prior to commencing delivery
- Vehicle driver will remain at delivery point until delivery process is completed
- Vehicle driver will report to designated Main Contractor personnel on completion of delivery
- Designated personnel will receive appropriate documentation and confirm integrity of storage container.

8.2.4.2 Mitigation during operation

Habitat Loss
The Benthic ecology report has established that the habitat loss associated with the developed is considered to be negligible. Indeed this loss will be partly offset by the increase in attached fauna and flora on the piled structures of both sets of berths, particularly those toward the middle and lower intertidal end of the new installations. The latter will represent a localised increase in biodiversity at both sites. No mitigation is required.

Marine Morphology
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 impact of the Carlingford Lough water body.

Oil and Chemicals
The key issues associated with the operation of the ferry terminals is associated with the risk of leaks or spillage of fuel, either during storage, transfer to the ferry or directly from the ferry. In addition care will be required during maintenance works, in order to ensure that adequate protection is given to Carlingford Lough water body. As a result the key mitigation measures proposed include:

- Adequate bunding for any fuel, oils or chemicals stored on-land in accordance with relevant PPGs and following the same guidance outlined for storage and refuelling during the construction phase;
- All hoses and couplings used for re-fuelling the ferry at Greenore and Greencastle will be of suitable recommended specifications in order to avoid hose breakages and spills/leaks through nozzles and couplings. All such equipment will be regularly inspected and maintained to prevent accidental spillages. Fuel storage tanks at Greencastle and Greenore piers will be adequately bunded and tamper-proof locked.
- Regular inspection of the condition of storage facilities and the ferry along with routine maintenance to ensure the risk of leaks is minimised;
- Ensuring any maintenance works are carried out following the most up-to-date and relevant best practice guidance available at that time.

Sewage and Storm Water
Provisions for the sewage and storm water requirements of the development are outline in Chapter 8.4. There will be no direct discharge to Carlingford Lough from either system but rather the effluent from the septic tank on the foul system and oil separator on the storm system will enter a percolation area.

Detailed percolation tests to inform the design of the treatment systems will be required, i.e. if inadequate percolation is available (and the national risk assessment carried out by the EPA to determine the potential risk from such systems indicated that the Greenore area may be at high risk then alternative proprietary systems will be required such as a reed bed system.

8.2.5 Residual Impact

Based on the impact assessment the impact of the proposed development on the Carlingford Lough coastal water body was considered to range from **negligible to significant/profound**.

However if the mitigation outlined in this section is fully implemented then the residual impact is considered to be **negligible**. In addition a WFD Assessment has been carried out (Appendix 8.5) and concluded that the proposed development will not compromise the achievement of the four main objectives of the WFD.

8.3 Flood Risk

8.3.1 Methodology

In Northern Ireland any proposed development adjacent to or within a floodplain requires a flood risk assessment to be undertaken in accordance with the requirements of Planning Policy Statement 15 (PPS15). For areas affected by fluvial flooding consideration of the 1% AEP (1 in 100 year) floodplain needs to be established and for coastal areas the 0.5 % AEP (1 in 200 year) event should be considered. In the case of Greencastle therefore consideration only needs to be given to the coastal flood risk and the 0.5 % AEP event.

In the Republic of Ireland a similar assessment will be required in accordance with the requirements of the Planning System and Flood Risk Management Guidelines. These have a slightly different approach in that consideration needs to be given to classifying the proposed development into 1 of 3 flood zones. Flood Zone A is all land affected by the 1 in 100/200 year flood event, Flood Zone B is all land between the 1 in 100/200 year event and 1 in 1000year event and Flood Zone C is all land beyond the predicted 1000 year flood extent. The guidelines then specify the various types of development that are compatible in each flood zone

8.3.2 Existing Environment

8.3.2.1 Fluvial Flooding

The potential for fluvial flooding at the application site is considered low as there are no fluvially dominated rivers in the vicinity.

