i. PREFACE

THE FOLLOWING CONSITUTES THE 'SCHEDULE OF COMMITMENTS' (CHAPTER 16 OF THE EIS) WHICH HAS BEEN UPDATED DURING THE COURSE OF THE ORAL HEARING FOR THE N4 PROPOSED ROAD DEVELOPMENT.

Document Control

Status	Issued For	Signed	Date	Approved
FINAL	*Publication*	*FM*[1]	*April **30**th, 2014*	*EC*[2]

[1] *B.Eng., PgDip. Env., C.Eng MIEI.*

[2] *B.Eng., MBA, C.Eng MIEI.*

Schedule of Commitments

The following Schedule of Commitments is that which has been updated during the course of the Oral Hearing for the N4 Proposed Road Development.

The following outlines how ammedndments or additional commitments are presented.

Text to be deleted is crossed out: ~~*Deleted*~~

Amendment text is in bold within square brackets: **[Amendment text]**

Nb. In most circumstances there will be both a deletion and an amendment. In some cases however there may only be one or other.

16 Schedule of Commitments and Summary of the Proposed Ameliorative Measures

16.1 Introduction

The Schedule outlined on the following pages lists the commitments and amelioration measures for the N4 Collooney to Castlebaldwin *Proposed Road Development*; which will be specified in the contract documents/client specification.

The environmental measures detailed within the EIS will be implemented as an integral part of the *Proposed Road Development*. An Environmental Operating Plan will be prepared in accordance with NRA Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan. This plan will outline procedures for the delivery of environmental mitigation measures and for addressing general day-to-day environmental issues that can arise during the construction phase of a national road development.

Table 16-1: Schedule of Commitments and Summary of Ameliorative Measures

No.	Stage	Description	Main Report (Volume 2) Reference
		GENERAL	
4.1	C	Normal hours of work will be Monday to Saturday 07:00 to 19:00 hours unless specific restrictions are placed on certain activities within certain chapters of the EIS. Certain operations may however be carried out outside of these hours with the permission of the contracting authority.	4.10.1
4.2	C&O	The site development works for the various spoil repositories/borrow pits shall be carried out in a manner which is demonstrable to achieve the performance objectives of the various sites (as described in section 4.10.2.2.2).	4.10.2.2.2
4.3	C	Compliance with and development of the Outline Construction and Demolition Waste Management Plan (as described in section 4.10.3) into a Construction Stage Plan.	4.10.3
4.4	C	The locations where local roads require temporary diversions during construction of the realignment are listed in Table 4-15 of Chapter 4. These diversions will in most cases be accommodated within the land-take required for construction of the *Proposed Road Development.* However, there are localised instances where the diversion may be via alternative routes on the local road network. All diversion routes will be properly sign posted. In all additional cases to those described below, local road access shall be maintained throughout the construction process via localised treatment measures within the landtake required for the *Proposed Road Development.*	4.10.6
4.5	C	Compliance with and development of the Outline Erosion and Sediment Control Plan (described in section 4.10.9) into a Construction Stage Plan.	4.10.9
4.6	C	The environmental commitments outlined in this EIS will as already discussed (section 4.10.8.3 of this Chapter) be included within the EOP to be developed by the Contractor. The Local Authority will appoint an Environmental Assurance Officer who shall be responsible for *inter-alia*: (1) Ensuring that the measures included in the EOP consider the full gamut of environmental commitments contained within this EIS; (2) Ensuring that the method statements and environmental measures detailed in the EOP are implemented on site via regular auditing procedures; (3) Ensuring that the controls described in the Erosion and Sediment Control Plan are adequately adhered to;	4.10.10

No.	Stage	Description	Main Report (Volume 2) Reference
		(4) Ensuring that the approach and objectives of the Spoil Management Plan are adequately adhered to; (5) The auditing of Waste Management practices carried out under the Construction and Demolition Waste Management Plan. In addition, the Environmental Assurance Officer shall audit any design changes made during the detailed design phase to ensure that the effects of such changes do not have any additional significant effects. The Environmental Assurance Officer will be delegated powers under the contract sufficient for any appropriate instructions to be issued.	
4.7	O	**[Planting in addition to that outlined in the mitigation sections of the Landscape and Visual chapter of the EIS is proposed in the following locations:** **Boundary Treatment** **Hedgerow planting as agreed with the Landscape and Visual expert (similar to hedgerow mix as per Chapter 10 of the EIS) will be provided (in agreement with the adjacent landowner) where existing agricultural fields are severed by the Proposed Road Development and where the following conditions are met:** **(1) The fenceline is not within Ecological sites/complexes as mapped on figures 12.2.1 to 12.2.8 of the EIS (volume 3);** **(2) There is no landscape mitigation already proposed within the CPO on the roadside closest to the landowner (unless it is significantly removed);** **(3) There is no existing hedgerow, tree-line or plantation present on the landowners side of the CPO;** **(4) CPO line is not on an existing boundary. Save as in agreed locations where the existing boundary requires removal to erect the fence line;** **(5) Fence line does not front onto domestic/business property or road bed;]**	EIS Addenda Section 4.8.5.3.1
4.8	O	**[Screen Planting** **Screen planting in the form of mature hedgerow mix will be provided between the verges of the Type 2 Dual Carriageway and the Eastern Parallel link between circa Ch. 800m and 1,800m (mainline chainages).]**	EIS Addenda Section 4.8.5.3.2
4.9	O	- **[Planting density between the Doorly junction and the proposed N4 shall be increased. This shall consist of a hedgerow mix on the north eastern side side of the roundabout for a distance of 100m from the Inscribed Circle Diameter of the roundabout on the western parallel link approach and on the farm access track exit]**	Additional landscape

No.	Stage	Description	Main Report (Volume 2) Reference
		- **A 1.2m high boundary (limestone) wall shall be provided within the CPO line where the closed section of the L7612-0 meets the proposed N4, this shall demarcate the closure of the aforementioned local road]** - **[An earthen berm shall be provided at the edge of the proposed CPO line on the left hand side of the alighment between circa Ch. 2,725m and c. Ch. 3,200m. This shall be provided underneath the proposed boundary treatment hedgerow mix]** - **[provide a 1m high earthen bund underneath the proposed hedgerow planting (left hand side of proposed embankment) provided between circa Ch. 7,870m and circa Ch. 8,090m];** - **[The Low canopy woodland mix proposed between circa Ch. 8,500m and 8,600m (right hand side) will be extended to the edge of the proposed farm track];** - **[A 1.5m high earthen berm will be provided on the left hand side of the proposed embankment inside teh CPO line from circa Ch. 9,200m to the CPO lines juncture with the L54033-0. This berm shall be planted with mixed hedgerow mix]** - **The Low canopy woodland mix (right hand side) shall be extended to cover the full extents of the embankment between between circa Ch. 10,600m and c. Ch. 10,810m;]**	commitments
CHAPTER 6 SOCIO ECONOMIC			
6.1	C&O	~~*'Encourage construction traffic to use new alignment where possible'*~~ **[Construction traffic will access the Greenfield site via controlled points as defined in chapter 4 of the EIS, haulage requirements will occur principally within the limits of the lands made available]*;***	6.5
6.2	C&O	Provide footpath (slightly elevated above road surface) and cyclepath (on the southern side of the link between Castlebaldwin village and the roundabout) at Castlebaldwin Junction (roundabout) with the realigned L1404-0;	6.5
6.3	C	Use signage to direct walkers to crossing at Castlebaldwin Junction where the *Proposed Road Development* severs the L1404-0 and Historical Trail;	6.5
6.4	C	Provide signage at Castlebaldwin and Toberbride junctions to encourage cyclists to use the existing road as an alternative to the new alignment in accordance with the provisions of the NRA DMRB;	6.5
6.5	C	Provide tourism signage in line with NRA guidelines at Castlebaldwin Junction including for Carrowkeel Megalithic Complex;	6.5
6.6	C	Provide services signage to encourage use of petrol, retail and food facilities in Castlebaldwin;	6.5

No.	Stage	Description	Main Report (Volume 2) Reference
6.7	C	Provide limited car parking for vehicles together with tourism information (for Carrowkeel, Castlebaldwin Fortified House, the Historical Trail and other local facilities) at the proposed landscaped mitigation area in Castlebaldwin as described in the Landscape and Visual Impact Assessment Chapter (See Fig. 10.1.8);	6.5
6.8	C	Allow for access to the landscaped area. See also mitigation proposed in the Landscape and Visual Impact Assessment Chapter.	6.5
CHAPTER 7 NON AGRICULTURAL PROPERTY (RESIDENTIAL)			
7.1	C	Where existing access is affected, this will be reinstated as described in Appendix 7.1 (Volume 4 of this EIS). In some cases it may not be feasible to reinstate the original access however an alternative access will be provided.	7.5
7.2	*C*	Where a boundary wall of a non-agricultural property is impacted upon by the *Proposed Road Development,* mitigation will involve the replacement of the boundary on a like for like basis, subject to issues of road safety. If necessary, these works will be carried out as part of the contract or the landowner may be compensated to replace the boundary wall.	7.5
7.3	*C*	The Contractor will be obliged to maintain reasonable access to all properties at all times during the construction of the *Proposed Road Development*. This may require temporary alternative access arrangements at some locations. Information will be made available to affected landowners on the construction programme and its impact on properties.	7.5
7.4	*C*	The NRA code of practice *Guide to Process and Code of Practice for National Road Projects Planning and Acquisition of Property for National Roads* will be adhered to with respect to all land potentially impacted by the construction of the *Proposed Road Development*. These measures include the following: - The local authority will appoint a Project Liaison Officer who will liaise and engage with the affected parties or their representatives on matters relating to the *Proposed Road Development*. The Project Liaison Officer will act as first point of contact should individual encounter difficulties; - Where excavations interfere with water supplies, sewers, or septic tanks, these services will be restored as a matter of urgency by the local authority or those acting on its behalf, provided the property owner facilitates all necessary access to enable this to be done; - Steps will be undertaken to minimise dust and mud from construction activities. Measures will include, as appropriate, the watering of the road and containment of material with dust or mud potential and are further outlined in the Air Quality chapter of this EIS; - Noise mitigation for construction activities will be incorporated into the development and mitigation measures will be	7.51

