OIFIG na nOIBREACHA POIBLÍ

OFFICE OF PUBLIC WORKS

River Deel (Crossmolina) Drainage Scheme

NATURA IMPACT STATEMENT

September 2020

Planning and Environmental Consultants

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RIVER DEEL (CROSSMOLINA) FLOOD RELIEF SCHEME

NATURA IMPACT STATEMENT

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1 INTRODUCTION

1.1 GENERAL INTRODUCTION

Ryan Hanley in association with McCarthy Keville O'Sullivan Ltd. (MKO) have been appointed to provide the information necessary to allow the competent authority to conduct an Article 6(3) Appropriate Assessment under Regulations 42 of the Birds and Natural Habitats Regulations 2011 – 2015 for a proposed flood relief scheme on the River Deel, Crossmolina, Co. Mayo. An Appropriate Assessment Screening Report has been prepared and is provided in Appendix I with the conclusions provided in Section 1.2 below.

This Natura Impact Statement was prepared in accordance with the European Commission guidance document Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC, 2001), European Communities (2018) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission and the Department of the Environment's Guidance on the Appropriate Assessment of Plans and Projects in Ireland (December 2009, amended February 2010).

In addition to the guidance documents referenced above, the following relevant guidance was considered in preparation of this report:

- *EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. European Commission.*

1.2 CONCLUSIONS OF APPROPRIATE ASSESSMENT SCREENING REPORT

The) Appropriate Assessment Screening report identified the potential for the proposed development to result in significant effects on two European Sites, in the absence of any mitigation.

The screening assessment concluded as follows:

It cannot be excluded beyond reasonable scientific doubt, in view of best scientific knowledge on the basis of objective information and in light of the conservation objectives of the relevant European sites, that the proposed development, individually or in combination with other plans and projects, would have a significant effect on the following European Sites:

- River Moy SAC (2298)
- Lough Conn & Lough Cullin SPA (004228)

Each of these sites is discussed individually below in terms of the Qualifying Interests/Special Conservation Interests with the potential to be affected and the pathways by which any such effects may occur. The reasons why the above screening assessment conclusion was reached are also set out.

1.2.1 River Moy SAC (002298)

The proposed flood relief scheme will result in direct effects on the River Moy SAC with works proposed within the SAC at the locations of the River Flow Control Structure and the Intake Weir. The ongoing maintenance of the River Deel between the Jack Garrett Bridge and just upstream of the Intake weir will be included in the OPW River Moy Maintenance Area as part of the flood relief scheme. This area is within the River Moy SAC. There is potential for habitat loss and disturbance to the aquatic habitats and species associated with the proposed works in this area.

The majority of the proposed development is located outside the SAC but there is potential for indirect effects in various forms such as hydrological and hydromorphological changes to the functioning of the river, water pollution or disturbance to result in significant effects on the River Moy SAC.

The following Qualifying Interests have the potential to be affected by the proposed works both directly through habitat loss and disturbance and indirectly through water pollution causing habitat deterioration and through potential changes to the hydromorphology of the river.

- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (91E0)*
- *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra marinus* (Brook Lamprey) [1096]
- *Salmo salar* (Atlantic Salmon) [1106]
- *Lutra lutra* (otter) [1355]

No pathway for effect was identified in relation to the other Qualifying interests of this SAC.

1.2.2 Lough Conn & Lough Cullin SPA (004028)

The proposed flood relief scheme has potential to result in direct effects on the SPA. Whilst no physical works are being carried out within the SPA, the washlands are located partially within it and could potentially be directly affected through physical disturbance and habitat deterioration.

There is also potential for indirect effects such as water pollution to result in significant effects on the Lough Conn & Lough Cullin SPA.

The following SCI species have the potential to be affected:

- *Aythya fuligula (Tufted Duck) [A061]*
- *Melanitta nigra (Common Scoter) [A065]*
- *Larus canus (Common Gull) [A182]*
- *Anser albifrons flavirostris (Greenland White-fronted Goose) [A395]*
- *Wetland and Waterbirds (A999)*

1.3 STATEMENT OF AUTHORITY

Pat was responsible for co-ordination of this NIS. 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. Elements of the survey work that informs this assessment were carried out by the following ecologists: Dervla O'Dowd (B.Sc. (Env.), MCIEEM), John Hynes (B.Sc. (Env), MSc (Eco.), MCIEEM), Laoise Kelly (B.Sc. (Env.), MCIEEM) Pamela Boyle (B.Sc. (Env), PhD), Chris Peppiatt (B.Sc., PhD), Julie O'Sullivan (B.Sc. (Biol.), M.Sc. Ecological Assessment) and James Owens (B.Sc. (Env), MSc) from McCarthy Keville O'Sullivan Ltd. A fisheries habitat assessment was undertaken by Ross Macklin and Bill Brazier of Triturus Environmental Ltd. The Screening Assessment detailed in this report was undertaken by Pat Roberts, Julie O'Sullivan and James Owens all of whom have the necessary qualifications and experience to undertake this assessment.

1.4 METHODOLOGY AND REPORT STRUCTURE

The information contained in this NIS is designed to allow the Competent Authority to assess 1) whether there will be any adverse effects on the integrity of a European Site and 2) the implications of the project, alone or in combination with other plans and projects, for a European Site in view of its Conservation Objectives.

