

Contents

	Page	
21	Schedule of Environmental Commitments	1762
21.1	General	1763
21.2	Waste	1765
21.3	Human Beings, Population and Health	1766
21.4	Material Assets Non-Agriculture	1767
21.5	Material Assets – Agriculture	1769
21.6	Air Quality and Climate	1770
21.7	Noise and Vibration	1772
21.8	Landscape and Visual	1777
21.9	Archaeology, Architectural and Cultural Heritage	1785
21.10	Soils and Geology	1786
21.11	Hydrogeology	1790
21.12	Hydrology	1793
21.13	Biodiversity	1798

21 Schedule of Environmental Commitments

This chapter of the EIAR collates all of the design and mitigation measures (referred to in this chapter as Environmental Commitments) to be implemented during the construction of the proposed N6 Galway City Ring Road, here after referred to as the proposed road development, to reduce/avoid as far as practical significant impacts on the receiving environment.

The following environmental commitments are an integral element of the application for Approval. Further work will develop the design of the proposed road development in a manner such that there is no material change in terms of significant adverse effects on the environment. Opportunities may be identified to further reduce the significance of adverse impact and, in some cases, improve the residual impact. In this way the design measures, mitigation strategies, objectives and implementation measures set out below may be refined so to provide the optimum solution based on available construction techniques and technologies at the time of construction.

Best practice and good construction practice when referred to in this document refer to measures contained in modern guidance documents which set out the practice and procedures for environmental protection during construction and operational phases of a road project.

Where Legislation, Standards or Guidance Documents are referred to it should be noted that at the time of construction or operation of the proposed road development any amendments to these documents are applicable.

This section provides a summary of the main commitments under each of the environmental headings listed. Full details of the various commitments should be obtained by reference to the individual chapters of the EIAR as a whole.

In the following tables "C" denotes a commitment which refers mainly to the construction phase and "O" denotes a commitment which refers mainly to the operational phase of the proposed road development.

21.1 General

Ref No.	Stage	Commitments
1.1	C	Contract documents will include a requirement for the Contractor to update and finalise the Construction Environmental Management Plan (CEMP) (Appendix A.7.5) for the proposed road development prior to construction once appointed and to implement and maintain it during the construction phase.
1.2	C	The final Schedule of Environmental Commitments will be included in the CEMP. The CEMP will detail implementation methodologies for all environmental commitments.
1.3	C	There will be a contract management team appointed by the client on site for the duration of the construction phase. The team will supervise the construction of the works including monitoring the Contractor's performance to ensure that the proposed construction phase environmental commitments are implemented and that construction impacts and nuisance are minimised.
1.4	C	The construction management team will liaise with neighbours and the general community during the construction phase to ensure that any disturbance is kept to a minimum.
1.5	C	<p>The Contractor's team will include a Senior Environmental Manager (SEM) who will be responsible for implementation of the Construction Environmental Management Plan (CEMP) during construction. The SEM will draw up a schedule of monitoring required, listing the type of report expected and detailing to who the reports should be sent, etc. It is the responsibility of the SEM to ensure that all monitoring is carried out by competent persons. Where the monitoring results fall outside the range contractually required, the SEM is responsible for initiating and reporting on corrective action. This may require the alteration of relevant Environmental Control Measures.</p> <p>The SEM will provide a briefing for all of the Contractor's senior management including the Project Manager, Programme Manager, Construction Manager, Design Engineers, Structures Agents and Site Agents on the CEMP and the Environmental Commitments/Requirements that must be met during the construction phase. The Employer's Site Monitoring Team will be monitoring compliance with the CEMP.</p>
1.6	C	Pollution control measures will be installed upstream of each outfall from the proposed road development. These measures will include an appropriate combination of filter drains, attenuation ponds, swales, petrol and oil interceptors, wetlands and infiltration trenches/ponds (ref Chapter 5, Description of the Proposed Road Development).
1.7	C	When the proposed road development is in cutting or on embankment less than 1.5m high, combined filter drains will be provided. Where the proposed road development is on embankment between 1.5m and 6.0m, carriageway runoff will be picked up in surface water channels alongside the carriageway.
1.8	C	Where filter drains and swales cannot be used, alternative forms of vegetated pollution control will be employed prior to outfalling to surface waters such as treatment wetlands.
1.9	C	Treatment wetlands will have a permanent pool of minimum depth and a volume to cater for the first flush rainfall event.
1.10	C	In areas of extreme or high vulnerability groundwater areas or karstified areas, sealed drainage systems will be used.

Ref No.	Stage	Commitments
1.11	C	Flow restriction and attenuation storage measures will be provided at each surface water outfall from the mainline and link roads of the proposed road development.
1.12	C	Attenuation ponds will cater for storm events up to the 1 in 100-year storm period event. An overflow discharge facility will be provided for storm events in excess of 1 in 100-year return periods.
1.13	C	Petrol/Oil Interceptors will be employed at every outfall from the mainline and link roads of the proposed road development.
1.14	C	A minimum emergency spillage containment volume of 25m ³ will be provided at all outfall locations from the mainline of the proposed road development as per DN-DNG-03022.
1.15	C	Side roads (regional, local and minor access roads) with kerbs will be drained using gullies with carrier drains or combined filter/carrier drains. Piped drains will discharge to an outfall, a sealed drain, sufficiently sized existing drainage systems, a ditch, a swale or to the mainline drainage system. Where topography and surface watercourse conditions dictate, a soakaway or infiltration trench/basin may be required.
1.16	C	Side roads that do not require kerbs will be drained using either over-the-edge drainage or combined filter drains. The surface water will discharge to a sufficiently sized existing drainage system, an outfall, a sealed drain, a ditch, a swale or to the mainline drainage system.
1.17	C	Access will be provided to all elements of the drainage system including the spillage containment facilities, the pollution control and the attenuation ponds.
1.18	C	Throughout the course of the construction of the proposed road development, on-going visual inspections and monitoring of the haul routes along public roads will be undertaken to ensure any damage caused by construction traffic is recorded and that the relevant local authority is notified. Arrangements will be made to repair any such damage to an appropriate standard in a timely manner such that any disruption is minimised. Upon completion of the construction of the proposed road development, the surveys carried out at pre-construction phase shall be repeated and a comparison of the pre and post construction surveys carried out to determine any sites requiring remediation work post construction.
1.19	C	All project staff and material suppliers will be required to adhere to the Construction Traffic Management Plan (CTMP). As outlined within the CTMP, the Contractor shall agree and implement monitoring measures to confirm the effectiveness of the CTMP and compliance will be monitored by the resident engineer on behalf of the client. Regular inspections/spot checks will also be carried out to ensure that all project staff and material supplies follow the agreed measures adopted in the CTMP.
1.20	C	Any structural damage caused to buildings/structures/wells as a result of the construction will undergo a full stabilisation and rehabilitation works.
1.21	C	The following are the measures that will be taken to ensure that the construction site and surroundings are maintained to a high standard of cleanliness: Daily inspections will be undertaken to monitor tidiness. A regular program of site tidying will be established to ensure a safe and orderly site. If necessary, scaffolding will have debris netting attached to prevent materials and equipment being scattered by the wind.

Ref No.	Stage	Commitments
		<p>Food waste will be strictly controlled on all parts of the site.</p> <p>Wheel wash facilities will be provided for vehicles exiting the construction site. Wheel wash run off will be stored in an onsite storage tank and will be disposed of by permitted waste haulage company at a permitted or licensed facility.</p> <p>In the unlikely event that mud is carried from the construction site to the public road, it will be cleaned as required and will not be allowed to accumulate.</p> <p>Loaded lorries and skips will be covered if required.</p> <p>Surrounding roads used by trucks for access to and egress from the site will be inspected regularly and cleaned, using an approved mechanical road sweeper, when required.</p> <p>In the event of any fugitive solid waste escaping the site, it will be collected immediately and removed to storage on site, and subsequently disposed of in the normal manner.</p>

21.2 Waste

Ref No.	Stage	Commitments
7.1	C	Waste generated during the construction phase will be carefully managed according to the accepted waste hierarchy which gives precedence to prevention, minimisation, reuse and recycling over disposal with energy recovery and finally disposal to landfill.
7.2	C	The waste hierarchy will be implemented by identifying opportunities to firstly prevent waste from being produced, and secondly minimise the amount of waste produced.
7.3	C	Where prevention and minimisation will not be feasible, ways to reuse or recycle waste will be sought, preferably on-site to avoid the impacts arising from transportation. If this is not feasible, opportunities to reuse or recycle the waste off-site will be investigated or waste will be sent to an energy recovery facility, and only where there is no alternative, will waste be disposed of to landfill.
7.4	C	All waste removed from the site will be collected only by Contractors with valid waste collection permits, under the Waste Management (Facility Permit and Registration) Regulations 2007 and (Amendment) Regulations 2008, 2014, 2015. All facilities to which waste will be taken will have appropriate waste licences or permits, under the Waste Management Acts 1996 - 2011, and the regulations thereunder, allowing them to accept the type of waste that is to be sent there.
7.5	C	Hazardous waste generation will be minimised, and such waste will be recovered where feasible, and only disposed of if recovery is not feasible. Hazardous waste will be managed in accordance with the relevant legislation.
7.6	C	All wastes from the construction of the proposed road development will be delivered to authorised waste facilities in accordance with the Waste Management Acts 1996-2011. By only using facilities with the appropriate waste permits/licence, Galway County Council will be satisfied that the Contractor will comply with the objectives of the Waste Management Act and that any environmental emissions (noise, dust, water) are managed at the destination site and therefore are legally the responsibility of the

Ref No.	Stage	Commitments
		owner/operator of the destination site. In this manner Galway County Council can be satisfied that the off-site spoil management aspect of the development is legally compliant with environmental and waste management legislation.
7.7	C	In general, construction waste materials may include general construction debris, scrap timber and steel, machinery oils and chemical cleaning solutions. The practice of excessive purchase of materials and equipment to allow for anticipated wastage will be avoided.
		The Construction and Demolition Waste Co-Ordinator will arrange for a waste audit of the proposed road development once construction has fully commenced on site and of any facilities to which waste from the proposed road development is delivered as required. The Employer will receive summaries of any audit reports which will be completed within three months of the end of each calendar year. The effectiveness and accuracy of the documentation will be monitored on a regular basis via routine site visits.
7.8	O	Operational waste will be delivered to authorised waste facilities in accordance with the Waste Management Acts 1996 to 2016.
		Following construction, the Non-native Invasive Species Management Plan will be updated for the operational phase, taking into account the results of the detailed construction non-native invasive species management plan and operational maintenance requirements. Follow on treatment methods such as chemical treatment may be employed if specified in the requirements for ongoing control.

21.3 Human Beings, Population and Health

Ref No.	Stage	Commitments
18.1	C/O	Provide pedestrian crossing facilities at junctions with minor roads serving local rural communities.
18.2	C	Provide temporary visual screening from construction works at St. James' Church cemetery in Bushypark and at St. James' School, Bushypark.
18.3	C/O	Provide pedestrian crossing facility at Bushypark Junction with N59 Link Road North during construction and operation
18.4	C	Avoid any prolonged severance and minimise duration of use by construction traffic of An Seanbóthar.
18.5	C	Provide for alternative access along the bank of the River Corrib, along with prior advice for walkers, if access restrictions apply due to construction of the overhead bridge crossing.
18.6	C	Phase construction works to minimise impacts on racing events at Galway Racecourse.
18.7	C	Provide directional signage for access to car dealership and An Post sorting centre on N83 during construction.
18.8	C/O	Provide pedestrian crossing facilities at N84 Headford Road Junction during construction and operation.
18.9	C/O	Provide a footpath within the proposed development boundary along School Road, Castlegar.

Ref No.	Stage	Commitments
18.10	C	Provide directional signage for a Briarhill Business Park, including a car dealership located here during both the construction.
18.11	C/O	Take measures to ensure that cul-de-sacs or adjacent lands are not used for illegal parking in the operational phase.
18.12	C	During construction, all public notifications and all public project updates are provided in both Irish and English languages.
18.13	C	While it is expected that day-to-day communications involved in the construction of the proposed road development will be through the English language, the Contractor shall have the capacity to communicate and correspond through the use of the Irish language and to devote adequate and proportionate staff resources to dealing with any individual wishing to correspond and communicate through the Irish language.
18.14	O	Placenames shall be cited in accordance with the relevant Placename Order issued under the Official Languages Act 2003.

21.4 Material Assets Non-Agriculture

Ref No.	Stage	Commitments
15.1	C	In the event of an approval of the Protected Road Scheme and Motorway Scheme and approval under Section 51 of the Roads Act 1993 (as amended), by An Bord Pleanála and subject to the availability of funding, Notice to Treat will be served firstly on owners, lessees and occupiers of the dwelling houses and commercial properties to be acquired, within six months of the scheme becoming operative, unless an application has been made for Judicial Review, in which case the Notice to Treat will be served in accordance with the provisions of Section 217 (6A) of the Planning and Development Act 2000 as inserted by the Compulsory Purchase Orders (Extension of Time Limits) Act 2010. Compensation will be agreed or determined by the property arbitrator as soon as possible after service of Notice to Treat. After compensation has been agreed or determined and satisfactory title has been produced, part payment can be made while the claimant remains for an agreed period in the property to be acquired. This will facilitate the claimant in removing uncertainty and will facilitate arrangements being made, as early as possible, to secure a replacement property.
15.2	C	Where existing access to property is affected, this will be reinstated or an alternative access provided.
15.3	C	Where the infrastructure for service providers is impacted, this will be diverted or reinstated in accordance with service providers' requirements prior to construction.
15.4	C	During construction, restricted access across the construction area at the NUIG Sporting Campus facilities will be maintained.