No.	Stage	Description	Main Report (Volume 2) Reference
		further outlined in the Noise and Vibration chapter of this EIS.	
		CHAPTER 8 NOISE & VIBRATION	
8.1	*O*	Provision of noise barriers as follows: **[Location R009** **The proposed mitigation measure for Location R009 consists of a 2 metre high 145 metre long barrier on the east side of the proposed scheme. The location of this barrier is shown in Fig. 8.1.1 contained within volume 3.]** Location R010 The proposed mitigation measure for Location R010 consists of a 3.5 metre high 45 metre long barrier on the east side of the *Proposed Road Development*. The location of this barrier is shown in Fig. 8.1.1 contained within volume 3. Location R016 The proposed mitigation measure for Location R016 consists of a 1.5 metre high 95 metre long barrier on the west side of the *Proposed Road Development*. The location of this barrier is shown in Fig. 8.1.2 contained within volume 3. Location R119 The proposed mitigation measure for Location R119 consists of a 4.0 metre high 145 metre long barrier on the east side of the *Proposed Road Development*. The location of this barrier is shown in Fig. 8.1.3 contained within volume 3. Location R227 The proposed mitigation measure for Location R227 consists of a 2.0 metre high 190 metre long barrier on the south side of the *Proposed Road Development*. The location of this barrier is shown in Fig. 8.1.6 contained within volume 3. **[For visual purposes this barrier will be extended to 10,500m (to the west) and 10,800m (to the east)]** Location R254 The proposed mitigation measure for Location R254 consists of a 4 metre high 200 metre long barrier on the north side of the *Proposed Road Development*. The location of this barrier is shown in Fig. 8.1.7 contained within volume 3.	8.5.1
8.2	*C*	The contract documents will clearly specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of *BS 5228-1* and the *European Communities (Noise*	8.5.2.1

No.	Stage	Description	Main Report (Volume 2) Reference
		Emission by Equipment for Use Outdoors) Regulations, 2001. These measures will ensure that: - No plant used on site will be permitted to cause an on-going public nuisance due to noise; - The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations; - All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract; - Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers; - Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use; - **[The use of construction site hoarding or localised screens will be used in work areas or around individual items of plant, where works have the potential to exceed the construction noise criteria.]** - Any plant, such as generators or pumps, which are required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen; - During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Table 8-9 (of Chapter 8) using methods outlined in BS 5228 "*Noise and Vibration Control on Construction and open sites*".	
8.3	*C*	Normal working times will be 07:00 to 19:00hrs Monday to Saturday. Works other than the pumping out of excavations, security and emergency works will not be undertaken outside these working hours without the written permission of the Contracting Authority. This permission, if granted, can be withdrawn at any time should the working regulations be breached. Works other than the pumping out of excavations, security and emergency works will not be undertaken at night and on Sundays without the written permission of the Contracting Authority. When overtime and shift work is permitted, the hauling of spoil and delivery of materials outside normal working hours is prohibited and the noise limits outlined in Table 8-9 (of Chapter 8) will apply.	8.5.2.2
8.4	*C*	The emergency work referred to above may include the replacement of warning lights, signs and other safety items on public roads, the repair of damaged fences, repair of water supplies and other services which have been interrupted, repair to any damaged temporary works and all repairs associated with working on public roads.	8.5.2.3
8.5	*C*	The NRA Guidelines recommend that in order to ensure that there is no potential for vibration damage during construction, vibration from construction activities will be limited to the values set out in Table 8-14 (of Chapter 8). Measures shall be taken to minimise vibration due to plant and machinery on the site and no machine which uses the dropping of	8.5.3

No.	Stage	Description	Main Report (Volume 2) Reference
		heavy weights for the purpose of demolition shall be permitted. Ground vibration from additional traffic due to the development under consideration would be expected to be orders of magnitude less than that required to cause cosmetic or structural damage to buildings or lead to disturbance of occupiers, hence mitigation measures are not required in respect of the operational phase. It may be concluded that the *Proposed Road Development* is not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or even cosmetic damage.	
		CHAPTER 9 AIR QUALITY AND CLIMATE	

9.1	*C*	The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within two hundred metres of the construction activities.
		
		In order to minimise dust emissions during construction, a series of mitigation measures have been prepared for implementation during the construction phase of the project. These measures are as follows:
		
		- Site roads will be regularly cleaned and maintained as appropriate. Hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads will be restricted to essential site traffic only. Any road that has the potential to give rise to fugitive dust will be regularly watered during dry and/or windy conditions;
		- *'Vehicles using site roads* **[which have an exposed soil finish]** *will have their speeds restricted where there is a potential for dust nuisance at nearby properties* **[where the works area occurs within 200m of a sensitive location. This restriction shall apply in the following identified locations:**
		  - **Mainline Ch. -100m to 2,600m (and to include adjoining proposed side roads);**
		  - **Mainline Ch. 2850m to Ch. 3200m;**
		  - **Mainline Ch. 3900m to Ch. 4300m (and to include adjoining proposed side roads);**
		  - **Mainline Ch. 5450m to Ch. 6000m (and to include adjoining proposed side roads);**
		  - **Mainline Ch. 6400m to Ch. 6800m (and to include adjoining proposed side roads);**
		  - **Mainline Ch. 7800m to Ch. 8900m (and to include adjoining proposed side roads);**
		  - **Mainline Ch. 9000m to Ch. 11300m (and to include adjoining proposed side roads);**
		  - **Mainline Ch. 11800m to Ch. 12200m;**
		  - **Mainline Ch. 12500m to Ch. 12750m (and to include adjoining proposed side roads);**
			9.51

No.	Stage	Description	Main Report (Volume 2) Reference
		- **Mainline Ch. 12900m to Ch. 14500m (and to include adjoining proposed side roads).** **Additionally a further restriction of 30kph shall apply in all other instances]** - ~~*Where practicable,* v~~**[V]**ehicles *exiting the site shall make use of a wheel wash facility prior to entering onto public roads. This will ensure that mud and other wastes are not tracked onto public roads. Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions;'* - Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods; - The dust minimisation procedures put in place will be monitored and assessed. In the event of dust nuisance occurring outside the site boundary, the effectiveness of existing measures will be reviewed and further mitigation will be implemented to rectify the problem. Provided the dust minimisation measures outlined above are adhered to, the air quality impacts during the construction phase will not be significant.	
		CHAPTER 10 LANDSCAPE & VISUAL	
10.1	*C&O*	Landscape and visual mitigation measures for this *Proposed Road Development* are predominantly in the form of roadside screen planting, the assimilation of embankments within the land take boundary of the proposed road, and the incorporation of measures for wildlife as informed by the Flora, Fauna & Fisheries Impact Assessment. These mitigation measures are shown on Figures 10.1.1 to 10.1.8 contained within Volume 3 of this EIS. Given the linear constraints of the planting zone, the structure of the landscape planting is generally intended to reflect the existing hedgerows and woodlands. The species composition of the screen planting will reflect the landscape context of each section of road. Throughout woodland areas proposed planting mixes include high and low canopy woodland mixes, riparian woodland mixes, hedgerow and shrub mixes as listed in the Table 10-6 to Table 10-12 contained within Chapter 10. Generally high canopy woodland is proposed within established woodland or forest areas with low canopy woodland, hedgerow or shrub mixes at woodland fringes. Riparian woodland is proposed at constructed wetlands and river crossings. In farmland areas shrub and hedgerow mixes are to be used to reinstate existing planting areas. A mature high canopy woodland and shrub mix is proposed for the landscape mitigation site at Castlebaldwin. This woodland mix contains a small proportion of standard size trees at planting stage. A suitable grassland treatment is proposed for all areas of open ground within the CPO where no screen or feature planting is proposed. The species mixes in these woodland areas are to reflect species found and in accordance with the Native Woodland Scheme Guidelines (Department of Agriculture, Fisheries and Food - Native Woodland Scheme – Establishment August 2011). In conjunction with the ecological consultant a list of tree and shrub species for the various habitats has been compiled that occur	10.5.1

No.	Stage	Description	Main Report (Volume 2) Reference
		along the route and the appropriate species mix will be applied for each zone. The habitat mixes are provided in the Table 10-6 contained within Chapter 10. At individual properties, the landscape and visual mitigation proposals are primarily focused on screening and reinstatement works including the replacement of existing boundary vegetation in order to integrate the *Proposed Road Development* into the existing landscape context. Mitigation measures at individual properties in a woodland setting normally comprise high or low canopy woodland planting. All areas including embankments and road verges outside proposed planting zones are to be seeded with a suitable semi-natural dry or wet grassland seed mix, similar to the species composition found in the locality in accordance with section 6.1 of the NRA Guide to Landscape Treatments for National Road Schemes in Ireland. Where the proposed alignment cuts into drumlin hills all cut slopes outside rock faces will be seeded with a suitable grass mix. Type 1 Spoil Repository/Borrow Pits located within hill sites will be re-graded to restore existing hill slopes and subsequently turned into grassland mimicking existing pastoral fields. Hedgerow planting is proposed in areas where existing hedgerow patterns existing to reconnect disrupted hedgerow lines. At constructed wetlands outside pool areas and areas proposed for riparian woodland planting a wet grassland treatment is to be implemented in accordance to 4.5.2 of the *NRA Guide to Landscape Treatments for National Road Schemes in Ireland*. At pool areas a marsh habitat containing sedges, grasses, Yellow Flag Iris (*Iris pseudacorus*), Reeds (*Phragmites australis*) and Bulrush (*Typha latifolia*) is to be planted. Surrounding banks in wetland areas will be graded to gentle slopes and shallow edges to allow further colonisation with marsh plant communities. Type 2 Spoil repository sites are to be re-graded with reclaimed peat material from the road works and be reseeded with a verge mix similar to the species *composition of the existing verge, with a high concentration of seed* mix to encourage rapid re-colonisation to control the spread of invasive species. The *measures outlin*ed for thi*s type of repository* are proposed t*o mimic bog wet*land conditions and to encourage re-colonization. An extensive infill area which is required to re-grade existing lands is proposed as Landscape Mitigation at Castlebaldwin south of Drumderry Hill. Details of this area are included in Figure 10.1.8 contained within Volume 3 of this EIS.	
10.2	*O*	A number of planting mixes, including a short and medium version of high canopy woodland, are proposed for different sections of the proposed road. The objective behind each planting mix is outlined below with specific plant mixes listed thereafter: - High canopy woodland mix– a collection of trees and shrubs which will eventually establish mature broadleaf woodland containing dominant species such as oak. Areas proposed for high canopy woodland mix are confined to established mature woodland clusters along the route. A mature woodland mix containing a small proportion of standard size trees is	10.5.2

