Non Technical Summary

1 INTRODUCTION

This Environmental Impact Assessment Report (EIAR) has been prepared by Ryan Hanley in association with MKO on behalf of the Office of Public Works (OPW) who propose to implement and maintain the River Deel (Crossmolina) Drainage Scheme.

The River Deel and Crossmolina Town have 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.

This EIAR complies with the EIA Directive and with the Irish EIA Regulations. The Environmental Impact Assessment (EIA) of the proposed project will be undertaken by the Minister of Public Expenditure and Reform (DPER), as the competent authority.

MKO and Ryan Hanley were engaged as environmental consultants on the proposed project and commissioned to prepare this EIAR in accordance with the requirements of the EIA Directive and the Irish EIA Regulations.

The EIAR provides information on the receiving environment and assesses the likely significant effects of the proposed project on it and proposes mitigation measures to avoid or reduce these effects. It then provides an assessment of the residual effects of the scheme taking into account the implementation of mitigation. The function of the EIAR is to provide information to allow the competent authority to conduct the Environmental Impact Assessment (EIA) of the proposed project.

All elements of the project, (including the weir, spillway, flow control structure, washlands, hydromorphology of the River Deel, maintenance and all ancillary works) have been assessed individually, and cumulatively together, and then in combination with other plans and projects as part of this EIAR.

The preparation of this EIAR has been undertaken in compliance with the provisions of the '*Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact*

Assessment', published by the Department of Housing, Planning and Local Government (DHPLG) in August 2018.

An EIAR for this project was put on public display in accordance with the Arterial Drainage Act (1945) and Amendment Act (1995), in Crossmolina Library and the offices of Mayo County Council for a period of four weeks between May 21st2018 and the 15th June 2018. Any observations and submissions relating to the project were reviewed and the EIAR has been updated and revised where relevant, to take account of any issues raised and to assess amendments to the design of the scheme that have occurred during the detailed design process. Following the exhibition in 2018, detailed hydromorphological assessments were undertaken along with additional flow modelling and detailed design and assessments. This led to the requirement for a change in the design of the scheme that included changes to the intake structure, the requirement for an instream flow control structure within the River Deel and the provision of an energy dissipation structure within the bypass channel. The EIAR has been updated to consider any comments received from the public and other consultees following the exhibition and also to reflect the changes in the design of the scheme.

The purpose of this EIAR is to enable the competent authority to carry out an assessment of the likely significant effects on the environment of the River Deel (Crossmolina) Drainage Scheme before it is consented. The EIAR describes the current state of the environment in the vicinity of the proposed development site in an effort to quantify the possible effects, if any, of the proposed development on the environment. It then provides details of the alternatives considered and the full details of all elements and stages of the proposed development. Following this, the environmental impacts of the proposed development are assessed individually, and cumulatively together, and then in combination with other plans and projects. This assessment process served to highlight any areas where mitigation measures may be necessary in order to protect the receiving environment from any significant negative effects as a result of the proposed development. Where necessary and appropriate, mitigation measures are prescribed and residual impacts are then assessed.

Each impact is described in terms of its quality, extent, duration, significance and type, where possible. A 'Do-Nothing' impact is also predicted in respect of each environmental theme in the EIAR. Residual impacts are also presented following any impact for which mitigation measures are prescribed. The remaining impact types are presented as required or applicable throughout the EIAR.

The companies and staff involved in the production of this EIAR all possess relevant skills, experience and qualifications that are necessary to undertake the assessments that informed this EIAR.

2. BACKGROUND TO THE PROPOSED DEVELOPMENT

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.

There has been a long history of flooding along the River Deel and in Crossmolina Town. The three most recent flood events were in 1989 and 2006 and 2015(twice) and resulted in flooding in the three main streets of the town as well as many other areas within the town. The floods led to significant effects on homes, businesses and amenities within the town. Shops, pubs and other businesses were forced to close and homeowners were severely disrupted. The proposed development will protect the residents and businesses within the town from future flood events and will allow for future commercial expansion within the town. The proposed development will also prevent the pollution that inevitably washes into the river following a flood event.

The design process comprises a number of steps involving co-ordination of project engineering and environmental teams. The following steps have been completed in the design and assessment process. These included a Constraints Study, Hydrology Analysis and Hydraulic Modelling, Flood Risk Assessments, Cost Benefit Analyses, Selection of Preferred Options, Appropriate Assessment Screening and Environmental Impact Assessment.

An environmental constraints study was completed at the outset of the project to identify the key environmental issues relating to the River Deel (Crossmolina) Drainage Scheme.

A description of the reasonable alternatives studied by the developer are provided in the EIAR along with an indication of the main reasons for the option chosen, taking into account the environmental effects. Following on from the initial Constraints Studies, an Options Assessment Report was initially produced for this scheme in 2014 and has been updated as the scheme has progressed thereafter. This contains a description, assessment and appraisal of the various options which were considered. A copy of the Options Assessment Report will be available to download from the OPW project website and includes a comparative assessment of the options considered.

Following the preliminary assessment of options, the following options were shortlisted for further consideration 1. Flood defences incorporating bridge replacement, 2. Combination of flood defences incorporating bridge replacement and increased conveyance (dredging), 3. Diversion Channel. The options assessment report provides a full description of the assessment of each of the above options Using Multi Criteria Analysis (MCA), the options have been assessed against technical, social, environmental and economic criteria. Each option has then been allotted a score based on OPW Guidance and by exercising professional judgement where allowed by OPW Guidance. This assessment was undertaken on the basis of potential impacts and in the absence of design and mitigation measures, which may overcome many of the potential environmental effects identified.

The MCA found that although, the diversion channel, was ranked second in the MCA environmental assessment, it was ranked first in the technical, economic and social criteria and was overall the preferred option in the MCA. The diversion channel has been identified as the most appropriate drainage Scheme for the River Deel and Crossmolina based on the options appraisal and in particular because it offers more benefit to Crossmolina Town for events with a 100year return period as the residual risk of flooding is reduced by the considerable additional conveyance capacity achieved by constructing the diversion channel. There is also minimal operational risk associated with the option as there is no reliance on mechanical, electrical or electronic systems or on human intervention in order to operate or perform successfully. With mitigation measure in place, no significant environmental impact is anticipated. With mitigation measures in place, no adverse effects on the integrity of any European Site are anticipated in view of their conservation objectives. This option is likely to be the most socially acceptable for the residents of Crossmolina (based on feedback from the public consultation), however it may be opposed by landowners and residents along the route of the diversion channel. The design of the channel was rationalised to minimise the landtake in so far as possible and the chosen channel route does not require the demolition of any existing premises.

The potential impact of the proposed development when considered in combination with other relevant plans and projects has been carried out in each chapter, with the purpose of identifying what influence the proposed development will have on the surrounding environment when considered in combination with relevant permitted, proposed and constructed projects in the vicinity of the proposed site.

Consultation with statutory and non statutory bodes and the public in relation to the project has been completed on a number of occasions at various stages in the design process between 2014 and 2020. The scheme was the subject of a public exhibition in 2018.

3. DESCRIPTION OF THE PROPOSED DEVELOPMENT

The River Deel (Crossmolina) Drainage Scheme has been designed in order to prevent flooding in Crossmolina Town during high flow events up to the 1% Annual Exceedance Probability (AEP) flood event, while minimising resulting changes in the hydrology of the river by avoiding any impact on river flows downstream of the river flow control structure for flows up to bank full flow.