Firstly, in Section 2 of the report, the proposed development is fully described.

Following on from this in Section 3, a description of the baseline environment is provided including both desk and field surveys.

In Section 4, the potential for the proposed development to result in adverse effects on each of the Qualifying Interests (QIs) and Special Conservation Interests (SCIs) of the relevant European Sites is fully assessed and the measures that are designed to mitigate any adverse effects are described.

In Section 5, the residual effects on the SCIs and QIs of the identified European Sites is assessed in the context of the conservation objectives for the site.

Following this, Section 6 provides a comprehensive assessment of the potential cumulative effects of the proposed scheme when considered in combination with other plans and projects.

Finally, in Section 7, a concluding statement is made as to whether the proposed development has the potential to result in adverse effects on any European Site

The assessment of potential adverse effects follows the precautionary principle as detailed in Article 191 of the Treaty on the Functioning of the European Union (EU). It aims at ensuring a higher level of environmental protection through preventative decision-taking in the case of risk and underpins the Habitats Directive (DoEHLG 2010). The precautionary principle is the underlying concept of sustainable development which implies that prudent action be taken to protect the environment even in the absence of scientific certainty (DoEHLG 2010).

The information contained in this report will allow the Competent Authority to determine that the proposed development will not on its own or in combination with other plans and projects adversely affect the integrity of any European Site.

2 DESCRIPTION OF THE PROPOSED DEVELOPMENT AND BASELINE ENVIRONMENT

2.1 SITE LOCATION

The proposed works are located approximately 750 metres to the south of the Jack Garrett Bridge in Crossmolina Town. The proposed channel runs from the bank of the River Deel (Grid Ref: E113141 N316508), it crosses a local road (leading south from Chapel Street) and proceeds in an easterly direction through farmland before crossing the R315 and veering south and crossing the local road to Gortnor Abbey and a local access to private properties. The proposed channel terminates to the east of the R315 in the townland of Mullenmore (Grid Ref: E114220 N316630). Additional areas surrounding the channel are required for the site compound. These are located on the lands surrounding the channel.

The text above describes the location of the physical works that are associated with the proposed flood relief scheme. 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. The washlands extend from the end of the channel and proceed over two large springs at Mullenmore before following the route of the Mullenmore stream and entering Lough Conn to the after approximately 550metres. The location of the proposed works is provided in Figure 2.1. In addition, the lands that benefit from the flood relief offered by the proposed flood relief scheme are assessed within this NIS. These lands are located downstream of the proposed works, adjacent to the River Deel as far as Knockadangan Bridge (Grid Ref: E115777 N319185), which is the most downstream crossing of the River Deel by the N59.

2.2 PROPOSED WORKS

The proposed works for the River Deel (Crossmolina) Drainage Scheme comprise the following;

Site investigation;

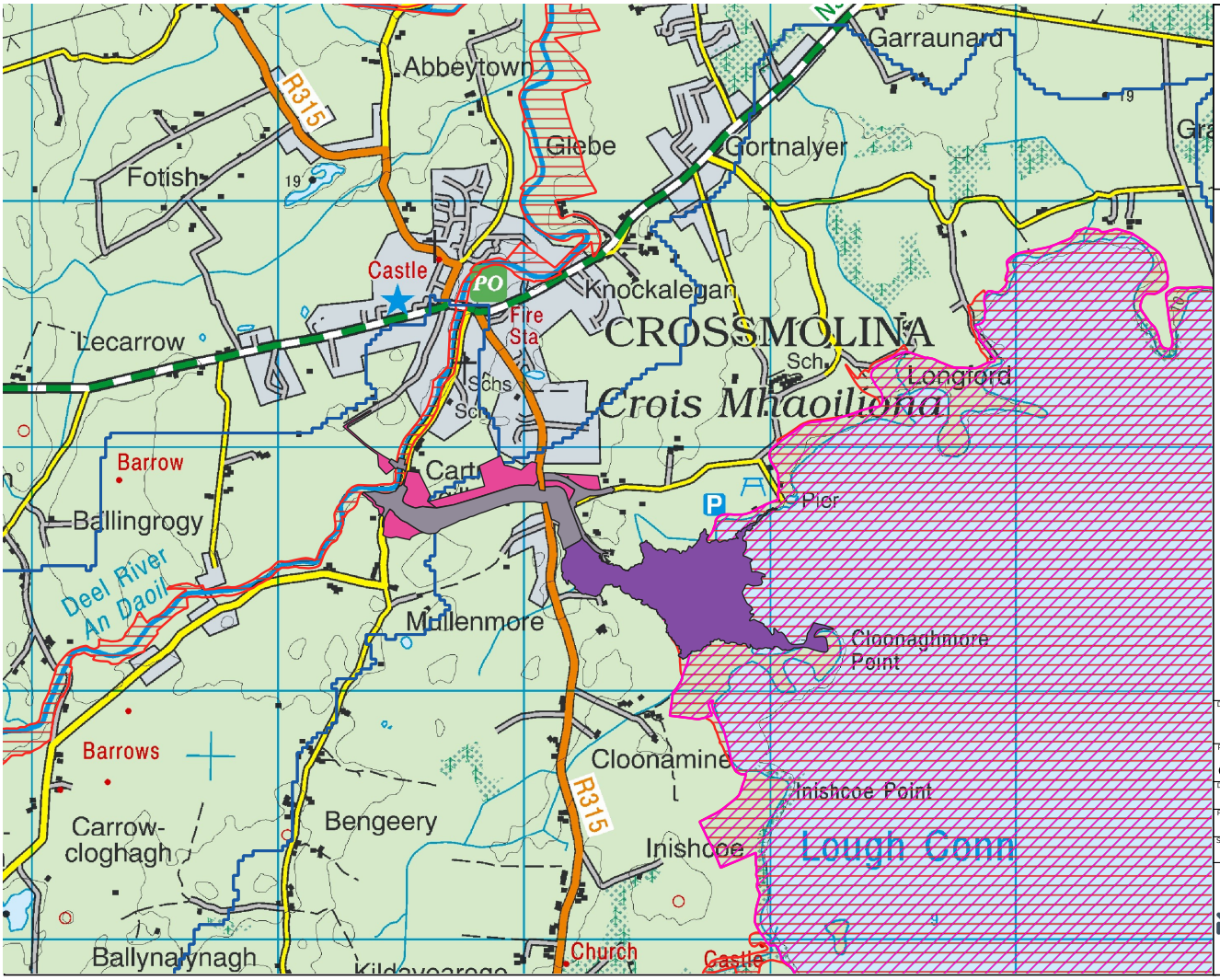
Site preparation and clearance;

