

Inspector's Report

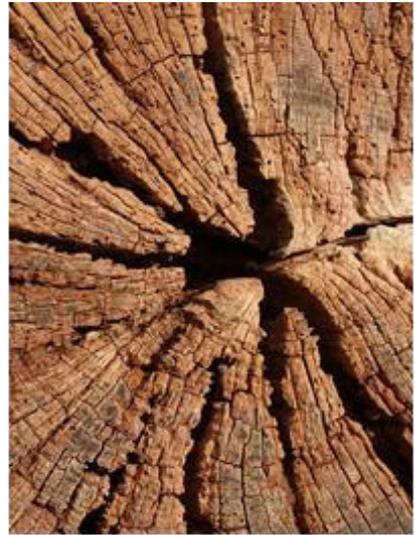
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19.0 Appendix 4: Ecological Impact Assessment, prepared by Richard Arnold of Thomson Environmental Consultant

20.0 Appendix 5: Hydrogeology report, prepared by James Dodd of Envireau Water

21.0 Appendix 6: Appropriate Assessment Report, prepared by Richard Arnold of Thomson Environmental Consultants

**19.0 Appendix 4: Ecological Impact Assessment, prepared by
Richard Arnold of Thomson Environmental Consultants**



**Ecological Impact Assessment
Report**

**N6 Galway City Ring
Road**

For

An Bord Pleanála

ABP Ref. ABP-302848-18, ABP-
302885-18

Project No.: IABP106/002

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1. Summary

- 1.1.1** The N6 Galway City Ring Road (N6 GCRR) is a proposed road development to the north of Galway, extending for approximately 18km from the R336 west of Bearna to a junction with the N6 at Briarhill, with a new crossing of the River Corrib. The proposed road is part Protected Road and part Motorway. As part of the application, the proposed road is the subject of an Environmental Impact Assessment and Natura Impact Assessment, as required by the EIA Directive and the Habitats Directive, respectively.
- 1.1.2** The route of the proposed road traverses two distinct geologies; granite in the west and limestone karst in the east, with the River Corrib separating the two. This, combined with generally low intensity land use, gives rise to two distinct sets of terrestrial habitats, with a mix of base-poor peatland habitats in the west, including wet heath, dry heath and blanket bog, and mix of calcareous habitats in the east, including woodland, calcareous grassland and limestone pavement. Due to these factors, the route corridor supports at least 658 native species of vascular plants and bryophytes, or about 37% of the total Ireland native flora. This includes six types of plant which are classified as near-threatened or vulnerable. In accordance with Transport Infrastructure Ireland (TII) guidelines, some areas of terrestrial habitat are of International importance, while others are of national, county or local value. These high value semi-natural habitats occupy about half of the land in the route corridor, with the rest, mainly in the east, being primarily improved agricultural grassland and sub-urban.
- 1.1.3** The route corridor supports a range of fauna commensurate with the habitats including marsh fritillary butterfly, marsh whorl snail, all nine species of Irish bat, most of the Irish land mammal species, including Irish hare, red squirrel, pine marten, Irish stoat, badger and otter, a variety of wintering birds, including a flock of oystercatcher, breeding birds, including barn owl and peregrine falcon, the only native reptile and two of the three amphibian species, and several native fish species, including salmon, brown trout and European eel. The populations of these species present in the route corridor range from local to international importance.
- 1.1.4** Much of the land and coastline in the vicinity of the route corridor is included in areas designated for their nature conservation interest, with Lough Corrib candidate Special Area of Conservation (cSAC) lying partly to the north and partly to the south of the route in the east, Moycullen Bogs Natural Heritage Area (NHA) lying to north of the route in the west and Galway Bay Complex cSAC to the south. Lough Corrib and Galway Bay are also designated as Special Protection Areas (SPA) for their bird interest. Where the route passes through the Galway City area, much of the high value terrestrial habitat areas mentioned above are included in Local Biodiversity Areas (LBAs), which have some protection through local development plan policy.
- 1.1.5** The design of the road includes measures to avoid or minimise direct impacts on the cSACs, NHAs and SPAs with mitigation measures also included to further remove residual risks to these designated areas. Several of the LBAs will however be bisected by the proposed road, as well as some equivalent quality habitat to the west of the Galway City area. Altogether, this would result in the loss of just over 100ha of the higher quality terrestrial habitat, including the loss of areas of two types of irreplaceable habitat, wet heath (2.47ha) and limestone pavement

(0.94ha), with the peatland habitats west of the Corrib accounting for most of the total, while approximately 5ha of woodland which supports red squirrel, pine marten and rare species of bats, would also be lost at Menlough. Direct or indirect impacts could occur during construction on at least one population of all the species mentioned above, and ongoing risks to the remaining populations during the operation of the road, especially those located to the south of the proposed road.

1.1.6 The applicant has proposed some compensation for the loss of terrestrial habitats. This is a total of 14.87ha, comprising wet woodland (0.18ha), dry heath (7.06ha), calcareous grassland (7.14ha) and wet grassland (0.49ha), along with an estimated 16ha of screening planting and 8ha of grassland creation in the soft estate for the proposed road which will also provide habitat for some species. The compensatory habitat is presented as a straight replacement however there is a risk that these areas are of lower quality or may fail, for example, 4.85ha of the dry calcareous grassland is to be created on top of buried peat in a quarry which may flood on occasion. Even taking it at face value, there would be an overall loss of higher value semi-natural habitats of 86.3ha, ameliorated to some degree by the (estimated) 24ha of roadside planting.

1.1.7 A range of mitigation measures to address the identified impacts on fauna have also been proposed, including timing site clearance to avoid the bird breeding season, rescuing animals found during site clearance, replacement roosts for bats, measures to reduce habitat degradation in proximity to the road and culverts and a bridge designed to facilitate the passage of wildlife across the proposed road. These measures are likely to ensure the proposed road does not contribute to local declines for badger, otter and the fish species, but all the other species mentioned will experience a net loss of habitat and populations along the route corridor are at further risk during the operation of the road.

1.1.8 Given this, there will be significant negative effects on features valued, in accordance with TII guidelines, at local to international value. This is acknowledged by the applicant e.g. EIAR p361 and p711-p712, although there are differences between the applicant's assessment and mine. For example, in my assessment more ecological features are subject significant impacts and there would be a net loss, rather than a net gain, of biodiversity. In its further information response, p83, the applicant makes the case that the amount of each habitat type lost to the proposed road becomes insignificant when compared to that present more widely. This has some validity; the proposed road would affect small areas of habitats and species populations which are internationally scarce but locally and regionally common. However, the twin geologies make the area unusual, the proposed road would impact on at least five species that are rare in Ireland, and the edge of the city may be particularly important for bats, having a combination of buildings for roosting and access to high quality foraging habitat. Moreover, in the context of Galway City, the loss of over 100ha of higher value terrestrial habitats is equivalent to 5 to 10% of the total and therefore not insignificant in this context.

1.1.9 In the event that the road is consented, I have identified some additional mitigation measures which would reduce the likelihood and/or severity of indirect effects on habitats and species populations but which would not change my conclusions on the significance of the identified residual impacts. This is because these measures do not address the overall loss of higher

value habitats, and their fragmentation and isolation. With more ambition, it would be possible to achieve better outcomes for biodiversity for example by better protecting and managing the remaining parts of local biodiversity areas and creating compensatory woodland in areas of currently low biodiversity value.

2. Introduction

2.1 Background

2.1.1 The N6 Galway City Ring Road is a proposed road development to the north of Galway City, approximately 18km in length, extending from a new junction with the R336 at the western side of Bearna to the existing N6 to the east of Galway City at Coolagh, Briarhill. The proposed road comprises a single carriageway from the new junction with the R336 to the Ballymoneen Road (approximately 5.6km of the route) and a dual carriageway from the Ballymoneen Road to where it joins the existing N6 (approximately 11.9km of the route), including a junction with the N59 at Letteragh. The proposed road would be a Protected Road from the R336 as far as the junction with the N59 and then a motorway eastward from the N59 junction to the N6. The proposal includes a number of junctions, link roads, slip roads and associated infrastructure. The applicant is Galway County Council, on behalf of itself and Galway City Council. The application for the N6 Galway City Ring Road follows a previous application for a new road to the north of Galway City, the N6 Galway City Outer Bypass. This was part consented however the decision was overturned in the Irish Supreme court following a ruling by the ECJ (European Union Court of Justice Case C-258/11).

2.2 Environmental Impact Assessment Report

2.2.1 To support the planning application, the applicant has prepared an Environmental Impact Assessment Report (**the EIAR**) for the N6 Galway City Ring Road which includes a chapter on biodiversity, which is 384 pages and is supported by 24 sets of figures and 26 appendices, mainly survey reports or results.

2.2.2 Following the production of the EIAR, additional relevant information has been provided by the applicant at various stages of the planning process (as set out in section 2.4 below). This includes:

- Request for Further Information Response Vols 1- 3, especially the main reports pages 66 - 82, **the "RFI response"**;
- Statement of Evidence: Responses to EIA Biodiversity Objection/Submission dated 19th February 2020, **the "Biodiversity Statement of Evidence"** (101 pages);
- A Corrigenda dated 21st February 2020, and updated 11th March 2020, which corrects some details in previously submitted documents, **the "Corrigenda"**;
- Response to Queries raised in Module 2 [sic] of the N6 Galway City Ring Road Oral Hearing dated 10th March 2020, **the "Module 1 response"**;
- EIAR Cumulative Impact Assessment Addendum Update Report (Dealing with proposed and permitted projects and plans since publication of the EIAR) dated 10th March 2020, updated on 15th October 2020 and again on 3rd November 2020 and supplemented on 4th November, with the last two forming the complete assessment, **the "cumulative assessment update"**; and
- The **Schedule of Environmental Commitments** which restates the mitigation measures committed to in the documents above, last updated 4th November 2020.

2.2.3 These documents together are taken to be information provided by the applicant in support of the ecological impact assessment, which is part of the assessment required under the EIA Directive, as amended. Additional information is provided in other planning documents including the Natura Impact Statement Report **the “NIS”** and **the “Design Report”** (submitted as part of the FIR response, Volume 4).

2.3 Submissions

2.3.1 The applicant refers to 47 submissions which relate to the biodiversity elements of the EIAR for the proposed N6 Galway City Ring Road prior to the oral hearing, of which 43 to 46 (depending on how these are counted) are addressed by the applicant in the Biodiversity Statement of Evidence. I note that a number of the objections were subsequently withdrawn prior to the completion of the oral hearing. The objections and submissions were wide ranging, each is summarised in Appendix 2. In summary, the submissions covered the following topics:

- Clarifications on impacts and mitigation proposals, and emphasis on the need for the latter to be effectively implemented;
- Objections to the proposed route because priority has been given to ecology and impacts on biodiversity over impacts on private property and the wellbeing of people in the route selection process;
- Objections to the location of compensatory habitat to be created in response to losses of Annex I habitat along the road route;
- Objections due to impacts on stone walls and the flora and fauna that they support, in conjunction with impacts on this type of boundary at private property; and
- Objections due to the loss of biodiversity in general, including garden wildlife, but also more specifically, including impacts on bees, ants, curlew, lesser horseshoe bats, pine marten, fox and hare.

2.3.2 As noted above, most of these submissions were responded to by the applicant in the Biodiversity Statement of Evidence dated 19th February 2020. These submissions and those received at the oral hearing are addressed directly in Appendix 2 of my report.

2.4 Further Information Request and Oral Hearing

2.4.1 Following the submission of the EIAR, a request for further information (FIR) was made by An Bord Pleanála in April 2019 with a response received from the applicant on 30th August 2019.

2.4.2 An oral hearing for the proposed road took place between 18th February 2020 and 4th November 2020, the hearing having been interrupted by the Covid-19 pandemic. The applicant responded to written submissions on ecology and hydrology/geohydrology on 19th and 20th February 2020, respectively, as set out in its statements of evidence. Oral submissions from the prescribed bodies including the Department of Culture, Heritage and the Gaeltacht (NPWS), pertaining to ecology and hydrology/ geohydrology were made on 21st February 2020, while Module 1, which dealt specifically with ecology and hydrology/geohydrology, took place on 24th and 25th February

2020 and 10th and 11th March 2020. Module 1 was completed prior to the interruption caused by the pandemic.

2.4.3 At the oral hearing, submissions related to the ecological impact assessment, or referred to potential effects on biodiversity (other than Natura 2000 sites). In summary these were:

- The Department of Culture, Heritage and the Gaeltacht (National parks and Wildlife Service) on 21st February, **NPWS3**, raised several points which it considers further detail is required in relation to the ecological impact assessment (in addition to those required for the appropriate assessment under the Habitats Directive) these were (i) potential de-watering affecting the water table at Moycullen Bogs NHA; (ii) marsh fritillary mitigation; (iii) Annex I habitat creation including remedial actions; (iv) mitigation for peregrine falcon; (v) net effect on barn owl foraging habitat; . The Department stressed the importance of effective and timely mitigation in order for the applicant's conclusions to hold.
- Mr Deidre Goggin raised points about the impacts on wildlife in and around homes and gardens at Castelgar and the links of a wildlife corridor to Ballinoolley wetlands which do not seem to have been considered by the applicant in the EIAR;
- Mr Kevin Gill raised concerns about the apparent priority of ecology and biodiversity over the impact on humans, in particular the effect on private property, in the route selection process and the potential for the mitigation (monitoring and management) to fail, citing examples of other failures, and how long the commitment to manage mitigation lasts, noting that the cost to people and the environment will be very high if the scheme is consented.
- Mr Peter Connelly who also raised concerns about the apparent priority of ecology and biodiversity over the impact on humans, preferring a route to the north of the GCRR, such as the GCOB, noting that the land here has all been subject to farming and querying whether mitigation/compensation could be applied, and also the impact on stone walls with around 3000m of stone wall lost and only 1000m created, with post and rail fencing used instead, which would cause damage to soils etc during installation and re-installation.
- Mr Brendon Mulligan cites one planet living principles including biodiversity protection, and the general need for biodiversity protection in general, and the links between climate change and biodiversity loss, and the need to act now, in response to the climate and biodiversity emergency, with the N6 GCRR contributing significantly to the detriment of biodiversity in Ireland, and the actual implementation of the mitigation is uncertain, questioning if the resources needed will really be available for it to be successfully implemented, meaning the outcome may be even worse than described in the EIAR with increased carbon emissions making matters worse still.
- Mr Patrick McDonagh who raised concerns about the effects of the flooding within Lackagh Quarry being exacerbated by material deposition in the quarry, the potential for polluted road run-off to reach Lough Corrib cSAC via ground water infiltration basins, the effect of material deposition within the quarry on petrifying springs within the quarry, the

effect on carline thistle in Lackagh Quarry, the potential loss of ant hills, foxes and the local hare population, which latter being a substantial population.

- Mr. Michael O'Connor makes points about the ability of the environment/biodiversity to recover, citing the Mutton Island Waste Water Treatment, and that adequate account appears to have been made of ecology/biodiversity impacts by the applicant in order for the road to be consented.
- Mr Tom Corr who represents Dermot and Sarah Harney who raised concerns about the use of a nearby building as a replacement bat roost, preferring it to be elsewhere, away from their property.
- Mr Stephen Dowds who represents of N6 Action Group who mainly makes points relevant to impacts on Lough Corrib cSAC which is relevant to the appropriate assessment report, but also sought clarification about the route selection process and avoidance of designated sites and development sites.
- Mr Vincent Carragher raises concerns about animal corridors and the movement of species, stated that the EIAR is flimsy and does not cover insects well enough, nor firm detail of corridors and how these will account for land-based invertebrates (as well as vertebrates), essentially is view is that the assessment and mitigation is not adequate.
- Mr. Dermot Flanigan on behalf of McHugh Property Group makes the case for material deposition areas and compensatory habitat to be other than in Lackagh Quarry, and for reduced quantity of grassland with a ratio of slightly greater than 1:1 being all that is required.
- Galway Athletics Board raised concerns about the impacts on (i) the River Corrib and surrounding area (including loss of access to nature by people) and its plant and animal life; (ii) badger, including the efficacy of badger/mammal underpasses, (iii) kingfisher, other birds and the adequacy of the bird survey which did not detect kingfisher; (iv) impacts on bats, including loss of 14 roosts in buildings and two in trees, loss of foraging habitat, noise and light pollution, and (v) risks to peregrine falcon, affecting one of only two nesting pairs in the whole of Galway. Also observes that (vi) NUIG new pitches application needs to be included in cumulative impact assessment; (vii) there has been lack of a biodiversity officer in Galway City to represent the views of local people; (viii) it is a fabrication in the EIAR to say that there will be no impact; (ix) that there will be a disparity between proposed mitigation and what will actually be delivered and (x) that the Development does not meet the objectives of the Galway City Development Plan or the National Biodiversity Plan.

2.4.4 These submissions were responded to by the applicant at the oral hearing, including a written response to the NPWS submission, which is included in the Module 1 response.

2.4.5 Further, Mr. Dodds and I put a series of questions to both the NPWS and the applicant to seek clarification on aspects of the EIAR, and to inform this report. The questions and the answers were provided by the NPWS in its submission on 10th March 2020 **NPWS4** and by the applicant in the Module 1 response. The four NPWS submissions are gathered in Appendix 1.

2.5 Site Visits and Scope

- 2.5.1 In addition to the information, observations and responses described above, I undertook two site visits to gain a general understanding of the receiving environment, these were on 6th and 7th March 2019 and 12th and 13th November 2019. Mr. Dodds also made a site visit.
- 2.5.2 This report is an ecological impact assessment based upon the information submitted by the applicant in support of the planning application, written submissions made by the NPWS and representations made by others at the Oral Hearing held in Galway in 2020. The purpose of the report is to assist An Bord Pleanála in undertaking its Environmental Impact Assessment of the proposed development.
- 2.5.3 This document contains measurements of areas which are either taken from the applicants work or measured by me using basic GIS tools but without undertaking detailed GIS work or the use of specialist GIS consultants. The areas that I have measured are therefore approximate and may not reconcile fully with the areas measured by the applicant.