The proposed works are detailed on the Scheme drawings included in Appendix 3A and are described generally in this section.

The proposed works for the River Deel (Crossmolina) Drainage Scheme 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.

An outline of the proposed Scheme is provided in Figure 3.1.

Operation and Maintenance

Flow in the river will be regulated by a river flow control structure and intake weir to be constructed on the river bank. Under normal hydrological conditions, water will continue to flow along the channel of the River Deel through Crossmolina Town and onwards to Lough Conn. There will be no appreciable effect on the existing hydrological regime within the river under all flow conditions except when the river is in flood.

The river flow control structure and intake structure have been specifically designed to ensure that the hydrological regime in the river is not altered during all but flood flow conditions. The river flow control structure has been sized so that when flows in the river exceed bank full flow, excess flow will be diverted over the intake weir, along the diversion channel, to Lough Conn, via the washlands. The intake weir will be set back from the permanent wetted channel of the river so as to minimise the effect on the river bank and thus minimise the potential for any negligible local changes to the flow regime that could be brought about by altering the river bank. The steel plates in the river flow control structure and along the intake weir will be set so as to minimise any hydrological changes in the River Deel, while mitigating flood risk in Crossmolina Town

Washlands

Due the local topography and environmental concerns, it was decided not to extend the diversion channel to Lough Conn, but to terminate the channel at the existing Mullenmore Strings and create washlands between the diversion channel and Lough Conn.

The areas designated as "Washlands" are those areas between the proposed channel and Lough Conn which under the Scheme, will be deliberately flooded to reduce flood waters in the River Deel and the consequent flood risk to Crossmolina Town.

The flood extents will vary depending on the lake level at the time of the overflow event and flow in the diversion channel. The washlands mainly consist of marginal agricultural lands, with the notable exception of existing farm buildings and an old mill at Mullenmore.

Operation Requirements and Maintenance Regime

Operational measures required will include regular scheduled maintenance of the diversion channel, river flow control structure and the intake structure, maintenance of the river gauges and groundwater monitoring points, and maintenance of vegetation on the river bank. Gravel tagging will be carried out to inform the frequency of maintenance.

Maintenance activities within the diversion channel will include grass cutting, and maintenance of vegetation at manageable levels, repairs to reinforced grass where required, inspection and repairs of other Scheme elements, such as fencing, bridges, gates and access tracks. Grass within the channel will be mowed using a tractor and mower to prevent scrub developing in the channel. The native hedges surrounding the diversion channel will be trimmed annually, outside the bird nesting season, using a tractor and flail.

Maintenance activities at the river flow control structure will include inspections of the structure and adjustable steel plates. Monitoring of any morphological adjustment and bed sediment characteristics will be carried out in the vicinity of the river flow control structure to ensure that any changes are recorded and any potential effects are identified.

Maintenance activities at the intake structure will include inspections, and maintenance of the reinforced concrete. This will be done from within the spillway, from the elevated platform and the riverbank access track. The operation of the new channel may result in some deposition of gravels in the reach between the intake structure and the river flow control structure. If required, removal of any accumulated 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. 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.

Bankside vegetation at the river flow control structure and intake structure will require maintenance on an ongoing basis to prevent it from reducing the capacity of the intake. This will not require in-stream works and will be undertaken with the use of strimmers operated by hand, on an annual basis.

Construction Programme and Estimated Cost

The construction works will last approximately 48 months. The estimated cost of the River Deel (Crossmolina) Drainage Scheme is €13.4 m, excluding VAT, including Non Contract Costs.

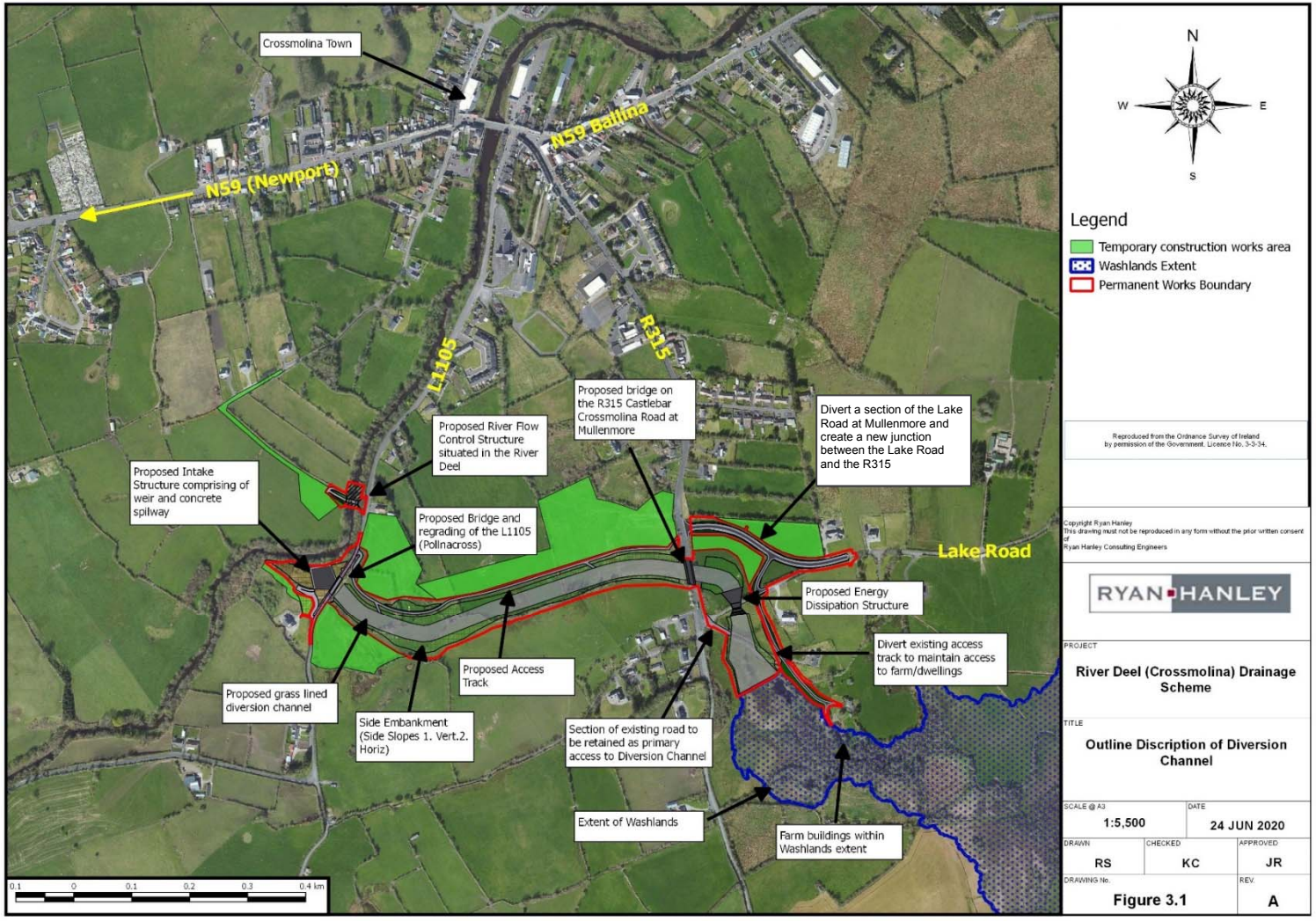

Figure 3.1: *Outline of Proposed Scheme*

4. POPULATION & HUMAN HEALTH

It has been decided to define the Study Area for the Human Beings Section of this EIAR as those DEDs in which the EIAR Study Area is located or located close to. The site of the proposed development lies within the Crossmolina South DED, with the Deel, Crossmolina North, Fortland, Ardagh and Carrowmore DEDs being located near the site of the proposed development. The total Study Area has a combined population of 4,198 persons and comprises of a total land area of 186.83 square kilometres. (Source: CSO Census of the Population 2016).