Ref No.	Stage	Commitments
15.5	C	<p>Alternative pitch facilities will be provided to replace the existing pitches directly impacted by the proposed road development. The facilities include a floodlit 3G GAA pitch and a floodlit 3G training area and associated site infrastructure for the drainage of these pitches and furniture such as ball-stop netting. The proposed road development also intercepts the existing sports pavilion resulting in direct impacts to its western end and the building will be modified as follows:</p> <ul style="list-style-type: none"> • The existing western plant room, 1 no. changing room, 1 no. storage area, 1 no. weights area and associated access hallways on both ground floor and upper levels will be demolished. • The western plant room and its associated plant will be relocated. • Construction and reconfiguration of the internal and external walls, roof, windows and door locations.
15.6	C	During the construction of the River Corrib Bridge, alternative access to that along the bank of the River Corrib will be provided.
15.7	C	Temporary stables will be provided for Galway Racecourse during the construction of the proposed road development until such time as the Galway Racecourse Tunnel is complete and the permanent stables and associated facilities are constructed.
15.8	C	Mitigation measures as detailed in individual accommodation works agreements, such as boundary treatment, domestic entrances, property condition surveys (as outlined below for Noise and Vibration), provision of ducting to facilitate services, maintenance of access during construction amongst other items will remove impacts related to the properties with partial landtake.
15.9	C	Where the infrastructure for service providers is impacted, this will be diverted or reinstated in accordance with service providers' requirements prior to construction. Service users will be notified in advance of any temporary disruption or outages necessitated by the construction works. The disruption to services or outages will be carefully planned so the duration is minimised.
15.10	C	Public water supply and foul water systems affected will be reconnected. All necessary diversions will be carried out in accordance with the local authority and Irish Water's requirements. Where private potable water supplies are impacted, a new well or alternative water supply or financial compensation for the loss of the well will be provided.

21.5 Material Assets – Agriculture

Ref No.	Stage	Commitments
14.1	C	The landowner will be provided with access to all separated land parcels during the construction of the proposed road development. Where temporary disruptions to this access occur landowners will be notified in advance.
14.2	C	Where existing water and electricity supplies are disrupted during the construction phase an alternative water source or electricity supply will be made available e.g. water tanker or electric cable ducting. If access to surface drinking water sources are permanently restricted alternative groundwater supplies will be provided (or compensation to allow farmer drill his own well).
14.3	C	Suitable boundary fencing will be erected to delineate the line of the proposed development boundary and prevent disturbance to adjacent land.
14.4	C	A key contact person will be appointed during the construction phase to facilitate communications between affected landowners and to facilitate the re-organisation of farm enterprises by farmers during critical times.
14.5	C	Landowners with lands adjoining sites where either rock breaking, blasting or piling takes place will be notified in advance of these activities.
14.6	C	The impacts on water quality will be minimised by way of a programme of environmental commitments for surface and ground water sources as described in Hydrogeology and Hydrology sections.
14.7	C	The spread of dust onto adjoining lands will be minimised by way of environmental commitments set out in the air section. Typically, the impact of dust on agricultural grazing livestock is not significant.
14.8	C	Where drainage outfalls are temporarily altered or land drains blocked or damaged an adequate drainage outfall will be maintained and land drains will be repaired.
14.9	O	All separated land parcels will be accessible either via the local road network, via accommodation access roads and access tracks.
14.10	O	Where existing water and electricity supplies to fields or farm yards are severed, the supply will be reinstated by provision of ducting where possible. Alternatively, where ducting is not feasible a permanent alternative water source or electricity supply will be made available. Compensation payments will enable farmers to replace power and water supplies.
14.11	O	Water from the proposed road development will be diverted to attenuation ponds before discharging to watercourses or to ground. The drainage design of the proposed road development will intersect existing field drains and carry the drainage water to suitable outfalls.
14.12	O	Landscaping along the proposed road development will minimise the visual impact on farms along the route of the proposed road development and will over time improve shelter in affected farms.

21.6 Air Quality and Climate

Ref No.	Stage	Commitments
16.1	C	<p>The assessment of potential construction impacts contained in Section 16.5.3 of Chapter 16, Air Quality and Climate includes the implementation of ‘standard mitigation’, as stated in the TII Guidelines. This shall include the following measures:</p> <ul style="list-style-type: none"> • Spraying of exposed earthwork activities and site haul roads during dry weather. • Provision of wheel washes at exit points. • Control of vehicle speeds and speed restrictions. It is proposed that site traffic is restricted to 20km/hr. This will help to minimise the occurrence of dust re-suspension. • Sweeping of hard surface roads.
16.2	C	<p>The following measures will be implemented. These measures are based on best practice as outlined in the British Research Establishment (BRE) document ‘Controlling particles, vapour and noise pollution from construction sites’ and the Institute of Air Quality Management (IAQM) ‘Guidance on the assessment of dust from demolition and construction’, 2016.</p> <ul style="list-style-type: none"> • A public communication strategy will be implemented by the Contractor which will outline procedures to inform members of the community on activities that may be disruptive, further details are contained in the CEMP in Appendix A.7.5. This appendix also includes details of a complaints register which will be implemented during the construction phase. • Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the Contractor through regular servicing of machinery. • During dry periods when dust generation is likely or during windy periods, construction areas and vehicles delivering material with dust forming potential will also be sprayed with water, as appropriate. • Areas where materials will be handled and stockpiled will be positioned away from main site access roads. These areas will also be designed to minimise their exposure to wind – all stockpiles shall be kept to the minimum practicable height with gentle slopes. • There shall be no long-term stockpiling on site and storage time will be minimised. • Material drop heights from plant to plant or from plant to stockpile will be minimised. • Water suppression will be used during the demolition of buildings. • Crushing and concrete batching plant will be located as far from sensitive receptors as is reasonably practicable. All storage bins and transfer points will be covered. Silos will be fitted with reverse jet air filters.
16.3	C	<p>Dust screens will be implemented at locations where there is the potential for air quality impacts during the construction phase at locations where sensitive receptors are located within 100m of the works. In addition, a 2m dust screen will be provided at the locations in the areas of the overlap of the proposed road development and the Lough Corrib cSAC and where the proposed road development is adjacent to Moycullen Bogs NHA.</p>
16.4	C	<p>Staff training and the vigilant management of operations ensure that all dust suppression methods are implemented and continuously inspected.</p>

Ref No.	Stage	Commitments
		Further details on employee training are provided in the CEMP in Appendix A.7.5 .
16.5	C	Dust deposition and PM ₁₀ /PM _{2.5} will be carried out to confirm the effectiveness of the environmental commitments.
16.6	C	Dust deposition monitoring will be conducted at a number of locations in the vicinity of the proposed road development. At a minimum, monitoring will be carried out at the two nearest sensitive receptors at locations where works of a 'major' scale is proposed while works are taking place in proximity. Monitoring will be carried out using the Bergerhoff method, i.e. analysis of dust collecting jars left on-site (German Standard VDI 2119, 1972). Results will be compared to the TA Luft guidelines. Should an exceedance of the TA Luft limit occur during the construction phase or a complaint be received in relation to dust levels, additional environmental commitments, for example more regular spraying of water, will be implemented. At least one month of dust deposition monitoring will be carried out in advance of the commencement of works to determine a baseline.
16.7	C	It is proposed to carry out particulate monitoring (PM ₁₀ and PM _{2.5}) at the nearest sensitive receptors upwind and downwind of the construction works where sensitive receptors have been identified within 25m of the works. This monitoring programme will take place when works likely to generate dust are being carried out. The monitoring will allow direct comparison with the PM ₁₀ and PM _{2.5} air quality standards on a daily basis.
16.8	C	The particulate and dust deposition limits will be used to determine potential occurrences of dust nuisance associated with the proposed construction works. Should the particulate and dust deposition limit values be approaching an exceedance during the construction works, the levels will be recorded by the Contractor. An investigation will subsequently be carried out to determine potential causes and the options available to reduce the level of dust.
16.9	C	All potential causes for the high dust levels will be analysed. These will include the construction works taking place, potential off site sources and meteorological conditions. Should the construction works taking place be identified as the primary cause of the high level, the Contractor will ensure that the environmental commitments listed above are improved upon. Should high dust levels continue to occur following these improvements, the Contractor will provide alternative environmental commitments and/or will modify the construction works taking place.
16.10	C	The following environmental commitments will be implemented during the construction phase of the development so as to minimise CO ₂ emissions: <ul style="list-style-type: none"> • Materials required for the construction works will be sourced locally where possible. There are operational quarries located in proximity to the proposed road development. Rock crushing will be undertaken on site where possible, to reduce the requirement to import crushed stone to site. • The Construction Traffic Management Plan outlined in the CEMP in Appendix A.7.5 will be implemented in full. This will minimise congestion and encourage car sharing and the use of public transport. • Materials will be handled efficiently on site to minimise the waiting time for loading and unloading, thereby reducing potential emissions. • Engines will be turned off when machinery is not in use.

Ref No.	Stage	Commitments
		<ul style="list-style-type: none"> The regular maintenance of plant and equipment will be carried out. Materials with a reduced environmental impact will be used where available, such as: Ground Granulated Blast Furnace Slag (GGBS) and Pulverised Fly Ash (PFA) will be used as replacements for Portland cements and Recycled steel.
16.11	C	<p>The Contractor will be required to implement an Energy Management System for the duration of the works. This will include the following at a minimum:</p> <ul style="list-style-type: none"> Use of thermostatic controls on all heating systems in site buildings. The use of insulated temporary building structures. The use of low energy equipment and power saving functions on all computer systems. The use of low flow tap fittings and showers. The use of solar/thermal power to heat water for the on-site welfare facilities including sinks and showers.

21.7 Noise and Vibration

Ref No.	Stage	Commitments
17.1	C	<p>The Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001. These measures will ensure that:</p> <ul style="list-style-type: none"> No plant used on site will be permitted to cause an ongoing 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. Any plant, such as generators or pumps that is 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, the Contractor will be required to manage the works to comply with the limits detailed in Table 17.1 using methods outlined in BS 5228-1:2009+A1 2011. Part 1 – Noise.
17.2	C	<p>The Contractor will be required to conduct construction noise predictions prior to works taking place and put in place the most appropriate noise control measures depending on the level of noise reduction required at any one location.</p>

Ref No.	Stage	Commitments
17.3	C	The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item of plant will be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action will be to identify whether or not said item can be replaced with a quieter alternative.
17.4	C	For static plant such as compressors and generators used at work areas such as construction compounds etc., the units will be supplied with manufacturers' proprietary acoustic enclosures where possible.
17.5	C	The Contractor will evaluate the choice of piling, excavation, breaking or other working method taking into account various ground conditions and site constraints. Where possible, where alternative lower noise generating equipment that would economically achieve, in the given ground conditions, equivalent structural/ excavation/ breaking results, these will be selected to minimise potential disturbance.
17.6	C	If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant, or the application of improved sound reduction methods in consultation with the supplier or the best practice use of equipment and materials handling to reduce noise. In practice, a balance may need to be struck between the use of all available techniques and the resulting costs of doing so. It is therefore proposed to adopt the concept of "Best Available Techniques", as defined in EC Directive 96/61.
17.7	C	Proposed noise mitigation techniques will also be evaluated in light of their potential effect on occupational health and safety. The following outline guidance relates to practical noise control at source techniques which relate to specific site considerations: <ul style="list-style-type: none"> • For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant will be switched off when not in use and not left idling. • For piling plant, noise reduction can be achieved by enclosing the driving system in an acoustic shroud. For steady continuous noise, such as that generated by diesel engines, it is possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover. • For percussive tools such as pneumatic concrete breakers, rock drills and tools a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensuring any leaks in the air lines are sealed. Erection of localised screens around breaker or drill bit when in operation in close proximity to noise sensitive boundaries are other suitable forms of noise reduction. • For concrete mixers, control measures will be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum. • For all materials handling, the Contractor will ensure that best practice site noise control measures are implemented including ensuring that materials are not dropped from excessive heights and drop chutes/dump trucks are lined with resilient materials. This is an important consideration for site compounds where materials are loaded and unloaded. Site compounds in close proximity to noise sensitive areas (refer to Table 17.10 of Chapter 17, Noise and

Ref No.	Stage	Commitments
		<p>Vibration) will incorporate a strict noise control policy relating to materials handling.</p> <ul style="list-style-type: none"> • Where compressors, generators and pumps are located in areas in close proximity to noise sensitive properties/ areas and have potential to exceed noise criterion, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation. • Resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can be controlled by fixing resilient materials in between the surfaces in contact. • Demountable enclosures can also be used to screen operatives using hand tools and may be moved around site as necessary. • All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.
17.8	C	As per <i>BS 5228 -1:2009+A1</i> screens on level sites shall be placed as close as possible to either the source or the receiver. The construction of the barrier will be such that there are no gaps or openings at joints in the screen material. Annex B of <i>BS 5228-1:2009+A1:2014</i> (Figures B1, B2 and B3) provide typical details for temporary and mobile acoustic screens, sheds.
17.9	C	The Contractor will carefully plan the site layout. Within site compounds, the placement of site buildings such as offices and stores between the site and sensitive locations can provide a good level of noise screening. Similarly, in some instances materials such as topsoil or aggregate along the route of the proposed road development can provide a degree of noise screening if placed between the source and the receiver.
17.10	C	Construction activity will mostly take place during daytime hours Monday to Friday and Saturdays (ref Section 17.2.2.1 of Chapter 17, Noise and Vibration). Depending on the noise emission levels experienced and associated noise impact, the Contractor will be flexible and able to conduct certain works at hours which reflect periods when the neighbouring properties have lower sensitivities to noise.
17.11	C	It will be necessary to work overtime (including weekends) and night shifts at certain critical stages during the project. Over the expected 36-month construction phase there will be up to 10 weeks of night time working along different sections of the proposed road development primarily to facilitate bridge works over existing roads.
17.12	C	Consideration will be given to the scheduling of activities in a manner that reflects the location of the site and the nature of neighbouring properties. Each potentially noisy event/activity will be considered on its individual merits and scheduled according to its noise level, proximity to sensitive locations and possible options for noise control. In situations where a particularly noisy activity is scheduled e.g. activities identified in Table 17.9 of Chapter 17, Noise and Vibration (rock breaking/crushing/impact piling etc.) or other activities of similar noise level, the use of other on-site activities will be scheduled to control cumulative noise levels.
17.13	C	A designated noise liaison officer will be appointed to site during construction works to establish a clear form of communication between the Contractor and residents or building occupants in noise sensitive areas. All noise complaints will be logged and followed up in a prompt fashion by the liaison officer.