3. Description of the Proposed Development

- 3.1.1 The applicant provides a description of the project in Section 5 of the EIAR and elsewhere in the application documents, especially the N6 Galway City Ring Road Design Report (Arup February 2019). In summary, the project comprises:
- New single carriageway road from a new junction with the R336 Coast Road at in An Baile Nua on the western side of Bearna eastwards for approximately 5.6km to the Ballymoneen Road, where there will be a new junction;
 - New dual carriageway from the Ballymoneen Road eastwards for approximately 11.9km to a new junction (the Coolagh Junction) with the existing N6;
 - A series of other junctions with the existing road network, including a junction with the N59 Moycullen Road at Letteragh, the N84 Headford Road, and the N83 Tuam Road;
 - Three link Roads, the N59 Link Road North, connecting to the N59 Moycullen Road, the N59 Link Road South, connecting to Letteragh Road, the Parkmore Link Road connecting to Ballybrit Business Park and the Parkmore Industrial Estate;
 - An open span bridge over the River Corrib, 620m in length with eight spans, the main span of 153m is over the river and without supports in the river, the eastern approach is one a retained embankment with five culverts passing beneath the road, with the bridge having a sealed and isolated drainage system which discharges to a new wetland/ attenuation area, Design Report p248, RFI response appendix A.1.1;
 - The Menlough viaduct which carries the road over an area of limestone pavement, with the viaduct 320m in length with eight spans of approximately 40m each, with some footings within the limestone pavement, with the viaduct having a sealed and isolated drainage system which discharges to a new wetland/ attenuation area, Design Report p250, RFI response appendix A.1.3;

- The 270m Lackagh Tunnel, which takes the road under (approximately 8.6m below) an area of limestone pavement, Design Report p251 to p255, RFI response Appendix A.1.4, and the 240m Galway Racecourse Tunnel, which takes the road under the racecourse, with both tunnels having a sealed and isolated drainage system, with collected water pumped to the nearest foul sewer, Design Report p255 to p258;
- Seven overbridges to standard design, four carrying roads over the proposed road development, one for wildlife and two at the Coolagh junction, Design Report p239 - p241 and FIR response Appendix A.1.7 , plus 10 underbridges all for roads, Design Report p242 - 244 and FIR response Appendix A.1.6.;
- Twenty-eight culverts and underpasses, with the majority of these including, being or providing a mammal underpass (although some are only suitable for bats, rather than walking mammals), Design Report p245 to p248, FIR response Appendix A.1.8 and the Module 1 response p26 and Appendix A;
- Ten Retaining walls between 6m and 288m in length, plus five strengthened slopes, Design Report p258 to 259;
- Drainage infrastructure, with flow rate and pollution controls, to collect and discharge rainwater which falls onto the new road surface and surface water flows (interceptor ditches), with discharge into watercourses, via attenuation ponds, to the west of the River Corrib (including indirectly and directly the River Corrib) and a combination of discharging to watercourses (again including the River Corrib, indirectly and directly) and into the ground, via infiltration basins, to the east of the River Corrib, reflecting the underlying geology (Design Report p265 - p301);
- Road lighting including at road junctions and along the main carriageway on the western and eastern approaches of the Lackagh tunnel and Racecourse tunnel, Design Report p332 - 333 and drawings GCOB-1300-D-000 to -015;
- Noise barriers at various locations, Design Report p261 - p264;
- Fencing of various types along the boundary, including timber post and rail, mammal proof fencing and palisade fencing (around ponds, etc.), FIR response Appendix A.8.1.
- Sign gantries, Design Report p259- p260;
- Forty potential Material Deposition Areas, including four at Lackagh Quarry (DA24, DA25, DA27 and DA28) see FIR response p13 to p15 and FIR response Appendix A1.11 (which supersedes the EIAR on this topic) and the Module 1 response p 38, p57-61;
- Compensatory habitat creation (or in some cases re-instatement) EIAR p 699, EIAR Figures 8.23.1 to 8.23.14 and EIAR Appendix A.8.26 FIR response Appendix A.1.11 p21 to p23;
- Other ecological mitigation areas, including an extensive area of land at Menlo (approximately 8ha) to the north of the proposed road development for bat and barn owl mitigation, see EIAR p710 and EIAR Figure 8.23.7;
- Landscaping of the soft estate to include screening planting (effectively woodland), boundary hedgerows and stone walls in specific locations and grassland sown with a low maintenance seed mix with stones over 50mm removed or buried, potential for some exposed rock in cuttings, EIAR p1110 and p1111; and

- (Up to) thirteen temporary construction compounds, Design Report p 387 and EIAR Figures 7.001 and 7.002.

3.1.2 The project will take approximately 36 months to construct, including archaeological trial trenching and ground investigation.

4. Study Area and Zone of Influence

4.1.1 The applicant describes the zone of influence in the EIAR p381 to p382, Figures 8.12.1 and 8.13.1. It is the road plus varying distances from this depending on the ecological feature or receptor under consideration and the pathways which connect it to the route corridor of the proposed road. In summary, the zone of influence considered in the EIAR is the footprint of the proposed road plus:

- Terrestrial habitats - 200m either side of the alignment.
- Aquatic habitats - as for terrestrial plus any downstream habitats (up to and including Galway Bay) including those connected via groundwater (which could be in any direction).
- Bats - the home range of the species in question, perhaps 1km being the maximum.
- Mammals other than bats - the home range of the species in question, perhaps 1km being the maximum.
- Birds - plus 300m or more, or 800m from blasting sites during construction.
- Amphibians - 0m plus any adversely affected wetlands.
- Common lizard - c.10m.

4.1.2 However, my view is that the zone of influence could extend beyond these distances for several features, as follows:

- Terrestrial habitats - traffic noise and isolation of habitats could extend the zone of influence beyond 200m.
- Scarce habitats and species populations - impacts at the project site could result in the remaining habitat parcels and species populations becoming more vulnerable, at almost any distance, but particularly if connected by one or two steps by dispersing plants and animals (supporting populations).
- Bats and other mammals - populations isolated by the proposed road could be affected beyond those which have a home range overlapping with the proposed road.
- Migratory birds and bats - impacts at the project site could have an impact on populations and the ecosystem at all other places used by the same migratory birds and bats.

4.1.3 The zone of influence should also be extended to include the haul roads and other areas subject to heavy construction traffic.

4.1.4 Cumulative impacts may also extend the zone of influence. The proposed road sits within a broader development plan for Galway City, which includes new residential development and more, with anticipated population growth and measures to encourage tourism. The additional mobility created by the road may encourage more visits by the increased population to sites of nature conservation importance in the locality, potentially causing damage by trampling etc. Therefore, such sites should also be considered in the zone of influence when considering cumulative impacts.

5. Legislation and Policy Context

5.1.1 The applicant lists the relevant legislation in the EIAR p366 and provides a list of guidance documents, EIAR p368, while the planning policy context, with respect to biodiversity was provided at the oral hearing in the module 1 response p41-43.

5.1.2 The Galway County Development Plan includes these policies and objectives:

- Policy NHB 1 Natural Heritage and Biodiversity - *It is the policy of Galway County Council to support the protection, conservation and enhancement of natural heritage and biodiversity, including the protection of the integrity of European sites..., the protection of Natural Heritage Areas, ...(and other designated sites including any future designations) and the promotion of the development of a green/ ecological network within the plan area, in order to support ecological functioning and connectivity...*
- Policy NHB 2 - Non-Designated Sites - *Recognise that nature conservation is not just confined to designated sites and acknowledge the need to protect non-designated habitats and landscapes and to conserve the biological diversity in the County.*
- Policy NHB 6 -...Biodiversity Plan[s] - *It is the policy of the Council to support the implementation of the National Biodiversity Plan and Galway County Biodiversity Plan and Galway County Heritage Plan in partnership with relevant stakeholders, subject to available resources.*
- Objective NHB 6 - *Protection of Bats and Bats Habitats Seek to protect bats and their roosts, their feeding areas, flight paths and commuting routes.....*
- Objective NHB 11 - *Trees, Parkland/Woodland, Stonewalls and Hedgerows - b) Seek to retain natural boundaries, including stonewalls, hedgerows and tree boundaries, wherever possible and replace with a boundary type similar to the existing boundary where removal is unavoidable.*
- Policy TI 8 - *Transportation Infrastructure Requirements - [the] solution [to the transport needs of the Galway Gateway] shall have due regard to the necessity to protect the environment and will comply fully with the requirements of the Habitats Directive.*

5.1.3 The Galway City Development Plan includes these policies:

- Policy 4.2 *Protect, conserve and support the development of an ecological network throughout the city which will improve the ecological coherence of the Natura 2000 network in accordance with Article 10 of the Habitats Directive.*
- Policy 4.2 *Protect Local Biodiversity Areas, wildlife corridors and stepping stones identified in the Galway City Habitat Inventory 2005 and Galway Biodiversity Action Plan 2014-2024 in supporting the biodiversity of the city and in the Council's role/responsibilities, works and operations, where appropriate.*
- Policy 4.2 *Support the actions of the Galway City Heritage Plan 2016-2021 and Biodiversity Action Plan 2014-2024 relating to, the protection of wildlife corridors and the prevention of wildlife habitat fragmentation.*

5.1.4 However, the City Plan does give precedence to the N6 GCRR in section 3.10 stating the objective (but not a policy) to “*give priority to the reservation of the N6 GCRR Preferred Route Corridor and the associated land requirements over other land uses and objectives in the City Development Plan*”. There does not seem to be a similar priority statement at the County level and the City level objective cannot apply outside the City boundary (i.e. the western part of the N6 GCRR near Bearná).

6. Appraisal Methodology

6.1 Consultation

6.1.1 The applicant consulted with the NPWS and other organisations during the design and planning application process, EIA p370-373. This continued up to and during the oral hearing in February and March 2020.

6.2 Desk Study

6.2.1 The applicant undertook an ecological desk study, drawing on a comprehensive range of sources, EIA p368.

6.3 Field Assessment

6.3.1 The applicant undertook a suite of ecology surveys to inform the ecological impact assessment, EIA p375. These include surveys of:

- Habitats
- Protected plants (for slender naiad *Najas flexilis* and varnished hook moss *Hamatocaulis vernicosus*)
- Bats, including radio tracking, hibernation surveys, activity surveys and roost surveys
- Otter
- Other mammals
- White-clawed crayfish

- Molluscs including freshwater pear mussel
- Marsh fritillary
- Birds, comprising red grouse, barn owl, peregrine, woodcock, breeding and wintering bird surveys
- Amphibians and reptiles
- Fish

6.3.2 The original surveys were supplemented by updated vegetation surveys completed in 2019, with a greater focus on the selected route for the proposed road, FIR response relevé dataset and Figures 2.4.00 to 2.4.120. The updated vegetation surveys provided a significant amount of additional data (>700 relevés) which, clearly, was not considered in the EIAR but was subsequently by the applicant in the FIR response, p26-p27.

6.4 Evaluation of Nature Conservation Interest

6.4.1 The applicant sets out the method for its evaluation of nature conservation value in the EIAR p377, which it says was in accordance with TII guidelines (NRA, 2009).

6.4.2 This guidance provides a five-point scale and gives examples for each:

- International importance
- National importance
- County importance (or vice-county in the case of plant or insect species)
- Local importance (higher value)
- Local importance (lower value)

6.4.3 There is more recent guidance from the Chartered Institute of Ecology and Environmental Management, first published in 2016 (CIEEM, 2018), although the approach is similar, and the applicant draws upon both.

6.4.4 Under both systems, the value of designated sites is assigned in accordance with the level of the designation, so an SAC is assigned international importance and so on. The TII guidelines also states that undesignated sites which fulfil the criteria for a designated site at a given level should be assigned that level of value.

6.4.5 The TII guidance offers guidance for site-based assessments rather than individual habitats, except for areas of habitat included in a biodiversity action plan, which, if viable, should be assigned county value, the guidelines suggest. This does not translate easily to the area around Galway City where the concept of 'site' is perhaps harder to define compared to more intensively farmed landscapes.

6.4.6 Outside of the designated sites, the applicant has evaluated individual habitats primarily on the basis of the inclusion of a habitat on a list (Annex I, etc), so any area of Annex I habitat outside of a designated site was assigned national value, for example.

- 6.4.7** However, the higher value habitat parcels along the route corridor are generally small, clustered and intermixed, sometimes with apparently lower value habitats, forming a mosaic which together have a value potentially greater than each parcel individually. Therefore, I grouped these into clusters (equivalent to sites), and evaluated each in accordance the TII guidance, as I felt this gives a better understanding of the value of each area. Even so, there remains the challenge of placing a value on habitats which are internationally scarce but abundant locally; using the TII guidelines means, for example, assigning 'sites' which support unviable areas of Annex I wet heath County importance even though this habitat is widespread in County Galway.
- 6.4.8** The TII guidelines suggest using the, *inter alia*, 1% criteria for evaluation species populations, so 1% or more of the national total would be of national importance and so on, which is a standard approach and works well when the data is available. The applicant has adopted this approach generally, particularly for protected species. However, species on the red list appear to have been omitted from the assessment and so I have included these. The guidance also makes clear that the value of an assemblage of species can be greater than its constituent parts, so I have considered this as well.

7. Description of the Existing Environment

7.1 Designated Areas

- 7.1.1** The applicant lists and describes sites designated for their nature conservation interest in the EIAR p383 to p396. These are summarised in my Table 1 (next page), along with their nature conservation value. For statutory designated sites, my assessment agrees with that presented by the applicant, EIAR p474. The non-statutory Local Biodiversity Areas are more problematic as these sometimes contain the same habitats as included in the statutory sites which are designated as of international and national importance, so it is not as simple as assigning local value to local sites. I have therefore evaluated these or parts of these under terrestrial habitats, where they are included in the surveys undertaken by the applicant.

Table 1: Designated sites within the zone of influence of the proposed road

Site Code	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to N6 GCRR Site (closest point)	Value
Natura 2000				
000297 000228	Lough Corrib cSAC pNHA including Ballycuirke Lough pNHA and River Corrib and adjoining wetlands LBA	Comprises Lough Corrib, River Corrib, twelve or more other rivers and the land surrounding the Lough, encompassing bog, heath, woodland, grassland and limestone pavement. Supporting important populations of stoneworts in the southern basin of Lough Corrib and a population of lesser horseshoe bats at Ebor Hall, plus Ballycuirke Lough pNHA	0 km (i.e. overlapping boundaries), to north and south	International
000268	Galway Bay Complex cSAC pNHA, including Rusheen Bay - Barna Woods - Illaunafamona LBA and Mutton Island and nearby shoreline LBA and overlapping with Lough Atalia and Renmore Lagoon LBA	Inner part of Galway Bay including shallow, inter-tidal inlets and bays, small islands, coastal cliffs, lagoons and surrounding terrestrial habitats.	0.16km, south	International
004042	Lough Corrib SPA	Lough Corrib.	0.2km	International
004031	Inner Galway Bay SPA	Inner Galway Bay, see description for Galway Bay Complex cSAC.	1.1km	International
004142 000253 NHA	Cregganna Marsh SPA NHA	Primarily lowland wet grassland with other habitats including limestone pavement.	4km, south-east	International
002034	Connemara Bog Complex cSAC pNHA	A very large site encompassing the majority of the south Connemara lowlands, underlain with granite and supporting areas of deep peat, with the main habitat being Atlantic blanket bog. The blanket bog is interspersed with a variety of base-poor terrestrial habitats and lakes, supporting a number of rare plant species.	6km west	International
004181	Connemara Bog Complex SPA	South Connemara lowlands, see description for Connemara Bog Complex cSAC.	9km west	International
000606	Lough Fingall Complex cSAC pNHA	Within an area of flat, low-lying limestone and supporting a complex of calcareous habitats including limestone pavements, calcareous grassland and a series of turloughs. The grassland supports a	9.5km south east	International

Site Code	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to N6 GCRR Site (closest point)	Value
		variety of orchids and an additional feature of the site is an internationally important population of lesser horseshoe bats.		
001312	Ross Lake and Woods cSAC pNHA	Ross lake is a mediums size lake on limestone supporting a variety of stoneworts adjoined by a conifer plantation and some broadleaved woodland. Supports otter and a breeding population of common gull.	10km north-west	International
000020	Black Head-Poulsallagh cSAC pNHA	Part of the Burren, including the shoreline, sand dunes at Fanore, limestone pavement and the Caher River.	11km south	International
000322	Rahasane Turlough cSAC pNHA	One of only two large turloughs in the country which still functions naturally, supporting two rare plant species including Fen Violet (<i>Viola persicifolia</i>), and is also the most important turlough in Ireland for its birdlife.	11.5km south east	International
004089	Rahasane Turlough SPA	Large turlough, see description for cSAC.	12km south-east	International
001285	Kiltiernan Turlough cSAC pNA	A relatively dry turlough which is notable for the presence of two rare plant species; alder buckthorn (<i>Frangula alnus</i>) and fen violet (<i>Viola persicifolia</i>)	12km south east	International
000242	Castletaylor Complex cSAC pNHA	Complex of habitats on limestone including Caranavoodaun turlough, limestone pavement, calcareous grassland, heath and woodland.	12km south east	International
001271	Gortnandarragh Limestone Pavement cSAC pNHA	Limestone pavement located on the south side of Lough Corrib, interspersed with heath, grassland and scrub, plus an area of bog, which the is only known locality for the endemic fungus <i>Entoloma jenny</i>	12.5km north-west	International
002244	Ardrahan Grassland cSAC	Large flat limestone area with a mosaic of calcareous habitats plus Brackloon Lough, a small marl lake, with adjoining wetlands and two small turloughs.	13km south east	International
000054	Moneen Mountain cSAC pNHA	Part of the Burren, open limestone pavement, associated grassland and heaths, plus scrub and woodland.	13km south	International
001926	East Burren Complex cSAC pNHA	All of the high ground in the eastern Burren area, comprising limestone pavement and associated calcareous grasslands and heath, scrub and woodland together with a network of calcareous lakes and turlough.	13km south	International

Site Code	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to N6 GCRR Site (closest point)	Value
002008	Maumturk Mountains cSAC	A series of peaks over 600m above sea level and surrounding areas, with wet heath, dry heath and blanket bog.	34km, northwest	International
002031	The Twelve Bens/Garraun Complex cSAC	A series of peaks over 500m above sea level and surrounding areas with heath and blanket bog, part of the Connemara National Park.	47km, northwest	International
Natural Heritage Areas and proposed Natural Heritage Areas				
002364	Moycullen Bogs NHA and part of Ballagh - Barnacranny Hill LBA	Connemara peatland, including blanket bog, fen, wet grassland, heathland and scrub, located east of Tonabrocky.	0m, immediately adjacent	National
002431	Oughterard District Bog NHA	Large area of lowland and upland blanket bog, interspersed with other peatland habitats.	15km	National
001267	Furbogh Wood pNHA	Oak woodland bordering the Furbogh River, and one of the few Atlantic woodlands which occurs directly at the coast, and on a mineral soil.	2.3km	National
000287	Kiltullagh Turlough pNHA	Turlough, unusual in supporting a dry grassland type.	2.2km	National
002083	Killarainy Lodge, Moycullen	Natterer's bat nursery roost	7.2km	National
001260	Drimcong Wood pNHA	Mixed broadleaved and coniferous woodland	8.2km	National
001788	Turloughcor pNHA	Wetland Supporting wintering bird populations	15km	National
Local Biodiversity Areas				
-	Unnamed LBA 1 at Cloughscoltia	Peatland habitats including wet grassland, west of the Cappagh Road	0m (crossed by proposed road)	See terrestrial habitats
-	Cappagh - Ballymoneen LBA	An area of blanket bog, fen, wet grassland and scrub located between Cappagh and Ballymoneen Roads.	0m (crossed by proposed road)	See terrestrial habitats
-	Unnamed LBA 2 at East of Ballymoneen Road	Peatland habitats including scrub and wet grassland, east of Ballymoneen Road	0m (crossed by proposed road)	See terrestrial habitats
-	Ballagh - Barnacranny Hill LBA	Connemara peatland, including blanket bog, fen, wet grassland, heathland and scrub, located east of Tonabrocky. This area is partly within Moycullen Bog NHA but appears to extend beyond it, encompassing peatland to the east of Lettaragh Road	0m (crossed by proposed road)	See terrestrial habitats
-	River Corrib and adjoining wetlands LBA	Partly within Lough Corrib cSAC pNHA	0m (road passes over)	See terrestrial habitats

Site Code	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to N6 GCRR Site (closest point)	Value
-	Menlough to Coolough Hill LBA	Partly within Lough Corrib cSAC pNHA, includes Lackagh Quarry	0m (crossed by proposed road)	See terrestrial habitats
-	Unnamed LBA 3 at Lackagh	Calcareous habitats including limestone pavement	0m (crossed by proposed road)	See terrestrial habitats
-	Ballindooley - Castlegar LBA	Area centred on Ballindooley Lough, includes fen, reed swamp, wet grassland, scrub and exposed limestone rock. The Castlegar area contains smaller areas of wet grassland, scrub and exposed limestone.	0m (crossed by proposed road)	See terrestrial habitats
-	Galway Racecourse, Ballybrit LBA	Large open area of species-rich calcareous grassland.	0m (road passes underneath and through?)	Local
-	Doughiska	Area of exposed limestone rock with calcareous grassland and scrub located along the eastern boundary of the city. The grassland contains orchid species and protected Small white orchid (<i>Pseudorchis albida</i>).	100m	At least local
-	Merlin Park Woods	Mature broad-leaf trees, mixed broad-leaf / conifer woodlands.	700m	At least local
-	Roscam	Relatively undisturbed examples of salt marsh, shingle banks, brackish lagoon, sandy shore and muddy sand shore, with calcareous grassland and scrub.	c.2km	At least local

7.1.2 The mapping available for the Local Biodiversity Areas is poor, with only a small-scale map without labels available in the Galway Local Development Plan. The boundaries are unclear, and some areas do not fit the name or description. As such, three areas are referred to as “unnamed LBA”, although these may be included in the named LBAs listed in Table 1 or possibly not within an LBA at all (the mapping is that unclear).

