Comhairle Contae Mhaigh Eo
Mayo County Council

OPW

River Deel (Crossmolina) Drainage Scheme

EIAR Addendum

July 2021

RYAN HANLEY

MKO Planning and Environmental Consultants

Client	**Office of Public Works**
Project Title	**River Deel (Crossmolina) Drainage Scheme – Environmental Services**
Report Title	**EIAR Addendum**

Rev.	Status	Author(s)	Reviewed By	Approved By	Issue Date
F	Final	P. Roberts K. Carney O. Cahill J. Reid	P. Roberts	M. Joyce	07/2021

TABLE OF CONTENTS

PREFACE

This document has been prepared in response to a request for supplementary information in relation to the EIAR for the River Deel (Crossmolina) Drainage Scheme. This request was received from the Department of Public Expenditure and Reform, who are responsible for the confirmation of the scheme under the Arterial Drainage Act, on the 18th May 2021.

A peer review of the EIAR was undertaken by Enviroguide Consulting Ltd. in May 2021 and a number of specific issues were raised that required clarification or the provision of supplementary information in order to facilitate the Competent Authority in the completion of the Environmental Impact Assessment of the scheme. Only the text that is included in the EIAR addendum and supersedes the text in the EIAR that was originally submitted is included in this document. Information on how the amended text and supplementary information address the issues raised in the peer review is provided in the RFI response document, which accompanies this addendum and should be read in conjunction.

The peer review documents included:

- Peer Review Document
- File Note and Recommendations

This EIAR addendum has been prepared to provide supplementary information and amendments to the EIAR to address all the points raised in the peer review.

The EIAR documents were not revised, instead all the necessary information is provided in amended EIAR text in this addendum document. It should be noted that the information contained in the addendum supersedes the equivalent information contained in the EIAR.

The addendum shows the revised EIAR text which provides the supplementary information required on a chapter by chapter basis and addresses each issue raised in the peer review document. Where required, the text from the original EIAR is provided in this addendum to provide context for text that has been revised to address the issues raised. Where this has been necessary, the text from the original EIAR is provided in Grey with the additional text provided in black.

Chapter 14 (Major Accidents and Natural Disasters) is an entirely new chapter that has been included following advice received during the Peer Review.

INTRODUCTION CHAPTER

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in relation to the Introduction Chapter and is to be read in conjunction with Chapter 1 of the River Deel (Crossmolina) Drainage Scheme EIAR. The peer review that was undertaken by Enviroguide Consulting recommended additions and revisions to Chapter One (Introduction) in the interests of clarity. These recommendations have been taken on board and details are provided below.

Statement of Authority

The Peer review document recommends that the names and qualifications of those who were involved in the preparation of the chapter be provided within each Chapter. It is noted that Chapter 1 of the EIAR provides these details in Table 1.2 but for convenience, the details of the contributor to this EIAR chapter and the addendum is provided below.

Pat Roberts

B.Sc. (Environmental Science) (2005) National University of Ireland, Galway

Member of Chartered Institute of Ecology and Environmental Management (CIEEM)

Pat is a Senior Ecologist and director of the Ecology team with MKO. with over 15 years' post graduate experience as a professional ecologist. Pat has worked as a senior ecologist on numerous OPW projects for over 10 years. These have included including flood relief schemes and drainage maintenance projects. Pats key strengths include his depth of knowledge and experience of a wide range of ecological and biodiversity topics. He currently manages the ecological team within MKO and ensures that the outputs from that team are of a very high standard and meet the requirements of the clients.

Pat was also responsible for the required revisions to the chapter that are provided in this addendum document.

1.4.1 General Structure

This EIAR uses the grouped structure method to describe the existing environment, the potential impacts of the proposed development thereon and the proposed mitigation measures and the residual impacts that remain thereafter. Background information relating to the proposed development, scoping and consultation undertaken and a description of the proposed development are presented in separate sections. The grouped format sections describe the methodologies followed and an assessment of the individual, cumulative and in combination impacts of the proposed development in terms of: population and human health; biodiversity; land, soils and water; air and climate, noise and vibration; landscape and visual; cultural heritage, and; material assets (including traffic and transportation), along with separate chapters presenting a consolidated version of all the mitigation from each of the chapters and an assessment of the interaction of the foregoing.

The EIAR also includes a non-technical summary, which is a condensed and easily comprehensible version of the EIAR document. The non-technical summary is laid out in a similar format to the main EIAR document and comprises a description of the proposed development followed by the existing environment, impacts and mitigation measures presented in the grouped format.

Table 1A shows the structure of the EIAR.

Chapter	Title	Content
1	Introduction	Chapter One first provides a brief description of the proposed development. It then sets out the legislative context, purpose and scope of EIA. Following this, it provides a comprehensive description of the Structure and content of the EIAR. This has been updated in this addendum to include a table describing the structure of the EIAR (Table 1.1). It then provides information on how the impacts are, described, quantified and assessed within the EIAR. Finally, the names of the staff that were involved in the production of the EIAR are provided along with their qualifications and the sections that they were responsible for.
2	Background	This chapter provides a brief overview of the physical characteristics of the site and surrounding lands, it then explains the need for the proposed development and sets out the planning context at various geographical scales. The chapter then outlines the scheme design process, the constraints study that was undertaken, the consideration of alternatives considered (As required under Article 5(d) of the EIA Directive (85/337/EEC)) (hereafter referred to as 'The Directive') and undertakes an assessment of the plans and projects that could result in a cumulative environmental impact when considered in combination with the proposed development. Following this, the chapter provides details of the scoping and consultation procedure undertaken in preparation of the EIAR including the public exhibition.
3	Description	This chapter provides a comprehensive description of all elements of the development. It describes the works associated with all phases of the proposed development including site preparation, construction, operation and ongoing maintenance. It provides a full description of the works methodologies to be employed and the nature of all elements of the development. It includes details of the mitigation and best practice to be employed and its appendices include the scheme drawings and a Construction Environmental Management Plan (CEMP)
4	Population and Human Health	This chapter covers the requirement for assessment on potentially significant effects to population and human health as required under Article 3(1)(a) of the Directive. The chapter first describes the receiving environment in terms of settlement, population, employment, land use and services. It then

Chapter	Title	Content
		discusses tourism in the area and human health and safety during all phases of the development. Following this, the chapter completes a comprehensive assessment of the potential impacts of the proposed development on Population and Human Health in all phases of the development.
5	Biodiversity	This chapter covers the requirement for assessment on potentially significant effects on Biodiversity as required under Article 3(1)(b) of the Directive. This chapter first describes the methods used to undertake the assessment and any limitations encountered. It then provides a comprehensive desk and field survey of the site study area. Following this, the chapter identifies key ecological receptors and completes a comprehensive impact assessment, which assesses the impact of all elements and phases of the proposed development on the identified Key Ecological Receptors and on Biodiversity in general.
6	Land Use, Soils and Geology	This chapter covers the requirement for assessment on potentially significant effects on land use, soils and geology as required under Article 3(1)(c) of the Directive. This chapter first describes the methodology used to undertake the assessment, it then assesses the impacts of the proposed development on land use, soils and geology.
7	Water	This chapter covers the requirement for assessment on potentially significant effects on water as required under Article 3(1)(c) of the Directive. This chapter provides details of the methodology followed when carrying out the assessment and any associated limitations. It then provides a comprehensive description of the baseline environment before undertaking a robust impact assessment.

Chapter	Title	Content
8	Air Quality & Climate/Noise & Vibration	This chapter covers the requirement for assessment on potentially significant effects on air quality/noise & vibration as required under Article 3(1)(c) of the Directive. This chapter provides details of the methodology followed when carrying out the assessment and any associated limitations. It then provides a comprehensive description of the baseline environment from a desk study and from available data before undertaking a robust impact assessment.
9	Landscape	This chapter covers the requirement for assessment on potentially significant effects on landscape as required under Article 3(1)(d) of the Directive. This chapter provides details of the methodology followed when carrying out the assessment and any associated limitations. It then provides a comprehensive description of the baseline environment before undertaking a robust impact assessment.
10	Cultural Heritage	This chapter covers the requirement for assessment on potentially significant effects on cultural heritage as required under Article 3(1)(d) of the Directive. This chapter provides details of the methodology followed when carrying out the assessment and any associated limitations. It then provides a comprehensive description of the baseline environment before undertaking a robust impact assessment.

Chapter	Title	Content
11	Material Assets	This chapter covers the requirement for assessment on potentially significant effects on material assets as required under Article 3(1)(d) of the Directive. This chapter provides a comprehensive description of the baseline environment before undertaking a robust impact assessment on the impact of all elements and phases of the development on material assets.
12	Schedule of Mitigation	Chapter 12 describes mitigation and monitoring as required under Article 5(1) in order to avoid, prevent, reduce, or if possible, offset any identified significant adverse effects on the environment and, where appropriate, describes any proposed monitoring arrangement.
13	Interaction of the foregoing	This chapter provides a description of how the various impacts identified interact with one another and how any such interaction has been identified and where necessary assessed in the EIAR.
14	Major Accidents & Natural Disasters	This chapter was included in the EIAR following recommendations made in the peer review document. It covers the requirement under Article 3(2) to include the expected effects deriving from the vulnerability of the proposed development to risks of major accidents and natural disasters. This risk was previously assessed in the material assets section of the EIAR. Note: this chapter would typically be included in advance of Chapter 13 but to avoid confusion by renumbering the existing EIAR chapters, it has been included as a new chapter 14.

Table 1A. Structure of EIAR

The EIAR chapters 1, 2 & 3 are concerned with providing an introduction, background and description of the proposed development and do not undertake an impact assessment. The

remaining chapters (with the exception of Ch.12, schedule of mitigation and Ch.13 interaction of the foregoing) all undertake an impact assessment and whilst the subjects considered vary greatly and the format of each may also vary to reflect this, they all follow a similar methodology and include certain necessary elements that are fundamental in providing a robust assessment.

The aspects of the methodology that are common to the assessment in all chapters are provided in Table 1B below.

Aspect	Content
Introduction	All assessment chapters provide an introduction, which clearly sets out what the chapter is assessing, how it is structured and what is included. Following recommendation in the peer review documents, the chapters in the EIAR addendum now contain a statement of authority with respect to the contributors to each chapter.
Methodology	Each chapter contains a description of the methods followed in undertaking the assessment, including the methods for any desk and field surveys. The methodology section of each chapter also highlights any limitations or difficulties encountered when carrying out the assessment.
Description of the Baseline or Receiving Environment	Each chapter describes the existing or baseline environment as it is exists in the absence of the proposed development. This provides the context in which any impacts will occur and enables the evaluation of any potential receptors
Impact Assessment	The potential direct and indirect impacts of the proposed development on the identified receptors are assessed in this section. The Impacts are classified in accordance with the relevant EPA document 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports – Draft August 2017' (EPA, 2017). Impacts are considered according to their quality, type, significance, extent and context, probability, duration and frequency. Where significant impacts are identified, the requirement for mitigation is identified. The 'Do Nothing' Scenario is also assessed – where an assessment is made of the likely effect of not proceeding with the proposed development.
Avoidance, Mitigation and Monitoring	Where significant effects are identified in the impact assessment, avoidance or mitigation measures are implemented to avoid (where possible) significant residual impacts. Avoidance measures are those which are considered in the design stage and implemented to avoid potential impacts before they occur. Mitigation measures mitigate for impacts that will unavoidably occur but will not be significant following their implementation. Measures may be employed to result in net positive impacts. Monitoring of the effectiveness of any mitigation is also prescribed.

Aspect	Content
Residual Impact Assessment	Following the implementation of mitigation or avoidance measures, a further impact assessment is undertaken to assess the residual impact of the proposed development on the identified receptors.
Cumulative Impact Assessment	This assessment considers the potential effect that the proposed development may have on the identified receptors when considered cumulatively with other chapters and in combination with other plans and projects.
Conclusion	This summarises the findings of the assessment and concludes the chapter

Table 1.B Methodology Employed to Produce each EIAR Chapter

BACKGROUND CHAPTER

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in relation to the Background Chapter and is to be read in conjunction with Chapter 2 of the River Deel (Crossmolina) Drainage Scheme EIAR. The peer review that was undertaken by Enviroguide Consulting recommended additions and revisions to Chapter Two (Background). Where practical, these recommendations have been taken on board and details are provided below.

The Peer review document recommends that the names and qualifications of those who were involved in the preparation of the chapter be provided within each Chapter. It is noted that Chapter 1 of the EIAR provides these details in Table 1.2 but for convenience, the details of the contributor to this EIAR chapter and the addendum is provided below.

Pat Roberts

B.Sc. (Environmental Science) (2005) National University of Ireland, Galway

Member of Chartered Institute of Ecology and Environmental Management (CIEEM)

Pat is a Senior Ecologist and director of the Ecology team with MKO. with over 15 years' post graduate experience as a professional ecologist. Pat has worked as a senior ecologist on numerous OPW projects for over 10 years. These have included including flood relief schemes and drainage maintenance projects. Pats key strengths include his depth of knowledge and experience of a wide range of ecological and biodiversity topics. He currently manages the ecological team within MKO and ensures that the outputs from that team are of a very high standard and meet the requirements of the clients.

Pat was also responsible for the required revisions to the chapter that are provided in this addendum document.

2.1 Introduction

The proposed flood protection measures are located to the south of Crossmolina town, in Co. Mayo. The area includes parts of the townland of Cartrongilbert, where the River Deel flows adjacent to a local road. The proposed channel to be constructed extends eastwards through agricultural land, and southwards to the townland of Mullenmore North with washlands extending eastwards as far as the shores of Lough Conn. A site location map is presented in Figure 2.1and a Site Layout Map is provided in Figure 2.2.

The project is located in the rural environs of Crossmolina with a population density that is generally low, and in proximity to wetland on the shores of Lough Conn. The Grid Reference co-ordinates for the approximate centre of the catchment study area are (E 114245, N 316446). The land within and around the site boundary is gently undulating to the west, in the region of the proposed spillway and in between this and the Regional Road R315. To the west and southwest of this, the land becomes flatter as it nears the shores of Lough Conn.

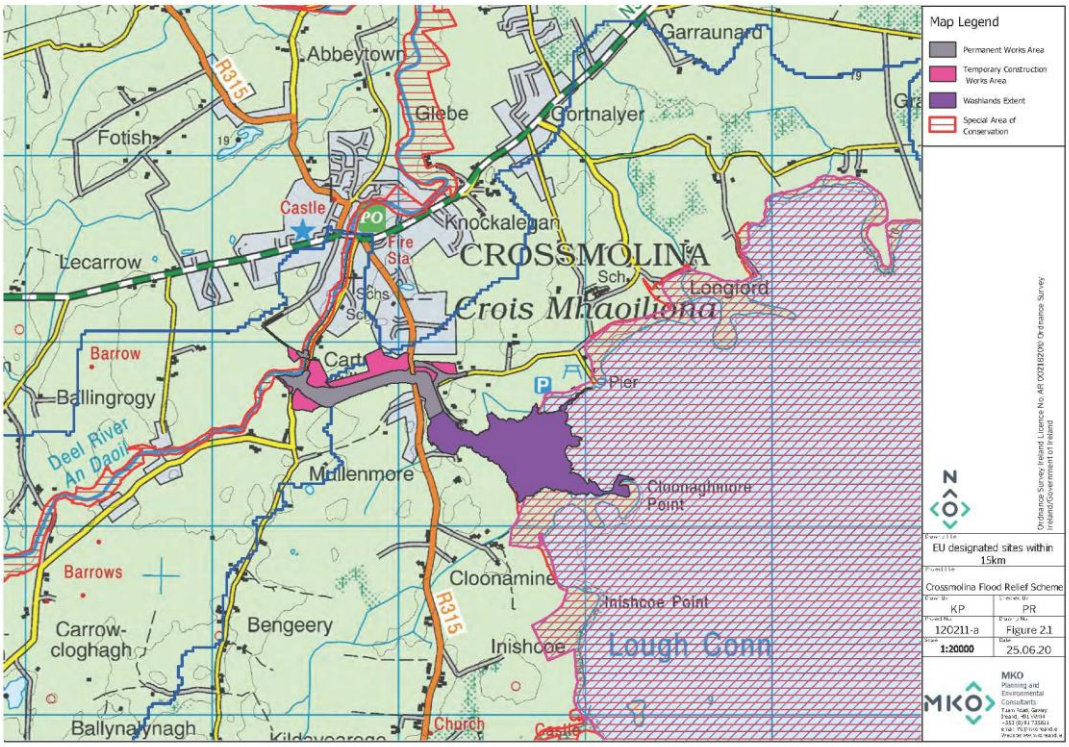


Figure 2.1 – Site Location

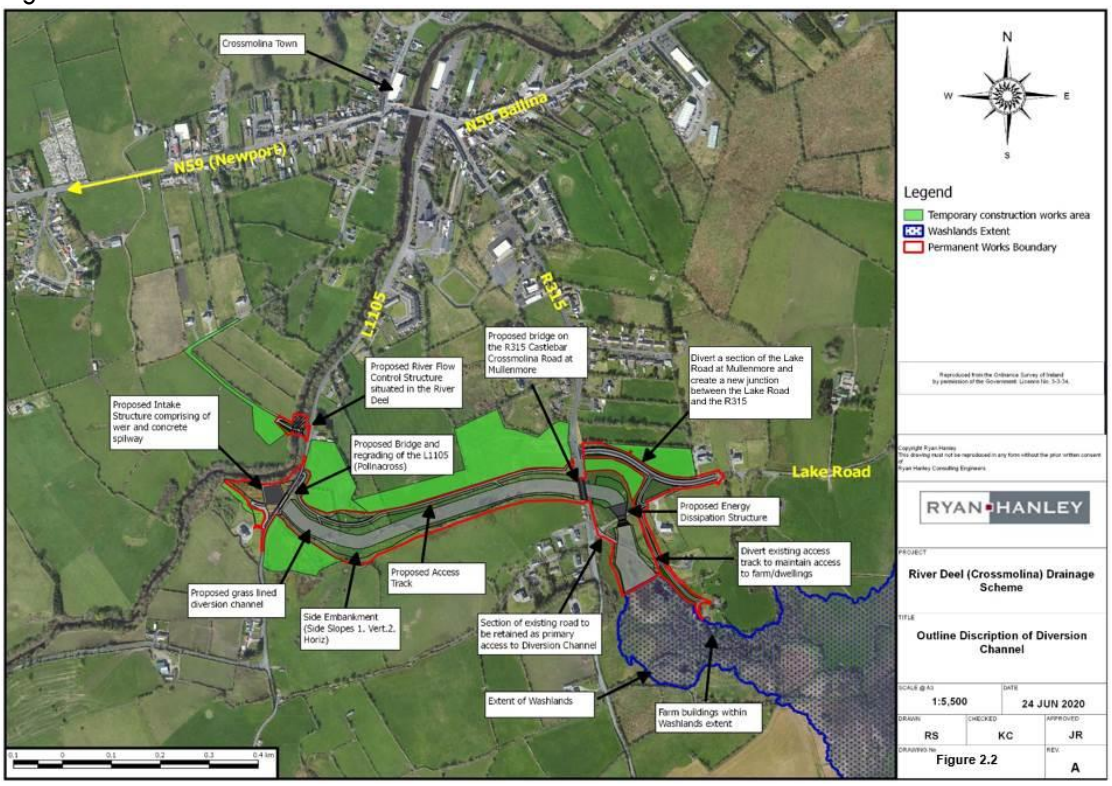


Figure 2.2 – Site Layout

2.3.1 National Level

National Flood Policy

The Office of Public Works has the main responsibility for devising and implementing measures to deal with flooding. This responsibility is assigned by Government Decision S 28507 of 7 March 1995. In addition, the Arterial Drainage (Amendment) Act, 1995 affords responsibility to the OPW for undertaking local flood relief work schemes.

The National Flood Policy that was adopted by Government in 2004 identified OPW as the lead agency in coordinating the management of flood risk in the State. The Policy introduced a shift away from solely structural to non-structural measures to protect against flooding. The report prepared by the Flood Management Review Group outlined that future Flood Management policy in Ireland would be:

> *'to minimise the national level of exposure to flood damages through the identification and management of existing, and particularly potential future, flood risks in an integrated, proactive and river basin based manner'.*

It encompasses a series of measures regarding sustainable flood prevention, protection and mitigation. An implementation plan of work programmes and associated resources that would be required to put the new policy into effect was developed by OPW.

In November 2007 the EU Floods Directive (Directive on the Assessment and Management of Flood Risks - 2007/60/EC) came into effect. The existing national Flood Policy described above is in line with the Directive.

2.3.1.1 Climate Action Plan 2019

Section 16.2 of this plan states:

> *'Effective climate adaptation can minimise risks and costs and also protect lives and property by building resilience into existing systems. This can ultimately help minimise the emergency response that is necessary in response to severe weather events. Work undertaken in the area of flood risk management to date is a good illustration of this principle. Flood risk prevention strategies often make use of assessments of long-term changes in flood intensity and frequency based on climate projections. This can build long term resilience into flood defences to cope with conditions that may arise in the future.'*

The proposed development not only meets the current design objectives of the project but also provides protection against future potential higher flood levels that may occur as a result of climate change.

2.3.1.2 Flood Risk Management - Climate Change Sectoral Adaption Plan

The Climate Action Plan 2019 describes the National Adaption Framework (NAF) This framework identifies 12 key sectors where Sectoral Adaption Plans (SAP) are to be submitted. One of these is Flood Risk Management and the lead Department for this plan is the OPW. The Flood Risk Management SAP that was prepared by the OPW includes the following Objective/Action:

> *2.B The Brief for the detailed development of flood relief schemes to include a requirement for a Scheme Adaptation Plan that will set out how climate change has been taken into account during the design and construction, and what adaptation measures might be needed and when into the future.*

The proposed development not only meets the current design objectives of the project but also provides protection against future potential higher flood levels that may occur as a result of climate change.

2.3.1.3 River Basin Management Plan for Ireland 2018 -2021

The Environmental Objectives and Priorities of the plan include the following:

- Ensure full compliance with relevant EU legislation
- Prevent deterioration
- Meet the objectives for designated protected areas
- Protect high-status waters

The proposed development has been specifically designed to comply with all relevant EU Legislation, to protect the high status waters in which it is situated and not to cause their deterioration whilst still achieving the aims of the project in respect of flood relief. The NIS that is prepared in support of this application ensures that a Habitats Directive Assessment can be facilitated and the objectives of European Designated Protected Areas will not be obstructed.

2.3.1.4 Consideration of the Circular Economy

The proposed development has been designed in line with the objectives of the EU Circular Economy Action Plan, which was adopted in March 2020. The Action Plan encourages sustainable consumption and aims to ensure that waste is prevented and the resources used are kept in the EU economy for as long as possible. The proposed development has been designed to reuse excavated material where possible. It will be classified as a construction by-product in the context of Article 27 of the European Communities (Waste Directive) Regulations. The construction phase of the development will provide for a dedicated waste storage area for any construction waste generated. All waste will be segregated and skips or bays will be provided for recyclable material. The management and appropriate classification of waste materials generated by the proposed development is described in Section 11.4 of the EIAR and demonstrates a commitment to sustainable use of resources, minimisation of waste and promotion of recycling.

The development not only considers the sustainable use of resources during operation but also follows a similarly sustainable approach during the long term/permanent operational phase of the development. An example of this approach is evident in the proposed management of gravels that may from time to time accumulate in the river channel upstream of the river flow control structure. These gravels will be made available to Inland Fisheries Ireland (IFI) for use in river enhancement projects that they might be undertaking within the catchment. This ensures that no such material is lost to the catchment or wasted, but is used in a sustainable manner that considers the circular economy.

DESCRIPTION OF THE PROPOSED DEVELOPMENT

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in relation to the description of the proposed Scheme and is to be read in conjunction with Chapter 3 of the River Deel (Crossmolina) Drainage Scheme EIAR.

The following supplementary information pertaining to Chapter 3 of the EIAR was requested by the Department of Public Expenditure and Reform on 18th May 2021 and is provided in this section of the EIAR Addendum:

> *"Address the following in Chapter 3: the extent and location of the bank protection should be detailed."*

The request for supplementary information and general comments in relation to Chapter 3 of the EIAR have been addressed in the subsequent sections of this Chapter.

Unless otherwise specified, any text provided below supersedes the text provided in the relevant section of the EIAR. In some instances, it has been necessary to reproduce text from the original EIAR. This text is shown in grey for ease of reference.

Statement of Authority

Details of the contributors to this chapter of the EIAR are provided below.

Dr. Kathryn Carney

BE (Hons), Bachelor of Engineering (Civil), National University of Ireland Galway (2008)

PhD Civil Engineering, National University of Ireland Galway (2012)

MIEI –Member of Engineers Ireland

Kathryn is a civil engineer with 8 years' post graduate experience in the field of civil and environmental engineering. Kathryn contributed to Chapter 3 of the EIAR and EIAR Addendum.

Jonathan Reid

BE (Hons) Bachelor of Engineering (Civil), National University of Ireland, Galway, (2003)

CEng, Chartered Engineer

MIEI, Member of Engineers Ireland

MIAHS, Member of the International Association of Hydrological Sciences

Jonathan has 17 years' experience in the management, design, planning and development of major civil engineering projects, including flood relief schemes. Jonathan has led Ryan Hanley's team in the preparation of EISs (and EIARs) on several flood schemes including the Lower Lee (Cork City), Blackpool (Cork), and Bandon. Jonathan contributed to Chapter 3 of the EIAR and EIAR Addendum.

Sinead Gavin

BSc Environmental Biology, Staffordshire University (2000)

MSc Environmental Resource Management, University College Dublin (2005)

CEcol, MCIEEM Chartered Ecologist and Member of Institute of Ecology and Environmental Management

Sinead has 13 years' experience as an environmental scientist and ecologist. She has undertaken environmental assessments for a wide range of large and small-scale infrastructural projects. Sinead has been responsible for the management and writing of a number of EISs/ EIARs, Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) (Screenings and Natura Impact Statements) for development of schemes close to and within Natura 2000 sites (SAC/SPA). Sinead has been involved in Oral hearings for road schemes, been responsible for the management of expert witnesses and acted as expert witness for EIS/EIA Reports. Sinead contributed to Chapter 3 of the EIAR.

Kathy and Jonathan were also responsible for the required revisions to the chapter that are provided in this addendum document.

3.1.3 Intake Structure

It will be necessary to construct a new intake weir to convey flood flows from the River Deel to the diversion channel and onwards to the washlands and Lough Conn. The location of the weir has been chosen so that any impact on the hydraulics of the river at the weir location is minimised up to bank full flow. This intake structure will be of reinforced concrete construction and will consist of various elements, including:

- A reinforced concrete spillway enclosed on four sides by a reinforced concrete retaining wall. The fifth open side will connect the spillway with the invert of the channel under the L1105 Pollnacross Bridge, which in turn opens up to the grass lined diversion channel downstream. The invert level of the spillway will be 16.5m O.D. at the bridge, rising locally adjacent to the weir.
- The reinforced concrete wall running along the river bank will incorporate the following elements:
    - An adjustable steel plate will be fixed to a 70m long section of intake weir (Two 35m lengths at right angles to each other). This will allow for adjustments in the weir level following construction of the Scheme and recalibration of the hydraulic model. The weir crest level will initially be set at 19.4 m O.D.
    - A narrow slot (c. 500 mm wide) will be cut into the weir at the point where the two 35m lengths of weir meet. This will allow flow to enter the channel before the weir overtops in order to provide an early warning of an overflow event.
- Safety fencing will be installed along the top of the reinforced concrete walls to prevent people or objects falling.
- A 4m wide access track will provide vehicular access to the river bank side of the intake structure for maintenance purposes.
- Rock armour/ stone gabions will be placed in order to provide scour protection to the river banks upstream and downstream of the intake location as detailed in Appendix 3A (Drawings L_01 and S_01) and Appendix 3D (Drawing SP_01).

3.3.2. Intake Structure

The construction of the intake structure will be carried out as follows:

- Isolation of works area, including erection of fencing and traffic management where required. The entire boundary of the works area with the River Deel will be fenced off

with a triple silt fence as shown on Construction Sequence Drawing: Stage 5 (Appendix 3B). A solid wall of sealed double bagged sand or soil bags will be constructed inside the silt fences to create a solid barrier between the works area and the river. All bankside works will be undertaken at times of good weather and low flow in the River where there is no potential for the works area to become inundated with water. A 2.4m high hoarding will be erected to mitigate noise impacts during the construction phase.

- Topsoil will be stripped as necessary to prepare the foundation of the intake structure and spillway. Topsoil will be stockpiled for reuse within the works area or stored for reuse in the dedicated site compound which is protected with silt fences. Where soil is to be stored for an extended period of time, it will be sown with grass seed to prevent any windblow or water erosion and subsequent run-off. Excavated material will be reused where possible, classified as a construction by-product in the context of Article 27 of the European Communities (Waste Directive) Regulations. Where it is not required for re-use, it will be removed by a licenced waste contractor.

- Excavation for foundations, blinding of formation, fixing of reinforcement, placing of formwork, placing of concrete, and stripping of formwork: Following detailed site investigation, it is not anticipated that rock breaking will be required during excavation. All formwork and fixing of reinforcement will be located within the defined works area. Formwork will be sealed to prevent any leakage of concrete during pours and will be constructed with sufficient capacity to prevent overspills. Concrete will not be poured at times when heavy rain is predicted in order to prevent potential run off and overspill from the formwork. Concrete works will be programmed to avoid water levels that may cause inundation of the works area in order to avoid potential water contamination. Should any ingress of water (ground or rain) occur prior to a concrete pour, waters will be pumped to ground to a discharge point (as described in section 3.3.1).

- Alarmed Sondes will be employed to measure turbidity in the River Deel upstream and downstream of the works area from Scheme confirmation and throughout construction of the intake structure. If there is a 5% difference between the NTU value recorded in the upstream and downstream Sondes and where NTU is above the average baseline conditions (likely to be approximately 10 NTU based on recorded data within the River Deel), all works will cease immediately until the source of the increased turbidity is identified and rectified (if caused by the construction works). If the increase in turbidity is clearly not attributed to the construction works, the works will proceed.

- Construction vehicles will work from hardstanding areas to avoid the generation of mud within the works area. Temporary hardstanding will be constructed of clean shone behind the proposed retaining wall and all machinery will work from this area.

- Wash out of concrete truck chutes will be carried out at a designated wash out tank located in the site compound, if required.

- Reinstatement of area: Soil will be placed on top of stone gabions at the upstream and downstream ends of the intake structure and taller native vegetation such as Hazel and Hawthorn will be planted in these areas.

- If in the unlikely event during construction works, it is considered that there is a possibility of flood water passing underneath the intake structure foundations, either sheet piles or grouting techniques will be required to provide a cut-off. The sheet piles may be metal or plastic and would be driven to the required depth using a piling hammer or similar. Monitoring of noise and vibration during critical periods at sensitive locations and along the river bed will be carried out as set out in Chapter 8, Section 8.5. Vibration levels will be limited to the levels set out in NRA, 2004.

3.3.3. River Flow Control Structure

The construction of the river flow control structure is to be carried out as follows:

- Isolation of the works area, including erection of fencing and site clearance. The fenced area will include the full area required to facilitate the works including an access road from the Boreen to the river bank at the location of the river flow control structure, the temporary site compound and temporary works areas as shown in Drawing AR_03 (Appendix 3A). A 2.4m high hoarding will be erected to mitigate noise impacts during the construction phase.

- Site preparation on the banks will require isolation of the works area outside channel, including erection of fencing. A triple silt fence will be constructed at all interfaces of the works area with the River Deel and the SAC in advance of construction works in the terrestrial works area. These works will be carried out at times of good weather and low flow in the river where there is no potential for significant volumes of surface water runoff from the works area or inundation with flood waters.

- Instream works are to be carried out when the river runs dry or at low flow if this is not possible. Prior to commencement of instream works, a number of surveys will be carried out, the details of which are presented in Chapter 5, Section 5.5.6. The instream works area will be constructed by lifting 1 tonne sealed double bagged bags of sand into the river to create a horseshoe cofferdam that will enclose no more than half the river at any one time to allow for the passage of fish if the river is not dry. If the works are undertaken at low flow, the area within the cofferdam will be electro fished under licence from the IFI which will be obtained in advance of dewatering the area. If dewatering is required, waters will be pumped to a designated discharge point (as described in section 3.3.1) that is located over 30m away from the River Deel.

- Cobbles, stones and boulders will be removed from the instream works area as required and stored within the terrestrial works area.

- The base for the river flow control structure will be excavated to foundation level and constructed using the best practice requirements for the use of concrete. All formwork and fixing of reinforcement will be located within the defined works area. Formwork will be sealed to prevent any leakage of concrete during pours and will be constructed with sufficient capacity to prevent overspills. Concrete will not be poured at times when rain is predicted in order to prevent potential run off and overspill from the formwork. Concrete works will be programmed to avoid high water levels in the River Deel that may cause inundation of the works area in order to avoid potential water contamination.

- Alarmed Sondes will be employed to measure turbidity in the River Deel upstream and downstream of the works area from confirmation of the Scheme and throughout construction of the river flow control structure. If there is a 5% difference between the NTU value recorded in the upstream and downstream Sondes and where NTU is above the average baseline conditions (likely to be approximately 10 NTU based on recorded data within the River Deel), all works will cease immediately until the source of the increased turbidity is identified and rectified (if caused by the construction works). If the increase in turbidity is clearly not attributed to the construction works, the works will proceed.
- Construction vehicles will work from hardstanding areas to avoid the generation of mud within the works area. Wash out of concrete truck chutes will be carried out at a designated wash out tank located in the site compound if required.
- Scour protection will be placed on the channel bed in the form of rip-rap.
- The timing for construction of the river flow control structure is dependent on periods when the river runs dry or there is low flow in the river and outside of the sensitive period for spawning fish in the River Deel. As such, it may be beneficial to construct the base for the river flow control structure at the earliest suitable opportunity and install the culverts when construction of the diversion channel has been completed. In this case, the base for the river flow control structure will be constructed as outline above and the gravels and cobbles will be replaced in the river until further works are carried out to complete the construction of the structure.
- A crane will be set up within the terrestrial works area to the east of the river flow control structure and the culverts will be lifted into place from the L1105. A temporary closure of the L1105 will be required to facilitate these works and traffic management and a diversion will be put in place. The precast reinforced concrete culverts will be installed at a level below the existing bed of the river and the gravels and cobbles will be replaced. The culverts installed in the initial phase of the works will be set at a lower invert than the subsequent phase to allow any flows that may be in the river at the time of the works to be directed through the recently constructed culvert, whilst the second half of the river is cofferdammed and the culverts installed in that section. Installation of adjustable steel plates, flood defence parapet, edge beam, access deck and safety rails will be carried out following installation of all culverts.
- Excavation for retaining wall foundations, blinding of formation, fixing of reinforcement, placing of formwork, placing of concrete, and stripping of formwork will be carried out for the construction of wing walls on both banks of the river. The walls will be constructed in accordance with the best practice requirements for the use of concrete as described above.
- The terrestrial area will be reinstated by re-seeding with native grass and planting of native tree species on the banks.

3.7 Cumulation with Other Proposed Projects

Table 3.1 provides a summary of projects and programmes in the local area which were considered in combination with the proposed Scheme to determine the potential for cumulative or in-combination effects on the environment. Further details are provided in Chapter 2, Section 2.8 of the EIAR.

Plans and Projects	Description
Ongoing Programmes on the River Deel	• OPW drainage maintenance programme, which includes the River Deel up as far as the Jack Garrett Bridge in Crossmolina. OPW complete drainage maintenance operations on the lower reaches of the River Deel as part of their obligation under the 1945 Arterial Drainage Act. These works are undertaken following the OPW's Drainage Maintenance & Construction Environmental Guidance (2019). Additional works such as vegetation and gravel berm removal are from time to time undertaken. Any such works have been considered in this cumulative impact assessment. • OPW/IFI/Mayo County Council, Japanese Knotweed eradication programme. The ongoing management of invasive species has been considered in this cumulative impact assessment.
Plans/Projects Identified in the Mayo County Council Planning Register	• Permission to construct new dwelling house, garage, waste water treatment system and all associated site works (Planning Ref: 15227). • Permission to retain a dwelling house, domestic shed and retain and upgrade proprietary effluent treatment system (Planning Ref: 1684). • Permission to construct a new vehicular and pedestrian entrance, roadway and carpark and all ancillary works to the existing cemetery (Planning Ref: 18789). • Permission to construct a single storey ASD unit extension to existing school building comprising of classrooms and ancillary accommodation together with alterations to existing building and site works (Planning Ref: 17869). • Permission for the retention of existing dwelling house and shed to the rear including retention of boundaries and all other associated works/services (Planning Ref: 17821). • Permission to construct dwelling house incorporating a basement with connections to public sewer and public water main including all other ancillary site works and services (Planning Ref: 16324). • Permission to construct a single storey extension within the school site, the block will include 5 no. classrooms, sanitary facilities, storage and circulation of approx. 443 sqm gross floor area in total. the development will also include an extension to existing car park and all associated siteworks and connections to existing services (Planning Ref: 15670). • Permission for the extension to existing school building, comprising of 1 no. classroom and 3 no. special education tuition rooms, including all associated development works and services. (Planning Ref: 19814) • Permission for the extension to the existing school building, comprising 1. no staff room and minor alterations to existing storage room including all associated development works and services (Planning Ref: 19953) • Permission for the extension to the existing school building, comprising of a new classroom and a new staff room facility, including all associated development works and services (Planning Ref:19117).