Ref No.	Stage	Commitments
17.14	C	<p>During the construction phase noise monitoring will be undertaken at the nearest sensitive locations to ensure construction noise limits outlined in Table 17.1 are not exceeded. Noise monitoring will be conducted in accordance with the International Standard ISO 1996: Acoustics – Description, measurement and assessment of environmental noise Part 1 (2016) and Part 2 (2017). The selection of monitoring locations will be based on the nearest sensitive buildings to the working area which will progress along the length of the road construction. It is recommended that noise control audits are conducted at regular intervals throughout the construction programme in conjunction with noise monitoring.</p> <p>In the case of vibration monitoring during construction the use of independent monitoring will be undertaken by external bodies for verification of results. Monitoring will be undertaken at identified sensitive buildings, where proposed works have the potential to be at or exceed the vibration limit values.</p>
17.15	C	<p>In terms of blast design control, specific guidance will be obtained from the recommendations contained within BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Vibration in relation to blasting operations in addition to experienced blast control techniques used by the Contractor. These will include some or all of the following:</p> <ul style="list-style-type: none"> • All blasting will be undertaken by professionally trained blast contractors. • Restriction of hours within which blasting can be conducted (09:00 – 18:00hrs). • Trial blasts will be tested in less sensitive areas to assist in blast designs and identify potential zones of influence. • Explosive charges will be properly confined by a sufficient amount of stemming. • Blasting contractors will ensure that the minimum amount of primer cord is used, and that no primer cord is located above ground. • Profiling will be carried out after each blast in order to ensure the geometry of the rock face can be established, enabling the optimum burden and spacing to be applied for subsequent blasts. • The design, execution and completion of any blasting within 150 metres of any existing structure shall require special considerations. This will include the use of pre and post condition structural surveys by a competent structural engineer. • Ground vibration and air over pressure (AOP) will be recorded simultaneously for each blast at the most sensitive locations, depending on the works area being blasted. • When blasting moves into a new area, an initial low level blast will be carried out (i.e. a low Maximum Instantaneous Charge (MIC)) and monitoring will be carried out simultaneously at a number of sensitive properties in different directions in order to generate specific scaled distance graphs. • The scaled distance graphs will be used to determine the optimum MIC for subsequent blasts area in order control vibration and AOP limits below the relevant limit values (as set out in Section 17.2.1) at the nearest sensitive buildings.
17.16	C	<p>In line with best practice mitigation measures from vibration sources, good communication and public relations are a key factor in reducing any startle effects to residents. In this instance, a Public Communications Strategy</p>

Ref No.	Stage	Commitments
		<p>will be implemented by the Contractor prior to the commencement of any blast works. In such cases, the following recommended environmental commitments are proposed:</p> <ul style="list-style-type: none"> • Relevant nearby residents will be notified before any work and blasting starts (e.g. a minimum of 24-hour written notification). • The firing of blasts will be undertaken, where possible, at similar times to reduce the 'startle' effect. • Ongoing circulars will be issued informing people of the progress of the blasting works. • The implementation of an onsite documented complaints procedure will be maintained by the Contractor. • The use of independent monitoring will be undertaken by external bodies for verification of results.
17.17	C	Vibration from construction activities should be limited to the values set out in Table 17.3 of Chapter 17, Noise and Vibration .
17.18	C	<p>In the case of vibration levels giving rise to human discomfort, in order to minimise such impacts, the following measures shall be implemented during the construction period:</p> <ul style="list-style-type: none"> • A clear communication programme will be established to inform adjacent building occupants in advance of any potential intrusive works which may give rise to vibration levels likely to exceed perceptible levels. The nature and duration of the works will be clearly set out in all communication circulars. • Alternative less intensive working methods and/or plant items shall be employed, where feasible. • Appropriate vibration isolation shall be applied to plant, where feasible. • Cut off trenches to isolate the vibration transmission path shall be installed where required. • In the case of impact piling or demolition works for instance, a reduction in the input energy per blow shall be considered where required. • Monitoring will be undertaken at identified sensitive buildings, where proposed works have the potential to be at or exceed the vibration limit values.
17.19	C	<p>Property condition surveys will be offered for all buildings within 50m of the proposed development boundary and those within 150m of proposed blasting works along the proposed road development.</p> <p>Property condition surveys will also be carried out at buildings and structures considered appropriate relative to their proximity to the works. Such property condition surveys shall be carried out by a Chartered Surveyor or Chartered Structural Engineer. Such property condition surveys, subject to the written agreement of relevant property owners, shall be carried out in two stages as the follows:</p> <ul style="list-style-type: none"> • the first stage shall consist of pre-construction condition surveys including photographic records which shall be carried out prior to the commencement of construction. • the second stage shall consist of post-construction condition surveys which shall include photographic records.
17.20	C	The location of potentially vibration sensitive activities have been identified for manufacturing facilities within the Parkmore and Racecourse

Ref No.	Stage	Commitments
		Business Parks. This location is in proximity to an area where blasting will take place as part of the proposed tunnel at Ballybrit. The most effective form of mitigation for this type of sensitive process is through on-going consultation with the property owners as the design and construction of the proposed road development progresses. This will involve baseline vibration monitoring and the use of trial blasts using an initial low level charge with simultaneously vibration measurements undertaken at the building. This information will be used to determine acceptable vibration levels for the facility relating to the sensitivity of the operating equipment. The results of this trial assessment will then set appropriate agreed limits values at the facility in question which will be monitored during subsequent blasts or other excavation methodologies. Where no safe limit is determined, the timing and scheduling of blasts will be undertaken in consultation with the facility when no sensitive operations are taking place. Given the short time period over which an individual blast takes place (i.e. a number of seconds), this approach is deemed to be feasible.
17.21	O	Low Noise Road Surface (LNRS) will be used to reduce noise generated at source.
17.22	O	Noise barriers as detailed in Table 17.14 in Chapter 17, Noise and Vibration and Figures 17.1.01 to 17.1.14 will be implemented to reduce noise levels along the propagation path between the source (proposed road development) and the specific receivers (houses, schools, churches etc.). These screens may be constructed as earth bunds, proprietary noise barriers or a combination of both.

21.8 Landscape and Visual

Ref No.	Stage	Commitments
12.1	C	Landscape mitigation proposals shall take account of the approaches and principles as set out in A Guide to Landscape Treatments for National Road Schemes in Ireland, in particular to Chapter 4: Components of the Roadside Landscape; Chapter 5: Soil Geographic Factors; and Chapter 6: Landscape Treatments. Unless otherwise qualified in the following or in Chapter 8, Biodiversity, seeding and planting proposals, including species and planting type and species shall be in accordance with Chapter 6 of the Landscape Guidelines (A Guide to Landscape Treatments for National Road Schemes in Ireland) adapted as required for local environmental and landscape conditions.
12.2	C	Site machinery shall operate within the proposed road development construction area.
12.3	C	Storage areas shall be located so as to avoid impacting further on existing residential and other property, woodlands, trees, hedgerows, drainage patterns, etc.
12.4	C	Solid site hoarding of minimum 2.0m in height shall be provided alongside construction works adjoining residential property or recreational amenities
12.5	C	Solid hoarding or similar, of minimum 2.0m in height shall be provided along any side of a proposed construction compound, where they are located within 100m of residential properties.
12.6	C	Construction compounds shall be fully-decommissioned and reinstated to their pre-construction condition at the end of the construction contract

Ref No.	Stage	Commitments
		unless these areas have been identified as habitat compensation or material deposition areas.
12.7	C	Side slopes and other landscape areas along the proposed road development shall be prepared for soiling, and either seeded and/or planted at the earliest possible opportunity. As such, some scope may exist for undertaking significant areas of seeding and planting prior to the end of the construction works. However, due to construction programming and seasonal restrictions, it is also likely that significant planting works will not be undertaken until the end of the major construction phase.
12.8	C	All mitigation planting will take place at the earliest opportunity feasible during the construction stage so as to maximise establishment prior to road opening.
Project Wide Measures		
12.9	O	<u>Cut slopes on mainline, link roads and local roads:</u> Cut slopes shall be finished to even gradients, topsoiled unless otherwise stated in this table or elsewhere in the EIAR. Slopes shall be free of rubble and stones over 50mm diameter. All such rubble/stone shall be removed or buried. Unless otherwise stated slopes shall be seeded to a low maintenance non-agricultural grassland or to a diverse grass/wildflower sward, as appropriate. Steep slopes may be hydro-seeded. Where exposed, stable rock cuttings/slopes will be retained as a landscape feature along the proposed road corridor.
12.10	O	<u>Embankments on mainline, link roads, and local roads:</u> Embankments shall be finished to even gradients, topsoiled unless otherwise stated in this table or elsewhere in the EIAR. Slopes shall be free of rubble and stones over 50mm diameter. All such rubble/stone shall be removed or buried. Unless otherwise stated slopes shall be seeded to a low maintenance non-agricultural grassland or to a diverse grass/wildflower sward, as appropriate. Steep slopes may be hydro-seeded.
12.11	O	<u>Verges & Roundabouts on mainline, link roads, and local roads:</u> Verges will be provided along both sides of mainline. Verges will also be provided around junctions and along local road re-alignments and tie-ins. Verges and roundabouts shall be finished to even or gently flowing gradients, with minimum 200mm topsoil. Areas shall be stone buried or raked will be free of rubble and stones over 25mm diameter. Verges and roundabouts will be seeded to low-maintenance seed mix.
12.12	O	<u>Ponds, swales, 'V-drains' etc.:</u> All slopes shall be evenly graded and free of rubble and stones over 50mm diameter. Slopes shall be seeded to low maintenance non-agricultural grassland or to a grass/wildflower sward, allowing for natural development over time. Steep slopes on pond edges and 'V-drains' may be hydro-seeded. Areas around ponds shall be a diverse landscape of low maintenance grassland/species-rich grass wildflower sward and plantings of scrub planting and/or low-canopy woodland and shrub planting. Hedgerows of blackthorn and hawthorn, hazel and holly, without tree species, shall be established along non-roadside boundaries. Non-palisade type fencing shall be secure pond areas.

Ref No.	Stage	Commitments
12.13	O	<p><u>Noise barriers/bunds:</u></p> <p>Where possible hedgerow scrub and shrub planting and/or low-canopy woodland of native species shall be established as either a narrow planting of 3.0m minimum width or double-staggered hedgerow along the full off-road face of barriers.</p> <p>Low-canopy and/or shrub planting of native species shall be established on the off road face of bunds. The planting shall include ash*, birch, blackthorn, elder, hawthorn, hazel, holly, rowan and/or willow species as appropriate. Plants shall be 90 to 120cm in height at planting.</p> <p>* Note: Due to the risk of Ash Dieback (<i>Chalara fraxinea</i>) and until further notice, ash (<i>Fraxinus</i> species) is no longer approved by the TII for planting schemes. This does not impact on the use of Mountain ash – also known as rowan (<i>Sorbus aucuparia</i>).</p> <p>Transparent noise barriers will be used on the River Corrib Bridge.</p>
12.14	0	<p><u>Plants and planting areas:</u></p> <p>All tree species over 150cm in height together with all Pine shall be appropriately staked and tied. All failed, dead or defective plants shall be replaced before the end of each and every year of defect aftercare.</p> <p>Full planting area will be free of stones over 50mm in diameter.</p>
12.15	O	<p><u>Grass areas:</u></p> <p>Grass areas shall provide full sward cover within 12 months of seeding. Any failed, bare or defective areas shall be re-seeded between March – May and/or August – September in each and every year of defect aftercare.</p>
12.16	O	<p><u>Unauthorised access, parking and/or encampment:</u></p> <p>Landscape proposals shall avoid creating areas considered as being suitable for unauthorised parking and shall use landscape proposals to deter and prevent such use.</p>
12.17	O	<p><u>Remnant areas:</u></p> <p>Any post-construction remnant lands shall be treated to a diverse range of grassland and/or planting proposals to include a minimum 30% planting, amended as locally appropriate. The remaining area shall be treated as locally appropriate low maintenance grass/species-rich sward.</p>
12.18	O	<p>Where feasible landscape measures shall include for the re-connection of existing field boundaries and hedgerows along the proposed road development. Where appropriate trees species as noted in Mitigation Tables 12.7 and 12.8 of the EIAR, shall be randomly spaced in a visually naturalistic manner within such hedgerows.</p>
12.19	O	<p>Where areas are in cut or fill, a grass or meadow sward will be established over the slope except in areas of cutting through stable rock (see Landscape Guidelines, Section 4.2: Cuttings and Embankments). Except where otherwise required, it is not proposed to plant either cut or fill slopes in their entirety, but to encourage a more naturalistic and locally sympathetic grouping of plantings within a semi-natural grass sward. Slopes may also be seeded to wildflower grassland and hydro-seeding may be utilised for seeding of steep slopes. It is expected that significant extent of rock cutting will arise on the proposed road development. Stable rock slopes will be retained as an exposed face for natural colonisation and as a local landscape features.</p>
12.20	O	<p>Along the length of the proposed road development, landscape areas within junctions and small areas of severed fields, plots or other property</p>

Ref No.	Stage	Commitments
		acquired for the construction of the proposed road development will be varyingly treated including being planted in a semi-natural copse like scrub plantings and native woodland species. (see Landscape Guidelines, Section 4.6: Additional Plots and Other Areas). Such planted blocks dispersed along the proposed road development will assist in the improvement of the longer-term visual character of the proposed road development and local surrounds. Particular attention shall be given to an appropriate extent and scale of planting in and surrounding junctions (see Landscape Guidelines, Section 4.3: Junctions, Interchanges and Roundabouts) and embankments (see Landscape Guidelines, Section 4.2.2: Embankments).
12.21	O	Certain areas along the length of the proposed road development have been set aside for drainage requirements/pollution control/attenuation. Where proposed these will be securely fenced and planted with locally appropriate hedgerows, shrubs and/or screen planting located along the proposed development boundary to minimise any visual impact from off road areas. However, it is noted that these features also offer the potential to provide for improved landscape diversity and habitat.
12.22	O	Proposed planting will generally be established using bare-root transplants, whips and feathered plants which adapt readily to disturbed ground conditions. A proportion, totalling not less than 5% of 'Half-standard' (6-8cm girth & 200cm-250cm tall) and a further 5% 'Standard' (8-10cm girth & 250cm-300cm tall) trees shall be used to supplement these plantings, especially in the vicinity of residential areas. All planting mixes will take cognisance of, and include native and local species as identified in the Chapter 8, Biodiversity . These requirements have been adapted and further detailed as appropriate to particular areas as set out in Table 12.8 of Chapter 12, Landscape and Visual of the EIAR.
12.23	O	Where used, tree species will be selected from a list of primarily native, naturalised and indigenous species, which will include alder, common ash (subject to planting restrictions at time of works), common birches, common oaks, mountain ash, Scots pine and willow species. Planting sizes will be from 75cm to 400cm in height and tree species will be planted at average 2.0m centres within the wider planting mix.
12.24	O	Shrub planting species utilised will be selected from a list of primarily native and indigenous species, which will include, blackthorn, elder, hawthorn, hazel, holly, guelder rose, spindle, willows and other plants found naturalised in the affected localities. Planting sizes will vary from 30 to 75cm in height and shrub species will be planted at between 1.0 and 1.5m centres depending of landscape type, see Table 12.8 of the EIAR.
12.25	O	Hedge planting will be primarily of blackthorn and hawthorn interspersed with other species such as elder, hazel, holly and those found locally. Hawthorn within hedgerows shall be planted at between 75 to 90cm in height and at 500mm centres in each of 2 double staggered rows or wider plantings where a denser effect is required. The hedgerow will be interspersed with standard-sized randomly spaced tree species such as alder, common ash and oaks, as appropriate to particular locality.
12.26	O	Areas to be seeded to meadow will be thinly topsoiled (5cm layer) and seeded with a locally appropriate seed mix. Mainline and side road verges will be cultivated, topsoiled minimum 200mm deep and stone buried to remove stones down to 25mm diameter prior to seeding to a low-maintenance grass seed mix.