7.2 Terrestrial Habitats

7.2.1 The applicant recorded many habitat types along the route of the proposed road, both inside and outside the boundary. Two overlapping systems of habitat classification are used the first is the Fossitt classification (Fossitt, 2007), which is a complete classification system for Irish habitats, and the second is Annex I habitats from the Habitats Directive (EC, 2013), which is an incomplete classification system covering Annex I habitats only.

7.2.2 As set out by the applicant, EIAR p 398 to 399, and elsewhere, the underlying geology is a key determinant of the habitats, with the geology to the west of the N59 Moycullen Road comprising granite and naturally supporting base poor, peatland habitats (heathland, bogs, fen and mire)

and that to the east comprising limestone and supporting base rich habitats (calcareous grassland, limestone pavement, turloughs and other ground water dependent ecosystems).

- 7.2.3** The habitat types were originally presented and described in the EIAR p397 to p427 and shown on Figures 8.14.1 to 8.14.15 and 8.15.1 to 8.15.15. This was based on work undertaken for the route selection and therefore updated survey work, classification and mapping were undertaken in response to the FIR request and is provided in the FIR response, Appendix A.3.1. and Figures 2.5.1 to 2.5.15 and 2.6.1 to 2.6.15, although these show habitats within the proposed road boundary only. This was further refined at the oral hearing with updated figures provided in the corrigenda.
- 7.2.4** The land within the red line boundary of the proposed road is 280ha in total. The applicant provides some information on the quantities of habitats within the route corridor, for some this is the amount present and amount lost, for others it is just the amount present or the amount lost, for others it is aggregated, and for one (Active Quarries and mines (ED4)) there is no data, corrigendum p13 to p16 . There is also no data presented in the EIAR on the total sizes of a given habitat parcel which can be an important determinant of the value of the habitat. However, mapping and a GIS dataset was provided as part of the FIR response.
- 7.2.5** Due to the intricate nature and abundance of higher value semi-natural habitats, I have grouped them geographically as a way of better understanding the baseline conditions, moving west to east, as follows:
- Cluster 1 Forramoyle (Ch. 0+000 to Ch. 1+600¹) mixed area of 4010/HH3 dry heath, 4030/HH1 wet heath, *7130/PB3 lowland active peat bog, GS3 acid grassland, GS4 wet grassland, WS1 scrub and HD1 bracken, includes Sruthan na Libeirti (a stream), extends eastwards from Knockhagteana to the Troscaigh Road L5387 to, south to Barna and northwards where it connects directly with Moycollen Bogs. It is likely to be of county value.
 - Cluster 2 Troscaigh (Ch.1+600 to Ch. 2+800), large areas of 4010 HH3 wet heath, 4030/HH1 dry heath *7130/PB3 active lowland blanket bog with WS1 scrub, GS4 wet grassland and HD1 bracken, it is a continuation of Cluster 1 extending from Troscaigh Road L5387 eastwards to Trusky East (Barna to Moycullen Road). This area is of at least national value as it supports three rare types of plants (see below).
 - Cluster 3 Cloughscoltia (Ch. 2+800 to Ch. 4+400, apparently² partly within unnamed LBA 1, but mostly outside the Galway City area), large areas of GS4 wet grassland including 6410 Molinia meadows, with areas of 4010/HH3 wet heath, 4030/HH1 dry heath and WS1 scrub, with some HD1 bracken. The Trusky and Barna Streams pass through this area from north to south. The area extends from Trusky East (Barna to Moycullen Road) to the Cappagh Road i.e, it is a continuation of Cluster 2. It is likely to be of county value.

¹ Ch. = chainage, which is a measurement in distance from the start of the proposed road in the west, with the first number whole kilometers and the second three digits being the additional meters from the nearest kilometers, here approximate overlap of each cluster with the route alignment is given.

² The available mapping of local biodiversity areas is poor, hence the uncertainty about which areas of land are included in LBAs, this does not affect the valuation of the area, however, it does determine which plan policies apply.

- Cluster 4 Cappagh Road to Ballymoneen Road (Ch 4+400 to Ch. 5+600, appears to be part of the Cappagh - Ballymoneen LBA), comprising comparatively large areas of 4010/HH3 wet heath, *7130/PB3 active lowland blanket bog and HD1bracken, plus smaller areas of 4030/HH1 dry heath, WS1 scrub, GS4 wet grassland and 6410 Molinia meadows on ... peaty...soils (Molinia caeruleae), plus the Tonabrocky Stream. This area extends southwards to developed residential land and northwards to Boleybeg East/Rahoon Road (with apparently similar habitats beyond). Active lowland blanket bog in particular is a high value habitat, which along with wet heath could be considered irreplaceable, making this one of the most important areas of base-poor habitats within the Galway City area, although more extensive areas occur outside the city area boundary (it is basically an extension of Moycullen Bog). This area is of at least county value.
- Cluster 5 East of Ballymoneen Road (Ch.5+750 to Ch. 5+950, apparently part within an unnamed LBA 2), mostly WS1 scrub with GS4 wet grassland, and towards the south patches of 4030/HH1 dry heath, 4010/HH3 wet heath, GS3 acid grassland, GS4 wet grassland and bracken, located between the Ballymoneen Road and Keeraun Bothrin extending southwards to developed land (Ard Fraoigh) of Galway City, it is relatively isolated from areas of similar habitats by residential developments and roads. This area is likely to be of county value, although it does include wet heath which is regarded as an irreplaceable habitat.
- Cluster 6 Knocknabrona/Knocknafrosca (Ch. 7+700 to Ch. 8+300, apparently included in the Ballagh - Barnacranny Hill LBA), mainly the Molinia dominated variety of GS4 wet grassland, EIAR p413 to p414, and WS1 scrub, plus smaller areas of 4030 European dry heaths/HH1 dry siliceous heath, GS3 dry-humid acid grassland, GS2 dry meadows (and grassy verges), PF2 poor fen and flush and HD1 dense bracken. It extends from an area of improved grassland east of the Letteragh Road north eastwards to the southwestern edge of the developments along the N59 Moycullen Road, and westwards as far as Moycullen Bogs NHA. This area is likely to be of county value.
- Cluster 7 Menlough (Ch. 9+600 to Ch. 10+450, apparently included in the Menlough LBA), in contrast to Clusters 1 to 6, the Menlough area is base-rich and therefore supports a completely different set of habitats and flora, with *8240 Limestone pavement mostly wooded with WN2 oak-ash-hazel woodland, plus a small *3180/FL6 turlough, *6210 calcareous grassland, GS1 calcareous grassland, WS1 scrub and WD1 mixed broadleaved woodland, from the River Corrib to Monument Road excluding land within cSAC, The eastern part of this area includes the same habitats as within the Lough Corrib cSAC although the limestone pavement is a little more wooded, there is no clear reason why this area was excluded from the cSAC. It provides a link between two parts of the cSAC and supports three priority Annex I habitats of the same type and quality as included in the cSAC, it is therefore likely to be of international value.
- Cluster 8 Lackagh (CH. 11+800 to Ch. 12+100, apparently included in unnamed LBA 3) another area of *8240 Limestone pavement including wooded with WN2 oak-ash-hazel woodland, interspersed with *6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) with orchids, WS1 scrub and GS1 calcareous grassland, to the east of Lackagh Quarry and west of the N84. This area is probably of county value.

- Cluster 9 Ballindooley Lough and surrounding land (Ch. 12+300 to Ch. 12+500, apparently included in the Ballindooley - Castlegar LBA), comprising the Lough 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp /FL3/FS1, with smaller areas of *7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* and 7230 Alkaline fens, surrounded by substantial areas of 6410 Molinia meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*)/GS4, and smaller parcels of WN2 oak-ash-hazel woodland, WS5 recently felled woodland, GS2 dry meadows, ER2 exposed calcareous rock, PF1 Rich Fen and Flush and WS1 Scrub, located to east of N84 and extending from the Lough southwards to Bathar an Choiste. This area is of at least national value.
- Cluster 10 Castlegar (Ch. 13+500 at nearest point, apparently included in the Ballindooley - Castlegar LBA), centred on large area of *8240 Limestone pavement some wooded with WN2 oak-ash-hazel woodland, plus 6510 Lowland hay meadows and smaller areas of scrub, dry calcareous (and neutral) grassland and dry meadows (and grassy verges), stretching from Tuam Road in the east to Ballindooley Lough in the west, somewhat fragmented due to agricultural improvements and the limestone pavement is a remnant of a larger area which has been quarried. Due to the large area of exposed limestone pavement present, and unimproved lowland hay meadow, this area is probably of international value.
- Cluster 11 Briarhill (Ch. 15+900 to Ch. 16+300, not included in an LBA), with a relatively equal mix of *8240 Limestone pavement, 6210 calcareous grassland, calcareous grassland, scrub, and oak-ash-hazel woodland, plus stone walls and treelines, with the cluster divided into three blocks separated by existing road infrastructure. Supports spring gentian (*Gentiana verna*) which is classified as Vulnerable in the Irish Red List and a rare species in northern Europe, making this area of international value.
- Cluster 12 Arduan (Ch. 16+950 to Ch. 17+150, not included in an LBA) a mix of 6210 calcareous grassland, GS1 calcareous grassland and WS1 scrub, to the east of Cluster 2 alongside and south of existing N6, likely to be of county value.

7.2.6 I have provided a value for each cluster, as though it were a site, using TII guidelines. However, probably a better way to think of it is that, apart from areas which have been developed or agriculturally improved, which is the minority, the general vicinity is of international importance for nature conservation due to the prevalence of a wide variety of Annex I habitats, including six priority types; limestone pavement, active lowland bog, calcareous fens, calcareous springs, turlough and calcareous grassland. There are better and more extensive, or even the best and most extensive, examples of peatland and limestone habitats nearby, in Connemara and the Burren, respectively. However, the value of these habitats around Galway City is elevated by the proximity of the peatland and limestone habitats, coupled with the River Corrib, Lough Corrib, and Galway Bay, providing a high level of biodiversity over a compact area. The value is further elevated because it is within easy reach of around 100,000 residents (and perhaps 10 to 20 times that number of tourists).

7.2.7 The total area of high value semi-natural habitats, mostly within the 12 clusters described above within the proposed road boundary is approximately 135ha, which is just under half of the total land within the proposed road boundary. Outside of the clusters described above, the land is generally more improved for agriculture and in some parts e.g. around Galway Racecourse is

more sub-urban in character. Patches of semi-natural habitats are present but, due to small size and isolation, these are not as valuable as the those included in the clusters.

7.3 Aquatic Habitats

Rivers and Streams

7.3.1 The main watercourse crossed by the proposed road is the River Corrib, EIAR p407-p408. The River is included partly in the Lough Corrib cSAC and partly in Galway Bay Complex cSAC , linking the two. It is therefore considered to be of international importance.

7.3.2 Five smaller watercourses would be crossed by the proposed road, all in the west and draining into Galway Bay. These are Sruthan na Libeirti (in Cluster 1), the Trusky Stream (in Cluster 3), the Bearnna Stream (in Cluster 3), the Tonabrocky Stream (in Cluster 4) and the Knocknacarragh stream. These are described in the EIAR p958 to p962 and shown on Figure 11.1.001. The importance for these streams for salmon is assessed in the EIAR p968 which indicates varying importance for salmon and all support otter. The watercourses are of at least local importance.

Ground Water Dependent Terrestrial Ecosystems

7.3.3 There are four Ground Water Dependent Terrestrial Ecosystems (GWDTE) in proximity to the proposed road:

- Coolagh Lakes, comprising three lakes, within Lough Corrib cSAC and therefore included within a site of international importance.
- Ballindooley Lough, comprising four lakes, within Cluster 9, for which see evaluation in paragraph 7.2.5
- Small turlough at Menlough Ch. 10+320., within cluster 7, paragraph 7.2.5.

7.3.4 These are described in the EIAR p402-p403.

Standing Water

7.3.5 Lough Corrib is outside the route corridor and upstream of the proposed road development, and therefore was not described by the applicant. It is the second largest lake in Ireland measuring 18,420ha and contains two distinct basins, the southern containing lime rich water and the northern containing oligotrophic to acidic water. It is included in the Lough Corrib cSAC and is of international importance (NPWS Site Synopsis).

Calcareous Springs

7.3.6 Twenty-seven springs (or seepage lines) were recorded at Lackagh Quarry, six being of the priority Annex I habitat, *7220 Petrifying springs with tufa formation (Cratoneurion), EIAR p404 and Appendix A.8.21. The springs are present as a result of quarrying and exist within an area which is otherwise of limited nature conservation value (but see assessment for peregrine falcon). The species supported by the springs are relatively common and widespread, despite the specialised nature of this habitat, and so the springs could be of local value.

Coastal/Marine

7.3.7 The coastal and marine habitats to the south of Galway City include a marine lagoon (Lough Atalia), a shallow bay with saltmarsh (Rusheen Lough) and vegetated shingle at Rusheen Bay/Silverstrand. These are included in the Galway Bay Complex cSAC and Inner Galway Bay SPA and are therefore of assigned international importance.

7.4 Flora

7.4.1 The twin geology of Galway (and coastal location) means that the area around Galway City is particularly rich in plant species. The applicant recorded from within the route corridor for the proposed road 778 vascular plants, bryophytes and lichens in total, including 59 non-native species. For native vascular plants and bryophytes, the total number of species found in Ireland is 1,764 of which the applicant recorded 658³, or about 37%, in approximately 360ha.

Mosses and Liverworts

7.4.2 The applicant recorded 239 species of mosses and liverworts combined within the route corridor. The total number of native species for Ireland is 784, so about 30% of the Ireland total is found in the route corridor. This total includes four species which are identified as being of concern in the Irish Red data book.

- Woodsy thyme moss *Plagiomnium cuspidatum*, which is classified as Near Threatened, it was found in three relevés⁴ 2680_R1 at Ch. 3+350, 2527_R1 at Ch4+450 and 2354_R1 at Ch. 12+950, with records on both sides of the River Corrib. This species has a scattered distribution in Ireland and is apparently more widespread in Britain. The population is likely to be of national importance.
- Lesser striated feather-moss *Plasteurhynchium striatulum*, which is also classified as Near Threatened, was found in six relevés 3857_R1 at Menlough Woods mitigation area, 4422_R1 at Ch. 9+800, 3941_R1 at Ch. 9+900, 4033_R1 in Lackagh Quarry, 5507_R1 at Ch.10+000 and 3790b_R1 at Ch. 10+100, which are all east of the River Corrib. This species occurs primarily in the Burren and around Galway, with scattered records elsewhere in Ireland. The population is likely to be of national importance.
- Imbricate bog-moss *Sphagnum affine*, classified as Vulnerable, it was found in relevés EC12 R2 at Ch.1+250 and lies inside the route alignment in an area classified as wet heath. This is in Cluster 2. *Sphagnum affine* is particularly rare with only three known locations in the whole of Ireland (red list criteria D2 = less than 5 locations in Ireland). This population is of at least national importance.
- Red bog-moss *Sphagnum capillifolium s. capillifolium* which is classified as data deficient which means that it is expected to be added to the red list when more is known about this

³ For comparison, the Burren, which is internationally famous for its flora, supports 1,100 plant species, or about 62% of the total. However, the Burren total includes aquatic and coastal species, and comes from an area of an order of magnitude greater at 250/560 square kilometres.

⁴ A relevé is a sample of the vegetation, created by recording all plant species within a given area e.g. 2m x2m, the applicant gave each a unique code in the format 1234_R1 or sometimes BEC123 or EC12 R1.

sub-species, it was found in relevé 735_R1 at Ch. 1+250 in the same area of wet heath as *S. affine*. *Sphagnum capillifolium s. capillifolium* is known to occur more widely than *S. affine* but it is still an apparent rarity and therefore this population should also be considered of national importance.

Vascular Plants

7.4.3 The applicant recorded 415 native vascular plants in the route corridor, compared to 980 native species of vascular plant in Ireland, so about 42% is found in the route corridor. This includes two species listed in the Irish red data book, three species which may be locally uncommon, up to twelve types of orchid and up to ten species which are specialities of limestone pavement and similar habitats in the west of Ireland.

- Spring gentian *Gentiana verna*, is classified as near threatened. In Ireland, it is only found in the Burren and around Galway, usually in association with limestone pavement, and is only found in one locality in Britain. There are three records, two at Briarhill (in Cluster 11) and one within Lough Corrib cSAC at Lackagh (above the location for the proposed Lackagh tunnel). There is the potential for this species to be present in other areas of exposed limestone pavement along the route corridor. The population is likely to be of at least national importance.
- Brown beak-sedge *Rhynchospora fusca*, which is also classified as near threatened. In Ireland, it is found in scattered localities in the midlands and west, especially County Kerry and County Galway, it is also scarce in Britain being mainly found in the New Forest, Dorset and a very few west coast locations. In the dataset, there is just one record in relevé EC25 R3 which is within an area of wet heath however the applicant did not provide the location for this relevé and its assumed to be outside the boundary for the proposed road. In FIR Appendix A.3.1, this species is listed again, this time in relevé EC14 R3 which is at Ch.2+350 just outside the route alignment and in area classified as *7130/PB3 active lowland blanket bog in Cluster 2. The population is likely to be of at least national importance.
- The locally uncommon species are fern grass *Catapodium rigidum*, which is more frequent further south and east, an eyebright *Euphrasia arctica*, which is more frequent north and east, and downy oat-grass *Helictotrichon pubescens*, which more frequent to the east, there were also two species apparently not, or very rarely⁵, recorded in Ireland and assumed to be non-native or errors; meadow oat-grass *Helictotrichion pratense* and marsh valerian *Valeriana dioica*. The populations of the first three are likely to be of at least local importance, while native populations of the last two would be of national importance.
- The orchid species recorded in the route corridor are pyramidal orchid *Anacamptis pyramidalis*, common spotted orchid *Dactylorhiza fuchsia*, O'kelly's spotted orchid *Dactylorhiza fuchsii v. okellyi*, heath spotted-orchid *Dactylorhiza maculata*, a sub-species of heath spotted-orchid *Dactylorhiza maculata s. ericetorum*, a spotted orchid *Dactylorhiza* sp.,

⁵ There are a few recent records of *Valeriana dioica* in Northern Ireland, but whether these are introduced or native is unclear.

common helleborine *Epipactis helleborine*, a helleborine *Epipactis* sp., fragrant orchid *Gymnadenia conopsea*, common twayblade *Listera (Neottia) ovata*, early purple orchid *Orchis mascula* and lesser butterfly-orchid *Platanthera bifolia*. These are all classified as being of least concern in Ireland however the variety *Dactylorhiza fuchsii* v. *okellyi* is found mainly in Ireland.