If the proposed development were not to proceed, the opportunity to protect Crossmolina from future flooding events would be lost. The construction phase of the proposed development will last approximately 48 months. Potential impacts from the project are both positive and negative, and range both from short term to long term and from insignificant to moderate.

The construction phase will have no impact on the population of the Study Area in terms of changes to population trends or density, household size or age structure. Many construction workers and materials will be sourced locally, thereby helping to sustain employment in the construction trade, and an increase in household spending and demand for goods and services in the local area. There will also be an influx of skilled people into the area, bringing specialist skills for both the construction and operational phases that could result in the transfer of these skills into the local workforce, thereby having a long-term positive impact on the local skills base. There is also the potential for short term slight negative impact on economic activity due to the proposed construction activities. This would predominantly be as a result of traffic and access issues which could have the potential to reduce traffic into local businesses. Angling at the site of the proposed development does not form a significant industry, and any impacts the proposed works will have on tourism will be imperceptible or slight. Potential increases in noise and dust levels, traffic issues and temporary impacts on visual amenity related to the works are likely to deter and/or disturb visitors during the construction phase. However, it should be noted that there are no significant tourist attractions pertaining to the site of the proposed development and its immediate surroundings.

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. Construction works will be sequenced so as to avoid unnecessary interruption to road users insofar as is practicable.

There will be an increase in noise levels in the vicinity of the proposed development site during the construction phase, as a result of machinery and construction work. The potential for impact on human health from noise emanating from the works is considered in terms of the nuisance and stress it may cause certain local residents although these impacts will be short-term in duration on any particular day and temporary (for the duration of the construction phase). Construction noise at any given noise sensitive location will be variable throughout the construction project, depending on the activities underway and the distance from the main construction activities to the receiving properties. Best practice measures for noise control will be adhered to onsite during the construction phase of the proposed development in order to mitigate the slight short-term

negative impact associated with this phase of the development. Impacts on each service will vary, but overall the proposed drainage scheme will have a potential temporary slight to moderate negative impact on services.

5. BIODIVERSITY

This section of the Environmental Impact Assessment Report (EIAR) describes the potential impacts of the proposed River Deel (Crossmolina) Drainage Scheme on biodiversity, flora and fauna

This chapter quantifies any potential direct and/or indirect significant effects relating to biodiversity and the identified Key Ecological receptors. It identifies the measures required to avoid, reduce and mitigate likely significant effects and assesses any residual effects that remain following the implementation of mitigation.

A number of desk and field surveys were undertaken. The walkover surveys were designed to detect the presence, or likely presence, of a range of protected species. Otter surveys were conducted and involved a search for all Otter signs e.g. spraints, scat, prints, slides, trails, couches and holts. Badger surveys were also undertaken in order to determine the presence of badger signs along and adjacent to the study area. Other surveys included detailed woodland and grassland surveys, invasive species surveys, bat surveys, fisheries habitat surveys, bird surveys and freshwater pearl mussel surveys

The potential for the proposed flood relief scheme to result in adverse effects on Natura 2000 Sites (SAC and SPA) as well as Nationally Designated Sites (Natural Heritage Areas) was assessed both in the EIAR and in the accompanying Natura Impact Statement.

The most ecologically significant habitats recorded were those that were associated with the River Moy SAC and Lough Conn and Lough Cullin SPA. These included the River Deel itself, Lough Conn and the surrounding alluvial woodlands. The Mullenmore Springs and associated Stream were found to be of lesser ecological significance but were still identified as key ecological receptors along with the threes, hedges and woodlands that are outside the SAC and do not conform to alluvial woodland.

The bird species recorded during the walkover surveys were typical of the habitats along the route of the proposed works. 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. Otter were found to use the areas associated with the Mullenmore Stream and the River Deel extensively and a disused holt was recorded within 10m of the proposed development. A disused badger sett was recorded along the footprint of the diversion channel. 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. The freshwater pearl mussel surveys that were undertaken revealed that there was a decline in the species within the river upstream of the Jack Garrett Bridge in Crossmolina with no live mussels were recorded in the vicinity of the proposed works in the most recent surveys (2019 and 2020).

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. The Crayfish plague is not known from the River Deel and no signs of this disease were recorded during any of the surveys undertaken. The River Deel is well known as a high quality fisheries habitat with significant populations of Salmon (*Salmo salar*), Trout (*Salmo trutta*) and Lamprey species (*Lampetra & Petromyzon Spp.*). The river also provides habitat for European eel. The substrate of the river, whilst silty at the edges and heavily shaded in places, supported good spawning gravels, cobbles and boulders. Whilst it has been drained through blasting during the original drainage of the channel (downstream of the Jack Garrett bridge) and dries out entirely during the summer months, it still retains very high-quality fishery features with a natural 'riffle, glide, pool' sequence throughout along much of its length. A dedicated fisheries habitat assessment was undertaken in May 2020

The most ecologically significant faunal species recorded or known to be present, those that are among the are the aquatic species associated with the River Moy, otter, white clawed crayfish, salmon, freshwater pearl mussel, and lamprey species. Badger, kingfisher, coarse fish, European eel and bats are assessed as being present and of some ecological significance in the area.

important.

A thorough and comprehensive assessment was undertaken of the potential significant effects of the proposed development both individually and in combination with other plans and projects on the identified Key Ecological Receptors was undertaken. Where necessary, mitigation was prescribed to avoid any significant effects that were identified. This mitigation includes detailed methodologies that will be followed during construction and operation and during the maintenance of the River Deel following construction of the development. It also includes, measures to replace and reinstate any loss of habitat and to minimise disturbance to fauna. The mitigation includes a plan for the treatment of invasive species and for maintaining biosecurity. It also includes a comprehensive programme of monitoring and auditing environmental performance and details of emergency response procedures.

The proposed scheme has been designed to achieve its aim of alleviating flooding in Crossmolina Town whilst also minimising effects on the sensitive ecological receptors including the River Deel, Lough Conn, the Mullenmore springs and stream, wet woodlands and wetlands. It has also been designed to avoid significant effects on any of the sensitive species that are associated with the area. The identified impacts and potential direct and indirect significant effects of the scheme on biodiversity have been fully identified, assessed, quantified and where necessary and appropriate, mitigated. Residual effects that remain post mitigation have also been assessed. A reasoned conclusion has been reached based on the assessment of the potential direct and indirect impacts, that the proposed scheme will not result in significant effects on biodiversity, flora or fauna either on its own or in combination with other plans and projects.

6. LANDUSE, SOILS AND GEOLOGY

Land

The Study Area is made up of agricultural lands. There will be a permanent loss of approximately 8.58 ha of agricultural lands as a result of the proposed diversion channel. During a flood event, 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. This loss is not significant on a national or regional level but constitutes a permanent slight negative impact on agricultural land in the Study Area.