No.	Stage	Description	Main Report (Volume 2) Reference
		proposed at the landscape mitigation site at Castlebaldwin. - Low canopy woodland mix – a collection of sub-dominant canopy woodland species with a reduced or no presence of dominant species such as oak. Areas proposed for low canopy woodland mix comprise woodland edges and small woodland clusters where dominant tree species are largely absent. - Riparian woodland mix – a collection of riparian dominant and sub-dominant canopy woodland species. Areas proposed for wet woodland mix comprise river and lake edges where established wet woodland species occur. - Shrub mix – a collection of high and low shrub species with a reduced presence or omission of low canopy tree species. Areas proposed for shrub planting comprise the proposed landscape mitigation area at Castlebaldwin. Shrub species are also contained within woodland areas. - Hedgerow and Mature Hedgerow mix – a collection of traditional hedgerow species proposed for locations where existing hedgerow lines are in existence and have been interrupted or disjointed by the proposed development. A mature hedgerow mix contains a small proportion of standard size trees. - Grass seeding – in all areas within the CPO where no woodland, shrub, hedgerow or feature planting is proposed a suitable grassland mix with species similar to the locality is to be applied. In general a dry meadows and grassy verges grass mix is to be applied to all road verges, embankments and areas within the constructed wetlands not subject to periodic flooding. A wet grassland mix is to be applied to poorly drained lowland areas, river banks and areas at constructed wetlands which are subject to periodic flooding. At pool areas a marsh habitat containing sedges, grasses, Yellow Flag Iris (*Iris pseudacorus*), Reeds (*Phragmites australis*) and Bulrush (*Typha latifolia*) is to be planted. - Grass mixes The selection of suitable grass mixes at detailed design stage will take into account the characteristics of specific locations. Reference is to be made to the Flora, Fauna and Fisheries Impact Assessment in devising an appropriate species list for each location. - Feature planting – consisting of specimen trees in linear or clustered arrangement to highlight landscape features or gateways The proposed plant mixes have been selected in consultation with the Flora, Fauna and Fisheries consultant having regard to 'A Guide to Habitats in Ireland' (Fossitt, 2000) and the NRA publication 'A guide to landscape treatments for National Road Schemes in Ireland' and consists of those described in Table 10-6 of Chapter 10.	
10.3	*C*	Irish provenance plant material will be utilised on the *Proposed Road Development*. The Contract Documents will require the Contractor to consult with a nursery early in the construction implementation stage to ensure such plant material is available at the end of the construction period. Note that Ash planting on national road schemes is not permitted (refer to NRA circular 05/2013) and ash trees are therefore excluded from the plant lists until further notice. The proposed minimum planting size for all woodland mixes are 2-3 year old tree seedlings (whips) of a height between 60-150cm	10.5.2.1

No.	Stage	Description	Main Report (Volume 2) Reference
		– 60cm for shrubs and 120cm-150cm for trees. The minimum planting size for marshland plants such as Yellow Flag Iris (*Iris pseudacorus*), Reeds (*Phragmites australis*) and Bulrush (*Typha latifolia*) is to be 70 to 90cm. Mature hedgerows to include standard (8-10cm girth) Oak and Rowan trees. Scots pine to be planted at 40cm height. Feature planting to consist of Extra Heavy Standard trees (14-16cm girth). Where mature plant material for reinstatement works such as standard trees are required then the Contractor must acquire whips in a nursery, at the commencement of the construction implementation stage, and ensure that these will have reached standard size by the end of construction such that Irish provenance standard trees will be available. Reinstatement works at individual properties will not include invasive species or potential invasive species (also refer to Invasive Species Ireland website invasivespeciesireland.com). Plant spacing shall be staggered at 1-2m centres. Planting density of the marshland pollution control species should be 4 per square metre. For hedgerows a staggered double row at 0.5m spacing should be planted. Plant material is described in Tables 10-6, 10-7, 10-8, 10-9, 10-10, 10-11 and 10-12 of Chapter 10.	
10.4	*C*	A walkover survey during construction will be undertaken to identify available soil types and soil pH in order to verify the appropriate native woodland mix from the lists provided under section 10.5.2 of Chapter 2. The survey will be under taken in accordance to the native woodland scheme manual (*Department of Agriculture Fisheries and Food publication – Native Woodland Scheme Manual 2008*) and the establishment report (*Department of Agriculture Fisheries and Food publication -Native Woodland Scheme – Establishment August 2011*).	10.5.2.2
10.5	*O*	<u>Proposed mitigation measures in relation to Landscape Features contributing to Character Distinctiveness</u> This section sets out planting mitigation measures in relation to woodland, hedgerow and shrub planting. In addition all areas within the CPO where no screen and feature planting is proposed are to be seeded with a suitable grass mix as detailed above. *Collooney to Toberscanavan Loughs (Chainage -190m - 1,600m)* - Clusters of roadside low canopy woodland and hedgerow planting are recommended to both sides of the *Proposed Road Development* and at the eastern parallel link throughout Toberbride, at Toberscanavan and east of the Toberscanavan Loughs; - Riparian woodland planting is proposed throughout the Toberscanavan Loughs woodlands. *Lackagh Fen basin between Doorly Hill and Lackagh (Chainage 1,600m-4,000m)* - Clusters of roadside low canopy woodland and sections of hedgerow planting will be planted to both sides of the *Proposed Road Development* and at the western parallel link throughout the Cloonamahan and Ardcurley townlands. - Riparian woodland clusters are proposed at the constructed wetlands south in Ardcurley.	10.5.3

No.	Stage	Description	Main Report (Volume 2) Reference
		- Hedgerow planting and pockets of low canopy woodland planting is recommended along the eastern slopes of Doorly Hill to the south of the proposed alignment. - Riparian woodland planting clusters are proposed at the constructed wetlands to the south of Doorly Hill. - At the overbridge at local road L-55016-0 west of Lackagh low canopy woodland planting, hedgerow planting and riparian woodland planting is proposed. *Lowland basin surrounding Lough Corran (Chainage 4,000m-5,700m)* - Along the alignment east of Lough Corran pockets of riparian woodland planting, hedgerow planting and shrub land planting are recommended. - Low canopy woodland planting and hedgerow planting will be carried out at proposed L-5502-0 local road overbridge south of the Lough Corran area. Shrub land planting is proposed at the local access track to the constructed wetlands further north. - Feature planting is proposed to mark the River crossing at Lough Corran and at Drumfin overbridge. *Local drumlin hills at Drumfin and Cloonlurg (Chainage 5,700m-6,900m)* - At the western foothills of Drumfin Hill mitigation measure include planting of hedgerow sections to reconnect disrupted hedgerow lines. - South-west of Drumfin riparian woodland planting is recommended surrounding the proposed constructed wetland area. - Further hedgerow planting to reconnect disjointed hedgerows will be carried out along the proposed overbridge at local road L1502-32 south of Drumfin and associated access tracks and link road. - Feature planting is recommended at the L1502-32 overbridge south of Drumfin. *Drumfin River Basin and local hill at Carrownagark (Chainage 6,900m- 8,400m)* - High canopy woodland planting is proposed along the existing forest area north of Drumfin River on either side of the proposed alignment. - Riparian woodland and feature planting is proposed at the Drumfin River crossing and further south at the proposed constructed wetlands. - Hedgerow planting is recommended throughout the western slopes of Carrownagark Hill to reconnect disrupted hedgerow lines. - Further hedgerow, low canopy woodland and feature planting clusters are proposed at the L-5402-0 underpass south of Carrownagark hill. - Hedgerow planting is suggested where existing hedgerow lines are disrupted to both sides of the proposed constructed wetland access track west of Carrownagark hill.	

No.	Stage	Description	Main Report (Volume 2) Reference
		Local drumlin hills at Kingsbrook and peatland basin surrounding Aghalenane Lough (Chainage 8,400m- 10,250m) - Riparian woodland planting is proposed at the constructed wetlands north east of Kingsbrook Hill. - Hedgerow planting will be carried out throughout the eastern slopes of Kingsbrook Hill to reconnect disrupted hedgerow lines. - Further hedgerow, low canopy woodland and feature planting clusters are proposed at a mainline bridge over a local road south of Kingsbrook Hill. - Linear mature hedgerow planting is proposed at the western road embankments throughout the *Proposed Road Development* west of Aghalenane and Ardloy Lough. - Further Riparian woodland planting is recommended at the constructed wetlands south of Ardloy Lough. *Local drumlin hills at Ardloy/ Springfield, Tawnagh & Cloonymeenaghan (Chainage 10,250m- 11,900m)* - Ground conditions permitting clusters of low canopy woodland and reconnection of hedgerow planting will be provided at the cut slopes and the spoil repository/ borrow pit site at Ardloy/ Springfield hill. - Low canopy woodland planting, riparian woodland planting and hedgerow planting clusters are proposed at the alignment between Ardloy/ Springfield Hill and Tawnagh Hill. - Low canopy woodland planting and hedgerow planting is recommended at the cut slopes and the spoil repository/ borrow pit site at Tawnagh Hill (ground conditions permitting). - Feature planting is proposed to the west of Ardloy/Springfield hill and east of Tawnagh Hill. - Hedgerow planting to reconnect disrupted hedgerow lines will be planted at the eastern slopes and spoil repository/ borrow pit site at Cloonymeenaghan hill (ground conditions permitting). *Peatland basin between Tawnagh and Drumderry (Chainage 10,900m- 12,600m)* - Where the proposed route crosses the peatland basin between Tawnagh and Drumderry at elevated levels low canopy woodland and hedgerow planting clusters are recommended along its eastern embankments, - Riparian woodland planting is proposed at the constructed wetlands north of Drumderry Hill. *Drumderry Hill and Castlebaldwin (Chainage 12,600m- 14,522m)* - Extensive mature hedgerow planting to reconnect existing hedgerow lines is recommended along the eastern slopes of Drumderry hill on either side of the proposed mainline development as well as at the access track and spoil repository/ borrow pit site west of the alignment. - Mature hedgerow planting is also proposed along the realigned L-1404-0 towards Annaghcor to the south east of Drumderry hill, along the boundary of the proposed infill area east of Castlebaldwin and at the proposed roundabout	