- The speciality plant species of limestone pavement and similar habitats in the west of Ireland that were recorded in the route corridor are *Gentiana verna*, hard shield fern *Polystichum auclatum*, wild madder *Rubia peregrina* and blue-moor grass *Sesleria caerulea*. Other species which have a population centred around Galway are St. Daboec's Heath *Daboecia cantabrica*, common juniper *Juniperus communis*, mountain everlasting *Antennaria dioica* and *Dactylorhiza fuchsii* v. *okellyi* while hedge bindweed subspecies roseata *Calystegia sepium* s. *roseata* is uncommon in Ireland and Britain, with a restricted, mainly coastal distribution and its stronghold along the west coast of Ireland, and the eyebright *Euphrasia tetraquetra* which also has a restricted coastal distribution.

7.4.4 In addition, there are records of three species protected under the Flora Protection Order 2015, slender cotton grass *Eriophorum gracile*, small white orchid *Pseudorchis albida* and varnished hook-moss *Hamatocaulis vernicosus* however these were not recorded within proximity to the proposed road EIA p427 Figure 8.2.1 and FIR response relevé dataset.

7.5 Invertebrates

Marsh Fritillary *Euphydryas aurinia*

7.5.1 The larval webs of the marsh fritillary butterfly *Euphydryas aurinia* were found in suitable habitat along the route corridor with variability in location and number from year to year, EIA p452-p454 and Figures 8.6.1 and 8.6.3 to 8.6.8. In summary, larval food webs were present in Clusters 1 to 4, all in the west. This species is estimated to occur in 705 1km squares in Ireland and the applicant recorded marsh fritillary larval food webs in 8 or 9 which is greater than 1% of the total, indicating national importance (Applicant: County, EIA p477).

Marsh Whorl Snail *Vertigo antivertigo*

7.5.2 During the surveys, a population of Marsh Whorl Snail *Vertigo antivertigo* was at four wetland sites; the banks of the River Corrib near Menlo Castle (within the cSAC), Coolagh Lakes (also within the cSAC), Ballindoley Lough (Cluster 9) and "at the marsh in Castlegar"; this is within the boundary of the proposed road at Ch.13+000, mapped as GM1 Marsh on Figure 8.14.9, and not in any of my clusters. This species is classified as vulnerable due to ongoing decline. The population(s) represent one of the 142 10km squares in which this species is known from in Ireland and one of only twelve in County Galway, it is therefore most likely of county importance (Applicant: Local Importance (Higher value), EIA p477).

Other terrestrial invertebrates

- 7.5.3** Other than molluscs, a general survey for invertebrates was not undertaken by the applicant, which leaves a gap in the baseline data (not subject to a Further Information Request). However, the general value for invertebrates can be inferred from the habitats present, with typically the value for invertebrate communities mirroring that of the value of vegetation communities, for which see paragraphs 7.2.5 and 7.2.7. One of the submissions received provides records of ant hills (probably yellow meadow ant) and two to three species of bumblebee.

Other Freshwater Invertebrates

- 7.5.4** White-clawed crayfish and freshwater pearl mussel were either found to absent during the surveys or ruled out due to unsuitable water chemistry, which is a sound approach.
- 7.5.5** Records of mussels in the River Corrib were discussed at the oral hearing. These are most likely to be swan mussel *Anodonta cygnea*. This species is classified as vulnerable in the Irish Red data Book, it being found in only 29 10km squares, four of which are in County Galway, and declining. If this is a correct identification, then the population is of national importance, (Applicant: not assessed).

7.6 Bats

- 7.6.1** The applicant recorded all nine of the bat species which occur in Ireland, including three which are uncommon or rare, with roosts present in the local area for at least eight species.

Lesser horseshoe bat *Rhinolophus hipposideros*

- 7.6.2** There are three populations of lesser horseshoe bat in the vicinity of the proposed road, the first centred on Castlegar, the second at Menlough (peak count of 43 at Menlo Castle) and the third at Aughnacurra (peak count 12), with at least the second two linked, with hibernation sites located at Cooper's Cave (6), Menlo Castle (several), Cloonnabinnia Cave (5), Moycullen Cave (3), EIAR p430-p439 Figure 8.18.1. The lesser horseshoe bat population is estimated at 12,791 nationally (NPWS, 2019), indicating that the Galway population may be of County importance, although its position relative to other roosts may confer higher value (Applicant: National, EIAR p477).

Whiskered bat *Myotis mystacinus*

- 7.6.3** Two Whiskered bat roosts were found and two Whiskered bats were captured, one at Merlin Woods to the east of the city and one at NUIG, which was later found to roost near Barna Woods EIAR p444-446, Figure 8.20.1. This species is the rarest of the bat species recorded and therefore the population is likely to be of national value (Applicant: Local (Higher), EIAR p477).

Natterer's bat *M. nattereri*

- 7.6.4** Four Natterer's bat roosts were recorded, all in buildings, and two Natterer's bats were captured, both in Menlough Woods (near to Menlo Castle, in Cluster 7), EIAR p444-446, Figure 8.20.1.

This is a rare species of bat in Ireland and the local population is therefore likely to be of national value (applicant: Local (Higher), EIAR p477).

Daubenton's bat *M. daubentonii*,

- 7.6.1** Six roosts of Daubenton's bat were recorded, including at Menlo castle, and twenty were captured, the captures were in woodland (Menlough Woods, Merlin Wood), at NUIG and at Cooper's Cave. A maternity roost of at least 25 bats was found in a wall along the River Corrib. This species, as is typical, was recorded foraging at rivers and wetlands, i.e. the River Corrib, Terryland River and Coolagh lakes, EIAR p444-446, Figure 8.20.1. Most of the unidentified *Myotis* records were along these watercourses as well, which is strong indicator that the majority were Daubenton's (another indicator is that the other two *Myotis* are much rarer generally). This species is widespread and about as numerous as the brown long-eared bat, with an estimated national population of 57,000 to 79,000. The population of this species is likely to be of local importance (Applicant: Local (Higher), EIAR p477).

Leisler's bat *Nyctalus leisleri*

- 7.6.2** Four roosts of Leisler's bat were located with three bats captured in surveys and this species otherwise recorded widely across the locality, EIAR p439-p440 Figure 8.19.1, indicating a typical density of this species for Ireland (approximately 1 bat/km²). It is a relatively common and widespread species in Ireland, the national population is 63,000 to 113,000 (NPWS, 2019), indicating that the Galway population may be of Local Importance (Applicant: Local (Higher), EIAR p477).

Common Pipistrelle *Pipistrellus pipistrellus*

- 7.6.3** Four roosts (plus perhaps three more) of common pipistrelle were located with six bats captured, and it was widely recorded in more rural areas especially along hedgerows, EIAR p440-p441 Figure 8.21.1. This species is very common with 1 to 2.4m individuals, or about 22 individuals per km². The survey results indicate typical or below typical densities and therefore the population is of local value at most (Applicant: Local (Higher), EIAR p477).

Soprano Pipistrelle *P. pygmaeus*

- 7.6.4** Fourteen roosts (plus perhaps three more) of soprano pipistrelle were found and this species was widely recorded in more rural areas, EIAR p441-442 Figure 8.21.1. This species is less common than the common pipistrelle, with 500,000 to 1.2m individuals and an average population density of about 10 per km². The survey results again indicate typical densities and therefore the population is of local value at most (Applicant: Local (Higher), EIAR p477).

Nathusius' Pipistrelle *P. nathusii*

- 7.6.5** No roosts of Nathusius' pipistrelle were found but it was recorded widely but infrequently across the locality, EIAR p442 Figure 8.20.1. It was most frequently recorded at the River Corrib. It is a much scarcer bat than the other pipistrelles with only 3,000 to 4,000 nationally and recorded at scattered locations across Ireland. The survey results indicate a population of perhaps 20 or so

bats, although this just an estimate, indicating that the population is of county importance (Applicant: Local (Higher), EIAR p477).

Brown long-eared bat *Plecotus auritus*

- 7.6.6** Twenty-seven day-roosts of brown long-eared bat were recorded by the applicant, plus 12 night-roosts, and four bats captured. The survey results indicate that this species was widespread, EIAR p443-444 Figure 8.20.1. This species is widespread and fairly common in Ireland with a national population estimated to be 62,000 to 97,000 (similar to Leisler's bat) and a density of approximately 1.3 per km². The survey results indicate the population around Galway is higher than this, perhaps due to the availability of buildings (for roosts) close to good foraging habitat. The population of brown long-eared bat may therefore be of County importance (Applicant: Local (Higher), EIAR p477).

7.7 Mammals other than bats

- 7.7.1** Other than seals, bats and extinct species, there are 15 species of terrestrial mammal which are native to Ireland or were introduced before 1500. The applicant recorded or found records of all except four black rat, house mouse, red deer and fallow deer (so 73%). Including bats brings the proportion of extant terrestrial mammal species recorded to 83% of the total native or long-introduced mammalian fauna. All the mammals other than bats that were recorded are classified as being of least concern in the Irish red list (Marnell, Looney, & Lawton, 2019).

Irish hare *Lepus timidus hibernicus*

- 7.7.1** Irish hare was recorded frequently by the applicant in the western part of the route corridor of the proposed road EIAR p450. This species is relatively common and widespread with an estimated population of between 338,000 and 999,000. The local population is likely to be local value (Applicant: Local (Higher), EIAR p477).

Red squirrel *Sciurus vulgaris*

- 7.7.1** The applicant reports that the red squirrel is found at Menlough and other woodlands locally, EIAR p450. This species is restricted to woodland and therefore has a widespread but patchy distribution in Ireland. The population is likely to be of at least local value, given the apparent absence of this species in the west of County Galway (Applicant: Local (Higher), EIAR p477).

Pine marten *Martes martes*

- 7.7.1** A pine marten was recorded at Menlough, with records also at Barna Woods and Mincloon, EIAR p450. It is most strongly associated with woodland and scrub. There are around 3,000 individuals in Ireland which makes this by far the scarcest mammal other than bats recorded in the route corridor for the proposed road. The national population is, however, increasing. The local population is likely to be of county importance (Applicant: Local (Higher), EIAR p477).

Irish stoat *Mustela erminea Hibernica*

- 7.7.1** An Irish stoat was recorded at Bóthar Nua at Menlough, Ch. 10+450 EIA p450, and this species is associated with woodland and populations of rabbits. The national population size is not known however the species has a widespread and possibly patchy distribution, indicating that the population may be of local importance (Applicant: Local (Higher) EIA p477).

Badger *Meles meles*

- 7.7.1** As would be expected, badger signs and therefore territories occur along the length of the route except the suburban areas around the Galway Racecourse, EIA p447-450, Figures 8.3.1 to 8.3.14. Sixteen in-use setts were found in the route corridor, including up to seven main setts. Badgers are a common and widespread species and therefore the population around Galway city is of no more than local value (Applicant: Local (Higher), EIA p477).

Otter *Lutra lutra*

- 7.7.2** Otter is present along watercourses bisected by and in proximity to the road, the River Corrib, the Bearna Stream and the Tonabrocky Stream, as well as Ballindooley Lough, Coolagh Lakes, and the shores of Galway Bay and Lough Corrib, EIA p428. The otters in the vicinity of the proposed road are most likely a single population, NPWS2. The applicant does not provide a population estimate but there may be less than five breeding females locally (only one potential breeding holt was found during the surveys). The otter is a widespread species in Ireland with an estimated population of between 7,218 and 10,186 breeding females nationally. The population is therefore likely to be of local importance (applicant: International, EIA p477).

Widespread mammal species

- 7.7.3** The applicant recorded or obtained records of wood mouse *Apodemus sylvaticus*, pygmy shrew *Sorex minutus*, rabbit *Orytolagus cuniculus*, hedgehog *Erinaceus europaeus* and fox *Vulpes Vulpes*, plus the more recently introduced, invasives bank vole *Myodes glareolus* and American mink *Mustela vison*. The populations of all but the last two are likely to be of no more than local value. (Applicant: hedgehog and pygmy shrew Local (Higher), other species populations not stated, assumed negligible, EIA p477).

7.8 Breeding Birds

Curlew *Numenius arquata*

- 7.8.1** A curlew was observed once during the breeding season at Ballindooley Lough (Cluster 9) so it was probably not breeding at this location. The date of the record is not stated but it could have been a late migrant, EIA p456. As there is no extant breeding population, it is inappropriate to value one (Applicant: Local Importance (Higher Value), EIA p477).

Ringed Plover *Charadrius hiaticula*

- 7.8.2** Ringed plover was recorded exhibiting breeding behaviour near the western edge of Galway Racecourse, EIA p 457. This is an unusual location for a species which breeds on beaches

and by rivers. This species breeds around the coast of Ireland and so the population here is likely to be of local importance only. (Applicant: Local Importance (Higher Value), EIAR p477).

Barn Owl *Tyto alba*

- 7.8.3** Barn owl was recorded breeding in one location in proximity to the proposed road, at Menlo Castle EIAR p457 and Figure 8.8.1 and Appendix A.8.15. This pair represents one of 400 -500 pairs in Ireland, (Lusby & O'Clery, 2014) the pair at Menlo Castle is therefore likely to be county importance. (Applicant: County, EIAR p477).

Peregrine Falcon *Falco peregrinus*

- 7.8.4** Peregrine falcon was recorded breeding at three quarries (three pairs), including Lackagh Quarry. There are around 500 pairs on the island of Ireland (Mee, 2012), which makes the three pairs here of collectively of county importance. (Applicant: County, EIAR p477).

Other species

- 7.8.5** Approximately fifty-nine other bird species were recorded in the route corridor for the proposed road. Excluding the species listed above, these were all common and widespread breeding species, although some are declining and included on the red and amber lists, or birds which are unlikely to be breeding locally, EIAR p454-p457. The populations are of local value, with those of open habitats such as stonechat, skylark, meadow pipit and linnet being of importance in the context of Galway city area (Applicant: Local Importance (Higher Value), EIAR p477).

7.9 Wintering Birds

- 7.9.1** There are 11 of the applicant's wintering bird surveys sites within the route corridor. These are set out in Table 2, moving west to east, with any high counts for the species in the locality in bold, EIAR p459-p465.

Table 2: Peak counts of wintering birds at sites within the route corridor

Site Code	Site Name	Birds Species (Peak Count)
WB08	Lough Inch/Moycullen Bogs NHA	Blackbird (1), Blue tit (2), Chaffinch (2), Common Gull (6), Cormorant (2), Curlew (1), Dunnock (1), Goldcrest (3), Golden Plover (73) , Goldfinch (25), Grey heron (3), Herring gull (1), Hooded crow (3), Jackdaw (1), Kestrel (1), Lapwing (17), Lesser Redpoll (1), Little grebe (2), Long tailed tit (7), Magpie (4), Mallard (4), Meadow pipit (12), Merlin (1) , Mute swan (3), Pheasant (1), Raven (6), Red grouse (1) , Redshank (2), Reed bunting (2), Robin (2), Rook (8), Skylark (4), Snipe (14) , Song thrush (1), Starling (1), Stonechat (2), Teal (6), Wood pigeon (2), Wren (2)
WB07	Troscaigh	Blackbird (1), Chaffinch (1), Cormorant (1) Curlew (3), Dunnock (1), Fieldfare (1), Goldcrest (1), Goldfinch (1), Grey heron (1), Herring gull (1), Hooded crow (5), Jackdaw (1), Kestrel (1), Linnet (1), Magpie (3), Mallard (2). Meadow pipit (1), Pheasant (3), Pied wagtail (1), Raven (1), Reed bunting

Site Code	Site Name	Birds Species (Peak Count)
		(2), Robin (3), Rook (7), Snipe (5), Song thrush (1), Starling (4), Stock dove (1), Wood pigeon (1), Woodcock (1), Wren (3)
WB03	Ballymoonen	Blackbird (2), Blue tit (1), Bullfinch (3), Chaffinch (1), Coal tit (2), Curlew (5) , Dunnock (2), Goldfinch (1), Great tit (1), Grey heron (1), Hooded crow(1), Jackdaw (1), Kestrel (1), Magpie (3), Mallard (2), Meadow pipit (1), Mistle thrush (2), Pheasant (1), Raven (1), Redwing (1), Reed bunting (1), Robin (4), Rook(1), Snipe (9), Sparrowhawk (1), Starling (1), Stonechat (2), Wood pigeon (1), Woodcock (1), Wren (3)
WB10	Bushypark	Blue tit (2), Common Gull (1), Curlew (2), Hooded crow (2), Jackdaw (17), Magpie (1), Meadow pipit (1), Robin (1), Rook (6), Snipe (6), Starling (1), Stonechat (1), Teal (1), Wood pigeon (7), Wren (1)
WB45	NUIG	Blackbird (3), Black-headed gull (47), Common Gull (21), Hooded crow (2), Jackdaw (18), Magpie (2), Oystercatcher (34) , Pied wagtail (1), Wood pigeon (1)
WB12	River Corrib	Black-headed gull (119), Common Gull (78), Coot (9), Cormorant (4), Curlew (16) , Feral Pigeon (25), GBBG (2), Great crested grebe (2), Grey heron (1), Grey wagtail (1), Herring gull (99), Kestrel (1), LBBG (1), Little grebe (3), Mallard (20), Meadow pipit (1), Moorhen (4), Mute swan (14), Oystercatcher (7), Pied wagtail (2), Redshank (1), Snipe (6), Sparrowhawk (1), Water rail (1)
WB04	Coolagh Lakes, in Lough Corrib cSAC	Bittern (1) , Black-headed gull (26), Coot (4), Cormorant (1), Great Black Backed Gull (2), Grey heron (1), Herring gull (3), Hooded crow (2), House Martin (1), Jackdaw (100), Jay (1), Little grebe (5), Mallard (8), Moorhen (2), Mute swan (2), Pied wagtail (6), Rook (2), Snipe (2), Sparrowhawk (1), Starling (5,000) , Swallow (100), Teal (4), Water rail (13) , Wood pigeon (41)
WB16	Lackagh Quarry	Kestrel (3)
WB02	Ballindooley Lough	Bar-tailed godwit (9) , Blackbird (3), Black-headed gull (21), Chaffinch (1), Coot (11), Cormorant (1), Curlew (8) , Great Black-Backed Gull (3), Goldfinch (1), Grey heron (2), Herring gull (4), Hooded crow (1), Jackdaw (1), Lapwing (16), Linnet (1), Little grebe (5), Magpie (1), Mallard (47) , Meadow pipit (1), Moorhen (4), Mute swan (4), Pheasant (1), Redwing (1), Robin (1), Rook (1), Shoveler (144) , Snipe (37) , Song thrush (1), Sparrowhawk (1), Starling (1), Stonechat (1), Teal (146) , Tufted duck (26), Water rail (1), Wigeon (28), Wood pigeon (1), Wren (1)
WB23	Galway Racecourse	Black-headed gull (3), Common Gull (3), Curlew (37) , Jackdaw (5), Magpie (1), Oystercatcher (1), Starling (10)
WB01	Arduan	Black-headed gull (21), Jackdaw (15), Magpie (2), Rook (5)

7.9.2 Most of the birds recorded at each site are likely to move around between sites and therefore form part of a wider population. For several species, this will mean that the individuals recorded belong to the internationally important populations associated with either Lough Corrib or Galway Bay, or both. These are bar-tailed godwit, black-headed gull, common gull, cormorant, coot, curlew, golden plover, grey heron, hen harrier, lapwing, redshank, shoveler, teal, tufted

duck and wigeon. The numbers recorded in proximity to the proposed road are higher than might be expected when compared to the totals for the two SPAs, see my Table 7.