	• Permission to construct dwelling house incorporating garage and septic tank with percolation area including all other ancillary site work and services (Planning Ref: 18545).
Other Plans/ Projects	• Bord Na Mona Bog Rehabilitation Plan (Shanvolahan sub-catchment) • Coillte Forestry; Tristia & Shannettra

Table 3.1 - Projects and Programmes

POPULATION & HUMAN HEALTH CHAPTER

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in relation to the population and Human Health Chapter and is to be read in conjunction with Chapter 4 of the River Deel (Crossmolina) Drainage Scheme EIAR.

Statement of Authority

The Peer review document recommends that the names and qualifications of those who were involved in the preparation of the chapter be provided within each Chapter. It is noted that Chapter 1 of the EIAR provides these details in Table 1.2 but for convenience, the details of the contributor to this EIAR chapter and the addendum is provided below.

Owen Cahill

B.Sc. (Hons) Construction Management, Galway Mayo Institute of Technology (2004).

M.Sc. Construction Management, Galway Mayo Institute of Technology (2007).

MSc. in Environmental Engineering at Queens University, Belfast in 2010.

Owen is an Environmental Engineer with MKO, with over 11 years of experience in the Environmental Management and Construction Industries. Owen's wide ranging multi sector experience has provided him with specialist knowledge and understanding of the challenges in the planning and delivery of developments with the minimum environmental impact and with practicality and constructability in mind.

Owen has been involved as a Project Manager on a range of energy infrastructure, commercial, residential, waste facility and quarry projects as well as managing the licensing requirements of a number of EPA licensed facilities.

Owen was also responsible for the required revisions to the chapter that are provided in this addendum document.

Summary of Impacts Table

The peer review document recommends that all of the potential impacts, including their likelihood and potential impact be summarised in a table at the conclusion of the Chapter which would also include mitigation measures and residual impacts.

Table 4.1. is provided below and summarises the impact assessment conclusions associated with construction phase of the proposed development relating to the Population & Human Health Chapter of the EIAR. Table 4.2 provides a similar table that relates to the operational phase.

Impact	Impact Characteristic			Mitigation	Residual Impact Significance
	Quality	Significance	Duration		
Employment, Economic and Investment:				See Section 4.6.2.1 of the EIAR and summarised as follows: • Traffic Management Plan • Outline Construction and Environmental Management Plan (CEMP)	Not Significant
Employment during Construction	Positive	Significant	Short-term		
Opportunity for Local Business	Positive	Slight	Short-term		
Upskill local Workforce	Positive	Moderate	Long-term		
Traffic and Access disruption	Negative	Slight	Short-term		
Population. Changes to trends, density or structure	No Impact			n/a	No Impact
Tourism. Impacts on angling due to the works.	Negative	Significant	Temporary	See Section 4.6.2.3 of the EIAR and summarised as follows: • Water pollution preventative measures as outlined in Chapters 5, 6 & 12 of the EIAR	Not Significant

Impact	Impact Characteristic			Mitigation	Residual Impact Significance
	Quality	Significance	Duration		
				• Outline Construction and Environmental Management Plan (CEMP)	
Noise. Increased levels as a result of the works	Negative	Significant	Short-term	See Section 4.6.2.4 of the EIAR and summarised as follows: • Selection of plant with low noise potential • Use of noise enclosures • Placing of plant away from sensitive properties	Not Significant
Dust. Increased levels as a result of the works	Negative	Slight	Short-term	See Section 4.6.2.5 of the EIAR and summarised as follows: • Wetting of surface during dry weather as a means of dust suppression • Monitoring of dust levels at agreed locations	Not Significant
Exhaust Emissions. An increase nitrogen dioxide, sulphur dioxide, benzene and carbon monoxide	Negative	Slight	Short-term	See Section 4.6.2.6 of the EIAR and summarised as follows: • Maintaining all construction vehicles and plant in good operational order • Sourcing material which will be required in large volumes such as aggregates	Not Significant

Impact	Impact Characteristic			Mitigation	Residual Impact Significance
	Quality	Significance	Duration		
				locally where possible to reduce potential emissions.	
Traffic and Transport Infrastructure as a result of the 4 year construction period	Negative	Slight	Temporary	See Section 4.6.2.7 of the EIAR and summarised as follows: • Appointment of a suitability qualified contractor • Consultation with Local Authority Roads Department • Use of industry standard traffic management measures • All residents and interested parties shall be consulted when planning these road closures to optimise the timing of same.	Not Significant
Services. Disruption of water, gas, electricity broadband and telecommunications distribution networks	Negative	Slight/Moderate	Temporary	See Section 4.6.2.8 of the EIAR and summarised as follows: • Consideration of services network in detailed design and assess record drawings • Site investigation to confirm the location of the existing pipework	Not Significant

Impact	Impact Characteristic			Mitigation	Residual Impact Significance
	Quality	Significance	Duration		
Tourism and Amenity. Loss of recreational amenity	Negative	Moderate	Short-term	See Section 4.6.2.9 of the EIAR and summarised as follows: • Water pollution preventative measures as outlined in Chapters 5 of the EIAR • Mitigation as outlined in Chapter 9 of the EIAR	Not Significant
Health and Safety. Construction sites and the machinery used on them pose a potential health and safety hazard to construction workers	Negative	Significant	Short-term	See Section 4.6.2.10 of the EIAR and summarised as follows: • Use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan. • Harris fencing will be erected around any excavations to prevent uncontrolled access to this area	Not Significant

Table 4.1 - Impact Assessment Summary – construction Phase

Impact	Impact Characteristic		
	Quality	Significance	Duration
Human Health and Safety	Positive	Significant	Long-term
Population	Positive	Significant	Long-term
Employment and Investment	Positive	Significant	Long-term
Land-use. Residential and commercial properties in the town. Enhanced agricultural use.	Positive	Significant	Permanent
Tourism	No impact		
Property Values. Increased protection to residential and commercial premises	Positive	Significant	Long-term

Table 4.2 - Impact Assessment Summary – Operational Phase

BIODIVERSITY CHAPTER

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in relation to the Biodiversity Chapter and is to be read in conjunction with Chapter 5 of the River Deel (Crossmolina) Drainage Scheme EIAR.

Statement of Authority

The Peer review document recommends that the names and qualifications of those who were involved in the preparation of the chapter be provided within each Chapter. It is noted that Chapter 1 of the EIAR provides these details in Table 1.2 but for convenience, the details of the contributors to this EIAR chapter and the addendum are provided below.

Pat Roberts
B.Sc. (Environmental Science) (2005) National University of Ireland, Galway
Member of Chartered Institute of Ecology and Environmental Management (CIEEM)

Pat is a Senior Ecologist and director of the Ecology team with MKO. with over 15 years' post graduate experience as a professional ecologist. Pat has worked as a senior ecologist on numerous OPW projects for over 10 years. These have included including flood relief schemes and drainage maintenance projects. Pats key strengths include his depth of knowledge and experience of a wide range of ecological and biodiversity topics. He currently manages the ecological team within MKO and ensures that the outputs from that team are of a very high standard and meet the requirements of the clients.

Pat was also responsible for the required revisions to the chapter that are provided in this addendum document.

James Owens
M.Sc Plant Ecology, National University of Ireland, Galway (2017)
BSc (Hons) Environmental Science, Ulster University Coleraine (2010)

James has over 6 years' post graduate experience in private practice where he has worked as both an ecological sub-consultant and in the private forestry sector. James' main areas of expertise are in vegetation surveys, habitat assessments, tree surveys, silvicultural practices habitat mapping, Appropriate Assessment Screening, Natura Impact Statements and Ecological Impact Assessments.

Ross Macklin
BSc Applied Ecology (2004) UCC
HDip GIS (2006) UCC
PDip Integrated Pest management UCD (2016)
PhD (in progress) UCC

Ross Macklin is an environmental scientist who specialises in freshwater ecology, fisheries and water quality analysis. He completed a fisheries habitat assessment of the River Deel to support the Biodiversity Chapter of the EIAR. He has been involved in numerous projects that examine the impact of land use practices on the ecology and water quality of lakes, rivers and wetlands. He is currently completing his PhD on the ecology and impact of common carp (Cyprinus carpio L.) in Ireland.

Dr Chris Peppiatt (provided services as a sub contractor undertaking bird surveys and was not originally included in table 1.2 of the EIAR – included here for completeness)
BSc. (HONS) Botany. University of Bristol, Dept. of Botany
PhD thesis (1997): 'University of Manchester Institute of Science and Technology, Dept. of Chemical Engineering & Dept. of Biochemistry and Applied Molecular Biology. MSc. Bioreactor Systems (Biotechnology). Loughborough University, Dept. of Chemical Engineering.

Chris has worked in the field of ecology/ornithology for over twenty years and regularly undertakes biodiversity chapters for large scale infrastructure projects with all associated surveying and reporting. Chris is an accomplished ornithologist and bird surveyor with in depth knowledge of the associated survey types and the requirements thereof.

Survey Type	Dates of Survey	Survey Locations	Name of surveyors
Woodland Survey	6th May 2015	Banks of River Deel downstream of intake structure	Pat Roberts
Preliminary Walkover Survey	16th December 2015	Entire study area	Pat Roberts
Bird Surveys	January 2016 – March 2017	Washlands	Dr. Chris Peppiatt
Multi-disciplinary walkover survey Otter Survey Badger survey	18th May 2016	Entire Study Area	Pat Roberts
Woodland Surveys	18th May 2016	Washlands	Pat Roberts
Multi-disciplinary walkover survey Otter Survey Badger Survey Invasive Species Survey	May 2017	Entire Study Area	Pat Roberts
Freshwater Pearl Mussel Stage 2 survey Crayfish Survey	11th May 2017	River Deel adjacent to the intake structure and Mullenmore Stream	Pat Roberts James Owens
Ecological Assessments associated with SI works and flow measurements	Throughout 2016 & 2017	Entire Study area and locations in the wider area up and downstream of the proposed scheme	James Owens

Multi-disciplinary walkover survey Otter Survey Badger Survey Invasive Species Survey Freshwater Pearl Mussel Survey Crayfish Survey	March 2018	Entire study area. Freshwater Pearl Mussel Survey undertaken in River Deel adjacent to the intake structure and flow control structure	James Owens
Walkover Survey of the River Deel downstream of Jack Garrett Bridge to Lough Conn – to identify potential alluvial woodland habitats within the benefitting lands	6th 7th & 8th March 2019	River Deel and its banks downstream of Jack Garrett Bridge	Pat Roberts James Owens
Freshwater Pearl Mussel Survey Crayfish Survey	8th April 2019	Freshwater Pearl Mussel Survey undertaken in River Deel adjacent to the intake structure and flow control structure	Pat Roberts
Dedicated surveys of woodlands downstream of Jack Garrett Bridge in the benefitting lands and Marsh within washlands	23rd, 24th July 2019	Entire study area	Pat Roberts
Otter Survey	July 2019	River Deel at intake structure and flow control structure	Pat Roberts
Multi-disciplinary walkover survey	19th September 2019	Verification of previous walkover surveys	Pat Roberts
Walkover of River Bed measuring particle size of substrate (to inform hydromorphological assessment)	21st 22nd October 2019	River Deel from upstream of the Intake Structure to downstream of the Jack Garrett Bridge	Pat Roberts Chris Peppiatt
Dedicated fisheries habitat survey	12th May 2020	Upstream of intake structure to Jack Garrett Bridge	Ross Macklin
Multi-disciplinary ecological walkover Survey	12th May 2020	Entire study area	Pat Roberts

Bat survey	27th May/28th May 2020	River Deel near intake structure and along diversion channel route	Pat Roberts James Owens

Table 5.1 Updated Summary of Ecological Surveys Completed to Date

5.4.3.2 Mammals

Evidence of badger and otter activity was recorded within the study area during the walkover surveys and as a result, dedicated surveys for these species were undertaken. The suitability of the site for bats was assessed during the ecological multi-disciplinary walkover surveys but whilst the site of the proposed scheme is likely to be used by foraging and commuting bats (especially the River Deel, Mullenmore Stream and Lough Conn), the proposed scheme will not result in the loss or damage to any significant roosting habitat and the loss of low hedges along the route of the drainage channel is unlikely to result in any significant effects on these taxa. A dedicated bat survey was however undertaken in the form of the deployment of three static detectors within the study area and is discussed below. Other species that are likely to occur in the area but were not recorded include Fox (*Vulpes vulpes*), Pine Marten (*Martes martes*), Rat (*Rattus norvegicus*) and Stoat (*Mustela erminea*), hedgehog (*Erinaceus europeus*) and small mammals such as pygmy shrew (*Sorex minutus*) and field mouse (*Apodemus sylvatica*). Mink (*Mustella vison*) are known from Lough Conn and surrounds but were not recorded during any of the surveys undertaken.

5.4.3.3 Invertebrates

Invertebrates were considered in the initial assessment of the site as part of Scoping. Following this, dedicated surveys for freshwater pearl mussel and white clawed crayfish were undertaken within the study area. No habitat for other protected invertebrates such as Marsh Fritillary (*Euphydryas aurinia*) was recorded. The multi-disciplinary walkover surveys also considered reptiles and amphibians including frog (*Rana temporaria*), smooth newt (*Lissotriton vulgaris*) and common lizard (*Zootoca vivipara*) but that these species were not recorded. It is however noted that the site of the proposed development does contain suitable habitat for common frog and should any frogs (or frog spawn) be encountered during construction of the proposed development and require translocation – the project ecologist will undertake any such management under an appropriate licence (Section 23 – Wildlife Act)

Freshwater Pearl Mussel

A dedicated survey for Freshwater Pearl Mussel (*Margaritifera margaritifera*) was carried out on the 11th May 2017 under licence from the National Parks & Wildlife Service (Licence No. C157/2015). The survey included the section of the River Deel adjacent to the proposed intake structure, which was surveyed when the River Deel was completely dry and of the Mullenmore Stream. The results of this survey as submitted to the NPWS are provided as Appendix 5B.

No pearl mussel were recorded in the Mullenmore Stream and very little suitable habitat for the species was recorded during the survey that was undertaken in 2017. In relation to the section of the River Deel that was surveyed, the following conclusion was made in the survey report in Appendix 5B:

> *Approximately 324 metres of channel within the river Deel and 928 metres of channel within the Mullenmore Stream. Pearl mussels were recorded within the river Deel but not in the Mullenmore Stream. The survey was conducted in accordance with the methodology set out by the NPWS in its Stage 1 and Stage 2 survey guidelines (Anon, 2004).*
>
> *The pearl mussel that were recorded were likely to be under extreme stress due to the lack of water and appeared to have been mobile within the river to reach the last remaining pools. Those mussels that were outside the water but still alive, clamped tightly shut and many were inverted so that the siphons were as close to the substrate as possible.*

This section of the river is subject to regular drought and dries out completely for short periods in most years (local knowledge) and yet supports a population of pearl mussel.

It is likely that the distribution of mussels within the channel will expand in high water levels and contract to the deeper areas as the water subsides.

The area surveyed corresponded to sections 33 and 34 in the 'Mapping of the Distribution of Margaritifera Margaritifera in the River Deel (Moy Catchment), Co. Mayo' (Moorkens & Killeen, 2009). Mussels were recorded as 'occasional' in this area during that survey (1-40 in every linear 100m) in 2009. The current survey recorded over 300 mussels per 100 metre section. This would have corresponded to a rating of 'Common' according to the parameters set in the 2009 report. The reasons for this are unknown but it is likely that the population of mussels is mobile within the river depending on conditions.

During the 2017 survey, the section of channel adjacent to the intake structure supported 410 live mussels and 2 dead shells. This transect was 166m in length and primarily consisted of cobble and gravel. At the time of the survey most of the river bed was completely dry with just one pool located in the downstream section of the transect.

The same transect was repeated in March 2018 and 173 live mussels and 5 dead shells were recorded within the same location as previously recorded (the deepest section of the river). The results of this survey are also included in Appendix 5B.

A further survey was undertaken in 2019 (Licence number C11 2019). The results of this survey are also included in Appendix 5B. During this survey, no live mussels were recorded in the vicinity of the proposed works. One live mussel was recorded, upstream of the works area but it was lying on its side as if it had been washed in. The River Deel has dried out completely for significant periods each year since the initial surveys in 2017. It appears likely that this drying out of the river has resulted in the loss of mussels in this section of the river.

During a dedicated fisheries survey that was undertaken on the 12th May 2020, the entire river channel between the Jack Garrett Bridge and approximately 200m upstream of the proposed works (where there will be no works or hydrological effects resulting from the proposed development) was walked in dry conditions. Less than live 50 mussels were recorded in this area and all of these were located between 100 and 200 metres upstream of the Jack Garrett Bridge with none recorded at the site of the proposed works or immediately up or downstream of them. Full details of these records are provided in Appendix 5G.

White Clawed Crayfish

Dedicated presence/absence surveys for white clawed crayfish were carried out whilst undertaking the freshwater pearl mussel surveys on the dates listed above. These revealed numerous crayfish within the River Deel, many of which had died due to desiccation as the river dried out or were concentrated in pools. Crayfish were also recorded in the Mullenmore Stream, though appeared far less frequent. The River Deel provides excellent habitat for this species in the vicinity of the proposed works. This is likely to be due in part to the fact that they were harder to observe in the wetted conditions and that the habitat was generally siltier and less suitable for the species. Crayfish were also recorded in the dedicated fisheries habitat survey that was undertaken on the 12th May 2020. Details of this survey are provided in Appendix 5C. The Crayfish plague is not known from the River Deel and no signs of this disease were recorded during any of the surveys undertaken.

5.4.5 Identification of KERs

Table 5.12. lists all identified receptors and assigns them an ecological importance in accordance with the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009). This table also provides the rationale for this determination and identifies the habitats that are Key Ecological Receptors.

Habitat/ Species and geographic importance	KER Y/N	Rationale
Eroding River (River Deel) and associated riparian fringes International Importance as habitat for aquatic species	Yes	The River Deel is designated for conservation as part of the River Moy SAC. Works are proposed within and immediately adjacent to this habitat. The river is a KER in the context of the habitat it provides for the range of aquatic species within it.
Lough Conn International Importance as habitat for aquatic species	Yes	Lough Conn is designated for conservation as part of the River Moy SAC. No work are proposed within or adjacent to Lough Conn but both the River Deel and the washlands discharge to this lake. The lake is a KER in the context of the habitat it provides for the range of aquatic species within it.
Depositing River (Mullenmore Stream) and Calcareous Spring (FP1) Local Importance (Higher Value)	Yes	The Mullenmore Stream provides high biodiversity value in the local context and provides connectivity with Lough Conn.
Wet Willow, Alder Ash woodland (WN6) where it has been identified as Annex I Alluvial Woodland (91E0) International inside SAC National Outside SAC	Yes	This habitat is located at two discreet locations within the River Moy SAC downstream of Jack Garrett Bridge and also within the same SAC within the washlands. It has been recorded outside the SAC around the Mullenmore Springs. There is potential for the proposed scheme to result in indirect effects on this habitat and it is included as a KER
Immature Wet Willow Alder Ash Woodland (WN6), Mixed Broadleaved Woodland (WD1), Scrub (WS1), Hedgerows (WL1), Treelines (WL2) Local Importance (Higher Value)	Yes	These are not Annex I habitats but do provide semi natural habitats with high biodiversity in a local context and are included as a KER on this basis.
Agricultural Grasslands, artificial drainage ditches and Built surfaces Local importance (Lower Value)	No	These habitats are common and widespread in the local and wider area and are of comparatively low ecological value.
Birds SCIs of the Lough Conn and Lough Cullin SPA International Importance	Yes	Whilst there is no potential for direct effects on the SPA, following the precautionary principle, there is potential for significant effects on water quality within the SPA, which could affect the habitat of these species.
Birds (non SCI) Local Importance (Higher Value)	Yes	Other species such as Kingfisher and songbirds that are not among the SCIs of the SPA have the potential to be significantly affected as a result of disturbance, habitat loss or degradation.
Bats Local Importance (Higher Value)	No	Whilst the River Deel provides high quality habitat for these species, there is no potential for the proposed scheme to result in significant loss or deterioration of roosting, foraging or commuting habitat. There is no potential for significant disturbance either. These species are not among the KERs
Badger Local Importance (Higher Value)	Yes	This species has been recorded within and surrounding the footprint of the proposed scheme. It has the potential to be significantly impacted through habitat loss and disturbance.

Otter International Importance	Yes	This species is among the QIs of the River Moy SAC. It has been recorded within and surrounding the footprint of the proposed scheme. It has the potential to be significantly impacted through habitat loss and disturbance.
Aquatic Species International Importance	Yes	Aquatic species including salmon, lamprey species and white clawed crayfish are among the QIs of the River Moy SAC. Other aquatic species such as freshwater pearl mussel, salmonid and coarse fish are not among the QIs of the SAC but are ecologically significant and are included as KERs
Other Faunal species recorded	No	The other faunal species recorded during the surveys undertaken in support of this EIAR and those species including small mammals, reptiles and amphibians were common and widespread in the local and wider area and are unlikely to be significantly affected by the proposed scheme.

Table 5.12 Identification of KERs

5.5.8 Consideration of Population Management and Critical Resources

The proposed development has been designed to minimise or avoid significant impacts on ecologically sensitive habitats and species. Where potential impacts on such habitats or species were identified, the design of the development was amended to avoid any such effects or mitigation was employed to ensure that no significant impacts remain.

As a result, it is confirmed that no significant effects on any species were recorded at the population level and it is not anticipated that there will be any requirement for specific management of significant populations of any species.

One of most ecologically sensitive area where works are proposed is the River Deel and it's associated habitats. The potential for significant effects on the river and the aquatic receptors therein was identified.

The construction footprint was minimised in this area to avoid the potential for effect to as little as possible. Following this, a range of surveys including otter surveys, and fisheries habitat surveys were undertaken and measures were put in place to ensure that there was no permanent loss of habitat or impacts that could have a population level effect on any species.

Other potential impacts on sensitive species or taxa including birds and badger were identified. A similar approach to that used in assessing aquatic habitats and species was followed and a similar conclusion reached – there would be no significant residual impacts on any species at the population level.

In addition, the resources that are critical to each species were considered throughout the assessment process. The multi-disciplinary walkover surveys are specifically designed to assess the study area for the presence of habitats and species of ecological significance. As part of this survey, potential habitat was also identified and where necessary specific and detailed surveys were undertaken to assess the use of particular habitats and/or resources for any particular species. Where critical habitats and/or resources were identified, the scheme was designed to avoid or minimise impacts thereon or, where impacts were unavoidable, mitigation was prescribed to ensure that no significant residual effects remained.

To use the example of aquatic receptors within the River Deel again. The river habitats were identified as a critical resource to those species within it along with the quality of the water, the hydrological regime and the riparian vegetation. As such, the scheme was designed to minimise works within the river, undertake the works to minimise disturbance to species and to replace river and riparian habitat within the site of the proposed works. It also includes mitigation, to avoid water pollution and has been designed to avoid significant effects on the hydrological regime within the river. Thus, the critical resources required by the sensitive aquatic receptors within and surrounding the River Deel, will not be affected.

The same approach is used when considering all other Key Ecological Receptors.

5.5.2.1 Impacts on Habitats during construction

The proposed scheme has been specifically designed to avoid where possible or otherwise minimize the loss or disturbance of ecologically sensitive habitats identified in the area such as the River Deel and the associated riparian corridor or the wet woodlands associated with the washlands. The habitats that will be permanently or temporarily affected by the scheme are listed below, complete with the area (and lengths) affected, are provided in Tables 5.13-5.14 below.

Habitat	Total Area Affected (Hectares)
Buildings and Artificial Surfaces (BL3)	0.68
Spoil and Bare Ground (ED2)	0.01
Improved Agricultural Grassland (GA1)	3.39
Amenity Grassland (GA2)	0.24
Dry Meadows and Grassy Verges (GS2)	0.03
Wet Grassland (GS4)	4.21
(Mixed) Broadleaved Woodland (WD1)	0.04
Wet Willow-Alder-Ash Woodland (WN6) (non Annex I)_	0.32
Scrub (WS1)	0.10
Upland Eroding River (FW1)	0.08

Table 5.13 Areas of habitat lost

Habitat	Total Length Affected (m)
Drainage Ditches (FW4)	352
Hedgerows (WL1)	1331
Treelines (WL2)	*140*

Table 5.14 Lengths of linear habitat lost

Impacts on Aquatic KER Habitats during construction

The identified aquatic KER habitats include:

- Eroding River (FW1) Habitat in The River Deel (International Importance)
- Depositing River (FW2) Habitat in the Mullenmore Stream (Local Importance (Higher Value)
- Limestone Marl Lake (FL3) in Lough Conn and associated lakeshore habitats (International Importance)

Direct effects only apply to the River Deel, in which physical works are proposed in the form of the flow control structure. Indirect effects apply to all receptors, which are located downstream

of the proposed works via either the River Deel or the washlands. The potential effects are described and characterised in detail in Table 5.15 below.

Description of Effect	**Direct effect – Habitat Loss** The proposed flow control structure is the only element of the proposed scheme that will have a direct effect on the River Deel during construction. It is the only element that is located within the river. The flow control structure is shown in detail in Drawing L_04 and Section Drawing S_04. (Appendix 3A, Chapter 3) and includes the structure itself, scour protection and a construction working area within the river channel. The habitats within the river do not conform to any Annex I habitat.
	Indirect Effect – Habitat deterioration resulting from Water Pollution The construction of the proposed scheme has the potential to result in water pollution during the construction phase. This could result not only from the instream construction works associated with the flow control structure but also as a result of run off from the construction of the terrestrial elements of the scheme that are adjacent to the river. Potential pollutants could include silt, hydrocarbons, cementitious material and other chemicals used in construction.
Characterisation of unmitigated effect	**Direct Effect – Habitat Loss** The loss of 0.08ha. of non-Annex I freshwater habitat within the River Deel is characterized as a **short term, reversible, negative impact of slight magnitude** (Impacts on aquatic species within the River Deel are considered in Table 5-20 below) given that the area lost is a tiny fraction of the overall amount of Eroding River habitat within the River. It is noted that the area where the river flow control structure is proposed is not unique and supports a similar habitat to that found both up and downstream
	Indirect Effect – Habitat deterioration resulting from Water Pollution The potential for the construction of the proposed scheme to result in pollution in various forms to enter the River Deel/Mullenmore Stream/Lough Conn is characterized as a **short Term, reversible negative effect of moderate magnitude.**
Assessment of Significance Prior to Mitigation	**Direct Effect – Habitat Loss** This habitat is widespread throughout the river channel, is not listed on Annex I of the EU Habitats Directives or among the Qualifying Interests of the SAC The loss of 0.08ha is not significant in the context of the overall receptor of international importance.
	Indirect Effect – Habitat Degradation resulting from Water Pollution The construction of the proposed scheme has the potential to result in pollution of the River Deel/Mullenmore Stream/Lough Conn over a large area downstream of the works. Whilst the potential effect is short term and the magnitude considered to be moderate, this is a potentially significant effect on these receptors of international importance.
Mitigation	*Direct Effect – Habitat Loss*

	• *Whilst no significant effect was identified in terms of habitat loss, mitigation is proposed within the design of the scheme to avoid any long term loss of habitat. The flow control structure has been designed so that the original bed of the river will be removed to facilitate construction but then will be replaced during the operational phase of the development.* • *Design drawings that show this are provided in Layout Drawing L_04 and Section Drawing S_04. Section 3 (Appendix 3A)*
	• *Indirect Effect – Habitat Degradation resulting from Water Pollution* • *The construction of the proposed scheme has been specifically designed to avoid the potential for water pollution. Details of the construction work practices and detailed method statements for each construction activity are provided in Section 5.5.6 below and in the OCEMP that is provided in Appendix 3C. Measures include:* • *Minimisation of Instream working area as outlined in construction drawings provided in Appendix 3A.* • *Appropriate timing of works to avoid sensitive periods, flooding or high flows.* • *Detailed construction drainage design to avoid potential run off* • *Detailed monitoring regime that ensures all measures are effectively employed during construction.* • *Employment of Environmental Clerk of Works.* • *Use of Sondes upstream and downstream of the works area to continually monitor water quality during the construction period.* • *Use of alarms that trigger when there is a* 5% difference between the NTU value recorded in the upstream and downstream Sondes and where NTU is above the average baseline conditions (likely to be approximately 10 NTU based on recorded data within the River Deel) • *Emergency procedures in place to minimise the potential for or impact of any pollution event.*
• *Residual Effect following Mitigation*	• *Direct Effect – Habitat Loss* • *Following the implementation of the mitigation described above, the loss of eroding river associated with the proposed works will be negligible and is not considered significant at any geographic scale.*
	• *Indirect Effect – Habitat Degradation resulting from Water Pollution* • *Following the implementation of the mitigation described above, the potential for pollution of the River Deel/Mullenmore Stream/Lough Conn during construction is minimised to insignificance.*
• *Potential for Cumulative Effect*	*As the construction will not result in any significant effects on the Eroding River habitat in the River Deel, the Depositing River habitat in the Mullenmore Stream or the lacustrine habitat of Lough Conn, it cannot contribute to any cumulative effect in this regard*

Table 5.15 Potential Effects on Aquatic KER Habitats

Construction of the Intake Structure

This will involve the construction of a new reinforced concrete intake structure and spillway on the banks of the River Deel at the upstream end of the abovementioned grass lined channel.

The entire boundary between the working area and the River Deel will be fenced off with a triple silt fence as shown in Plate 5.16. In addition to this, a solid wall of double walled one tonne sand bags, filled with soil will be constructed inside the silt fences to create a solid barrier between the works area and the river (and SAC). The bags will be filled away from the river and transported to the site.

All works will be undertaken entirely within the confines of the works area as described above. Topsoil will be stripped as necessary to prepare the foundations. It will be either stockpiled for re-use within the confines of the works area or removed from the site and stored for re-use within the dedicated site compound at a location that is over 30metres from any watercourse and is adequately protected with silt fences. Where soil is to be stored over a calendar month, it will be sown with grass seed to prevent any windblow or water erosion and subsequent run-off. Where it is not required for re-use, it will be removed to an authorised waste facility.

Following detailed site investigations, the requirement for rock breaking to be undertaken is not anticipated.

The invasive species, Japanese knotweed has been identified from three locations within the works area (as shown below) and has been the subject of ongoing treatment for the last two years. These stands of knotweed will be managed as per the invasive species management plan below to avoid its spread.

Following soil removal, formworks and steel for the structure will be constructed ensuring that all works are located within the defined works area that is protected from run off by the solid barrier described above.
Formwork will be of solid construction and will be sealed to prevent any leakage of concrete during pouring operations.

Whilst no significant excavations are proposed, should any ingress of water (ground or rain) require pumping out prior to the pouring of concrete, this will be pumped from the site of the intake structure and discharged to a discharge point within the diversion channel as described in the preceding sections.
The weather forecast will be checked prior to the pouring of the concrete and no such works will be undertaken when bad weather is forecast. Works will be planned/programmed to avoid water levels that may cause inundation of the works area and any works at any time when water levels that may cause inundation of the works area will be avoided. Concrete will not be poured at times when heavy rain is predicted as this may lead to run off and over spillage of the form work.

Form work will be constructed with an adequate capacity and additional freeboard to prevent any spillage.

Alarmed Sondes will be placed in the river and will measure turbidity upstream and downstream of the works area. If there is a 5% difference between the NTU value recorded in the upstream and downstream Sondes and where NTU is above the average baseline conditions (likely to be approximately 10 NTU based on recorded data within the River Deel), all works will cease until the source is identified and the problem rectified (if it is found to be associated with the proposed works).

Concrete trucks and other construction vehicles will work entirely from hard standing areas to avoid the generation of mud within the works area. Temporary hard standing will be made of clean stone behind the proposed wall location (landward side) and all machinery will work from this area.
Concrete trucks will not be washed out at the site of the proposed works. If chutes require wash out, this will be undertaken at a designated wash out tank located in the site compound. This will recycle waters within the tank.
Stone gabions will be placed at the upstream and downstream ends of the intake structure and the soil will be placed on the top of these. Taller native vegetation such as Hazel and Hawthorn will be planted in these drier areas.
All bankside works will be undertaken at times of low water and good weather, when there is no potential for the works area to become inundated with flood water.
There will be no storage of materials, machinery or soil in areas that are susceptible to flooding.

Monitoring

The construction works will be monitored at several levels of seniority as described below to ensure that the environmental best practice prescribed in this document is fully adhered to and is effective. The following system will be put in place to ensure compliance.

The contractor will assign a member of the site staff as the environmental officer with the responsibility for ensuring the environmental measures prescribed in this document are adhered to.
All operatives working on the site will be made fully aware of the environmental responsibilities, conditions and requirements along with a full description of the methods to be employed. This information will be imparted at a dedicated site induction prior to commencing work on the site.
A checklist will be filled in on a weekly basis to show how the measures above have been complied with. Any environmental incidents or non-compliance issues will immediately be reported to the project team and that the project team will take corrective action if necessary.
The construction management team will be regularly monitoring the works and will be fully briefed and aware of the environmental constraints and protection measures to be employed.
Whilst the works to construct the channel will be ongoing over a long period and will involve only works a relatively small area at any one time, the site will be visited by a suitably qualified ecologist (ECoW) on a weekly basis. An audit of the works will be undertaken during these weekly visits and it will be ensured that the prescribed methods are employed. Any potential impacts additional to those predicted will be highlighted and if necessary, additional measures put in place to prevent them. Any deviance from the agreed methodology will be highlighted and if necessary rectified.

Sondes will be put in place in the River Deel upstream and downstream of the works area and also in the Mullenmore Stream. These will continuously measure turbidity from the time that the scheme is confirmed and will gather baseline data from the river prior to any works commencing. They will continuously measure turbidity throughout the construction period. If there is a 5% difference between the NTU value recorded in the upstream and downstream Sondes and where NTU is above the average baseline conditions (likely to be approximately 10 NTU based on recorded data within the River Deel), an alarm will sound and a message will be sent to the site foreman and the ECoW. Works will be ceased until the cause of the difference is identified and (if it is associated with the works) rectified

The works associated with the construction of the flow control structure and site set up for the intake structure will require full time, on-site supervision from the ECoW. The other elements of the works will be overseen by the ECoW but will involve regular inspections and audits throughout the construction phase.

The ECoW will be responsible for:

- Ensuring that the works are carried out in accordance with the approved method statements.
- Highlighting and discussing any deviance from the agreed plan. Deviances will be agreed with the relevant authorities and the project team in advance of adoption.
- Taking water samples and turbidity readings as appropriate. Discussing works and preparations with the site staff to ensure that works can be completed as per agreed method statements.
- Stop works if there are any significant effects on the River Deel as a result of pollution or changes to the flow or danger of inundation of the works area.

BD=Birds Directive; RL = BoCCI Red List; Seen = recorded; Breed = breeding; Non-B = non-breeding; Poss = possible breeding; Prob = probable breeding; Conf = confirmed breeding

Common Name	Scientific Name	Breeding Atlas 68-72		Breeding Atlas 88-91		Breeding Atlas 07-11		Conservation Status
		G11	G12	G11	G12	G11	G12	
Dunlin	*Calidris alpina*	No	No	No	No	Non-breeding	No	BD, RL
Common Wood Pigeon	*Columba palumbus*	Conf	Conf	Breeding	Breeding	Prob	Prob	BD
Hen Harrier	Circus cyaneus	No	No	No	No	No	No	BD
Corncrake	*Crex crex*	Prob	Prob	Breeding	Seen	Poss	No	BD, RL
Whooper Swan	*Cygnus cygnus*	No	No	No	No	Non-breeding	No	BD

Common Name	Scientific Name	Breeding Atlas 68-72		Breeding Atlas 88-91		Breeding Atlas 07-11		Conservation Status
		G11	G12	G11	G12	G11	G12	
Merlin	*Falco columbarius*	Prob	No	No	No	No	No	BD
Peregrine Falcon	*Falco peregrinus*	No	No	No	No	No	Conf	BD
Common Snipe	*Gallinago gallinago*	Conf	No	Breeding	Breeding	Prob	Poss	BD
Great Northern Diver	*Gavia immer*	No	No	Seen	No	Non-breeding	No	BD
Common Pheasant	*Phasianus colchicus*	Conf	Prob	Breeding	Breeding	Poss	Prob	BD
Golden Plover	*Pluvialis apricaria*	No	No	No	No	Non-breeding	No	BD, RL
Common Tern	*Sterna hirundo*	Conf	No	Breeding	No	Poss	No	BD
Arctic Tern	*Sterna paradisea*	Prob	No	Breeding	No	No	No	BD, RL?
Sandwich Tern	*Sterna sandvicensis*	Conf	No	No	No	No	No	BD
Common Kingfisher	*Alcedo atthis*	Prob	Prob	No	No	Prob	No	BD
Mallard	*Anas platyrhynchos*	Conf	Conf	Breeding	Breeding	Conf	Poss	BD
Red Grouse	*Lagopus lagopus*	Conf	No	No	No	No	No	RL
Common Scoter	*Melanitta nigra*	Conf	No	Breeding	No	Poss	No	RL
Curlew	*Numenius arquata*	Poss	Poss	Seen	Breeding	Non-breeding	No	RL
Lapwing	*Vanellus vanellus*	Conf	Prob	Breeding	No	Conf	No	BD, RL

Common Name	Scientific Name	Breeding Atlas 68-72		Breeding Atlas 88-91		Breeding Atlas 07-11		Conservation Status
		G11	G12	G11	G12	G11	G12	
Pintail	*Anas acuta*	No	No	No	No	No	No	BD, RL
Northern Shoveler	*Anas clypeata*	Conf	No	No	No	No	No	BD, RL
Twite	*Carduelis flavirostris*	Poss	No	No	No	No	No	RL
Yellowhammer	*Emberiza citrinella*	Prob	Conf	Breeding	Breeding	No	No	RL
Herring Gull	*Larus argentatus*	No	No	Seen	No	No	No	RL
Black-headed Gull	*Larus ridibundus*	Conf	Poss	Breeding	No	Conf	No	RL
Jack Snipe	*Lymnocryptes minimus*	Na	Na	No	No	No	No	BD
Redshank	*Tringa totanus*	Poss	No	Breeding	No	Poss	No	RL
Barn owl	*Tyto alba*	No	No	No	No	Conf	Poss	RL
Woodcock	*Scolopax rusticola*	Prob	No	No	No	No	No	BD, RL
Common Goldeneye	*Bucephala clangula*	No	No	No	No	No	No	RL
Eurasian Wigeon	*Anas penelope*	No	No	No	No	No	No	RL
Common Pochard	*Aythya ferina*	No	No	No	No	No	No	RL

Table 5.9 Breeding Bird Atlas Data (Hectads G11 and G12)

Summary of Impacts Table

The peer review document recommends that all of the potential impacts, including their likelihood and potential impact be summarised in a table at the conclusion of the Chapter which would also include mitigation measures and residual impacts.