Geology

The Geology of the Study Area is underlain by Limestone with Calcareous Shale. Marine Shelf facies present in the bedrock indicate oceanic influence during formation. The upper reaches of the River Deel are underlain by Carboniferous Slate Series, Calciferous Sandston Series and Lower Avonian Shales and Sandstones.

Limestone bedrock was encountered during the site investigation works. Rockhead was encountered at depths ranging from 1.2m to 19.8m with varying numbers of voids encountered. The bedrock was typically highly weathered and fractured at upper levels becoming more competent with depth. The area is rich in old karst features such as dolines, caves, swallow holes. Karst springs, the largest of which are located at Mullenmore, can also be found at Tobermore and Tobernagawna.

No sites that have been identified for Geological Heritage are located within or in proximity to the study area. The study area is rich in karst features, many of which have gone undocumented prior to the commissioning of the hydrogeological assessment associated with this scheme.

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

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.

The closest recorded landslide is 9.9km from the Study Area. There are no known geohazards within the Study Area.

The 'Geological Survey of Ireland Online Database and the site investigation indicate that the Study Area comprises the following subsoils:

- Made ground

- Peat
- Fluovioglacial deposits
- Alluvium
- Glacial Till
- Glaciofluvial Sands and Gravels

Made Ground is found throughout and in many cases is typically brownish grey sandy gravelly clay with low to medium cobble content. The route of the diversion channels is largely made up natural soils but made ground was is encountered during the site investigation in areas where the proposed diversion channel crosses the R315, Lake Road and access roads south of the Lake Road. No contaminated lands were identified along or in the vicinity of the proposed scheme.

The site investigation indicates that localised deposits of Peat are present in the Study Area at depths of up to 5 metres.

Fluvioglacial deposits, typically medium dense sands and gravels with localised pockets of firm sandy gravelly clays interspersed throughout are present in the Study Area.

Alluvium soils were not encountered as part of the site investigation.

The site investigation confirms the presence of sands and gravels within the Study Area.

Potential Impacts on Geology

The key impact associated with the construction phase of the River Deel (Crossmolina) flood Relief Scheme is the excavation, handling, storage, processing and transport of earthworks materials. The estimated volume of excavation anticipated during the construction phase is 166,400 m^3.

Loss of Bedrock

Excavated material will be reused where possible. Only small quantities of bedrock will be encountered; it is abundant through the area and the portion to be removed is considered imperceptible.

Loss of Geological Heritage

There are no sites in the vicinity of the proposed works of geological or geomorphological importance on a national or county scale. Due to possible exposure of bedrock as a result of proposed excavation works it is just as likely that the impact will be positive as negative.

Loss of Quaternary Geology

The impact of the removal of excavated material from the proposed works will be minimal as these subsoils are in abundance throughout. Excavated subsoils will be reused as fill where possible. With mitigation in place, the impact of the Scheme on quaternary geology will be imperceptible.

Soils

Soil Associations

The Study Area comprises principally Degraded Grey Brown Podzolics (50%). Associated soil classifications are defined as Peat (15%), Brown Earth (5%), Gleys (10%) and Podzols (10%). These soils are mainly derived from Limestone glacial till. Made Ground from the surface was recorded in a number of locations as part of the site investigation studies.

Potential Impacts on Soil

Loss of Soil

As any soils underlying the proposed works are abundant on a local and regional scale, they are of relatively low environmental and/or ecological value. The volume of soils encountered throughout the construction phase will be also be relatively small in comparison to the volume of excavated material generated. Taking into account that any excavated topsoil will be used to reinstate the diversion channel, in conjunction with the mitigation measures detailed in the EIAR, soil loss will be mitigated and the residual effect of the proposed Scheme on soil will be insignificant.

Contaminated Land

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. In addition, three strands of Japanese Knotweed *Fallopia japonica* have been identified in the footprint of the proposed Scheme. The implementation of the mitigation measures detailed in the EIAR will mitigate the risk of contamination as a result of fuels and chemicals associated with construction as well soils contaminated with Japanese Knotweed. The residual impact of contaminated land as a result of the proposed Scheme is considered to be a short term slight negative impact.

It is considered that the design of the proposed Scheme, the scale of the works and the implementation of effective mitigation and best practice will ensure that the proposed Scheme, when considered on its own or in combination with other plans and projects, will not result in significant effects on land, soils and geology.

7. WATER

The Study Area is located in the Deel sub-catchment in the north-west of the Moy catchment (Figure 7.1). The River Moy drains a catchment of approximately 1,966 km^2 before entering the sea at Killala Bay.

The River Deel, originating in the Nephin mountain range, is susceptible to intense rainfall and as a result is prone to flooding.

Flood plains along the River Deel are generally not wide and end in steep sided slopes and low-lying hills. This features of the River Deel, combined the lack of any attenuation upstream of Lough Conn has created a flashy river, prone to rapid increases in flow, and consequential flood risk. A number of tributaries feed into the River Deel.

The aquifers underlying the Study Area are classified as 'Lg' Locally Important Sand/Gravel Aquifer (Recharge coefficient: 85%; and recharge: 804 mm/yr) and 'Rk' Regionally Important Aquifer – Karsified (Recharge coefficient: 60%; and recharge: 572 mm/yr). Groundwater vulnerability is 'High' (sand and gravels) and 'Moderate' (limestone till).

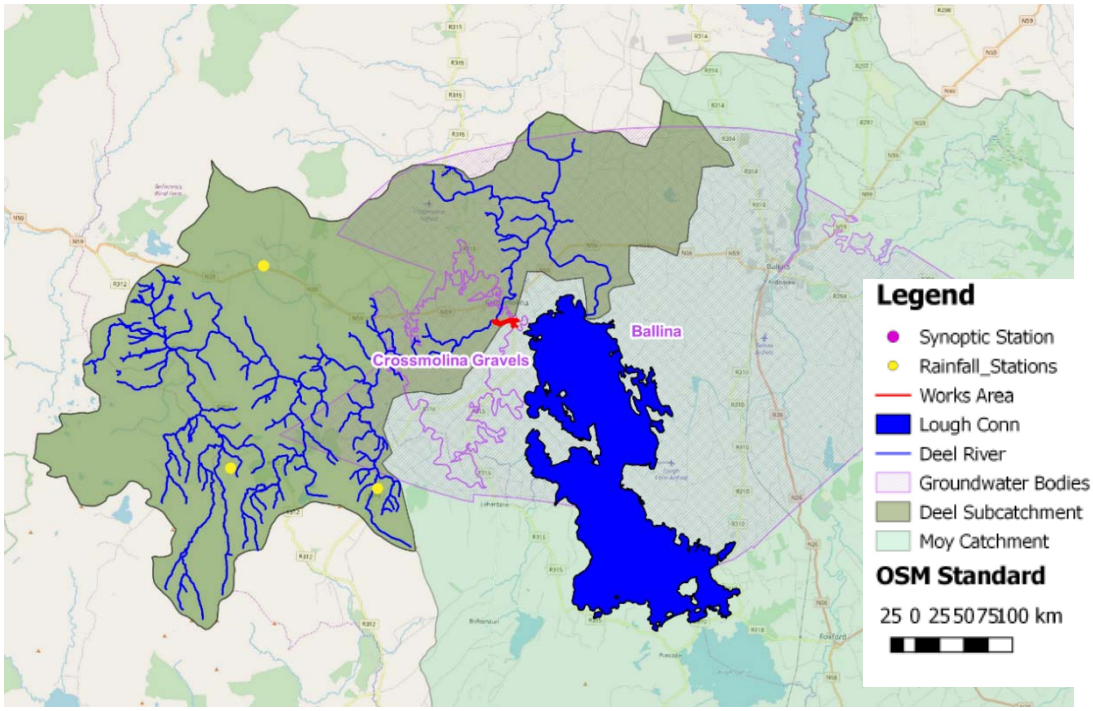

Figure 7.1 Deel sub-catchment and associated waterbodies in relation to the Works Area.