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;



Map Legend

- Permanent Works Area
- Temporary Construction Works Area
- Washlands Extent
- Special Area of Conservation

Drawing Title	EU designated sites within 15km
Project Title	Crossmolina Flood Relief Scheme
Drawn By: KP	Checked By: PR
Project No.: 120211-a	Drawing No.: Figure 2.1
Scale: 1:20000	Date: 25.06.20

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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;

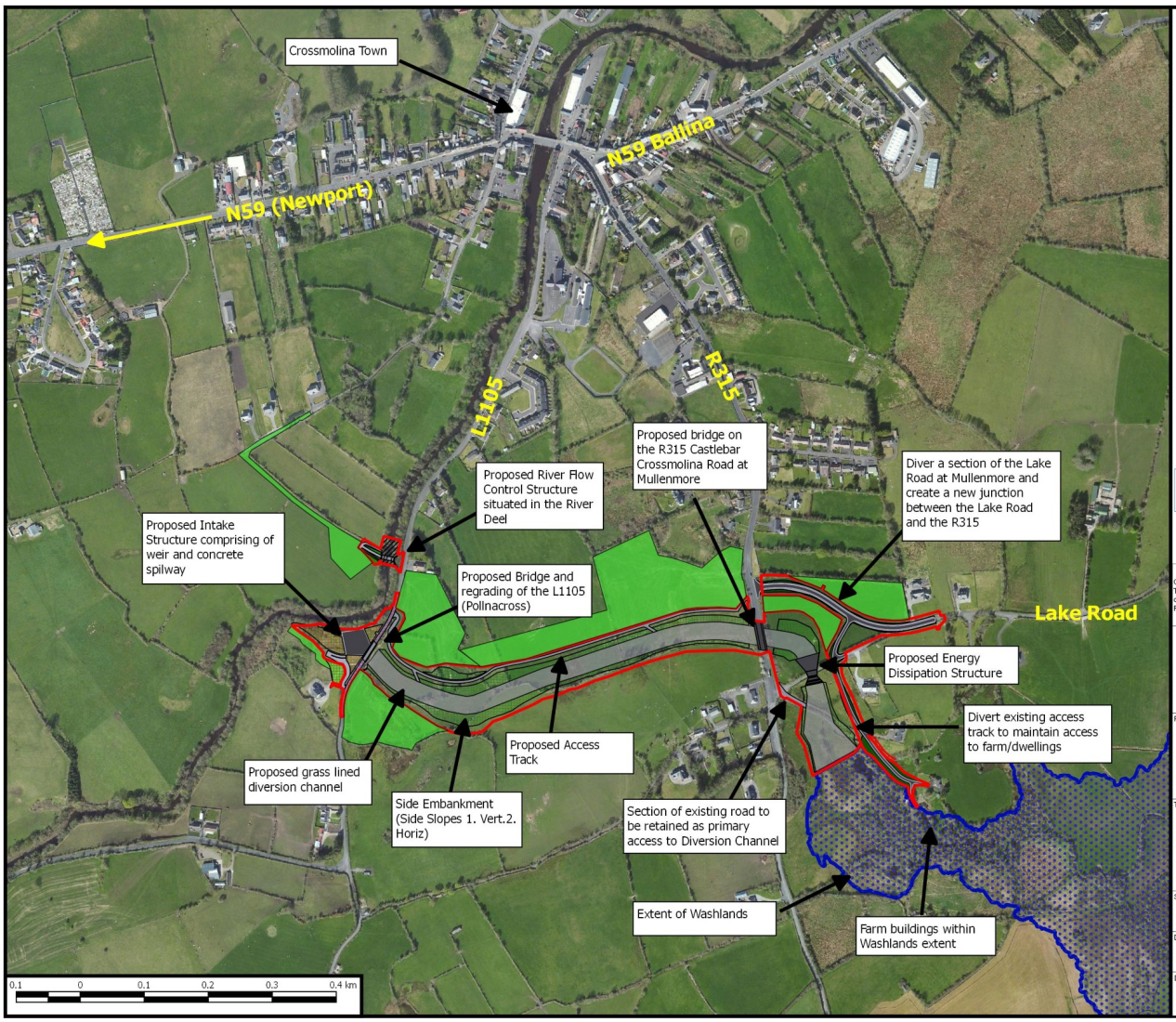
Construction of an access track along the top of the channel between the L1105 and the R315. An access track will also be constructed alongside the intake structure linking the L1105 to the river bank. This will be used for maintenance purposes;