No.	Stage	Description	Main Report (Volume 2) Reference
		south of Drumderry Hill. - Feature planting is recommended at the roundabout south of Drumderry Hill, at the northern and eastern infill site boundary and at the link roads to Castlebaldwin. - High canopy woodland underplanted with shrub planting is proposed at the shaped mounds within the proposed landscape mitigation site. - Riparian woodland planting is proposed at the constructed wetlands south of Castlebaldwin. - Hedgerow planting is recommended at the tie in section with the existing N4 to replace disrupted hedgerow lines. - A landscaped area with amenity grassland is proposed north of the infill site at Castlebaldwin with a viewing area towards the Castlebaldwin historic site.	
10.6	*O*	Mitigation and avoidance Measures in the vicinity of individual properties Mitigation proposals in addition to reinstatement measures are discussed under this section for properties anticipated to experience 'Moderate or Significant Adverse' impacts. Mitigation measures for properties with lesser anticipated impacts are listed in Appendix 10.1 contained within volume 3 of this EIS. *Chainage -190m to Chainage 2,200m (Figure 10.1.1 and 10.1.2 of Volume 3)* - A broad low canopy woodland planting strip is proposed on the roadside slopes below properties No. 03 and 05 at Toberbride. Further low canopy woodland planting is proposed on the opposite side of the alignment at the top of the eastern cut slopes to provide screening of the eastern parallel link. - A hedgerow mix is also proposed along the local elevated access road at property 06a. - At Toberscanavan mitigation measures include clusters of low canopy planting and hedgerow planting along the main line and parallel eastern link to the west of elevated properties No. 9a and 9 and at road side property No. 10. At this property a solid noise barrier is also proposed. - Hedgerow planting and a solid noise barrier is proposed at receptor No. 16. *Chainage 2,200m to Chainage 3,420m (Figure 10.1.2 of Volume 3)* - Hedgerow and low canopy woodland planting clusters are proposed along the eastern edge of the *Proposed Road Development* at Doorly Hill to the rear of property No. 105 to provide additional screening. *Chainage 3,420m to Chainage 5,340m (Figure 10.1.3 of Volume 3)* - To the north of the three dwellings No. 117,118 and 119 mitigation measures include planting of a generous swath of low canopy woodland. In addition a solid noise barrier is proposed to the east of property No. 119. - Further stretches of hedgerow and low canopy woodland planting are recommended on the road embankments to both	10.5.4

No.	Stage	Description	Main Report (Volume 2) Reference
		sides of the mainline route corridor to the east and west of properties No. 117, 118, 119 and 121. - Riparian woodland planting surrounding proposed constructed wetlands is proposed south and north of properties No. 117 and 118. *Chainage 5,340m to Chainage 7,200m (Figure 10.1.4 of Volume 3)* - Proposed mitigation measures at property 156 include low canopy woodland planting to both sides of the embankments along the proposed overbridge west of this property to ensure the privacy of this property. *Chainage 7,200m to Chainage 9,050m (Figure 10.1.5 of Volume 3)* - Mitigation measures are recommended for the proposed mainline overpass east of property No. 199, comprising low canopy woodland planting to ensure the privacy of this property. In addition hedgerow planting is recommended along the proposed accommodation track to the north of both properties. - Further hedgerow planting will be carried out at the overbridge west of property No. 197. South-west of this property riparian woodland planting is recommended to enclose the proposed constructed wetlands in this area. *Chainage 9,050m to Chainage 10,950m (Figure 10.1.6 of Volume 3)* - West of properties No. 206 and 207 at the eastern slopes of Kingsbrook hill hedgerow planting is recommended to both sides of the *Proposed Road Development* to provide screening and to reconnect existing hedgerow lines. - In addition a low canopy woodland mix is recommended at the eastern overbridge embankments adjacent to property No. 207 to ensure the privacy of this property. - North of the elevated settlement cluster at Aghalenane which includes properties No. 218, 219, 220 and 221 continuous mature hedgerow planting will be carried out along the southern road embankment extending from Kingsbrook to Ardloy/Springfield to provide screening of the *Proposed Road Development* whilst retaining filtered views of the lake areas further north. - Recommended mitigation measures for property No. 225 comprise low canopy woodland screening to protect the privacy of this dwelling. This will also provide screening to property No. 224. - At property No. 227 a noise barrier, low canopy woodland and hedgerow planting are proposed to the south of the route alignment to protect the privacy of this dwelling and to reconnect existing hedgerow lines. *Chainage 10,950m to Chainage 12,800m (Figure 10.1.7 of Volume 3)* - North of properties No. 239 and 240 generous swaths of low canopy woodland planting, hedgerow planting and feature planting along the cut slopes facing the affected properties are recommended to provide a high level of screening of the *Proposed Road Development* and accommodation track.	

No.	Stage	Description	Main Report (Volume 2) Reference
		- West of properties No. 245 and 247, where the *Proposed Road Development* runs at elevated levels clusters of low canopy woodland and mature hedgerow planting is proposed. - North-west of elevated property No. 255 riparian woodland planting is recommended within the proposed constructed wetlands and mature hedgerow planting further south along the proposed access track. *Chainage 12,800m to Chainage 14,520m (Figure 10.1.8 of Volume 3)* - At the eastern hill slopes of at Drumderry Hill facing properties No. 263, 264, 265, 268, 269, 271,271A, 272, 273and 274 extensive mature hedgerow planting is proposed to both sides of the route between circa Chainage 12,500m and circa Chainage 13,500m to provide screening and to reconnect disjointed hedgerow lines. - Further mature hedgerow and feature planting will be carried out along the L1404-0 west of the proposed alignment, the proposed roundabout at Castlebaldwin and to the east of the proposed landscape mitigation site to provide screening for properties 276,277,278 and 279.	
CHAPTER 11 AGRICULTURAL PROPERTY			
11.1	*O*	A total of twenty eight land parcels, out of the 106 assessed land parcels, have areas of lands, which have been severed. New access will be required on 39 land parcels. Access is deemed to be required where it has to be provided to a sub-divided area or to a retained area of land where the entire road frontage is removed. There are fifty land parcels on which the existing access point(s) will be affected or a new access point off an existing road may be required. The access points will have to be reinstated on these land parcels. The extent and complexity of such access provisions vary with each farm depending on the nature of the impact and the type of enterprise being carried out. In some cases simple gateways will suffice, while in other cases new accommodation roads and bridges may have to be constructed. Timber post and rail fencing with stock proofing as appropriate will be provided along the main line, regional, local and accommodation roads. The Local Authority will maintain the fence along the National road. It will be the responsibility of the landowners to maintain the fence along regional, local and accommodation roads. Appendix 11.2 (Volume 4) summarises the level and nature of the impact the route will have on each individual farm and proposed mitigation measures relating to accommodation works.	11.5.1
11.2	*C*	<u>Construction Noise</u> Good communication between the contractor and the landowners during the construction phase will prevent undue disturbance	11.5.2.1

No.	Stage	Description	Main Report (Volume 2) Reference
		due to noise. Good communication with farmers will facilitate the organisation of farm enterprises, so that vulnerable livestock are kept as far away as feasible from the construction work during critical times. The contractor shall minimise impacts on agricultural lands due to construction noise by way of a programme of mitigation measures for noise and vibration control as described in the Noise and Vibration impact assessment chapter of this EIS Chapter 8.	
11.3	*C*	Dust The contractor will employ measures to prevent the spread of dust onto adjoining lands. These measures are set out in the Air Quality chapter 9 of the EIS. Good communication between the contractor and the farmers in the proximity of construction activities will facilitate on-going farm enterprises so that valuable livestock are kept as far away as possible from the construction work during critical times.	11.5.2.2
11.4	*C*	Restricted Access to sub-divided Parcels As in the case of mitigating noise and dust pollution, good communication between individual farmers and the construction authorities will minimize difficulties caused by the restriction of access to severed land parcels. Such communication will produce a workable arrangement, which will allow all parties to continue their work in return for some compromise to other parties. There also should be proper termination of existing boundaries. Maintenance of open access to all landholdings and properties is required. Temporary fencing will be erected as required to delineate the site boundary and to minimize disturbance to adjacent lands. Farmers may need to move animals across the construction site while they await more permanent measures to be put in place and this will be facilitated by providing gates where needed until such time as the access arrangements are in place for these farmers when these gateways will be replaced by permanent stock-proof fencing.	11.5.2.3
11.5	*C*	Disturbance of Field Drainage Works In cases where impeded drainage during construction will cause obvious difficulty to a particular landowner, temporary measures will be taken to allow waters to drain to less critical areas and so minimise the impact.	11.5.2.4
11.6	*C*	Soil Disturbance Areas if so required on a temporary basis for road construction purposes will be returned to agricultural use following the completion of the *Proposed Road Development*.	11.5.2.5
11.7	*C*	Provision of Ducting. Where required, separate ducting will be given to take water supply and electric fencing across the proposed road to the land on	11.5.2.6

No.	Stage	Description	Main Report (Volume 2) Reference
		the other side. The location of these will be agreed in advance of road construction on an individual farm basis and put in place during the construction phase. Again some temporary measures may be needed, such as water tanks and battery power electric fencing to ensure that disruption to farming is minimized.	
		CHAPTER 12 FLORA, FAUNA & FISHERIES (Commitments set out by receptor)	
		Designated Conservation Sites	
12.1	*C*	The mitigation measures highlighted for the flora and fauna sections below will be sufficient to protect those Annex I habitats and Annex II species for which the designated sites within the zone of influence have been designated. With regard to the Unshin River cSAC and the Lough Arrow cSAC and SPA complex, specific mitigation measures for the protection of water quality have been set out for works undertaken within or adjacent to watercourses connected to these designated areas. The drainage design, set out in Chapter 4 of the EIS, in addition to the Outline Erosion and Sediment Control Plan, provides the best available mitigation by avoidance to minimise impacts on watercourses and waterbodies within the study area, thus reducing the potential for downstream impacts potentially affecting water-dependant qualifying interests within designated sites during construction stage. Any plant or equipment that may have worked in environments where invasive species are present shall be suitably cleaned by high pressure hose before being employed on site to prevent the spread of invasive species. Water used for this washing process shall always be intercepted and prevented from draining back into watercourses.	12.51
		Toberscanavan Lough	
12.2	*C*	The road construction works **[to be developed as per Section 4.8.5.1.4 of the EIS]** area will be fenced off to avoid further loss of this habitat than is required. Habitat clearance within the LMA will be limited to the area required for the footprint of the road and machinery access. The Outline Erosion and Sediment Control Plan sets out effective measures for the protection of water quality during construction.	12.51
12.3	*O*	The Drainage Design (Chapter 4) and mitigation measures specified in the Hydrological and Hydrogeological Assessment (Chapter 14) provide operational stage mitigation for the effective protection of surface water and groundwater. ~~The proposal to allow for a possible incremental change to water levels via an adjustable weir includes the requirement that no significant change be affected on the receiving environment in the local context, and requires consultation with the NPWS (Section 4.8.5.1.4 of the EIS).~~ **[A weir shall be provided as described in Section 4.8.5.4 of the E.I.S. (as amended).]**	12.52