Table 5.3. is provided below and summarises the impact assessment conclusions associated with construction phase of the proposed development relating to the Biodiversity Chapter of the EIAR. Table 5.4 provides a similar table that relates to the operational phase.

Receptor	Impact Description	Pre-mitigation magnitude and significance	Mitigation	Residual Impact
Non KER Habitats	Habitat Loss and disturbance	Permanent not significant reversible negative effect	Fencing off to protect additional or un-necessary habitat loss Sowing of pollinator friendly seed mixes Management of grasslands within the scheme area as wildflower meadows	No Significant Residual Impact
Aquatic Habitats	Habitat Loss	short term, reversible, negative impact of slight magnitude	Whilst no significant effect was identified in terms of habitat loss, mitigation is proposed within the design of the scheme to avoid any long term loss of habitat. The flow control structure has been designed so that the original bed of the river will be removed to facilitate construction but then will be replaced during the operational phase of the development.	No Significant Residual Impact
	Habitat Deterioration	short Term, reversible negative effect of moderate magnitude.	Minimisation of Instream working area as outlined in construction drawings provided in Appendix 3A. Appropriate timing of works to avoid sensitive periods, flooding or high flows. Detailed construction drainage design to avoid potential run off Detailed monitoring regime that ensures all measures are effectively employed during construction. Employment of Environmental Clerk of Works.	

			Use of Sondes upstream and downstream of the works area to continually monitor water quality during the construction period. Use of alarms that trigger when there is a 5% difference in turbidity between the upstream and downstream sondes and turbidity is above the average measured baseline within the river (likely to be approximately 10 NTU based on recorded data within the River Deel). Emergency procedures in place to minimise the potential for or impact of any pollution event.	
Terrestrial KER Habitats	Habitat Loss	permanent, reversible, negative impact of slight magnitude	Planting of 0.46ha of woodland and 2,445m of native hedgerows Fencing off of construction area to avoid un-necessary habitat loss	No Significant Residual Impact
	Habitat Deterioration	short Term, reversible negative effect of negligible magnitude	Measures for mitigating water pollution summarized above in relation to aquatic habitats	
Non KER Fauna	Habitat Loss and disturbance	Permanent not significant reversible negative effect	N/A	No Significant Residual Impact
Aquatic KERs including otter	Habitat Loss	short term, reversible, negative impact of slight magnitude	Whilst no significant effect was identified in terms of habitat loss, mitigation is proposed within the design of the scheme to avoid any long term loss of habitat. The flow control structure has been designed so that the original bed of the river will be removed to facilitate construction but then will be replaced during the operational phase of the development to ensure that there is no loss of fisheries habitat associated with the proposed scheme. Design drawings that show this are provided in Appendix 3A Layout Drawing L_04 and Section Drawing S_04. The loss of riparian habitat will be minimised by fencing off the minimum area necessary to complete the proposed works to avoid un-necessary habitat loss. In addition, following construction, the	No Significant Residual Impact

			temporary bankside works area will be reinstated with the planting of native trees and shrubs.	
	Habitat Deterioration	short Term, reversible negative effect of moderate magnitude (slight in respect of otter)	Indirect Effect – Habitat Degradation resulting from Water Pollution The construction of the proposed scheme has been specifically designed to avoid the potential for water pollution. Details of the construction work practices and detailed method statements for each construction activity are provided in Section 5.5.6 and in the OCEMP that is provided in Appendix 3C. Measures are summarised in relation to aquatic habitats are applicable here also.	
	Disturbance	Short Term reversible Moderate Negative Effect	Instream work will only be undertaken, when the river is dry or outside the sensitive period for spawning lamprey and salmonid fish in the River Deel (July 1st to October September 30th) Prior to any instream works a crayfish survey will be undertaken by a suitably qualified ecologist and any crayfish encountered will be translocated under licence to areas upstream of the proposed works. Similarly, prior to any instream works being undertaken, a survey for freshwater pearl mussel will be undertaken by a suitably qualified ecologist. In the unlikely event that freshwater pearl mussel are present, a derogation licence will be sought from the NPWS to facilitate their translocation to a suitable location within the river (where it does not dry out for extended periods on an annual basis. When dewatering the river (if necessary), no more than 50% of the river will be blocked at any one time, thus allowing continued passage for the aquatic KERs through the catchment. Where cofferdams are required to facilitate a dry working area, the area inside the cofferdam will be electro-fished under licence from the IFI prior to drawdown.	
	Crayfish Plague	permanent, irreversible, significant, negative effect	All plant, machinery and equipment will be thoroughly cleaned and disinfected using Virkon 1% biocide prior to arrival and departure from the site to prevent the spread of invasive species such as Asian Clam, Zebra Mussel, Crayfish plague. Biosecurity measures are described in full in Section 5.5.6.	

Badger	Habitat Loss	short term, reversible, negative not significant effect	The loss of habitat will be minimised by fencing off the minimum area necessary to complete the proposed works to avoid un-necessary habitat loss. In addition, following construction, the works area will be reinstated with the planting of native grasslands, trees and shrubs.	No Significant Residual Impact
	Disturbance	short term, reversible, negative impact of Slight magnitude	Prior to construction, a dedicated Badger survey will be undertaken of the entire works area by a suitably qualified ecologist to determine the current status of badger activity throughout the site. Should any active setts be encountered, during the dedicated pre-construction badger survey (if badgers have migrated into the area since the recent dedicated surveys that have been undertaken), they will be similarly avoided where possible. Should setts be identified within the development footprint during the pre-construction surveys (i.e. if the abandoned sett is re-occupied or if additional new setts are identified), a licence will be sought to exclude the Badgers in advance of the undertaking of any construction or clearance works. All works will be carried out in accordance with the 'Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes' (NRA 2008) and OPW EP 23 – Badger Procedure (OPW 2019)	
Birds	Habitat Loss	permanent, reversible, negative effect that is not significant	Whilst no significant effect was identified in terms of habitat loss for nesting, roosting or foraging birds, mitigation is proposed within the design of the scheme to avoid any long term loss of habitat. The loss of 1,471m of hedgerow and tree line and 0.46ha. of woodland habitat will be mitigated through the planting of 2,204 metres of native hedgerow and 221 metres of native tree line. Along with the replanting of trees surrounding the infrastructure at the intake and flow control structures.	No Significant Residual Impact

	Habitat deterioration	short Term, reversible negative effect of slight magnitude	The construction of the proposed scheme has been specifically designed to avoid the potential for water pollution. Details of the construction work practices and detailed method statements for each construction activity are provided in Section 5.5.6 and in the OCEMP that is provided in Appendix 3C. Measures are summarised in relation to aquatic fauna are applicable here also. Whilst no significant disturbance and displacement effects on bird species are predicted, all works will be carried out in strict accordance with Section 40 of the Wildlife Act (1976 – 2012)	

Table 5.3 Summary of construction impacts table - Biodiversity

Receptor	Impact Description	Pre-mitigation magnitude and significance	Mitigation	Residual Impact
Flows and hydrological/hydromorphological regime in the River Deel	Changes to aquatic habitats	short term slight effect	The scheme has been designed specifically to avoid any effects on the river at any flow levels with the exception of those flows that exceed the bank full flow and result in flooding. These flows occur infrequently (less than once per year) for very short periods of time (max 36 hours in case of 1:100 year flood and decreasing with more frequent floods). The hydrological modelling undertaken concludes that there will be a drop in velocity between the intake weir and the flow control structure when the weir becomes operational. This will lead to the infrequent deposition of gravels and cobbles within the river channel at this location. These will need removing on a periodic basis. Any removal of gravels will be undertaken when the river is dry. There will be no instream works and only the top of the accumulated gravel berm will be removed – leaving the low water channel undisturbed and	No Significant Residual Impact

			unaffected. A tracked machine will be used to access the river channel from near the intake weir and will remove the gravels. Any gravels that are removed will be made available to the IFI for use in fisheries enhancement elsewhere in the catchment.	
Riparian Woodlands between the Proposed Works and the Jack Garrett Bridge No Impacts on Annex I Alluvial Woodlands Predicted	Habitat deterioration	Long term not significant effect	During the maintenance works associated with the operation of the scheme. The riparian trees within the channel will be assessed and any trees that are likely to fail under flood conditions will be removed to ground level (coppiced). In addition, any low branches that are shown to be gathering trash or compromising river flow during high water will be removed to reduce obstruction to conveyance of water and to prevent the further deposition of silt within the river channel. Following preliminary inspections undertaken, it is anticipated that the majority of the trees will be retained and the overall vegetation structure will remain similar to the existing situation. There will be no significant changes to the level of shading along the channel with continued dappled shading of the channel. Works will be carried out on foot using chainsaws or from the roadside using tree shears. There will be no requirement for machinery to track in the riparian area. No in- stream works as part of this maintenance works (all works will be carried out at low water). Ongoing maintenance of the riparian vegetation will include rotational coppicing of (mainly) Grey Willow to prevent any trees becoming sufficiently large to become unstable in a flood situation and to prevent low branches from trapping silt or slowing the conveyance of water to a large extent. This will be undertaken without the tracking of machinery in the riparian area and without the requirement for in-stream works. All cut material will be removed from the site.	No Significant Residual Impact

			Continuous cover of riparian vegetation will be retained through rotational management and root systems will be retained to prevent soil from becoming destabilised and allow for vigorous and fast re-growth. Continuous cover of riparian vegetation will be retained through rotational management and root systems will be retained to prevent soil from becoming destabilised and allow for vigorous and fast re-growth.	
Washlands	Increased velocities	Long term not significant effect	Construction of an energy dissipation structure Potential bank protection works on Mullenmore Stream if required following monitoring	No Significant Residual Impact
Fish and other Aquatic Species	Barrier to passage along the River Deel	Long term significant effect	The flow control structure (which is the only instream structure) has been specifically designed to facilitate continued passage of all aquatic species through the catchment	No Significant Residual Impact
	Stranding of Fish	Long term not significant effect	Construction of thalweg in the bypass channel	No Significant Residual Impact
	Habitat Deterioration	Long term not significant effect	Maintenance operations avoid instream works and are small scale with mitigation described above in relation to alluvial woodlands and flows, hydrological and hydromorphological regime	

Table 5.4 Summary of operational impacts table - Biodiversity

LAND USE GEOLOGY AND SOILS CHAPTER

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in relation to Land Use, Geology and Soils and is to be read in conjunction with Chapter 6 of the River Deel (Crossmolina) Drainage Scheme EIAR.

The following supplementary information pertaining to Chapter 6 of the EIAR was requested by the Department of Public Expenditure and Reform on 18th May 2021 and is provided in this section of the EIAR Addendum:

> *"Confirm the figure of 166,400 cubic metres of soil material to be excavated as part of the proposed works."*

The request for supplementary information and general comments in relation to Chapter 6 of the EIAR have been addressed in the subsequent sections of this Chapter.

Unless otherwise specified, any text provided below supersedes the text provided in the relevant section of the EIAR. In some instances, it has been necessary to reproduce text from the original EIAR to allow for ease of understanding and to provide context. This text is shown in grey for ease of reference.

Statement of Authority

Details of the contributors to this chapter of the EIAR are provided below.

Dr. Kathryn Carney

BE (Hons), Bachelor of Engineering (Civil), National University of Ireland Galway (2008)

PhD Civil Engineering, National University of Ireland Galway (2012)

MIEI –Member of Engineers Ireland

Kathryn is a civil engineer with 8 years' post graduate experience in the field of civil and environmental engineering. Kathryn contributed to Chapter 6 of the EIAR and EIAR Addendum.

Jonathan Reid

BE (Hons) Bachelor of Engineering (Civil), National University of Ireland, Galway, (2003)

CEng, Chartered Engineer

MIEI, Member of Engineers Ireland

MIAHS, Member of the International Association of Hydrological Sciences

Jonathan has 17 years' experience in the management, design, planning and development of major civil engineering projects, including flood relief schemes. Jonathan has led Ryan Hanley's team in the preparation of EISs (and EIARs) on several flood schemes including the Lower Lee (Cork City), Blackpool (Cork), and Bandon. Jonathan contributed to Chapter 6 of the EIAR and EIAR Addendum.

6.3.1 Agricultural Land

6.3.1.1 Impact on Agricultural land

Permanent Slight Negative Impact

There will be a total permanent loss of approximately 8.58 ha of agricultural lands as a result of the proposed diversion channel. During flood conditions, an additional area of up to 23.7 ha of agricultural

land will be flooded as a result of the new washlands created downstream of the diversion channel, dependent on levels in Lough Conn at the time of an overflow event. The agricultural land affected by the washlands will not be permanent land loss but temporarily unusable during a flood event. During the construction phase there will be an additional temporary loss of 6.74 ha of agricultural land to facilitate the temporary works areas as shown in Chapter 3, Figure 3.1. The areas of permanent loss as a result of the Scheme, the temporary loss during the construction phase and the extent of the washlands during flood conditions are shown in Appendix 6E.

22 landowners will lose a portion of their land as a result of the proposed diversion channel, washlands or both. 16 landowners will be directly affected by permanent land lost as a result of the diversion channel construction. 5 landowners will be affected by the new washlands created downstream of the Scheme and 1 landowner will be affected by both permanent land lost as a result of the diversion channel construction and the new washlands created downstream of the Scheme. A table showing the land lost for each landowner can be found in Appendix 6D.

Impacts on land use have been assessed in Chapter 11 (Material Assets). Where possible, impacts on agricultural land use during the construction and operational phases of the Scheme have been mitigated in the design of the Scheme. The route of the diversion channel has been chosen with regard to several factors including the goal to minimise the division of existing fields and land holdings where possible.

The Scheme when constructed will mitigate flood risk to Crossmolina Town, and as a consequence the agricultural lands along the river bank downstream will benefit from reduced flood risk as a result of the Scheme construction. Access to these lands via Crossmolina Town and other local access routes, which are presently cut off during flood events, will also improve as a result.

Based on this assessment, the impact of the proposed Scheme on land is imperceptible on a national and county level, however it constitutes a permanent slight negative impact on agricultural land in the Study Area due to the permanent loss of 8.58 ha of agricultural land during the operation phase of the Scheme.

6.4.4 Economic Geology

The term 'economic geology' refers to commercial activities involving soil and bedrock. The activities involved principally comprise aggregate extraction (sand and gravel pits and quarries) and mining. A number of sources were examined for information on such commercial activities within the Study Area, including:

- Mayo County Council Planning Department (Application for Registration of Quarries under Section 261, Planning and Development Act 2000)
- Mayo County Development Plan (2014-2020)
- Concrete Products Directory (Irish Concrete Federation)
- Aerial Photographs (2005)
- ENVision Mines Site, the EPA's online Historic Mines Inventory

The sources consulted above indicate that there are no active quarries within the Study Area. The nearest active quarries are presented in Table 6.1:

Location	Status	Operators
Coolturk, Crossmolina. 8km outside Study Area	Active	Coolturk Quarries
Mullafarry, Killlala. 13 km outside Study Area	Active	Mullafarry Quarry LTD

Table 6.1 Quarries in the vicinity of the Study Area

The locations of these quarries are shown on Drawing SG001 in Appendix 6B.

As the abovementioned quarries are outside the Study Area, it is not envisaged that there will be any direct impact on these facilities from the proposed Drainage Scheme.

Excavated material will be reused on site where possible classified as a construction by-product in the context of Article 27 of the European Communities (Waste Directive) Regulations. Surplus excavated material will be transported off site by a licensed haulier to an authorised disposal or recovery facility and in compliance with all the mitigation measures within the EIAR. Where feasible, material will be removed from site and transported to the closest suitably licenced facility to be processed and used on other construction projects in the vicinity. Any contaminated material will be transported to an approved waste facility for treatment and safe disposal.

Potential quarries for disposal and as sources of material are discussed below.

Coolturk quarry has been identified as one of a number of potential disposal site for excavated material from the proposed channel (subject to approval). Coolturk Quarry is authorised under Waste Facility Permit no. WFP-MO-15-0035-02 to accept the List of Waste (LoW) codes for the excavated material (17 03 / 17 05). Both Coolturk and Mullafarry quarries are potential sources for imported granular material during the construction contract.

6.4.7 Potential Impacts on Geology

The key significant effects associated with the construction phase of the River Deel (Crossmolina) flood Relief Scheme are the excavation, handling, storage, processing and transport of earthworks materials. The estimated volume of excavation anticipated during the construction phase is presented on Table 6.3.

Origin of Excavation	Volume of Material
Diversion channel, bridge and retaining wall foundations energy dissipation structure and intake structure	166,400 m^3

Table 6.3 Volumes of Excavated Material

Potentially negative environmental impacts associated with the handling of excavated materials are dust, air quality and noise impacts associated with the handling and transport of excavated materials. These impacts can arise directly as a result of on-site excavation and construction activities or indirectly, due to placement of excess unsuitable materials at off-site locations. An assessment of dust, air and noise impacts associated with the Scheme are presented in Chapter 8 of the EIAR and EIAR Addendum. An assessment of impacts associated with waste materials is presented in Chapter 11 of the EIAR and EIAR Addendum.

Limited geotechnical ground truthing comprising minor site investigation works and archaeological test trenches will be carried out on commencement of the construction stage of the Scheme, the effect of which is predicted to be imperceptible and as such has not been assessed below.

6.5.3.2 Contaminated Land

Potential Short Term Moderate Negative Impact

Soil contamination may result from the improper management, storage and handling of fuels and lubricants for plant and machinery and of non-hazardous or hazardous liquid and solid wastes during the construction phase of the proposed Scheme. Localised contamination of soils could result from an accident, spill or leak resulting in a short term moderate negative impact.

The site investigation carried out to date indicates the presence of made ground, which may contain construction debris. It is possible that hazardous materials may be encountered during construction works at this location or during excavation of the R315, L1105 or Lake Road for example.

In addition, three strands of Japanese Knotweed *Fallopia japonica* have been identified in the footprint of the proposed Scheme as discussed in Chapter 5, Section 5.4. Failure to implement appropriate management of soil contaminated with Japanese Knotweed during the construction phase of the Scheme could result in the spread and regrowth of the species in other areas.

There will be no additional impact during the operation phase of the Scheme.

Mitigation Measures

In order to reduce the risk of soil contamination as a result of accidents spill or leaks, and water contamination from on site soil and material storage, the following measures will be implemented;

- Fuels, chemicals, liquids and solid wastes will be stored on impermeable surfaces. Fuels stored on site will be minimised. Plant refuelling shall be undertaken using a jeep mounted bowser to minimise storage of fuel on site. Small quantities of chemicals and petrol required for tools shall be stored with drip trays in a vented fuel store in the temporary works compound
- Plant refuelling shall be undertaken on impermeable surfaces within a suitably constructed bund in accordance with best practice guidelines. No refuelling will be permitted in or near soil or rock cuttings. Only designated trained operatives will be authorised to refuel plant on-site
- Plant shall be inspected regularly for any leaks
- Storage of fuel and oil will be regularly inspected for leaks or signs of damage
- A lock system will be fitted on all taps, nozzles or valves associated with refuelling equipment
- All hydrocarbons and other potential contaminants will be stored within suitably constructed bunds in accordance with best practice guidelines. The bunds will be sized to hold 110% of the volume of the stored contaminants in order to contain a spill should it occur. The base and walls of the bund shall be impermeable to water and oil
- Spill kits will be provided at refuelling areas and at high risk/sensitive sites
- Large volumes of excavated material will not be allowed to accumulate within the temporary working areas. Any stockpiling of soils will be greater than 10 metres away from any surface waters, and runoff will be prevented by the use of a silt fence
- There will be no storage of materials, machinery or soil in areas that are susceptible to flooding

- Where contaminated soil is encountered, the ECoW will assess the extent of contamination and will supervise any operations involving contaminated soil. Any contaminated soil will be transported to an approved waste facility for treatment and safe disposal.
- An emergency response plan to deal with accidental spillages is contained within the Outline Construction Environmental Management Plan (Appendix 3C). This will include providing toolbox talks regarding the appropriate use of spill kits and best practice for the management of accidental spills.

All Japanese Knotweed within and surrounding the site of the proposed works will be subject to the Invasive Species Management Plan (Chapter 5, Section 5.5.6.5). The following measures will be implemented in order to mitigate against the risk of moving soil contaminated with Japanese Knotweed;

- A pre-construction invasive species survey will be undertaken at the site of the proposed Scheme
- In advance of any works being carried out on the site of the proposed Drainage Scheme, any invasive species that occur within the identified works area will be subject to treatment with a non-persistent glyphosate herbicide. This will be undertaken at the end of the growing season (late August – September) and the method of application and chemical formulation will be agreed with all relevant stakeholders prior to application and treatment. Some of the stands are currently being treated in advance of any works. It is intended that these advance works will weaken the plant in advance of the construction works
- Treatment will be undertaken from hand held sprayers and will avoid the potential for spray drift into other areas.
- In all areas where Japanese Knotweed has been identified within the footprint of the proposed works (including areas within 7 metres of recorded stems) will be fenced off and included within the Knotweed Management Plan.
- Knotweed and contaminated soil will be excavated from its current location and removed to a containment bund within the works area for ongoing treatment. The location of this bund is shown in Chapter 5, Figure 5.10.
- The loading of each truck will be undertaken on a surface that can be easily cleaned (such as a radon barrier) and will be inspected by a suitably qualified ecologist and if necessary, brushed down before departure to ensure that there is no knotweed present on the outside of it.
- The excavation will be overseen by a suitably qualified ecologist and will involve the excavation of the Knotweed and associated rhizomes. The ecologist will inspect the excavated area following removal and will determine whether all rhizomes have been removed. Once satisfied, the sites will be declared free from Knotweed.
- All excavation machinery will be thoroughly cleaned and disinfected prior to leaving the section of the proposed works that is subject to the Knotweed Management Plan.
- Following completion of the construction and reinstatement, the site will be sown with grass seed mix and allowed to quickly re-vegetate.
- Follow up surveys will be undertaken for at least three years following the construction to ensure that these small stands are completely eradicated.

Residual Impact –Short Term Slight Negative Impact

The implementation of the above measures will mitigate the risk of contamination as a result of fuels and chemicals associated with construction. The residual impact of contaminated land as a result of the proposed Scheme is considered to be a Short Term Slight Negative Impact.

6.7 Summary of Potential Impacts on Land Use, Soils and Geology

Receptor	Impact Description	Pre-mitigation magnitude and significance	Mitigation	Residual Impact
Land Use	Loss of agricultural land	Imperceptible on a national and county level, and permanent slight negative impact on agricultural land in the Study Area	-	Imperceptible on a national and county level, and permanent slight negative impact on agricultural land in the Study Area
Geology	Loss of bedrock	Potential Permanent Not Significant Negative Impact	• Any bedrock removed during construction will be reused elsewhere where possible. • Material removed will be transported to the closest suitably licensed facility to be processed and used on other construction projects in the vicinity, where possible	Permanent Imperceptible Negative Impact
Geology	Loss of Geological Heritage	Neutral Impact		Neutral Impact
Geology	Loss of Quaternary Geology	Potential Permanent Slight Negative Impact	• Excavated subsoils will be reused as fill where possible. • Surplus materials will be transported to the closest suitably licensed facility to be processed and reused in other construction projects in the vicinity, where possible. • Where reuse is not possible, material will be transported to an approved waste facility for safe disposal.	Permanent Imperceptible Negative Impact
Soil	Loss of Soil	Potential Permanent Not Significant Negative Impact	• Any excavated topsoil will be stored on site and used to reinstate the channel. • All storage will be within the temporary works area. • The amount stored at any time will be minimised by completing the channel on a sectional basis • Topsoil storage areas will be defined and fenced off with silt fencing to prevent run off. • A surface water management system will be put in place. • Vegetation and soil will be left in place for as long as possible prior to excavation and stockpiling of soil will be minimised during wet weather periods. • Soil stockpiles will be shaped so as to shed water. • Surface water run-off from exposed soil surface will be intercepted and redirected to silt management areas	Neutral Impact

			• Granular materials will be placed over bare soil, particularly in the vicinity of watercourses, to prevent erosion of fines and/or rutting by construction machinery.	
Soil	Soil contamination	Potential Short Term Moderate Negative Impact	• Fuels, chemicals, liquids and solid wastes will be stored on impermeable surfaces. Fuels stored on site will be minimised. • Plant refuelling shall be undertaken using a jeep mounted bowser to minimise storage of fuel on site. • Small quantities of chemicals and petrol required for tools shall be stored with drip trays in a vented fuel store in the temporary works compound • Plant refuelling shall be undertaken on impermeable surfaces within a suitably constructed bund in accordance with best practice guidelines. • Plant shall be inspected regularly for any leaks • Storage of fuel and oil will be regularly inspected for leaks or signs of damage • A lock system will be fitted on all taps, nozzles or valves associated with refuelling equipment • All potential contaminants will be stored within suitably constructed bunds in accordance with best practice guidelines. • Spill kits will be provided at refuelling areas and at high risk/sensitive sites • Large volumes of excavated material will not be allowed to accumulate within the temporary working areas. Any stockpiling of soils will be greater than 10 metres away from any surface waters, and runoff will be prevented by the use of a silt fence • There will be no storage of materials, machinery or soil in areas that are susceptible to flooding • Where contaminated soil is encountered, the ECoW will assess the extent of contamination and will supervise any operations involving contaminated soil. Any contaminated soil will be transported to an approved waste facility for treatment and safe disposal.	Short Term Slight Negative Impact

			• An emergency response plan to deal with accidental spillages is contained within the Outline Construction Environmental Management Plan. • All Japanese Knotweed within and surrounding the site of the proposed works will be subject to the measures specified in the Invasive Species Management Plan	

Table 6.1 Summary of operational impacts table – Land Use, Soils & Geology

WATER CHAPTER

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in relation to Water and is to be read in conjunction with Chapter 7 of the River Deel (Crossmolina) Drainage Scheme EIAR.

The general comments in relation to Chapter 7 of the EIAR have been addressed in the subsequent sections of this Chapter.

Unless otherwise specified, any text provided below supersedes the text provided in the relevant section of the EIAR. In some instances, it has been necessary to reproduce text from the original EIAR to allow for ease of understanding and provide context. This text is shown in grey for ease of reference.

Statement of Authority

Details of the contributors to this chapter are provided below.

Dr. Connie O'Driscoll

BSc Marine Science, National University of Ireland, Galway (2004)

HDip Education, National University of Ireland, Galway (2006)

PhD Environmental Engineering, National University of Ireland Galway (2012)

MCIEEM, Chartered Institute of Ecology and Environmental Management

Connie is an Ecologist and Environmental Scientist with 9 years' post graduate experience in the field of Environmental and Ecological Research, Environmental Impact Assessment, and Appropriate Assessment. Connie specialises in aquatic and wetland assessment and water quality. Connie was responsible for the water chapter (Ch.7) in conjunction with Sinead Gavin. Connie contributed to Chapter 7 of the EIAR.

Sinead Gavin

BSc Environmental Biology, Staffordshire University (2000)

MSc Environmental Resource Management, University College Dublin (2005)

CEcol, MCIEEM Chartered Ecologist and Member of Institute of Ecology and Environmental Management

Sinead has 13 years' experience as an environmental scientist and ecologist. She has undertaken environmental assessments for a wide range of large and small-scale infrastructural projects. Sinead has been responsible for the management and writing of a number of EISs/ EIARs, Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) (Screenings and Natura Impact Statements) for development of schemes close to and within Natura 2000 sites (SAC/SPA). Sinead has been involved in Oral hearings for road schemes, been responsible for the management of expert witnesses and acted as expert witness for EIS/EIA Reports. Sinead contributed to Chapter 7 of the EIAR.

Dr. David Drew

PhD, Bristol University (1967)

BA, Nottingham University (1964)

Dr Drew is a former professor of Trinity College and was Senior Lecturer in Hydrogeology, Hydrology and Karst, Trinity College Dublin 1972 – 2011. Dr Drew has worked extensively in karst hydrogeological assessments throughout Ireland. Dr. Drew completed a karst hydrogeology assessment that is included as Appendix 7A to the EIAR.

Dr. Jonathan Turner

BSc Univ Newcastle upon Tyne

MSc University College London

PhD Univ.of Wales Aberystwyth

Dr. Jonathan Turner is a Lecturer in Physical Geography in the UCD School of Geography. Jonathan teaches courses on Earth Systems, River, Estuaries and Coasts and River Catchment Management. His research interests lie in the fields of River Science, Geomorphology and Environmental Change. Jonathan is a Director of the UCD Geography Itrax Core Scanner platform, which was acquired under HEA Equipment Renewal funding in 2009. Much of his research centres on the application of this facility, alongside other complementary palaeoenvironmental methods, to answer research questions related to environmental change and reconstruction. These collaborative projects range from research in deep marine contexts to shallow floodplain environments and more recently rock cores. Jonathan is currently involved in a number of research projects including HydroSed (2020-2024) which is investigating the hydrological and sediment impacts of forestry operations in Ireland and Reconnect (2016-2020) which focuses on the ecohydromorphological impacts of barriers to flow, such as weir structures. Jonathan is also involved in the Ancient Methone Archaeology which includes integrated geophysical and geomorphological investigations to reconstruct the buried harbour and shoreline of the ancient port of Methone, Greece. Recently completed projects include SILTFLUX (2012-2016), INFER (2012-14) and Source2Sink (2016-2018).

Jonathan completed an assessment of the Bed Sediment: Characterisation, Entrainment Thresholds and Transport Rates for the River Deel that is included as Appendix 7B to the EIAR.

Dr. Kathryn Carney

BE (Hons), Bachelor of Engineering (Civil), National University of Ireland Galway (2008)

PhD Civil Engineering, National University of Ireland Galway (2012)

MIEI –Member of Engineers Ireland

Kathryn is a civil engineer with 8 years' post graduate experience in the field of civil and environmental engineering. Kathryn contributed to Chapter 7 of the EIAR Addendum.

7.4.3.2 Use of Potential Water Contaminants

Potential Short term, Significant, Negative Impact

Many substances used and produced on construction sites have the potential to pollute both groundwater and surface water if not properly managed and treated (i.e. lubricants, cement, mortar, silt, soil, waste from site compound facilities, and other substances which arise during construction). The washing of construction vehicles and equipment also poses a pollution risk to watercourses. The spillage or leaking of fuel or oil from fuel tanks or construction vehicles has the potential to contaminate soils, groundwater and surface water.

The works area lies within and in close proximity to surface waterbodies, the River Deel (ID), Mullenmore South Springs and Lough Conn. The works area lies above highly vulnerable groundwater bodies Crossmolina Gravels (Locally important aquifer) and Ballina (Regionally important aquifer). Findings from the karst hydrogeological assessment (refer to Appendix 7A) indicate sinks are upstream of the works area (Figure 7.4) and as such only localised groundwater will be potentially impacted upon.

Such substances entering the receiving surface water and groundwater bodies could damage the habitat of local populations of fish and aquatic invertebrates and also cause direct harm to aquatic fauna.

Mitigation Measures - Generation of Silt-Laden Run-off & Increase in Suspended Solids & Use of Potential Water Contaminants

The following mitigation measures will be put in place to protect the ground and surface waters in the Study Area and will ensure no leaching of sediment or pollutants to enter localised groundwater or surface water.

The extent of development work will be managed by completing the works in a number of distinct stages which will enable an orderly and structured site development. An outline of the construction sequencing is provided in Section 3.4, Chapter 3 and the construction sequence drawings (Appendix 3B).

Measures to minimise the suspension and transfer of sediment and pollutants to ground and surface waters will be implemented. These measures are as follows:

- Where dewatering is required, waters will be pumped to lands that are over 30 metres from any watercourse and discharged via a silt bag to a discharge point. The discharge point will consist of a circle of triple silt fences surrounding a circle of straw bales wrapped in Terram. All waters pumped from the excavation will filter though the silt bag, straw bales and silt fences before diffusely discharging to the ground. The discharge points will be constructed prior to commencement of construction works and will be monitored on a daily basis when in use to ensure that the release of any polluting material is mitigated.
- Any stockpiling will be further than 10 metres from the river bank, and runoff will be prevented by the use of a silt fence.
- Prior to construction of the river flow control structure, the instream works areas will be constructed by creating a horseshoe cofferdam. Construction works will be carried out when the river runs dry if possible or at low flow conditions (outside of the sensitive period for spawning fish in the River Deel).
- A triple silt fence will be constructed at all interfaces of the works area with the River Deel in advance of construction works on the banks of the river at the river flow control structure. Works undertaken on the river banks will be carried out at times of good weather and low flow in the river where there is no potential for significant volumes of surface water runoff from the works area or inundation with flood waters.
- The entire boundary of the works area within the River Deel will be fenced off with a triple silt fence as shown on Construction Sequence Drawing: Stage 5 (Appendix 3B) for the construction of the intake structure. A solid wall of sand or soil bags will be constructed inside the silt fences to create a solid barrier between the works area and the river. All bankside works will be undertaken at times of good weather and low flow in the River where there is no potential for the works area to become inundated with water.
- All works undertaken on the banks will be fully consolidated to prevent scour and run off of silt. Consolidation may include use of protective and biodegradable matting (coirmesh) on the banks and also the sowing of grass seed on bare soil.
- Measures specified in the Outline Construction Environmental Management Plan (CEMP) (Appendix 3C) will be adhered to in order to ensure all works are carried out in a manner designed to avoid and minimise any adverse impacts on the receiving environment.
- All concrete works will be carried out in dry conditions, with no in-stream pouring of concrete, and in accordance with the best practice measures provided Chapter 3, Section 3.3.

- A silt fence will be erected on all sides of the temporary site compounds to prevent any run off from the perimeter of the compounds.
- There will be no refuelling of machinery within the river channel. Refuelling will take place at designated locations in the site compound at distances of greater than 30 metres from the watercourse.
- No vehicles will be left unattended when refuelling and a spill kit including an oil containment boom and absorbent pads will be on site at all times.
- Wash out of concrete truck chutes will be carried out at a designated wash out tank located in the site compound, if required.
- Any fuel that is stored on the site will be in a double skinned, bunded container that will be located within a designated site compound at a location that is removed from the river. The locations of the site compounds are shown on the construction sequence drawings (Appendix 3B). All construction materials and plant will be stored in the site compounds. The compounds will also house the site offices and portaloo toilets. The compounds will be located on ground that is not prone to flooding or will be surrounded by a protective earth bund to prevent inundation. The site compounds will be surfaced with a hard standing to prevent generation of mud. A silt fence will be erected on all sides of the compounds to prevent any run off from the perimeter of the compounds. The locations of the site compounds will be adequately buffered to prevent any surface water runoff.
- All vehicles will be regularly maintained and checked for fuel and oil leaks.
- See also Chapter 5 of this EIAR for mitigation measures for aquatic ecology.
- With regard to the diversion channel,166,000 m^3 of excavated material is anticipated. This material will be reused where possible on site or contained and transported off site as it is generated to reduce any risk of mobilisation to receiving watercourses. Excavated topsoil will be stored separately for reuse in reinstatement works on site and the storage area will be fenced off with silt fencing to prevent any run off.
- Works in the vicinity of the Mullenmore Stream will take place during a dry period to prevent any erosion of bare soil to Mullenmore South stream and subsequently Lough Conn.
- There will be no storage of materials, machinery or soil in areas that are susceptible to flooding.