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 2.2. and drawings are provided in Appendix II



N

W E

S

Legend

- Temporary construction works area
- Washlands Extent
- Permanent Works Boundary

RYAN HANLEY

PROJECT

River Deel (Crossmolina) Drainage Scheme

TITLE

Outline Discription of Diversion Channel

SCALE @ A3	DATE
1:5,500	24 JUN 2020

DRAWN	CHECKED	APPROVED
RS	KC	JR

DRAWING No.	REV.
Figure 2.2	A

The following section will provide a general description of each of the proposed work elements. Details relating to construction methods and management of environmental impacts during construction are presented in Section 2.3.

2.2.1 Site Investigation and Site Clearance

Site investigation has been undertaken to date to inform the detailed design of the Drainage Scheme as follows:

- 15/09/2016 – 24/07/2017: Site investigation to the South and Southwest of Crossmolina Town. Running Northeast/ Southwest along the edge of the River Deel and long the route of the proposed diversion channel from the River Deel north of Moneymore towards Lough Conn.
- 28/02/2018 – 25/05/2018: Site investigation 1km to the South of Crossmolina Town, across agricultural between and adjacent to Chapel Road in the West and the R315 to the East.
- 12/02/2019 – 13/02/2019: A geophysical survey was carried out at the proposed location of the intake structure with comprises approximately 2 ha of residential and agricultural land.

Limited ground truthing will be carried out on commencement of the construction stage. This will also incorporate the excavation of archaeological test trenches along the channel route as detailed in Chapter 10 of this Report.

In order to construct the proposed Scheme, it will be necessary to remove walls, fences, and vegetation in advance of excavation and construction works. Clearance works will take approximately 5 -10 days and will take place on a phased basis as work proceeds in each works area, and in consideration of seasonal restrictions. The sequence of the construction works is detailed in Section 3.4. Vegetation will be cut and moved to a suitable location on site or removed from the site. Where excavation is required in order to remove roots, any unconsolidated ground will be sown with grass seed following reinstatement to prevent erosion.

Overall, the proposed development will require the removal of approximately 1,471m of tree line and hedgerow along with a small area (0.46 ha) of recently established woodland and scrub where the intake structure is to be located and Mixed Broadleaved Woodland at the location of the Flow Control Structure. It will be necessary to construct silt control measures as set out in Sections 2.3.2 and 2.3.3.

Three small strands of Japanese Knotweed have been identified within the works area which are subject to the management plan detailed in Chapter 5.

Temporary working areas will be required during the construction period in order to accommodate vehicle movements, stockpiling of material, and construction and removal of temporary site compounds. The footprint of the temporary working area is shown on Figure 2.1.

2.2.2 Grass Lined Channel

It will be necessary to excavate a new channel to convey flood water from the intake weir on the banks of the River Deel to Lough Conn via the washlands.

The channel will be grass lined. The grass will generally be unreinforced, with reinforcement proposed to prevent potential scouring at locations where high velocities have been predicted by the hydraulic model.

The proposed channel base width is 28m, with side slopes at 1:2. Invert levels will vary from 16.5m O.D. at Pollnacross (L1105) Bridge to 13.6 m O.D. at the downstream end. The proposed channel will have a longitudinal gradient of 1:1000. The anticipated volume of excavated material is 166,000 m^3. 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. The estimated number of round trips associated with the removal of surplus excavated material from site is approximately 24,000, which will be spread over the anticipated construction period as detailed in Section 2.4. Any storage of excavated material will be on a temporary basis, on site within the temporary works area as shown on Figure 2.1 and separate from the topsoil storage. Large volumes of excavated material will not be allowed to accumulate within the temporary working areas.

The surface area of the channel is 6.6 ha (16.3 Acres), including the area between channel and boundary fences.

The channel base will incorporate a narrow longitudinal low flow concrete channel, the purpose of which is to provide a flow path for low flows in the channel. Low flows will occur when a lower section of the intake weir starts to overtop. This will provide a natural warning for anyone who find themselves in the channel in advance of a flood event. Warning signage will be provided at appropriate locations and flashing beacons will be provided at locations within the channel as part of the flood early warning system.

An access track will run along the top of the channel between the L1105 and the R315. Access points will be provided from this track to the channel base to facilitate maintenance activities. Fences will be erected to separate the channel and access track from surrounding agricultural land. Approximately 1,870 m of hedging will be planted along the new boundary. Gates will be provided along the fence line to facilitate access to the track by OPW. In one instance it is proposed that this track will be used to provide access for a Landowner to a field in lieu of an access that is to be extinguished.