- 7.9.3** Most of the remaining species are common and widespread (although many are declining) and recorded in typical numbers. Therefore, the wintering populations recorded are of local value at most. The exceptions (plus more detail on hen harrier) are assessed below.

Bittern Botaurus stellaris

- 7.9.4** A bittern was recorded at the Coolagh Lakes (WB04) which is within the Lough Corrib cSAC. This is a very rare winter visitor to Ireland and most likely a vagrant rather than this being a regular wintering site for this species. If it is a vagrant, then there is not really a population in the locality. It does however indicate the value of the Coolagh lakes as a site capable of attracting rare birds, such as the bittern. (Applicant: County, EIAR p461)

Merlin Falcon Falco columbarius

- 7.9.5** A merlin was recorded in the area west of Lough Inch (WB08), which is part of Moycullen Bogs NHA, in December 2014. There are an estimated 250+ breeding pairs in Ireland (Mee, 2012) with the main location being in west Connacht. The breeding birds are supplemented in winter by migrants from Iceland (Balmer, et al., 2013) and the bird recorded is likely to be a representative of a larger number of birds present in winter at Moycullen Bogs which is perhaps of County importance (Applicant: County, EIAR p461).

Hen Harrier Circus cyaneus

- 7.9.6** A Hen harrier was recorded in the area east of Lough Inch (WB06), this is also part of Moycullen Bogs NHA in January 2015, EIAR p463. These are highly mobile birds and there is at least a possibility that this species would be found within wet heath and bog habitats closer to the route corridor of the proposed road e.g. WB08. There are an estimated 190-220 breeding pairs and these are thought to be resident, not supplemented by birds which breed overseas in winter (Balmer, et al., 2013). The bird is likely to be representative of a small wintering population in Connemara, which breeds elsewhere in Ireland, and may be of international importance (Applicant: International, due to link to SPA populations, EIAR p461)

Red Grouse Lagopus lagopus

- 7.9.7** Evidence of red grouse was recorded during the winter at Lough Inch/Moycullen NHA (WB08). This species is sedentary (not migratory and with juvenile dispersal being less than 1km) indicating a potential breeding population nearby. This species is declining rapidly and there are now less than 2,000 pairs on the island of Ireland (Cummins, et al., 2015). Any viable population is therefore likely to be of national importance (Applicant: Local Importance (Higher Value), EIAR p477).

Snipe Gallinago gallinago

- 7.9.8** A relatively large count of snipe came from both Lough Inch/Moycullen Bogs NHA (WB08) and Ballindoolley Lough (WB02), 17 and 37 respectively. This species is on the amber list, and these

numbers could be up to county importance (Applicant: Local Importance (Higher Value), EIAR p477).

Starling *Sturnus vulgaris*

- 7.9.9** A large starling roost of 5,000 birds was recorded at the Coolagh Lakes (WB04). This species is still common and widespread but it is on the amber list of birds of conservation concern (as a breeding species) and this is a sizeable roost, which may be of County value (Applicant: Local Importance (Higher Value), EIAR p477).

Water Rail *Rallus aquaticus*

- 7.9.10** A large count of water rail (13) was made from the Coolagh lakes (WB04). This species is on the green list however, the count is significant at least locally, indicating at least local value for this population (Applicant: Local Importance (Higher Value), EIAR p477).

7.10 Amphibian and Reptiles

- 7.10.1** Smooth newt *Lissotriton vulgaris* and common frog *Rana temporaria* were recorded from various waterbodies along the route corridor, EIAR p465 -p467. These species are therefore likely to make use of the habitats in and around the route corridor for the proposed road.

- 7.10.2** The applicant recorded common lizard *Zootoca vivipara* at 50% of its selected survey sites, all west of the River Corrib, indicating widespread occurrence of this species in the peatland habitats here, EIAR p467.

- 7.10.3** The amphibian and reptile populations are likely to be of local importance. (Applicant: Local Importance Higher Value).

7.11 Fish

- 7.11.1** The fish communities of the watercourses crossed by the proposed road are described and assessed in the EIAR p467 - p470. Fish species recorded include in the freshwater sections include European eel *Anguilla anguilla*, brown trout *Salmo trutta*, Atlantic salmon *Salmo salar* and sea trout *Salmo trutta* morpha *trutta*, plus sea lamprey *Petromyzon marinus* and brook lamprey *Lampetra planeri* in the River Corrib. The Coolagh Lakes and Ballindooley Lough both support a variety of introduced coarse fish.

- 7.11.2** The European eel is a critically endangered species and therefore the populations here are potentially of international importance, and the same level of importance could be attributed to salmon and the lampreys where these form part of the Lough Corrib cSAC population. The other fish populations are likely to be of local importance. (Applicant: European eel, international; all other fish populations, Local Importance Higher Value).

7.12 Predicted Baseline Conditions

- 7.12.1** The surveys that informed the baseline conditions have taken place over several years and there is the potential for habitats to expand or contract, species populations to rise and fall.

However, the applicant has undertaken habitat surveys over three periods, 2013/14, 2015 plus minor additions in 2016 and 2017 and then again in 2019. The applicant describes the changes in the FIR response p26 - p27, with an apparent large increase in dry calcareous and neutral grassland GS1 from 13.7ha to 43.5ha and smaller changes in other habitats, some of which is due to more accurate mapping in 2019, with other changes due to changes in management and scrub encroachment. The increase in GS1 is not fully explained by the applicant but since there was no corresponding decrease in higher value habitats or Key Ecological Receptors, the new areas of GS1 may be derived from areas previously mapped as Improved agricultural grassland GA1. This, combined with scrub encroachment, would suggest a general trend of reducing intensity of land use, which can result in both increases and decreases in biodiversity, but would generally be positive if large areas of grassland are becoming more diverse. A second trend influencing biodiversity is the increasing residential and other development around Galway city which would generally have a negative effect on biodiversity, EIAR p480-481.

8. Construction Stage Impacts

8.1 Designated Areas

Natura 2000 Sites

8.1.1 The construction stage impacts on Natura 2000 sites are assessed separately in the appropriate assessment report and by the applicant in the NIS and in the EIAR p482-p490. The appropriate assessment report necessarily focuses on the qualifying interest features of these sites. The conclusion of the appropriate assessment is that, with mitigation, adverse effects on the integrity of Natura 2000 sites can be avoided during the construction stage. Therefore, the impacts on Natura 2000 sites would not be significant, providing the mitigation measures are properly implemented.

8.1.2 The remaining ecological features (habitats, invertebrates, bats and other mammals) present within these sites, especially Lough Corrib cSAC, are addressed under the headings below.

Moycullen Bogs NHA

8.1.3 There would be no direct impact on Moycullen Bogs during NHA construction, however, as the NHA lies adjacent to the boundary for the proposed road, there is the potential for indirect habitat damage and disturbance of fauna within the NHA through dust (EIAR p492), site run-off (EIAR p494), spread of invasive non-native species (EIAR p493) noise, light and presence of construction workers. However, the construction period is of short duration and the potential impacts can be mitigated, although some additional mitigation measures to those proposed by the applicant are required to protect the NHA, see Section 11.2.

Proposed Natural Heritage Areas

8.1.4 There are two proposed Natural Heritage Areas pNHA in proximity to the proposed road, these are Lough Corrib pNHA and Galway Bay pNHA. The Lough Corrib pNHA includes the River Corrib at the point where it is crossed by the proposed road extending downstream to the

existing N6 bridge, as well as the Coolagh Lakes and surrounding wetlands. The pNHA is wholly included within the Lough Corrib cSAC but not as extensive, for example, it excludes the limestone pavement at Menlough. The Galway Bay pNHA includes the River Corrib as far upstream as the first road bridge crossing, as well as Lough Atalia. It is wholly included within the Galway Bay Complex cSAC. There does not appear to be a separate site synopsis for these two pNHAs and therefore the interest features are assumed to be as for the corresponding Natura 2000 sites, where these also occur within the pNHA, plus any other species populations of note, which include marsh whorl snail, swan mussel, the bats which forage along the River Corrib and wintering birds at the Coolagh Lakes. The potential effects on these two pNHAs are therefore as described for the relevant Natura 2000 sites, EIA p494-p495, plus the potential effects on the species populations described below.

- 8.1.5** The remaining proposed Natural Heritage Areas fall into two categories; those included within Natura 2000 sites, for which see Table 1 and the appropriate assessment report, and those which lie outside. The latter are all greater than 2km distant and therefore unlikely to be directly or indirectly affected by the construction of the proposed road, EIA p491.

Local Biodiversity Areas

- 8.1.6** The proposed road will bisect several local biodiversity areas, resulting in habitat loss during construction, EIA p599-p601, which may⁶ be as follows:
- Unnamed LBA 1 (partly overlaps Cluster 3 Cloughscoltia where this is within the Galway City area), approximately 4.3ha, EIA p599;
 - Cappagh - Ballymoneen LBA (overlaps with Cluster 4 Ballymoneen Road to Cappagh Road), approximately 7.3ha, EIA p599;
 - Unnamed LBA 2 (overlaps with Cluster 5 East of Ballymoneen Road), approximately 2.2ha EIA p599;
 - Ballagh - Barnacranny Hill LBA (overlaps with Cluster 6 Knocknabrona/Knocknafrosca), approximately 6.0ha EIA p599;
 - Menlough to Coolough Hill LBA (overlaps with Cluster 7 Menlough), approximately 6.4ha EIA p600;
 - Unnamed LBA 3 (overlaps with Cluster 8 Lackagh), approximately 1.8ha EIA p600; and
 - Ballindooley - Castlegar LBA (overlaps Cluster 9 Ballindooley and Cluster 10 Castlegar), approximately 1.0ha, EIA p600 to p601.
- 8.1.7** The total area of land within Local Biodiversity Areas that would be directly affected by the proposed road could be c. 29 hectares. The areas of the LBAs adjoining the boundary for the proposed road will also be at risk from indirect effects from construction, as described for Moycullen Bogs NHA, however, the degree of risk is higher due to the long lengths of the

⁶ As previously noted, the available mapping for LBAs is poor, making assessment of the impacts problematic; the unnamed LBAs may not be designated and the extent of the other LBAs is unclear. The applicant also describes losses of habitat at Doughiska EIA p601 however this is apparently outside the Doughiska LBA.

proposed road which passes through and adjacent to the LBAs. The River Corrib and wetlands LBA will also be crossed by the proposed road and potentially subject to indirect effects, including suspended solid pollution from site run-off, EIAR p600, while the road passes underneath the Galway Racecourse LBA, with no direct impacts during construction, EIA p601.

8.1.8 The loss of terrestrial habitats within these areas and outside them is addressed in more detail below, note that the losses of habitats listed from within the LBAs paragraph 8.1.6 is a subset of those shown in Table 3.

8.2 Terrestrial Habitats

Habitat Loss

8.2.1 The proposed road will result in direct loss of habitat along the route. This is described in the EIAR p496 - p497 and p504 - p521 with updated quantities provided in the FIR response and finally in the Corrigenda. The total habitat losses for Annex I types is presented in Amended Table 4.1 Corrigenda p13-p14 and the amount of each habitat type valued at local or higher value within the development boundary are provided in the Corrigenda Amended Table 2 p14-p16. It is not clear if the total of these habitats within the boundary will be lost but it is assumed that this is the case.

8.2.2 The applicant takes a reductionist approach, quantifying the losses of all the habitats individually. This needs to be done, but there are a lot of different habitat types and these are present in intertwined and co-dependent patches, for example wet heath, dry heath, wet (Molinia) grassland, bracken and scrub are frequently recorded together with the collective value usually being greater than the individual parts, see paragraph 7.2.5. In Table 3, I give the approximate losses of habitats by cluster which should be read in conjunction with the applicant's work.

Table 3: Terrestrial Habitats directly lost during the construction stage

Cluster	Habitats Present	Value	Habitat Loss Approx..	Fragmented	Isolated
Cluster 1 Forramoyle	4010/HH3 dry heath, 4030/HH1 wet heath *7130/PB3 lowland active peat bog, GS3 acid grassland, GS4 wet grassland, WS1 scrub and HD1 bracken.	County	14.3ha	Yes	Yes
Cluster 2 Troiscaigh,	4010 HH3 wet heath, 4030/HH1 dry heath *7130/PB3 active lowland blanket bog with WS1 scrub, GS4 wet grassland and HD1 bracken	National	6.7ha	Yes	Yes

Cluster	Habitats Present	Value	Habitat Loss Approx..	Fragmented	Isolated
Cluster 3 Cloughscoltia (partly within unnamed LBA 1)	Wet grassland including 6410 Molinia meadows, with areas of 4010/HH3 wet heath, 4030/HH1 dry heath and WS1 scrub, with some HD1 bracken	County	13.9ha	Yes	Yes
Cluster 4 Ballymoneen Road to Cappagh Road (within Cappagh - Ballymoneen LBA)	4010/HH3 wet heath, *7130/PB3 active lowland blanket bog and HD1bracken, plus smaller areas of 4030/HH1 dry heath, WS1 scrub, GS4 wet grassland and 6410 Molinia meadows	County	7.3ha	Yes	Yes
Cluster 5 East of Ballymoneen Road (within unnamed LBA 2)	WS1 scrub with GS4 wet grassland, and towards the south patches of 4030/HH1 dry heath, 4010/HH3 wet heath, GS3 acid grassland, GS4 wet grassland and bracken,	County	2.2ha	Yes	Yes
Cluster 6 Knocknabrona/ Knocknafrosca (Ballagh - Barnacranny Hill LBA)	GS4 wet grassland, and WS1 scrub, plus smaller areas of 4030 European dry heaths/HH1 dry siliceous heath, GS3 dry-humid acid grassland, GS2 dry meadows (and grassy verges), PF2 poor fen and flush and HD1 dense bracken.	County	6.0ha	Yes	Yes
Sub-total Peatland Habitats			50.4ha		
Cluster 7 Menlough (Menlough to Coolough Hill LBA)	*8240 Limestone pavement mostly wooded with WN2 oak-ash-hazel woodland, plus a small *3180/FL6 turlough, *6210 calcareous grassland, GS1	International	5.4ha (incl. 0.8ha under viaduct)	Yes	Yes

Cluster	Habitats Present	Value	Habitat Loss Approx..	Fragmented	Isolated
	calcareous grassland, WS1 scrub and WD1(mixed broadleaved woodland)				
Cluster 8 Lackagh (unnamed LBA 3)	*8240 Limestone pavement including wooded with WN2 oak-ash-hazel woodland, interspersed with *6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) with orchids, WS1 scrub and GS1 calcareous grassland,	County	1.8ha	No	Yes
Cluster 9 Ballindooley Lough (Ballindooley - Castlegar LBA)	3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp /FL3/FS1, with smaller areas of *7210 Calcareous fens with Cladium 7230 Alkaline fens, 6410 Molinia meadows GS4, WN2 oak-ash-hazel woodland, WS5 recently felled woodland, GS2 dry meadows, ER2 exposed calcareous rock, PF1 Rich Fen and Flush and WS1 Scrub,	National	1.0ha	No	No
Cluster 10 Castlegar (Ballindooley - Castlegar LBA)	*8240 Limestone pavement some wooded with WN2 oak-ash-hazel woodland, plus 6510 Lowland hay meadows and smaller areas of scrub, dry calcareous	International	<1.0ha	No	No

Cluster	Habitats Present	Value	Habitat Loss Approx..	Fragmented	Isolated
	(and neutral) grassland and dry meadows (and grassy verges),				
Cluster 11 Briarhill	*8240 Limestone pavement, 6210 calcareous grassland, calcareous grassland, scrub, and oak-ash-hazel woodland, plus stone walls and treelines,	International	4.0ha	Yes	Yes
Cluster 12 Arduan	6210 calcareous grassland, GS1 calcareous grassland and WS1 scrub,	County	0.7ha	No	No
Sub-total Calcareous Habitats			12.9ha	-	-
			63.3ha	-	-

8.2.3 In addition to the habitats inside the clusters, there are areas of (semi-improved) neutral and calcareous grassland and scrub, plus smaller parcels, hedgerows and treelines which brings the total losses of habitats of local value or higher up to 100ha (including dense bracken which the applicant excludes), and 147ha of negligible value habitats, although as discussed in paragraph 7.12.1, the value of the grassland may be improving over time due to reductions in the intensity of agriculture, meaning that the losses of local value habitats may be higher when the proposed road comes to be constructed.

8.2.4 The loss of woodland, plus fragmentation and isolation, at Menlough is notable. Native woodland is a relatively scarce habitat in Ireland, there being only 132,000 hectares nationally (10,000 in Galway), compared to for example 159,000 hectares of wet heath and 257,400 ha of blanket bog. Large areas are even scarcer, with most woodlands being less than 5ha in size, while that at Menlough (with some dominated by non-native beech *Fagus sylvatica*) may be around 35ha in size. Approximately 5ha of this woodland would be lost to the proposed road, equivalent to 0.05% of the Galway total of native woodland.

8.2.5 The loss of higher value habitats is greatest in the western portion of the proposed road, with a total of 50.4ha of semi-natural habitats within the clusters lost versus 12.9ha within the clusters for the eastern portion, where the main areas of impact are at Menlough Woods and at Brialhill/Ardaun.

Habitat Fragmentation

- 8.2.6** The applicant does not fully address habitat fragmentation in the EIAR although it is mentioned.
- 8.2.7** Habitats will be fragmented at the level of the habitat parcel, for example, an area of wet heath at Troscaigh will be divided in two by the proposed road, with a larger fragment to the north of the proposed road and a much smaller fragment to the south. Other examples include wet heath at Cloughscoltia and the woodland at Menlough woods. Habitats will also be fragmented more broadly with Cluster 1 through to Cluster 7, plus Cluster 11 all divided into two parts by the proposed road, see Table 3.
- 8.2.8** Dividing areas of habitat can compound the effects of habitat loss, which can make each smaller fragment (and especially the smallest) less resilient to external threats such as climate change, nutrient enrichment, invasive species and so on and less able to support the full range of species expected for the habitat type and those that remain more vulnerable to local extinction.