Waterbodies associated with the Study Area, which could potentially be impacted upon are:

- the Deel (Crossmolina)_040, which receives water from the Deel (Crossmolina)_030 and Shanvolahan_010 river waterbodies; and
- the Moy_100 (Mullenmore Stream) which will receive water from the diversion channel

Groundwater bodies potentially impacted include Crossmolina Gravels and Ballina. Directly receiving waterbodies are all categorised as having 'good' status and 'not at risk'.

There is no record of surface water abstractions from the River Deel for human consumption. There is a public water supply scheme in operation in Crossmolina Town (c1,500 population), along with a number of Group Water Schemes (GWSs) in operation in and in the vicinity of the Study Area. The abstractions for GWSs are located in Ballinabaun and Moylaw. The abstractions for agriculture and domestic use are located in Creevy and Kinard.

The Deel and its catchment provide opportunities for a range of recreational activities. The lower section of the River Deel is popular with kayakers. The River Deel provides valuable salmon and trout spawning and nursery habitat for the Lough Conn and River Moy fisheries, and provides the main spring salmon spawning and nursery habitat for these fisheries.

The potential impacts of the proposed construction and operation activities on the hydrology, hydrogeology and water quality relate to:

- Generation of Silt-Laden Run-off & Increase in Suspended Solids
- Use of Potential Water Contaminants
- Impact on Flooding
- Impact of the operation of the wash lands on the environment
- Changes to natural instream conditions of the River Deel during events where flows exceed bank full flow
- Increased water volumes on natural instream conditions on the Mullenmore Spring and associated Mullenmore Stream during overflow events
- Impact on the sand and gravel aquifer as a result of channel construction
- Alterations to ground and surface waters due to the interception of karst groundwater pathways

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. No significant effects or deterioration in water quality are anticipated.

With mitigation measures in place, the operation of the diversion channel and washlands will constitute an occasional slight negative impact in terms of water quality and aquatic habitat in the Moy_100 river waterbody and Lough Conn. No significant effects or deterioration in water quality status is anticipated.

The implementation of mitigation measures will mitigate against any impact to the hydromorphology of the River Deel resulting from the river flow control structure and the intake weir. In addition, the construction of the diversion channel will divert flood waters away from the lower reaches of the River Deel which would otherwise have significant effects in terms of mobilisation and transport of suspended sediment and nutrients downstream.

The operation of the proposed Scheme will mitigate against flooding in Crossmolina Town up to the 1% AEP flood event. This will result in a permanent significant positive cumulative effect in terms of human health and safety and water quality by reducing flooding and possible contamination by polluted flood waters.

Mitigation has been incorporated into the Scheme Design to mitigate against increased water volumes on natural instream conditions of the Mullenmore Spring and Mullenmore Stream during overflow events 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. The residual impact on instream conditions will be occasional imperceptible negative impact.

As part of the Scheme, 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. Excavation depths along the entire diversion channel have been minimised in so far as is practicable in order to minimise any impact to the sand and gravel aquifer as a result of channel construction. The residual impact constitutes a permanent insignificant 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. 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. Based on the extensive hydrogeological assessment, this constitutes a permanent imperceptible negative impact and no significant effects are anticipated.

The proposed Scheme, with mitigation measures in place, will not lead to any deterioration in water quality status and will not impair objectives for any European site. Following a detailed assessment of the receiving environment and potential impacts of the proposed Scheme on its own and in combination other plans and projects, no significant cumulative or in-combination effects on water are anticipated.

8. AIR QUALITY & CLIMATE/ NOISE AND VIBRATION

Air Quality and Climate

National and European statutory bodies have set limit values for various air pollutants. EU legislation on air quality requires that areas are divided into zones for the assessment and management of air quality. Crossmolina is categorised as Zone D (all rural populations <15,000). Existing baseline levels of NO_2, PM_{10}, $PM_{2.5}$, CO and benzene based on extensive long-term data from the EPA are likely to be below ambient air quality limit values in the vicinity of the proposed Scheme.

Construction activities may lead to the emission of dust. 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.

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 no not have the potential to cause significant health impacts. As the construction phase of the Scheme is short term, the potential for dust nuisance and significant levels of particulate matter will be short term and will vary spatially during the construction phase.

Construction traffic will give rise to CO_2 and N_2O emissions during the construction phase of the proposed Scheme which can impact on air quality and climate. As these emissions will only be associated with the construction phase of the development, the impact will be short term in nature. With mitigation measures in place, the proposed Scheme will have a short term negligible impact on air quality and climate during the construction phase.

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.

Noise and Vibration

The vast majority of potential noise and vibration impact of the proposed works on the surroundings will occur during the construction phase. There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this type may be found in the National Roads Authority (NRA) publication Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004) which indicates the following criteria and hours of operation. The majority of the construction activity is expected to occur during the hours of 8 am and 6 pm.

Table 8.4 indicates the maximum permissible noise levels at the facade of dwellings during the construction period as recommended by the NRA (Now TII).

Days and Times	Noise Levels (dB re. $2x10^{-5}$ Pa)	
	$L_{Aeq(1hr)}$	L_{Amax}
Monday to Friday 07:00 to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60*	65*
Saturdays 08:00 to 16:30hrs	65	75
Sundays & Bank Holidays 08:00 to 16:30hrs	60*	65*

Table 8.4 Maximum permissible noise levels at the facade of dwellings during construction

*Note: Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant local authority.

Works associated with the proposed development may contribute to noise impact are as follows:

- Construction of bridge and road infrastructure;
- Construction of new channel and associated infrastructure;
- HGV movements;
- Piling works.

Seven noise sensitive locations (NSLs) were identified based on their proximity to the proposed works. Expected noise levels at the NSLs were calculated based on a worst case scenario that would only occur during the short span of time, that the listed plant items are at the closest point to each of the noise sensitive locations and assuming that no screening is in place.

During the construction phase of the project and with mitigation measures and monitoring in place, nearby residential properties will not be exposed to significant noise emissions from construction work given that they, in most cases, are over 20m from the works.

Given that the construction phase of the development is short term in nature and calculated levels with mitigation measures in place will meet or be less than the 70 dB criteria, it is expected that the various noise sources will be relatively slight. Furthermore, the application of binding noise limits and hours of operation, along with implementation of appropriate noise control measures such as screening will ensure that noise impact is kept to a minimum. The residual impact will be a short term slight negative impact.

These predicted noise levels associate with construction traffic movements are within the minimum design criterion of 70dB $L_{Aeq(1hr)}$. The impact on the local environment is expected to be a short term negligible impact.