No.	Stage	Description	Main Report (Volume 2) Reference
		Lackagh Fen	
12.4	*C*	The road construction works area will be fenced off to avoid further loss of this habitat than is required. Habitat clearance within the LMA will be limited to the area required for the footprint of the road and machinery access. Works within this area will be monitored by a suitably qualified ecologist to ensure that no unnecessary damage is imposed on this habitat.	12.51
.12.5	*O*	Mitigation measures for the protection of Lackagh Fen require effective management of surface water and groundwater flows. Measures for the protection of groundwater flows are set out in Chapter 4 and include the provision of a drainage layer at the base of the road embankment; rock fill to allow the through-flow of groundwater; and vertical hydraulic barriers to stop groundwater from flowing along the embankment	12.52
		Boathole Lough and Lough Corran	
12.6	*C*	Water quality mitigation measures have been set out in the Outline Erosion and Sediment Control Plan and in Chapter 14 Hydrological and Hydrogeological Assessment for the effective protection of surface water and groundwater. The road construction works area will be fenced off to avoid any further loss of peatland habitat than is required. Habitat clearance within the LMA will be limited to the area required for the footprint of the road and machinery access and will not require works within raised bog or lake/lakeshore habitats identified as ecological interests of the Boathole Lough & Lough Corran Co. Sligo Biodiversity Site. Works within this area will be monitored by a suitably qualified ecologist to ensure that no unnecessary damage is imposed on this habitat. The Outline Erosion and Sediment Control Plan sets out effective measures for the protection of water quality during construction.	12.51
12.7	*O*	Water quality mitigation measures have been set out in Chapter 4 (Description of *Proposed Road Development*) and in Chapter 14 Hydrological and Hydrogeological Assessment for the effective protection of surface water and groundwater.	12.52
12.8	*O*	Measures for the protection of groundwater flows are set out in Chapter 4 (Description of *Proposed Road Development*) and in the Hydrological and Hydrogeological Assessment (Chapter 14) and include the provision of vertical hydraulic barriers to stop groundwater from flowing along the embankment.	12.52

No.	Stage	Description	Main Report (Volume 2) Reference
		During the operational phase the surface water runoff and attenuation ponds must be managed and monitored to ensure that they are working effectively and impacts to surface and ground water quality are not arising. **[The acrotelm and surface sods taken from the cutover bog and transition mire habitats at the south eastern corner of the Lough Corran complex will be used for the reinstatement of the peat repository site within the CPO directly adjacent to this peatland complex. This Acrotelm shall be sourced from a stockpile which has not been stored for a period of greater than 6 months during winter and 3 months during summer].**	
Ardloy & Aghalenane Loughs			
12.9	*C*	The road construction works area will be fenced off to avoid further loss of this habitat than is required. Habitat clearance within the LMA will be limited to the area required for the footprint of the road and machinery access. The Outline Erosion and Sediment Control Plan sets out effective measures for the protection of water quality during construction.	12.51
12.10	*O*	Measures for the protection of groundwater flows are set out in Chapter 4 (Description of *Proposed Road Development*) and in the Hydrological and Hydrogeological Assessment (Chapter 14) and include the provision of a drainage layer at the base of the road embankment and vertical hydraulic barriers to stop groundwater from flowing along the embankment. During the operational phase the surface water runoff and attenuation ponds must be managed and monitored to ensure that they are working effectively and impacts to surface and ground water quality are not arising.	12.52
Cuileencroobagh Lough			
12.11	*C*	The Outline Erosion and Sediment Control Plan sets out effective measures for the protection of water quality during construction.	12.51
12.12	*O*	Measures for the protection of surface water and groundwater flows are set out in the Hydrological and Hydrogeological Assessment (Chapter 14).	12.52
Swallow Holes Complex			
12.13	*C*	The Outline Erosion and Sediment Control Plan sets out effective measures for the protection of water quality during construction.	12.51

No.	Stage	Description	Main Report (Volume 2) Reference
12.14	*O*	Measures for the protection of surface water and groundwater flows are set out in Chapter 4 (Description of *Proposed Road Development*) and in the Hydrological and Hydrogeological Assessment (Chapter 14) and include the provision of: Silt traps, sedimentation basins and / or hydrocarbon interceptors to be constructed at sensitive outfalls.	12.52
Marsh (GM1)			
12.15	*C*	The road construction works area will be fenced off to avoid further loss of this habitat than is required. Habitat clearance within the LMA will be limited to the area required for the footprint of the road and machinery access. Compensatory planting of native wet grassland species will be carried out post construction in line with the prescriptions of the Landscape and Visual Impact Assessment (Chapter 10).	12.51
Wet willow/alder/ash woodland (WN6)			
12.16	*C*	The road construction works area will be fenced off to avoid further loss of this habitat than is required. Habitat clearance within the LMA will be limited to the area required for the footprint of the road and machinery access. Works within this area will be monitored by a suitably qualified ecologist to ensure that no unnecessary damage is imposed on this habitat. Compensatory planting of native species will be carried out post construction in line with the prescriptions of the Landscape and Visual Impact Assessment (Chapter 10).	12.51
Oak/ash/hazel woodland (WN2)			
12.17	*C*	The road construction works area will be fenced off to avoid further loss of this habitat than is required. Habitat clearance within the LMA will be limited to the area required for the footprint of the road and machinery access. Works within this area will be monitored by a suitably qualified ecologist to ensure that no unnecessary damage is imposed on this habitat. Compensatory planting of native species will be carried out post construction in line with the prescriptions of the Landscape and Visual Impact Assessment (Chapter 10).	12.51
Scrub (WS1)			

No.	Stage	Description	Main Report (Volume 2) Reference
12.18	*C*	The road construction works area will be fenced off to avoid further loss of this habitat than is required. Habitat clearance within the LMA will be limited to the area required for the footprint of the road and machinery access. Works within this area will be monitored by a suitably qualified ecologist to ensure that no unnecessary damage is imposed on this habitat. Compensatory planting of native species will be carried out post construction in line with the prescriptions of the Landscape and Visual Impact Assessment (Chapter 10).	12.51
		Hedgerows (WL1) / Treelines (WL2)	
12.19	*C*	The road construction works area will be fenced off to avoid further loss of this habitat than is required. Habitat clearance within the LMA will be limited to the area required for the footprint of the road and machinery access. Works within this area will be monitored by a suitably qualified ecologist to ensure that no unnecessary damage is imposed on this habitat. Compensatory planting of native species will be carried out post construction in line with the prescriptions of the Landscape and Visual Impact Assessment (Chapter 10).	12.51
		Exposed calcareous rock (ER2) at Carrownagark	
12.20	*C*	The road construction works area will be fenced off to avoid further loss of this habitat than is required. Habitat clearance within the LMA will be limited to the area required for the footprint of the road and machinery access.	12.51
		Badger	
12.21	*C*	Mitigation measures for badgers are set out in the 'Non-volant Mammal Report' (Appendix 12.3 of Volume 4) and include: a pre-construction survey, badger evacuation measures, protection of setts, provision of two underpasses in the townlands of Carrownagark and Drumderry, badger resistant fencing along the entire corridor, supervised sett destruction and creation of artificial setts. All culverts/bridges greater than 1m in diameter will be designed to be passable by mammals by incorporating a ledge. (Also an operational mitigation). Badger-proof mammal fencing will be installed along the entirety of the road corridor to provide protection for foraging and commuting animals, as detailed in the Non-volant Mammal Report (Appendix 12.3 of Volume 4). Further surveying of badgers will be undertaken immediately prior to the land clearance and construction works and mitigation	12.51

No.	Stage	Description	Main Report (Volume 2) Reference
		measures altered according to the results of these surveys. (Also an operational mitigation) Prior to any work commencing in the vicinity of a badger sett directly affected by the road (within 30m), it must be ensured that badgers are excluded and evacuated All works affecting badger setts will require consultation with the NPWS and can only be carried out under licence and with the supervision of an approved ecologist.	
12.22	*O*	Operational mitigations for badger are limited to ensuring that the mitigations employed during construction phase including artificial setts and wildlife fencing are operating effectively.	12.52
		Otter	
12.23	*O*	Mitigation measures for otter include the provision of mammal ledges within culverts and mammal fencing along the road corridor, as detailed in the Non-volant Mammal Report (Appendix 12.3 of Volume 4).	12.51
12.24	*O*	No operational mitigations, other than the maintenance of mammal fencing as for badger, are required for otter.	12.52
		Pine marten, Irish stoat and Irish hare	
12.25	*C*	Exclusion fencing and mammal passes for badger and otter will minimise disturbance to these species.	12.51
12.26	*O*	No operational mitigations, other than the maintenance of mammal fencing as for badger, are required for pine marten, Irish stoat and Irish hare.	12.52
		Bats	
12.27	*C*	Habitat creation and provision of linear woodland corridors as set out in the Landscape and Visual Impact Assessment mitigations (Chapter 10); provision of alternative roosts after consultation with NPWS; careful timing of the works; restriction on lighting; checking of mature trees prior to felling by an ecologist; checking of buildings/ structures prior to demolition by an ecologist	12.51
		Atlantic salmon	
12.28	*C*	No works will be carried out during the salmonid close season (unless agreed with IFI). Water quality protection measures will be adhered to following the prescriptions of the Hydrological and Hydrogeological	12.51

No.	Stage	Description	Main Report (Volume 2) Reference
		Assessment (Chapter 14) and the Outline Erosion and Sediment Control Plan.	
12.29	*O*	Operational mitigations to protect water quality within the aquatic environment will also protect salmon.	12.52
		White-clawed crayfish	
12.30	*C*	Minimisation of footprint within the aquatic environment, with further requirements for removal of this species in advance of works in the aquatic environment. Water quality protection measures will be adhered to following the Outline Erosion and Sediment Control plan and the Hydrological & Hydrogeological Assessment (Chapter 14)	12.51
12.31	*O*	Operational mitigations to protect water quality within the aquatic environment will also protect white-clawed crayfish.	12.52
		Brook lamprey	
12.32	*C*	Mitigations for water quality and the protection of salmon within the aquatic environment will serve to protect lamprey. Water quality protection measures will be adhered to following the Outline Erosion and Sediment Control plan and the Hydrological & Hydrogeological Assessment (Chapter 14). Brook lamprey will be removed prior to any works carried out within the instream habitats, particularly along the shallow water's edge. This will require an electrical fishing survey and a licence to undertake this work from the Department of Communications, Energy and Natural Resources.	12.51
12.33	*O*	Operational mitigations to protect water quality within the aquatic environment will also protect brook lamprey.	12.52
		Marsh fritillary butterfly	
12.34	*C*	Mitigation includes design and creation of new wetland habitats in the form of Constructed Wetlands as set out in the Landscape and Visual Impact Assessment (Chapter 10). These habitats will be suitable for colonisation by the food plant (Devil's bit scabious) and will form 'stepping stones' for the connectivity of suitable habitat within the *Proposed Road Development*. Additional surveys in advance of construction are required for larvae / larval webs, with potential requirement for translocation during the construction stage.	12.51
12.35	*O*	Mitigation includes replanting and management of high diversity grassland and wetland habitat within the proposed Constructed	12.52