Habitat Isolation

- 8.2.9** The proposed road will isolate the remaining fragments of semi-natural habitat closest to the city from more extensive areas of semi-natural habitats on the other side of the proposed road. This affects the fragmented habitats/clusters, paragraph 8.2.7, and cluster 8 Lackagh which lies to the south of the proposed road, see Table 3. The coastal location of Galway compounds the isolation. Isolated habitats are likely to be less resilient, as described in paragraph 8.2.7., with additional risks as a result of the more urban location e.g., waste dumping, unofficial recreation, cessation of traditional farming. The last of these could cause profound changes, with ungrazed vegetation succeeding to scrub and woodland.

Habitat Degradation

- 8.2.10** As for Moycullen Bogs, paragraph 8.1.3.

8.3 Aquatic Habitats

Habitat Loss

- 8.3.1** During construction, sections of watercourses will be culverted, resulting in the loss of riparian habitats and shading of the watercourse, EIAR p514 - p515, as shown in Table 4 (next page), with the total length of watercourses affected being just under 1km. In addition, one watercourse, the Tonabrocky Stream will be re-routed causing a further loss of riparian habitat with a net loss of 145m.

Table 4: Lengths of watercourse culverted and substantially re-routed

Watercourse	Culvert Reference	Approx. Chainage	Approx. Length Culverted (m)	Length re-routed
Sruthán na Libeirtí	C00/01	0+650	100	45
Sruthán na Libeirtí	C00/02	1+000	50	40
Small coastal stream	C01/01	1+500	25	
Trusky Stream	C02/01a	2+800	40	65
Trusky Stream	C02/01b	2+850	75	
Trusky minor drain	C03/01	3+050	50	
Trusky minor drain	C03/02	3+350	10	
Bearna Tributary	C03/03	3+925	50	
Unnamed	C03/04	3+940	50	
Bearna Stream	C04/01	4+100	50	
Tonabrocky	C04/02	4+900	100	395m (becomes 250m)
Knocknacarra Minor Drain	C06/01	6+850	75	
Knocknacarra Minor Drain	C07/02B	7+250	20	
Knocknacarra Minor Drain	C07/02A	7+210	100	
Minor Drain Dangan	C08/01	8+375	100	
Minor Drain Coolagh	C10/02	10+730	40	
Knocknacarra Minor Drain	C07/01a	N59 Link Road south 1+600	50	
TOTAL:			985	

Habitat Degradation

- 8.3.2** The main risk to aquatic habitats during the construction period is through site run-off containing high levels of suspended solids, which could result in the killing of aquatic animals and plants, and smothering of spawning grounds where these exist downstream of the crossing point, EIAR p467, as is the case in at least the Trusky, Bearna and Tonabrocky Streams. A second key risk is the potential to inadvertently spread non-native invasive species on construction machinery, EIAR p500, especially if these are inadequately cleaned when moving between catchments.

Habitat Fragmentation/Isolation

8.3.3 The culvert design allows for the development of a natural riverbed and continued passage for aquatic species (fish, etc) through the culvert, equivalent to the baseline., thereby avoiding potential effects from fragmentation and isolation.

8.4 Flora

8.4.1 Based on the relevé data, construction stage would result in the following potential impacts on red data book flora:

- Woodsy thyme moss *Plagiomnium cuspidatum*, one population would be directly affected (at least partially lost) at Ch. 3+350 (2680_R1), while the other two may also be affected directly or indirectly, as the record is within the boundary for the proposed road but not within areas obviously subject to earthworks at Ch4+450 (2527_R1) and at Ch. 12+950 (2354_R1).
- Lesser striated feather-moss *Plasteurhynchium striatulum*, one population would be directly affected (at least partially lost) at Ch. 9+800 4422_R1 as the recorded location is within the footprint of the proposed road, while three further records of this species, at Ch. 9+900 (3941_R1), Ch.10+000 (5507_R1) and at Ch. 10+100 (3790b_R1), are inside the boundary but outside obvious earthworks and therefore may be lost or partially lost, with the remaining two records in areas not likely to be impacted during construction.
- Imbricate bog-moss *Sphagnum affine*, the only recorded population would be lost (or at least partially lost) at Ch.1+250 (EC12 R2) is it occurs in the centre of the alignment for the proposed road.
- Red bog-moss *Sphagnum capillifolium s. capillifolium*, the only recorded population would be lost or partially lost at Ch.1+250 (765_R1).
- Spring gentian *Gentiana verna*, the three known locations are not directly affected by earthworks, one being above the proposed Lackagh tunnel and the other two being at Briarhill, but are at risk from indirectly from construction activity, especially dust. As this species is most likely to be found within areas of exposed limestone pavement, it probably does not occur in areas subject to earthworks elsewhere.
- Brown beak-sedge *Rhynchospora fusca*, the only known location is just outside the route alignment at Ch.2+350 (EC14 R3) however it is conceivable that this species distribution also extends into the route alignment for the proposed road wherever there is wet heath or blanket bog, and even if not, it is vulnerable to indirect effects such as dust and even slight changes in hydrology.

8.4.2 Therefore, five (of six) red data book species of sub-species would be directly impacted by the proposed road development, the most serious being *Sphagnum affine* which is classified as Vulnerable.

8.4.3 Of course, the above is based upon relevé data and it would be surprising if this captured the full extent of any plant distribution, which means the above represents both the minimum population present and the minimum number of populations impacted.

8.4.4 In addition to the red data book flora, populations of locally scarce species, characteristic species and orchids would also be affected during site clearance.

8.5 Invertebrates

Marsh Fritillary

- 8.5.1** The applicant reports a direct loss of 5.2ha of marsh fritillary habitat, all in the western part of the route corridor, which is 4.7% of the total that was recorded by the applicant in the route corridor and obviously a smaller proportion of that in the county, etc. A population decline commensurate with the habitat loss would be expected, with the possibility, when combined with other impacts, of losing this species from one (M2424) of the 705 1km² in which it currently occurs.

Marsh Whorl Snail

- 8.5.2** The proposed road will result in the loss of most of the marsh at Castlegar (Ch. 13+000) where a marsh whorl snail population was recorded, and most likely the loss of the population from here. This is the smallest of the three sites where this species was recorded along the route corridor, and the species was recorded elsewhere in the same 1km² at Ballindooley Lough.

Other terrestrial invertebrates

- 8.5.3** The effects of loss of habitat on invertebrate populations is expected to be commensurate with losses of habitat and flora.

Other Freshwater Invertebrates

- 8.5.4** No impacts are expected on populations of white clawed crayfish or freshwater pearl mussel, EIAR p564. The potential swan mussel population in the River Corrib is vulnerable to aquatic pollution during the construction stage, in the same way as the fish species that are qualifying interest features of the Lough Corrib cSAC. The effects on other aquatic invertebrates are expected to be commensurate with aquatic habitats, see section 6.3.

8.6 Bats

Bat roosts

- 8.6.1** There will be a loss of fourteen buildings (PBR) containing up to 19 bat roosts and two trees (PTR) containing bat roosts, EIAR p526 to p530, and two further roosts likely to be disturbed during construction, as shown in Table 5 (next page).

Table 5: Bat roosts directly or indirectly affected by the proposed road

Species	Lost maternity roost	Lost other roost	Disturbed maternity roost	Disturbed other roost	Maternity roost Within 100m	Other roost Within 100m (or known to be used by same bats)	TOTAL
Lesser horseshoe bat	PBR178	PBR210 and PBR204		PBR154		PBR06, PBR156, PBR219, PBR129, PBR85, PBR154, PBR153, (PBR54), (PBR112)	13
Natterer's Bat						PBR73	1
Daubenton's bat						PBR06	1
Leisler's bat		PTR48				PBR139	2
Pipistrelle species		PBR182				PBR242	2
Common pipistrelle		PBR205				PBR228	2
Soprano pipistrelle		PBR267, PBR255, PBR177, PBR196, PBR205 and PTR43			PBR225	PBR49	8
Brown long-eared bat	PBR256 and PBR178	PBR267, PBR204, and PBR196	PBR173	PBR183	PBR145, PBR192	PBR49, PBR225, PBR156	12
Unknown species		PBR253 and PBR270					2
TOTAL	3	16	1	2	3	18	43

8.6.2 There will also be a further 15 trees felled which are assessed as high potential to support roosting bats. This number would be expected to change over time, as trees age, with potentially more trees with high potential affected by the time that the road is constructed.

- 8.6.3** The loss of the roosts and potential roosts, plus disturbance to others, as indicated in Table 5 has the potential to cause a reduction in the bat populations listed with lesser horseshoe bats, brown long-eared bat and soprano pipistrelle being the most likely to suffer population level effects as a result of roost loss and disturbance during construction.

Bat Foraging Habitat

- 8.6.4** The entire area within the proposed road boundary lies within a Core Sustenance Zone (CSZ) of at least one of the identified bat roosts in Table 5 (the furthest distance apart of any of the roosts in Table 5 is 2900m, at the western end), EIAR p548, and within this there is approximately 100ha of high quality bat foraging habitat that would be lost to the proposed road. As the applicant points out, the area lost is less than 7% of the CSZ in each case, EIAR p530 to p548 although, as the applicant also points out, for lesser horseshoe bats at Menlo Castle the loss of habitat is a key part of the foraging habitat at Menlough Woods, EIAR p547, and this assumes that the bats are as likely to cross the land affected by the proposed road when it is operational as they are today, EIAR p532. This is unlikely to be the case and, as each of the bat roosts identified are on or about the route alignment, 40% to 50% of the CSZ will become less accessible and the route to get there more perilous during and after construction. Further, for those roosts located to the south of the proposed road, such as PBR49, PBR173, PBR145 and PBR153, the more readily accessible half of the CSZ may be of lower quality as it could include urban and residential areas, see Operational impacts paragraph 9.6.1.

Bat Commuting Routes

- 8.6.5** During site clearance, all hedgerows, treelines and stonewalls within the boundary of the proposed road would be lost, and all watercourses covered over except the River Corrib. These features are known to be used by most bat species (the exception being Leisler's bats) as both foraging habitat and commuting routes. There are around 200 linear features that would be bisected by the proposed road. Those closest to roosts or joining roosts to the best foraging habitat are the likely to be the most important for bats.
- 8.6.6** It is notable that the applicant does not appear to have undertaken full surveys⁷ to determine which of these crossing points is the most important for bats, EIAR p620 but plans to do this post-consent (10 or 20% have been surveyed to date). The surveys do show that the proposed road is crossed by lesser horseshoe bat (two of 21 locations surveyed, EIAR p435), Myotis bat species (7, p446), Leisler's bat (6, EIAR p440), common pipistrelle (16, EIAR p441), soprano pipistrelle (21, EIAR p442) and Nathusius' pipistrelle (2, EIAR p442). The results indicate that it is also likely to be crossed by brown long-eared bat⁸ (EIAR, p444) and the Myotis records may include Natterer's bat and Whiskered bat. Multiplying the results from the crossing point surveys

⁷ Twenty-one crossing points, an average of one per 850m, were surveyed, as shown on EIAR Figure 8.22.1, out of a possible c.200 linear features bisected by the proposed road. This is however supplemented by static monitoring surveys which were placed at an additional 18 linear features bisected by the road (plus others coincidental with the crossing point surveys).

⁸ Brown long-eared bat is harder to detect with acoustic monitoring devices.

by 8 to 10 might give a truer reflection of bat activity across the proposed road and the degree to which bat commuting activity could be disrupted.

Additional Impacts

8.6.7 Lighting during construction works during the bat active season could temporarily displace bats or disrupt their behaviour.

8.7 Mammals other than bats

Irish hare

8.7.1 During site clearance, there is a risk of direct mortality of Irish hare EIAR p561 to p562, particularly during the peak breeding season in spring and early summer when small leverets are hiding in vegetation (the adults being able to escape easily).

8.7.2 Irish hare occupies a range of open habitats at widely varying densities; however, the average density is 3.19 hares/km² (McGowan, et al., 2019). The applicant recorded this species in the western part of the route corridor, beyond the River Corrib, with the loss of habitat here being approximately 0.75km² which is enough habitat for 2.3 hares, a tiny fraction of the estimated Irish population of 223,000.

Red squirrel

8.7.1 Red squirrel has also been recorded at Menlough Woods plus a few other places locally. Menlough woods will be directly impacted during site clearance for the proposed road. During site clearance, there is a risk of killing red squirrel, especially when kittens are in the dreys (February to July, inclusive).

8.7.2 The red squirrel is confined to woodland, with little of this habitat available locally. The proposed road will result in the loss of 8ha of woodland of which most, say 5ha, must be in Menlough Woods, which is an estimated total of 35ha. The proposed road would therefore result in approximately 14% loss of the woodland here and effectively divide the woodland in two, albeit with some connectivity under the proposed River Corrib Bridge and Menlough Viaduct.

8.7.3 A single red squirrel requires a minimum of 1.5ha of woodland and obviously more than that is required for a viable population. Assuming the population of red squirrel at Menlough Woods is at the maximum possible density, we would expect a population decline of about 4 animals due to the loss of 5ha of woodland at Menlough and the remaining population would be divided into two, creating two separate populations of approximately nine squirrels, which is clearly less viable than a single population of 23. The impact may be ameliorated to some degree when the screening planting along the proposed road reaches maturity, however accessibility to the new habitat would be constrained by the River Corrib and Lackagh Quarry. There is a risk of losing red squirrel entirely from Menlough Woods through population decline rather than displacement.

Pine marten

- 8.7.4** There is a record of pine marten was at Menlough Woods, plus only two other places locally. Menlough woods will be directly impacted by the proposed road and so there is also the risk of pine marten dens, including breeding dens, being destroyed during site clearance and therefore a risk of killing pine marten, especially when kits are present in the den (March to June, inclusive).
- 8.7.5** Like the red squirrel, the pine marten is primarily a woodland species. The pine marten has large territories with females 14-25ha and males 50-80ha. The loss of woodland habitat at Menlough is equivalent to up to 35% of a female's territory and 10% of a male's territory. The landscape is largely unwooded which means there is not much alternative habitat available for this species. Given the risks from traffic, new woodland along the proposed road is not suitable habitat for pine marten. Moreover, the proposed road divides Menlough Woods into two, which may further compromise its continued suitability for pine marten. The loss, rather than displacement, of one breeding female territory seems likely.

Irish stoat

- 8.7.6** The Irish stoat is similarly at risk during vegetation clearance, with young present in the nest from April to early July. This species is not as restricted to woodland as the pine marten and red squirrel and is therefore less vulnerable to more serious effects on the local population as a result of the loss of woodland habitat at Menlough. Whilst loss of habitat due to the construction of the proposed road would most likely result in some decline, it would be proportionally much less than the more specialist mammal species.

Badger

- 8.7.1** The proposed road would result in the loss of three badger setts (main sett S9, subsidiary sett S11 and subsidiary sett S14) which belong to two separate badger groups (S9 and S11, Lackagh Group and S14 the Cappanabornia Group) and construction activity would potentially result in disturbance for a further two setts (main sett S3 and subsidiary sett S10), EIAR p557 and any setts present in dense vegetation that was not surveyed could also be lost or disturbed. Without mitigation, there is a risk of killing badgers in their setts during site clearance.
- 8.7.2** The proposed road would also result in the loss of badger foraging habitat for ten badger social groups whose territories overlap with the proposed road, EIAR p557-p558. There were badger signs along most of the route corridor for the proposed road except Lackagh Quarry (400m of the route) and the area around Galway Racecourse (2km of the route), leaving around 245ha of suitable foraging habitat lost or becoming inaccessible/undesirable for badger foraging. There are no territory maps provided by the applicant and so calculating losses per individual territory is not straightforward. However, the median badger territory size in Ireland is 130ha (Hayden & Harrington, 2000) and the average direct loss per territory here is 24.5ha, which is approximately 18% of the median territory size.
- 8.7.3** Unmitigated, the proposed road could also prevent badgers from reaching the part of their foraging area. Fortunately, one of the social groups with a main sett (S3) closest to the road is

close to the River Corrib Bridge which should allow access either side of the proposed road. However, the other is next to Lackagh Quarry, which is unsuitable for badger foraging and creates a barrier to badger movement, meaning this social group could lose access to 50% of its foraging area (the route over the Lackagh Tunnel being too long). Other social groups could be similarly affected, although the proportion of their territory is likely to be less.

- 8.7.4** The direct loss of habitat due to the proposed road would put at least some of the badger social groups under pressure, which would be substantially worsened if the badgers had no way to reach the far side of the road.
- 8.7.5** Construction activity also has the potential to disturb badgers in their setts when this causes significant ground vibration. Badgers are quite tolerant of noise and vibration, so any effects would be very short-lived.

Otter

- 8.7.1** There are no known otter breeding holts within the route corridor and so there is little risk of direct mortality or disturbance during site clearance.
- 8.7.2** Other than the River Corrib, there would be small loss of riparian habitat alongside the watercourses crossed by the proposed road, however, this is unlikely to affect food availability for otters and therefore effects on the otter population are unlikely, EIAR p523.
- 8.7.3** During the installation of culverts, otter movements could be interrupted. However, this is easily mitigated by the provision of safe passage through the construction site during the hours of darkness.
- 8.7.4** Impacts on aquatic habitats as described in Section 6.4 could also impact on otter if severe enough to affect otter food supply or availability.

Widespread mammal species

- 8.7.5** All of the other mammal species recorded are at risk from direct mortality during site clearance, especially when breeding, and would be likely to suffer a small degree of population decline commensurate with the loss of habitat, which would be partially offset for the smaller species by the creation of new woodland and grassland habitat in the soft estate. The population decline attributed to the construction of the proposed road would be a tiny fraction of the of the national population in each case.

8.8 Breeding Birds

- 8.8.1** During site clearance there is a risk of destroying birds' nests if carried out during the bird breeding season. Both ground nesting and bush/tree nesting bird species were recorded, so this risk applies to heathland etc as well as woodland and scrub, EIAR p572. Birds nesting close to the construction site could also be disturbed resulting in loss of a clutch of eggs, with barn owl at Menlo Castle (140m distant) and peregrine falcon at Lackagh Quarry (0m distant) being the most sensitive EIAR p572 to p573. Both species are however quite tolerant of human activity,

and frequently nest in or on buildings that are in use, suggesting that these birds may not be seriously affected during construction of the proposed road.

- 8.8.2** The proposed road will result in loss of bird nesting and foraging habitat EIAR p571 to p572, which includes all of the semi-natural, agricultural and sub-urban habitats within the boundary of the proposed road, approximately 187ha (of which up to 76ha is improved agricultural grassland of limited value for breeding birds).
- 8.8.3** The applicants mapping indicates losses of territories of breeding birds of conservation concern (red and amber list species) as shown on the applicant's Figure and in my Table 6. For each species, the number of territories affected is a very small proportion of the national total, and likely to be less than 0.05% of the county total, except for linnet which has a relatively low population density in the west of Connacht. However, the number of territories affected is likely to be more than 1% of the Galway City total, especially Stonechat (estimated up to 7% loss) and Linnet (estimated minimum 3% loss). This assumes, as is likely, that available habitat is the principal factor limiting the populations of these species and that the birds would not simply be displaced elsewhere. The data was not provided for green list species, the territory count would obviously be higher if these species were included.