The NRA (now TII) Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004) details the permissible vibration levels during construction phase for national road schemes. These are listed in Table 8.5.

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

Table 8.5 Allowable Vibration During Construction Phase

The majority of the construction activities which will be employed during the construction phase of the proposed scheme with the exception of sheet piling are unlikely to generate perceptible vibrations at the noise sensitive locations. Piling activity is generally one of the most significant sources of vibration on construction sites.

With the implementation of mitigation measures and monitoring and the use of piling methods that are viable to reducing vibration impacts such as the 'press-in' method at all piling locations, the likely impact of vibration from the proposed construction works on the local environment would not be significant.

Based on the assessment of cumulate impact of the proposed Scheme as well as in combination with all other plans and projects in the vicinity, no significant effects relating to air quality, climate, noise and vibration are anticipated.

9. LANDSCAPE AND VISUAL

Chapter 9 of the EIAR assesses the likely direct and indirect significant landscape and visual effects of the proposed development. It assesses these effects on both the site itself and within a wider study area surrounding the proposed development site.

The proposed development site is currently predominantly a series of agricultural fields, but includes the River Deel riverbank and will also cross two public roads. The wider landscape consists mainly of tracts of undulating agricultural land predominantly used for pasture. Lough Conn and its lakeshore can also be found within approx. one kilometre of the proposed development.

In order to carry out this assessment, a desk study was undertaken which identified relevant policies and guidelines, both at national and local level and photomontages were prepared from three viewpoint locations.

The landscape within the study area was assessed for value and sensitivity and it was found that the majority of areas that will be affected by the proposed development are neither of high value nor particularly sensitive to this type of development.

Landscape effects are considered to be localised, due to the flat and gently undulating nature of the landscape and are not likely to be experienced from viewers outside the immediate vicinity of the site, though more pronounced negative effects will occur in the vicinity of the Intake structure. The spillway channel will affect the landscape fabric (excavation of the channel will change the topography at a local level) but proposed planting will be a positive effect. The grass and stone-lined channel (apart from a small central channel known as a thalweg, which is hard surfaced) will be permeable and blend into the landscape. Landscape effects range from Slight to Moderate Negative Effects, though landscape effects on the wider landscape character areas are considered Imperceptible.

There will be no significant residual effect on the landscape character and any moderate effects will be very localised and minimised through remedial planting over time so that the long-term residual effect will be slight.

The proposed river flow control structure will have a Not Significant Neutral Visual Effect, as it will not be visible from the adjacent road and the changes arise only from replanting and replacement of a wall.

Due to the flat and gently undulating nature of the landscape, and the fact that the lake cannot be seen from the majority of the study area, the views of the scheme will be very localised and are not likely to be experienced from viewers outside the immediate vicinity of the site.

The main location where visual effects will arise will be the proposed intake structure and bridge at Pollnacross where the proposed spillway will be clearly visible, along with removal of vegetation and raising of the road level. Of the four viewpoints taken to assess this proposed structure the average of all four can be described as giving rise to a Moderate Negative Visual Effect. Tree planting will reduce visual effects for the nearby dwelling over time.

The proposed channel will be visible but only from the areas where it is near to roads or dwellings. In areas, where it cuts through agricultural fields or wet grassland, will not have a

high number of viewers, hence, this does not give rise to any notable visual effects. The proposed channel is grass lined which will minimise visual effect, illustrated by the photomontages.

The proposed energy dissipation structure, channel, road realignment will have visual effects from the R315 and along the realigned Lake Road these are considered Moderate Negative Visual Effects. Planting of hedgerows and trees will reduce visual effects over time. Vegetation is to be retained where possible. Overall visual effects range from Slight to Moderate, Neutral to Negative Visual Effects.

As the mitigation measures in the form of remedial planting matures there will be a Long-Term, Slight, Neutral to Negative Visual Impact.

In most cases, the visual impacts relate to changes arising from ancillary project elements, such as replacement of vegetation, road realignment, introduction of pavement or changes in landform, rather than the visibility of the flood control infrastructure. Despite the project covering a large area it will only be visible over very limited areas.

10. CULTURAL HERITAGE

The proposed scheme is located within the Baronry of Tirawley and extends through the Civil Parish of Crossmolina. The proposed scheme extends through the townlands of Mullenmore North (An Muileann Mór: great mill) and Cartrongilbert (Chartún Ghilbeirt: Gilbert's quarter). The townland name Mullenmore is recorded in the 1604 Calendar of Patent Rolls of James I and it is, therefore, likely that a mill was operating in the locality from at least that time. An iron mill is believed to have been located at this site as early as the mid-18th century. This ceased production when the timber in the vicinity was exhausted and was in a state of ruin by 1800.

The Down Survey of 1641 records that the townland of Mullenmore North was in the ownership of Sir Richard Blake while the 1670 Down Survey lists Richard Franklin as the landowner. The 1641 Survey records that Cartrongilbert townland was common land at the time while it is listed as a possession of Andrew Ram on the 1670 Survey. The area is named Mullinmore on the Down Survey map and no traces of a mill or any other structures are depicted.

The Griffith's Valuation (1848-1864) records that Mullenmore North was in the ownership of Sir William Palmer in the mid-19th century who was leasing the lands to tenants. It also records that an iron mill had formerly been located within the townland and that the existing mill had an annual rent of £30.10s. The soils in the townland are described as heavy clays and the tenants were recorded as being of middling circumstances and residing in stone houses.

The 6-inch OS map of 1840 shows a corn mill (CHS 2), with two corn kilns to the north, within the proposed area of washland to the south of the eastern terminal of the diversion channel. The 25-inch OS map of 1900 shows a number of unnamed buildings at this location and, while a lime kiln is indicated to the southeast, there are no traces of the two corn kilns previously indicated in the area to the north. The existing remains of the corn mill are not listed as a recorded archaeological site or as a protected. There are no buildings, structures or potential archaeological features indicated on the line of the diversion channel and proposed local road diversions on either of these maps (Figure 10.1). The diversion channel does extend along a section of the townland boundary (CHS 3) between Mullenmore North and Cartrongilbert to the north.

There are no recorded archaeological sites on the footprint of the proposed scheme, or within the washlands to the east, and the nearest recorded example is an unclassified enclosure (CHS 1; MA038-159----) located approx. 225m to the south of the west end of the diversion channel. A hydrogeological assessment of the study area has suggested that the enclosure may actually be a natural feature known as a doline: a conical depression caused by karst activity. There are no buildings or other structures within the study area listed as protected structures or included in the NIAH and the nearest example is Gortnaraby House, an 18th century country house (NIAH ref. 31303801) located outside the study area, approx. 1km to the northeast of the nearest section of the diversion channel. The consulted historic OS maps do not show any demesne or curtilage features associated with this house located within footprint of the proposed channel or washlands.

The County Mayo Development Plan (2014) also outlines a number of objectives in relation to the protection of the architectural heritage resource within the county and the example relevant

to the proposed scheme is AH-09, which includes the protection of industrial buildings as an objective of the Council.