No.	Stage	Description	Main Report (Volume 2) Reference
		Wetlands within the CPO as detailed in the Landscape and Visual Impact Assessment (Chapter 10). This will provide suitable habitat to support the colonisation of the food plant (Devil's bit scabious). It is proposed to undertake a pre-construction baseline survey of Marsh fritillary populations at Lackagh Fen, Aghalenane/Ardloy Loughs and at any other locations this species has been recorded within the development footprint. The success of the geotechnical, hydrological and hydrogeological mitigation for road construction in each of these areas shall be measured by comparing post construction monitoring results against those pre construction ones. Post Construction recording shall be carried out at both 12 months and 24 months after construction. These results will be used to inform future design measures on road construction projects.	
		Vertigo geyeri	
12.36	*C*	Mitigation measures set out in Chapter 4 (Description of the *Proposed Road Development*) and in the Hydrological and Hydrogeological Assessment (Chapter 14) for the effective protection of surface water and groundwater flows will effectively protect the supporting habitats of this species. The protection of groundwater-dependant spring habitats at Aghalenane and Ardloy Loughs Complex will effectively protect this species.	12.51
12.37	*O*	The measures for the protection and sustainable management of the hydrological and hydrogeological regime at the supporting Annex I habitats (Aghalenane and Ardloy Loughs) are set out in Chapter 4 and in the Hydrological and Hydrogeological Assessment (Chapter 14). It is proposed to undertake a pre-construction baseline survey of Vertigo geyeri at Aghalenane/Ardloy Loughs. The success of the geotechnical, hydrological and hydrogeological mitigation for road construction at this location shall be measured by comparing post-construction monitoring results against those pre construction ones. Post Construction recording shall be carried out at both ~~12 months~~ **[1 year]** and ~~24 months~~ **[5 years]** after construction. These results will be used to inform future design measures on road construction projects.	12.52
		General comments	
12.38	*C*	During the construction phase of the project the works will be monitored by an ecologist (whose attendance shall be as determined by the Environmental Manager appointed under the EOP) to ensure that the measures to protect water quality and terrestrial ecology are fully implemented by the contractor. Impacts within the zone of impact will be monitored to ensure that these are retained within the accepted impact area and no further impacts are caused that may extend to designated sites within the vicinity of the *Proposed Road Development*. All fill material brought into the site will be screened at source at the donor site for invasive species, including Japanese knotweed, Himalayan balsam etc. to avoid spread of these species into the *Proposed Road Development* site. Invasive species found to be established within the works area will be managed and controlled to prevent their spread throughout the site or outside of the	12.51

No.	Stage	Description	Main Report (Volume 2) Reference
		site, in advance of the construction works commencing. Should any areas that could potentially be used by frogs for spawning require disturbance between the months of February to June, the area will be inspected by an ecologist to ensure that no spawn or tadpoles are present. A derogation license from the NPWS will be required if frogs/frogspawn are to be interfered with. Any necessary modifications to the proposed mitigation measures will be made to accommodate any changes in the populations of protected species within the site. These changes will be agreed in advance with the local NPWS ranger. Details of construction and operational phase monitoring will need to be agreed with NPWS at the pre-construction phase and must include for the supervision of site works by a suitably qualified ecologist (as and when required under the EOP or as determined by the EAO), with provision for an aquatic ecologist with experience in protected aquatic species and fisheries to be present during any works in the aquatic environment.	
12.39	*O*	Bat boxes, vegetative corridors, underpasses and mammal fencing will be monitored by a suitably qualified ecologist to determine the efficiency of the mitigation measures. If artificial setts are required for badgers, these will require a detailed monitoring programme to establish the success of the setts.	12.52
		CHAPTER 13 SOILS AND GEOLOGY	
13.1	*C*	<u>Mitigation by avoidance</u> The design is considered the best possible, in terms of minimising the impact to the geological environment. The 'cut and fill' approach has been followed as far as was reasonably practicable emphasising the requirement to utilise excavated suitable material from road cuts in road embankments; however, the earthworks balance has been largely determined by: - Poor ground conditions; - The requirement to accommodate over bridges and under bridges; - Mitigation by avoidance and reduction which was been actively applied to the design primarily as a result of hydrological and hydrogeological impacts and the influence this has on the vertical alignment; - The requirement to provide suitable cover for drainage culverts; The result of these requirements is a significant deficit of suitable material and a surplus of unsuitable material generated onsite. However, having regard to the Department of Environment, Heritage and Local Government (DoEHLG) document: *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects* and the NRA Guidelines for *the Management of Waste from National Road Projects* and through the preparation of the Spoil Management Report (Appendix 4.3 contained within volume 4 of this EIS) and the Outline Construction and Demolition Waste Management Plan (Appendix 4.4	13.5.1

No.	Stage	Description	Main Report (Volume 2) Reference
		contained within volume 4 of this EIS), the design phase included an analysis of the 'spoil' geological materials being generated and expected surplus and geological materials handling procedures. The design adheres to the fundamental principles for the effective management of raw materials and spoil for road construction by prioritising spoil prevention/minimisation, followed by spoil re-use, recycling and finally disposal for materials that cannot be subject to the other options. Any further changes at the detailed design stage (if made) must ensure that there is no increase in the level of impact to the environment.	
13.2	*C*	Mitigation by reduction *Materials Re-Use* Referring to article 2 (1)c of the Directive on Waste and an interpretation of the legislation provided to the design team (Spoil Management Report), soil and rock material excavated from within the boundaries of the CPO and used for site engineering purposes are unlikely to fall within the definition of waste. *Suitable topsoil & subsoil material* The recovered volume of suitable topsoil & subsoil material is considered sufficient for landscaping purposes throughout the *Proposed Road Development* and there are no anticipated requirements for the import or disposal of 'topsoil' material. In addition, the recovered volume of suitable subsoil material and bedrock material, processed into general fill, is to be used in embankments, screening bunds and noise barriers. It will be the contractor's responsibility to source the deficit, some of which is likely to be from the Type 1/Type 02 Spoil Repositories/Borrow Pits included within the limits of the *Proposed Road Development,* or, from local licensed quarries, or, from further borrow pits identified by the contractor in the vicinity of the works. *Unsuitable topsoil & subsoil material* An overview of the estimated quantities of unsuitable topsoil & subsoil material generated by the *Proposed Road Development* and the methods for its treatment and handling are outlined in section 4.10.2.2 of this EIS and within the Spoil Management Report contained within appendix 4.3 to this EIS. The general conceptual approach is to identify options/sites within the vicinity of the *Proposed Road Development* which are considered suitable in principle to accept or use spoil material arising from the *Proposed Road Development*. The land spreading of excavated soil and subsoil material outside the boundaries of the road project generally requires planning permission but some forms of land reclamation may constitute exempt development under the Planning and Development Regulations. While this is ultimately the ruling of the consent authority, the contractor should satisfy themselves if such an activity is required that planning permission has been obtained or is not required for the offsite management of waste generated on the	13.5.2

No.	Stage	Description	Main Report (Volume 2) Reference
		project. *Rock material* The preliminary design includes for the recovery and appropriate re-use of in the region of 27,000m^3 rock material, excavated at proposed road cuts. This material is to be re-used either in excavated form or processed as aggregates, in embankments, facings, noise barriers, culvert headwalls, gabions, channel linings, buttresses in rock slopes, rock trap bunds and road drainage systems. In addition to this there is potential for rock material to be won on site principally from the Type 02 Spoil Repositories/Borrow Pits No. 01, 02 and 03, this material may be used by the contractor in similar instances to the above.	
13.3	*C*	Soil Disposal This volume of 'waste' (which is the material remaining) is to be stockpiled separately to any potentially contaminated 'waste' soil materials. The potential of this volume of 'waste' for reuse is to be explored in preference to offsite disposal. However, should offsite disposal prove the most suitable option, the stockpile is to be examined for non-inert materials such as wood, which are generally not acceptable at permitted waste land spreading sites, and should be removed prior to transport. On inspection, the stockpile is to be removed offsite by a licensed haulier. The main contractor shall be required to keep full records of all waste collection permits held by subcontractors involved in moving 'waste' soil and subsoil materials from the *Proposed Road Development*, all waste licences, permits and registration certificates covering the destination of the 'waste', details of any exemption from the above requirements and details of the quantities and type of 'waste'. In addition, the contract documents are to ensure that all relevant legislation is complied with and that a waste management plan is prepared in accordance with Department of Environment, Heritage and Local Government document: *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects*.	13.5.3
13.4	*C*	Soil Handling *Topsoil* The handling of excavated 'topsoil' materials is to be managed in such a way to maintain the structure and integrity of the suitable materials for re-use. The following principles are to apply: - Avoid compaction of 'topsoil' materials by heavy machinery, which could limit vegetation establishment and encourage water-logging - Stockpile different 'topsoil' types separately - Shape stockpiles to shed water - Avoid repeated handling of 'topsoil' material, which could damage the soil structure	13.5.4

No.	Stage	Description	Main Report (Volume 2) Reference
		- Avoid stockpiling the 'topsoil' material to greater than two meters in height, which could create internal anaerobic conditions and damage the soil structure - Avoid transport over long distances and movement of 'topsoil' during wet weather - If quantities of 'topsoil' are limited, mix with subsoil or PEAT *Subsoil* The handling of excavated subsoil materials is also to be managed in such a way to maintain the structure and integrity of the suitable materials for re-use, in particular by minimising the ingress of water. The following principles are to apply: - Ensure that the vegetation and topsoil are in place for as long as possible - Avoid excavation and placing of subsoil during wet weather to maintain soil structure - Avoid stockpiling where feasible - Compact the subsoil material immediately after placement - Ensure that gradients on the compacted subsoil minimises the ingress of water - Remove ruts caused by heavy equipment also to minimise the ingress of water *Peat* The handling of excavated peat is more challenging in that the soil structure is less rigid and that stockpiled peat can have adverse effects on surface water bodies reaching the acidic and coloured leachate. Much of the peat excavated from the *Proposed Road Development* will be used to reinstate borrow pits along the *Proposed Road Development* corridor. The details of borrow pit locations, proposed reinstatement fill material characteristics and construction techniques are contained in the Spoil Management Report which is contained in Appendix 4.3 in the EIS. In terms of general handling of peat soils across the site, the following principles are to apply: - Avoid compaction of soft or peaty materials by heavy machinery, which could limit vegetation establishment and encourage water-logging; - Ensure that a geotechnical engineer/ engineering geologist is onsite to supervise and manage excavation works where excavation will intercept peat >1m depth; - Ensure that excavations which may undermine the upslope component of peat are sufficiently supported by buttress, frame or rampart to resist lateral slippage; - Drain the peat where excavation will intercept >1m depth in advance of excavation activity (1 month in advance	