Table 6: Breeding Bird Territories of conservation concern lost to the proposed road

	Territories directly impacted	Ireland Pop Estimate (Crowe, Musgrove, & O'Halloran, 2014)	Estimated % of Galway City Population (based on average density)
Robin	33	4,769,540	0.90 =
Meadow pipit	19	1,46,310	1.68 O
Linnet	11	451,430	3.16 U
Goldcrest	7	611,280	1.48 =
Greenfinch	7	693,890	1.31 U
Stonechat	6	109,770	7.09 O
Mistle thrush	2	197,070	1.32 U
Coot	2	No data	-
Skylark	1	322,900	0.40 O

O likely over-estimate, U likely underestimate, based on density mapping for Ireland (Balmer, et al., 2013)

- 8.8.4** Some of the species affected nest in trees and shrubs and may benefit from the screening planting however nesting close to roads is hazardous and avoided by many bird species, which means that the new planting should be discounted as mitigation.

8.9 Wintering Birds

- 8.9.1** Nine of the identified wintering bird areas which are directly impacted by the proposed road development, five in a minor way and four more significantly; WB03 (Balllymoneen) 4.2ha, WB45 (NUIG sporting ground) 3.7ha, WB16 (Lackagh Quarry) and WB01 (Arduan).
- 8.9.2** For each of the wintering bird species (i.e. migratory or semi-migratory birds which spend the winter locally) recorded, the total numbers affected in each case is likely to be less than 0.05%

of the national (Burke, et al., 2018) (Lewis, Burke, & Crowe, 2016) (Lewis L. J., Burke, Fitzgerald, Tierney, & Kelly, 2019) and county populations. However, as shown in Table 7, the numbers of gulls and oystercatcher at WB45 NUIG are surprisingly high compared to the average total count for Inner Galway Bay (a proxy for local populations and the best available data), being more than 1% in each case.

Table 7: Wintering bird populations affected by the proposed road

Site	Species	Peak Count	National Population estimate in winter	Lough Corrib 5 year mean I-Webs	Galway Bay 5 year mean I-Webs	% of Galway Bay Population
WB03 Ballymoonen	Curlew	5	28,300	34	604	0.8 O
	Redwing	1	ND	NA	NA	NA
	Woodcock	1	ND	NA	NA	NA
WB45 NUIG	Black-headed gull	47	>57,900	70	3108	1.5 O
	Common Gull	21	>30,200	74	1215	1.7 O
	Oystercatcher	34	42,875	0	558	6.0 O
WB01 Arduan	Black-headed gull	21	>57,900	70	3108	0.67 O

8.9.3 As pointed out by the applicant, only parts of these wintering bird survey sites will be directly affected, there is similar suitable habitat available locally and the use of these sites by the birds is somewhat transient, with birds also using other sites. The expected response to habitat loss at these sites for the gulls is therefore displacement within the site or elsewhere, rather than population decline attributable to the proposed road, EIAR p577 - p578. However, this is less certain for oystercatcher which make regular use of the WB03 NUIG fields with the proposed road directly affecting about 10% of this site and dividing it in two. The birds may continue to use the site but if displaced elsewhere, the evidence suggests they would not fare well (Burton, Rehfish, & Clark, 2002).

8.9.4 Construction activity also has the potential to displace birds from beyond the area directly affected due to noise and the visibility of human operatives, as assessed by the applicant EIAR p578 to p586. Many bird species quickly habituate to human activity and the construction period is of a short duration which means that long term affects are not likely from construction activity (but see operation effects Section 7.10). Once again, the oystercatcher population at WB03 NUIG is the most at risk of the wintering birds.

8.10 Amphibian and Reptiles

8.10.1 Site clearance has the potential to result in direct mortality of common frog and smooth newt, EIAR p590, and common lizard EIAR p592-p593.

8.10.2 There would also be a direct loss of habitat for these species. For common frog, there appear to be around 10 breeding sites affected directly and for smooth newt it is two. These are spread fairly evenly along the route of the proposed road, except at Galway racecourse and around. This means that the terrestrial habitats along the proposed road will also be used by these species with the land within 100m of these breeding sites likely to be the most important, an estimated 8ha.

8.10.3 For common lizard, the loss of habitat is estimated by the applicant to be c4.7ha of peatland and heathland habitats, all in the western part of the proposed road, the module 1 response p33. This would be the minimum since it excludes wet grassland (15.2ha), dense bracken (14ha), acid grassland (up to 7.8ha) and about 14ha scrub which are interspersed among the two heathland types and may also support this species at least along the margins (Marnell, 2002). There is no data on population densities for this species in Ireland however data from elsewhere indicates 40 per hectare is a reasonable estimate, indicating an impact on more than 200 individuals, assuming, as is likely, that adjoining habitats are at carrying capacity. This would however be ameliorated by the creation of new habitats, including translocation of dry heath, within the soft estate. As the applicant points out, EIAR p592 and response to module 1 p33, the loss of habitats and numbers of lizards affected would be a very small proportion of that occurring locally and more widely in Galway.

8.11 Fish

8.11.1 The proposed road development will include culverting of watercourses as set out in the EIAR p514 -515 and my Table 4. The fish surveys either did not reveal any fish or only low numbers of fish at the locations of the culverts, EIAR p597, and therefore the risk of direct mortality during construction is low and the loss of riparian habitat, this is unlikely to impact on fish populations, as the applicant describes, EIAR p594 - p595. The main risk to fish species during construction appears to be from site run-off which is high in suspended solids, should this make its way into the watercourses and affect fish populations and spawning habitat downstream from the construction site. These include European eel (Sruthán na Líbeirtí, Trusky Stream, Bearna Stream, Tonabrocky Stream and Knocknacarra Stream), brown trout *Salmo trutta* (Trusky, Bearna and Tonabrocky), sea trout (Tonabrocky) and Atlantic salmon parr *Salmo salar* (Tonabrocky), with spawning habitat present in at least the Trusky, Bearna and Tonabrocky Streams.

9. Operation Stage Impacts

9.1 Designated Areas

Natura 2000 sites

9.1.1 Potential effects during the operation stage for Natura 2000 sites are described in the appropriate assessment report.

Moycullen Bogs NHA

9.1.2 Moycullen Bogs NHA is approximately 3,600ha, divided into three separate blocks; (i) one, the smallest (23.7ha), within the Galway City area; (ii) one (61ha) in Tonabrocky; and (iii) a much larger area further to the north and west of Galway City. It is the first of these that is next to the boundary for the proposed road, however it is the proposed N59 link road rather than the main carriageway which is closest to the NHA. The main carriageway is more than 200m away from the NHA at its closest point, while approximately 1.7ha of the NHA is within 50 - 200m of the N59 link road, this equates to 7% of the Galway City element of the NHA and less than 0.05% of the total NHA.

9.1.3 There is a theoretical risk that this 1.7ha of NHA is affected by noise pollution, artificial light, air pollution (exhaust emissions) and water pollution (road run-off) during the operation of the road.

9.1.4 The N59 link road will be lit along its entire length however the applicant's modelling indicates that significant light spill would not reach the NHA, it being less than 1.0 LUX at the very edge of the NHA and only c.2ha hectares of the NHA within 200m of the proposed road (beyond which baseline light levels would be expected). The air quality modelling undertaken by the applicant indicates that air pollution would not be sufficient to cause a change in the vegetation within this or any part of the NHA, EIAR p492 - p493, while road run-off can be controlled through the scheme drainage design so as not to cause an impact. The NHA is primarily rain fed and, following the review of the potential impacts undertaken by Mr. James Dodds, water quantity within the NHA is expected to be maintained.

9.1.5 This leaves road noise. There were no noise monitoring stations at Moycullen Bogs NHA for the environmental impact assessment, the nearest being receiver 126 which is predicted to experience a 3dB increase from 49dB to 52dB, however this is closer to the existing N59 and therefore the increase may be higher for the small part of Moycullen Bogs NHA in proximity to the proposed road. Given the relatively small area affected (in comparison to the total size of the NHA) and the subtle effects of noise on wildlife, this is also unlikely to have an appreciable effect on the NHA.

Proposed Natural Heritage Areas

9.1.6 As for Natura 2000 sites, where these are coincidental. The other pNHAs are greater than 2km distant and are therefore unlikely to suffer indirect effects because of the proposed road during operation.

Local Biodiversity Areas

9.1.7 The proposed road bisects or is adjacent to up to eight areas included within Local Biodiversity Areas and so there is potential for indirect effects on each of these. As before, the local biodiversity areas have been considered in conjunction with terrestrial habitats, see section 7.2. Given the length of the proposed road passing through/adjacent to these local biodiversity areas, the potential for indirect effects is much greater than it is for Moycullen Bogs NHA. As discussed under construction impacts for terrestrial habitats, six of these LBAs will be fragmented, leaving an isolated area of habitat to the south of the road. These areas will be effectively encapsulated within the urban areas, and given their now smaller size less resilient to urban impacts from, for example, invasive plant species, informal recreation and lack of traditional management.

9.2 Terrestrial Habitats

9.2.1 The terrestrial habitats, including the local biodiversity areas, in proximity to the proposed road are at risk from indirect effects during the operation of the road. These could arise from ongoing isolation, as described in paragraph 8.2.9, and noise pollution, artificial light, shading from structures, air pollution (exhaust emissions) and water pollution (road run-off) and changes in water quantity, which could degrade the terrestrial habitats over varying distances from the proposed road, as discussed below.

Noise

9.2.2 From the proposed junction with the existing N6 at Briarhill to the N59 (eastern section), the proposed road is predicted to receive approximately 40,000 AADT (annual average daily traffic) in 2039 with a design speed of 100km/h while the remainder (western section) is predicted to receive 15,000 AADT with a design speed of 85km/h, EIAR p246 and p280. The noise assessment in the EIAR focussed on properties; looking at a few of these indicates that in more rural locations in the west noise levels could be elevated by, for example, 27dB at 50m from the proposed road (receiver 13), 12dB at 125m (receiver 15) and 6dB at 150m (receiver 21), although one location showed an increase of 17dB at 300m (52). In the east, the figures are comparable with 20dB at 50m from the road (168), 18dB at 125m (167), 18dB at 175m (165) and 17dB at 300m (166). Similar levels of noise increase would be experienced by all the habitat clusters apart from Clusters 11 and 12, which are already subject to higher noise levels from existing roads. We do not know how far away elevated noise levels would extend beyond the road but it appears that it would be several hundred metres, say 500m, and would encompass large areas of higher quality terrestrial habitat (within the clusters).

Light

9.2.3 For Clusters 1 -5, lighting is proposed at junctions only, with minimal light spill into the adjoining habitats. Cluster 6 would be crossed by the N59 link road would be lit along its entire length and therefore this cluster would experience elevated light levels. Cluster 7, at Menlough, would not experience elevated light levels as the proposed road would be unlit. Clusters 8 to 12 would experience elevated light levels as the proposed road would be lit where it passes through or alongside these clusters. The total length of lit road (each side added together, where habitats

exist on both sides) alongside higher value habitats (in the clusters) would be c. 2,600m on the main carriageway and c.3000m on the N59 Link road. The applicant's light modelling, the design report Drawing No. GCOB 1300 D 1 to 15, indicates that light levels would be elevated by 1.0 LUX (equivalent to the light at 1m from a lit candle) at 25m from the carriageway, and it would obviously decrease with further distance from the road. So near baseline levels could be assumed within, say, 150m from the road, giving an area of higher value terrestrial habitats experiencing increased light levels as 168ha.

Shading

- 9.2.4** The potential for habitat degradation resulting from shading is addressed in the EIAR p502, and in the appropriate assessment report. Other than the River Corrib, the main area subject to shading is in Cluster 7 Menlough where the Menlough viaduct will shade the ground below, and prevent rainfall, sufficient to kill most of the vegetation underneath the viaduct.

Air Pollution

- 9.2.5** The potential for habitat degradation resulting from air pollution is addressed in the EIAR p503-p504, which presents the air quality modelling undertaken by the applicant. This indicates that whilst emissions would be elevated along the route of the road, the degree of elevation from the baseline is not likely to affect the vegetation community beyond the soft estate or 30m from the edge of the carriageway. The most at risk habitat clusters are 9 and 10 where the traffic volume is greatest, and there may still be some plant species at risk in other locations, see Section 7.5.

Water Pollution

- 9.2.6** The potential for habitat degradation resulting from water pollution is addressed in the EIAR p500-p501. In the west, polluted road run-off could affect terrestrial habitats directly in proximity to the road. However, this is addressed in the scheme design through capturing and treating road run-off prior to discharge, design report p292. In the east, polluted run-off could affect groundwater quality and therefore ground water terrestrial ecosystems. Again, this is addressed in the scheme design through capturing and treating the run-off before discharging to the ground. The effectiveness of these systems has been assessed separately by Mr James Dodds (Dodds, 2020) and found to be adequate to avoid significant impacts. However, these systems require maintenance to continue functioning beyond the medium term and so there is a residual risk of water pollution affecting these habitats.

Water Quantity

- 9.2.7** The proposed road has the potential to reduce or increase water quantities in a given habitat by interrupting surface water flows and capturing and re-distributing water through the road drainage system. However, the habitats in the west are fed primarily through direct rainfall, while those in the east are fed by groundwater which has been taken into account with scheme design by ensuring captured rainfall is discharged to the same groundwater body as now. This has also been assessed separately by Mr. James Dodds.

Summary of Potential Indirect Effects during Operation

9.2.8 Table 8 provides a summary assessment for each terrestrial habitat cluster/local biodiversity area.

Table 8: Sources of potential indirect effects on terrestrial habitats during operation

(grey text is duplicated from Table 3)

Cluster	Habitats Present	Value	Light	Noise	Air	Water
Cluster 1 Forramoyle	4010/HH3 dry heath, 4030/HH1 wet heath *7130/PB3 lowland active peat bog, GS3 acid grassland, GS4 wet grassland, WS1 scrub and HD1 bracken.	County	~N	Y	=	(N)
Cluster 2 Troscaigh,	4010 HH3 wet heath, 4030/HH1 dry heath *7130/PB3 active lowland blanket bog with WS1 scrub, GS4 wet grassland and HD1 bracken	National	~N	Y	=	(N)
Cluster 3 Cloughscoltia (partly within an unnamed LBA 1)	wet grassland including 6410 Molinia meadows, with areas of 4010/HH3 wet heath, 4030/HH1 dry heath and WS1 scrub, with some HD1 bracken	County	~N	Y	=	(N)
Cluster 4 Ballymoneen Road to Cappagh Road (part of the Cappagh - Ballymoneen LBA),	4010/HH3 wet heath, *7130/PB3 active lowland blanket bog and HD1 bracken, plus smaller areas of 4030/HH1 dry heath, WS1 scrub, GS4 wet grassland and 6410 Molinia meadows	County	~N	Y	=	(N)
Cluster 5 East of Ballymoneen Road (part within an unnamed LBA 2)	WS1 scrub with GS4 wet grassland, and towards the south patches of 4030/HH1 dry heath, 4010/HH3 wet heath, GS3 acid grassland, GS4 wet grassland and bracken,	County	~N	Y	=	(N)

Cluster	Habitats Present	Value	Light	Noise	Air	Water
Cluster 6 Knocknabrona/ Knocknafrosca (included in the Ballagh - Barnacranny Hill LBA)	GS4 wet grassland, and WS1 scrub, plus smaller areas of 4030 European dry heaths/HH1 dry siliceous heath, GS3 dry-humid acid grassland, GS2 dry meadows (and grassy verges), PF2 poor fen and flush and HD1 dense bracken.	County	Y on N59	Y	=	(N)
Cluster 7 Menlough (included in the Menlough LBA)	*8240 Limestone pavement mostly wooded with WN2 oak-ash-hazel woodland, plus a small *3180/FL6 turlough, *6210 calcareous grassland, GS1 calcareous grassland, WS1 scrub and WD1(mixed broadleaved woodland)	Inter-national	N	Y	=	(N)
Cluster 8 Lackagh (included in unnamed LBA 3)	*8240 Limestone pavement including wooded with WN2 oak-ash-hazel woodland, interspersed with *6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco- Brometalia</i>) with orchids, WS1 scrub and GS1 calcareous grassland,	County	Y, (south side)	Y	=	(N)
Cluster 9 Ballindooley Lough (included in the Ballindooley - Castlegar LBA)	3140 Hard oligo- mesotrophic waters with benthic vegetation of Chara spp /FL3/FS1, with smaller areas of *7210 Calcareous fens with Cladium	National	Y	Y	Y	(N)

Cluster	Habitats Present	Value	Light	Noise	Air	Water
	7230 Alkaline fens, 6410 Molinia meadows GS4, WN2 oak-ash-hazel woodland, WS5 recently felled woodland, GS2 dry meadows, ER2 exposed calcareous rock, PF1 Rich Fen and Flush and WS1 Scrub,					
Cluster 10 Castlegar (included in the Ballindooley - Castlegar LBA)	*8240 Limestone pavement some wooded with WN2 oak-ash-hazel woodland, plus 6510 Lowland hay meadows and smaller areas of scrub, dry calcareous (and neutral) grassland and dry meadows (and grassy verges),	Inter-national	Y	Y	Y	(N)
Cluster 11 Briarhill	*8240 Limestone pavement, 6210 calcareous grassland, calcareous grassland, scrub, and oak-ash-hazel woodland, plus stone walls and treelines,	Inter-national	Y	N	=	(N)
Cluster 12 Arduan	6210 calcareous grassland, GS1 calcareous grassland and WS1 scrub,	County	Y	N	=	(N)

Y elevated levels expected, N levels expected to be similar to baseline, ~ mostly, = elevated levels, but expected to be insufficient to change the vegetation type, (N) requires maintenance to achieve

9.2.9 Areas of semi-natural habitats outside the clusters in proximity to the road would be affected similarly.

9.2.10 Traffic noise, combined with artificial light where it occurs, and perhaps also to a small degree air pollution, combined with traffic mortality (see subsequent sections) is likely to affect the abundance and distribution of fauna along the route corridor (as discussed in the next few sections) which could have subtle impacts on the vegetation and habitats. There is some research suggesting this would be the case (Shannon, et al., 2016) (Morley, Jones, & Radford,

2014) (Mulder, Koricheva, Huss-Danell, Högberg, & Joshi, 1999), with the effect extending over perhaps a few hundred metres.

9.3 Aquatic Habitats

9.3.1 During the operation of the road, aquatic habitats are at risk from reductions in water quality and changes in water quantity, however this has been addressed in the scheme design, as described in paragraphs 9.2.6 and 9.2.7. Provided the system works as intended both the water quality and quantity should be maintained in all the watercourses. There is even the potential for water quality to improve in the short term if existing traffic flows are diverted from roads which do not have road run-off treatment capacity. As noted previously, this is dependent on maintenance of the drainage infrastructure, especially the wetland treatment ponds and pollutions interceptors. Effects on aquatic habitats are further assessed by Mr. James Dodds.