The excess excavated material, which will consist predominantly of glacial till, will be transported to an authorised waste or recovery facility. The impact of anticipated traffic movements associated with the transport of excavated material from the site is assessed.

2.2.3 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.

2.2.4 River Flow Control Structure

The proposed river flow control structure will consist of a series of precast concrete box culverts positioned across the River Deel; one central 6m wide, two peripheral 3m wide culverts and a fourth 3m wide culvert which will facilitate maintenance and remain closed by default. The river flow control structure has been designed to restrict downstream flows during flood condition but not to result in an effect at low or medium flows. The upstream face of the river flow control structure will have a top level of 20.8 m O.D. The river flow control structure will incorporate adjustable steel plates to allow for adjustment of the level of water passing through the structure following construction of the Scheme. The plates will be adjusted to ensure that the river flows continue to be regulated in accordance with the Scheme design based on hydrometric data retrieved from the gauges on site.

In order to cut off alternative flow paths, it will be necessary to construct reinforced concrete walls/ sheet piles either side of the flow control structure and raise the field levels on the left bank. This new embankment will also serve as an access to the deck of the flow control structure during the maintenance phase as shown in the Scheme Drawings (Appendix II).

Scour protection will be provided on the river bed upstream and downstream of the structure to mitigate against scouring of the river bed. The scour protection will consist of a concrete base, overlain by rip rap and replacement of the natural river gravels on the river bed.

2.2.5 Bridges

The proposed grass lined channel will cross two main roads, namely the L1105 and the R315. It will therefore be necessary to construct two new permanent bridges to keep these two roads open.

The Pollnacross (L1105) Bridge will consist of a reinforced concrete deck spanning 20 m between reinforced concrete abutments. There will be two carriageways, and one footpath. As the bridge soffit has been selected based on hydraulic considerations, the approach road (L1105) will need to be raised at either end of the bridge to facilitate bridge construction and to raise the road above the 1% AEP flood

level (18.64 m O.D.). The road level will be raised to 20.6 m O.D. and 21.265 m O.D. at the southern and northern ends of the bridge, respectively. Safety barriers will extend along the road edges on the approaches to the bridge.

The Mullenmore (R315) bridge will consist of a reinforced concrete deck, also spanning 20m between reinforced earth abutments/ wing walls. The abutments will be constructed on piled foundations. There will be two carriageways, and two footpaths. The existing ground is elevated relative to the proposed channel invert and hydraulic considerations have not been a determining factor in selecting a bridge soffit level. It will therefore not be necessary to carry out any significant regrading of existing road levels at this location. Safety barriers will extend along the road edges on the approaches to the bridges.

2.2.6 Energy Dissipation Structure

The energy dissipation structure will be located to the east of the R315, approximately 150 m upstream of the termination point of the proposed diversion channel and will limit the velocity of water entering the washlands from the diversion channel in order to prevent scouring of the channel in the downstream sections. The energy dissipation structure will take the form of a reinforced concrete Parshall flume structure as shown on Drawing S_05, Appendix II, with a drop in elevation from 15.84 m O.D. to 13.75 m O.D. across the structure. A series of precast reinforced concrete bollards will be constructed at the downstream end the flume to reduce the energy of the flood water and therefore the velocity of the water exiting the flume.

The low flow channel will be piped underneath the throat of the flume and will re-emerge at the downstream end of the structure.

2.2.7 Road Realignment (Lake Road)

The proposed grass lined channel will also cross the Lake Road and two avenues, which provide access to properties located to the South of the Lake Road. The Lake Road is used to access Gortnoraby Pier, the rear entrance of Gortnoraby School, a wastewater pumping station, local residences and farmland. It will be necessary to realign the existing Lake Road and create a new junction with the R315. This will necessitate the permanent closure of a section of the existing road and realignment of the existing avenues connecting the Lake Road to properties to the South to suit the new layout. It will also be necessary to elevate the realigned property access avenues to prevent flooding of these access routes. The new section of Lake Road will incorporate two new footpaths.

Fences will be erected along the revised property boundaries. Gates will be provided along the fence line to facilitate new access points for landowners. Access points may be revised subject to agreement with individual landowners. Access at any or all locations has been assessed.

Surface water from the new road will be collected via a new surface water drainage system. Surface water runoff will be routed through new petrol interceptor(s), before discharging to the low flow channel at the base of the new diversion channel.

2.2.8 Non Structural Measures

Non-structural measures required will include operation of a basic flood early warning system incorporating early hydraulic warning, flashing beacons, planning and control measures and building regulations regarding flood-proofing of buildings.

2.2.9 Operation and Maintenance

Operational Changes

As noted above, the proposed infrastructure 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.

Flow in the river will be regulated by a river flow control structure and the 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. This has been achieved by the adoption of the following design measures:

- 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.

The river flow control structure will incorporate adjustable steel plates so that the level can be raised or lowered to refine the balance of flows between the River Deel and the new channel during the operation of the Scheme. Adjustments may be made following recalibration of the hydraulic model. The model will be periodically recalibrated following high flow events, and based on updated hydrometric data, which will include data from the new hydrometric gauges installed in connection with this Scheme.