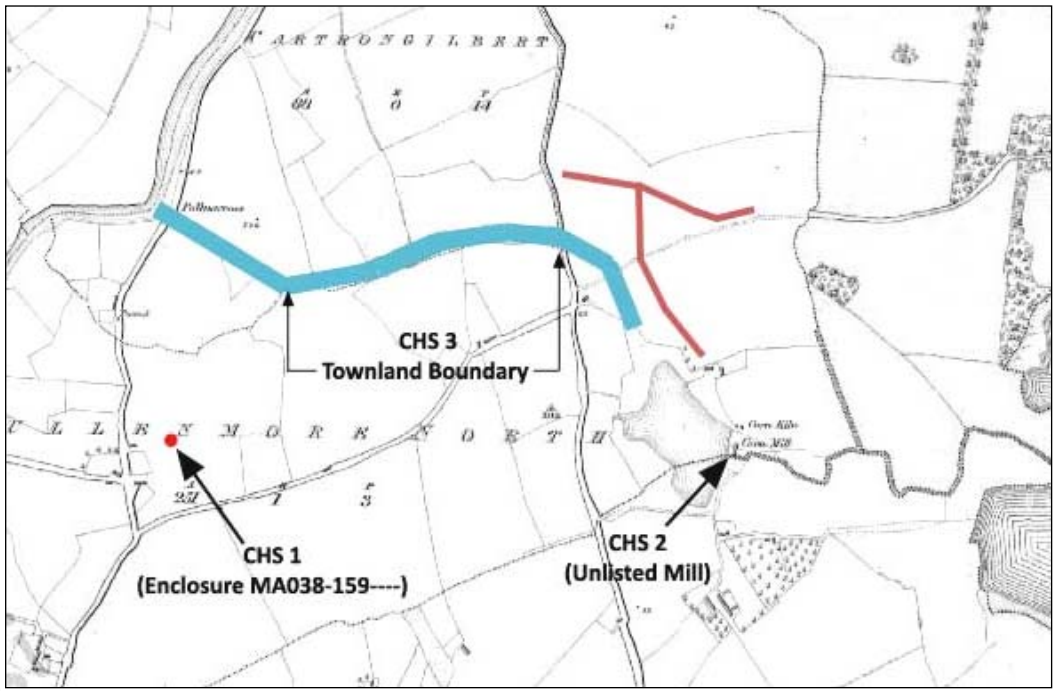

Figure 10.1: Extract from 1st edition OS map (survey date 1840) showing CHS locations and approx. lines of diversion channel (blue) and local road diversions (red) [OSI Licence SU 0003318]

The proposed scheme will not have any likely significant adverse impacts on the cultural heritage resource during the construction phase.

The implementation of the mitigation measures will provide for either the avoidance of the cultural heritage resource or the proper and adequate recording of this resource (including currently unknown archaeological features). The periodic increased flow resulting from the proposed scheme may contribute to an acceleration of the ongoing degeneration of the unlisted corn mill ruins buildings (CHS 2) within the washland area in the east end of the scheme during the operational phase. The proposed scheme will, therefore, have a likely direct, moderate negative impact of permanent duration on the corn mill site during the operational phase. The proposed scheme will result in an alleviation of flooding events in Crossmolina Town which will result in an indirect positive impact on the cultural heritage resource within the town.

Pre-construction archaeological test trenching will be undertaken within the accessible green field areas to be impacted by ground reduction works to create the diversion channel and local road diversions. This will include investigations on the line of the townland boundary between Mullenmore North and Cartrongilbert (CHS 3). In the event that any unrecorded features of archaeological significance are encountered the archaeologist will consult with Mayo County Council (MCC) and NMS in order to determine further appropriate mitigation measures.

It is proposed to carry out works within the channel of the River Deel at the location of the River flow control structure. Works in this area will be subject to archaeological monitoring.

There are no excavation works proposed within the environs of the mill site (CHS 2) and no archaeological investigations to assess potential impacts of ground reduction interventions are required at this location. A detailed building survey of the mill ruins will be undertaken by a suitably-qualified and experienced archaeologist in order to compile a full record of the extant structures in written, drawn and photographic formats.

All identified impacts will be addressed by mitigation during the pre-construction and construction phases of the proposed scheme which will provide for the recording and/or avoidance of known and potential cultural heritage features. As a result, there shall be no likely significant adverse residual impacts on the cultural heritage resource.

11. MATERIAL ASSETS

Traffic and Roads

The road network in Crossmolina comprises local, regional roads and one national secondary route through the town itself. The primary road access to Crossmolina Town is via the N59 National Secondary Route, passing through the town in an East West direction and directly serves a large portion of the town centre. Chapel Street/ L1105 runs in parallel to the River Deel along the right bank. The L1105 is used to access areas around Rake Street and Richmond, which can also be accessed via the N59 and R315. The R315 runs south of Crossmolina Town towards Laherdaun and Castlebar.

The potential impacts of the River Deel (Crossmolina) Drainage Scheme on the road network have been assessed in terms of:

- Impact on transport infrastructure
- Impact of construction traffic
- Impact of works in the vicinity of the roads network
- Impact of road closures

The residual impact during the construction phase of the Scheme, with mitigation measures in place, will be a short term not significant negative impact. During the operation phase of the Scheme, the residual impact of the proposed Scheme is that the transport infrastructure will be improved (the widening of the L1105 at the new bridge and the construction of footpaths on the R315 bridge and the realigned Lake Road) and flood risk on roads within and in the vicinity of Crossmolina Town including the N59, R315, L1005 will be mitigated, resulting in a permanent significant positive impact.

The impact of additional traffic volumes due to construction traffic will be short term. With the 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.

Relatively short, localised delays are likely to be encountered by motorists at the locations of proposed works in the immediate vicinity of the road network due to construction traffic entering and exiting the works areas. This impact will be a short term impact and there will be no residual impact on completion of the proposed works.

Temporary road closures will be required during construction of the Pollnacross Bridge (L1105). In the case of a road closure, traffic will be diverted to the R315 and R316 which will result in an increase in journey time by car of approximately 10 minutes (7.5km) at worst case scenario.

Temporary road closures may also be required during construction of the Mullenmore Bridge (R315) if it does not prove possible to maintain one lane of traffic on the existing road open at all times. In this case, traffic will be diverted temporarily along the realigned Lake Road.

The temporary closure of the L1105 and temporary lane closure or road closure of the R315 to facilitate the proposed construction of two new bridges is likely to cause a moderate to significant temporary impact to the flow of traffic in the vicinity of the works. In the case of road

closures, alternative diversion routes have been identified. There will be no residual impact once the proposed Scheme is completed.

Existing Services

An assessment of the impact of the proposed Scheme on existing services in the Study Area was carried out. These are:

- Water Distribution Network
- Gas Network
- Electricity Network
- Telecommunications Network

The proposed Scheme will potentially impact the water distribution network at locations where the proposed works are in the vicinity of the water distribution network. Watermains may be encountered during excavation. It is possible that watermains could be damaged during the construction phase, resulting in distribution to the potable water supply in the area. Any diversions necessary to avoid accidental clashes during the construction phase will be designed, planned and agreed with Irish Water in advance of the construction phase of the Scheme. The Contractor will carry out additional site investigation in order to confirm the location of the watermains. The residual impact to the water distribution network during the construction phase is a temporary not significant negative impact. There will be no residual impact to the water distribution network during the operation phase of the Scheme.