No.	Stage	Description	Main Report (Volume 2) Reference
		where possible) to reduce pore water content and thus instability of the peat substrate; - Position such drains at an oblique angle, and never parallel, to slope contours to ensure ground stability; - Ensure that discharge volumes are attenuated prior to discharge (in accordance with the Outline Erosion and Sediment Control Plan) to watercourses by entrapping suspended sediment in gravel or aggregate material at the drain base; - Avoid stockpiling of peat in close proximity to watercourses, in particular the catotelm layer which is below the vegetated acrotelm layer (>0.3m depth) and behaves like a fluid once disturbed; - **[Peat shall be stored securely in suitable repository/stockpile sites designed by a Geotechnical Engineer.]** - Move any excavated catotelm peat to at least 100m away from drains or streams, where feasible; - If unavoidable, establish cut-off drainage, sediment percolation through vegetation, gravel at the drain base to entrap suspended solids, stilling ponds and/ or sedimentation ponds to minimise the effects of peat runoff on watercourses; - Protect riparian zones by restricting construction disturbance within 50m of streams and drains; - Monitor the drainage and attenuation system during the construction phase (in accordance with the Outline Erosion and Sediment Control Plan), particularly at all upstream and downstream sections relative to stockpiled peat. *Erosion & Sediment Control Plan* The disturbance and exposure of soil material during road construction is inevitable; therefore the adoption of erosion and sediment control plans is essential to prevent sediment pollution and to prevent or slow runoff to allow any suspended solids to settle out in situ. The Outline Erosion and Sediment Control Plan describes the methods that will be employed in this regard and is included as Appendix 4.5 in this EIS.	
13.5	*C*	Soil Chemistry & Water Quality All fuel and other hydrocarbons stored on site during the construction phase are to be located in an impermeable bunded area designed to contain the volume of fuel stored. All refuelling of vehicles and equipment on site is to take place on an impermeable area and drainage from this area is to be contained and treated appropriately to remove contaminants prior to discharge to the surface water drainage system. All material and equipment on site is to be stored appropriately to minimise the risk of contamination of soil or groundwater. All foul drainage (from toilets, canteens etc) from construction compounds is to be collected in sealed systems and disposed of to the foul sewage network in the area or to an appropriate on-site treatment system.	13.5.5

No.	Stage	Description	Main Report (Volume 2) Reference
		These measures also mitigate the impact of removing soil and subsoil material on groundwater by reducing the protection afforded to underlying groundwater aquifer.	
13.6	*C*	Collapse of karst features The classification of karst ground conditions by typical morphological assemblages provides guidelines for the encountering of karst features during construction works. The classification suggests that epikarst-type rock head encountered within the study area indicates a 'youthful' or reactivated 'relic' karst system, which is characterised by small 'drop-out' or 'buried' dolines or sinkholes, as identified during the karst survey, and widespread fissuring within a few meters of the surface, as indicated by the identification of an epikarst layer in the geophysical survey. The collapse of soil into pre-existing cavities or voids in the bedrock can be triggered by induced local increases of water input to the soil as a result of inadequate drainage along the *Proposed Road Development* or the lowering of the water table from above to below rock head. Research shows that drainage control is the key mitigation measure to minimise possible doline or sinkholes failure in a 'youthful' karst system and that the majority of highway related sinkholes identified in US study occurred along unsealed roadside trench drains. Preventative strategies and drainage control measures in karst areas, i.e. where karst features have been identified, are to include the use; of sealed drainage, services and ditches, flexible infrastructure lines and sealed joints along the road surface, the backfilling of excavation and trenches with excavated material to ensure the same order of permeability and the discharge of road drainage to an existing stream or to a location some distance away from the highway pavement. The collection and conveyance of road runoff in particularly sensitive areas (detailed in Chapter 14 of this EIS), should be included for in the construction methodology. Further details on drainage control are given in the Hydrological and Hydrogeological Impact Assessment Chapter and are to be applied in particular around proposed cuts. Should collapse occur during construction, the collapse is to be excavated to the bedrock drain, then refilled with inert material graded upward from coarse rocks to finer sediments to allow natural flow through the bedrock drain without the loss of sediments that cause collapse, as recommended by the American Geological Institute (AGL). The use of an additional preventative strategy such as the incorporation of geogrid reinforcement at the base of the structural road pavement in cut areas or within the embankment in fill areas, will be considered, where there is substantial soil cover over bedrock and a history of sinkhole/ doline failures. While this is not the case in the karst areas of this *Proposed Road Development*, this strategy will be considered depending on the geological conditions encountered during construction. All excavation and backfilling work in karst areas is to be supervised by a karst expert whose attendance shall be as determined by the Environmental Project Manager employed by the contractor under the Environmental Operating Plan. The measures to mitigate the impact of collapse of karst features on groundwater are detailed in the Hydrology & Hydrogeology chapter.	13.5.6

No.	Stage	Description	Main Report (Volume 2) Reference
		CHAPTER 14 HYDROLOGY & HYDROGEOLOGY	
14.1	*C*	Mitigation by avoidance The design is considered the best possible, in terms of minimising the impact to the hydrological and hydro-geological environment. Mitigation by avoidance has been actively applied to the alignment design as the Impact Assessment progressed. This includes changes made to the road design as potential impacts became apparent which are discussed in Chapter 3 of this EIS (Consideration of Alternatives).	14.5.1
14.2	*O*	Mitigation by Reduction Design Phase The current road alignment is considered the best possible design, in terms of minimising the impact to the hydrological and hydrogeological environment through mitigation by avoidance and mitigation by reduction (as described in Chapters 3 and 4 of this EIS). Any further changes at the detailed design stage (if made) must ensure that there is no increase in the level of impact to the environment. *Drainage Design* A drainage system is an integral part of the *Proposed Road Development* design and includes containment for accidental spillages at each outfall, petrol/ oil interceptors, and attenuation ponds in the form of constructed wetlands. The drainage system is designed so that surface runoff, as far as is practicable, remains in the same surface catchment area as under pre-construction conditions, that surface runoff flows through suitable attenuation infrastructure where necessary before flowing into catchments or streams and that surface runoff flows in sealed drainage for the section of the development that crosses or encounters any active karst conduits. The increased attenuation and containment of the proposed drainage system is a certain indirect impact of the *Proposed Road Development* on the existing drainage regime during the operational phase, by attenuating road runoff and by containing accidental spillages where the existing N4 road has no attenuation, containment for accidental spillages and petrol interceptors, and is considered a positive one. The importance of the surface water quality is rated as high for the streams receiving runoff from the outfalls as they flow into the Unshin River and Lough Arrow which are classified by the EPA as having good status, as per above; the magnitude of this impact is rated as minor beneficial, as there is a likely reduction in pollution risk of 50% or more where existing risk is <1% annually; and therefore the significance of this impact is rated minor beneficial. The increase in the volume and rate of surface runoff discharging from the catchments as a result of an increase in impervious area is a certain indirect impact of the *Proposed Road Development* on the existing drainage regime during the operational phase. The attenuation balancing ponds are designed to accommodate a 100-year return period flow and are designed to have adequate	14.5.2.1

No.	Stage	Description	Main Report (Volume 2) Reference
		storage to allow a permissible outlet flow similar to the maximum existing flow from the catchment in accordance with UK Highways Agency publication *Vegetative Treatment Systems For Highway Runoff HA103/06* and UK Highways Agency (2009) *Surface and Sub-surface Drainage Systems for Highways HD33/06*. The importance of the surface water quality is rated as high for streams flowing into the Unshin River and Lough Arrow as per above; the magnitude of this impact is rated as negligible, resulting in a negligible change in predicted peak flood level; and therefore the significance of this impact is rated imperceptible. The design of embankments at Lackagh Fen (as described in the Geotechnical section of Chapter 4) includes sheetpiles where soft ground is encountered during excavations, rockfill below the water table to allow the through flow of groundwater, and vertical hydraulic barriers to stop groundwater from flowing along the embankment. These measures will reduce the hydrogeological impacts on the fen as a result of the development. The design of embankments at Boathole and Lough Corran (as described in the Geotechnical section of Chapter 4) includes a drainage layer at the base of the embankment, sheetpiles where soft ground is encountered during excavations, rockfill below the water table to allow the through flow of groundwater, and vertical hydraulic barriers to stop groundwater from flowing along the embankment. These measures will reduce the hydrogeological impacts on the Loughs as a result of the development. The design of embankments at Ardloy and Aghalenane Loughs and adjacent to the Boathole Lough (as described in the Geotechnical section of Chapter 4) incorporates a drainage layer at the base of the embankment and vertical hydraulic barriers to prevent groundwater movement along the embankment. Also provided at Ardloy and Aghalenane Loughs is traverse embankment drainage measures. These measures will reduce the hydrogeological impacts on the site as a result of the development. The increased attenuation and containment of the proposed drainage system is a certain indirect impact of the *Proposed Road Development* on the conservation areas during the operational phase, by attenuating road runoff and by containing accidental spillages where the existing N4 road has no attenuation, containment for accidental spillages and petrol interceptors, and is considered a positive one. The importance of the conservation areas is rated high, very high and extremely high; the magnitude of this impact is rated as minor beneficial, as there is a likely reduction in pollution risk of 50% or more where existing risk is <1% annually; and therefore the significance of this impact is rated minor beneficial. Flow monitoring of streams DX1 to DX11 is to be undertaken prior to construction, in order to provide accurate baseline data for comparison during the construction and operation phases.	
14.3	*O*	<u>Water Quality</u> Engineering controls for calculated storm runoff volumes will be provided for the artificial road catchment and the attenuation and release of this water to the natural catchment. Attenuation of storm runoff and sediment settlement is particularly important for all drainage on the development as all parts of the road ultimately drain into either the Unshin River cSAC (c. Ch 00-190mm-	14.5.2.2