Ref No.	Stage	Commitments
12.27	O	Where lighting is proposed, the lighting design shall meet the requirements of BS EN 13201-2:2003 and BS5489-1: 2003, Code of Practice for Design of Road Lighting. Lighting of Roads and Public Amenity Areas and shall comply with the requirements of the DMRB TD 34-91. The detailed lighting design shall be completed in a manner, which will minimise glare and will ensure that light-spill effect is minimised.
Specific Measures		
12.28	O	In specific locations barriers and/or earth bunds may be provided to reduce the impact of noise. Such features shall, wherever possible, be integrated within the proposed landscaping measures.
12.29	O	All of the following specific environmental commitments will be taken account of in the detailed design and implementation of landscape measures: <ul style="list-style-type: none"> • Location of cut-off drains at the top of cuttings and at the bottom of embankments. • The location and requirements for maintenance access along the mainline of the proposed road development. • Locations where rock is encountered in cuttings. Such rock faces may be retained as geological features of the corridor of the proposed road development. • The location and integration of noise barriers within the landscape design. • Clearance zones (TD19 - Safety Barrier Standards). • Sight-lines, including at junctions and to carriageway signage, etc.
12.30	O	Where feasible reinforced earth retaining wall approaches will be incorporated so as allow for a green landscape finish to all or part of the retaining structures. A limestone finish will be used where structural walls are required and for the abutments of the proposed bridge over the N59 Moycullen Road. The stone will consist of natural limestone, matching the character of the local stone, with a strong horizontal axis of between 5 to 1 and 7 to 1 (i.e. horizontal to vertical dimension).
12.31	O	Landscape Measures also take account of the specific protection and environmental commitments detailed in Chapter 8, Biodiversity . In particular, the measures include: <ul style="list-style-type: none"> • Retained habitats, trees and hedgerows on land-take boundaries, etc. will be fenced-off and protected during construction works. • Specific measures are proposed at a number of locations for mitigation of potential impact on Bat species. This includes: <ul style="list-style-type: none"> ○ the provision of artificial bat roosts – with specific planting to encourage use. ○ the provision of a planted wildlife overbridge (Ch. 12+700) with tie-in planting to local hedgerows and proposed planting on the boundary of the proposed road development, which will maximise potential benefit and use. ○ dense planting, with trees for improvement of connectivity along the boundary of the proposed road development: <ul style="list-style-type: none"> ○ west of the crossing of the L1323 Letteragh (Ch. 7+200 – Ch. 7+280). ○ along embankments to either side of the proposed bridge over the River Corrib.

Ref No.	Stage	Commitments
		<ul style="list-style-type: none"> ○ between the crossing of the N84 Headford Road at Ballindooley and School Road at Castlegar. ○ hedgerow planting for improvement of connectivity of habitats to the east of Menlo Castle. ○ hedgerow and copse planting for enhancement of foraging habitat to the north of Menlo Castle. ● In order to deter Barn Owls from foraging close to the proposed road development, embankments and cuttings, other than rock cuttings or cut slopes left to naturally regenerate, will be densely planted with low growing scrub (e.g. blackthorn, hawthorn) from Ch. 8+550 to Ch. 17+500. ● In order to deter Barn Owls from over flying the proposed road development, planting of closely-spaced trees (approx. 2m centres) greater than 3m in height will be established along the top of the embankments between Ch. 9+600 and Ch. 10+100.
12.32	O	<p>6.0m wide Screen Planting (Planting at 1.0m centres for visual screening shall be of a minimum of 6m in width. The planting shall extend for a minimum of 100m to either side of any adjoining residential property or amenity. (refer to Figures 12.4.01 to 12.4.14)).</p> <ul style="list-style-type: none"> ● Planting will include a dense planting at 1m centres of alder, birch, blackthorn, elder, geulder rose, holly, hawthorn, hazel, rowan, and willow species. Shrubs shall be planted at between 60 to 90cm in height. ● Scots pine of minimum 60cm in height at planting shall comprise 20% of the overall plant numbers and holly at a minimum of 45cm in height shall comprise a further 15%. ● Tree species, planted equally at half-standard (6-8cm girth) and standard size (8-10cm girth), shall comprise minimum 10% of the mix.
12.33	O	<p>3.0m wide Screen Planting (Where space is limited planting at 1.0m centres for visual screening shall be of a minimum of 3m in width. The planting shall extend for a minimum of 100m to either side of any adjoining residential property or amenity. (refer to Figures 12.4.01 to 12.4.14)).</p> <ul style="list-style-type: none"> ● Planting will include a dense planting at 1m centres of alder, birch, blackthorn, elder, geulder rose, holly, hawthorn, hazel, rowan, and willow species. Shrubs shall be planted at between 60 to 90cm in height. ● Scots pine of minimum 60cm in height at planting shall comprise 20% of the overall plant numbers and holly at a minimum of 45cm in height shall comprise a further 15%. ● Tree species, planted equally at half-standard (6-8cm girth) and standard size (8-10cm girth), shall comprise minimum 20% of the mix.
12.34	O	<p>Stone Wall Boundaries (Stone walls as indicated on Figures 12.4.01 to 12.4.14).</p> <ul style="list-style-type: none"> ● Where indicated stone walls will be replaced along impacted sections of property and road boundaries on local roads. The stone from the disturbed sections of existing walls will be retained and re-used (generally granite to west; limestone to east) where possible to reinstate these new boundaries. The boundary walls may be backed by hedgerows of locally appropriate species, i.e. blackthorn, hawthorn and holly to west and hazel, hawthorn and holly to east. Elsewhere, where stone walls are removed the stone will be retained and made available for re-use by the adjacent property owners for

Ref No.	Stage	Commitments
		the construction of a new stone wall on their side of the proposed development boundary if they wish.
12.35	O	<p>Boundary Hedgerow (Typical double staggered hedgerow with tree planting, where locally appropriate).</p> <ul style="list-style-type: none"> Primarily blackthorn (30%), hawthorn (40%) and holly (10%) hedgerow in west interspersed with other species (20%) such as elder, willow, and those found locally. Primarily hazel (30%), hawthorn (40%) and holly (10%) hedgerow to east interspersed with other species (20%) such as blackthorn elder, willow, and those found locally. Hawthorn plants shall be of c.90cm in height and planted at 50cm centres in each of two double staggered rows, 25cm apart. Other plants of c.50cm in height shall be interspersed. The hedgerow may be interspersed with 'half-standard-sized' (6-8cm girth) alder, birch and/or oak trees planted at random spacings but averaging a min. of 1 tree per 25 linear metre. Limited tree species, such as birch and mountain ash may also be included as 'whips' at 150cm in height.
12.36	O	<p>Retaining Walls and structure over the N59 Moycullen Road (Use of reinforced earth retaining systems and limestone finishes for structural elements. Retaining Wall Structures R08/01; R08/02; R08/07 & R08/04; and Bridge Structure S08/02 (Ch. 8+300 to Ch. 8+670))</p> <ul style="list-style-type: none"> Where feasible reinforced earth retaining wall approaches will be incorporated so as allow for a green landscape finish to all or part of the retaining structures. Planting of trees shall also be provided along the base of the structure. These shall include smaller growing species such as alder, birch and rowan planted as Selected Standards (i.e. 14cm girth or greater). A limestone finish will be used for the external finish of the abutments for the proposed bridge over the N59 Moycullen Road and where structural walls are required. The stone will consist of natural limestone, matching the character of local stone, with a strong horizontal axis of between 5 to 1 and 7 to 1 (i.e. horizontal to vertical dimension).
12.37	O	<p>Bat habitat enhancement (new 2m wide tree and shrub hedgerow, with occasional planted copses located north and east of Menlo Castle.)</p> <ul style="list-style-type: none"> New hedgerow of native species will be established with plants at 0.5m staggered centres in each of 5 rows located 0.5m apart to sub-divide existing open fields. Standard-sized trees species (min 8-10cm girth, 2.4m high) will be planted at 15m staggered centres in each of the 3 central rows. Diverse range of shrub species will be planted between trees in the central rows and throughout the outer 2 rows. Circa 15m diameter woodland copses will be established within open fields using similar approach, densities and species Planting will be protected by stock-proof fence, c.1.25m high located at 1.0m offset to either side of the outer row of the new hedgerow. Tree species to include alder, birch, oak, rowan, planted as standards (as above) and whips (1.25m high). Shrubs to comprise mainly blackthorn, hawthorn and hazel (combined 60%), with elder, holly, spindle, willow etc. Hawthorn plants shall be of between c.90cm in height and all other shrubs shall be c.60cm in height.

Ref No.	Stage	Commitments
12.38	O	<p>Wildlife Overpass (Ballindooley/Castlegar, Structure S12/02 (Ch. 12+700))</p> <ul style="list-style-type: none"> • Wildlife overpass (c.30m wide) will be landscaped to provide for connective habitat across proposed road development. Planting to consist of a central narrow grass path bounded on either side by tree-lined hedgerows of native species. • Soil depths to vary from minimum c.45cm depth at edges to c.1.5m depth along centre-line of both hedgerows. Planted element of both hedgerow lines will be c.2m wide with standard-sized trees (min 8-10cm girth, 2.4m high) planted at 3m staggered centres in each of 2 rows in each hedgerow. Diverse range of shrub species will be planted between trees and along the line of each hedgerow. • Planting to tie-in to proposed planting leading east and west on upper slopes of cuttings on both sides of the proposed road development. This will form a continuous hedgerow/planted network. • Tree species to include alder, birch, oak, rowan, planted as standards (as above) and whips (1.25m high). Shrubs to comprise mainly blackthorn, hawthorn and hazel (combined 60%), with elder, holly, spindle, willow etc. • Hawthorn plants shall be of between c.90cm in height and all other shrubs shall be c.60cm in height.
12.39	O	<p>Barn Owl Planting</p> <p><u>Typical double staggered treeline with dense under planting, between Ch. 9+600 and Ch. 10+100.</u></p> <ul style="list-style-type: none"> • Deterrent tree planting to comprise alder, birch and/or rowan planted at 3m in height (min 12-14cm girth) and at 2.0m centres in each of 2 rows 1.5m apart. • Dense low scrub planting to comprise blackthorn (50%), hawthorn (20%), hazel (10%) and holly (10%) hedgerow in the west interspersed with other species (10%) such as elder, willow, and those found locally. • Hawthorn plants shall be of c.90cm in height and planted at 50cm centres. Blackthorn and other plants shall be of c.50cm in height and planted at 50cm centres in staggered rows, 50cm apart. <p><u>Dense low scrub planting on all embankments and cut slopes (other than rock cuttings or cut slopes left to naturally regenerate) from Ch. 8+550 to Ch. 17+540.</u></p> <ul style="list-style-type: none"> • Dense low scrub planting to comprise blackthorn (50%), hawthorn (20%) hazel (10%) and holly (10%) interspersed with other species (10%) such as elder, willow, and those found locally. • Hawthorn plants shall be of c.90cm in height and planted at 50cm centres. Blackthorn and other plants shall be of c.50cm in height and planted at 50cm centres in staggered rows, 50cm apart. • Compensatory Habitat Areas (CHA) along the proposed road development will be as detailed in Appendix A.8.26.

21.9 Archaeology, Architectural and Cultural Heritage

Ref No.	Stage	Commitments
13.1	C	Archaeological monitoring and investigations will be undertaken as part of the site clearance works for the construction of the proposed road development in order to record and preserve any buried findings using the appropriate methods. This programme of archaeological test trenching will be carried out within the footprint of the proposed road development prior to construction going ahead. This will target the sites and areas of archaeological and cultural heritage potential as outlined in Section 13.5.3 of Chapter 13, Archaeology, Architectural and Cultural Heritage as well as previously undisturbed areas within the proposed development boundary.
13.2	C	Test trenching will be carried out under Ministerial Directions in consultation with the Department of Culture, Heritage and the Gaeltacht and a TII Project Archaeologist. Full provision will be made available for the excavation of any archaeological features and/or deposits that may be identified, if that is deemed the most appropriate manner in which to proceed.
13.3	C	Prior to demolition, the thatched cottage BH 12 will be subject to a full measured, written and photographic survey. This will be carried out by a suitably qualified person or team under Ministerial Directions in consultation with the Department of Culture, Heritage and the Gaeltacht and a TII Project Archaeologist.
13.4	C	The demesne landscape associated with Menlo Castle (DL 8), at Dangan Lower (DL7) and at Bushypark House (DL4) will be subject to a detailed photographic and written record prior to the construction of the proposed road development. This will be carried out by a suitably qualified person or team under Ministerial Directions in consultation with the Department of Culture, Heritage and the Gaeltacht and a TII Project Archaeologist.
13.5	C	All Cultural Heritage (CH) sites listed in Table 13.17 of Chapter 13, Archaeology, Architectural and Cultural Heritage that include built heritage remains will be subject to a detailed written and photographic survey (to include test trenching where appropriate). This shall be carried out under Ministerial Directions in consultation with the Department of Culture, Heritage and the Gaeltacht and a TII Project Archaeologist. Full provision will be made available for the excavation of any archaeological features and/or deposits that may be identified, if that is deemed the most appropriate manner in which to proceed.
13.6	C	Archaeological wade or underwater assessments will be carried out at any natural water courses (AAPs) to be impacted upon by the proposed road development by disturbance to their banks or beds. This shall be carried out under Ministerial Directions in consultation with the Department of Culture, Heritage and the Gaeltacht and a TII Project Archaeologist. Full provision will be made available for the excavation of any archaeological features and/or deposits that may be identified, if that is deemed the most appropriate manner in which to proceed.
13.7	C	Any section of Townland Boundary to be impacted upon will be subject to a detailed written and photographic survey (to include test trenching where appropriate). This shall be carried out under Ministerial Directions in consultation with the Department of Culture, Heritage and the Gaeltacht and a TII Project Archaeologist. Full provision will be made available for the excavation of any archaeological features and/or deposits that may be

Ref No.	Stage	Commitments
		identified, if that is deemed the most appropriate manner in which to proceed.
13.8	C	Excavation of all previously recorded archaeological sites – where these fall, in whole or in part, within the footprint of the development – will be carried out under Ministerial Direction in consultation with the Department of Culture, Heritage and the Gaeltacht and a TII Project Archaeologist.
13.9	C/O	Archaeological sites (AH) 15, 16, 29, 11, 12, 23 and 26 will be subject to a detailed photographic and written landscape record to preserve their current setting prior to the construction and operation of the proposed road development. This shall be carried out by a suitably qualified person or team under Ministerial Directions in consultation with the Department of Culture, Heritage and the Gaeltacht and a TII Project Archaeologist.
13.10	C/O	Protected Structures (BH) 1, 7, 9, 10 and 17 will be subject to a detailed photographic and written landscape record to preserve their current setting prior to the construction and operation of the proposed road development. This shall be carried out by a suitably qualified person or team under Ministerial Directions in consultation with the Department of Culture, Heritage and the Gaeltacht and a TII Project Archaeologist.
13.11	C/O	Cultural Heritage Sites (CH) 20, 23, 8, 25, 30, 35, 42 and 54 will be subject to a detailed photographic and written landscape record to preserve their current setting prior to the construction of the proposed road development. This shall be carried out by a suitably qualified person or team under Ministerial Directions in consultation with the Department of Culture, Heritage and the Gaeltacht and a TII Project Archaeologist.