Excavation for the diversion channel, foundations of the Mullenmore Bridge (R315) and the new junction on the R315 could encounter a gas main that runs along the R315. It is possible that this gas main could be damaged during the construction phase, affecting the supply to properties in the area and potentially causing a fire or explosion. The locations of the gas pipelines relative to the proposed works will be confirmed in advance of construction and any diversions necessary to avoid accidental clashes during construction phase will be designed, planned and agreed with Bord Gáis in advance of the construction phase. Works will be carried out in accordance with Gas Networks Ireland publication 'Safety advice for working in the vicinity of natural gas pipelines'. Taking into account the mitigation measures, the residual impact to the gas network during the construction phase is a temporary not significant negative impact. There will be no residual impact to the gas network during the operation phase of the Scheme.

Electricity cable laid in close proximity to the location of the proposed access road realignment, energy dissipation structure and diversion channel has the potential to be damaged during excavation works. There are also a number of overground electricity cabling crosses in the vicinity of the proposed works. There are existing public lighting columns on the left side of the R315 on the approach to the town commencing at the junction of the R315 and the Lake Road. There is also public lighting on the right side of Lake Road towards the Gortnoraby School. There is also a kiosk located off the R315 close to the proposed works. A 3 phase power supply line is located close to the proposed intake structure.

Prior to excavation the Contractor will carry out additional site investigation, including slit trenches, in order to determine the exact location of the electricity network in close proximity to the works area. This will ensure that the underground electricity network will not be damaged during the construction phase. It is considered that any likely impacts to or from the overhead cables will be mitigated by applying standard construction practices. The Contractor will be obliged to adhere to the ESB Code of Practice for Avoiding Danger from Overhead Electricity Lines, May 2019 and the HSA Code of Practice for Avoiding Danger from Underground Services, 2010. Following the implementation of mitigation measures, the residual impact to the electricity network during the construction phase is a temporary not significant negative impact. There will be no residual impact to the electricity network during the operation phase of the Scheme.

Works are proposed along the R315 where telecommunication cables are present below ground. Should these cables clash with the works they could become damaged during construction phase. Prior to excavation the Contract will carry out additional site investigation in order to determine the exact location of any underground telecommunications cables. Any diversions necessary to avoid accidental clashes during construction phase will be designed, planned and agreed with the service provider in advance of the construction phase. the residual impact to the telecommunications network during the construction phase, with mitigation measures in place, is a temporary not significant negative impact. There will be no residual impact to the telecommunications infrastructure following the construction phase.

Waste Management During Construction

The River Deel (Crossmolina) Drainage Scheme will produce a significant volume of surplus excavated material during the construction phase. 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 will be made available to IFI for use in fisheries enhancement elsewhere in the catchment.

A breakdown of the estimated volumes of waste associated with the construction of the Scheme are shown in Table 11.1.

Origin of Waste	Estimated Volume of Waste
Diversion Channel	166,000
Bridge/ Retaining Wall Foundations	300
Miscellaneous	100
Total	**166,400**

Table 11.1 – Estimated C&D Waste resulting from the proposed scheme

All current and applicable waste management legislation will be applied and adhered to. The Contractor will 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 will be held by the relevant contractor.

Any material which is not reused will be separated out and sent to the appropriate recycling facility or waste facility if deemed unsuitable for recycling. During construction 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 waste storage area and disposed of to a permitted or licensed facility.

All works carried out in areas where Japanese Knotweed has been identified will be included in a Knotweed Management Plan.

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. Although not foreseen, if contaminated soils are encountered, they will be stored separately to the inert material and transported to an appropriately licensed facility by permitted contractors.

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.

With mitigation measures in place, the residual impact of construction and demolition waste generated during the construction phase will be a short term imperceptible negative impact.

Land Use and Access to Property

The development has the potential to sever access to residential properties, and agricultural land. 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. Access to property along the Lake Road will be maintained by realigning the road and creating a new junction with the R315 Regional Road.

Where access to residential properties is to be extinguished, alternative access routes will be provided. Where existing access routes to agricultural lands are to be extinguished, these will be replaced.

The proposed drainage scheme will result in a significantly reduced risk of flooding in Crossmolina Town which will have a significant positive impact on residential and commercial properties in the town. Property values will be maintained or increased as a result and the ability to obtain housing insurance will be greatly improved.

As the new infrastructure will mainly traverse agricultural land between the River Deel and the Mullenmore Springs, there will be limited impact on residential landholdings. While no houses will be lost based on the chosen diversion channel route, the Scheme will encroach on 4 no. landholdings, to construct elements of the scheme including the intake structure, diversion channel and realigned Lake Road. There will be no direct impact on commercial properties.

The main permanent impacts on agricultural activity as a consequence of the scheme will consist of permanent acquisition of land for construction of the scheme and severing of landholdings. There will be a total permanent loss of approximately 8.58 ha of agricultural lands as a result of the proposed diversion channel. During the construction phase there will be an additional temporary loss of 6.74 ha of agricultural land to facilitate the temporary works areas. 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 washlands mainly consist of marginal agricultural lands, with the notable exception of existing farm buildings and an old mill at Mullenmore.

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. This has not been possible in all cases and severance of some landholdings is proposed. Access to land will be maintained or alternative access will be provided. In addition, there will be changes in frequency and duration for which livestock will need to be removed from agricultural land. This inconvenience, while significant to individual farmers, is not significant on a county or national level. 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.

The agricultural lands along the river bank downstream of Crossmolina town 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.

Accidents and Disasters

Due to Ireland's geographical location and temperate oceanic climate, the proposed Scheme is less vulnerable to natural disasters such as earthquakes or tsunamis. The potential natural disasters that could occur are therefore limited to flooding and fire.

The proposed Scheme has been designed to prevent flooding in Crossmolina Town up to the 1% AEP flood event and is highly adaptable to increasing flood risk due to climate change, 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. 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. 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.

It is considered that the risk of significant fire occurring and affecting the proposed Scheme is limited due to the nature of the scheme itself. The grass lined channel and reinforced concrete structures (Intake Structure, River Flow Control Structure and Energy Dissipation Structure) would be largely unaffected by fire.

The Scheme is designed to reduce flooding up to the 1% AEP flood event and will therefore have a permanent significant positive effect on flooding during the operation phase of the Scheme.

12. SCHEDULE OF MITIGATION

All the mitigation that is detailed in all other chapters of the EIAR and related appendices is provided in a comprehensive schedule where, fore ease of reference, all measures can be accessed by the reader in one location within the document.

13. INTERACTION OF THE FOREGOING

Chapters 4 to 11 of this EIAR identify the potential environmental impacts that may occur in terms of Population and Human Health, Biodiversity, Soils and Geology, Water - Hydrology and Hydrogeology, Air and Climate / Noise and Vibration, Landscape, Cultural Heritage, and Material Assets, as a result of the proposed development. All of the potential impacts of the proposed development and the measures proposed to mitigate them have been outlined in those chapters within the EIAR. However, for any development with the potential for significant environmental impact there is also the potential for interaction amongst these impacts. The result of interactive impacts may either exacerbate the magnitude of the impact or ameliorate it.

A number of instances where there is or was an interaction between the impacts in the various sections have been identified and details of how any resultant adverse impacts have been averted are presented in the EIAR.

Where any potential interactive negative impacts have been identified in the EIAR, a full suite of appropriate mitigation measures have already been included in the relevant sections of the EIAR and are included in a schedule of mitigation that is included as Chapter 12 of the EIAR.