Monitoring

- Runoff from works, stockpile and compound areas will be monitored and observed daily to ensure that it is not impacting on any local watercourses. Both hydrocarbons and silt cause discolouration so are easy to visually monitor for their presence.
- Alarmed Sondes will be employed to measure turbidity in the River Deel upstream and downstream of the works area during construction of the river flow control structure and intake structure. If 5% difference between the NTU value recorded in the upstream and downstream Sondes and where NTU is above the average baseline conditions (likely to be approximately 10 NTU based on recorded data within the River Deel), all works will cease immediately until the source of the increased turbidity is identified and rectified (if caused by the construction works). If the increase in turbidity is clearly not attributed to the construction works, the works will proceed.
- If necessary, water sampling and monitoring of the local water courses will also be completed to test for Total Suspended Solids (TSS) and hydrocarbon concentrations. The necessity will be determined by the Ecological Clerk of Work.

Residual Impact

Short Term Imperceptible Negative Impact

With the abovementioned mitigation measures and monitoring in place, the residual impact on water quality resulting from the generation of silt-laden run-off, increase of suspended solids and use of potential water

pollutants during the construction phase of the scheme is anticipated to be short term imperceptible negative impact. No significant effects or deterioration in water quality are anticipated.

7.6 Summary of Potential Impacts on Water

Receptor	Impact Description	Pre-mitigation magnitude and significance	Mitigation	Residual Impact
Water Quality	Generation of silt-laden run-off and increase in suspended solids during construction phase of the Scheme	Short term significant negative impact	• Where dewatering is required, waters will be pumped to lands that are over 30 metres from any watercourse and discharged via a silt bag to a discharge point. The discharge point will consist of a circle of triple silt fences surrounding a circle of straw bales wrapped in Terram. All waters pumped from the excavation will filter though the silt bag, straw bales and silt fences before diffusely discharging to the ground. The discharge points will be constructed prior to commencement of construction works and will be monitored on a daily basis when in use to ensure that the release of any polluting material is mitigated. • Any stockpiling will be further than 10 metres from the river bank, and runoff will be prevented by the use of a silt fence. • Prior to construction of the river flow control structure, the instream works areas will be constructed by creating a horseshoe cofferdam. Construction works will be carried out when the river runs dry if possible or at low flow conditions (outside of the sensitive period for spawning fish in the River Deel). • A triple silt fence will be constructed at all interfaces of the works area with the River Deel in advance of construction works on the banks of the river at the river flow control structure. Works undertaken on the river banks will be carried out at times of good weather and low flow in the river. • The entire boundary of the works area within the River Deel will be fenced off with a triple silt fence for the construction of the intake structure. A solid wall of sand or soil bags will be constructed inside the silt fences to create a solid barrier between the works area and the river. All	Short term imperceptible negative impact

			bankside works will be undertaken at times of good weather and low flow in the River. • All works undertaken on the banks will be fully consolidated to prevent scour and run off of silt. • Measures specified in the Outline Construction Environmental Management Plan (CEMP) will be adhered to. • All concrete works will be carried out in dry conditions, with no in-stream pouring of concrete, and in accordance with the best practice measures. • A silt fence will be erected on all sides of the temporary site compounds to prevent any run off from the perimeter of the compounds. • There will be no refuelling of machinery within the river channel. Refuelling will take place at designated locations in the site compound at distances of greater than 30 metres from the watercourse. • No vehicles will be left unattended when refuelling and a spill kit including an oil containment boom and absorbent pads will be on site at all times. • Wash out of concrete truck chutes will be carried out at a designated wash out tank located in the site compound, if required. • Any fuel that is stored on the site will be in a double skinned, bunded container that will be located within a designated site compound. All construction materials and plant will be stored in the site compounds. The site compounds will be surfaced with a hard standing. A silt fence will be erected on all sides of the compounds. • All vehicles will be regularly maintained and checked for fuel and oil leaks. • See also Chapter 5 of this EIAR for mitigation measures for aquatic ecology. • Excavated material will be reused where possible on site or contained and transported off site. Excavated topsoil will be stored separately for reuse in reinstatement works	

			on site and the storage area will be fenced off with silt fencing to prevent any run off. • Works in the vicinity of the Mullenmore Stream will take place during a dry period. • There will be no storage of materials, machinery or soil in areas that are susceptible to flooding.	
Water Quality	Use of potential water contaminants	Short term significant negative impact	• A silt fence will be erected on all sides of the temporary site compounds to prevent any run off from the perimeter of the compounds. • There will be no refuelling of machinery within the river channel. Refuelling will take place at designated locations in the site compound at distances of greater than 30 metres from the watercourse. • No vehicles will be left unattended when refuelling and a spill kit including an oil containment boom and absorbent pads will be on site at all times. • Wash out of concrete truck chutes will be carried out at a designated wash out tank located in the site compound, if required. • Any fuel that is stored on the site will be in a double skinned, bunded container that will be located within a designated site compound at a location that is removed from the river. The locations of the site compounds are shown on the construction sequence drawings (Appendix 3B). All construction materials and plant will be stored in the site compounds. The compounds will also house the site offices and portaloo toilets. The compounds will be located on ground that is not prone to flooding or will be surrounded by a protective earth bund to prevent inundation. The site compounds will be surfaced with a hard standing to prevent generation of mud. A silt fence will be erected on all sides of the compounds to prevent any run off from the perimeter of the compounds. The locations of the site compounds will be adequately buffered to prevent any surface water runoff.	Short term imperceptible negative impact

			• All vehicles will be regularly maintained and checked for fuel and oil leaks. • See also Chapter 5 of this EIAR for mitigation measures for aquatic ecology. • There will be no storage of materials, machinery or soil in areas that are susceptible to flooding.	
Flooding	Impact on flooding during operation phase of the Scheme	Permanent significant positive impact	-	Permanent significant positive impact
Water quality and aquatic habitat	Impact of the operation of the diversion channel and washlands on the environment	Occasional moderate negative impact	• The diversion channel will be grass lined and is designed to maximise the erosion resistance of the wash land (CIRIA,2003). • Areas of predicted high velocities will be reinforced with a geotextile layer and scour protection. • The energy dissipation structure has been designed so as to reduce the velocities of flood waters entering the washlands from the diversion channel. • Consideration will be given to root growth and distribution, root penetration, root survival during drought/ management requirements, climate and seed germination/ grass growth, soil conditions and choice of grass mixtures. • During the construction phase of the Scheme, the works will be sequenced so as to ensure that flow will not be diverted to the diversion channel and wash land area until the grass has been established in the diversion channel • Cattle will not be permitted on the diversion channel to minimise disturbance.	Occasional slight negative impact
Hydromorphology	Changes to natural instream conditions of the River Deel during events where flows exceed bank full flow	Permanent slight negative impact	• Should aggradation occur upstream of the river flow control structure, removal of gravels in this reach will be carried out when the river is dry using a tracked machine which will access the river bank from the vicinity of the intake structure. There will be no instream works. The top of the accumulated gravels will be removed leaving the low water channel unaffected.	Permanent imperceptible negative impact

			• All gravels removed will be made available to IFI for use in fisheries enhancement elsewhere in the catchment and will be stored on site for this purpose.	
Instream Conditions of the Moy_100 River Waterbody	Increased water volumes on natural instream conditions on Mullenmore South Spring and associated Moy_100 river waterbody, during overflow events	Occasional slight negative impact	• Mitigation has been incorporated into the Scheme Design by inclusion of an energy dissipation structure and associated scour protection. The energy dissipation structure will reduce velocities of water entering the washlands and therefore the potential for erosion. The scour protection will also reduce the potential for erosion where velocities are predicted to be highest in the Works Area.	Occasional Imperceptible Negative Impact
Type A Locally Important Sand and Gravel Aquifer	Lowering the water table within Type A locally important sand and gravel aquifer	Permanent slight negative impact	As part of the Scheme (hydrogeological assessment), observation boreholes have been installed adjacent to the channel route and also near the springs with sensors to continuously monitor groundwater conductivity and stage in order to determine the local hydrogeology of the subsoils and bedrock. Data collection will continue during and subsequent to channel construction, with installation of new standpipes as required to replace standpipes disturbed or removed in the course of constructing the scheme. Excavation depths along the entire diversion channel have been minimised in so far as is practicable.	Permanent insignificant negative impact
Karst Groundwater Pathways	Alterations to ground and surface waters due to the interception of karst groundwater pathways	Permanent imperceptible negative impact	An extensive hydrogeological assessment was carried out to investigate if the proposed Scheme would result in any changes to the river flow outside the high flood conditions. The investigations concluded that the proposed route for the diversion channel is located to the north and east of the zone of concentrated groundwater flow between the Deel sinks and Mullenmore Springs. A diversion channel located north of Pollnacross is unlikely to encounter the main karst flow system but may interact with local ground water in the subsoil and upper bedrock. Excavation depths at the downstream end of the diversion channel have been minimised in so far as is practicable and a buffer will be maintained around the spring within which no deep excavations will take place. Notwithstanding this, care shall be taken where excavations take place close to the Mullenmore Springs.	Permanent imperceptible negative impact

AIR QUALITY & CLIMATE /NOISE & VIBRATION CHAPTER

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in relation to Air Quality and Climate, Noise & Vibration and is to be read in conjunction with Chapter 8 of the River Deel (Crossmolina) Drainage Scheme EIAR.

The following supplementary information pertaining to Chapter 8 of the EIAR was requested by the Department of Public Expenditure and Reform on 18th May 2021 and is provided in this section of the EIAR Addendum:

> *"Assess the impact of dust from the excavated material in Chapter 8."*

The request for supplementary information and general comments in relation to Chapter 8 of the EIAR have been addressed in the subsequent sections of this Chapter.

Unless otherwise specified, any text provided below supersedes the text provided in the relevant section of the EIAR. In some instances, it has been necessary to reproduce text from the original EIAR to allow for ease of understanding and provide context. This text is shown in grey for ease of reference.

Statement of Authority

Details of the contributors to this chapter are provided below.

Sinead Gavin

BSc Environmental Biology, Staffordshire University (2000)

MSc Environmental Resource Management, University College Dublin (2005)

CEcol, MCIEEM Chartered Ecologist and Member of Institute of Ecology and Environmental Management

Sinead has 13 years' experience as an environmental scientist and ecologist. She has undertaken environmental assessments for a wide range of large and small-scale infrastructural projects. Sinead has been responsible for the management and writing of a number of EISs/ EIARs, Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) (Screenings and Natura Impact Statements) for development of schemes close to and within Natura 2000 sites (SAC/SPA). Sinead has been involved in Oral hearings for road schemes, been responsible for the management of expert witnesses and acted as expert witness for EIS/EIA Reports. Sinead contributed to Chapter 8 of the EIAR.

Dr. Kathryn Carney

BE (Hons), Bachelor of Engineering (Civil), National University of Ireland Galway (2008)

PhD Civil Engineering, National University of Ireland Galway (2012)

MIEI –Member of Engineers Ireland

Kathryn is a civil engineer with 8 years' post graduate experience in the field of civil and environmental engineering. Kathryn contributed to Chapter 8 of the EIAR and EIAR Addendum.

Mervyn Keegan

Diploma Environmental Science, IT Sligo (1995)

Bachelor of Science, Coventry University (1996)

Master of Science Degree in Environmental Science, Queens University Belfast (1998)

Post Graduate Diploma in Acoustics and Noise Control, University of Ulster

Member of Institute of Acoustics.

Mervyn has over 20 years of environmental consultancy experience and his main areas of professional expertise are in Acoustics & Noise Control and Air Quality & Odour consultancy, including impact assessment and mitigation design. Mervyn contributed to the Dust Impact Assessment provided as Appendix 8A to the EIAR Addendum.

Olivia Maguire

Science Honours Degree in Geography, Queens University (1997),

Master of Science Degree in Environmental Science, Queens University Belfast (1998)

Bachelor of Science Degree in Occupational Safety and Health (With Distinction), IT Sligo (2018)

Member of the Institute of Environmental Management & Assessment.

Olivia has over 15 years of environmental consultancy experience. Olivia's role involves the delivery of a wide range of environmental and occupational health & safety consultancy services to public and private sector clients in areas including occupational health assessments including noise at work and indoor air quality surveys, environmental noise and air quality surveys, air dispersion modelling and environmental permitting applications and compliance monitoring. Olivia contributed to the Dust Impact Assessment provided as Appendix 8A to the EIAR Addendum.

8.4 Air Quality and Climate Impact Assessment

8.4.2 Air Quality – Dust Generation

Potential Short Term Slight Negative Impact

Construction activities may lead to the emission of dust. Dust is classified as matter with a particle size of between 1 and 75 microns (1-75 µm). As dust particles fall out of suspension in the air, dust deposition typically occurs in close proximity to the site and potential impacts generally occur within 500 metres of the dust generating activity. Deposition rates decrease with distance from the generating source and larger particles deposit closer to the source. Sensitivity to dust depends on the duration of the dust deposition, the dust generating activity, and the nature of the deposit. Therefore, a higher tolerance of dust deposition is likely to be shown if only short periods of dust deposition are expected and the dust generating activity is expected to stop.

The potential for dust to be emitted will depend on the type of activity being carried out in conjunction with environmental factors including levels of rainfall, wind speed and wind direction. Assuming worst case scenario, dust deposition may impact on properties within 500 m of the works during the construction phase of the Scheme. Dust generation rates depend on the site activity, particle size (in particular the silt content, defined as particles smaller than 75 microns in size), the moisture content of the material and weather conditions. Dust emissions are dramatically reduced where rainfall has occurred due to the cohesion created between dust particles and water and the removal of suspended dust from the air. It is typical to assume no dust is generated under "wet day" conditions where rainfall greater than 0.2 mm has fallen. 30-year average data (1961-1990) from Belmullet and Claremorris meteorological stations identified that typically 249 and 230 days per annum are "wet", respectively. Therefore, for greater than 63% of the time no significant dust generation will be likely due to meteorological conditions.

Large particles which are greater than 75 microns in size fall out of atmospheric suspension and are therefore deposited in close proximity to the source. Smaller particles which are less than 75 microns can remain in atmospheric suspension for a greater distance and therefore give rise to potential dust nuisance. Particles which are less than 75 microns in size are referred to as silt. Emission rates are normally predicted on a site-specific particle size distribution for each dust emission source.

The majority of dust produced during the construction period will be deposited in close proximity to the source and any impacts from dust will generally be within several hundred meters of the construction area (UK ODPM, 2000).

Construction activities such as excavating and earth moving are likely to produce some level of dust during the construction phase of the project. These activities will mainly produce particles of dust greater than 10 microns, these particles are considered a nuisance but do not have the potential to cause significant health impacts.

A Dust Impact Assessment for the Scheme is included in Appendix 8A. The potential dust emissions from the proposed scheme are associated with excavation of approximately 166,400m^3 of material, construction activities and the transport of surplus excavated material from the works area which may lead to trackout of dust and dirt from the works area to the public road network.

As set out in Chapter 11, Table 11.4, the estimated total number of round trips from site for the removal of excavated material will range from 10,400 – 17,000 over the anticipated construction programme. The potential dust emissions magnitude associated with excavation, construction works and trackout is defined as large. The sensitivity of the area to dust soiling effects on people and property is defined as medium; in terms of potential earthworks and construction dust impacts. The sensitivity of the area is low in terms of potential trackout dust impacts. Dust impacts from the transport of surplus excavated materials will be low (Appendix 8A).

As the construction phase of the scheme is short term, the potential for dust nuisance and significant levels of PM_{10} and $PM_{2.5}$ will be short term and will vary spatially during the construction phase, constituting a **short term slight negative impact**. Mitigation measures relating to dust generation are detailed below.

8.4.5 Mitigation Measures – Air Quality & Climate

The generation of dust is dependent on the construction activity being carried out. Environmental factors such as rainfall, wind speed and wind direction will also affect dust emissions. A worst case scenario has been assumed in the assessment. In order to predict and reduce the volume of dust emissions pertaining to the construction phase of the proposed Scheme, dust control measures have been developed and are included in the Outline Construction Environmental Management Plan (OCEMP) (Appendix 3C). Any measures specified in the plan that are to be carried out by third parties will be contractual obligations.

A number of measures will be implements in order to minimise dust impact:

- Communications:
    - A stakeholder communications plan will be developed and implemented. The plan will include community engagement before work commences on site
    - The name and contact details of the person(s) accountable for air quality and dust issues shall be displayed on the site boundary as well as the regional office contact details.
- Dust management:

- A Dust Management Plan (DMP) will be developed and implemented. The DMP shall include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.

- Site Management:
  - All dust and air quality complaints will be recorded, causes identified and appropriate measures taken to reduce emissions. A record of measures taken will be maintained.
  - The complaints log will be made available to the Local Authority on request.
  - Any exceptional incidents that cause dust and/or air emissions will be recorded in the logbook as well as the actions taken to resolve the situation.
- Preparing and maintaining the site:
  - The site layout will be planned so that machinery and dust causing activities are located away from receptors, as far as is possible.
  - Solid screens or barriers will be erected around dusty activities or the site boundary that are at least as high as any stockpiles on site.
  - Specific operations with a high potential for dust production will be enclosed
  - Site fencing, barriers and scaffolding will be cleaned using wet methods
  - Materials that have the potential to produce dust shall be removed from site as soon as possible, unless being re-used on site.
  - If materials are being reused on site, stockpiles will be covered or fenced to prevent wind whipping.
- Operation of machinery and sustainable travel:
  - All vehicles will be switched off when stationary
  - Mains electricity or battery powered equipment will be used where practicable in lieu of diesel or petrol powered generators
  - Maximum speed limits of 10 mph shall be imposed on unsurfaced haul roads and works areas. A maximum speed limit of 15 mph will be imposed on surfaced haul roads and works areas.
  - A Construction Logistics Plan will be produced to manage the sustainable delivery of goods and materials.
- Construction measures
  - Scabbling of concrete surfaces will be avoided where possible
  - Sand and other aggregates will be stored in bunded areas and will not be allowed to dry out
  - Any bulk cement or dry powder materials delivered to site will be delivered in enclosed tankers and stored in silos with suitable control systems to prevent escape of material and overfilling during delivery. Smaller supplies of fine powder materials will be stored in sealed bags to prevent dust emissions

- Measures specific to trackout:
    - Water assisted dust sweepers will be used on access and local roads to remove, as necessary, any materials tracked out of the site.
    - Dry sweeping of large areas will be avoided.
    - Transport vehicles entering and leaving the works area will be covered to prevent escape of materials during transport
    - On site haul routes will be inspected for integrity and any repairs necessary will be carried out as soon as reasonably practicable. All inspections of haul routes will be recorded in the site logbook
    - Hard surfaced haul routes will be regularly cleaned and regularly damped down with fixed or mobile sprinkler systems or mobile water bowsers.
    - A wheel washing system will be implemented
    - Access gates to be located at least 10m from receptors where possible
- All site roads within the construction works boundary shall be regularly inspected, cleaned and maintained during the construction phase. The construction works boundary is shown in Appendix 3A.
- Hard surface roads within the construction site boundary shall be swept to remove mud and aggregate materials from their surface.
- Any road that has the potential to give rise to dust emissions must be regularly inspected and watered during periods of dry and/or windy weather to minimise the movement of dust particles to the air and ensure that dust does not cause a nuisance.
- Speeds shall be restricted on hard surface roads and vehicles transporting materials with dust potential must ensure that the material is enclose or covered with tarpaulin at all times.
- The construction traffic routes identified in Chapter 11 (Material Assets), shall be regularly inspected for cleanliness and cleaned as necessary to minimise the movement of dust particles to the air, as detailed in the OCEMP.
- In the event of dust nuisance occurring outside the site boundary, movement of materials must be terminated immediately and procedures implements to rectify the problem.
- The dust management plan shall be reviewed at regular intervals during the construction phase to ensure that best practice and procedures are in place to minimise dust emissions.
- All plant and materials shall be stored in dedicated areas on site.
- Stockpiling of excavated material will be minimised by coordinating excavation, spreading and removal of surplus material off site.

A number of mitigation measures will be implemented in relation to exhaust emissions and climate during the construction phase:

- Machinery will be switched off when not in use.
- All construction vehicles and plant will be maintained in good operational order.

- Aggregate materials used in construction shall be sourced locally where possible to reduce potential emissions.

The following mitigation measures will be implemented in relation to the risks associated with flooding during the construction phase of the Scheme:

- Works will be sequenced, and temporary works areas have been selected to avoid potential for inundation of the works area by flood water in so far as is practicable during construction stage. The final section of the diversion channel to be constructed will be the section between the high point downstream of the L1105 bridge and the intake structure, thereby ensuring that the diversion channel will not become operational until the downstream extents of the channel have been fully reinstated.
- Works on the intake structure and river flow control structure will be carried out at times of good weather and low flow in the river where there is no potential for significant volumes of surface water runoff from the works area or inundation with flood waters.
- There will be no storage of materials, machinery or soil in areas that are susceptible to flooding

8.4.6 Monitoring

The dust mitigation measures put in place will be strictly monitored and assessed throughout the construction phase to ensure their effectiveness as identified in the OCEMP (Appendix 3C).
Dust monitoring shall be carried out as follows:

- Daily inspections shall be carried out to monitor dust within and in the vicinity of the Study Area, including roads. Monitoring shall include regular dust soiling checks of surfaces within 100 m of the site boundary.
- Regular site inspections shall be carried out in order to ensure that the dust control measures are being implemented effectively.
- The frequency of site inspections shall be increased when activities with a high potential to produce dust are being carried out (e.g. excavation and earth moving) or during prolonged dry or windy conditions.
- Dust deposition, dust flux or PM_{10} monitoring locations shall be agreed with the Local Authority. Baseline monitoring shall be carried out a minimum of 3 months in advance of works commencing on site.
- Inspection results shall be recorded and made available to the Local Authority on request.

8.4.7 Residual Impact – Air Quality and Climate

Short Term Negligible Impact and Permanent Significant Positive Impact

The implementation of the mitigation measures set out above will minimise impacts associated with dust generation, emissions and flood risk during construction, therefore the proposed Scheme will have a **short-term negligible impact** on air quality and climate during the construction phase.
The proposed Scheme will have a **negligible impact** on air quality once operational.
The proposed Scheme is highly adaptable to increasing flood risk due to climate change. As a result, lands that are at risk of flooding due to climate change will benefit from the proposed Scheme and the subsequent impacts of flooding due to climate change will be mitigated. This constitutes a **permanent significant positive impact** during the operation phase of the Scheme.

8.9 Summary of Potential Impacts on Air & Climate, Noise & Vibration

Receptor	Impact Description	Pre-mitigation magnitude and significance	Mitigation	Residual Impact
Air Quality	Dust generation	Short term slight negative impact	• Mitigation measures are specified in section 8.4.5 of the EIAR and EIAR Addendum. • A stakeholder communications plan will be developed and implemented. The plan will include community engagement before work commences on site • The name and contact details of the person(s) accountable for air quality and dust issues shall be displayed on the site boundary as well as the regional office contact details. • A Dust Management Plan (DMP) will be developed and implemented. The DMP shall include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections. • All dust and air quality complaints will be recorded, causes identified and appropriate measures taken to reduce emissions. A record of measures taken will be maintained. • The complaints log will be made available to the Local Authority on request. • Any exceptional incidents that cause dust and/or air emissions will be recorded in the logbook as well as the actions taken to resolve the situation. • The site layout will be planned so that machinery and dust causing activities are located away from receptors, as far as is possible. • Solid screens or barriers will be erected around dusty activities or the site boundary that are at least as high as any stockpiles on site. • Specific operations with a high potential for dust production will be enclosed • Site fencing, barriers and scaffolding will be cleaned using wet methods	Short term negligible impact

			• Materials that have the potential to produce dust shall be removed from site as soon as possible, unless being re-used on site. • If materials are being reused on site, stockpiles will be covered or fenced to prevent wind whipping. • All vehicles will be switched off when stationary • Mains electricity or battery powered equipment will be used where practicable in lieu of diesel or petrol powered generators • Maximum speed limits of 10 mph shall be imposed on unsurfaced haul roads and works areas. A maximum speed limit of 15 mph will be imposed on surfaced haul roads and works areas. • A Construction Logistics Plan will be produced to manage the sustainable delivery of goods and materials. • Water assisted dust sweepers will be used on access and local roads to remove, as necessary, any materials tracked out of the site. • Dry sweeping of large areas will be avoided. • Transport vehicles entering and leaving the works area will be covered to prevent escape of materials during transport • On site haul routes will be inspected for integrity and any repairs necessary will be carried out as soon as reasonably practicable. All inspections of haul routes will be recorded in the site logbook • Hard surfaced haul routes will be regularly cleaned and regularly damped down with fixed or mobile sprinkler systems or mobile water bowsers. • A wheel washing system will be implemented • Access gates to be located at least 10m from receptors where possible • All site roads within the construction works boundary shall be regularly inspected, cleaned and maintained during the construction phase. The construction works boundary is shown in Appendix 3A.	

			• Hard surface roads within the construction site boundary shall be swept to remove mud and aggregate materials from their surface. • Any road that has the potential to give rise to dust emissions must be regularly inspected and watered during periods of dry and/or windy weather to minimise the movement of dust particles to the air and ensure that dust does not cause a nuisance. • Speeds shall be restricted on hard surface roads and vehicles transporting materials with dust potential must ensure that the material is enclose or covered with tarpaulin at all times. • The construction traffic routes shall be regularly inspected for cleanliness and cleaned as necessary to minimise the movement of dust particles to the air. • In the event of dust nuisance occurring outside the site boundary, movement of materials must be terminated immediately and procedures implements to rectify the problem. • The dust management plan shall be reviewed at regular intervals during the construction phase to ensure that best practice and procedures are in place to minimise dust emissions. • All plant and materials shall be stored in dedicated areas on site. • Stockpiling of excavated material will be minimised by coordinating excavation, spreading and removal of surplus material off site.	
Air Quality	Exhaust emissions	Short term slight negative impact	• Machinery will be switched off when not in use. • All construction vehicles and plant will be maintained in good operational order. • Aggregate materials used in construction shall be sourced locally where possible to reduce potential emissions.	Short term negligible impact
Climate	Construction phase impact on climate	Short term negligible temporary impact	-	Short term negligible impact

Climate	Impact due to climate change during construction phase	Temporary significant negative impact	• Works will be sequenced, and temporary works areas have been selected to avoid potential for inundation of the works area by flood water in so far as is practicable during construction stage. The final section of the diversion channel to be constructed will be the section between the high point downstream of the L1105 bridge and the intake structure, thereby ensuring that the diversion channel will not become operational until the downstream extents of the channel have been fully reinstated. • Works on the intake structure and river flow control structure will be carried out at times of good weather and low flow in the river where there is no potential for significant volumes of surface water runoff from the works area or inundation with flood waters. • There will be no storage of materials, machinery or soil in areas that are susceptible to flooding	Short term negligible impact
Climate	Operation phase impact on climate	Permanent significant positive impact	-	Permanent significant positive impact
Noise	Reinforced concrete works, new channel works and road realignment	Short term moderate to significant negative impact	Mitigation measures are set out in Section 8.6.5 of the EIAR. • where noise levels at NSLs are anticipated to exceed the daytime noise criteria, hoarding extending to a height of 2.4 m will be erected between the works area and the NSL. • limiting the hours during which site activities are likely to create high levels of noise or vibration are permitted; • establishing channels of communication between the contractor/developer, Local Authority and residents; • appointing a site representative responsible for matters relating to noise; • monitoring typical levels of noise during critical periods and at sensitive locations and along the river bed. • Furthermore, a variety of practicable noise control measures will be employed. These will include: ○ selection of plant with low inherent potential for generation of noise;	Short term slight negative impact
Noise	Site investigation	Temporary negligible impact		Temporary negligible impact

			○ erection of enclosures as necessary around noisy processes and items such as generators, heavy mechanical plant or high duty compressors; ○ placing of noisy plant as far away from sensitive properties as permitted by site constraints	
Noise	Piling	Temporary moderate to significant negative impact	• an alternative piling process which is viable to reduce noise and vibration impacts such as the Giken Seisakusho 'Silent Piler', or Variable Frequency Hammer or Variable Static Moment piling will be employed, if it is necessary to include sheet piling in the works.	Short term slight negative impact
Noise	HGV movements	Short term negligible impact	-	Short term negligible impact
Vibration	Vibration impact during construction	Temporary moderate negative impact	Mitigation measures are specified in Section 8.7.1 of the EIAR. These will include: • establishing channels of communication between the contractor/developer, Local Authority and residents; inform affected residents of time of blasting or piling 24 hours in advance; • appointing a site representative responsible for matters relating to vibration; • monitoring typical levels of vibration during critical periods and at sensitive locations and along the river bed. • If traditional piling methods are employed, a test pile will be erected at the piling location closest to the nearest sensitive locations. Vibration monitoring will then be conducted to confirm that ground borne vibration will be within the guidance criteria limits and that no structural damage will therefore occur to adjacent buildings. • Vibration monitoring will also be conducted at locations along the river bed which are in proximity to piling activities in order to ensure that vibration will not adversely affect the aquatic environment. • Furthermore, a variety of practicable vibration control measures will be employed. These will include: ○ selection of plant with low inherent potential for generation of vibration;	Temporary imperceptible negative impact

			○ placing of vibratory plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.	

LANDSCAPE CHAPTER

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in relation to the Landscape Chapter and is to be read in conjunction with Chapter 9 of the River Deel (Crossmolina) Drainage Scheme EIAR.

Statement of Authority
The Peer review document recommends that the names and qualifications of those who were involved in the preparation of the chapter be provided within each Chapter. It is noted that Chapter 1 of the EIAR provides these details in Table 1.2 but for convenience, the details of the contributors to this chapter are provided below.

Evelyn Sikora
Bachelor of Landscape Architecture (2006) Edinburgh College of Art/Heriot Watt University
Masters in Planning and Sustainable Development (2010) University College Cork

Evelyn is a Landscape Architect & Planner with five years of experience working as a landscape architect in private practice in Ireland. Evelyn worked with McCarthy Keville O'Sullivan between 2014 and 2018. Evelyn's key strengths and expertise are in the Landscape and Visual Impact Assessment field, while she also has experience in landscape design, master planning, recreation planning and project management.

Joanna Mole
MSc Renewable Energy Systems Technology, 2005, Loughborough University.
Post-Graduate Diploma in Landscape Architecture, 1995, Leeds Metropolitan University.
BSc(Hons) in Landscape Design and Plant Science, 1992, Sheffield University.

Joanna is a Landscape and Visual Impact Assessment Specialist and Chartered Landscape Architect with McCarthy O'Sullivan Ltd. with over 15 years of experience working as a landscape architect in both private practice and local authorities. Prior to taking up her position with McCarthy Keville O'Sullivan in October 2017, Joanna worked as a Landscape Architect with Kav-Banof in Israel and held previous posts with CSR in Cork, LMK in Limerick, Geo Architects in Israel and Groundwork Bridgend in South Wales. Joanna is a Chartered Landscape Architect with specialist knowledge in Landscape and Visual Impact assessments for projects ranging from individual houses to large windfarms, cycle route design and landscape contract management. Since joining MKO Joanna has been involved in projects such as energy infrastructure, extraction industry and residential projects. Within MKO Joanna works as part of a large multi-disciplinary team to produce EIA Reports. Joanna holds chartered membership of the British Landscape Institute since 1998 and has been an examiner for British Landscape Institute professional practice exam.

Pat Roberts provided the summary table of impacts that is provided in the EIAR Addendum.

Summary of Potential Impacts on Landscape

The peer review document recommends that all of the potential impacts, including their likelihood and potential impact be summarised in a table at the conclusion of the Chapter which would also include mitigation measures and residual impacts.

Table 9.5. is provided below and summarises the impact assessment conclusions associated with construction phase of the proposed development relating to the Landscape Chapter of the EIAR.

Receptor	Impact Description	Pre-mitigation magnitude and significance	Mitigation	Residual Impact
Views throughout Study Area	Removal of trees, vegetation and bankside habitat	Moderate, Negative Landscape and Visual Effect along River Deel	A total of 2445 linear metres of hedgerow or tree lines will be planted along the boundary of the development footprint. This will exceed the amount being lost (1471 linear metres) 974 linear metres, ensure hedgerow habitat is replaced and will assist in re-creating the natural patterns in the landscape. Similarly, the amount of woodland lost will be replaced through planting to screen the development. In particular, planting to screen the spillway form the residence at Pollnacross will lessen the visual effect as it matures. All planting will be native species that are found in the local area and shown in Appendix 3A	No significant residual effect
		Slight Negative Landscape and Visual Effect in other areas within Scheme - roadside		
Views throughout Study Area	Construction of Channel and Spillway	Moderate Negative Visual Effect in respect of spillway	Mitigation Measures which will reduce the landscape and visual effects include planting of vegetation as shown in Appendix 3A, which will reduce both landscape and visual effects.	No significant residual effect
		Imperceptible to Slight Negative Visual Effects in respect of grass lined channel		
Landscape Effect	Construction of channel and spillway	Slight Negative Landscape Effects in areas where the proposed channel cuts through agricultural grassland		

		Moderate Negative Landscape Effects in areas where a combination of works will locally change the rural character and replace permeable surfaces with impermeable		
Views from Study Area	Construction Works - Construction Traffic, Materials and Temporary Site Buildings	Moderate, Negative, Temporary Impact	Any negative impact associated with the proposed works on the visual amenity and landscape within the study area, will be minimised as described in Chapter 11 (Material Assets) and through the implementation of the Outline Construction and Environmental Management Plan (OCEMP). A construction compound will be used to house materials, plant and machinery, welfare facilities and site offices as part of the CEMP and traffic movements will be subject to regulation through the traffic management plan. Best practice measures for noise control will be adhered to onsite during the construction phase of the proposed development, as described in Chapter 8 Air, Climate and Noise and Vibration. These measures will mitigate the slight short-term negative impact associated with construction phase noise.	No significant residual effect
Visual Effects at River	Constructed Scheme	Not Significant	N/A Mitigation Measures which will reduce the landscape and visual effects include planting of vegetation as outlined above which will reduce the visual effects.	No significant residual effect
Visual at Bridge and Intake Structure	Constructed Scheme	Worst Case – Moderate to Significant		
Visual at Energy Dissipation Structure and road realignment	Constructed Scheme	Worst Case – Moderate to Significant		

Table 9.5 Summary of operational impacts table – Landscape

CULTURAL HERITAGE CHAPTER

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in relation to Cultural Heritage and is to be read in conjunction with Chapter 10 of the River Deel (Crossmolina) Drainage Scheme EIAR.

The general comments in relation to Chapter 10 of the EIAR have been addressed in the subsequent sections of this Chapter.

Unless otherwise specified, any text provided below supersedes the text provided in the relevant section of the EIAR.

Statement of Authority

Details of the contributors to this chapter are provided below.

John Cronin
B.A. (UCC), 1991, MRUP (UCD) 1993, MUBC (UCD), 1999

Colm Chambers
B.A. (UCC), 2008, M.A. (UCC), 2011

Martin McGonigle
B.A. (GMIT), 2001, MSc. (UU),2002

John, Colm and Martin were responsible for the production of the Cultural Heritage Chapter (Ch.10) of the EIAR. All three individuals have each amassed a wide range of experience in the preparation of archaeological and cultural heritage assessments, including EIA assessment for flood relief schemes in Bandon, Cork City and Blackpool.

Kathryn Carney provided the summary table of impacts that is provided in the EIAR Addendum.

10.8 Summary of Potential Impacts on Cultural Heritage

Receptor	Impact Description	Pre-mitigation magnitude and significance	Mitigation	Residual Impact
Cultural Heritage	Construction phase impact to Enclosure	Medium significance neutral impact	None required	No likely significant adverse residual impacts on the cultural heritage resource
Cultural Heritage	Construction phase impact to Corn Mill Site	Medium significance neutral impact	Level 3 Building Survey report will be compiled and submitted to MCC and NMS	No likely significant adverse residual impacts on the cultural heritage resource during construction phase
Cultural Heritage	Operation phase impact to Corn Mill Site	Direct moderate negative impact of permanent duration	Level 3 Building Survey report will be compiled and submitted to MCC and NMS	Direct moderate negative impact of permanent duration
Cultural Heritage	Construction phase impact to Townland boundary between Mullenmore North and Cartrongilbert	Low significance, likely direct, slight negative impact of permanent duration	Testing to be carried out under licence issued by NMS. A report will be compiled and submitted to NMS and OPW Project Archaeologists	No likely significant adverse residual impacts on the cultural heritage resource

MATERIAL ASSETS CHAPTER

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in relation to Material Assets and is to be read in conjunction with Chapter 11 of the River Deel (Crossmolina) Drainage Scheme EIAR.

The following supplementary information pertaining to Chapter 11 of the EIAR was requested by the Department of Public Expenditure and Reform on 18th May 2021 and is provided in this section of the EIAR Addendum:

> *"Review the Traffic Impact Assessment in view of the response to clarification on soil quantity"*
> *"Provide more detail on the proposed waste management to include details of proposed facilities."*

The request for supplementary information and general comments in relation to Chapter 11 of the EIAR have been addressed in the subsequent sections of this Chapter.

Unless otherwise specified, any text provided below supersedes the text provided in the relevant section of the EIAR. In some instances, it has been necessary to reproduce text from the original EIAR to allow for ease of understanding and provide context. This text is shown in grey for ease of reference.

Statement of Authority

Details of the contributors to this chapter are provided below.

Dr. Kathryn Carney

BE (Hons), Bachelor of Engineering (Civil), National University of Ireland Galway (2008)

PhD Civil Engineering, National University of Ireland Galway (2012)

MIEI –Member of Engineers Ireland

Kathryn is a civil engineer with 8 years' post graduate experience in the field of civil and environmental engineering. Kathryn contributed to Chapter 11 of the EIAR and EIAR Addendum.