21.10 Soils and Geology

Ref No.	Stage	Commitments
9.1	C	Construction techniques that comply with the requirements of statutory bodies in terms of noise, vibration, soil and groundwater contamination and disposal of contaminated material for both soil and rock cuttings will be adopted.
9.2	C	All excavated material, excluding a small potential volume of hazardous material, will be re-used as construction fill and material deposition areas minimising the loss of the feature. The Contractor will ensure acceptability of the material for re-use within the proposed road development with appropriate handling, processing and segregation of the material.
9.3	C	<p>A construction earthworks programme will be implemented as part of the CEMP included in Appendix A.7.5, which will be finalised by the Contractor, for the proposed road development which categorises the source of material for each fill section. During the finalisation of this programme, the fill limitations outlined below will be incorporated.</p> <p>To prevent impact to the local peatland habitats, the following fill limitations will be incorporated at the locations identified Table 9.18 of Chapter 9, Soils and Geology</p> <ul style="list-style-type: none"> Only pavement and capping layers protected from surface water runoff and groundwater movements are permitted to be derived from non-native material

Ref No.	Stage	Commitments
		<ul style="list-style-type: none"> All other acceptable fill material will be derived from native material or other pH compatible material
9.4	C	A drainage layer or starter layer, in accordance with the TII publication CC-SCD-00606, will be implemented for the construction of embankments in areas prone to flooding. The introduction of a drainage layer will ensure hydraulic conductivity exists across the flood plain and removes the risk of the embankment acting as a flood barrier.
9.5	C	<p>Earthworks haulage will be along predetermined routes within and outside the proposed development boundary as shown on Figures 7.101 to 7.123. The identified haulage routes are along existing national, regional and local routes or within the proposed development boundary.</p> <p>Where compaction occurs due to truck movements and other construction activities on unfinished surfaces, remediation works will be undertaken to reinstate the ground to its original condition. Where practicable, compaction of any soil or subsoil which is to remain in-situ along the proposed road development will be avoided.</p>
9.6	C	In the event the embankment will be constructed of local material, the introduction of a drainage layer or starter layer will reduce the likelihood of run-off of fine material. Alternatively, the introduction of a geotextile separator will reduce the potential impact in areas. A composite system, combining a drainage layer and a geotextile separator will be implemented in embankments constructed with cohesive fill material. Sediment control methods are outlined in the CEMP in Appendix A.7.5 .
9.7	C	Ground settlement, horizontal movement and vibration monitoring will be implemented during construction activities to ensure that the construction does not exceed the design limitations. In situations where the site specific blast design has determined that blasting is not feasible in a particular location due to excessive ground vibrations, alternative extraction methods such as hydraulic breaking, hydraulic splitting, chemical splitting and electrical disintegration may be implemented and monitored. Monitoring will be implemented during blasting, during excavation of cuts, for overburden slopes steeper than 1V:2H (V= vertical slope, H = horizontal slope) and rock slopes steeper than 1V:1.5H. The Employer's Site Monitoring Team will be monitoring the reports on a weekly basis to ensure compliance with the commitments in relation to vibration limits.
9.8	C	A geotechnical expert will be appointed by the Contractor and will be present to monitor the surrounding ground vibrations near sensitive receptors during blasting works. The Employer's Site Monitoring Team will be monitoring the reports on a weekly basis to ensure compliance with the commitments in relation to vibration limits.
9.9	C	<p>A trial blast, and will be carried out as part of a blast assessment. The monitored trial blast will be undertaken in the same bedrock formation by the blasting contractor in a controlled location, not exceeding the vibration limitations of the local sensitive receptors, posing no risk to sensitive receptors including Annex I habitat in Lough Corrib cSAC. The trial blast will calibrate the blast design to a site specific design.</p> <p>The blast target vibration limit is defined as 20% more conservative than the conservative design approach vibration limit of 25mm/sec at the ground surface which includes areas of Limestone pavement at Lackagh Tunnel. In addition, the Limestone pavement will be monitored during the tunnelling works for any effects from the blast vibrations. In the unlikely event that the blast target vibration limit at the surface is exceeded, blasting works will cease on site until it is understood the basis for the</p>

Ref No.	Stage	Commitments
		<p>increased vibration. The blast design will then be recalibrated and blasting works will proceed with continued monitoring. Allowable distances for the various construction methods are given in the section below on Noise and Vibration.</p> <p>The Employer's Site Monitoring Team will inspect the trial blast reports to check compliance with the limitation limits in vibration at surface.</p>
9.10	C	<p>Importation of materials from outside the site will be minimised by ensuring that materials arising within the site area are used to the greatest extent possible. Any surplus material remaining which cannot be incorporated into the construction fill activities shall be placed in material deposition areas within the proposed road development.</p> <p>Hazardous material will be transported off site for disposal or recovery at appropriately licence or permitted sites as outline above for Construction Activities.</p>
9.11	C	<p>Construction of structures will be completed in accordance with the CEMP in Appendix A.7.5. The construction of the River Corrib Bridge will meet the requirements of the: River Corrib Bridge Constructability Examination Appendix A.7.1; the Menlough Viaduct will meet the requirements of the Menlough Viaduct Constructability Examination Appendix A.7.2, the Lackagh Tunnel will meet the requirements of the Lackagh Tunnel Geotechnical and Hydrogeological Appraisal Appendix A.7.3 and the Galway Racecourse Tunnel will meet the requirements of the Galway Racecourse Tunnel Constructability Report Appendix A.7.4.</p> <p>The adopted construction techniques will comply with the requirements of statutory bodies in terms of noise, vibration, soil and groundwater contamination and disposal of contaminated material.</p>
9.12	C	<p>For the construction of Lackagh Tunnel a hydrogeology and geotechnical expert will be appointed by the Contractor and will be present to monitor at all times when the construction activities have the potential to impact on groundwater or the Annex I habitats at the surface, namely Limestone pavement and Calcareous grassland. This includes the supported rock face of Lackagh Quarry Face and retaining walls for the Western Approach. Monitoring of the exposed rock slopes and retaining walls will be carried out during construction and operation to ensure there is no impact to the Annex I habitat. In the extremely unlikely event that instability is observed additional support measures will be installed to ensure that there is no impact to the Annex I habitat. The additional support measures comprise ground anchors, rock bolts, rock dowels, rock mesh, shotcrete or a combination of these measures, designed to the relevant design standards (Eurocode 7, BS8081) and best practice guidance documents.</p> <p>The Employer's Site Monitoring Team will review weekly monitoring reports to check stability of rock slopes in Lackagh Quarry.</p>
9.13	O	<p>The rock and overburden retaining systems in Lackagh Quarry and Western Approach will continue to be monitored as part of the TII (Transport Infrastructure Ireland) maintenance schedule to ensure that they continue to operate as intended for the design life of the proposed road development. In the extremely unlikely event that instability within the rock mass is observed additional support measures (e.g. rock bolts, rock dowels, rock mesh, shotcrete or a combination of these measures will be</p>

Ref No.	Stage	Commitments
		installed to ensure that there is no impact to the structural integrity ¹ of the Limestone pavement.
9.14	C	Ground settlements will be controlled through selection of the foundation type and method of construction which are suitable for the particular ground conditions. To minimise soil movements due to pile operations in the vicinity of sensitive receptors, each pile shall be constructed sequentially in a direction away from the sensitive receptor. Previously installed piles act as a shield as soil movements are greater in a direction away from the stiffer zone i.e. away from the piles and sensitive receptors.
9.15	C	During construction, the Limestone pavement at Menlough Viaduct will be protected and will not be impacted by implementing a protection system comprising of geogrid, protection geotextile and layers of material. Refer to Menlough Viaduct Constructability Report in Appendix A.7.2 for further details.
9.16	C	Samples of ground suspected of contamination will be tested for contamination during the detailed investigation and ground excavated from these areas will be disposed of to a suitably licence or permitted sites in accordance with the current Irish Waste Management legislation.
9.17	C	Good housekeeping (daily site clean-ups, use of disposal bins, etc.) on the site, and the proper use, storage and disposal of these substances and their containers will prevent soil contamination. For all activities involving the use of potential pollutants or hazardous materials, material such as concrete, fuels, lubricants and hydraulic fluids will be carefully handled and stored to avoid spillages. Potential pollutants shall also be adequately secured against vandalism and will be provided with proper containment according to codes of practice. Any spillages will be immediately contained and contaminated soil removed from the site and disposed of to an appropriately permitted or licenced site according to the current Irish Waste Management Legislation by the Contractor.
9.18	C	The Contractor is required to make provision for removal of any concrete wash water. Concrete trucks will be directed back to their batching plant for washout. The arrangement for concrete deliveries to the site will be discussed with suppliers before commencement of work, outlining the agreed assessed routes, prohibiting on site washout and discussing emergency procedures.
9.19	C	As a minimum, the carriageway drainage network will be sealed in areas where the proposed road development crosses rock particularly prone to karstification. Through the use of engineered solutions, including an impermeable barrier, cement slurry or grout, direct run-off from the paved surface of the proposed road development will be prevented from entering into the rock along the proposed alignment, as this could cause further deterioration and instability of the rock mass. Individual mitigation measures will be assessed on a case by case basis, determined by the extent of karst and make-up of the proposed road development as outlined in the karst protocol which is part of the CEMP in Appendix A.7.5 . Inspections of karst features will be undertaken by a hydrogeologist and/or geotechnical expert in order to determine the appropriate remediation measure. These remedial measures include but are not limited to the removal of all loose, soft, weak or voided soil material, backfilling voids with an agreed combination of boulders cobbles / chunk rock / cement

¹ Structural Integrity of the rockmass that supports the mosaic of Limestone pavement and Calcareous grassland is the physical and mechanical geotechnical properties that control the behaviour of the geotechnical Limestone pavement environment

Ref No.	Stage	Commitments
		slurry and installation of a high strength geosynthetic to form a competent, safe foundation platform.

21.11 Hydrogeology

Ref No.	Stage	Commitments
10.1	C	No dewatering will occur during construction at Menlough Viaduct or Lackagh Tunnel (or its approaches). Furthermore, the construction sequence will take into account the seasonal groundwater fluctuation. During the winter groundwater high it may be necessary to limit the depth of works so that dewatering is not required.
10.2	C	Galway Granite Batholith EW01, 02 (three cuttings), 04, 07 and 09: Groundwater intercepted will be collected and piped to the surface water receptor it would naturally have drained to.
10.3	C	Limestone: Construction dewatering of the bedrock aquifer may seasonally be required in EW27 during peak groundwater levels. Any dewatering will be discharged to the same groundwater body.
10.4	C	Construction of the Galway Racecourse Tunnel and its approaches will require dewatering of the bedrock aquifer. All groundwater intercepted will be managed and discharged within the same groundwater body.
10.5	C	EW27: Groundwater will be controlled within the excavation by collection in drains or sumps. If groundwater is intercepted, it will be piped and discharged at an infiltration basin within the same groundwater body. Intercepted groundwater is controlled and infiltrates back to the same groundwater body.
10.6	C	Where infiltration basins are used for discharge of site runoff during construction the runoff will be managed on site, collected and treated as per the Sediment Erosion and Pollution Control Plan (Refer to Section 8 of the CEMP in Appendix A.7.5).
10.7	C	Infiltration basin S19a and S19b include lining the sides of the excavation to ensure vertical groundwater infiltration so that all discharges drain through the placed subsoil for the full thickness of the unsaturated zone.
10.8	C	The following measures included in the CEMP will be implemented to control the potential for pollution from accidental spillages on site: <ul style="list-style-type: none"> • Stockpiling of contaminated material is not permitted. • Good housekeeping on the site during construction, and the proper use, storage and disposal of these substances and their containers will prevent groundwater contamination. • For all activities involving the use of potential pollutants or hazardous materials, under the CEMP, the Contractor will be required to ensure that material such as concrete, fuels, lubricants and hydraulic fluids will be carefully handled and stored to avoid spillages. Potential pollutants shall also be adequately secured against vandalism and will be provided with proper containment according to codes of practice. Any spillages will be immediately contained and contaminated soil removed from the site and properly disposed of. • The Contractor will finalise the Incident Response Plan in the CEMP in Appendix A.7.5 prior to work commencing and regularly update it for pollution emergencies which will be developed by the appointed