8.3.2.2 Coastal flooding

Existing RPS models of Carlingford Lough have derived the extreme water levels shown in Table 8.6 at the proposed development site.

Table 8.6: Extreme Tidal Water Levels

Annual Exceedance Probability (AEP)	Return Period (years)	Water Level to OD (Malin)
0.5%	200	3.75m
0.1%	1000	3.97m

8.3.2.3 Climate Change

The UKCIP02 and the Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) Report (2007) sets out likely scenarios for sea level rise in around the UK. They take into account the effects of eustatic sea level rise, isostatic rebound, tectonic change and sediment consolidation. It states that the scenarios for sea level rise by the 2080s are between 23 and 36cm but a wider range of models reviewed by SNIFFER have produced a range between 9cm and 69cm. Based on this uncertainty, a level of 50cm, which is nearer the top of this range, would be a conservative estimate for the likely sea level rise by the year 2100 for Carlingford Lough. Table 8.7 therefore presents predicted flood levels for the year 2100.

Table 8.7: Predicted 2100 Tidal Flood Levels

Annual Exceedance Probability (AEP)	*Return Period (years)*	*Water Level Present Day (m OD)*	*Water Level 2100 (m OD)*
0.5%	200	2.73	3.23

The proposed development would therefore need to take account of the 2100 flood level when considering finished floor and development levels across the application site and the design of the piers and slipways.

8.3.3 Impact Assessment

8.3.3.1 Coastal Flooding

From the topographical information provided, the application site designated for the offices and car parking in Greencastle has current levels between 4m OD Malin and 6m OD Malin. This would therefore be considered outside the predicted 0.5% AEP floodplain and is therefore compatible with all types of development under the requirements of PPS 15. However mitigation measures to deal with the effects of climate change and in particular sea level rise may be required.

In relation to the Greenore site, levels range between 3.27m OD to 4.2m OD Malin, therefore in line with the planning policy and Flood Risk Management Guidelines the proposed development site would be considered as being within the following flood zones:

- partially within Flood Zone A - all land beneath 3.75m contour
- partially within Flood Zone B – all land between the 3.75m and 3.97m contour
- partially within Flood Zone C - all land above the 3.97m contour.

Flood Zone C is considered suitable for all types of development, Flood Zone B is generally suitable for all but the most vulnerable types of development and a ferry terminal would not fall within this category and Flood Zone A is only suitable for water compatible development or development which requires a water side location. Given that a ferry terminal obviously requires a water side location the proposed development would therefore be suitable for development within Flood Zone A. It should be noted that even though development may be suitable mitigation measures will still be required to provide a sufficient freeboard to proposed development and finished floor levels above the predicted extreme water levels including the effects sea level rise.

The proposed development consists of car parking, offices and a pier and slipways to facilitate the ferry. Given the flood risk described in the previous section it would be necessary to consider the impact of the predicted extreme water levels to the proposed development. Generally when considering finished floor and development levels in sites affected by coastal flooding both Rivers Agency (NI) and Louth County Council/OPW (RoI) require a freeboard of up to 600mm to be added to the predicted 0.5% AEP (200yr) flood level with an additional 500mm for the predicted effects of climate change on sea level rise.

This would equate to 1.1m added onto the present day 0.5% AEP (200yr) tidal flood level of 3.75m OD i.e. a proposed development or finished floor level of 4.85m OD. This requirement has to be balanced against the requirement to have a functional slipway and the fact that during events of this magnitude the ferry is unlikely to be operational therefore mitigating to this level can be overly conservative.

8.3.3.2 Potential for Flooding via the Storm Drainage Network

All storm drainage from the proposed developments will discharge, via an oil interceptor, to a percolation area and will not have a direct discharge to the Lough. Providing this is designed to the appropriate standards there should be no increase in flood risk associated with the proposed storm drainage system.