Jonathan Reid

BE (Hons) Bachelor of Engineering (Civil), National University of Ireland, Galway, (2003)

CEng, Chartered Engineer

MIEI, Member of Engineers Ireland

MIAHS, Member of the International Association of Hydrological Sciences

Jonathan has 17 years' experience in the management, design, planning and development of major civil engineering projects, including flood relief schemes. Jonathan has led Ryan Hanley's team in the preparation of EISs (and EIARs) on several flood schemes including the Lower Lee (Cork City), Blackpool (Cork), and Bandon. Jonathan contributed to Chapter 11 of the EIAR and EIAR Addendum

11.2.2 Existing Traffic

The annual average daily traffic (AADT) data and percentage of heavy goods vehicles (HGV) for the N59 between Crossmolina and Bangor-Erris, Moylaw are presented in Table 11.1.

	2019	2018	2017
AADT	2179	2070	1978
% HGV	4.6%	4.9%	4.2%

Table 11.1 Traffic flows on the N59 between Crossmolina and Bangor-Erris, Moylaw (Source: Transport Infrastructure Ireland www.nratrafficdata.ie)

The peak hourly traffic flows for the N59 between Crossmolina and Bangor-Erris, Moylaw are presented in Table 11.2.

Road Name	AADT (2019)	Peak Hourly Flow (11am-12 noon)	Peak Hourly Flow (5 – 6 pm)
N59 Between Crossmolina and Bangor-Erris	2179	137	188

Table 11.2 Peak hourly traffic flows on the N59 between Crossmolina and Bangor-Erris, Moylaw 2017 (Source: Transport Infrastructure Ireland www.nratrafficdata.ie)

Traffic surveys were carried out in 2007 and June 2021 by Mayo National Roads Design Office (NRDO) (Table 11.3). The surveys included for the main routes through Crossmolina Town. The Mayo NRDO 2021 traffic survey will provide the baseline for the traffic impact assessment of the River Deel (Crossmolina) Drainage Scheme.

The anticipated routes of the traffic generated during the construction phase are presented on Table 11.3.

Road Name	AADT (2007)	AADT (2021)
N59 – Ballina Street	5000	5638
N59 – Main/Bridge Street	1200	-
N59 – Erris Street	3200	3086
R315 – Church Street	2100	2111
R315 – Mullenmore Street	2800	3502
Chapel Street	900	1948
The Boreen - North of Carpark	-	597
The Boreen - South of Carpark	-	164

Table 11.3 – Recorded Traffic Flows on Anticipated Construction Traffic Routes (NRDO 2007)

The busiest areas in Crossmolina Town, as shown above are the N59 (Ballina Street, Erris Street and Main/ Bridge Street) and the R315 (Mullenmore Street and Church Street).

11.2.3 Construction Traffic

Construction related traffic will originate from the delivery of materials to site, removal of surplus excavated material from site and transport of employees to, from and throughout the site. The estimated number of round trips is approximately 24,000 – 30,500 over the anticipated construction period of up to 4 years. A breakdown of the estimated number of trips is provided in Table 11.4.

The removal of surplus material will comprise primarily of material excavated for construction of the diversion channel and intake structure. To a lesser extent, surplus material will also arise from excavation during construction of the bridges and road realignment. The estimated number of round trips from site for removal

of surplus material is 10,400 – 17,000 over the anticipated construction programme, which equates to approximately 44 – 56% of the overall number of anticipated round trips.

The estimated number of round trips for construction personnel employed on site is approximately 10 - 30 round trips per day over the construction period, depending on the level of activity on site. These trips include staff movements to and from the site compounds and works areas. It is estimated that construction of the Scheme will take a maximum of four years to allow for phasing of work associated with the programme restrictions outlined in the Chapter 3 (Description of Proposed Development).

Table 11.4 gives a breakdown of the estimated construction traffic for River Deel (Crossmolina) Drainage Scheme and the estimated minimum and peak number of round trips per day. The minimum number of round trips represents the scenario where there is a slow down in construction activity and only workforce movements take place. The peak number of round trips represents the worst-case scenario and has therefore been used in the assessment of impact of construction traffic in Section 11.2.4.2.

Description of Trip	Total Round Trips	Round Trips Per Day	Location
Delivery of Materials	2,000	0 - 10	All Routes
Removal of Excavated Material	10,400-17,000	0 – 67	All Routes
Workforce	11,440	10 - 30	All Routes
Total (peak)		107	
Total (during a slow down in construction activity)		10	

Table 11.4 – Estimated Construction Traffic

11.2.4.2 Potential Impact of Construction Traffic

Potential Short Term Slight Negative Impact and Potential Occasional Imperceptible Negative Impact

Table 11.5 compares the predicted peak construction traffic with the existing traffic flows in Crossmolina town. A worst-case scenario has been assumed in relation to the daily volume of construction traffic, as detailed in Section 11.2.3 and Table 11.4:

Road Name	Annual Average Daily Traffic	Construction Traffic	
		Peak Daily Construction Traffic	As a Percentage of Existing Traffic
N59 – Ballina Street	5638	107	1.90%
N59 – Erris Street	3086	107	3.47%
R315 – Church Street	2111	107	5.07%
R315 – Mullenmore Street	3502	107	3.06%
L1105 - Chapel Street	1948	107	5.49%
The Boreen – North of Carpark	579	14[a]	2.42%
The Boreen – South of Carpark	164	14[a]	8.54%

Table 11.5– Peak Daily Construction Traffic as a Percentage of Existing Traffic on Anticipated Construction Traffic Routes

[a]*Peak daily construction traffic for works associated with the construction of the river flow control structure.*

During the construction phase, the predicted increase in traffic as a result of construction traffic is estimated to range in an increase of 1.90% to 8.54% on existing base levels assuming the worst-case scenario. It is

predicted that the L1105/Chapel Street and the Boreen (south of the carpark) will have the largest percentage increase in existing traffic volumes during the construction phase of the proposed scheme due to the smaller volumes of traffic currently using the roads, however it is not anticipated that this will result in notable traffic congestion. It is not anticipated that there will be a significant increase in journey time along the anticipated traffic routes as a result of construction traffic. The potential impact will be short term in nature.

During the operation phase of the Scheme, traffic associated with the Scheme maintenance will have an occasional imperceptible negative impact on traffic due to the small volume and infrequent nature of the maintenance works (Chapter 3, Section 3.2.4).

Mitigation Measures

Traffic volumes on the L1105 will be mitigated by the road closure during the construction of the Pollnacross Bridge, which will increase traffic volumes using the R315. The L1105 will be used for delivery of materials during construction of the river flow control structure which will minimise construction traffic on the Boreen.

A Road Transport and Traffic Management Report will be prepared to include a map indicating the proposed public roads or haulage routes for removal of surplus material off site, as listed in Table 11.5.

In addition, the following mitigation measure will be implemented within the Plan:

- The locations at which traffic management measures will be put in place will be agreed with the BMD-West Engineer prior to commencement of the construction phase.
- The contractor will confirm the proposed laden weight of trucks identified, max length of same, Journey time and number of trips per route per day to and from works sites.
- The contractor will confirm the proposed start and finish times as outlined in this document and days for truck haulage and estimate the minimum and maximum number of days for full operation.
- Pull-in lay-bys or hardstands for overtaking of slow moving traffic will be identified along the proposed haulage routes.
- Any traffic control measures will be carried out with the agreement and under the supervision of the local Area Engineer. Road signage on the public road network will comply with the Department of the Transport's Traffic Signs Manual "Chapter 8 Temporary Traffic Measures and Signs for Roadworks".
- Traffic management measures will be designed in accordance with the "Guidance for the Control and Management of Traffic at Roadworks – Second Edition".

Residual Impact – Short Term Not Significant Negative Impact and Occasional Imperceptible Negative Impact

The impact of additional traffic volumes due to construction traffic will be short term. With the above mitigation measures in place, it is not anticipated that the volume of construction traffic will significantly affect the flow of traffic through Crossmolina Town and it is not anticipated that there will be a significant increase in journey time along the anticipated traffic routes.

During the operation phase, traffic associated with maintenance of the Scheme will have an occasional imperceptible negative impact on traffic volumes.

11.4.2 Classification of Waste

Excavation for the proposed diversion channel, bridge foundations, retaining wall and embankment foundations and road alignment will give rise to a surplus volume of material during the construction phase of the proposed scheme. The topsoil and excavated material will be reused on site where possible. In addition, any gravels removed from the River Deel as part of the maintenance regime (Chapter 3, Section 3.2.4) will be made available to IFI for use in fisheries enhancement elsewhere in the catchment. It is anticipated that approximately 166,400 m^3 of excavated material will have to be exported from the site.

The European Waste Codes (EWC) for typical waste materials that may possibly be generated during the construction phase are outlined in Table 11.10.

Waste Material	LoW
Soil, stones and dredged spoil	17 05
Bituminous mixtures, coal tar and tarred products	17 03
Concrete, Bricks, Tiles and Ceramics	17 01
Metals (including their alloys)	17 04
Waste Hydraulic Oils*	13 01
Wastes of Liquid Fuels*	13 07
* Denotes Hazardous Materials	

Table 11.10 – Applicable List of Waste (LoW) Code

A breakdown of the estimated volumes of waste, origin of waste, and List of Waste (LoW) Codes are shown on Table 11.11. The volumes are estimated based on the extent of excavation required and local topography.

Origin of Waste	LoW Code	Estimated Volume of Waste (m^3)
Diversion Channel	17 05/17 03	166,000
Bridge/ Retaining Wall Foundations	17 05/17 03	300
Miscellaneous	17 05/ 17 04/17 03/17 01/ 13 01/ 13 07	100
	Total	**166,400**

Table 11.11 – Estimated C&D Waste resulting from the proposed scheme

Three strands of Japanese Knotweed (*Fallopia japonica*) were identified in the works area and an area of the proposed washlands. Therefore, any soil removed from any effected areas must be managed in accordance with the Invasive Species Management Plan as set out Chapter 5.

11.4.3 Potential Impact during Construction Phase

Potential Permanent Moderate Negative Impact

As detailed in Chapter 6, the vast majority of surplus material will be generated during the construction of the diversion channel and will consist of natural Fluvioglacial deposits and Glacial till.

Poor management of waste has the potential to cause nuisance and an adverse environmental impact, particularly due to the presence of Japanese Knotweed in the proposed working areas. Mismanagement of soil removed from these areas could lead to the spreading of the invasive alien species in other areas. Waste that is not managed and stored appropriately on site may result in water and ground pollution on or

in the vicinity of the site. Litter and debris may be generated from leftover construction materials, packaging from materials and mixed waste produced by the site staff.

Poor management of excavated waste could lead to the disposal of waste deemed unsuitable for reuse or recycling in facilities that do not carry the appropriate licenses.

In addition, if waste is not managed and stored correctly on site, it has the potential to cause nuisance and environmental impact. Litter may be generated from packaging taken from materials, mixed waste produced by the construction workers (lunches, cigarette waste etc.), or from debris from leftover/damaged construction materials. Poor management of waste may also result in water and ground pollution on the site or adjacent to the site.

Fuels and hydraulic oils/lubricants that will be used during the construction phase are classed as hazardous. There will be fuels stored on site for machinery and construction vehicles along with oils and lubricants. Should any spillages, waste or surplus liquids be disposed of incorrectly it could cause serious harm to the surrounding environment.

The potential impacts of construction and demolition waste on the environment, given the presence of Japanese Knotweed in the study area, are predicted to be permanent and moderate.

Mitigation Measures

All current and applicable waste management legislation will be applied and adhered to. Contractors that are engaged in the transport of waste off-site will comply with the provisions of the Waste Management Act (1996) (as amended), associated Regulations and the Waste Management Plan prepared in accordance with 'Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects (2006)'. As such, the Contractor must handle, transport and dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities. A waste collection permit to transport the waste which has been issued by the National Waste Collection Permit Office must be held by the relevant contractor.

Waste receiving facilities must also be appropriately licensed or permitted for the waste being received. The Contractor will be prohibited from delivering waste to unlicensed facilities and Operators of such facilities cannot receive any waste, unless in possession of a waste permit granted by the Local Authority under the 'Waste Management (Facility Permit & Registration) Regulations 2007' (as amended) or a waste license granted by the EPA. The permit/license held will specify the type and quantity of waste able to be received, stored, sorted, recycled and/or disposed of at the specific site. The contractor shall provide details of all proposed waste facilities to the Area Engineer before works commence on site. It has been confirmed that there are appropriate facilities in the area available to receive and process waste material.

The construction compound for the proposed scheme will have a dedicated Waste Storage Area (WSA) for any construction waste generated. Receptacles/skips or bays will be provided for each recyclable material.

Bedrock, Block and Concrete

It is reasonable to assume that gravels and bedrock may be encountered during the excavation of the diversion channel, bridge foundations. Made ground is likely to be encountered in areas where the proposed diversion channel crosses the R315, Lake Road and access roads. Any material which is not reused will be separated out and sent to an appropriate authorised recycling facility or waste facility if deemed unsuitable for recycling.

During construction of the two new bridges, the intake structure, river flow control structure, energy dissipation structure, access roads and footpaths it is reasonable to assume that there will be some waste concrete and blocks generated. This waste will be adequately contained and stored within the WSA of the construction compound. It will then be disposed of to an appropriate authorised licensed facility.

Soil/Subsoil

As mentioned above, the majority of the C&D generated from the construction phase will result from the excavation of the proposed diversion channel. All works carried out in areas where Japanese Knotweed has been identified will be managed in accordance with the measures set out in the Invasive Species Management Plan (Chapter 5).

Excavated material will be reused where possible, classified as a construction by-product in the context of Article 27 of the European Communities (Waste Directive) Regulations 2011.

Soils generated from excavations which is not in a Japanese Knotweed infested area will be stored separately from the gravels and bedrock and will be transported to an appropriately licensed facility by permitted contractors. Where feasible, material will be removed from site and transported to the closest suitably licenced facility to be processed and used on other construction projects in the vicinity.

Coolturk Quarry has been identified as one of a number of potential disposal site for excavated material from the proposed channel (subject to approval). Coolturk Quarry is currently authorised under Waste Facility Permit no. WFP-MO-15-0035-02 to accept the List of Waste (LoW) codes for the excavated material (17 03 / 17 05).

Although it is not foreseen, if contaminated soils are encountered, they will be stored separately to the inert material. Samples will be taken and tested in order to appropriately classify the material as non-hazardous or hazardous to establish the criteria for the acceptance of waste at landfills. They will then be transported to an appropriately licensed facility for treatment and safe disposal by permitted contractors.

Scrap Metal

Reinforced concrete is likely to be used as part of the construction of the river flow control structure, intake structure, energy dissipation structure and two new bridges. As such it is reasonable to assume that a small amount of scrap metal be generated.

Scrap metal is highly recyclable and as such it will be segregated from other waste and recycled accordingly.

Timber

A small amount of timber waste may also be generated as a result of hoarding around works areas, or from shuttering for in-situ concrete pours. It is likely that this timber can be reused for a number of different functions throughout the construction phase however a small amount of waste will be generated, and the timber as a whole could be disposed of as the construction phase comes to a close.

Timber that is uncontaminated, i.e. free from paints, preservatives, glues etc, will all be recycled. Should any timber be deemed to be contaminated it will be collected by an appropriately permitted specialist contractor and disposed of in an appropriately licensed facility.

Hazardous Materials

If hazardous materials are used/encountered on site, i.e. bituminous mixtures containing coal tar, timber with paint, asbestos concrete pipes, a specialist contractor will be employed to carry out an environmental clean-

up to remove all traces of contaminated material from the site. The specialist contractor will be licensed under the 'Waste Management (Collection Permit) Regulations, 2007' (as amended). This will be disposed of at an appropriately licensed facility.

In order to avoid any hazardous materials infiltrating the ground water during construction and operation phase there will be a bunded area constructed within the site compound with sufficient volume to contain any spills. All plant refuelling, maintenance or washing will be carried out within the bunded area. Spill kits will also be available at this area to facilitate the quick and effective cleaning of any substances.

Documentation

Waste will be weighed, either by weighing mechanism on the truck or at the receiving facility, and these records will be kept by the contractor (both hard and soft copies).

A copy of all waste collection permits, for all waste contractors will be kept by the Waste Manager, working on behalf of the Contractor, on site.

If the waste is being transported to another site, a copy of the waste permit or EPA Waste License for that site must be provided and kept by the Waste Manager. If the waste is being shipped abroad, a copy of the Transfrontier Shipping (TFS) document must be obtained from Dublin City Council (as the relevant authority on behalf of all local authorities in Ireland) and kept on site along with details of the final destination (permits, licenses etc). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

All information will be entered into the waste management system to be maintained on site.

Residual Impacts – Short Term Imperceptible Negative Impact

Taking into account the abovementioned mitigation measures, the residual impact of construction and demolition waste generated during the construction phase will be a Short Term imperceptible negative impact.

11.9 Summary of Potential Impacts on Material Assets

Receptor	Impact Description	Pre-mitigation magnitude and significance	Mitigation	Residual Impact
Traffic and Transport	Impact on transport infrastructure	Short term slight negative impact and permanent significant positive impact	• New bridge construction will be carried out in accordance with the design standards • Construction of roads will be carried out in consultation with the Local Authority • General condition and structural surveys will be carried out on all routes that may be impacted • Construction details of lay-buys or hardstand will be provided where required to facilitate construction traffic • Weight/height restrictions on proposed haul routes will be identified and complied with • Durable bound surface and a secure joint will be formed between access road and the public road • Adequate drainage will be maintained at all times • Cleaning regime for plant will be implemented	Short term not significant negative impact and permanent significant positive impact
Traffic and Transport	Impact of construction traffic	Short term slight negative impact and occasional imperceptible negative impact	• A Road Transport and Traffic Management report will be prepared • Locations for traffic management measures will be agreed with the BMD West Engineer prior to construction phase • The proposed laden weight and max length of trucks will be confirmed along with journey time and number of trips per route per day to and from the works area • Pull-in lay-bys or hardstands will be identified on proposed haul routes • Traffic control measures will be carried out in agreement and under the supervision of the local area engineer • Road signage will comply with the Department of Transport's Traffic Signs Manual "Chapter 8 Temporary Traffic Measures and Signs for Roadworks" • Traffic management measures will be in accordance with the "Guidance for the Control and Management of Traffic at Roadworks- Second Edition"	Short term not significant negative impact and occasional imperceptible negative impact

Traffic and Transport	Works in the vicinity of the road network	Short term slight negative impact	• Localised traffic disruptions will be mitigated through use of industry standard traffic management measures • Road signage will comply with the Department of Transport's Traffic Signs Manual "Chapter 8 Temporary Traffic Measures and Signs for Roadworks" • Durable bound surface and a secure joint will be formed between access road and the public road • Adequate drainage will be maintained at all times • Cleaning regime will be implemented for plant	Short term imperceptible negative impact
Traffic and Transport	Road Closures	Temporary significant negative impact	• Works will be sequenced to avoid unnecessary interruption to road users • Realigned Lake Road to be constructed in advance of the two new bridges thereby providing an alternative route to the R315 locally at the Mullenmore Bridge • Any road or lane closures will be timed to minimize the impact to the flow of traffic • Works will be out at off peak times if possible • Residents and interested parties will be consulted with planning road closures to optimise timing • A schedule of road closures will be published in advance of works commencing	Temporary moderate to significant negative impact
Services	Impact of site investigation on services	Temporary imperceptible negative impact	• Standard industry methodologies to be implemented to mitigate impact to existing services	Temporary imperceptible negative impact
Services	Impact to water distribution network	Temporary moderate negative impact	• Service drawings and detailed site investigation will be assessed to determine the locations of watermains relative to the proposed works • Additional site investigation will be carried out to confirm the location of watermains • Any anticipated clashes will be identified and any diversions necessary will be designed, planned and agreed with Irish Water	Temporary not significant negative impact

Services	Impact to gas network	Temporary significant negative impact	• Locations of gas pipelines will be confirmed in advance of construction • Service drawings and detailed site investigation will be assessed to determine the locations and depth of gas pipelines relative to the proposed works • Additional site investigation will be carried out to confirm the location of watermains • Any anticipated clashes will be identified and any diversions necessary will be designed, planned and agreed with Bord Gáis	Temporary not significant negative impact
Services	Impact to electricity network	Temporary significant negative impact	• Locations of electricity network will be confirmed in advance of construction • Service drawings and detailed site investigation will be assessed to determine the locations and depth of the underground electricity network relative to the proposed works • Additional site investigation will be carried out to confirm the location of the underground electricity network • Any anticipated clashes will be identified and any diversions necessary will be designed, planned and agreed with the ESB • Impacts to or from overhead cables will be mitigated by applying standard construction practice and adherence to the ESB Code of Practice for Avoiding Danger from Overhead Electricity Lines, May 2019 and the HAS Code of Practice for Avoiding Danger from Underground Services, 2010	Temporary not significant negative impact
Services	Impact to telecommunications network	Temporary moderate negative impact	• Locations of telecommunications network will be confirmed in advance of construction • Service drawings and detailed site investigation will be assessed to determine the locations and depth of the existing network relative to the proposed works • Additional site investigation will be carried out to confirm the location of the underground telecommunications network • Any anticipated clashes will be identified and any diversions necessary will be designed, planned and agreed with the service provider • Impacts to overhead cables will be mitigated by applying standard construction practice	Temporary not significant negative impact

Waste Management	Impact due to construction phase waste management	Permanent moderate negative impact	• All current and applicable waste management legislation will be applied and adhered to • Contractors that are engaged in the transport of waste off-site will comply with the provisions of the Waste Management Act (1996) (as amended), associated Regulations and the Waste Management Plan prepared in accordance with 'Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects (2006) • Waste receiving facilities must also be appropriately licensed or permitted for the waste being received. • The contractor shall provide details of all proposed waste facilities to the Area Engineer before works commence on site. • The construction compound for the proposed scheme will have a dedicated Waste Storage Area (WSA) for any construction waste generated. • Receptacles/skips or bays will be provided for each recyclable material. • Excavated soil/subsoil material will be reused where possible, classified as a construction by-product in the context of Article 27 of the European Communities (Waste Directive) Regulations 2011. • If contaminated soils are encountered, they will be stored separately to inert material and transported to an appropriately licensed facility for treatment and safe disposal by permitted contractors	Short term imperceptible negative impact
			• Scrap metal will be segregated from other waste and recycled accordingly • Timber that is uncontaminated will be recycled • If hazardous material is used or encountered on site, a specialist contractor will be employed to carry out an environmental clean-up to remove all traces of contaminated material from the site	
Waste Management	Impact due to operation phase waste management	Temporary slight negative impact	• Waste from maintenance activities will be placed in appropriate waste streams designated for recycling, reuse or disposal	Neutral impact

Land Use	Access to property	Permanent significant negative impact	• Access to property along the Land Road will be maintained by realigning the road and creating a new junction with the R315 • Where access to residential properties are to be relocated, alternative access routes will be provided • Any extinguished access to agricultural properties will be replaced • The diversion channel rote has been chosen with regard to several factors including the goal to minimize the division of field and land holdings where possible	Permanent significant positive impact
Land Use	Residential and commercial land use	Potential moderate positive impact	• The route of the diversion channel has been chosen with regard to several factors including the goal to minimise impacts on residential properties where possible. • Encroachment on residential landholdings has be minimised by design so far as is practicable.	Permanent significant positive impact
Land Use	Agricultural land use	Permanent moderate negative impact	• Good communication between the Communications Officer and the landowners during the construction phase will prevent undue disturbance due to noise, dust and to minimise difficulties caused by the restriction of access to severed land parcels • Where existing access routes to agricultural lands are to be extinguished, these will be replaced where practicable. • Where access points are to be relocated, these will be agreed with landowners in advance of construction works	Permanent slight negative impact

SCHEDULE OF MITIGATION

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in respect of the Schedule of Mitigation and is to be read in conjunction with Chapter 12 of the River Deel (Crossmolina) Drainage Scheme EIAR. Whilst the peer review document found this chapter of the EIAR to be detailed and comprehensive, in line with all the other chapters, a statement of authority has been provided.

Statement of Authority

The Peer review document recommends that the names and qualifications of those who were involved in the preparation of the chapter be provided within each Chapter.

Owen Cahill

B.Sc. (Hons) Construction Management, Galway Mayo Institute of Technology (2004).

M.Sc. Construction Management, Galway Mayo Institute of Technology (2007).

MSc. in Environmental Engineering at Queens University, Belfast in 2010.

Owen is an Environmental Engineer with MKO, with over 11 years of experience in the Environmental Management and Construction Industries. Owen's wide ranging multi sector experience has provided him with specialist knowledge and understanding of the challenges in the planning and delivery of developments with the minimum environmental impact and with practicality and constructability in mind.

Owen has been involved as a Project Manager on a range of energy infrastructure, commercial, residential, waste facility and quarry projects as well as managing the licensing requirements of a number of EPA licensed facilities.

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
Construction Phase				
Drainage Design and Management				
MM15	EIAR Ch3, 14	The timing for construction of the river flow control structure is dependent on periods when the river runs dry or there is low flow in the river and outside of the sensitive period for spawning fish in the River Deel.		
MM16	EIAR Ch3, 14 OCEMP Section 8	The construction works have been sequenced, as detailed in Section 3.4, so as to ensure that flow will not be allowed into the channel from the river until the grass lining has been established		
MM18	EIAR Ch3, 14	A temporary construction compound will comprise the following: • temporary site offices, port-a-loo toilets, facilities for staff and car-parking areas. • storage areas for construction materials. • bunded containment areas for plant refuelling, maintenance, washing and for the storage of fuels and site generators. • a dedicated waste storage area for any construction waste generated. Skips or bays will be provided for recyclable material. wheel wash area for construction and delivery vehicles and a designated wash out tank for wash out of concrete trucks following concrete pours.		
Construction Management				
MM26	EIAR Ch5, 14 NIS Section 4	Construction of the proposed scheme has been specifically designed to avoid the potential for water pollution. Details of the construction work practices and detailed method statements for each construction activity. Measures include:		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		• Minimisation of Instream working area as outlined in construction drawings provided in Appendix 3A. • Appropriate timing of works to avoid sensitive periods, flooding or high flows. • Detailed construction drainage design to avoid potential run off • Detailed monitoring regime that ensures all measures are effectively employed during construction. • Employment of an Environmental Clerk of Works. • Use of Sondes upstream and downstream of the works area to continually monitor water quality during the construction period. • *Use of alarms that trigger when there is a 5% difference between the NTU value recorded in the upstream and downstream Sondes and where NTU is above the average baseline conditions (likely to be approximately 10 NTU based on recorded data within the River Deel)* Emergency procedures in place to minimise the potential for or impact of any pollution event.		
MM29	EIAR Ch5, 8, 14 OCEMP Section 3 NIS Section 2	The following measures will be put in place to avoid the occurrence of any adverse impacts resulting from the use of hydrocarbons on the site. • Fuels, chemicals, liquids and solid wastes will be stored on impermeable surfaces. Fuels stored on site will be minimised. Plant refuelling shall be undertaken using a jeep mounted bowser to minimise storage of fuel on site. Small quantities of		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		chemicals and petrol required for tools shall be stored with drip trays in a vented fuel store in the temporary works compound • Plant refuelling shall be undertaken on impermeable surfaces within a suitably constructed bund in accordance with best practice guidelines . No refuelling will be permitted in or near soil or rock cuttings. Only designated trained operatives will be authorised to refuel plant on-site • Plant shall be inspected regularly for any leaks • Storage of fuel and oil will be regularly inspected for leaks or signs of damage • A lock system will be fitted on all taps, nozzles or valves associated with refuelling equipment • All hydrocarbons and other potential contaminants will be stored within suitably constructed bunds in accordance with best practice guidelines. The bunds will be sized to hold 110% of the volume of the stored contaminants in order to contain a spill should it occur. The base and walls of the bund shall be impermeable to water and oil • Spill kits will be provided at refuelling areas and at high risk/sensitive sites • Large volumes of excavated material will not be allowed to accumulate within the temporary working areas. Any stockpiling of soils will be greater than 10 metres away from any surface waters, and runoff will be prevented by the use of a silt fence		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		• There will be no storage of materials, machinery or soil in areas that are susceptible to flooding • Where contaminated soil is encountered, the ECoW will assess the extent of contamination and will supervise any operations involving contaminated soil. Any contaminated soil will be transported to an approved waste facility for treatment and safe disposal. An emergency response plan to deal with accidental spillages is contained within the Outline Construction Environmental Management Plan. This will include providing toolbox talks regarding the appropriate use of spill kits and best practice for the management of accidental spills.		
MM30	EIAR Ch7, 14 NIS Section 2	Measures to minimise the suspension and transfer of sediment and pollutants to ground and surface waters will be implemented. These measures are as follows: • Where dewatering is required, waters will be pumped to lands that are over 30 metres from any watercourse and discharged via a silt bag to a discharge point. The discharge point will consist of a circle of triple silt fences surrounding a circle of straw bales wrapped in Terram. All waters pumped from the excavation will filter though the silt bag, straw bales and silt fences before diffusely discharging to the ground. The discharge points will be constructed prior to commencement of construction works and will be monitored on a daily basis when in use to ensure that the release of any polluting material is mitigated. • Any stockpiling will be further than 10 metres from the river bank, and runoff will be prevented by the use of a silt fence. • Prior to construction of the river flow control structure, the instream works areas will be constructed by creating a horseshoe cofferdam. Construction works will be		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		carried out when the river runs dry if possible or at low flow conditions (outside of the sensitive period for spawning fish in the River Deel). • A triple silt fence will be constructed at all interfaces of the works area with the River Deel in advance of construction works on the banks of the river at the river flow control structure. Works undertaken on the river banks will be carried out at times of good weather and low flow in the river where there is no potential for significant volumes of surface water runoff from the works area or inundation with flood waters. • The entire boundary of the works area within the River Deel will be fenced off with a triple silt fence as shown on Construction Sequence Drawing: Stage 5 (Appendix 3B) for the construction of the intake structure. A solid wall of sand or soil bags will be constructed inside the silt fences to create a solid barrier between the works area and the river. All bankside works will be undertaken at times of good weather and low flow in the River where there is no potential for the works area to become inundated with water. • All works undertaken on the banks will be fully consolidated to prevent scour and run off of silt. Consolidation may include use of protective and biodegradable matting (coirmesh) on the banks and also the sowing of grass seed on bare soil. • Measures specified in the Outline Construction Environmental Management Plan will be adhered to in order to ensure all works are carried out in a manner designed to avoid and minimise any adverse impacts on the receiving environment. • All concrete works will be carried out in dry conditions, with no in-stream pouring of concrete, and in accordance with the best practice measures provided Chapter 3		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		• A silt fence will be erected on all sides of the temporary site compounds to prevent any run off from the perimeter of the compounds. • There will be no refuelling of machinery within the river channel. Refuelling will take place at designated locations in the site compound at distances of greater than 30 metres from the watercourse. • No vehicles will be left unattended when refuelling and a spill kit including an oil containment boom and absorbent pads will be on site at all times. • Wash out of concrete truck chutes will be carried out at a designated wash out tank located in the site compound, if required. • Any fuel that is stored on the site will be in a double skinned, bunded container that will be located within a designated site compound at a location that is removed from the river. The locations of the site compounds are shown on the construction sequence drawings (Appendix 3B). All construction materials and plant will be stored in the site compounds. The compounds will also house the site offices and port-a-loo toilets. The compounds will be located on ground that is not prone to flooding or will be surrounded by a protective earth bund to prevent inundation. The site compounds will be surfaced with a hard standing to prevent generation of mud. A silt fence will be erected on all sides of the compounds to prevent any run off from the perimeter of the compounds. The locations of the site compounds will be adequately buffered to prevent any surface water runoff. • All vehicles will be regularly maintained and checked for fuel and oil leaks. • See also Chapter 5 of this EIAR for mitigation measures for aquatic ecology. • With regard to the diversion channel,166,000 m^3 of excavated material is anticipated. This material will be reused where possible on site or contained and		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		transported off site as it is generated to reduce any risk of mobilisation to receiving watercourses. Excavated topsoil will be stored separately for reuse in reinstatement works on site and the storage area will be fenced off with silt fencing to prevent any run off. • Works in the vicinity of the Mullenmore Stream will take place during a dry period to prevent any erosion of bare soil to Mullenmore South stream and subsequently Lough Conn. There will be no storage of materials, machinery or soil in areas that are susceptible to flooding.		
Air Quality/Dust				
MM57	EIAR Ch4, 8 OCEMP Section 3	In periods of extended dry weather, dust suppression (localised wetting of surfaces) may be necessary within and around the site to ensure dust does not cause a nuisance. A number of measures will be implements in order to minimise dust impact: • Communications: o A stakeholder communications plan will be developed and implemented. The plan will include community engagement before work commences on site o The name and contact details of the person(s) accountable for air quality and dust issues shall be displayed on the site boundary as well as the regional office contact details. • Dust management:		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		○ A Dust Management Plan (DMP) will be developed and implemented. The DMP shall include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections. • Site Management: ○ All dust and air quality complaints will be recorded, causes identified and appropriate measures taken to reduce emissions. A record of measures taken will be maintained. ○ The complaints log will be made available to the Local Authority on request. ○ Any exceptional incidents that cause dust and/or air emissions will be recorded in the logbook as well as the actions taken to resolve the situation. • Preparing and maintaining the site: ○ The site layout will be planned so that machinery and dust causing activities are located away from receptors, as far as is possible. ○ Solid screens or barriers will be erected around dusty activities or the site boundary that are at least as high as any stockpiles on site. ○ Specific operations with a high potential for dust production will be enclosed ○ Site fencing, barriers and scaffolding will be cleaned using wet methods		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		○ Materials that have the potential to produce dust shall be removed from site as soon as possible, unless being re-used on site. ○ If materials are being reused on site, stockpiles will be covered or fenced to prevent wind whipping. • Operation of machinery and sustainable travel: ○ All vehicles will be switched off when stationary ○ Mains electricity or battery powered equipment will be used where practicable in lieu of diesel or petrol powered generators ○ Maximum speed limits of 10 mph shall be imposed on unsurfaced haul roads and works areas. A maximum speed limit of 15 mph will be imposed on surfaced haul roads and works areas. ○ A Construction Logistics Plan will be produced to manage the sustainable delivery of goods and materials. • Construction measures ○ Scabbling of concrete surfaces will be avoided where possible ○ Sand and other aggregates will be stored in bunded areas and will not be allowed to dry out ○ Any bulk cement or dry powder materials delivered to site will be delivered in enclosed tankers and stored in silos with suitable control systems to prevent escape of material and overfilling during delivery.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		Smaller supplies of fine powder materials will be stored in sealed bags to prevent dust emissions • Measures specific to trackout: o Water assisted dust sweepers will be used on access and local roads to remove, as necessary, any materials tracked out of the site. o Dry sweeping of large areas will be avoided. o Transport vehicles entering and leaving the works area will be covered to prevent escape of materials during transport o On site haul routes will be inspected for integrity and any repairs necessary will be carried out as soon as reasonably practicable. All inspections of haul routes will be recorded in the site logbook o Hard surfaced haul routes will be regularly cleaned and regularly damped down with fixed or mobile sprinkler systems or mobile water bowsers. o A wheel washing system will be implemented o Access gates to be located at least 10m from receptors where possible • All site roads within the construction works boundary shall be regularly inspected, cleaned and maintained during the construction phase. The construction works boundary is shown in Appendix 3A.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		• Hard surface roads within the construction site boundary shall be swept to remove mud and aggregate materials from their surface. • Any road that has the potential to give rise to dust emissions must be regularly inspected and watered during periods of dry and/or windy weather to minimise the movement of dust particles to the air and ensure that dust does not cause a nuisance. • Speeds shall be restricted on hard surface roads and vehicles transporting materials with dust potential must ensure that the material is enclose or covered with tarpaulin at all times. • The construction traffic routes identified in Chapter 11 (Material Assets), shall be regularly inspected for cleanliness and cleaned as necessary to minimise the movement of dust particles to the air, as detailed in the OCEMP. • In the event of dust nuisance occurring outside the site boundary, movement of materials must be terminated immediately and procedures implements to rectify the problem. • The dust management plan shall be reviewed at regular intervals during the construction phase to ensure that best practice and procedures are in place to minimise dust emissions. • All plant and materials shall be stored in dedicated areas on site. • Stockpiling of excavated material will be minimised by coordinating excavation, spreading and removal of surplus material off site.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
Traffic				
MM68	EIAR Ch11, 14	The construction of the reinforced concrete bridges will be carried out by a suitably qualified and experienced contractor who will be supervised to ensure that the works are carried out correctly. This will ensure that the bridges will be constructed safely and ensure the structural integrity of the structure		
MM69	EIAR Ch11, 14	Road Transport and Traffic Management Report will be prepared to include a map indicating the proposed public roads or haulage routes for removal of surplus material off site, as listed in Table 11.5 of Chapter 11. In addition, the following mitigation measure will be implemented within the Plan: • The locations at which traffic management measures will be put in place will be agreed with the BMD-West Engineer prior to commencement of the construction phase. • The contractor will confirm the proposed laden weight of trucks identified, max length of same, Journey time and number of trips per route per day to and from works sites. • The contractor will confirm the proposed start and finish times as outlined in this document and days for truck haulage and estimate the minimum and maximum number of days for full operation. • Pull-in lay-bys or hardstands for overtaking of slow moving traffic will be identified along the proposed haulage routes. • Any traffic control measures will be carried out with the agreement and under the supervision of the local Area Engineer. Road signage on the public road network will comply with the Department of the Transport's Traffic Signs Manual "Chapter 8 Temporary Traffic Measures and Signs for Roadworks".		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		• Traffic management measures will be designed in accordance with the "Guidance for the Control and Management of Traffic at Roadworks – Second Edition".		
MM70	EIAR Ch11, 14	The contractor will also be obliged to provide the following mitigation measures: • Road signage on the public road network will comply with the Department of the Transport's Traffic Signs Manual "Chapter 8 Temporary Traffic Measures and Signs for Roadworks". • Site entrance locations off the public road may require a durable bound surface and a secure joint must be formed between the access road and the public road. A durable bound surface is required on access roads for a minimum distance of 10 m from the public road • Adequate drainage will be maintained at all times to ensure that no surface water from the site or site access discharges to the public roads Cleaning regime for plant will be implemented in order to minimise mud/dust on public roads		
Waste Management				
MM73A	EIAR Ch11	• All current and applicable waste management legislation will be applied and adhered to • The construction compound for the proposed scheme will have a dedicated Waste Storage Area (WSA) for any construction waste generated. Receptacles/skips or bays will be provided for each recyclable material.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		• Excavated material will be reused where possible, classified as a construction by-product in the context of Article 27 of the European Communities (Waste Directive) Regulations 2011. • Soils generated from excavations which is not in a Japanese Knotweed infested area will be stored separately from the gravels and bedrock and will be transported to an appropriately licensed facility by permitted contractors. Where feasible, material will be removed from site and transported to the closest suitably licenced facility to be processed and used on other construction projects in the vicinity. • If contaminated soils are encountered, they will be stored separately to the inert material. Samples will be taken and tested in order to appropriately classify the material as non-hazardous or hazardous to establish the criteria for the acceptance of waste at landfills. They will then be transported to an appropriately licensed facility for treatment and safe disposal by permitted contractors. • Scrap metal will be segregated from other waste and recycled accordingly. • Timber that is uncontaminated will all be recycled. Should any timber be deemed to be contaminated it will be collected by an appropriately permitted specialist contractor and disposed of in an appropriately licensed facility. • If hazardous materials are used/encountered on site a specialist contractor will be employed to carry out an environmental clean-up to remove all traces of contaminated material from the site. The specialist contractor will be licensed under		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		the 'Waste Management (Collection Permit) Regulations, 2007' (as amended). This will be disposed of at an appropriately licensed facility. • Waste will be weighed, either by weighing mechanism on the truck or at the receiving facility, and these records will be kept by the contractor (both hard and soft copies). A copy of all waste collection permits, for all waste contractors will be kept by the Waste Manager, working on behalf of the Contractor, on site.		
MM73B	EIAR Ch14	The proposed development will also be subject to a fire safety risk assessment in accordance with Chapter 19 of the Safety, Health and Welfare at Work Acts 2005 to 2014, which will assist in the identification of any major risks of fire on site, and mitigation of the same during operation.		
Operational Phase				
MM76	EIAR Ch7, 14	Data from hydrometric gauges installed in connection with the Scheme will be monitored and the hydraulic model will be periodically recalibrated following high flow events to inform if any adjustments are required to the adjustable steel plates on the river flow control structure and along the intake weir.		