No.	Stage	Description	Main Report (Volume 2) Reference
		13,200m) or the Lough Arrow cSAC (c. Ch13,200m-14,400m). To minimise the impact on surface water and groundwater quality, the following mitigation measures are to be adopted: - Streams DX1 to DX11 and selected groundwater monitoring boreholes are to be monitored prior to construction, in order to provide accurate baseline data for comparison during the construction and operations phases; - As outlined in the drainage design (as discussed in Chapter 4 and appendix 4.1 (volume 4) of this EIS), petrol interceptors and containment (and settlement) facilities are to be constructed at each outfall to mitigate for the risk of pollution from road runoff and accidental spillages; - Verges within the design incorporate grassed surface water channels where the design standards permits to reduce soil erosion and suspended matter in runoff; - A strict procedural approach to groundwater pumping (if required) and surface runoff, which conforms to best industry practice, is to be agreed upon, prior to construction (see the Emergenecy Response section in the Outline Erosion and Sediment Control Plan).; - Grassed surface channels where used are to be sealed at locations where the bedrock aquifer is classified as extremely vulnerable, i.e. where less than 3m of subsoil is present. Current information predicts that such conditions may be encountered at c. Ch. 2,800m-3,175m, c. Ch 3,875m-4,175m and c. Ch. 10,300m-10,540m. - The Grassed surface Water Channels if used shall be sealed where possible karst features have been identified, current information predicts these locations to be from c. Ch 9,500m to c. Ch10,500m, although more locations may be identified during construction.	
14.4	*C*	Material Handling Of significance during the construction phase of the project is the excavated materials handling, storage and re-use. There is potential for direct and indirect negative impacts on ground stability and water quality. Control of surface water runoff from the site during the construction phase and operational phase of the *Proposed Road Development* will be required in order to manage potential runoff of contaminants into the streams. Hydrology To minimise the impact on drainage during construction, the following mitigation measures are to be adopted: - Flow monitoring of streams DX1 to DX~~*10*~~ **[11]** is to be undertaken during construction on a monthly basis and for up to one year after construction, in order to ensure the impact on baseline flows is minimised.	14.5.2.3

No.	Stage	Description	Main Report (Volume 2) Reference
		Water Quality To minimise the impact on surface water and groundwater quality during construction a detailed operating procedure is contained in the Outline Erosion and Sediment Control Plan (Appendix 4.5 to this EIS) and the following general mitigation measures are to be adopted: - Streams DX1 to DX~~10~~ **[11]** and selected groundwater monitoring boreholes are to be monitored during construction on a monthly basis and for up to one year after construction, in order to minimise the impact on baseline hydrochemistry; - Strict adherence to an agreed approach to pumping and surface runoff and the emergency spill plan is to be operated during construction; - Fuels, oils and chemicals are to be stored on impermeable bases, away from drains and watercourses; - Refuelling of plant and vehicles is to be done on impermeable surfaces, away from drains and watercourses; - Silt traps, settlement lagoons, wetlands or hydrocarbon interceptors are to be placed at sensitive outfalls. Groundwater Levels To monitor and minimise the impact on groundwater levels during construction, the following mitigation measures are to be adopted: - Groundwater level monitoring is to be undertaken at all available groundwater monitoring boreholes during construction on a monthly basis and for up to one year after construction and compared to the available pre-construction monitoring data. Groundwater Flow To minimise the impact on groundwater flow during construction, the following mitigation measures are to be adopted: - Where the proposed road cut extends to bedrock, all construction activity is to be closely monitored by a karst expert to identity any subsurface karst collapse features or active karst conduits in the unlikely event of encountering such features; - If such active karst conduits are found, additional drainage of sufficient capacity is to be incorporated into the existing drainage design for the road, in order to allow the water to flow freely during periods of high precipitation, thus preventing flooding potential; - Should active karst conduits be encountered, a system of sealed drainage is to be provided in order to intersect the	

No.	Stage	Description	Main Report (Volume 2) Reference
		proposed road alignment, consisting of a pipe of suitable dimension for floodwaters to route the water beneath the road. This closed drainage is to be independent of the road drainage, which has the potential to intercept and carry contaminated road runoff into karst bedrock features. Groundwater Supply Wells To minimise the impact on groundwater supply wells, the following mitigation measures are to be adopted: - Groundwater levels are to be monitored in the identified spring-fed well of Carrownagark group water scheme well at c. Ch. 7,900m during the construction phase. Should the well be impacted by the *Proposed Road Development*, the replacement or access to an equivalent water supply is to be dealt with as part of the accommodation works.	
14.5	*O*	Drainage The potential increase in the volume and rate of surface runoff discharging from the catchments as a direct result of increased impervious areas and the potential change in the hydraulic behaviour of local streams receiving the increased surface runoff are considered to have a slight impact on the Unshin River, its tributaries the Markree Demesne Stream, Turnalaydan Stream, Drumfin River, Springfield Stream, Lissycoyne Stream and Drumderry Stream (Lough Arrow Catchment) surface catchment areas overall. However to minimise the impact on drainage during operation, the following mitigation measures will be adopted: - Drainage outfalls are designed to be served by suitably sized constructed wetlands or interceptor ponds which will limit the runoff rate to that of existing Greenfield runoff (based on QBAR) rates for the site at all of the outfalls; - Attenuation of surface runoff is designed to be served by suitably sized holding ponds to reduce impact on stream flow. Water Quality To minimise the impact on surface water and groundwater quality during the operational phase, the following mitigation measures are to be adopted in accordance with the drainage design described in chapter 4: Spill containment measures and constructed wetlands[3] will be constructed at all outfalls. In addition hydrocarbon interceptors will be constructed at all outfalls from the mainline (national primary) carriageway. The existing N4 road has no attenuation, containment for accidental spillages and petrol interceptors, and is considered a positive one. The importance of the fisheries value is rated **medium**; the magnitude of this impact is rated as **minor beneficial**, as there is a likely reduction in pollution risk of 50% or more where existing risk is <1% annually; and therefore the significance of this impact is	14.5.2.4

[3] Except in the case of outfall 01, where existing attenuation facilities will be utilised.

No.	Stage	Description	Main Report (Volume 2) Reference
		rated **minor beneficial.**	
		CHAPTER 15 ARCHITECTURAL, ARCHAEOLOGICAL AND CULTURAL HERITAGE	
15.10	*C*	General In accordance with the Code of Practice (2000) between the National Roads Authority and the Minister of the Department of Arts, Heritage and the Gaeltacht, every effort has been made to avoid direct impacts on archaeological or architectural heritage features. One recorded archaeological monument which is the site of a levelled possible enclosure will be directly impacted upon by the *Proposed Road Development*. No National Monuments or protected buildings will be directly impacted by the proposed route. One possible enclosure was identified on aerial photographs in Doorly townland. If the presence of an enclosure is confirmed during archaeological test trenching it is proposed that this site will be preserved by record in agreement with the Department of Arts, Heritage and the Gaeltacht. All necessary licences, procedures and consents as specified in the National Monuments Act 1930-2004 will be complied with as part of this mitigation strategy. All mitigations shall be carried out under Ministerial Directions. The detailed methodology for all of proposed built heritage mitigation will be set out in method statements agreed with the National Monuments Service, in consultation with the National Museum of Ireland, and these method statements will form the basis for applications for the relevant statutory consents for the work, in accordance with the *National Monuments Acts 1930–2004.* Several different sorts of mitigation have been mentioned above in relation to specific impacts. The mitigations include further archaeological investigations, surveys, and screen-planting, all as set out with respect to individual affected features in Table 15-16 (of Chapter 15).	15.5.1
15.2		Specific mitigations **Targeted archaeological test excavations** shall be carried out at all those locations, detailed above and in Table 15-16 (of Chapter 15), which are deemed to have archaeological potential. **Building surveys** shall be carried out on those structures, as detailed above and in Table 15-16 (of Chapter 15), that are being directly impacted on by the *Proposed Road Development*. **Townland Boundary Surveys** shall be carried out of those sections of townland boundaries, as detailed above and in Table 15-16 (of Chapter 15), that are being traversed by the *Proposed Road Development*. **Wade surveys** shall be carried out of those sections of watercourses, as detailed above and in Table 15-16 (of Chapter 15), that are being directly impacted on by the *Proposed Road Development*	15.5.2

No.	Stage	Description	Main Report (Volume 2) Reference
		Screen planting. It is proposed, as detailed in Table 15-16 (of Chapter 15), that the carefully designed hedgerow and feature planting alongside the junction and embankments in Castlebaldwin as outlined in the Landscape and Visual Impact Assessment Chapter (10) of this EIS, will substantially lessen any visual impact of the *Proposed Road Development* from the Carrowkeel Passage Tomb cemetery and from the 17th century fortified house at Castlebaldwin. It is noted that the existing N4 is visible from both monuments already. **Geophysical survey** shall be employed, as detailed in Table 15-16 (of Chapter 15), at number of potential archaeological sites, in advance of test excavations and also where possible in other areas along the proposed route so as to inform the test trenching strategy.	
15.3		General mitigation measures *Archaeological Investigations (Test Excavations and Archaeological Excavation)* - In addition to the targeted site specific test trenching proposed (see above), a general testing strategy will be applied to all lands required for the *Proposed Road Development*. All archaeological features or finds and architectural and cultural heritage revealed will be mitigated prior to or during the construction of the *Proposed Road Development* in agreement with the National Monuments Section and the NRA Project Archaeologist. - The archaeological test trenching shall entail mechanical excavation of a 2m-wide trench along the centre-line of the proposed route with regular offset trenches to the edge of the land to comprise a testing sample of a minimum of 10% of the landtake. This is to be organised by and carried out in the presence of suitably qualified archaeologists and carried out under Ministerial Directions. During test excavations, upon discovery of any archaeological features or horizons the topsoil will be removed to the level of any archaeological features, if present; otherwise the trenches shall be excavated to the depth of subsoil. - Subsequent mitigation will involve either preservation *in situ* or preservation by record through full archaeological excavation. All mitigation practices will be carried out in accordance with current best practice and under Ministerial Directions. *Reporting and dissemination* - Illustrated technical and interpretive reports on all archaeological investigations on the *Proposed Road Development* will a) be filed with the regulatory authorities (National Museum of Ireland, National Monuments Service) and b) offered also to Sligo Library Service within 12 months of the completion of all archaeological fieldwork on the *Proposed Road Development*. - An illustrated summary of any significant archaeological discoveries will be offered for publication in an appropriate periodical (e.g. *Sligo Field Club publications*) or in the NRA's archaeological monograph series within 24 months of the	15.5.3

No.	Stage	Description	Main Report (Volume 2) Reference
		completion of fieldwork.	