The adjustable plate on the intake weir will initially be set at 19.4 m O.D.

2.2.10 Washlands

Due to the local topography and environmental concerns, the diversion channel does not extend to Lough Conn, but terminate the channel at the existing Mullenmore Springs and creates 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 washlands will extend from the termination point of the channel to Lough Conn. The washlands extents shown on the scheme drawings represent the extent to which flood waters will propagate in the event that the 92 cumec design flow overtops the intake weir, flows down the new channel and across the washlands

en route to Lough Conn. 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.

2.2.11 Benefitting Lands

The Scheme when constructed will redirect flood waters away from Crossmolina Town, directly to the flood plains of Lough Conn.

The proposed infrastructure 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 intake structure up to bank full flow.

The river flow control structure will induce a slight increase in flood extents along the river banks upstream of the structure for minor flood events up to the 1 in 10 year flood event (10% AEP). For larger flood events in excess of the 1 in 10 year flood event (0.1% AEP – 4% AEP), the extent of flooding upstream of the structure will reduce as shown on Drawing RFSC ZOI_01, Appendix II.

Lands that will benefit from the Scheme include Crossmolina Town and lands along the banks of the River Deel between the river flow control structure and Lough Conn as shown on drawings BL_01 and BL_02 (Appendix II).

2.2.12 Operational 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. In the unlikely event that structural repair works are required, works will be subject to an individual ecological impact assessment and Screening for Appropriate Assessment.

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 grass will be cut in September of each year and in March, if required. Specific measures to be employed are provided in Appendix III. 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. This will be done from the access platform. 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. Monitoring will be carried out annually at a minimum and more frequently if required depending on hydrodynamic conditions.

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. The storage area will be located above the flood line within the permanent works area. It is not anticipated that this maintenance will be required on a regular basis.

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.

As part of the proposed Drainage Scheme, the section of the River Deel from just upstream of the intake structure to the Jack Garrett Bridge in Crossmolina Town will formally be included within the OPW Drainage Maintenance Programme for the Moy Catchment Drainage Scheme, which already extents upstream on the River Deel as far as Jack Garrett Bridge. Maintenance will involve the regular assessment of trees and branches in the area, periodic trimming of woody vegetation at the edges of the channel upstream of the Jack Garrett Bridge and the removal of any that are likely to fall and become trapped in the opening of the Jack Garrett Bridge. There will be no loss or deterioration of habitat as a result of this maintenance (which is carried out on an Ad Hoc basis at present). No requirement for in-stream works or silt removal has been identified either in the absence of the proposed Drainage Scheme or with it in place. All maintenance works will be the subject of Screening for AA as part of the OPW drainage maintenance and works in the region will be subject to the OPW environmental protocols and SOPs. Further details relating to methods by which these works will be completed are presented in Appendix III.

2.3 ANTICIPATED CONSTRUCTION METHODS

Details of anticipated construction methods are provided below. Further details relating to the management and monitoring of environmental impacts during the construction phase of the Scheme are provided in the Outline Construction Environmental Management Plan (Appendix IV).

2.3.1 Grass Lined Diversion Channel

The construction of the diversion channel will be carried out as follows:

- Isolation of works area, including erection of fencing and site clearance. The fenced area will include the full area required to facilitate the works including the temporary site compounds and temporary works areas.
- Temporary works will be put in place, including the provision of silt management as shown in the construction stage drawings (Appendix II).
- Construction of the diversion channel will commence at the downstream end and works will proceed in successive sections. Each section will be reinstated in advance of commencing the subsequent section. The sequencing of construction works for the diversion channel is presented in Section 2.4.
- Prior to excavation, the site investigation report and service drawings will be examined to determine the location of existing services in proximity to the works. Additional site investigation

will be carried out prior to excavation in order to determine the exact location of services. This will be small scale in nature and has been assessed.

- Construction of the channel will involve removal of overburden and excavation to foundation level. Excavated material will be stored on site on a temporary basis within the working areas shown on the drawings. 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. Large volumes of excavated material will not be allowed to accumulate within the temporary working areas. 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. Surplus excavated material will be transported off site to an authorised waste or recovery facility. The anticipated volume of excavated material is 166,000 m^3. The estimated number of round trips associated with the removal of surplus excavated material from site is approximately 24,000, which will be spread over the anticipated construction period as detailed in Section 2.4.
- The works area will be managed so as to ensure that ingress of waters to the works area will be minimised and that any clean waters are prevented from entering where possible. Following detailed site investigation, it is anticipated that dewatering will be required on a temporary basis during the channel excavation between the R315 bridge and the energy dissipation structure. 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. 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. The silt management area is shown on the Construction Sequence Stage 1 drawing (Appendix II). A sonde will be placed in the Mullenmore springs and stream and turbidity will be continually monitored to ensure that there is no effect of the proposed works on this watercourse.
- Reinstatement of the diversion channel will involve replacing topsoil from within the same section of works on the channel bed and sloping banks, levelling, raking and seeding with grass and wild-flower seed on the channel base and banks, respectively. A low flow channel will be constructed along the centre of the channel bed. Geotextile grass reinforcement layer will be placed in advance of grass seeding in areas identified by the hydraulic model to be at risk of erosion due to high water velocities during flood events. The construction works have been sequenced, as detailed in Section 2.4, so as to ensure that flow will not be allowed into the channel from the river until the grass lining has been established.
- Construction of a permanent 4m wide access track north of the diversion channel spanning from the L1105 to the R315 as shown on the scheme drawings (Appendix II).