8.3.3.3 Potential for flooding from surface water flooding

In order for an application site to be at risk of surface water flooding it generally has to be located in a depression of low lying land and/or surrounded by an area of elevated land of sufficient area to produce substantial overland flow. In this case the land on both sides of the Lough is flat with no contributing area of elevated land and therefore the risk of surface water flooding would be considered low.

8.3.4 Mitigation Measures

8.3.4.1 Greencastle

Given the coastal flood risk as discussed above the following mitigation measures for the Greencastle site are recommended:

- Locate all offices and as much car parking as possible above the 4.85m OD contour.
- Consider the effects of the predicted coastal flood levels on the pier and slipways and mitigate as far as reasonably possible in the structural design.
- Consider the design water levels of 4.85m OD in the design of all storm drainage.

8.3.4.2 Greenore

In relation to the Greenore site, it will not be possible to raise the land to 4.85m OD as the proposed development needs to tie into the existing road network, which has levels in the vicinity of 4m. In addition should an event of this magnitude occur the ferry is unlikely to be operational and even if it was the access road would be flooded thereby preventing passengers from reaching the terminal. Therefore the main consideration should be the protection of key infrastructure which may be susceptible to the effects of flooding and the acceptance that car parking will flood during events of this magnitude. The following mitigation measures for the Greenore site are recommended:

- Locate offices or other key infrastructure which may have electrics or furnishings in areas above the 3.97m OD contour (i.e. within Flood Zone C) and if possible achieve the proposed finished floor level or protection to 4.85m OD level.
- Locate only car parking within flood Zone A and B
- Consider the effects of the predicted coastal flood levels on the pier and slipways and mitigate as far as reasonably possible in the structural design.
- Consider the design water levels of 4.85m OD in the design of all storm drainage.

8.3.5 Residual Impact and Compliance with Planning Policy

Providing the mitigation measures above are introduced to the design it is considered that, although the proposed development is technically within the 0.5% AEP floodplain and partially within Flood Zone A, it will still be compliant with Planning Policy Statement 15 and the Planning System and Flood Risk Management Guidelines. This is due to the fact that under both documents this type of development is considered as water compatible and therefore can be constructed within a floodplain providing consideration is given in the design to the effects of flooding and sea level rise on both property and life.

8.4 Drainage

8.4.1 Methodology

The purpose of this section is to identify the proposals for water sewerage and drainage infrastructure for the proposed facilities developments at both Greencastle and Greenore to allow operation of a vehicular ferry across the mouth of Carlingford Lough. It broadly assesses the implications of the proposed developments on any existing sewerage infrastructure and also considers the impact of the storm run-off arising from the scheme.

The key infrastructure issues in relation to drainage and sewerage of the proposed development site are fundamental to the planning and construction of the site as a whole. These key issues include:

- Water supply
- How the site may be serviced for foul sewerage discharges
- How the storm water runoff will be managed and discharged from the site

8.4.2 Existing Environment

8.4.2.1 Water Supply

As the proposed site at Greencastle is currently greenfield it does not have a water supply. However there is a Northern Ireland Water (NIW) watermain on the Greencastle Pier Road and it is envisaged that the development will be connected to this watermain to service the site.

The main requirement for water in the proposed development will be for the following:

- Water supply for small domestic use in the portacabin;
- Water supply may be used for firefighting - Water supply will be brought along the pier at Greencastle and fire hydrants provided as the vessels will be moored here overnight.

The existing port water facilities at Greenore are serviced by Louth County Council and it is envisaged that this service will be retained and extended to facilitate the development.

The main requirement for water in the proposed development will be for the following:

- Water supply for small domestic use in the portacabin;
- Water supply may be used for fire fighting.

8.4.2.2 Sewage and Storm Water Infrastructure

The proposed site at Greencastle is currently greenfield and therefore does not have any existing sewage or storm water infrastructure servicing the site.

Whilst the proposed site at Greenore is adjacent to the Port facilities it does not have any existing sewage or storm water infrastructure nor does it connect to the local network that exists in the vicinity.