Table 12.1Mitigation Measures (Excerpt)

INTERACTION OF THE FOREGOING

This Chapter of the Environmental Impact Assessment Report (EIAR) Addendum provides supplementary information in respect of the Schedule of Mitigation and is to be read in conjunction with Chapter 13 of the River Deel (Crossmolina) Drainage Scheme EIAR. Whilst the peer review document found this chapter of the EIAR to be adequate and its findings have not changed following the supplementary information provided following the peer review, in line with all the other chapters, a statement of authority has been provided.

Statement of Authority

The Peer review document recommends that the names and qualifications of those who were involved in the preparation of the chapter be provided within each Chapter. It is noted that Chapter 1 of the EIAR provides these details in Table 1.2 but for convenience, the details of the contributors to this chapter are provided below. It is noted that the preparation of this chapter required collaboration from the entire project team, though it was finalised and completed by one contributor.

Pat Roberts
B.Sc. (Environmental Science) (2005) National University of Ireland, Galway
Member of Chartered Institute of Ecology and Environmental Management (CIEEM)

Pat is a Senior Ecologist and director of the Ecology team with MKO. with over 15 years' post graduate experience as a professional ecologist. Pat has worked as a senior ecologist on numerous OPW projects for over 10 years. These have included including flood relief schemes and drainage maintenance projects. Pats key strengths include his depth of knowledge and experience of a wide range of ecological and biodiversity topics. He currently manages the ecological team within MKO and ensures that the outputs from that team are of a very high standard and meet the requirements of the clients.

14. MAJOR ACCIDENTS & NATURAL DISASTERS CHAPTER

Introduction

This section of the Environmental Impact Assessment Report (EIAR) describes the likely significant negative effects on the environment arising from the vulnerability of the proposed Crossmolina Drainage Scheme to risks of major accidents and/or natural disasters. It has been completed in accordance with the guidance set out by the Environmental Protection Agency (EPA) in 'Guidelines on Information to be contained in Environmental Impact Statements' (EPA, 2017) and the European Commission in relation to Environmental Impact Assessment of Projects (Directive 2011/92/EU, as amended by 2014/52/EU), namely '*Guidance on the preparation of the Environmental Impact Assessment Report*'.

The assessment of the vulnerability of the proposed development to major accidents and natural disasters is carried out in compliance with the EIA Directive (2014/52/EU) which states the need to assess:

> *"the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or natural disasters which are relevant to the project concerned."*

The objective of this assessment is to ensure that appropriate precautionary actions are taken for those projects.

> *"because of their vulnerability to major accidents and/or natural disasters, are likely to have significant adverse effects on the environment".*

Based on the requirements of the EIA Directive, this chapter seeks to determine:

- The relevant major accidents and/or natural disasters, if any, that the proposed development could be vulnerable to;
- The potential for these major accidents and/or natural disasters to result in likely significant adverse environmental effect(s); and
- The measures that are in place, or need to be in place, to prevent or mitigate the likely significant adverse effects of such events on the environment.

Statement of Authority

The Peer review document recommends that the names and qualifications of those who were involved in the preparation of the chapter be provided within each Chapter. It is noted that Chapter 1 of the EIAR provides these details in Table 1.2 but for convenience, the details of the contributor to this chapter is provided below.

Owen Cahill

B.Sc. (Hons) Construction Management, Galway Mayo Institute of Technology (2004).

M.Sc. Construction Management, Galway Mayo Institute of Technology (2007).

MSc. in Environmental Engineering at Queens University, Belfast in 2010.

Owen is an Environmental Engineer with MKO, with over 11 years of experience in the Environmental Management and Construction Industries. Owen's wide ranging multi sector experience has provided him with specialist knowledge and understanding of the challenges in the planning and delivery of developments with the minimum environmental impact and with practicality and constructability in mind.

Owen has been involved as a Project Manager on a range of energy infrastructure, commercial, residential, waste facility and quarry projects as well as managing the licensing requirements of a number of EPA licensed facilities.

Assessment Methodology

14.1.1 General

The following sources of information and literature pertinent to the area were used in the preparation of this section:

- Census of Ireland,
- Regional Planning Guidelines for the West Region 2010-2022,
- Regional Spatial and Economic Strategy (RSES), published by the Northern and Western Regional Assembly on 23 January 2020,
- Mayo County Development Plan, 2014-2020,
- Mayo County Council Website,
- Fáilte Ireland,
- Local Community Websites: www.crossmolina.ie

Major accidents or natural disasters are hazards which have the potential to affect the proposed development. These include accidents during construction and operation caused by operational failure and/or natural hazards. The assessment of the risk of major accidents and/or disaster considers all factors defined in the EIA Directive that have been considered in this EIAR, i.e. population and human health, biodiversity, land, soil, water, air and climate and material assets, cultural heritage and the landscape.

14.1.2 Legislative Context

14.1.2.1 Legislation

An assessment of the following key elements was undertaken in accordance with the EIA Directive (2014/52/EU):

- The vulnerability of the proposed Scheme to potential accidents and disasters
- The proposed Scheme's potential to cause major accidents or disasters which pose a risk to human health, cultural heritage and/ or the environment

The information relevant to major accidents and/or disasters to be included in the EIAR is set out in Section 8 of Annex IV of the EIA Directive as follows:

> *"(8) A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to Union legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant*

adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies".

14.1.2.2 Guidance Documents

The following guidance documents have be consulted in the preparation of this section:

- European Commission. (2017). Environmental Impact Assessment of Projects – *Guidance on the preparation of Environmental Impact Assessment Reports*
- Environmental Protection Agency. (2017). *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*
- Department of Environment, Heritage and Local Government (2010) *A Guide to Risk Assessment in Major Emergency Management*
- *Environmental Protect Agency (2014) Guidance on Assessing and Costing Environmental Liabilities*
- Department of Defence (2020) *A National Risk Assessment for Ireland*
- Mayo County Council (2020) *Major Emergency Plan for Mayo*

14.1.3 Categorisation of the Baseline Environment

A desk-study has been completed to establish the baseline environment for which the proposed risk assessment is being carried out. This will influence both the likelihood and the impact of a major accident or natural disaster. Local and regional context has been established prior to undertaking the risk assessment to develop an understanding of the vulnerability and resilience of the area to emergency situations.

Further detail on the baseline environment is provided in Section 14.3

14.1.4 Impact Assessment Methodology

14.1.4.1 Introduction

This assessment is focused on an understanding that the proposed development will be designed, built and operated in line with best international current practice. Therefore, the vulnerability of the proposed development to risks of major accidents and natural disasters is considered low when taking account of the intended purpose of the overall development to alleviate the impact of such natural disasters.

Current EIA practice already includes an assessment of some potential accidents and disaster scenarios such as pollution incidents to ground and watercourses as well as assessment of flooding events. These are described in detail in the relevant EIAR assessment chapters (Refer to Chapters 4 and 11 for further detail).

14.1.4.2 Site-Specific Risk Assessment Methodology

A site-specific risk assessment identifies and quantifies risks focusing on unplanned, but possible and plausible events occurring during the construction and operation of the proposed development. The approach to identifying and quantifying risks associated with the proposed development by means of a site specific risk assessment is derived from the EPA Guidance on Assessing and Costing Environmental Liabilities document. The following steps were taken as part of the site specific risk assessment:

- Risk identification
- Risk classification, likelihood and consequence; and
- Risk evaluation

Risk Identification

Risks have been reviewed through the identification of reasonably foreseeable risks in consultation with relevant contributors to this EIAR. The identification of risks has focused on non-standard but plausible incidents that could occur at the proposed development during construction and operation.

In accordance with the European Commission EIAR Guidance, risks are identified in respect of the projects:

1. Potential to cause accidents and/or disasters,
2. Vulnerability to potential disaster/accident

Risk Classification

Classification of Likelihood

After identifying the potential risks, the likelihood of occurrence of each risk has been assessed. An analysis of safety procedures and proposed environmental controls was considered when estimating likelihood of identified potential risks occurring. Table 14.1 defines the likelihood ratings that have been applied.

The approach adopted has assumed a 'risk likelihood' where one or more aspects of the likelihood description are met.

Table 14.1 Classification of Likelihood (Source: DoEHLG, 2010)

Ranking	Likelihood	Description
1	Extremely Unlikely	May occur only in exceptional circumstances; once every 500 or more years
2	Very Unlikely	Is not expected to occur; and/or no recorded incidents or anecdotal evidence; and/or very few incidents in associated organisations, facilities or communities; and / or little opportunity, reason or means to occur; may occur once every 100-500 years.
3	Unlikely	May occur at some time; and /or few, infrequent, random recorded incidents or little anecdotal evidence; some incidents in associated or comparable organisation's worldwide; some opportunity, reason or means to occur; may occur once per 10-100 years.
4	Likely	Likely to or may occur; regular recorded incidents and strong anecdotal evidence and will probably occur once per 1-10 years
5	Very Likely	Very likely to occur; high level of recorded incidents and/or strong anecdotal evidence. Will probably occur more than once a year.

Classification of Consequence

The consequence rating assigned to each risk has assumed that all proposed mitigation measures and/or safety procedures have failed to prevent the major accident and/or disaster. Further the Mayo County Council Major Emergency Plan, if implemented as intended, would work to reduce the consequence of any major accident or disaster. The consequence of the impact if the event occurs has been assigned as described in Table 14.2.

The consequence of a risk to/from the proposed development has been determined where one or more aspects of the consequence description are met, i.e. risks that have no consequence have been excluded from the assessment.

Table 14.2 Classification of Impact (Source: DoEHLG, 2010)

Ranking	Likelihood	Impact	Description
1	Minor	Life, Health, Welfare Environment Infrastructure Social	Small number of people affected; no fatalities and small number of minor injuries with first aid treatment. No contamination, localised effects <€0.5M Minor localised disruption to community services or infrastructure (<6 hours).
2	Limited	Life, Health, Welfare Environment Infrastructure Social	Single fatality; limited number of people affected; a few serious injuries with hospitalisation and medical treatment required. Localised displacement of a small number of people for 6-24 hours. Personal support satisfied through local arrangements. Simple contamination, localised effects of short duration €0.5-3M Normal community functioning with some inconvenience.
3	Serious	Life, Health, Welfare Environment Infrastructure Social	Significant number of people in affected area impacted with multiple fatalities (<5), multiple serious or extensive injuries (20), significant hospitalisation.

Ranking	Likelihood	Impact	Description
			Large number of people displaced for 6-24 hours or possibly beyond; up to 500 evacuated. External resources required for personal support. Simple contamination, widespread effects or extended duration €3-10M Community only partially functioning, some services available.
4	Very Serious	Life, Health, Welfare Environment Infrastructure Social	5 to 50 fatalities, up to 100 serious injuries, up to 2000 evacuated Heavy contamination, localised effects or extended duration €10-25M Community functioning poorly, minimal services available
5	Catastrophic	Life, Health, Welfare Environment Infrastructure Social	Large numbers of people impacted with significant numbers of fatalities (>50), injuries in the hundreds, more than 2000 evacuated. Very heavy contamination, widespread effects of extended duration. >€25M Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. Community unable to function without significant support.

Risk Evaluation

Once classified, the likelihood and consequence ratings have been multiplied to establish a 'risk score' to support the evaluation of risks by means of a risk matrix.

The risk matrix sourced from the DoEHLG *Guide to Risk Assessment in Major Emergency Management* and as outlined in Table 14.3) indicates the critical nature of each risk. This risk matrix has therefore been applied

to evaluate each of the risks associated with the proposed development. The risk matrix is colour coded to provide a broad indication of the critical nature of each risk:

- The red zone represents 'high risk scenarios';
- The amber zone represents 'medium risk scenarios'; and
- The green zone represents 'low risk scenarios'.

Table 14.3 Classification of Impact (Source: DoEHLG, 2010)

		Consequence Rating				
		1.Minor	2.Limited	3. Serious	4.Very Serious	5.Catastrophic
Likelihood Rating	5.Very Likely					
	4.Likely					
	3. Unlikely					
	2.Very Unlikely					
	1.Extremely Unlikely					

Baseline Conditions

The Major Emergency Plan prepared by Mayo County Council (2021) outlines the following major hazards that have the potential to lead to a major emergency in county Mayo:

1. Road traffic collision involving bus with passengers
2. Rail accident
3. Aircraft collision / hull loss
4. Marine incident with ferry
5. Severe weather event
6. Inland flooding
7. Landslides
8. Tsunami event
9. Industrial incident at Seveso Upper Tier site
10. Liquid petroleum gas, LPG
11. Oil pollution
12. Crowd safety

13. Contamination of water supply
14. Pandemic

The risks which are most relevant to this assessment are described in the sections that follow.

14.1.5 Road Traffic Collision

The proposed development will utilise the existing road network during the construction phase. Construction related traffic will originate from the delivery of materials to site, removal of surplus excavated material from site and transport of employees to, from and throughout the site. The localised traffic disruptions as a result of other proposed works throughout the scheme will be mitigated through the use of industry standard traffic management measures. These traffic management measures should be designed in accordance with the Department of Transport's 'Guidance for the Control and Management of Traffic at Roadworks – Second Edition (2010)'.

On completion of the construction phase, the road network will be restored to its original condition prior to the works and therefore the measures set out for this particular hazard will be as per those set out in the Major Emergency Plan prepared by Mayo County Council (2021).

14.1.6 Severe Weather Conditions

The premise of the entire River Deel (Crossmolina) Drainage Scheme is to alleviate any future flooding within the town of Crossmolina which has a long history of flooding. The four most recent flood events in 1989, 2006, and 2015 (twice) resulted in flooding of three main streets in Crossmolina Town. Any future severe weather events pose the most common risk to the proposed development, particularly during the construction phase.

14.1.7 Flooding

The long history of flooding in Crossmolina Town is well established. The potential for flooding during the construction and specifically the construction of the various elements intended to alleviate flooding including the overflow channel must be considered. Measures will be put in place during the construction stage to mitigate potential effects should flooding occur at this stage in the development. These measures are summarised in the EIAR and in Section 14.4.2.

14.1.8 Industrial Incident

The proposed Scheme is not connected to or in the vicinity of any site regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations (SEVESO sites), therefore no significant effects associated with major industrial accidents involving dangerous substances are anticipated.

Risk Assessment

This section outlines the possible risks associated with the proposed development for the construction, operation and decommissioning phases.

These risks have been assessed in accordance with the relevant classification as outlined in Table 14.1 and 14.2

As outlined in Section 14.2.4, the consequence rating assigned to each potential risk assumes that all proposed mitigation measures and safety procedures have failed to prevent the major accident and/or disaster.

14.1.9 Likely Significant Effects

14.1.9.1 Do-Nothing Scenario

If the proposed development were not to proceed, the existing river channel and regime of reactive maintenance would remain as it is, resulting in many of the same potential impacts as have occurred previously (most recently in December 2015) and listed above in Section 4.3.2 of the EIAR.

14.1.9.2 Assessment of Effects During Construction

A risk register has been developed which contains all potentially relevant risks identified during the construction phase of the proposed development. Two risks specific to the construction of the proposed development have been identified and are presented in Table 14.4.

Table 14.4 Risk Register – Construction Phase

Risk ID	Potential Risk	Possible Cause
Potential vulnerability to disster risks		
A	Flooding of the construction site resulting in the premature use of the overflow channel and potential impacts on Lough Conn which is a sensitive ecological receptor	Extreme weather- periods of heavy rainfall, taking into account climate change, strong winds and tidal events
Potential to cause accidents and / or disasters.		
B	Discharge or spillage of fuel, chemical solvents into watercourse or percolated to groundwater	Fuel spillage during delivery to site. Failure of fuel storage tank or tanks in plant and machinery and vehicles.
C	Fire/ Gas Explosion / Contact with Overhead Electrical Line	Inadequate information on existing services Employee negligence.

14.1.9.3 Assessment of Effect During Operation

Six risks specific to the operation of the proposed development have been identified and are presented in Table 14.5

Table 14.5 Risk Register – Operational Phase

Risk ID	Potential Risk	Possible Cause
Potential vulnerability to disaster risks		
D	Flooding of areas upstream of the River Flow Control Structure	Extreme weather- periods of heavy rainfall, taking into account climate change, strong winds and tidal events

Risk ID	Potential Risk	Possible Cause
		Failure in the operation of the river flow control structure
Potential to cause accidents and / or disasters.		
D	Bridge collapse	Structural collapse of proposed bridges
F	Discharge or spillage of fuel, chemical solvents, sewage or wastewater into watercourse or percolated to groundwater	A vehicular incident on the public road involving fuel, wastewater or sewage transportation in the operational phase.
G	Fire/ Gas Explosion	Equipment or infrastructure failure; Electrical problems; and Employee negligence.
H	Collapse/ damage to structures	Earthquakes; and Vehicular collisions due to driver negligence on public roads.
I	Vehicle collisions on site	Driver negligence or failure of vehicular operations on site roads.

These risks have been assessed in accordance with the relevant classification (Refer to Table 14.1 and Table 14.2) and the resulting risk analysis is given in Table 14.6.

The risk register is based upon possible risks associated the proposed development. As outlined in Section 14.2.4.2, the consequence rating assigned to each potential risk assumes that all proposed mitigation measures and safety procedures have failed to prevent the major accident and/or disaster.

Table 14.6 Risk Assessment

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
Construction Phase								
Potential vulnerability to disaster risks								
A	Flooding of the construction site resulting in the premature use of the overflow channel and potential impacts on Lough Conn which is a sensitive ecological receptor	Extreme weather-periods of heavy rainfall, taking into account climate change, strong winds and tidal events	Sedimentation of the River Deel and Lough Conn, Damage to, or depletion of aquatic habitats and species;	4	The risk of flooding is considered likely considering it has occurred twice in the previous ten years.	2	The risk of flooding during the construction will result in a limited consequence in that there would be 'a limited number of people affected' with 'localised effects of short duration.' There will be 'normal community functioning' in Crossmolina with 'some inconvenience'	8

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
Potential to cause accidents and / or disasters								
B	Discharge or spillage of fuel, chemical solvents into watercourse or percolated to groundwater	Fuel spillage during delivery to site. Failure of fuel storage tank or tanks in plant and machinery and vehicles.	Damage to, or depletion of aquatic habitats and species	3	As outlined in Chapter 3, fuel will be stored on-site but in a bunded area to ensure containment and prevent spillages of fuel. No fuels, chemicals or solvents will be stored outside of the confines of the site	1	The risk of a fuel spillage during the construction will result in a limited consequence in that there would be 'a limited number of people affected' with 'localised effects of short duration' through the use of bunded containment areas during construction. There will be 'normal community functioning' in Crossmolina with 'some inconvenience'	3

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
C	Fire/ Gas Explosion / Contact with Overhead Electrical Line	Inadequate information on existing services Employee negligence.	Illness or loss of life; Damage to, or depletion of habitats and species; and Impacts on ambient air quality.	2	The risk of contact with any such services is considered very unlikely as adequate information should be made available on the location of services. Works methodologies and technology for the location of such services is a well-established standard practice in construction.	2	The risk of flooding during the operational phase will result in a limited consequence in that there would be 'a limited number of people affected' with 'localised effects of short duration.' There will be 'normal community functioning' in Crossmolina with 'some inconvenience'	4
Operational Phase								
Potential vulnerability to disaster risks								
D	Flooding of areas upstream of the	Extreme weather-periods of heavy rainfall,	Sedimentation of the River Deel,	2	The risk of flooding is considered very unlikely considering it has been designed to	2	The risk of flooding during the operational phase will result in	4

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
	River Flow Control Structure	taking into account climate change, strong winds and tidal events Failure in the operation of the proposed River Flow Control Structure	Damage to, or depletion of aquatic habitats and species; Flooding of property.		prevent flows in the River Deel from flooding Crossmolina town during potential flood events exceeding the 1% Annual Exceedance Probability, also known as the 100 year event.		a limited consequence in that there would be 'a limited number of people affected' with 'localised effects of short duration.' There will be 'normal community functioning' in Crossmolina with 'some inconvenience'	
Potential to cause accidents and / or disasters								
E	Bridge collapse	Structural collapse of proposed bridges	Injury or loss of life	1	Standard and current best practice construction measures will be implemented by the design engineer or contractor during detailed design/construction.	2	In the event of the collapse of any of the proposed bridge structures when in operational use, a limited consequence is envisaged in that a 'limited number	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
					The risk of bridge collapse in the operational phase is extremely unlikely in that it 'may occur only in exceptional circumstances'		of people' will be affected, with 'a few serious injuries.' There will also be 'localised displacement of a small number of people for 6-24 hours, with normal community	
F	Discharge or spillage of fuel, chemical solvents, wastewater or sewage into watercourse or percolated to groundwater	A vehicular incident on the public road involving fuel, wastewater or sewage transportation in the operational phase.	Damage to, or depletion of aquatic habitats and species	2	Having regard to public road speed limits, the predicted risk of such an occurrence is considered to be 'very unlikely'	1	The risk of a fuel, wastewater of sewage spillage during the operational phase will result in a limited consequence in that there would be 'a limited number of people affected' with 'localised effects of short duration' due to the low volumes	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
							anticipated. There will be 'normal community functioning' in Crossmolina with 'some inconvenience' For an incident involving fuel transportation on the public road, The 'Mayo County Council Oil Spill Contingency Plan (Inland Waters)' detailed in the Mayo County Council Major Emergency Plan will work to reduce the consequence of such an incident	
G	Fire/ Gas Explosion	Equipment or infrastructure failure;	Illness or loss of life;	2	As outlined in Chapter 3, fuel will not be stored on-site post	2	Should a fire/explosion occur at the site, a	4

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		Electrical problems; and Employee negligence.	Damage to, or depletion of habitats and species; and Impacts on ambient air quality.		construction therefore fuel is not considered to be a significant fire risk. In accordance with Chapter 19 of the Safety, Health and Welfare at Work Act 2005 (the 2005 Act), the development shall be subject to a fire safety risk assessment which would assist in the identification of any major risks of fire on site, and mitigation of the same during operation.		limited consequence in that there would be 'a limited number of people affected' with 'localised effects of short duration' due to the nature of the project and the lack of infrastructure or fuel storage during operation that would result in any such incident. There will be 'normal community functioning' in Crossmolina with 'some inconvenience' The 'generic command, control & co-ordination systems' as well as the 'common elements	

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
							of response' detailed in the Mayo County Council Major Emergency Plan will work to reduce the consequence of potential fire/explosions at the site.	
H	Collapse/ damage to structures	Earthquakes; and Vehicular collisions due to driver negligence on public roads.	Injury or loss of life.	1	According to the Irish National Seismic Network (INSN), earthquakes measuring ~2 on the Richter Scale are "normal" in terms of seismicity in Ireland. These are known as microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. As such, buildings in Ireland are extremely unlikely to	2	In the event of a building collapse, a serious impact would occur in that 'a significant number of people in affected area would be impacted with multiple fatalities (<5), multiple serious or extensive injuries (20), significant hospitalisation.'	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
					be damaged or collapse due to seismic activity. Having regard to public road speed limits, it is not predicted that any collision of vehicles and any infrastructure would result in significant damage/collapse.			
I	Vehicle collisions on site	Driver negligence or failure of vehicular operations on site roads.	Injury or loss of life.	3	A limited number of vehicles will be permitted on the site as part of general maintenance of infrastructure. As such, it can be determined that there is some 'opportunity, reason or means' for a vehicle collision to occur on site, 'at some time.' An unlikely risk is therefore predicted.	1	A minor consequence is predicted. Having regard to on-site speed limits and vehicular movements, a 'small number of people would be affected' should a vehicular collision occur, with 'no fatalities and small number of	3

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
							minor injuries with first aid treatment.'	

The risk assessment for each of the potential risks identified are consolidated in Table 14.7 which provides their 'risk score.' A corresponding risk matrix is provided in Table 14.8, which is colour coded in order to provide an indication of the critical nature of each risk. As outlined in Section 14.2.4.2, the red zone represents 'high risk' scenarios', the amber zone represents 'medium risk scenarios' and the green zone represents 'low risk scenarios.

Table 14.7 Risk Scores

Risk ID	Potential Risk	Likelihood Rating	Consequence Rating	Risk Score
A	Flooding of the construction site resulting in the premature use of the overflow channel and potential impacts on Lough Conn which is a sensitive ecological receptor	4	2	8
C	Fire/ Gas Explosion / Contact with Overhead Electrical Line	2	2	4
D	Flooding of areas upstream of the River Flow Control Structure	2	2	4
G	Fire/ Gas Explosion	2	2	4
B	Discharge or spillage of fuel, chemical solvents into watercourse or percolated to groundwater	3	1	3
I	Vehicle collisions on site	3	1	3
H	Collapse/ damage to structures	1	2	2
E	Bridge collapse	1	2	2
F	Discharge or spillage of fuel, chemical solvents, sewage or wastewater into watercourse or percolated to groundwater	2	1	2

Table 14.8 Risk Matrix

		Consequence Rating				
		1.Minor	2.Limited	3. Serious	4.Very Serious	5.Catastrophic
Likelihood Rating	5.Very Likely					
	4.Likely		**A**			
	3. Unlikely	**B, I**				
	2.Very Unlikely	**F**	**D,C,G**			
	1.Extremely Unlikely		**E, H**			

Table 14.8, presents the potential risks identified during the construction and operation of the proposed development all or which can be classified as 'low-medium risk scenarios.'

The scenario with the highest risk score in terms of a major accident and/or natural disaster during the construction phase of the proposed development was identified as being 'Flooding of the construction site resulting in the premature use of the overflow channel'.

The scenarios with the highest risk score in terms of a major accident and/or natural disaster during the operational phase of the proposed development were identified as being 'Flooding of areas upstream of the River Flow Control Structure, and 'fire/explosion.'

14.1.1.1 Flooding During Construction

There is a potential risk of the flooding during the construction of the site resulting in the premature use of the overflow channel. The risk of flooding the site during construction was given a risk score of 8. However, as outlined in Chapter 3, the works will be sequenced, and temporary works areas selected to avoid potential for inundation of the works area by flood water in so far as is practicable during construction stage The flood risk is still 'likely' to occur, but will have 'limited' consequences should it do so, representing a 'medium-risk scenario' during the construction phase.

14.1.1.2 Flooding During Operation

The proposed development in its operational phase will inevitably benefit the protection of the site as part of the works and the successful development of the project considering its objectives. The provision of the new infrastructure including the river flow control structure and its adaptability to flood events results in the risk of such floods resulted in a risk score of 4 due to an occurrence being considered 'very unlikely' and having 'limited' consequences should it do so, representing a 'low-risk scenario' during the operational phase.

14.1.1.3 Fire/Explosion

There is a potential risk of fire/explosion associated with operational phase maintenance and general servicing. However, as outlined in Section 14.2.1, the scope of this assessment has been based on the understanding that the proposed development will be designed, built and operated in line with current best practice. Further, in accordance with Chapter 19 of the Safety, Health and Welfare at Work Acts 2005 to 2014, the proposed development shall be subject to a fire safety risk assessment which will assist in the identification of any major risks of fire on site, and mitigation of the same during operation.

Therefore, the risk of fire/explosion occurring at the proposed development resulting in a major accident and/or disaster was given a risk score of 4 This indicates a scenario that is 'very unlikely' to occur and having 'limited' consequences should it do so, representing a 'low-risk scenario' during the operational phase.

14.1.10 Mitigation Measures

14.1.10.1 Mitigation During Construction

As outlined in Section 14.4.1, the scenario with the highest risk score in terms of the occurrence of major accident and/or disaster during construction was identified as 'Flooding of the construction site resulting in the premature use of the overflow channel and potential impacts on Lough Conn which is a sensitive ecological receptor'.

The proposed mitigation will include;

- Works will be sequenced so that the construction of the river flow control structure and the section of diversion channel between the intake structure and high point to the east of the L1105 are the final elements of the scheme to be completed. This is to avoid a situation where, in a flood event, the diversion channel and works area are flooded prematurely.
- The temporary works areas have been selected to avoid potential for inundation of the works area by flood water in so far as is practicable.
- There will be no storage of materials, machinery or soil in areas that are susceptible to flooding.
- An emergency response plan, as detailed in Section 5.5.6 of the EIAR, will be implemented in the event of any incident during construction.
- Construction of the river flow control structure and intake structure will be timed to coincide with no / low flows in the River Deel, where possible.

As outlined in Section 3.3 of the EIAR, a detailed Construction Environmental Management Plan (CEMP) will be prepared prior to the commencement of any works. The CEMP will be a live document maintained by the contractor that will work to ensure that potential risks of major accident and/or disaster are identified, avoided and mitigated, as necessary. Refer to Appendix 3C for an outline CEMP that sets out the minimum standards to be employed by the contractor.

14.1.10.2 Residual Effects During Construction

The risk of a major accident and/or disaster during the construction of the proposed development is considered 'low' in accordance with the '*Guide to Risk Assessment in Major Emergency Management*' (DoEHLG, 2010). It is considered that there will not be significant residual effect(s) during the construction of the proposed development.

14.1.10.3 Mitigation During Operation

As outlined in Section 14.2.4, the proposed development will be designed and built in line with current best practice and, as such, mitigation against the risk of major accidents and/or disasters will be embedded through the design.

In accordance with the provision of the European Commission '*Guidance on the preparation of Environmental Impact Assessment Reports*', a Risk Management Plan will be prepared and implemented on site to ensure an effective response to disasters or the risk of accidents. The plan should include sufficient preparedness and emergency planning measures.

Section 14.4.1 outlines the scenarios with the highest risk score in terms of a major accident and/or disaster during operation were identified as being 'Flooding of areas upstream of the River Flow Control Structure and 'fire/explosion.'

The proposed development and its the River Flow Control Structure is designed to mitigate potential effects should flooding and any potential flood events exceeding the 1% Annual Exceedance Probability, also known as the 100-year event occur at this stage in the development. The Scheme will also be adaptable to floods in excess of the 1% AEP, given that flows in excess of Q100 are split between the River Deel and the diversion channel, with the majority diverted to the diversion channel.

The proposed development will also be subject to a fire safety risk assessment in accordance with Chapter 19 of the Safety, Health and Welfare at Work Acts 2005 to 2014, which will assist in the identification of any major risks of fire on site, and mitigation of the same during operation.

14.1.10.4 Residual Effects During Operation

The risk of a major accident and/or disaster during the operation of the proposed development is considered 'low' with regards the '*Guide to Risk Assessment in Major Emergency Management*' (DoEHLG, 2010). It is therefore considered that there will not be significant residual effect(s) during the operation of the proposed development.

Table 14.9 Impact Assessment Summary

Risk ID	Potential Risk/Impact	Impact Characteristic			Mitigation	Residual Impact Significance
		Quality	Significance	Duration		
Construction Phase						
A	Flooding of the construction site resulting in the premature use of the overflow channel and potential impacts on Lough Conn which is a sensitive ecological receptor	Negative	Significant	Short-term	Works will be sequenced so that the construction of the river flow control structure and the section of diversion channel between the intake structure and high point to the east of the L1105 are the final elements of the scheme to be completed.	Not significant
B	Discharge or spillage of fuel, chemical solvents into watercourse or percolated to groundwater	Negative	Significant	Short-term	As outlined in Chapter 3 of the EIAR, fuel will be stored on-site but in a bunded area to ensure containment and prevent spillages of fuel. No fuels, chemicals or solvents will be stored outside of the confines of the site. An emergency response plan, as detailed in Section 5.5.6 of the EIAR, will be implemented in the event of any incident during construction.	Not significant

Risk ID	Potential Risk/Impact	Impact Characteristic			Mitigation	Residual Impact Significance
		Quality	Significance	Duration		
C	Fire/ Gas Explosion / Contact with Overhead Electrical Line	Negative	Significant	Short-term	The presence and location of existing underground services will be confirmed prior to commencement of construction. Consultation with the various utliies will be undertaken to provide the necessary information.	Not significant
Operational *Phase*						
D	Flooding of areas upstream of the River Flow Control Structure	Negative	Moderate	Short-term	The proposed development and the associated River Flow Control Structure is designed to mitigate potential effects should flooding and any potential flood events exceeding the 1% Annual Exceedance Probability, also known as the 100-year event occur at this stage in the development. The Scheme will also be adaptable to floods in excess of the 1% AEP, given that flows in excess of Q100 are split between the River Deel and the diversion channel, with the majority diverted to the diversion channel	Not significant
E	Bridge collapse	Negative	Significant	Temporary	Standard and current best practice construction measures will be implemented by the design engineer or	Not significant

Risk ID	Potential Risk/Impact	Impact Characteristic			Mitigation	Residual Impact Significance
		Quality	Significance	Duration		
					contractor during detailed design/construction.	
F	Discharge or spillage of fuel, chemical solvents, sewage or wastewater into watercourse or percolated to groundwater	Negative	Significant	Short-term	Although the proposed development does not proposed any mitigation to manage the risk of such an occurrence, there will be a reliance on the maintenance of a safe public road network and public road speed limits by the relevant authorities.	Not significant
G	Fire/ Gas Explosion	Negative	Significant	Short-term	The proposed development will also be subject to a fire safety risk assessment in accordance with Chapter 19 of the Safety, Health and Welfare at Work Acts 2005 to 2014, which will assist in the identification of any major risks of fire on site, and mitigation of the same during operation.	Not significant
H	Collapse/ damage to structures	Negative	Significant	Short-term	Although the proposed development does not proposed any mitigation to manage the risk of such an occurrence, there will be a reliance on the maintenance of a safe public road	Not significant

Risk ID	Potential Risk/Impact	Impact Characteristic			Mitigation	Residual Impact Significance
		Quality	Significance	Duration		
					network and public road speed limits by the relevant authorities.	
I	Vehicle collisions on site	Negative	Significant	Temporary	The site rules as communicated during site induction for personnel on site during the operational phase will include a provision for on-site speed limits and vehicular movements.	Not significant

14.1.11 Monitoring

14.1.11.1 Monitoring During Construction

As outlined in Section 3.3 of the EIAR, a detailed Construction Environmental Management Plan (CEMP) will be prepared prior to the commencement of any works. The CEMP will be a live document maintained by the contractor that will work to ensure that potential risks of major accident and/or disaster are identified, avoided and mitigated, as necessary. Refer to Appendix 3C for an outline CEMP that sets out the minimum standards to be employed by the contractor.