2.3.2 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 II). 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 2.3.1).
- 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 an increase in turbidity of 20% or greater is identified downstream of the works, 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.

2.3.3 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 II). 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 Appendix III. 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 2.3.1) 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 an increase in turbidity of 20% or greater is identified downstream of the works, 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.

2.3.4 Bridges

The construction of bridges will be carried out by traditional methods comprising the activities listed below. Both bridges are to be constructed in accordance with the design standards; the Transport Infrastructure Ireland Publications (Technical) and the Structural Eurocodes, including EC0 Basis of Structural Design, EC1 Actions on Structures, EC2 Design of Concrete Structures and EC7 Geotechnical Design.

These works are not proposed in close proximity to the River Deel, Mullenmore Springs, Lough Conn or any other sensitive ecological receptor.

Pollnacross Bridge (L1105)

- The works area will be isolated and traffic management set up as required. Temporary road closures will be required as it will not be possible to maintain one lane of traffic on the existing road open at all times. Traffic will be diverted via the R316 and R315 as detailed in Chapter 11 Material Assets.
- The works area will be fenced off from the wider area and will be subject to the silt management and pollution control measures specified in Section 2.3.1.
- Service diversions will be required in advance of bridge construction. Prior to excavation, the site investigation report and service drawings will be assessed to determine the location of existing services in proximity to the works. Additional site investigation will be carried out prior to excavation in order to determine the exact location of services.
- Excavation of existing road surface, filling and compacting raised approach roads to bridge along L1105, and construction of temporary road surface.
- Excavation for foundations.
- Blinding of formation, fixing of reinforcement, placing of formwork, placing of concrete, and stripping of formwork for bridge abutments and channel bed.
- Delivery and installation of reinforced concrete bridge beams.
- Construction of concrete bridge deck and footpath including laying service ducts, fixing of reinforcement, placing of formwork, placing of concrete, and stripping of formwork.
- Installation of bridge parapets and safety barrier along approaches to bridge.
- Construction of permanent road surface followed by line marking.
- Reinstatement of area including the placement of topsoil, raking and reseeding with grass (channel base) and wild flower seed (channel banks).

Mullenmore Bridge (R315)

- The works area will be isolated and traffic management set up as required. Temporary road closures will be required if it does not prove possible to maintain one lane of traffic on the existing road open at all times. Traffic will be diverted temporarily along the realigned Lake Road.
- Temporary works will be put in place, including construction of silt fences, and the works will be subject to the silt and pollution control measures specified in section 2.3.1. Service diversions will also be required in advance of bridge construction. This will notably include diversion of a gas transmission main.
- The works area will be managed so as to ensure that ingress of waters to the works area will be minimised and that any clean waters are prevented from entering where possible. Following detailed site investigation, it is anticipated that dewatering will be required during the excavation for the R315 bridge foundations. Waters will be pumped to lands that are over 30 metres from any watercourse and discharged via a silt bag to a discharge point located in the diversion

channel downstream of the R315 bridge. The discharge point will consist of a circle of triple silt fences surrounding a circle of straw bales wrapped in Terram geotextile. 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 which in use to ensure that the release of any polluting material is mitigated.

- Piling and excavation for foundations. Monitoring of noise and vibration will be carried out. Vibration levels will be limited to the levels set out in NRA, 2004.
- Phased installation of concrete panels, anchors and placement and compaction of earthen infill to form a piled bridge abutment adjoining concrete panelled reinforced earth wing walls.
- Blinding of formation, fixing of reinforcement, placing of formwork, placing of concrete, and stripping of formwork for pile cap and channel bed.
- Delivery and installation of reinforced concrete bridge beams supported on the new pile caps.
- Construction of concrete bridge deck and footpaths including laying service ducts, fixing of reinforcement, placing of formwork, placing of concrete, and stripping of formwork.
- Installation of bridge parapets and safety barrier along approaches to the new bridge.
- Construction of permanent road surface followed by line marking.
- Reinstatement of area including the placement of topsoil, raking and reseeding with grass (channel base) and wild flower seed (channel banks).

2.3.5 Energy Dissipation Structure

The construction of the energy dissipation structure will be carried out as detailed below. These works are not proposed in close proximity to the River Deel, Mullenmore Springs, Lough Conn or any other sensitive ecological receptor.

- Isolation of works area, including erection of fencing and site clearance.
- Temporary works will be put in place and works will be subject to the silt and pollution control measures specified in section 2.3.1. Service diversions will be carried out as required.
- Should dewatering be required during the excavation for the Energy Dissipation Structure, waters will be pumped to lands that are over 30 metres from any watercourse and discharged via a silt bag to a discharge point located in the diversion channel downstream of the energy dissipation structure. 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 which in use to ensure that the release of any polluting material is mitigated.
- Piling and excavation to foundation level. Excavated material will be stored on site on a temporary basis within the working areas shown on the scheme drawings (Appendix II). Monitoring of noise and vibration during critical periods will be carried out.