8.4.3 Impact Assessment

8.4.3.1 Water Supply

It is expected that the existing NIW network at Greencastle will be capable of servicing the new development without causing any disruption to local homeowners' water supply. The existing network at Greenore is also expected to be capable of servicing the new development without causing any disruption to the village's water supply. The impact of the development on water supply is considered as negligible.

8.4.3.2 Sewage Infrastructure

Proposals for the development include one toilet in the respective portacabins located in the ferry terminal areas at Greencastle and Greenore hence a foul drainage system will need to be constructed at both locations to treat arising wastewater. Sewage effluent from the facilities could cause pollution of the groundwater through inadequate percolation areas. There is also a risk of pollution to surface water through overland flow and subsurface flow.

Given the scale of the facilities which are small in magnitude (1 toilet) and the sensitivity of the receiving environment, i.e. Carlingford Lough, the impact of the sewage discharges has the potential to be of moderate significance, particularly if the collection, treatment and disposal of the waste water are not dealt with in an appropriate manner.

8.4.3.3 Storm Water Infrastructure

Land raising, construction of hardstanding and the installation of drainage features will change existing drainage conditions permanently at both terminal sites; however, no significant impacts to groundwater flow would be anticipated as the land raising is minor and no significant earth works are proposed.

As the storm water systems will not be connected to the existing local public network, there will be no impact on the local waste water infrastructure from the storm water drainage.

The site at Greencastle is currently a greenfield site and proposals include construction of approximately 2,300m^2 hardstanding area for off-road queuing for the ferry. The site at Greenore is currently surfaced with stone which provides a natural drainage percolation system, however, this surfacing will also be replaced with hardstanding to accommodate off road queuing for the ferry. This will reduce the ability of both sites to naturally attenuate surface water and there is the potential for fuel and oil residues from the hard standing areas to discharge to Carlingford Lough.

Given the scale of the hardstanding areas and a change in land use type from Greenfield to ferry terminals the impact on the sensitive receiving environment in Carlingford Lough as detailed in earlier sections of this report is assessed to be of moderate significance.

8.4.4 Mitigation Measures

8.4.4.1 Sewage

Waste from the toilets at Greencastle and Greenore will be diverted though an underground septic tank of minimum capacity 3,800l (3.8m^3) and subsequently discharged to a percolation area through 100mm diameter smooth wall PVC pipes with perforations of 8mm diameter at 75mm centres employing a herringbone drainage network consisting of 2 sets of 6no tails each 6m in length. All percolation pipes are to be laid in trenches of minimum width 500mm and to be surrounded by 8-32mm washed gravel.

The septic tank must conform to BS 6297-1983 or EN 12566 Part 1 or 4 and EPA Code of Practice Section 7 and sited at least 15m away from building/ditch or drain. Prior to construction percolation tests must be completed in accordance with BS EN 752-4 1998, BS 6297-1983 and Klargester TDS0005 based on ground conditions at time of construction and number of persons served. Refer to engineering drawing IBM0358/102 and IBM0358/202 for full schematic layout.

During construction for both sites all foul waste will be tankered and disposed of appropriately off site. It is predicted that any construction impacts from storm water will be short term and minor. Suitable SUDS, taking account of proximity to sensitive waters, will be installed on site during construction in accordance with CIRIA guidance.

8.4.4.2 Surface Water Drainage

Surface levels at the Greencastle terminal have been designed to follow broadly the natural gradient of the ground towards the coastline where surface water will be collected through gullies. The proposed surface levels at Greenore broadly following existing levels. At both sites all surface drainage waters will be routed through Klargester or similar approved oil interceptors prior to discharge through a percolation area using herringbone drainage. No drainage outfalls to Carlingford Lough are proposed in these works.
The surface water drainage network, providing it is properly maintained and inspected, will lead to minimal impact on water quality in the Lough.

As the storm water systems will not be connected to the existing local public network, there will be no impact on the local waste water infrastructure from the storm water drainage.

8.5 References

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