14.1.11.2 Monitoring During Operation

The operator of the proposed development will continue to assess the risk of major accidents and/or disasters on site on an on-going basis during operation.

The maintenance programme, record of reported incidents, as well as general site activities will be monitored on an on-going basis to ensure risk of major accidents does not increase over time.

14.1.12 Decommissioning Phase

It is not anticipated that any situation will arise where decommissioning of the proposed development will be required. The nature of the works is to alleviate flooding in the area and therefore the removal of any infrastructure installed as part of the proposed development for that purpose is not foreseen.

14.1.13 Assessment of Cumulative and In Combination Impacts

14.1.13.1 Cumulative Impact Assessment

All elements of the proposed Scheme were assessed in order to identify any cumulative effects.

Considering the nature of the area and historical events, the construction phase of the project will give rise to changes in the management of flood waters during events. This will create some short-term inconvenience for locals during the works. These impacts will be mitigated in so far as is possible in accordance with a detailed Construction Environmental Management Plan (CEMP).

These effects and the measures that are in place to avoid any cumulative or interactive effects are fully described in this EIAR.

14.1.13.2 In Combination Impact Assessment

A search in relation to plans and projects that may have the potential to result in a cumulative impact with the project on the environment was carried out as part of the EIAR. The proposed Scheme has been considered, in combination with plans and the projects set out in Chapter 2, Section 2.8 of the EIAR. In addition, the following data sources were assessed:

- Mayo County Development Plan (2014 – 2020)
- Relevant Local Area Plans
- National River Basin Management Plan 2018- 2021
- An Bord Pleanála Website (Planning Searches)
- Myplan.ie
- Web search for major infrastructure projects in County Mayo

The proposed drainage scheme will provide increased protection to residential and commercial premises in Crossmolina as well as the alleviating the potential scenario with the highest risk score in terms of a major accident and/or natural disaster during the construction and operational phase of the proposed development. Overall, a long-term significant positive cumulative impact is anticipated.

Following a detailed assessment of the potential for any further impact when considered in combination with any or all of the plans and projects set out in set out in Chapter 2, Section 2.8, the proposed Scheme, with mitigation measures in place, was found to have no potential for significant in-combination or cumulative increase in the vulnerability of the proposed development to major accidents or natural disasters.

Appendix 3C – Addendum to the OCEMP

Appendix 3C – Addendum to Outline Construction & Environmental Management Plan

2.4.4 Intake Structure

The construction of the intake structure will be carried out as follows:

- Isolation of works area, including erection of fencing and traffic management where required. The entire boundary of the works area with the River Deel will be fenced off with a triple silt fence as shown on Construction Sequence Drawing: Stage 5 (Appendix 3B). A solid wall of sealed double bagged sand or soil bags will be constructed inside the silt fences to create a solid barrier between the works area and the river. All bankside works will be undertaken at times of good weather and low flow in the River where there is no potential for the works area to become inundated with water. A 2.4m high hoarding will be erected to mitigate noise impacts during the construction phase.
- Topsoil will be stripped as necessary to prepare the foundation of the intake structure and spillway. Topsoil will be stockpiled for reuse within the works area or stored for reuse in the dedicated site compound which is protected with silt fences. Where soil is to be stored for an extended period of time, it will be sown with grass seed to prevent any windblow or water erosion and subsequent run-off. Excavated material will be reused where possible, classified as a construction by-product in the context of Article 27 of the European Communities (Waste Directive) Regulations. Where it is not required for re-use, it will be removed by a licenced waste contractor.
- Excavation for foundations, blinding of formation, fixing of reinforcement, placing of formwork, placing of concrete, and stripping of formwork: Following detailed site investigation, it is not anticipated that rock breaking will be required during excavation. All formwork and fixing of reinforcement will be located within the defined works area. Formwork will be sealed to prevent any leakage of concrete during pours and will be constructed with sufficient capacity to prevent overspills. Concrete will not be poured at times when heavy rain is predicted in order to prevent potential run off and overspill from the formwork. Concrete works will be programmed to avoid water levels that may cause inundation of the works area in order to avoid potential water contamination. Should any ingress of water (ground or rain) occur prior to a concrete pour, waters will be pumped to ground to a discharge point (as described in section 3.3.1).
- Alarmed Sondes will be employed to measure turbidity in the River Deel upstream and downstream of the works area from Scheme confirmation and throughout construction of the intake structure. If 5% difference between the NTU value recorded in the upstream and downstream Sondes and where NTU is above the average baseline conditions (likely to be approximately 10 NTU based on recorded data within the River Deel), all works will cease immediately until the source of the increased turbidity is identified and rectified (if caused by the construction works). If the increase in turbidity is clearly not attributed to the construction works, the works will proceed.
- Construction vehicles will work from hardstanding areas to avoid the generation of mud within the works area. Temporary hardstanding will be constructed of clean shone behind the proposed retaining wall and all machinery will work from this area.

- Wash out of concrete truck chutes will be carried out at a designated wash out tank located in the site compound, if required.
- Reinstatement of area: Soil will be placed on top of stone gabions at the upstream and downstream ends of the intake structure and taller native vegetation such as Hazel and Hawthorn will be planted in these areas.
- If in the unlikely event during construction works, it is considered that there is a possibility of flood water passing underneath the intake structure foundations, either sheet piles or grouting techniques will be required to provide a cut-off. The sheet piles may be metal or plastic and would be driven to the required depth using a piling hammer or similar. Monitoring of noise and vibration during critical periods at sensitive locations and along the river bed will be carried out as set out in Chapter 8, Section 8.5. Vibration levels will be limited to the levels set out in NRA, 2004.

2.4.5 River Flow Control Structure

The construction of the river flow control structure is to be carried out as follows:

- Isolation of the works area, including erection of fencing and site clearance. The fenced area will include the full area required to facilitate the works including an access road from the Boreen to the river bank at the location of the river flow control structure, the temporary site compound and temporary works areas as shown in Drawing AR_03 (Appendix 3A). A 2.4m high hoarding will be erected to mitigate noise impacts during the construction phase.
- Site preparation on the banks will require isolation of the works area outside channel, including erection of fencing. A triple silt fence will be constructed at all interfaces of the works area with the River Deel and the SAC in advance of construction works in the terrestrial works area. These works will be carried out at times of good weather and low flow in the river where there is no potential for significant volumes of surface water runoff from the works area or inundation with flood waters.
- Instream works are to be carried out when the river runs dry or at low flow if this is not possible. Prior to commencement of instream works, a number of surveys will be carried out, the details of which are presented in Chapter 5, Section 5.5.6. The instream works area will be constructed by lifting 1 tonne sealed double bagged bags of sand into the river to create a horseshoe cofferdam that will enclose no more than half the river at any one time to allow for the passage of fish if the river is not dry. If the works are undertaken at low flow, the area within the cofferdam will be electro fished under licence from the IFI which will be obtained in advance of dewatering the area. If dewatering is required, waters will be pumped to a designated discharge point (as described in section 3.3.1) that is located over 30m away from the River Deel.
- Cobbles, stones and boulders will be removed from the instream works area as required and stored within the terrestrial works area.
- The base for the river flow control structure will be excavated to foundation level and constructed using the best practice requirements for the use of concrete. All formwork and fixing of reinforcement will be located within the defined works area. Formwork

will be sealed to prevent any leakage of concrete during pours and will be constructed with sufficient capacity to prevent overspills. Concrete will not be poured at times when rain is predicted in order to prevent potential run off and overspill from the formwork. Concrete works will be programmed to avoid high water levels in the River Deel that may cause inundation of the works area in order to avoid potential water contamination.

- Alarmed Sondes will be employed to measure turbidity in the River Deel upstream and downstream of the works area from confirmation of the Scheme and throughout construction of the river flow control structure. If there is a 5% difference between the NTU value recorded in the upstream and downstream Sondes and where NTU is above the average baseline conditions (likely to be approximately 10 NTU based on recorded data within the River Deel), all works will cease immediately until the source of the increased turbidity is identified and rectified (if caused by the construction works). If the increase in turbidity is clearly not attributed to the construction works, the works will proceed.
- Construction vehicles will work from hardstanding areas to avoid the generation of mud within the works area. Wash out of concrete truck chutes will be carried out at a designated wash out tank located in the site compound if required.
- Scour protection will be placed on the channel bed in the form of rip-rap.
- The timing for construction of the river flow control structure is dependent on periods when the river runs dry or there is low flow in the river and outside of the sensitive period for spawning fish in the River Deel. As such, it may be beneficial to construct the base for the river flow control structure at the earliest suitable opportunity and install the culverts when construction of the diversion channel has been completed. In this case, the base for the river flow control structure will be constructed as outline above and the gravels and cobbles will be replaced in the river until further works are carried out to complete the construction of the structure.
- A crane will be set up within the terrestrial works area to the east of the river flow control structure and the culverts will be lifted into place from the L1105. A temporary closure of the L1105 will be required to facilitate these works and traffic management and a diversion will be put in place. The precast reinforced concrete culverts will be installed at a level below the existing bed of the river and the gravels and cobbles will be replaced. The culverts installed in the initial phase of the works will be set at a lower invert than the subsequent phase to allow any flows that may be in the river at the time of the works to be directed through the recently constructed culvert, whilst the second half of the river is cofferdammed and the culverts installed in that section. Installation of adjustable steel plates, flood defence parapet, edge beam, access deck and safety rails will be carried out following installation of all culverts.
- Excavation for retaining wall foundations, blinding of formation, fixing of reinforcement, placing of formwork, placing of concrete, and stripping of formwork will be carried out for the construction of wing walls on both banks of the river. The walls will be constructed in accordance with the best practice requirements for the use of concrete as described above.

- The terrestrial area will be reinstated by re-seeding with native grass and planting of native tree species on the banks.

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
Construction Phase				
Drainage Design and Management				
MM15	EIAR Ch3, 14	The timing for construction of the river flow control structure is dependent on periods when the river runs dry or there is low flow in the river and outside of the sensitive period for spawning fish in the River Deel.		
MM16	EIAR Ch3, 14 OCEMP Section 8	The construction works have been sequenced, as detailed in Section 3.4, so as to ensure that flow will not be allowed into the channel from the river until the grass lining has been established		
MM18	EIAR Ch3, 14	A temporary construction compound will comprise the following: • temporary site offices, port-a-loo toilets, facilities for staff and car-parking areas. • storage areas for construction materials. • bunded containment areas for plant refuelling, maintenance, washing and for the storage of fuels and site generators. • a dedicated waste storage area for any construction waste generated. Skips or bays will be provided for recyclable material. wheel wash area for construction and delivery vehicles and a designated wash out tank for wash out of concrete trucks following concrete pours.		
Construction Management				
MM26	EIAR Ch5, 14 NIS Section 4	Construction of the proposed scheme has been specifically designed to avoid the potential for water pollution. Details of the construction work practices and detailed method statements for each construction activity. Measures include: • Minimisation of Instream working area as outlined in construction drawings provided in Appendix 3A.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		• Appropriate timing of works to avoid sensitive periods, flooding or high flows. • Detailed construction drainage design to avoid potential run off • Detailed monitoring regime that ensures all measures are effectively employed during construction. • Employment of an Environmental Clerk of Works. • Use of Sondes upstream and downstream of the works area to continually monitor water quality during the construction period. *Use of alarms that trigger when there is When there is a 5% difference between the NTU value recorded in the upstream and downstream Sondes and where NTU is above the average baseline conditions (likely to be approximately 10 NTU based on recorded data within the River Deel)* Emergency procedures in place to minimise the potential for or impact of any pollution event.		
MM29	EIAR Ch5, 8, 14 OCEMP Section 3 NIS Section 2	The following measures will be put in place to avoid the occurrence of any adverse impacts resulting from the use of hydrocarbons on the site. • Fuels, chemicals, liquids and solid wastes will be stored on impermeable surfaces. Fuels stored on site will be minimised. Plant refuelling shall be undertaken using a jeep mounted bowser to minimise storage of fuel on site. Small quantities of chemicals and petrol required for tools shall be stored with drip trays in a vented fuel store in the temporary works compound		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		• Plant refuelling shall be undertaken on impermeable surfaces within a suitably constructed bund in accordance with best practice guidelines. No refuelling will be permitted in or near soil or rock cuttings. Only designated trained operatives will be authorised to refuel plant on-site • Plant shall be inspected regularly for any leaks • Storage of fuel and oil will be regularly inspected for leaks or signs of damage • A lock system will be fitted on all taps, nozzles or valves associated with refuelling equipment • All hydrocarbons and other potential contaminants will be stored within suitably constructed bunds in accordance with best practice guidelines. The bunds will be sized to hold 110% of the volume of the stored contaminants in order to contain a spill should it occur. The base and walls of the bund shall be impermeable to water and oil • Spill kits will be provided at refuelling areas and at high risk/sensitive sites • Large volumes of excavated material will not be allowed to accumulate within the temporary working areas. Any stockpiling of soils will be greater than 10 metres away from any surface waters, and runoff will be prevented by the use of a silt fence • There will be no storage of materials, machinery or soil in areas that are susceptible to flooding		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		• Where contaminated soil is encountered, the ECoW will assess the extent of contamination and will supervise any operations involving contaminated soil. Any contaminated soil will be transported to an approved waste facility for treatment and safe disposal. An emergency response plan to deal with accidental spillages is contained within the Outline Construction Environmental Management Plan. This will include providing toolbox talks regarding the appropriate use of spill kits and best practice for the management of accidental spills.		
MM30	EIAR Ch7, 14 NIS Section 2	Measures to minimise the suspension and transfer of sediment and pollutants to ground and surface waters will be implemented. These measures are as follows: • Where dewatering is required, waters will be pumped to lands that are over 30 metres from any watercourse and discharged via a silt bag to a discharge point. The discharge point will consist of a circle of triple silt fences surrounding a circle of straw bales wrapped in Terram. All waters pumped from the excavation will filter though the silt bag, straw bales and silt fences before diffusely discharging to the ground. The discharge points will be constructed prior to commencement of construction works and will be monitored on a daily basis when in use to ensure that the release of any polluting material is mitigated. • Any stockpiling will be further than 10 metres from the river bank, and runoff will be prevented by the use of a silt fence. • Prior to construction of the river flow control structure, the instream works areas will be constructed by creating a horseshoe cofferdam. Construction works will be carried out when the river runs dry if possible or at low flow conditions (outside of the sensitive period for spawning fish in the River Deel).		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		• A triple silt fence will be constructed at all interfaces of the works area with the River Deel in advance of construction works on the banks of the river at the river flow control structure. Works undertaken on the river banks will be carried out at times of good weather and low flow in the river where there is no potential for significant volumes of surface water runoff from the works area or inundation with flood waters. • The entire boundary of the works area within the River Deel will be fenced off with a triple silt fence as shown on Construction Sequence Drawing: Stage 5 (Appendix 3B) for the construction of the intake structure. A solid wall of sand or soil bags will be constructed inside the silt fences to create a solid barrier between the works area and the river. All bankside works will be undertaken at times of good weather and low flow in the River where there is no potential for the works area to become inundated with water. • All works undertaken on the banks will be fully consolidated to prevent scour and run off of silt. Consolidation may include use of protective and biodegradable matting (coirmesh) on the banks and also the sowing of grass seed on bare soil. • Measures specified in the Outline Construction Environmental Management Plan will be adhered to in order to ensure all works are carried out in a manner designed to avoid and minimise any adverse impacts on the receiving environment. • All concrete works will be carried out in dry conditions, with no in-stream pouring of concrete, and in accordance with the best practice measures provided Chapter 3 • A silt fence will be erected on all sides of the temporary site compounds to prevent any run off from the perimeter of the compounds.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		• There will be no refuelling of machinery within the river channel. Refuelling will take place at designated locations in the site compound at distances of greater than 30 metres from the watercourse. • No vehicles will be left unattended when refuelling and a spill kit including an oil containment boom and absorbent pads will be on site at all times. • Wash out of concrete truck chutes will be carried out at a designated wash out tank located in the site compound, if required. • Any fuel that is stored on the site will be in a double skinned, bunded container that will be located within a designated site compound at a location that is removed from the river. The locations of the site compounds are shown on the construction sequence drawings (Appendix 3B). All construction materials and plant will be stored in the site compounds. The compounds will also house the site offices and port-a-loo toilets. The compounds will be located on ground that is not prone to flooding or will be surrounded by a protective earth bund to prevent inundation. The site compounds will be surfaced with a hard standing to prevent generation of mud. A silt fence will be erected on all sides of the compounds to prevent any run off from the perimeter of the compounds. The locations of the site compounds will be adequately buffered to prevent any surface water runoff. • All vehicles will be regularly maintained and checked for fuel and oil leaks. • See also Chapter 5 of this EIAR for mitigation measures for aquatic ecology. • With regard to the diversion channel,166,000 m^3 of excavated material is anticipated. This material will be reused where possible on site or contained and transported off site as it is generated to reduce any risk of mobilisation to receiving watercourses. Excavated topsoil will be stored separately for reuse in		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		reinstatement works on site and the storage area will be fenced off with silt fencing to prevent any run off. • Works in the vicinity of the Mullenmore Stream will take place during a dry period to prevent any erosion of bare soil to Mullenmore South stream and subsequently Lough Conn. There will be no storage of materials, machinery or soil in areas that are susceptible to flooding.		
Air Quality/Dust				
MM57	EIAR Ch4, 8 OCEMP Section 3	In periods of extended dry weather, dust suppression (localised wetting of surfaces) may be necessary within and around the site to ensure dust does not cause a nuisance. A number of measures will be implements in order to minimise dust impact: • Communications: o A stakeholder communications plan will be developed and implemented. The plan will include community engagement before work commences on site o The name and contact details of the person(s) accountable for air quality and dust issues shall be displayed on the site boundary as well as the regional office contact details. • Dust management: o A Dust Management Plan (DMP) will be developed and implemented. The DMP shall include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required

		• Site Management:
		  ○ All dust and air quality complaints will be recorded, causes identified and appropriate measures taken to reduce emissions. A record of measures taken will be maintained.
		  ○ The complaints log will be made available to the Local Authority on request.
		  ○ Any exceptional incidents that cause dust and/or air emissions will be recorded in the logbook as well as the actions taken to resolve the situation.
		• Preparing and maintaining the site:
		  ○ The site layout will be planned so that machinery and dust causing activities are located away from receptors, as far as is possible.
		  ○ Solid screens or barriers will be erected around dusty activities or the site boundary that are at least as high as any stockpiles on site.
		  ○ Specific operations with a high potential for dust production will be enclosed
		  ○ Site fencing, barriers and scaffolding will be cleaned using wet methods
		  ○ Materials that have the potential to produce dust shall be removed from site as soon as possible, unless being re-used on site.
		  ○ If materials are being reused on site, stockpiles will be covered or fenced to prevent wind whipping.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required

		• Operation of machinery and sustainable travel:
		  ○ All vehicles will be switched off when stationary
		  ○ Mains electricity or battery powered equipment will be used where practicable in lieu of diesel or petrol powered generators
		  ○ Maximum speed limits of 10 mph shall be imposed on unsurfaced haul roads and works areas. A maximum speed limit of 15 mph will be imposed on surfaced haul roads and works areas.
		  ○ A Construction Logistics Plan will be produced to manage the sustainable delivery of goods and materials.
		• Construction measures
		  ○ Scabbling of concrete surfaces will be avoided where possible
		  ○ Sand and other aggregates will be stored in bunded areas and will not be allowed to dry out
		  ○ Any bulk cement or dry powder materials delivered to site will be delivered in enclosed tankers and stored in silos with suitable control systems to prevent escape of material and overfilling during delivery. Smaller supplies of fine powder materials will be stored in sealed bags to prevent dust emissions
		• Measures specific to trackout:		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		○ Water assisted dust sweepers will be used on access and local roads to remove, as necessary, any materials tracked out of the site. ○ Dry sweeping of large areas will be avoided. ○ Transport vehicles entering and leaving the works area will be covered to prevent escape of materials during transport ○ On site haul routes will be inspected for integrity and any repairs necessary will be carried out as soon as reasonably practicable. All inspections of haul routes will be recorded in the site logbook ○ Hard surfaced haul routes will be regularly cleaned and regularly damped down with fixed or mobile sprinkler systems or mobile water bowsers. ○ A wheel washing system will be implemented ○ Access gates to be located at least 10m from receptors where possible • All site roads within the construction works boundary shall be regularly inspected, cleaned and maintained during the construction phase. The construction works boundary is shown in Appendix 3A. • Hard surface roads within the construction site boundary shall be swept to remove mud and aggregate materials from their surface. • Any road that has the potential to give rise to dust emissions must be regularly inspected and watered during periods of dry and/or windy weather to minimise		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		the movement of dust particles to the air and ensure that dust does not cause a nuisance. • Speeds shall be restricted on hard surface roads and vehicles transporting materials with dust potential must ensure that the material is enclose or covered with tarpaulin at all times. • The construction traffic routes identified in Chapter 11 (Material Assets), shall be regularly inspected for cleanliness and cleaned as necessary to minimise the movement of dust particles to the air, as detailed in the OCEMP. • In the event of dust nuisance occurring outside the site boundary, movement of materials must be terminated immediately and procedures implements to rectify the problem. • The dust management plan shall be reviewed at regular intervals during the construction phase to ensure that best practice and procedures are in place to minimise dust emissions. • All plant and materials shall be stored in dedicated areas on site. • Stockpiling of excavated material will be minimised by coordinating excavation, spreading and removal of surplus material off site.		
Traffic				
MM68	EIAR Ch11, 14	The construction of the reinforced concrete bridges will be carried out by a suitably qualified and experienced contractor who will be supervised to ensure that the works are carried out correctly. This will ensure that the bridges will be constructed safely and ensure the structural integrity of the structure		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
MM69	EIAR Ch11, 14	Road Transport and Traffic Management Report will be prepared to include a map indicating the proposed public roads or haulage routes for removal of surplus material off site, as listed in Table 11.5 of Chapter 11. In addition, the following mitigation measure will be implemented within the Plan: • The locations at which traffic management measures will be put in place will be agreed with the BMD-West Engineer prior to commencement of the construction phase. • The contractor will confirm the proposed laden weight of trucks identified, max length of same, Journey time and number of trips per route per day to and from works sites. • The contractor will confirm the proposed start and finish times as outlined in this document and days for truck haulage and estimate the minimum and maximum number of days for full operation. • Pull-in lay-bys or hardstands for overtaking of slow moving traffic will be identified along the proposed haulage routes. • Any traffic control measures will be carried out with the agreement and under the supervision of the local Area Engineer. Road signage on the public road network will comply with the Department of the Transport's Traffic Signs Manual "Chapter 8 Temporary Traffic Measures and Signs for Roadworks". Traffic management measures will be designed in accordance with the "Guidance for the Control and Management of Traffic at Roadworks – Second Edition".		
MM70	EIAR Ch11, 14	The contractor will also be obliged to provide the following mitigation measures:		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		• Road signage on the public road network will comply with the Department of the Transport's Traffic Signs Manual "Chapter 8 Temporary Traffic Measures and Signs for Roadworks". • Site entrance locations off the public road may require a durable bound surface and a secure joint must be formed between the access road and the public road. A durable bound surface is required on access roads for a minimum distance of 10 m from the public road • Adequate drainage will be maintained at all times to ensure that no surface water from the site or site access discharges to the public roads Cleaning regime for plant will be implemented in order to minimise mud/dust on public roads		
Waste Management				
MM73A	EIAR Ch11	• All current and applicable waste management legislation will be applied and adhered to • The construction compound for the proposed scheme will have a dedicated Waste Storage Area (WSA) for any construction waste generated. Receptacles/skips or bays will be provided for each recyclable material. • Excavated material will be reused where possible, classified as a construction by-product in the context of Article 27 of the European Communities (Waste Directive) Regulations 2011. • Soils generated from excavations which is not in a Japanese Knotweed infested area will be stored separately from the gravels and bedrock and will be transported to an appropriately licensed facility by permitted contractors. Where		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		feasible, material will be removed from site and transported to the closest suitably licenced facility to be processed and used on other construction projects in the vicinity. • If contaminated soils are encountered, they will be stored separately to the inert material. Samples will be taken and tested in order to appropriately classify the material as non-hazardous or hazardous to establish the criteria for the acceptance of waste at landfills. They will then be transported to an appropriately licensed facility for treatment and safe disposal by permitted contractors. • Scrap metal will be segregated from other waste and recycled accordingly. • Timber that is uncontaminated will all be recycled. Should any timber be deemed to be contaminated it will be collected by an appropriately permitted specialist contractor and disposed of in an appropriately licensed facility. • If hazardous materials are used/encountered on site a specialist contractor will be employed to carry out an environmental clean-up to remove all traces of contaminated material from the site. The specialist contractor will be licensed under the 'Waste Management (Collection Permit) Regulations, 2007' (as amended). This will be disposed of at an appropriately licensed facility. • Waste will be weighed, either by weighing mechanism on the truck or at the receiving facility, and these records will be kept by the contractor (both hard and soft copies). A copy of all waste collection permits, for all waste contractors will be kept by the Waste Manager, working on behalf of the Contractor, on site.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
MM73B	EIAR Ch14	The proposed development will also be subject to a fire safety risk assessment in accordance with Chapter 19 of the Safety, Health and Welfare at Work Acts 2005 to 2014, which will assist in the identification of any major risks of fire on site, and mitigation of the same during operation.		
Operational Phase				
MM76	EIAR Ch7, 14	Data from hydrometric gauges installed in connection with the Scheme will be monitored and the hydraulic model will be periodically recalibrated following high flow events to inform if any adjustments are required to the adjustable steel plates on the river flow control structure and along the intake weir.		

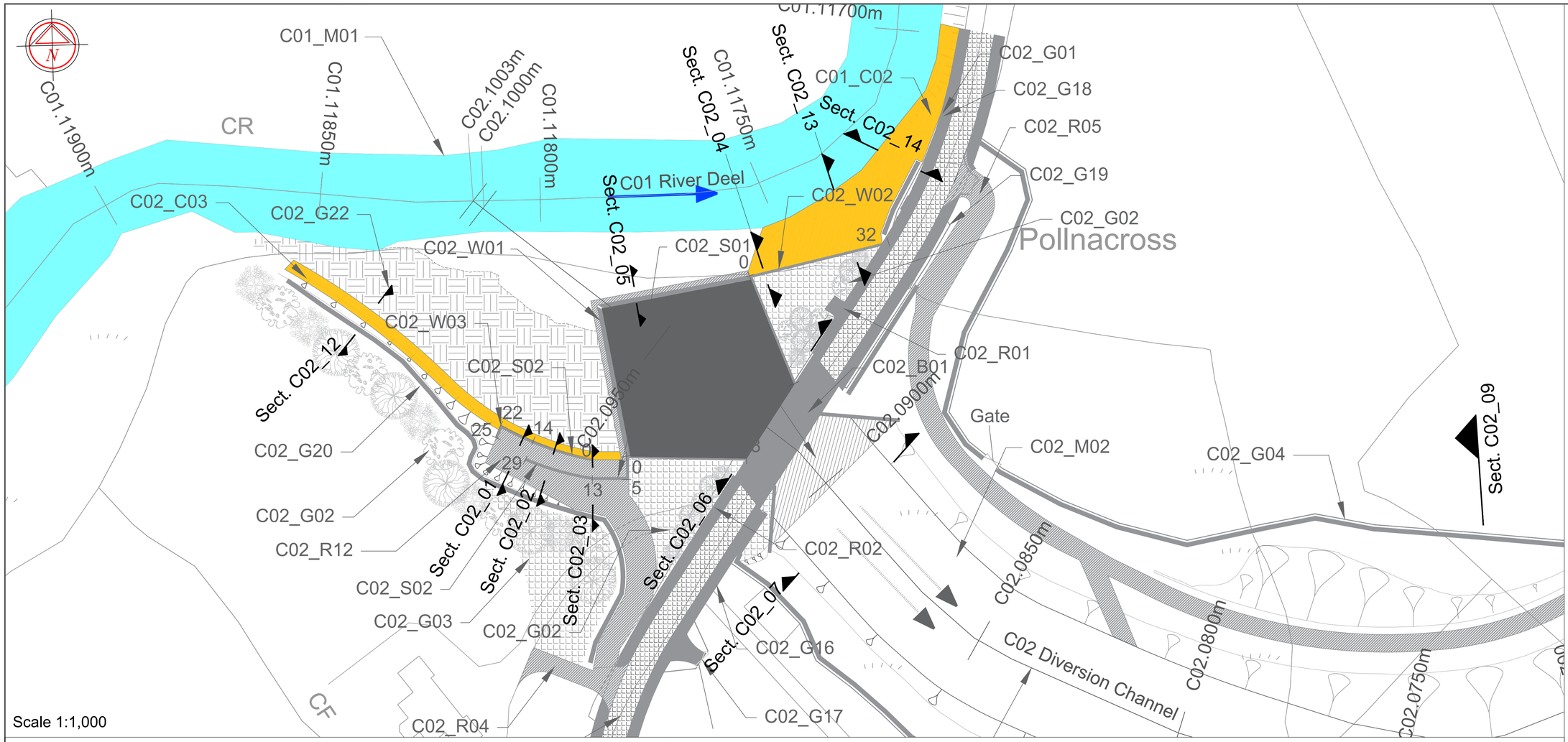
Table 6.1 Mitigation Measures (excerpt)

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
Construction Phase					
MX9	EIAR Ch3 OCEMP Section 8	Alarmed Sondes will be employed to measure turbidity in the River Deel upstream and downstream of the works area from Scheme confirmation and throughout construction of the intake structure. If there is a 5% difference between the NTU value recorded in the upstream and downstream Sondes and where NTU is above the average baseline conditions (likely to be approximately 10 NTU based on recorded data within the River Deel), all works will cease immediately until the source of the increased turbidity is identified and rectified (if caused by the construction works).	Continuous Monitoring	As required	ECoW
Operational Phase					

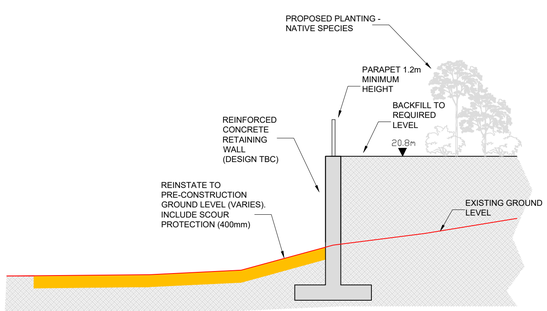
Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
MX23	EIAR Ch14	The maintenance programme, record of reported incidents, as well as general site activities will be monitored on an on-going basis to ensure risk of major accidents does not increase over time.	Ongoing	As Required	Construction Manager/Design Engineer/OPW

Table 7.1 Monitoring Proposals (Excerpt)

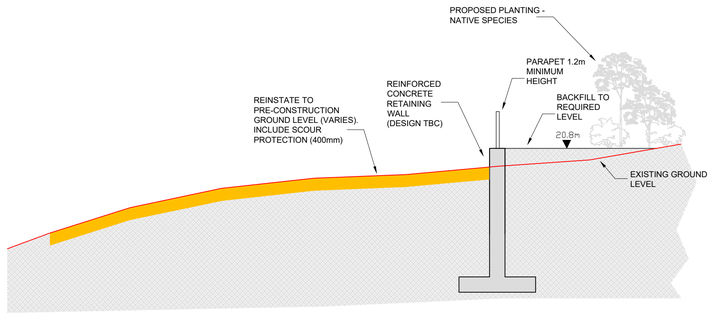
Appendix 3D – Extent of Scour Protection at Intake Structure



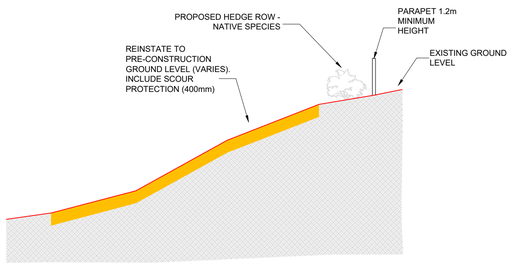
Scale 1:1,000



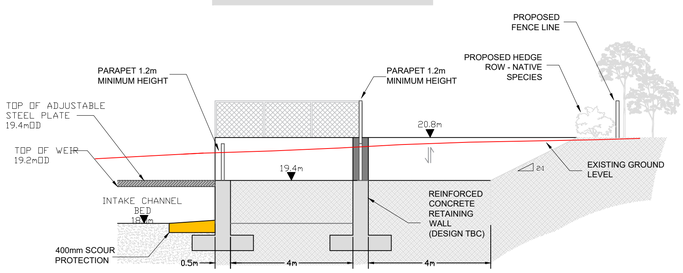
SECTION C02-04



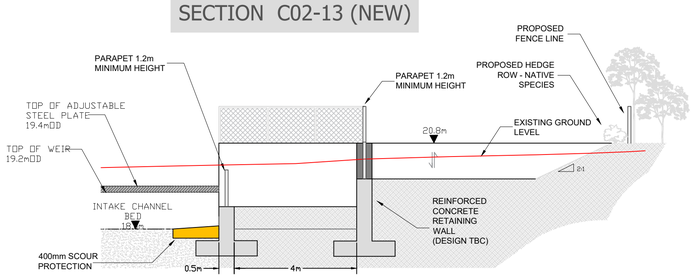
SECTION C02-13 (NEW)



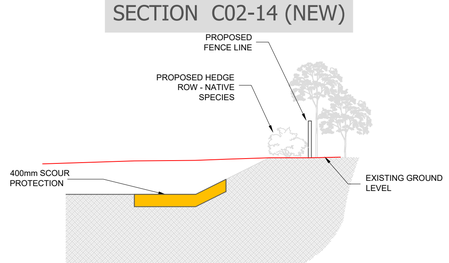
SECTION C02-14 (NEW)



SECTION C02-01



SECTION C02-02



SECTION C02-12 (NEW)

Scale 1:100

NOTES

1. Levels are to Malin Ordinance Datum and dimensions are in meters unless otherwise stated.
2. Do not scale from drawing. Dimensions/scheme elements are subject to change following detailed design.
3. Drawings to be read in conjunction with other Confirmation Drawings and Schedules.
4. Location of proposed field entrances to be agreed with landowners.
5. Refer to drawings L_01 & S_01 for further details

LEGEND

Proposed Rip-Rap Scour Protection

	DATE	DRN	DESCRIPTION	CHK	APD

REVISIONS

DRAWING STATUS

☐ PRELIMINARY ☐ CONTRACT ☐ TENDER ☐ CONSTRUCTION
☐ EXHIBITION ☒ CONFIRMATION ☐ AS CONSTRUCTED ☐ DRAFT

RYAN HANLEY
CONSULTING ENGINEERS
1 Galway Business Park, Upper Newcastle Road
Dangan, Galway
Tel:(091)587116 Fax:(091)587110
Email: rhc@ryanhanley.ie
Web: www.ryanhanley.ie
DUBLIN OFFICE: 170 Ivy Exchange, Granby Place, Parnell Square West, Dublin 1

CLIENT

THE OFFICE OF PUBLIC WORKS

PROJECT

RIVER DEEL (CROSSMOLINA)

DRAINAGE SCHEME

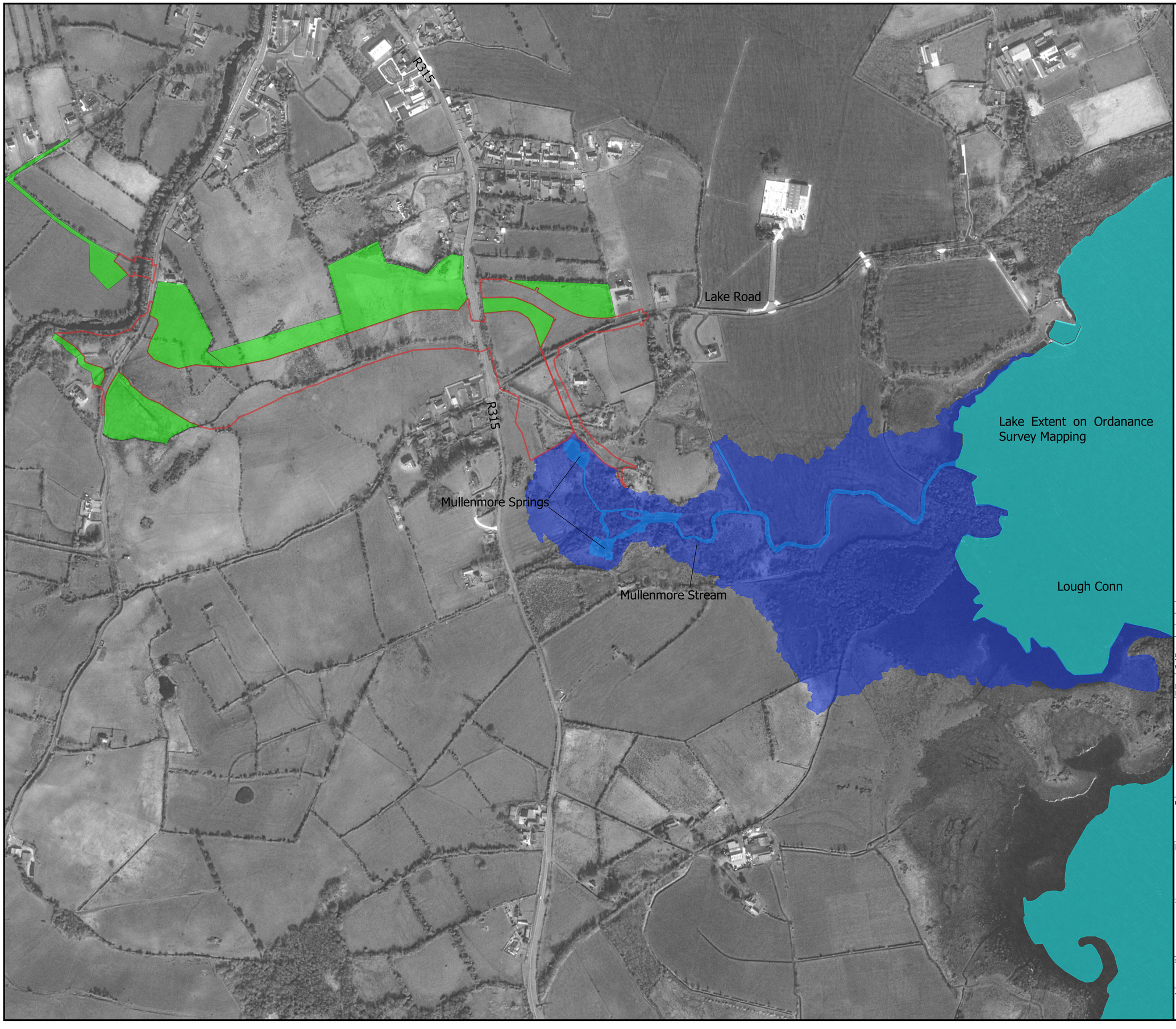
TITLE

EXTENT OF SCOUR PROTECTION AT INTAKE

SCALE @ A1	DATE	DRAWN	CHECKED	APPROVED
See Plate	June 2021	DP	JR	JR

JOB No.	CAD FILE PATH	DRAWING No.	REV.
2267	06/Scheme	SP_01	

Appendix 6E – Proposed Permanent and Temporary Landtake including Washlands



N
W
E
S

Legend

- Temporary Construction Works Area
- Permanent Works Area
- 1% AEP Washland Extents
- Lake/Spring/Stream extents on Ordanance Survey Maps

REV	DATE	DRN	DESCRIPTION	CHK	APD

REVISIONS

DRAWING STATUS

☐PRELIMINARY ☐CONTRACT ☐TENDER ☐CONSTRUCTION
☐FOR APPROVAL ☒CONFIRMATION ☐AS CONSTRUCTED ☐DRAFT

RYAN HANLEY
CONSULTING ENGINEERS
1, Galway Business Park
Dangan, Galway
Tel: (091)587116 Fax:(091)587110
Email: rhc@ryanhanley.ie
Web: www.ryanhanley.ie

CLIENT
THE OFFICE OF PUBLIC WORKS

PROJECT
RIVER DEEL (CROSSMOLINA) - DRAINAGE SCHEME

TITLE
PROPOSED PERMANENT & TEMPORARY LANDTAKE INCLUDING WASHLANDS

SCALE @ A1	DATE	DRAWN	CHECKED	APPROVED
1:5000	25/06/2021	DP	JR	JR

JOB No.	Drawing No.	REV.
2267	Appendix 6E	0

Appendix 8A – Dust Impact Assessment Report for the proposed River Deel (Crossmolina) Drainage Scheme.