- Blinding of formation, fixing of reinforcement.
- Delivery and installation of precast concrete units.
- Placing of formwork, placing of concrete, and stripping of formwork.
- Installation of safety fencing.
- Reinstatement of area including the placement of topsoil, raking and reseeding with grass.

2.3.6 Road Realignment

The construction of the roads proposed as part of the Scheme is likely to be carried out by traditional methods comprising the following activities:

- Isolation of works area, including erection of fencing and site clearance.
- Temporary works will be put in place, and works will be subject to the silt and pollution control measures specified in section 2.3.1.
- Excavation to foundation level. Excavated material will be stored on site on a temporary basis within the working areas shown on the drawings. Excavated topsoil will be stored separately for reuse. Surplus excavated material will be transported off site to an authorised waste or recovery facility.
- Installation of pipework for road drainage and other ducting required to facilitate installation of underground utilities. This will include placement of pipe bedding, surround, placing and compaction of backfill material.
- Construction of concrete footpaths, including fixing of reinforcement, placing of formwork, placing of concrete, and stripping of formwork.
- Construction of road including sub base, road base, base course and wearing course. This will be followed by line marking.
- Reinstatement of the area, including the placement of topsoil, raking and grass seeding of the road verges.

2.4 CONSTRUCTION PROGRAMME AND SEQUENCING OF PROPOSED WORKS

The construction works will last approximately 48 months and will be carried out in the stages detailed below and shown in the Construction Sequence drawings (Appendix II). Site clearance and fencing of works areas will be carried out on a phased basis, and in consideration of seasonal restrictions, as work proceeds in each works area.

1. The preliminary construction sequence for Stage 1 is shown in Construction Sequence Drawing: Stage 1 (Appendix II). Stage 1 is anticipated to take approximately 6 months. Works include:
    - Temporary site compound set up.
    - Realignment of the lake road and access roads will be constructed in conjunction with excavation of an area of the diversion channel upstream of R315. Excavated material

from this section of the diversion channel works will be used as fill in the road works where required.

2. The preliminary construction sequence for Stage 2 is shown in Construction Sequence Drawing: Stage 2 (Appendix II). Stage 2 is anticipated to take approximately 9 months. Works include:
    - Construction of the R315 bridge.
    - Diversion channel works downstream of the proposed energy dissipation structure.
3. The preliminary construction sequence for Stage 3 is shown in Construction Sequence Drawing: Stage 3 (Appendix II). Stage 3 is anticipated to take approximately 6 months. Works include:
    - Construction of the energy dissipation structure
    - Diversion channel works from energy dissipation structure to the R315 bridge.
4. The preliminary construction sequence for Stage 4 is shown in Construction Sequence Drawing: Stage 4 (Appendix II). Stage 4 is anticipated to take approximately 9 months. Works include:
    - Temporary site compound set up.
    - Construction of the L1105 bridge and raising and regrading of the existing road approaching the bridge.
    - Channel works from the R315 bridge to the high point downstream of the L1105 bridge (Point D on drawing).
5. The preliminary construction sequence for Stage 5 is shown in Construction Sequence Drawing: Stage 5 (Appendix II). Stage 5 is anticipated to take approximately 12 - 14 months. Works include:
    - Construction of the intake structure and spillway
    - Construction of the final section of the diversion channel between the high point downstream of the L1105 bridge and the intake structure.
6. 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 lamprey and fish in the River Deel. As such, it may be beneficial to construct the structure in two phases (i) construct the base for the river flow control structure at the earliest suitable opportunity when there no flow in the river Deel and (ii) install the culverts and complete the structure after the diversion channel construction has been completed. This two phased approach has been shown in Construction Sequence Drawings: Stage 1 and Stage 6. The construction of the River Flow Control Structure is anticipated to take approximately 6 months.

The construction works have been sequenced so as to adhere to the following programme constraints:

- 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.
- Works will be sequenced so as to avoid unnecessary interruption to local landowners and road users insofar as is practicable.

- The realigned Lake Road will be constructed in advance of constructing the bridges or the diversion channel. Construction of the diversion channel will commence from the downstream (Lough Conn) end.
- Construction of the river flow control structure and intake structure will be timed to coincide with no / low flows in the River Deel insofar as is possible.
- Instream works (including preparatory work) will only be undertaken when the river is dry and outside of the sensitive period for spawning lamprey and salmonid fish in the River Deel from July to September (inclusive) and in consultation with Inland Fisheries Ireland to avoid accidental damage or siltation of spawning beds.
- To avoid impacting on bird nesting sites, the vegetation removal within the defined working area will not be carried out during the peak bird nesting season of March to August (inclusive) prior to the onset of works.
- Christmas non-working time is from the beginning of the second week of December to the end of the second week of January

2.5 TEMPORARY CONSTRUCTION WORKS FACILITIES

Provision has been made within the working area for location of temporary site compounds, the locations of which are shown on the construction sequence drawings (Appendix II).

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 compounds will be adequately buffered to prevent any surface water run off or will incorporate a surface water collection and treatment system if required.

The compounds will comprise the following elements:

- temporary site offices, portaloo 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.

The preliminary site compound layout is provided in Appendix II.