Ref No.	Stage	Commitments
		Contractor. The Contractor shall implement all the measures detailed in Incident Response Plan.
10.9	C	<p>In the event of karst being encountered the Karst Protocol shall be implemented, which is documented in the CEMP (Appendix A.7.5):</p> <ul style="list-style-type: none"> • Where karst features are encountered during construction works these will be assessed by a hydrogeologist and an engineering geologist. In the case of excavations (road cuttings, tunnels, bridge pier excavations) then the karst feature shall be excavated and backfilled with course fill and sealed. • With regard to karst features being intercepted in excavations for earthworks (including viaducts, bridges and tunnels) and infiltration basins. The Karst Protocol preserves the hydraulic connectivity of the feature using granular material to fill but then seals the karst from the excavation using a liner (geotextile and or concrete depending on the site specifics). • Where dewatering of the bedrock aquifer is proposed, groundwater level monitoring will be installed before construction, during the construction phase and 12 months following construction to enable potential effects from dewatering to be identified. If the monitoring indicates there is a measurable impact beyond that stated in this EIAR, then work with the potential to increase drawdown will be made safe and cease until the hydrogeological assessment is revised based on the site conditions and mitigation employed if appropriate. • In order to reduce potential contamination impacts, stockpiling of contaminated material and leachate generation will be prohibited. In the situation that potential contaminated material is encountered it will be tested and disposed of in an appropriate manner and in line with current water management legislation. If it is not possible to immediately remove contaminated material, then it will be stored on, and covered by, polythene sheeting to prevent rain water infiltrating through the material. The time frame between excavation and removal will be kept to an absolute minimum.
10.10	C	Five wells (W50-10, W50-12, W50-13, W50-14 and W50-15) will be lost during the construction of the proposed road development. These will each be mitigated by providing a replacement well, connecting to mains supply where available or by financial compensation. Where wells have to be abandoned as part of the proposed road development they will be sealed and abandoned in general accordance with Well Drilling Guidelines produced by the Institute of Geologists of Ireland (IGI 2007).
10.11	C	Replacement wells, storage tank, associated pumping equipment and pipework for Wells W50-13 and W50-14 will be commissioned and tested to ensure adequate yield rates in advance of wells W50-13 and W50-14 being decommissioned.
10.12	C	Wells outside of the proposed development boundary but within the drawdown zone of influence may be impacted by reduced groundwater levels during construction. All wells within 150m of the proposed development boundary (or 50m from the calculated drawdown ZoI if greater) will be monitored for water level on a monthly basis for 12 months before construction, during construction and for 12 months after construction. If the monitoring indicates that the proposed road development has impacted on a supply or geothermal well then mitigation will be applied.
10.13	C	To ensure the protection of quality of groundwater potable supplies, all wells within 150m of the proposed development boundary will be monitored for water quality on a monthly basis. All wells will be

Ref No.	Stage	Commitments
		monitored for standard drinking water quality parameters on a monthly basis for 12 months before construction, during construction and for 12 months after construction. If the monitoring indicates that the proposed road development has impacted on a supply, then mitigation will be applied.
10.14	C	The groundwater dependent terrestrial ecosystems (GWDTE) that have been flagged as being at risk are all in areas where the groundwater pathways are karstic. In this regard the Karst Protocol, as detailed above, forms part of mitigation to prevent groundwater quality or quantity being impacted. Additional mitigation is also employed to ensure that European sites are not impacted.
10.15	C	There will be no surface water discharges to the Coolagh lakes and all runoff will be treated before being discharged to ground at infiltration basins. Infiltration basins are designed to include settlement to remove sediment and have an appropriate thickness of subsoil below invert level.
10.16	C	Pouring of the concrete in excavations (River Corrib Bridge, Menlough Viaduct and Lackagh Tunnel) will only be undertaken when the excavation has been inspected by a qualified hydrogeologist. Inspection of the full depth and extent of each excavation will be undertaken to identify if any significant flow paths, such as the karst enhancement of the bedrock permeability, are present. If no significant flow paths are present, then the hydrogeologist will document accordingly and confirm that there is no risk to groundwater from concrete leakage. If significant pathways are present then impacts which may arise from flow along these pathways shall be designed by the hydrogeologist based on the karst mitigation plan, these may comprise of installing a high permeability zone to replace the groundwater pathways which would be removed by the foundations and/or sealing the linkage from excavation to protect the karst. The design of the mitigation measures shall be approved by a qualified hydrogeologist to confirm that there will be no negative impacts to groundwater.
10.17	O	During the operational phase of the proposed road development inspection and maintenance will occur to ensure that the infiltration basins continue to operate as intended for the design life of the proposed road development.
10.18	O	Infiltration basins require regular inspection to confirm that no observable subsidence in the infiltration has occurred due to karst. Inspection is recommended on 5-year frequency.
10.19	O	If karst features and potential pathways are found to be present during inspection, then the Karst Protocol developed for the construction phase will be implemented to ensure that no preferential pathways have formed within the infiltration basin.

21.12 Hydrology

Ref No.	Stage	Commitments
11.1	C	<p>The CEMP included in Appendix A.7.5 will be finalised by the Contractor in advance of the commencement of construction and the following will be implemented as part this plan:</p> <ul style="list-style-type: none"> • An Incident Response Plan detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, logging of non-compliance incidents and any such risks that could lead to a pollution incident, including flood risks. • A Sediment Erosion and Pollution Control Plan (Refer to Section 8 of the CEMP in Appendix A.7.5). This shall include water quality monitoring and method statements to ensure compliance with environmental quality standards specified in the relevant legislation. • All necessary permits and licenses for instream construction works associated with the provision of culverts, bridges and outfalls. OPW Section 50 consent has been received for all culverts and bridges proposed in the EIAR. Changes to these structures as part of the detailed design and construction stage will require new Section 50 consent to be obtained. • Inform and consult with OPW Western Arterial Drainage Section who have responsibility for the Corrib-Mask Arterial Drainage scheme and the ongoing control of river and lake levels at the Salmon Weir Barrage in Galway City. • Continue to inform and consult with Inland Fisheries Ireland (IFI). • Continue to inform and consult with National Parks and Wildlife Service (NPWS).
11.2	C	<p>Construction activities will be required to take cognisance of the all relevant guidance documents for construction work on, over or near water including:</p> <ul style="list-style-type: none"> • Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016). • Shannon Regional Fisheries Board – Protection and Conservation of Fisheries Habitat with particular reference to Road Construction. • Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites (Eastern Regional Fisheries Board). • Central Fisheries Board Channels and Challenges – The Enhancement of Salmonid Rivers. • CIRIA C793 The SuDS Manual. • CIRIA C624 Development and Flood Risk – guidance for the construction industry. • CIRIA C532 Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors. • CIRIA C648 Control of Water Pollution from Linear Construction Projects, technical guidance. • CIRIA C649 Control of Water Pollution from Linear Construction Projects, site guide. • Guidelines for the Crossing of Watercourses during the Construction of National Road schemes (NRA, 2006). • Road Drainage and the Water Environment DN-DNG-03065 (TII, June 2015).

Ref No.	Stage	Commitments
		Vegetated Drainage Systems for Road Runoff DN-DNG-03063 (TII, June 2015).
11.3	C	As set out in the Sediment Erosion and Pollution Control Plan (Refer to Section 8 of the CEMP), the sediment, erosion and pollution controls will be monitored and maintained throughout the construction of the proposed road development. This shall include the regular water quality monitoring for sediments and hydrocarbons (monitoring the sediment concentrations in the receiving water) and the inspection of the pollution control facilities and method statements to ensure compliance with environmental quality standards specified in the relevant legislation.
11.4	C	<p>Separate from the on-going and detailed monitoring carried out by the Contractor as part of the CEMP; the Site Environmental Manager (SEM) shall carry out the inspection/ monitoring regime described below on behalf of the Employer. The results will be stored in the SEM's Monitoring file and will be available for inspection/ audit by the Client, NPWS or IFI and OPW (where relevant). All inspections/ monitoring/ results will be recorded on standard forms. Inspections will include the following:</p> <ul style="list-style-type: none"> • Inspect the Principal Control Measures outlined in the CEMP on a weekly basis. Report findings to the Contractor. • Inspect surface water treatment measures (ponds, tanks, mini-dams, sandbags, etc.) on a daily basis and obtain turbidity readings in the outlet receiving water. • Inspect all outfalls to watercourses and groundwater bodies on a daily basis and obtain turbidity readings. Where excavation, deposition, pumping out or concreting works are on-going in the vicinity obtain turbidity readings three times per day in the outlet receiving water. • Daily visual inspection of watercourses to which there is a discharge from the works and those where there is construction works in the vicinity. • Wheel wash facilities shall be inspected on a weekly basis. • Stockpiles shall be monitored on a daily basis while being filled or emptied and otherwise on a weekly basis. • Control measures for works at or near water bodies shall be inspected on a daily basis. • Concrete operations at or near watercourses shall be supervised and designated chute washing out facilities shall be inspected on a daily basis. • Site compounds and satellite compounds shall be inspected on a weekly basis. • The Contractor's monitoring results shall be audited by the SEM on a frequent basis (6 times per quarter at a minimum). • The investigatory level for turbidity is defined as a 10ntu difference between the ambient upstream watercourse level and the level downstream of the works. • Notwithstanding the stringent prevention measures listed above, in the unlikely event of an accidental release of sediment to a watercourse causing plumes or in the unlikely event of an exceedance of the turbidity investigatory levels arising, the following shall take place: <ul style="list-style-type: none"> ○ It shall be investigated immediately and thoroughly by the SEM and the Contractor. ○ The Incident Response Plan shall be activated.

Ref No.	Stage	Commitments
		<ul style="list-style-type: none"> ○ The relevant NPWS, IFI and local authority staff will be notified immediately. ○ The Contractor will be required to take immediate action to detect source of release, corrective action to prevent release and to implement measures to ensure that such discharges do not re-occur. ○ Works if stopped shall not recommence until appropriate corrective measures to avoid any repetition are put in place. Such measures shall be agreed with the SEM following consultation with the NPWS and IFI. ○ Works and/ or discharges from the works shall not recommence until written consent is received from the SEM. <p>Where the SEM considers that the risk of a sediment release is high for a particular construction activity, he/she shall inform the Contractor and request protective action to be taken before the construction activity commences. The SEM will be delegated powers under the contract sufficient for these instructions to be issued and implemented.</p>
11.5	C/O	<p>Water Quality Monitoring will be required prior to, during and post construction. Baseline water quality sampling shall commence a minimum of six months prior to construction and conclude a minimum of three months after full operation has commenced to assess potential residual impact. Turbidity monitoring will be included in sensitive watercourses downstream of the proposed road development crossings. The local authority will make recommendations regarding all the water quality parameters to be assessed, the sampling interval and locations. However, as a minimum requirement there will be monthly water quality analysis from a minimum of one upstream and one downstream sampling point at each construction water outfall and surface water crossing point. Furthermore, turbidity monitoring will be carried out on a daily basis.</p> <p>The Employer's Site Monitoring Team will review weekly monitoring reports to check water quality at receiving watercourses.</p>
11.6	C	<p>The following outlines the principal environmental commitments that will be prescribed for the construction phase in order to protect all catchment, watercourse and ecologically protected areas from direct and indirect impacts:</p> <ul style="list-style-type: none"> • All constructional compound areas will be required to be located on dry land and set back from river and stream channels and out of floodplain areas. Floodplain areas include the Flood Risk Zones A and B and therefore all constructional compound areas need to be on lands above the 1000year return period flood level. • The storage of oils, fuel, chemicals, hydraulic fluids, etc. will not occur within 100m of the River Corrib or within the Floodplain Area as defined above. • Surface water flowing onto the construction area will be minimised through the provision of temporary berms, diversion channels and cut-off ditches, where appropriate. • Management of excess material stockpiles to prevent siltation of watercourse systems through runoff during rainstorms will be undertaken. This may involve allowing the establishment of vegetation on the exposed soil and the diversion of runoff water off these stockpiles to the construction settlement ponds and avoiding stockpiling of material in vicinity of sensitive watercourses. • Where construction works are carried out adjacent to turloughs, fens, stream and river channels and lakes, protection of such waterbodies

Ref No.	Stage	Commitments
		<p>from silt load shall be carried out through use of reserved grassed buffer areas, timber fencing with silt fences or earthen berms. These measures will provide adequate treatment of constructional site runoff waters before reaching the watercourses.</p> <ul style="list-style-type: none"> • Use of settlement ponds, silt traps and bunds and minimising construction activities within watercourses. Where pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap or sedi-mat. • All watercourses that occur in areas of land that will be used for site compound/storage facilities will be fenced off at a minimum distance of 5m. In addition, measures will be implemented to ensure that silt laden or contaminated surface water runoff from the compound site does not discharge directly to the watercourse. Compounds shall not be constructed on lands designated as Flood Zone A or B in accordance with the OPW's The Planning System and Flood Risk Management Guidelines (November 2009). Site compounds will not be permitted in a European Sites (i.e. Lough Corrib cSAC). • Protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance with the TII document "Guidelines for the crossing of watercourses during the construction of National Road Schemes". All chemical and fuel filling locations will be contained within bunded areas and set back a minimum of 10m from watercourses and floodplain areas. • Foul drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner to prevent pollution. • The construction discharge will be treated such that it will not reduce the environmental quality standard of the receiving watercourses. • Riparian vegetation along the identified sensitive watercourses will be fenced off to provide a buffer zone for its protection to a minimum distance of 5m except for proposed crossing points. • The use and management of concrete in or close to watercourses will be carefully controlled to avoid spillage. Where on-site batching is proposed, this activity will be carried out well away from watercourses. Washout from such mixing plants will be carried out only in a designated contained impermeable area. • All material deposition areas must be adequately bunded and compartmentalised such that the rainwater outflow from these facilities is adequately controlled and treated prior to reaching the receiving surface watercourses. The sediment control requirements are set out in the Sediment, Erosion and Pollution Control Construction Management Plan section of the CEMP (refer to Appendix A.7.5)
11.7	O	<p>The flood relief mitigation measures to eliminate the flood risk of the proposed road development in the N83 Tuam Road and reduce the existing flood risk in this area are described as follows (refer also to Figure 11.6 and Table 11.41 of Chapter 10, Hydrology):</p> <ul style="list-style-type: none"> • Prevent the upgraded portion of the N83 Tuam Road from spilling laterally northwards into the driveways of existing flood risk houses by: <ul style="list-style-type: none"> ○ Upgrade and provide effective road drainage network along the existing N83 Tuam Road for a length of 780m