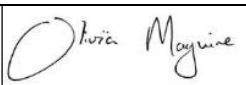
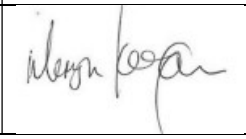
CLIENT: Ryan Hanley.

PROJECT: Dust Impact Assessment Report for the proposed River Deel (Crossmolina) Drainage Scheme.

Prepared by: AONA Environmental Consulting Ltd.

Date: June 2021

REPORT CONTROL

Client:	Ryan Hanley		
Project:	Dust Impact Assessment Report for the proposed River Deel (Crossmolina) Drainage Scheme		
Job Number:	ENV-7067		
Document Checking:			
Author:	Olivia Maguire, B.Sc, M.Sc.	Signed:	
Review By:	Mervyn Keegan, B.Sc, M.Sc.	Signed:	

Issue	Date	Status	Checked for Issue
1	16/06/2021	Draft Report	OM
2	24/06/2021	Final Report	MK
3	02/07/2021	Final Report	MK

AONA Environmental Consulting Ltd.
Unit 8A,
Northwest Business Park,
Sligo
F91 E285

www.aonaenvironmental.ie

Contents

1 DUST IMPACT ASSESSMENT

1.1 Introduction

AONA Environmental Consulting Ltd. was commissioned by Ryan Hanley to prepare a Dust Impact Assessment to assess the potential dust deposition impacts due to the River Deel (Crossmolina) Drainage Scheme in Crossmolina, Co. Mayo.

Previously submitted planning documents, including the EIAR for the Scheme have been reviewed by the Department of Public Expenditure and Reform (DPER) and DPER have requested the following additional information in relation to the previously submitted Air Quality & Climate/Noise & Vibration Chapter of the EIAR for the Scheme:

Assess the impact of dust from excavated material in Chapter 8

The DPER EIAR peer review notes the following in relation to Chapter 8 of the EIAR:

"The Chapter does not adequately assess the impact of dust from the proposed development on the environment. The excavation of 166,400 cubic metres of soil/clay has the potential to generate considerable dust under certain conditions. This should be addressed in order to accurately assess the potential impact. In addition, the transport of this material also has the potential to generate significant dust. Furthermore, the impact of the considerable volume of heavy traffic required for the proposed development on air quality should be assessed."

Based on detailed discussions with Ryan Hanley with regards to the above information request, it was advised to the applicant that dust dispersion modelling for a construction site is potentially a very inaccurate process or prediction, due to the many variables that exist within a construction site in terms of processes, contractor practices and management, the relatively short duration of works, seasonality, prevailing weather conditions, etc. Most dust degenerating activities on construction works sites will be completed within 12 months. In comparison, dust dispersion modelling for projects such as quarries and mines is a more accurate process as repeatable and regular annual events/processes occur over many consecutive years. Also, accurate dust dispersion modelling is a relatively expensive exercise as it requires meteorological data, accurate terrain data, digital mapping, detailed topographical surveys, detailed accurate inputs from an operator, as well as a significant details in relation to duration, frequency, periods of operation, volumes and types of materials, etc. Therefore, a Construction Dust Impact Assessment has been prepared in accordance with the *Institute of Air Quality Guidance on the assessment of dust from demolition and construction*. This is the industry best practise for such a project as the River Deel (Crossmolina) Drainage Scheme in Crossmolina, Co. Mayo. This is a risk based approach which determines appropriate and suitable mitigation measures that can be directly advised to the contractor as a specific set of planning conditions.

During the 'Construction Phase' there will be the potential for an air quality and dust impact due to the nature of the proposed construction activities. A construction dust assessment has been undertaken to determine whether air quality impacts are likely to arise from the construction of the proposed development, using the "Guidance on the assessment of dust from demolition and construction" (Version 1.1), published by The Institute of Air Quality Management in February 2014.

Given the nature of the proposed development, it is expected that there will be no air quality and dust impact during the 'Operation Phase'.

1.2 Assessment Methodology

1.2.1 Dust Deposition Guidelines

Dust particles can be classified into those that are easily deposited and those that remain suspended in the air for long periods. This division is useful as deposited dust is usually the coarse fraction of particulates that causes dust annoyance, whereas suspended particulate matter is implicated more in exposure impacts. Airborne particles have a large range of diameters, from nano-particles and ultrafine particles (diameters less than 0.1µm) to the very large particles with diameters up towards 100µm. There is no clear dividing line between the sizes of suspended particulates and deposited particulates, although particles with diameters >50 µm tend to be deposited quickly and particles of diameter <10 µm (PM_{10}) have an extremely low deposition rate in comparison. Therefore, the size of suspended and deposited dust particles affects their distribution and as such requires two very different approaches to sampling these fractions. PM_{10} is the fraction of airborne (suspended) particulates which contains particles of diameter less than 10µm. $PM_{2.5}$ is the fraction of airborne (suspended) particulates which contains particles of diameter less than 2.5µm. PM_{10} and $PM_{2.5}$ particles can penetrate deep into the respiratory system increasing the risk of respiratory and cardiovascular disorders. Total Suspended Particles (TSP) is the term used when referring to larger particles which do not have a specified size limit. It is common for TSP to be measured alongside PM_{10} and $PM_{2.5}$ particularly at industrial sites when dust monitoring is undertaken.

Particulate matter can emanate from natural and anthropogenic sources. Natural sources include sea salt, forest fires, pollen and moulds. Natural sources are unregulated and harder to control. Anthropogenic sources can be regulated and understanding the sources of particulate matter is very important. PM_{10} is most commonly associated with road dust and construction activities. Wear and tear of brakes and tyres on vehicles and crushing activities at construction sites can all contribute to a rise in PM_{10}. $PM_{2.5}$ is associated with fuel burning, industrial combustion processes and vehicle emissions. Larger particles (100µm diameter) are likely to settle within 5-10m of their source under a typical mean wind speed of 4-5 m/s, and particles between 30-100 µm diameter are likely to settle within 100m of the source. Smaller particles, particularly those <10

μm in diameter, i.e. PM_{10}, have a greater potential to have their settling rate impeded by atmospheric turbulence and to be transported further from their source. Dust emissions are exacerbated by dry weather and high wind speeds. The impact of dust therefore, also depends on the wind direction and the relative location of the dust source and receiver.

Currently no Irish statutory standards or limits exist for the assessment of dust deposition and its tendency for causing nuisance. Similarly, no official air quality criterion has been set at a European or World Health Organisation (WHO) level, although a range of national 'yardstick' criteria from other countries is found in literature.

The Quarries and Ancillary Activities, Guidelines for Planning Authorities states that following with regard to the control of dust;

"*There are currently no Irish statutory standards or EPA guidelines relating specifically to dust deposition thresholds for inert mineral/aggregate dust. (See, however, the Air Quality Standards Regulations 2002 for measurement standards). There are a number of methods to measure dust deposition (such as the Frisbee method) but only the German TA Luft Air Quality Standard relates a specific method (i.e. Bergerhoff) of measuring dust deposition with dust nuisance. On this basis it is recommended that the following TA Luft dust deposition limit value be adopted at site boundaries near quarry developments:*

Total dust deposition (soluble and insoluble): 350 milligram per square metre per day (when averaged over a 30-day period).

Best practice dust control measures should be proposed by the applicant".

In England and Wales, a *'custom and practice'* limit of 200 mg/m^2/day is sometimes referenced using Frisbee-type Deposition Gauges. This value was derived by multiplying a historical, typical UK median background by 3.5 (which was the ratio of the 95th percentile to the median). It should be noted that because background dust levels can vary significantly from place to place and with season, the authors Vallack & Shillito were clear that the preferred approach is to calculate a bespoke site-specific "complaints likely" dust guideline, where sufficient local baseline monitoring data is available (at least 12-months) based on 3.5 times the median background level. However, such bespoke local baseline data is often not available and in such cases the authors recommended using as a fall-back the 95th percentile of typical UK background data. It is important that the limitations of the 200 mg/m^2/day benchmark are appreciated: firstly, it is simply a custom and practice yardstick and it was never based on actual dose-response data; secondly, in deriving this default "complaints likely" guideline, the authors used a dataset that was quite old and not necessarily indicative of today's background levels.

The German TA Luft Regulations, "Technical Instructions on Air Quality Control" state that total dust deposition (soluble and insoluble, measured using Bergerhoff type dust deposit gauges as per German Standard Method for determination of dust deposition rate, VDI 2119) should not exceed a dust deposition rate of 350 mg/m^2/day (when averaged over a 30+/-2 day period). The

use of this limit value is appropriate to minimise the impact of airborne dust levels on the receiving environment beyond the site boundary. The German TA Luft criteria for '*possible nuisance'* and '*very likely nuisance'* are 350 mg/m^2/day and 650 mg/m^2/day, respectively.

Criteria from other countries that can be referred to include;

- In the USA, Washington has set a state standard of 187 mg/m^2/day for residential areas.
- Western Australia also sets a two-stage standard, with '*loss of amenity first perceived'* at 133 mg/m^2/day and '*unacceptable reduction in air quality*' at 333 mg/m^2/day.
- The Swedish limits promoted by the Stockholm Environment Institute, and used regularly in Scotland, range from 140 mg/m^2/day for rural areas to 260 mg/m^2/day for town centres.

These go some way to addressing the view that the annoyance impact (and hence potential for complaints) depends on the worsening of dust levels above existing background levels.

In 2005, the UK Highways Agency released an Interim Advice Note 61/05 '*Guidance for Undertaking Environmental Assessment of Air Quality for Sensitive Ecosystems in Internationally Designated Nature Conservation Sites and SSSIs*' as a supplement to the Design Manual for Roads and Bridges (DMRB) Guidelines. This interim guidance states that dust or particles falling onto plants can physically smother the leaves affecting photosynthesis, respiration and transpiration. The literature suggests that the most sensitive species appear to be affected by dust deposition at levels above 1,000 mg/m^2/day which is considerably greater than the level at which most dust deposition may start to cause a perceptible nuisance to humans. As such, once dust deposition rates are maintained within the guidelines for human nuisance the impact of dust deposition on sensitive ecosystems is considered negligible. Therefore, the following dust deposition limits are typically recommended;

- Dust Deposition Rate limit = 350 mg/m^2/day (averaged over a 30+/-2 day period using Bergerhoff Gauge Method).
- Dust Deposition Rate limit affecting sensitive ecological receivers = 1,000 mg/m^2/day
- PM_{10} 24 Hour Mean concentration limit = 50 µg/m^3 not to be exceeded more than 35 times a calendar year
- PM_{10} Annual Mean concentration limit = 40 µg/m^3
- $PM_{2.5}$ Annual Mean concentration limit = 25 µg/m^3

1.2.2 Guidance on the assessment of dust from demolition and construction

As prescribed within Environmental Protection UK and the Institute of Air Quality Management, Land-use Planning & Development Control: Planning For Air Quality (January 2017) the proposed River Deel (Crossmolina) Drainage Scheme has been assessed in accordance to the "Guidance on the assessment of dust from demolition and construction" (Version 1.1), published by The Institute of Air Quality Management in February 2014. This guidance has been referenced to assess the potential impact of the vehicle movements and the earthworks phase of the proposed

works. Good practice construction mitigation measures are recommended to be implemented to minimise emission quantities during construction.

1.3 Existing Environment

1.3.1 Baseline Air quality

No baseline air quality or dust deposition survey has been undertaken. Reference has been made to EPA data to quantify the existing air quality in proximity to the proposed development site.

The EPA has divided the country into zones for the assessment and management of air quality. The zones adopted in Ireland are Zone A, the Dublin conurbation; Zone B, the Cork conurbation; Zone C, comprising 21 large towns in Ireland with a population >15,000; and Zone D, the remaining area of Ireland. The background air quality in the area of the development is of good quality and the site is located in 'Zone D' as denoted by the EPA.

Nitrogen Dioxide (NO_2), Ozone and Particulate Matter (PM_{10}) background concentrations in 2021 (to 01/06/2021) have been referenced from the Castlebar EPA Air Quality monitoring station which is approximately 27 km south of the development site.

The CAFE (Clean Air for Europe) Directive sets air quality standards for member states in Europe and has been transposed into Irish legislation by the Air Quality Standards Regulations. Table 1 shows that there were not any exceedances of these EU CAFÉ directive annual mean limits or WHO guideline values for NO_2, Ozone or PM_{10} from January to June 2021.

Table 1: Castlebar EPA Air Quality monitoring station data January – May 2021

Month	NO_2 (µg /m^3)	Ozone (µg /m^3)	PM_{10} (µg /m^3)
January	10.01	46.87	15.17
February	5.58	60.67	17.03
March	6.17	61.84	19.83
April	6.94	69.66	16.32
May	4.86	67.36	12.54
EU CAFÉ Directive Limit Value	40 µg/m^3	None specified	40 µg/m^3
WHO annual mean guideline	40 µg/m^3	None specified	20 µg/m^3

The Environmental Protection Agency's Air Quality Index for Health (AQIH) is a number from one to 10 that identifies the current air quality currently in a region and whether or not this might affect human health. A reading of 10 means the air quality is very poor and a reading of one to three inclusive means that the air quality is good. The AQIH readings are based on five air pollutants which can harm human health: Ozone gas, nitrogen dioxide gas, sulphur dioxide gas, $PM_{2.5}$ particles and PM_{10} particles. The AQIH at Castlebar is currently 3 - Good [index calculated at 17.29, Tuesday June 1, 2021] (EPA, 2021).

The most recent annual report on air quality "Air Quality in Ireland 2019" (EPA, 2020), details the range and scope of monitoring undertaken as part of the National Ambient Monitoring Programme (AAMP) which commenced at the end of 2017. The report concluded that, based on the ambient air quality monitoring carried out by the EPA in 2019, air quality in Ireland was mostly within the statutory limit and target values. Levels above the more stringent WHO guideline values were observed for particulate matter (PM_{10} and $PM_{2.5}$), ozone and NO_2. NO_2 was measured at 21 monitoring stations in 2019. There was one exceedance of the EU annual limit value at St Johns Road west in Dublin. All other concentrations observed were below the annual limit values.

PM_{10} and $PM_{2.5}$ was monitored at 30 monitoring stations in 2019. There were no exceedances of the EU limit values (annual and daily). However, the World Health Organisation (WHO) PM_{10} air quality guideline daily value was exceeded at 14 of the 30 monitoring stations and $PM_{2.5}$ at 25 of the 30 monitoring stations.

1.4 Predicted Impacts

1.4.1 Do Nothing Scenario

The 'Do Nothing' scenario is defined as the option involving no future expenditure on flood defences or maintenance of existing defences/channels. There is no air quality and dust impact from the 'Do Nothing scenario'.

1.4.2 Construction Phase

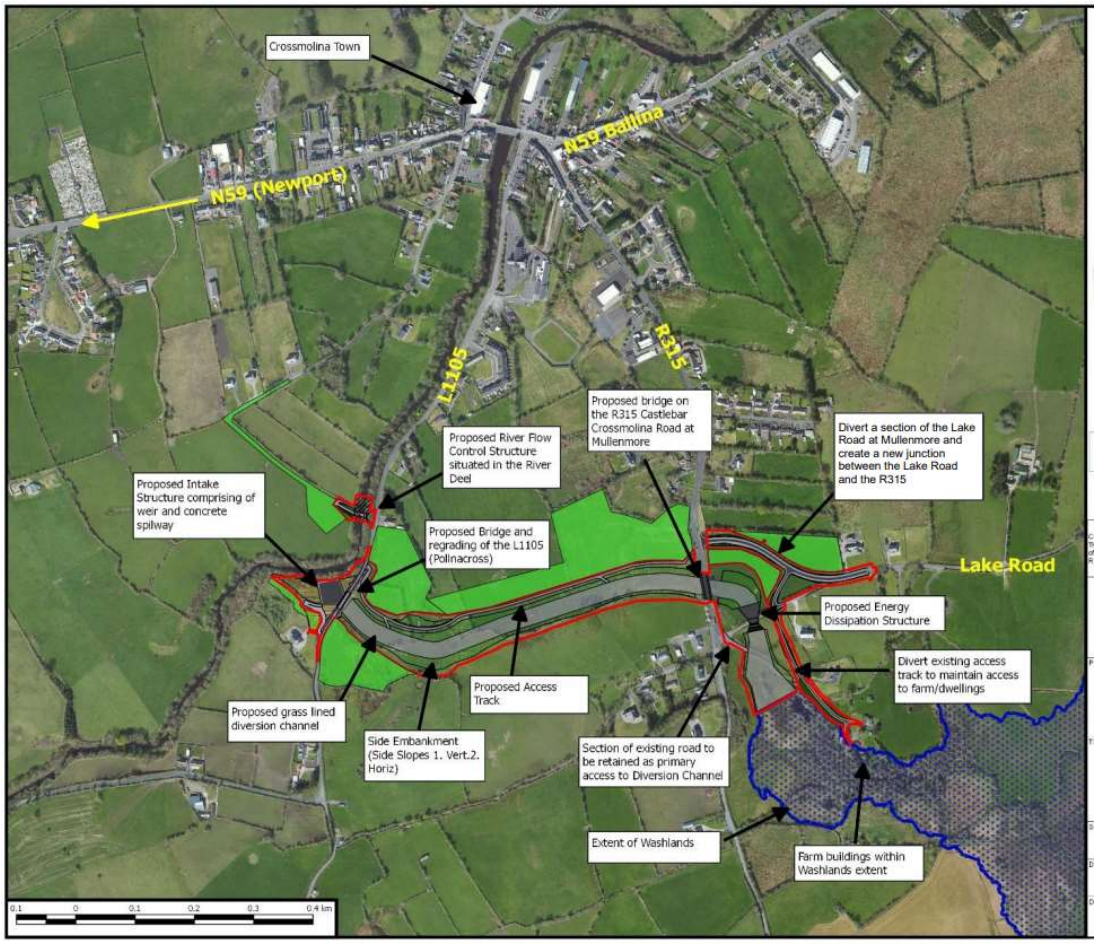
Description of Proposed Construction Works:

The River Deel in Crossmolina has a long history of flooding. The four most recent flood events in 1989, 2006, and 2015 (twice) resulted in flooding of three main streets in Crossmolina Town. Approximately 120 properties were inundated by flood water during the most extreme of these floods in December 2015. As such, there is a critical need for measures to be employed to alleviate any future flooding within the town. The proposed flood scheme for the River Deel is a diversion channel upstream of the town with a capacity of 110 cumec, which will redirect flood waters away from the town, directly to the flood plains of Lough Conn. The scheme will be designed to cater for the 1% Annual Exceedance Probability (AEP) flood event (also known as the 100-year flood event), but will also cater for a larger flood event as the diversion channel has additional capacity. This will safeguard against flooding associated with potential future climate change that could increase the size of the 100-year flood event. The proposed infrastructure has been designed in order to prevent flooding in Crossmolina Town, while minimising resulting changes in the hydrology of the river, by avoiding any significant impact on river flows downstream of the intake structure for flows up to bank full flow.

The proposed works for the River Deel (Crossmolina) Drainage Scheme as shown in Figure 1 comprise the following;

- Site investigation;
- Site preparation and clearance;
- Construction of a new grass lined diversion channel commencing at the River Deel/ L1105 and terminating in the townland of Mullenmore to the East of the R315 Crossmolina to Castlebar Regional Road;
- Construction of a new reinforced concrete intake structure and spillway on the banks of the River Deel at the upstream end of the abovementioned grass lined channel complete with an adjustable steel plate at the top of the 70m reinforced concrete intake structure;
- Construction of a new river flow control structure incorporating adjustable steel plates. The structure will consist of a series of precast box culverts and will be located approximately 155 metres downstream of the intake structure;
- Construction of an earthen embankment and reinforced concrete retaining walls/ steel sheet piling at the river flow control structure;
- Construction of a new reinforced concrete energy dissipation structure within the proposed diversion channel to the south east of the R315;
- Construction of two new bridges, one each on the R315 (Mullenmore Bridge) and L1105 (Pollnacross Bridge);
- Raising the L1105 at the approach to the new bridge;
- Realignment of the Lake Road and creation of a new junction with the R315. This will necessitate the closure of a section of the existing road;
- Realignment and raising of existing avenues connecting the Lake Road to properties to the South;
- Creation of washlands between the termination point of the new channel and Lough Conn;
- Removal of existing access points/ access routes and creation of new access points;
- Construction of an access track along the top of the channel between the L1105 and the R315. An access track will also be constructed alongside the intake structure linking the L1105 to the river bank. This will be used for maintenance purposes;
- Localised regrading of ground levels, erection of fencing and access gates, to facilitate pedestrian/ vehicular access to and around flood defences, or to redirect overland surface water flow paths; Utility diversions where required;
- Maintenance activities and other non-structural measures

Figure 1: Outline of the proposed scheme



The estimated total number of round trips from site for the removal of excavated material will range from 10,400 - 17,000 round trips over the anticipated construction programme, assuming 16 – 30 T per vehicle. In relation to haulage routes, Coolturk Quarry has been identified as one of a number of potential disposal sites for excavated material from the proposed channel (subject to approval).

Construction Dust Impact Assessment:

STEP 1: Screening the Need for a Detailed Assessment

An assessment will normally be required where there is:

- a 'human receptor' within:
    - 350 m of the boundary of the site; or
    - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s)
- an 'ecological receptor' within:
    - 50 m of the boundary of the site; or
    - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s)

STEP 2: Assess the Risk of Dust Impacts

The risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts should be determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large (STEP 2A); and
- the sensitivity of the area to dust impacts (STEP 2B), which is defined as low, medium or high sensitivity.

These two factors are combined in STEP 2C to determine the risk of dust impacts with no mitigation applied. The risk category assigned to the site can be different for each of the four potential activities (demolition, earthworks, construction and trackout). More than one of these activities may occur on a site at any one time. Where appropriate, the site can be divided into 'zones' for the dust risk assessment.

Step 2A: Define the Potential Dust Emission Magnitude

Earthworks, construction and trackout will occur during the construction phase. Table 2 describes the potential dust emission class criteria for each outlined construction activity.

Table 2: Criteria Used in the Determination of Dust Emission Class

Activity	Criteria used to Determine Dust Emission Class		
	Small	**Medium**	**Large**
Earthworks	• Total site area <2,500m^2 • soil type with large grain size (e.g. sand), • <5 heavy moving earth vehicles active at any one time • formation of bunds <4 m in height • Total material moved <20,000 tonnes	• Total site area 2,500 – 10,000m^2 • Moderately dusty soil type (e.g. silt) • 5-10 heavy moving earth moving vehicles active at any one time. • formation of bunds 4 m - 8 m in height, • Total material moved 20,000 – 100,000 tonnes.	• Total site area >10,000m^2 • potentially dusty soil type (e.g. clay) • >10 heavy earth moving vehicles active at any one time. • formation of bunds >8 m in height • Total material moved >100,000 tonnes
Construction	• Total building volume <25,000m^3 • Construction material with low potential for dust release	• Total building volume 25,000 – 100,000m^3 • Potentially dusty construction material (e.g. concrete) • On-site concrete batching	• Total building volume >100,000m^3 • On-site concrete batching • Sandblasting
Trackout	• <10 outward HDV trips in any one day • surface material with low potential for dust release, • Unpaved road length <50m	• 10 - 50 outward HDV trips in any one day • moderately dusty surface material (e.g. high clay content), • Unpaved road length 50-100m	• >50 outward HDV trips in any one day • potentially dusty surface material (e.g. high clay content • Unpaved road length >100m

The potential dust emission magnitudes for the proposed development were estimated using information provided and determined using the criteria detailed in Table 2 as follows;

Earthworks:

Earthworks covers the processes of soil-stripping, ground-levelling, excavation and landscaping.

- The site works area is 6.6 hectares (66,000m^2) for the permanent works area for the diversion channel only. The permanent works area for the scheme is 8.58 ha (85,800m^2) and the temporary works area is an additional 6.74 ha (67,400m^2).
- The majority of excavation required will comprise excavating for the diversion channel. Although this excavated material will be reused where possible, a significant volume of excavated material will be removed from the proposed Scheme. The volume of excavated material is estimated to be 166,400 m^3 (166,000 m^3 - diversion channel, 300 m^3 - bridges, retaining wall foundations, 100 m^3 - misc).

- The site itself contains potentially dusty soil types. The geology of the study area is composed of made ground and alluvial deposits (silt, clay, sand and gravel) overlying limestone with Calcareous Shale.
- It is assumed that there will be >10 heavy moving earth moving vehicles active at any one time.
- Therefore, the dust emission magnitude for Earthworks is defined as **Large**.

Construction:

Construction covers any activity involved with the provision of a new structure (or structures), its modification or refurbishment. (See above list of construction involved in proposed project).

- The total building volume will be >100,000 m^3.
- Construction material contains potentially dusty soil types (excavation material and concrete).
- On site concrete batching is probable.
- Therefore, the dust emission magnitude for construction is defined as **Large**.

Trackout:

Trackout cover the transport of dust and dirt from the construction site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.

The estimated total number of round trips from site for the removal of excavated material will range from 10,400 - 17,000 round trips over the anticipated construction programme, assuming 16 – 30 T per vehicle. In relation to haulage routes, Coolturk Quarry has been identified as one of a number of potential disposal sites for excavated material from the proposed channel (subject to approval).

The predicted construction phase traffic volumes have been referenced from Chapter 11 Material Assets (Table 11.4) of the EIAR.

- Considering the predicted daily number of HGV movements over construction period, there will be greater than 50 outward HGV movements in any one day.
- The unpaved road length will be >100m.
- Therefore, the dust emission magnitude for trackout was defined as **Large**.

Step 2B: Define the Sensitivity of the Area

The sensitivity of the area takes account of a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10}, the local background concentration; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

The criteria for determining the sensitivity of receptors is detailed in Table 3 for dust soiling effects and health effects of PM_{10}.

Table 3: Criteria for Determining Sensitivity of Receivers

Sensitivity of Receiver	Criteria for Determining Sensitivity	
	Dust Soiling Effects	**Health Effects of PM_{10}**
High	Dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms	Residential properties, hospitals, schools and residential care homes
Medium	Parks, places of work	Office and shop workers not occupationally exposed to PM_{10}
Low	Playing fields, farmland, footpaths, short-term car parks and roads	Public footpaths, playing fields, parks and shopping streets

The criteria detailed in Tables 4 and 5 were used to determine the sensitivity of the area to dust soiling effects and human health impacts.

Table 4: Sensitivity of the Area to Dust Soiling Effects on People and Property.

Receiver Sensitivity	Number of Receivers	Distance from Source (m)			
		<20m	**<50m**	**<100m**	**<350m**
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 5: Sensitivity of the Area to Human Health Impacts.

Receiver Sensitivity	Annual Mean PM_{10} Conc	Number of Receivers	Distance from Source (m)				
			<20m	<50m	<100m	<200m	<350m
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m^3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

Table 6: Sensitivity of the Area to Ecological Impacts.

Receiver Sensitivity	Distance from Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Sensitivity of Receivers

The major settlement within the Study Area is Crossmolina. Crossmolina is identified as "other town or village" in the Mayo County Development Plan 2014-2020. A population of 1,044 was reported in the Census of Ireland 2016, with the population density of the study area recorded as 22.5 persons per square kilometre.

Table 7 outlines the range of numbers of properties within specific distance bands from the proposed construction activities to determine the receptor sensitivity of the area to Dust Soiling Effects on People and Property.

Table 7: Cumulative number of sensitive receivers within 20m, 50m, 100m, 200m and 350m of the site.

Parameter	Number of Receivers within Distance from Site (m)				
	<20m	<50m	<100m	<200m	<350m
No. of receivers in proximity to Site	1	8	15	>20	>30
Receiver Sensitivity	Medium	Low	Low	Low	Low

Sensitivity of People to Dust Soiling

- Earthworks and Construction: There is one sensitive residential property within 20m of the proposed construction activities on the site. There are 8 sensitive residential properties within 50m of the site. Therefore, the sensitivity of the Area to Dust Soiling Effects on People and Property is **Medium**; in terms of potential earthworks and construction dust impacts.
- Trackout: As general guidance, without site-specific mitigation, trackout may occur from roads up to 500 m from large sites (as determined in Step 2A). As shown in Table 4, the sensitivity of the area is **Low**; in terms of potential trackout dust impacts.
- Dust impacts from the transport of wet and moist materials to potential disposal sites from the removal of excavated material will be **Low**. Coolturk Quarry has been identified as one of a number of potential disposal sites for excavated material from the proposed channel (subject to approval).

Sensitivity of the Area to Human Health Impacts

Section 1.2.1 outlines baseline air quality in the study area. The PM_{10} concentrations recorded at Castlebar EPA Air quality monitoring station for 2021 to date are well below the EU annual limit value of 40µg/m^3 and WHO air quality guideline of 20µg/m^3 respectively. Therefore, the sensitivity of the Area to Human Health Impacts is **Low**; in terms of potential earthworks, construction and trackout dust impacts.

Sensitivity of the Area to Ecological Impacts

Dust deposition due to earthworks, construction and trackout has the potential to affect sensitive habitats and plant communities.

Proposed works are partially within the River Moy SAC (002298) and 300m east of Lough Conn and Lough Cullin SPA with the washlands being partially within the SPA. Whilst there are no physical works associated with the lands over which the waters will discharge (washlands), they are included within the study area and the impacts thereon are assessed. Table 6 outlines Sensitivity of the Area to Ecological Impacts. A high receiver sensitivity is those receivers with an international or national designation Therefore, the sensitivity of the Area to Ecological Impacts is **high**; in terms of potential earthworks, construction and track out dust impacts.

The sensitivity of the area to dust soiling, human health impacts and ecological impacts for each activity is summarised in Table 8.

Table 8: Outcome of Defining the Sensitivity of the Area

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Low
Human Health	Low	Low	Low
Ecological Impacts	High	High	High

Step 2C: Define the Risk of Impacts

In accordance with the IAQM Guidance, the dust emission magnitude (Step 2A) and sensitivity of the area (Step 2B) have been combined and the risk of impacts from earthworks and trackout determined (before mitigation is applied). The risk of dust soiling, impact on human health and ecological impact before mitigation, is summarised in Table 9.

Table 9: Summary Dust Risk to Define Site-specific Mitigation

Potential Impact	Dust Emission Magnitude		
	Earthworks	Construction	Trackout
Dust Soiling	Medium Risk	Medium Risk	Low Risk
Human Health	Low Risk	Low Risk	Low Risk
Ecological	High Risk	High Risk	High Risk

1.4.3 Operation Phase

There will be no air quality and dust deposition impact from the 'Operation Phase'.

1.5 Mitigation Measures

1.5.1 Do Nothing Scenario

There will be no air quality and dust mitigation measures required for the 'Do Nothing scenario'.

1.5.2 Construction Phase

Step 3: Site-Specific Mitigation

In accordance with the IAQM Guidance, for proposed mitigation measures, the highest risk category should be applied. Therefore, the mitigation measures applicable to a **High Risk site** should be applied. These are as follows:

General Measures

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.

Dust Management

- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.
- Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.

Monitoring

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary.
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

- Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas.
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.

- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Measures specific to construction.

- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures specific to trackout.

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site logbook.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10 m from receptors where possible.

1.5.3 Operation Phase

There are no air quality and dust mitigation measures required for the 'Operation Phase'.

1.6 Residual Impact

1.6.1 Do Nothing Scenario

There is no air quality and dust impact from the 'Do Nothing scenario'.

1.6.2 Construction Phase

Step 4: Determine Significant Effects

Construction site dust control measures and good construction site management and practice is capable of effectively mitigating the potential for significant impact of fugitive dust emissions. Therefore, the potential for fugitive dust emission effects at the nearest residential properties and ecological receptors will be controlled to ensure impacts are of negligible significance.

The IAQM Guidance recommends that significance is only assigned to the effect after considering the construction activity with mitigation. Therefore, the detailed mitigation measures have been defined in a form suitable for implementation by way of a planning condition and will be included in a Construction Environmental Management Plan.

One sensitive receptor has been noted within 20m of the proposed construction works. The proposed construction works are within River Moy SAC and Lough Conn and Lough Cullins SPA. Using the IAQM methodology for the assessment of impacts from construction activities, the following is indicated in Table 9;

- the risk of dust soiling impacts are medium for earthworks and construction and are low for trackout;
- the impacts on human health are low for earthworks, construction and for trackout; and
- the ecological impacts are high for earthworks, construction and trackout.

In accordance with the IAQM Guidance, the highest risk category measures have been applied in the determination of appropriate mitigation measures. The significance of impacts arising from the risks identified together with the proposed mitigation measures are summarised in Table 10.

Together with the proposed mitigation measures and the existing low background particulate (PM_{10}) concentrations, the construction phase activities on the proposed site will not cause an exceedance of the air quality objectives at receptor locations.

Table 10: Summary of Significance of Impact including Site-specific Mitigation.

Potential Impact	Significance	
	Earthworks	Trackout
Dust Soiling	Negligible	Negligible
Human Health	Negligible	Negligible
Ecological	Negligible	Negligible

1.6.3 Operation Phase

There is no air quality and dust impact from the 'Operation Phase'.

1.7 Monitoring

1.7.1 Construction Phase

Monitoring

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority if and when requested. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary.
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority if and when requested.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Agree dust deposition and/or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.

1.8 Interactions with other Environmental Effects

An assessment of the potential impact of dust deposition on ecological receptors in proximity to the proposed woks has been undertaken. Proposed works are partially within the River Moy SAC (002298) and 300m east of Lough Conn and Lough Cullin SPA with the washlands being partially within the SPA. Therefore, the sensitivity of the Area to Ecological Impacts is High. Appropriate construction phase mitigation measures have been outlined to ensure that the potential impact on the SAC will be negligible.

1.9 Difficulties Encountered in Compiling this Information.

No difficulties were encountered in the preparation of the Air Quality & Dust Impact Assessment.