Ref No.	Stage	Commitments
		<ul style="list-style-type: none"> ○ Provide interceptor drain to capture rapid hill slope runoff from the southeast reaching the N83 Tuam Road ○ Provide for infiltration of this interceptor drain for the less severe rain storm events ○ Connect this interceptor drain to the proposed flood compensation storage ● Compensate flood storage lost by providing compensation storage of 8,030m³ in the form of an excavated rectangular engineered storage pond. The base elevation of 16m OD and a top design water level elevation of 17.5m OD ● Connect this compensation storage to the remaining low-lying natural flood storage area located to the northwest of the proposed road development so that both storage areas are hydraulically linked via culverts. ● Provide for permanent a pumping station and rising mains from the proposed compensation flood storage facility to discharge to the existing storm sewer with maximum pumping capacity of 250l/s
11.8	O	<p>Refer also to Table 11.41 in Chapter 11, Hydrology which outlines the required storage volumes required for the catchment for a range of return periods and durations events.</p> <p>The required flood storage, with an available pumping rate of 0.25cumec (i.e. 250l/s) from the engineered storage pond, is 20,700m³ for the 100year event which is further increased to 24,800m³ to include for 20% climate change</p> <p>The available storage provided in the engineered storage pond at a top water level of 17.5m OD is compensation storage of 8,030m³ and the remaining (with proposed road development) natural storage provided of 18,470m³ gives a total available flood storage of 26,500m³, which is sufficient to achieve to meet and exceed the required storage.</p>
11.9	O	<p>To minimise the residual flood risk associated with the blockage of flood relief culverts and associated drainage assets there will be regular (monthly) inspection of N83 Flood Relief facilities be carried out to ensure that the system is in proper working order and performing as designed.</p>

21.13 Biodiversity

Ref No.	Stage	Commitments
General		
8.1	C/O	All measures within this section will be implemented by the Contractor under the supervision of the supervision of the Project Ecologist (employed by the Employer) and/or the Ecological Clerk of Works (employed by the Contractor).
Designated Areas for Nature Conservation		
8.2	C/O	<p>The environmental commitments required to ensure that the proposed road development will not result in a likely significant effect (i.e. adversely affect the integrity of) on the European sites within its ZoI (Lough Corrib cSAC, Lough Corrib SPA, Galway Bay Complex cSAC and Inner Galway Bay SPA) include measures to:</p> <ul style="list-style-type: none"> • Minimise the habitat loss in Lough Corrib cSAC and to avoid loss of QI habitats within Lough Corrib cSAC (refer to habitats section below). • maintain the structural integrity of the rock mass supporting QI habitats in Lough Corrib cSAC during the construction of the proposed Lackagh Tunnel (and its western approach) (refer to soils and geology environmental commitment 9.9, 9.11 to 9.17). • avoid habitat degradation in Lough Corrib cSAC as a result of potential hydrogeological impacts during construction and operation (refer to Hydrogeology Section). • protect water quality in receiving watercourses during construction (refer to Hydrology Section). • control dust emissions during construction to prevent impacts on vegetation in Lough Corrib cSAC (refer to Air Quality and Climate Section). • avoid the introduction or spread of non-native invasive species to European sites during construction or operation. • avoid/reduce the disturbance/displacement effects of blasting on wintering birds using Ballinoooley Lough (Refer to wintering birds section below). • avoid the proposed road development restricting Otter movement within the Bearnna Stream catchment (Refer to Otter section below). • avoid mortality of the QI species of Lough Corrib cSAC. These include both measures to ensure that construction materials are not introduced into the River Corrib and to remove the risk of Otter being killed/injured due to collisions with road traffic (Refer to Otter section below).
8.3	C/O	<p>The environmental commitments that are required to ensure that the proposed road development will not significantly affect Moycullen Bogs NHA are as follows:</p> <ul style="list-style-type: none"> • Avoid/reduce the disturbance/displacement effects of blasting on wintering birds using Ballinoooley Lough (Refer to wintering birds section below). • Measures to control dust emissions during construction to prevent impacts to vegetation/habitats within Moycullen Bogs NHA at Tonabrocky – see Air Quality and Climate section below. These include control measures such as spraying of exposed earthwork

Ref No.	Stage	Commitments
		<p>activities and site haul roads during dry weather, wheel washes, control of site vehicle speeds, road sweeping and dust screens.</p> <ul style="list-style-type: none"> Measures to avoid the introduction or spread of non-native invasive species to Moycullen Bogs NHA during construction or operation. These are detailed in the Non-Native Invasive Species Management Plan which forms part of the CEMP in Appendix A.7.5. Measures to control surface water runoff from the construction site to prevent an accidental pollution event affecting peatland habitats within Moycullen Bogs NHA at Tonabrocky – see Hydrology section below.
Habitats		
8.4	C	To minimise the loss of Annex I habitat, areas of these habitat types within the proposed development boundary but which are not required to construct the proposed road development will be retained and fenced off for the duration of construction. These are shown on Figures 8.23.1 to 8.23.14 .
8.5	C	To minimise the loss of habitat associated with the proposed road development, there are also areas within the proposed development boundary which are included for mitigation planting where general construction works will not be undertaken. These are shown on Figures 8.23.1 to 8.23.14 .
8.6	C	The minimum working area to facilitate the construction of the supporting structures associated with the proposed River Corrib Bridge will be used. This area will be clearly delineated and fenced off at the outset of works and maintained for the duration of the construction programme. No works for the construction of the River Corrib Bridge within Lough Corrib cSAC boundary will be undertaken outside of this zone.
8.7	C	Where possible, woodland, scrub, treelines and hedgerows which lie within, or along the boundary of the proposed road development, that are not directly impacted by the proposed road alignment or drainage will be retained. These areas will be protected for the duration of construction works and fenced off at an appropriate distance. Vegetation to be retained is shown on Figures 8.23.1 to 8.23.14 and on Figures 12.2.01 to 12.2.14 (landscape design).
8.8	C	Where possible, areas of river channel and bankside vegetation which lie within, or along the boundary of the proposed road development, that are not directly impacted by the proposed road alignment or drainage will be retained. These areas will be protected for the duration of construction works and fenced off at a distance of 5m from the stream/river bank.
8.9	C	The Petrifying spring feature present in Lackagh Quarry, which lies c.25m to the north of the mainline of the proposed road development at Ch. 11+400, will be retained and shotcrete ² will not be used as part of the quarry face stabilisation measures at the spring site.
8.10	C	Any vegetation (including trees, hedgerows or scrub adjacent to, or within, the proposed development boundary) which is to be retained shall be afforded adequate protection during the construction phase in accordance with the Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes (National Roads Authority, 2006), as follows:

² A concrete product which is sprayed at high velocity into a rock face as a structural/stabilising component.

Ref No.	Stage	Commitments
		<ul style="list-style-type: none"> • All trees along the proposed development boundary that are to be retained, both within and adjacent to the proposed development boundary (where the root protection area of the tree extends into the proposed development boundary), will be fenced off at the outset of works and for the duration of construction to avoid structural damage to the trunk, branches or root systems of the trees. Temporary fencing will be erected at a sufficient distance from the tree so as to enclose the Root Protection Area (RPA) of the tree. The RPA will be defined based upon the recommendation of a qualified arborist. • Where fencing is not feasible due to insufficient space, protection for the tree/hedgerow will be afforded by wrapping hessian sacking (or suitable equivalent) around the trunk of the tree and strapping stout buffer timbers around it. • The area within the RPA will not be used for vehicle parking or the storage of materials (including soils, oils and chemicals). The storage of hazardous materials (e.g. hydrocarbons) or concrete washout areas will not be undertaken within 10m of any retained trees, hedgerows and treelines: <ul style="list-style-type: none"> ○ A qualified arborist shall assess the condition of, and advise on any repair works necessary to, any trees which are to be retained or that lie outside of the proposed development boundary but whose RPA is impacted by the works. Any remedial works required will be carried out by a qualified arborist. ○ A buffer zone of at least 5m will be maintained between construction works and retained hedgerows to ensure that the root protection areas are not damaged.
8.11	C	The mitigation strategy outlined in the Non-Native Invasive Species Management Plan included in the CEMP (see Appendix A.7.5) will be implemented sufficiently far in advance of the proposed construction works commencing so as to allow time to adequately control all target non-native invasive species populations within the Zone of Influence (ZoI) of the proposed road development, having regard to the specific timing/seasonal constraints that apply in relation to each individual species.
8.12	C	The implementation of the Non-Native Invasive Species Management Plan will include a pre-construction re-survey within the proposed development boundary. In accordance with the NRA guidance this survey will include accurate 1:5,000 scale mapping for the precise location of non-native invasive plant species. The pre-construction surveys will be undertaken by suitable experts with competence in identifying the species concerned.
8.13	C	In accordance with the <i>Guidelines on the Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads</i> (National Roads Authority, 2010), where cut, pulled or mown noxious weed or non-native invasive plant species material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of no less than 0.5m in the case of noxious weeds, or by incineration (at a licenced facility having regard to relevant legislation) or disposal to licenced landfill in the case of non-native invasive plant species.
8.14	C	The taproots of docks and roots of creeping thistle are not suitable for composting or shallow burial, requiring disposal to landfill, incineration

Ref No.	Stage	Commitments
		or burying at a depth of no less than 1.5m (practical only during the construction phase). Where burial is being used to dispose of Japanese knotweed, the material will be buried to a depth of 5m and overlain with a suitable geotextile membrane. All disposals will be carried out in accordance with the Waste Management Acts 1996 - 2011.
8.15	C	In relation to aquatic non-native invasive species all construction works, and any aquatic survey work that may be carried out (e.g. electrofishing), will comply with best practice biosecurity protocols for aquatic work – for example IFI’s Biosecurity Protocol for Field Survey Work (IFI, 2010).
8.16	O	Areas of Annex I habitat within the proposed development boundary which are identified to be retained and fenced off during the construction of the proposed road development will also be avoided during the operational phase.
8.18	C/O	There will be no fencing within Annex I habitats that are located within Lough Corrib cSAC.
8.19	C/O	Areas of compensatory habitat will be created, managed and monitored as set out in the Compensatory Habitat Management Plan in Appendix A.8.26 .
Otters		
8.20	C	A pre-construction check of all suitable Otter habitat will be required within 12 months of any constructions works commencing.
8.21	O	Otter passage facilities will be provided at all watercourses used by Otter (e.g. raised ledges within structures, or separate dry 600mm pipes installed adjacent to culverts). Mammal underpasses will be constructed in accordance with the <i>Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes</i> (National Roads Authority, 2008). The locations where Otter passage facilities will be provided are listed in Table 8.36 of Chapter 8, Biodiversity and shown on Figures 8.23.1 to 8.23.14 .
8.22	O	Mammal-resistant fencing will be installed in accordance with the specification outlined in <i>Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes</i> (National Roads Authority, 2008). The locations where mammal-resistant fencing is to be installed are shown on Figures 8.23.1 to 8.23.14 .
8.23	O	Quarterly monitoring of the effectiveness of the environmental commitments will be undertaken in the first year after the completion of construction works.
Bats		
8.24	C	The Bat Derogation Licence included in Appendix A.8.25 will be submitted to National Parks and Wildlife for their approval.
8.25	C	The environmental commitments set out in the Bat Derogation Licence included in Appendix A.8.25 shall be adhered to by the Contractor.
8.26	O	The schedule of structures to provide bat passage and the function that they serve in terms of mitigating the potential barrier effect are as per Table 8.35 of Chapter 8, Biodiversity and Figures 8.23.1 to 8.23.14 .
8.27	O	The proposed planting design associated with the Castlegar Wildlife Overpass comprises of a double hedgerow in the middle section of the overpass (to mimic a 4m wide bóithrín). Each of the hedgerows will then diverge out to create a “mouth” at the entrance to the overpass on both sides of the proposed road development to funnel bats in to the centre of

Ref No.	Stage	Commitments
		the overpass. Plate 2, of Chapter 8, Biodiversity , shows the schematic design and location of the proposed overpass.
8.28	O	No lighting will be provided at or on any of the structures which have been designed to provide bat passage, with the exception of S06/01 where lighting will be provided to also allow for safe use by pedestrians. All of the bat underpasses (as well as artificial roosts) that are designed for Lesser horseshoe bats will have connecting woody vegetation features. Other bats species are not as reliant on hedgerows and woodland edges. Whilst there are many existing landscape features outside of the proposed development boundary, the bat mitigation strategy cannot rely on these in the long term as they may be subject to interventions by third parties. In effect, what will be created is a hedgerow corridor leading up to underpasses in the section of the proposed road development between Aughnacurra and Castlegar. This planting provides a guaranteed green corridor connecting up the underpasses/overpasses and will allow bats to adapt more easily to any future landscape scale losses of connecting habitat features. The hedgerow planting leading up to underpasses will be maintained and the growth of the hedgerow monitored for 5 years following completion and remediation works undertaken if deemed necessary.
8.29	C	As the baseline level of bat activity and roost occupancy can change over time, pre-construction monitoring will be carried out in advance of construction works commencing to ensure that the data against which the post-construction monitoring will be compared to is as up-to-date as possible (refer to Bat Derogation Licence included in Appendix A.8.25). Monitoring of the effectiveness of the bat mitigation and compensation measures will also be undertaken during and post-construction. Where the monitoring identifies issues with either the mitigation or compensation measures (e.g. light spill affecting usage), these will be remediated to ensure that those measures will achieve their aims with respect to mitigating or compensating for impacts on the local bat populations (refer to Bat Derogation Licence included in Appendix A.8.25).
Badgers		
8.30	C	A detailed summary of the environmental commitments as they relate to each of the Badger setts within the ZoI of the proposed road development is presented in Appendix A.8.24 and summarised in Table 8.36 of Chapter 8, Biodiversity . The non-interference zones (30m, 50m, and 150m) as they relate to each of the Badger setts within the ZoI of the proposed road development are illustrated on Figures 8.23.1 to 8.23.14 . A pre-construction check of the activity status of all setts will be required within 12 months of any constructions works commencing within the ZoI of the setts discussed below.
8.31	C	In order to prevent any disturbance to Badger setts not directly affected by the proposed road development: <ul style="list-style-type: none"> • No heavy machinery shall be used within 30m of Badger setts at any time. • No works shall be undertaken within 50m of active setts during the breeding season. • Lighter machinery (generally wheeled vehicles) shall not be used within 20m of a sett entrance. • Neither blasting nor pile driving shall be undertaken within 150m of active setts during the breeding season (December to June inclusive)

Ref No.	Stage	Commitments
8.32	C	Prior to works commencing, a non-interference zone of 30m will be established around each of the Badger setts within the ZoI of the proposed road development, as shown on Figures 8.23.1 to 8.23.14 . If the sett is active, non-interference zone will be extended to 50m during the breeding season (December to June inclusive). The fencing shall be as noted in Chapter 7, Construction Activities of a sufficient durability to maintain the exclusion zone throughout the construction period or, if required, until such time as the sett in question is excluded/removed.
8.33	C	Where setts require exclusion and removal, or temporary exclusion for the duration of the construction period, this will be undertaken in accordance with the methodology detailed in the Guidelines for the Treatment of Badgers during the Construction of National Road Schemes (National Roads Authority, 2006): <ul style="list-style-type: none"> • All Badger setts requiring exclusion and removal will require a monitoring period of at least five days to confirm activity status in advance of any construction works commencing. • If the sett is active, then it shall not be removed within the Badger breeding season (December to June inclusive). To exclude or remove an active Badger sett outside of this period, inactive entrances shall be soft and hard-blocked with one-way gates installed on active entrances. One-way gates will be tied open for three days before being set to exclude, and then monitored for a period of at least 21 days before the sett is deemed inactive and destroyed. If at any time during the monitoring period the sett becomes active, the exclusion process/programme must commence again from day 1 of the 21-day monitoring period. • For inactive setts, entrances will be soft-blocked (lightly blocked with vegetation and soil) and if all entrances remain undisturbed for a period of five days the sett should be destroyed immediately. This can be undertaken at any time of the year for inactive setts.
8.34	C	An artificial sett is required to mitigate for the loss of the main sett (S9), in conjunction with a subsidiary sett (S11), of the Lackagh Badger group. The requirements relating to the provision and design of the artificial sett are set out in Appendix A.8.24 . The location of the artificial sett is shown on Figures 8.23.1 to 8.23.14 .
8.35	C	Inaccessible areas (see Figures 8.3.1 to 8.3.14) will require a pre-works survey for badger setts in advance of site clearance. If a sett is uncovered, works must cease and a non-interference zone of 30m established; extended to 50m during the breeding season if set is active (December to June inclusive). Sett removal will follow the process outlined above.
8.36	O	To avoid badger road casualties, mammal passage facilities will be provided at strategic locations along the route of the proposed road development. Mammal underpasses will be constructed in accordance with the <i>Guidelines for the Treatment of Badgers during the Construction of National Road Schemes</i> (National Roads Authority, 2006). Where engineering constraints conflict with the recommended locations at detailed design phase, mammal underpasses may be moved to the nearest most suitable location, but not more than c.250m away. The locations where Badger passage facilities will be provided are listed in Table 8.36 and are shown on Figures 8.23.1 to 8.23.14 .
8.37	O	A number of the mammal passage structures lie within the modelled light spill zone and artificial lighting may affect their usage by Badger: structures C07/04, C07/01(b) and C12/01. Screening will be provided to

Ref No.	Stage	Commitments
		ensure that the approaches and entrances to these structures are unaffected by light spill.
8.38	O	Mammal-resistant fencing will be required to guide badgers to the underpasses and will be installed in accordance with the specification outlined in <i>Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes</i> and will include badger proofing of emergency access roads and other similar access points, where located in areas where mammal-resistant fencing is to be installed. The locations where mammal-resistant fencing is to be installed are shown on Figures 8.23.1 to 8.23.14 .
8.39	O	In accordance with the recommendations described in the <i>Guidelines for the Treatment of Badgers during the Construction of National Road Schemes</i> (National Roads Authority, 2006), quarterly monitoring of the effectiveness of the environmental commitments will be undertaken in the first year after the completion of construction works.
Other mammal species (excluding bats)		
8.40	O	The schedule of structures to provide for mammal passage, as per Table 8.36 and as shown on Figures 8.23.1 to 8.23.14 , are required to ensure permeability for all other mammal species across the proposed road development during operation.
Invertebrates		
8.41	C	To avoid the destruction of Marsh fritillary eggs or the mortality of Marsh fritillary caterpillars, the following mitigation strategy will be implemented in relation to the site clearance works: <ul style="list-style-type: none"> All areas within the proposed development boundary, which have been identified as suitable habitat to support the Marsh fritillary butterfly, will be subject to a pre-construction larval web survey. This will be undertaken during the mid-August to the end of September window immediately preceding site clearance works. If larval webs are present, they will be translocated to another area of suitable habitat; either outside of the proposed development boundary or, if within, to an area of suitable habitat that will remain unaffected by construction works for the duration. Once all larval webs have been removed from the affected areas, or if no larval webs were recorded, the vegetation will be immediately cleared or cut to ground level to render the area unsuitable for the species to recolonise. The vegetation shall be maintained in this state until such time as the topsoil is removed.
Birds		
8.42	C	Where feasible, vegetation (<i>e.g.</i> hedgerows, trees, scrub and grassland) will not be removed, between the 1 March and the 31 August, to avoid direct impacts on nesting birds. Where the construction programme does not allow this seasonal restriction to be observed, then these areas will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to clearance. Areas found not to contain nests will be cleared within 3 days of the nest survey, otherwise repeat surveys will be required.
8.43	O	Planting of woodland, hedgerow and grassland habitats along the proposed road development as detailed in the landscape drawings (Figures 12.2.01 to 12.2.14) will provide compensatory habitat for some bird species.

Ref No.	Stage	Commitments
8.44	O	To further minimise the effects of breeding habitat loss, a total of 20 nest boxes will be erected by an ecologist in suitable locations away from the busy junctions/roadways. The siting and type of nest boxes will be decided on by an ecologist at locations where trees will be planted or retained along the proposed road development; as shown on Figures 12.2.01 to 12.2.14 .
8.45	C	To minimise the effects of current levels of disturbance to the Barn owl nest site at Menlo Castle, and thereby reduce any cumulative effect that construction activities nearby may have, alternative nesting sites will be provided in the vicinity. Three Barn owl nest boxes will be erected across the area shown on Figures 8.23.1 to 8.23.14 and will consist of either nest boxes erected on suitable trees or pole-mounted nest boxes. Preference will be given to erecting nest boxes on suitable trees, where possible. Tree mounted boxes will be erected at least 3m above ground level on a mature tree with few or no low branches to obscure the nest box. The selected tree shall be either isolated in a hedgerow or situated on a woodland edge with the access hole facing open ground. Pole-mounted nest boxes will be erected at a minimum height of 4.5m above ground. The nest box design (e.g. entrance hole size, floor area and depth from bottom of entrance hole to nest) shall be in accordance with the design requirements published by The Barn Owl Trust (http://www.barnowltrust.org.uk/). Nest boxes will be inspected annually for defects/damage and cleaned out/repared as required to ensure waterproofness and the internal box depth.
8.46	O	Sections along the proposed road development will be planted with dense low growing scrub cover (e.g. blackthorn) to discourage Barn owls from foraging near the proposed road development. The planting will be of a density to minimise the lag time between planting and obtaining sufficient ground cover to deter foraging Barn owl.
8.47	O	In areas where there is a high probability that Barn owls may regularly attempt to cross the proposed road development (the section of embankment between Ch. 9+600 and Ch. 10+100), lines of closely spaced (approximately 2m centres) trees, greater than 3m in height, will be planted along the top of the embankments of the proposed road development; outside of the safety barrier and clear zone. The understorey will also be densely planted. This is to present a solid vegetated barrier to deflect Barn owl from these high-risk areas and/or force birds to fly over the proposed road development above the road traffic.
8.48	O	All mitigatory planting will be in place at the earliest feasible stage during construction to ensure that the mitigation is functioning as soon as possible. The locations where planting will be used to reduce the risk of Barn owl mortality from road traffic are shown on Figures 8.23.1 to 8.23.14 and on the landscape drawings (Figures 12.2.01 to 12.2.14).
8.53	O	Following implementation of all environmental commitments for Barn Owls and completion of construction of the proposed road development, the following monitoring measures are proposed: <ul style="list-style-type: none"> • Surveys will be undertaken of roadside planting schemes at the end of years one and two with the objective of identifying and replacing failed plantings. • A road casualty survey to record barn owl mortalities along the route of the proposed development will be conducted once per week for a period of two years by a suitably qualified and experienced ornithologist. The proposed road development will be driven at a

Ref No.	Stage	Commitments
		<p>steady pace in both directions so that all sections and both sides of the route will be covered. Where noted, all barn owl mortalities will be assigned to either the “breeding” season (March to July) or “non-breeding” season (August to January). Location details of the casualty will be recorded, including a 10-digit GPS co-ordinate, position on the route (central median, hard shoulder, or verge) and orientation (southbound, northbound, eastbound, and westbound). The age class of the bird will be determined and classed as either “pre-breeding” if first or second calendar year recovered before March, or “adult” if the bird is second calendar year recovered later than March or older. The adjacent habitat feature will be noted. This methodology is in line with that utilised for Barn Owl population status and the extent of road mortalities in relation to the Tralee Bypass (O’Clery et al., 2016).</p> <ul style="list-style-type: none"> Monitoring to determine activity and breeding status of all active sites within 5km of the proposed road development over two breeding seasons (March to July). This will be carried out concurrently with the road casualty survey, and will involve visits to known and potential nesting sites to determine brood size and breeding success. Where accessible, nests will be visited in order to ring owlets (subject to an appropriate licence from the NPWS). <p>A report summarising the findings of the above monitoring will be submitted at the end of year two to the NPWS. The report may include further recommendations pending survey outcomes.</p>
8.54	C	To minimise the potential for construction works near Lackagh Quarry to disturb the Peregrine falcon nest site, works from the Lackagh Tunnel to the N84 Headford Road Junction will commence prior to mid-February. The installation of rock bolts on the cliff faces in the vicinity of the nest site will be undertaken in a sensitive manner (as advised by a suitably experienced ecologist) so as to minimise any potential disturbance to the nest site during the breeding season, particularly if the nest site is occupied.
8.55	C	Construction noise will be kept to a minimum in accordance with BS 5228 (2009).
8.56	C	Blasting associated with the eastern approach to Lackagh Quarry (Ch. 11+800 to Ch. 12+100) will be carried out between the months of April to September (inclusive) to minimise the exposure of wintering birds at Ballindooley Lough to blasting-related disturbance.
8.57	C	Blasting associated with the cutting at Castlegar (Ch. 12+550 to Ch. 13+650) will take approximately nine months to complete, with an estimated five blast events per week. To minimise the exposure of wintering birds at Ballindooley Lough to blasting-related disturbance, all of those nine months must be in the April to September period (inclusive) within consecutive years.
Amphibians		
8.58	C	If works to clear any of the habitat features suitable to support amphibian species are to begin during the season where frogspawn or tadpoles may be present (February – mid-summer), or where breeding adult newts, their eggs or larvae may be present (mid-March – September), a pre-construction survey will be undertaken to determine whether breeding amphibians are present.
8.59	C	In the case of Common frog, any frog spawn, tadpoles, juvenile or adult frogs present will be captured removed from affected habitat by hand net

Ref No.	Stage	Commitments
		and translocated to the nearest area of available suitable habitat, beyond the ZoI of the proposed road development.
8.60	C	In the case of Smooth newt, individuals will be captured and removed from affected habitat either by hand net or by trapping and translocated to the nearest area of available suitable habitat, beyond the ZoI of the proposed road development. If used, the type and design of traps shall be approved by the NPWS. This is a standard and proven method of catching and translocating Smooth nest.
8.61	C	If the size or depth of the habitat feature is such that it cannot be determined whether all amphibians have been captured, it will be drained under the supervision of a suitably experienced ecologist to confirm that no amphibian species remain before it is destroyed or infilled. Any mechanical pumps used to drain the habitat feature will have a screen fitted, and be sited, such that no amphibian species can be sucked into the pump mechanism.
8.62	C	Any capture and translocation works shall be undertaken immediately in advance of site clearance/construction works commencing.
8.63	O	The schedule of structures to provide for mammal passage, as per Table 8.36 and as shown on Figures 8.23.1 to 8.23.14 , are required to ensure permeability for amphibian species across the proposed road development during operation.
Reptiles		
8.64	C	In order to minimise the risk of site clearance and construction works disturbing, or causing the mortality of, Common lizard the following schedule of site clearance works will be followed in the areas highlighted on Figures 8.10.1 to 8.10.8 , where the presence of Common lizard has been confirmed: <ul style="list-style-type: none"> grass, scrub or heath vegetation will be removed during the winter period, where possible, avoiding potential Common lizard hibernacula sites (dry sites which provide frost-free conditions e.g. stone walls, underground small mammal burrows, piles of dead wood or rubble). where this is not possible and clearance will be undertaken during the active season (March through to September, inclusive), vegetation will be cut first to approximately 15cm, and then to the ground, under supervision of an ecologist. This will allow the opportunity for lizards to be displaced by the disturbance and leave the affected area. stone walls (or other potential hibernacula sites) will be removed during the active season (March through to September, inclusive) under the supervision of an ecologist, when they are less likely to be in use by torpid lizards.
8.65	O	The schedule of structures to provide for mammal passage, as per Table 8.36 and as shown on Figures 8.23.1 to 8.23.14 , are required to ensure permeability for the Common lizard across the proposed road development during operation.
Fish		
8.66	C	To minimise the effects of habitat loss on fish species, all sections of river/stream channel within the proposed development boundary, but not within the footprint of the proposed road development and associated infrastructure, will be protected from site clearance and construction works. Rivers/streams will be fenced off at a minimum distance of 5m

Ref No.	Stage	Commitments
		from the river bank and within this zone the natural riparian vegetation will be retained.
8.67	C	<p>To minimise the potential effects of construction works on fish species the following environmental commitments will be implemented:</p> <ul style="list-style-type: none"> • No instream works will be carried out between the months of October and June (inclusive) to avoid the most sensitive time for fish species and fish species movements. • Design of new sections of river channel shall be in accordance with the principles outlined in Channels & Challenges. Enhancing Salmonid Rivers. (O’Grady, 2006). • Immediately prior to rivers/streams being diverted into a newly constructed river channel or culvert, they will be electrofished (if required) to capture and transfer fish from the original channel to the new one. Once the watercourse has been diverted this will be followed by a manual search of the original watercourse to transfer any remaining fish to the new river/stream channel). • Any water abstraction points required for dust suppression will be agreed with IFI and the suction head shall be screened to ensure that fish are removed during the abstraction process.
8.68	C	All temporary crossing structures used to cross watercourses during construction will be designed in accordance with the <i>Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters</i> (IFI, 2016) and <i>Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes</i> (National Roads Authority, 2005) to maintain fish and macroinvertebrate passage, and to prevent sedimentation and erosion.