9.4 Flora

9.4.1 The retained populations of red data book plant species are potentially at risk from indirect effects in the way described in paragraph 9.2.10, with vulnerabilities as follows:

- Woodsy thyme moss *Plagiomnium cuspidatum*, partially retained population (?) at Ch. 3+350 (2680_R1), and retained populations at Ch4+450 (2527_R1) and at Ch. 12+950 (2354_R1) potentially vulnerable to air pollution (Bignal, Ashmore, & Headley, 2008) (Pescott, et al., 2015)
- Lesser striated feather-moss *Plasteurhynchium striatulum*, partially retained population (?) at Ch. 9+800 4422_R1 and retained populations at Ch. 9+900 (3941_R1), Ch.10+000 (5507_R1) and at Ch. 10+100 (3790b_R1) are potentially vulnerable to air pollution.
- Imbricate bog-moss *Sphagnum affine*, if partially retained the population at Ch.1+250 (EC12 R2) is vulnerable to even slight reductions in water supply and possibly also air pollution.
- Red bog-moss *Sphagnum capillifolium s. capillifolium*, if partially retained the population at Ch.1+250 (765_R1) could be affected in the same way as *S.affine*.
- Spring gentian *Gentiana verna*, is likely to be very vulnerable to nitrogen deposition as it is found in extremely infertile sites (Ellenberg value = 1), it may however be sufficiently removed from the route in all three known locations to be affected by nitrogen deposition.
- Brown beak-sedge *Rhynchospora fusca*, the only known location is just outside the route alignment at Ch.2+350 (EC14 R3), it is also found in extremely infertile sites (Ellenberg value = 1) and it is a wet-site indicator, often on water-saturated, badly aerated soil (Ellenberg value = 9), it is therefore vulnerable to air pollution and slight changes in hydrology.

9.4.2 Some of the locally uncommon, locally characteristic and orchid species may be similarly vulnerable.

9.5 Invertebrates

Marsh Fritillary

- 9.5.1** There are three main risks for marsh fritillary during the operations stage, isolation of the populations south of the proposed road, mortality while trying to cross and degradation of its habitats in proximity to the road, which is most likely to arise from lack of management, see NPWS1. Given the mobility of the butterfly, it is plausible that sufficient numbers cross the proposed road for all current populations to be maintained, EIAR p570, however the populations south of the road are at greater risk, with only 7.6ha of suitable habitat available (see also cumulative effects).

Marsh Whorl Snail

- 9.5.2** The marsh whorl snail could be at risk from reduction in water quality, however, as described in paragraphs 9.3.1, the scheme design includes measures to trap and treat road run-off. The remaining risk is that populations become more isolated. The marsh whorl snail occurs at large sites, north and south of the proposed road, Ballindooley Lough and Coolagh Lakes/River Corrib, respectively. These populations are likely to be resilient and there is no obvious connection between these populations currently. The proposed road would appear not to change this situation.

Other terrestrial invertebrates

- 9.5.3** As for terrestrial habitats.

Other Freshwater Invertebrates

- 9.5.4** As for aquatic habitats.

9.6 Bats

- 9.6.1** The key risks for the bat populations during the operation of the proposed road are collisions with vehicles, EIAR p552, and effective habitat loss due to lighting, EIAR p555, along the proposed road, with the construction stage effects continuing to have an impact; loss of foraging habitat, reduced access to habitat on the far side of the proposed road from the roost and isolation of colonies to the south of the road, EIAR p554.

9.7 Mammals other than bats

- 9.7.1** All of the mammal species identified in the route corridor are at risk from direct mortality from road traffic and populations becoming isolated to the south of the road, EIAR p524-p526 (otter) p560 - p561 (badger) p562 (other mammals). Mammal species may also avoid the habitats in proximity to the road, compounding the effects of habitat loss (i.e. the effective habitat loss is more than the footprint of the road) (Benítez-López, Alkemade, & Verweij, 2010). The smaller populations of larger and/or more specialist species with such as Irish hare, red squirrel, pine marten and badger are most vulnerable. Otter is also vulnerable to direct mortality but less vulnerable to isolation since this species also uses the coastal habitats of Galway Bay.

- 9.7.2** The road design includes some locations where safe passage could be achieved, the River Corrib (red squirrel, pine marten, badger and otter), the Menlough Viaduct (red squirrel, pine marten and badger) and over the Lackagh Tunnel (pine marten and badger) and further crossing points are proposed in mitigation or in conjunction with culverts for watercourses. However, this is obviously very different from the situation without the proposed road. Direct mortality or avoidance of the area could suppress populations in proximity to the road, while isolated populations of Irish hare, red squirrel and pine marten to the south of the road of are at increased risk of dying out. The road design includes mammal resistant fencing which will prevent or reduce mortality for some species (e.g. badger, Irish hare) but may have limited effectiveness for others which can easily scale the fence (e.g. fox, pine marten)
- 9.7.3** A further risk comes from artificial lighting affecting the behaviour of nocturnal mammals however lighting is not proposed in proximity to otter habitats EIAR p525, in areas with badger setts or activity, EIAR p561, at Menlough Woods (with red squirrel and pine marten) or along most of the western section (where Irish hare was recorded), design report drawing GCOB-1300-D-000 to -015.

9.8 Breeding Birds

- 9.8.1** The density of breeding birds in proximity to roads is reduced (Benítez-López, Alkemade, & Verweij, 2010). This may be due to road noise or direct mortality or a combination, EIAR p573. The effect is variable between species and depends on the volume and speed of the traffic. For the most sensitive species and the busiest roads, the effect is detectable for several kilometres (Reijnen, Foppen, & Veenbaas, 1997) but more usually species abundance is suppressed up to 1km from the road (Benítez-López, Alkemade, & Verweij, 2010). If direct mortality is the reason, then this can lead to the creation of a population sink⁹ and a reduction in populations more widely, EIAR p574.
- 9.8.2** The applicant's bird surveys extended just 100m either side of the footprint of the proposed road, sometimes less, which means that the surveys did not cover the areas over which displacement/population effects could occur. A reasonable but crude assumption is that the numbers of territories displaced would be double those directly lost for all except corvids and raptors. For birds of conservation concern the number of territories displaced can be estimated from the data in my Table 6, which indicates for all the species listed more than 1% of the Galway City population would be affected, with the populations of stonechat and linnet perhaps most impacted. Displacement or mortality of the barn owl pair which breeds at Menlo Castle is likely EIAR p574-p575, while loss of the peregrine pair from Lackagh Quarry is also a risk (albeit lower) for the same reasons, EIAR p575.

⁹ A recent study in Portugal indicated 7 blue tit, 4 goldfinch and 3 house sparrows were killed by traffic per km of road per year with mortality higher during the breeding season, suggesting population level effects. (Pinto, Lourenço, Mira, & Santos, 2020)

9.9 Wintering Birds

9.9.1 Other than possible effects on aquatic habitats, see section 7.4, the main risk for wintering birds is permanent displacement of wading birds occurring in proximity to the road. Wading birds generally prefer open spaces, avoiding field boundaries, dense vegetation and other infrastructure. The regular oystercatcher flock at WB45 NUIG may be displaced from here, as the proposed road would reduce the size of largest of the playing fields, EIAR p584, while curlew at Ballymoonen could also be displaced from part of the area (the EIAR does not give exact locations for the records of these flocks of birds). As previously discussed, displaced wading birds are not thought to fare well.

9.10 Amphibian and Reptiles

9.10.1 The amphibian species are potentially at risk from changes in water quality and quantity, although as previously noted, the scheme design includes measures to control this risk.

9.10.2 An additional risk is from direct mortality with animals following traditional routes to reach breeding ponds and meeting road traffic, EIAR p591, or becoming trapped in the road drainage system if this is a kerb and gully pot arrangement. The design report indicates that the entire eastern section from the N59 to N6 may have kerbs, gully pots and sub-surface carrier drains, and the same is true for junctions and link roads elsewhere, design report p280 to p281. Other locations appear to have gully pots and sub-surface carrier drains but no kerb. Kerbs and gully pots can act like a fencing and pitfall trap system and would pose a significant risk to amphibian populations with breeding ponds within 100m of the proposed road such as at the smooth newt population at Castlegar and the common frog populations are Briarhill.

9.10.3 Isolation is a further risk, EIAR p591, however both amphibian species can do well in sub-urban areas and along road verges.

9.10.4 Reptiles are similarly at risk from direct mortality and isolation EIAR p593 -p594, although this species can still do well at large, isolated sites and along road verges. The main risk for common lizard might be changes in vegetation management in currently suitable habitats to the south of the proposed road (see cumulative effects).

9.11 Fish

9.11.1 As for aquatic habitats.

10. Proposed Avoidance, Mitigation & Compensations Measures

10.1 Approach

10.1.1 The applicant's proposals for avoidance, mitigation and compensation are summarised over the following pages, with references to the relevant document for further details and the reference for the schedule of environmental commitments. In a few instances, I did not consider the mitigation credible in which case I have marked it as 'discounted mitigation'.

10.2 Designated Areas

Natura 2000

- See appropriate assessment report, SEC 8.2

Moycullen Bogs

- Standard measures for dust control during construction EIAR p613 plus a 2m [high] dust screen adjacent to Moycullen Bogs, EIAR p613 SEC 8.3 (as updated March 2020).
- Measures to control surface water run-off, EIAR p613 and CEMP EIAR Appendix A.7.5. SEC 8.3.
- Measures for non-native invasive species control during construction, as set out the invasive species management plan included in the CEMP, which covers Japanese knotweed, Himalayan knotweed and Rhododendron as these species are listed in Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011 as amended, SEC 8.3.

10.3 Terrestrial Habitats

- Retention of some Annex I habitats within the proposed road boundary, with quantities calculable by subtracting the losses shown in amended table 4.1 (column 6) in the corrigendum p13-p14 from the total shown in amended Table 2 (column 2) in the corrigendum p14-p15, including one petrifying spring, with retained parts of Annex I habitats to be protected by fencing during the construction period EIAR p611 SEC 8.4, 8.9 and 8.16
- Protection of tree and hedgerow roots of retained vegetation EIAR p612 SEC 8.10
- Standard dust control measures during construction EIAR p613
- Measures to control the spread of invasive species EIAR p614 - p615 SEC 8.11, 8.12, 8.13, 8.14, 8.15
- Areas of compensatory habitat will be created as set out in the Compensatory Habitat Management Plan in Appendix A.8.26. SEC 8.18 and 8.19 (as updated March 2020) with locations of donor and receptors sites shown on Figures 1-9 in Appendix A.21.3 of the March 2020 Schedule of Additional Environmental Commitments, plus Ecology site Management

Plans to be prepared for all compensatory habitats, which will include translocation details SEC 8.19 (as updated March 2020).

- The compensatory habitat is to be created partly from donor material from lost areas of habitat within the proposed road boundary, as summarised in Table 9, noting that the amount of material is less than the total area due to the presence of other habitats in 60% of the donor sites.

Table 9: Summary of donor sites for habitat translocation

Dominant Habitat Code	Habitat Name	No. of donor sites	Average size	Total Area (ha)
GS1	Dry calcareous grassland	30	0.3954	11.8624
GS1 6210	Dry calcareous grassland (Annex I)	4	0.0611	0.2445
GS4 6410	Wet grassland	1	0.0723	0.0723
HD1, plus HH1 & HH3	Bracken (with dry and wet heath)	1	0.1239	0.1239
HH1 4030	Dry heath	44	0.0412	1.8124
HH1/HH3 4030/4010	Dry & wet heath	1	0.0962	0.0962
HH3 4010	Wet heath	23	0.0737	1.6967
PB3 *7130	Lowland blanket bog	1	0.0143	0.0143
WN6 *91E0	Riparian woodland	2	0.0722	0.1444
WS1	Scrub	2	0.0591	0.1181
All types		109	0.1484	16.1852

- The donor material is to be translocated to one of 29 small receptor sites, which are typically in the soft estate, in some cases are enclosed by road infrastructure (slip roads, etc), with larger area at Lackagh Quarry, as summarised in Table 10, noting that these differ slightly from totals given elsewhere and that there is an excess of dry calcareous grassland from donor sites (4.96ha excess) and a shortfall of heath (3.29ha shortfall), wet grassland (0.42ha) and 'forest' (0.04ha).

Table 10: Summary of receptor sites

Habitat Code	Proposed Habitat Type	No. of Receptor Sites	Average Size	Total
4030	Dry heath	21	0.33	7.03
6210	Calcareous grassland	6	1.19	7.14
6410	Molina meadow	1	0.49	0.49
*91E0	Alluvial Forest	1	0.18	0.18
All types		29	0.51	14.84

- The receptor sites already support habitats of a wide variety of types which is hard to summarise as there were 65 different mosaics of habitat recorded as present between the 29 receptor sites, however, there are 22 instances of wet grassland dominated mosaic, 19 of bracken and six of scrub, while improved agricultural grassland (of low ecological value) appears to dominate just three receptor sites (2.29ha) and bare ground/quarry floor another three (4.85ha), the remaining receptor sites (and about 50% of the total area) are mostly in areas that already have nature conservation value, including land within local biodiversity areas. Nineteen of the receptor sites are also material deposition areas and at least one is also a site compound.
- Three receptor/habitat creation sites for calcareous are located in Lackagh Quarry (6210.R5, 6210.R6 and 6210.R8) on top of material deposition including base-poor peat, the robustness of which was debated at the oral hearing, and with the quarry reported to be prone to flooding and difficult to access for grazing; this does not seem like a viable long term solution to creating dry calcareous grassland and so should be discounted by 50% due to risk of failure.
- The landscaping plans show that most (estimated 80% of the length and 80% of the width) of the soft estate is to be planted with screen planting at either minimum 3m wide or minimum 6m wide, with 6m wherever space allows, EIAR p1113, the total area in hectares is not stated in the EIAR, but it could be in the order of 16ha, comprising:
 - dense planting at 1m centres of alder, birch, blackthorn, elder, guelder 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%; and
 - Tree species, planted equally at half-standard (6-8cm girth) and standard size (8-10cm girth), shall comprise minimum 10% of the mix.
- Grassland seeding amongst the screening planting, seeded to a low maintenance non-agricultural grassland or to a diverse grass/wildflower sward, as appropriate, again the total

area in hectares is not stated in the EIAR, but it could be in the order of 8ha, EIAR p 1110 Table 12.7 and figures 12.01.01 to 12.01.15.

- Excavated blocks of limestone pavement will be placed within those lands along the east bank of the River Corrib in Menlough which are proposed for habitat retention, enhancement and creation, SEC8.71.
- *Discounted mitigation:* Loss of other habitats within the proposed boundary to be minimised, however the retained quantities are not stated, and therefore this mitigation measure must be discounted until quantities are provided, EIAR p612, SEC 8.7.

10.4 Aquatic Habitats

- Standard measures to control site run-off during construction, EIAR p613 and CEMP EIAR Appendix A.7.5.
- Measures to protect groundwater quantity and quality during construction and operation which have been separately assessed by Mr. James Dodds (Dodds, 2020) and deemed adequate.
- *Discounted mitigation:* Where possible retention of channel and bankside vegetation SEC8.8, discounted as it is uncertain if this will be achieved and to what extent.

10.5 Flora

- No specific mitigation for flora, see terrestrial habitats.

10.6 Invertebrates

Marsh whorl snail

- No specific mitigation for marsh whorl snail, see aquatic habitats.

Marsh fritillary

- Pre-construction survey and translocation of larval food webs EIAR p641 and the module 1 response p6-p9 SEC 8.41 (as updated in March 2020)
- Management of two areas of translocated and retained (6410.R1, 0.49ha, and an area of retained wet heath etc at Ch. 3+000, 0.6ha) Annex I habitats within the boundary of the proposed road, one at Ch.0+900 and a second at Ch. 3+000, with the vegetation maintained in a suitable condition for marsh fritillary, the module 1 response p7-p10.

10.7 Mammals other than bats

Otter

- Pre-construction survey to check for otter holts, EIAR p615 and SEC 8.20, and monitoring “of the effectiveness of environmental commitments” for one-year post-construction, SEC 8.23.

- Ledges to be installed within all culverts on stream used by otter, EIAR Table 8.36 indicates this applies to only the Bearna Stream C04/01 and Tonabrocky Stream C04/02, EIAR p615-p616, SEC 8.21 and 8.72.
- Mammal resistant fencing in accordance with TII guidelines to be installed in proximity to the culverts, EIAR p616 and Figures 8.23.1 to 8.23.14, SEC 8.22.

Badger

- Pre-construction survey of badger setts, SEC 8.30, and inaccessible areas, SEC 8.35, plus post-construction monitoring for one year 8.39.
- Exclusion zones will be established around retained badger setts during construction (>20m light machinery allowed in non-breeding season, >30m heavy machinery allowed in non-breeding season, >50m all works in breeding season and >150m all blasting in breeding season), demarcated by fencing EIAR p634, SEC 8.31 8.32.
- Badger sett closure will be done under licence and following standard protocols EIAR p635, SEC 8.33.
- Creation of an artificial badger sett in compensation for the loss of main sett S9 and subsidiary sett S11 at Lackagh EIAR p635, Figures 8.23.1 to 8.23.14 and Appendix A.8.24, SEC 8.34.
- Culverts and underpasses under the road to facilitate the passage of badgers, EIAR p639 SEC 8.36 and 8.74, as shown in Table 11, these are an average of 611m apart (treating those less than 50m apart as one crossing point), with a maximum of 3,550m separation at the western end of the proposed road and a further three locations where crossing points are separated by more than 1,000m, screening at tunnel entrances where needed to reduce artificial light, SEC 8.37.
- Mammal resistant fencing to guide badgers to underpasses, with the fencing along the entire route on both sides except to the south of the Galway Racecourse tunnel, EIAR p639 SEC 8.38, RFI response Appendix A.9.1.

Other mammal species

- None during construction.
- Culverts and underpasses, as described for badger, EIAR p640 SEC 8.40

Table 11: Proposed crossing points for otter and badger

(with other structures in grey text)

Structure	Location	Dimensions	Other Functions	Separation, from nearest western crossing point	Suitable for badger	Suitable for otter
Pipe C00/00	0+550	600mm	-	+550m	Yes	No
Culvert C00/01	0+640	2.5m wide by 1.35m high	Sruthán na Libeirtí Stream	N/A	No	No
Culvert C02/01b	2+840	2.5m wide by 2.5m high	Trusky Stream	N/A	No	No
Culvert C03/01	3+040	2.5m wide by 1.2m high	Trusky minor drain	N/A	No	No
Culvert C03/03	3+920	2.5m wide by 2.5m high	Bearna Stream Tributary	N/A	No	No
Culvert C03/04	3+640	2.5m wide by 2.5m high	Bearna Stream Tributary	N/A	No	No
Culvert C04/01	4+100	5m wide by 2.5m high with ledge	Bearna Stream	+3,550m	Yes	Yes
Culvert C04/02	4+895	3.1m wide by 2.5m high with ledge	Tonabrocky Stream	+795m	Yes	Yes
Pipe C05/01	5+270	600mm	-	+375m	Yes	No
Road Overbridge S06/01	6+335		Rahoon Road with lighting to allow safe pedestrian access	N/A	No	No
Culvert C06/00	6+450	2.5m wide by 2.5m high	-	+1180m	Yes, but unintended	No
Culvert C06/01	6+850	2.5m wide by 2.5m high	Knocknacarra Drain	N/A	Yes?	No
C06/01b	6+850	1200mm	Knocknacarra Drain	N/A	Error in Table 5.6 ?	No
Culvert C07/00	7+100	2.5m wide by 2m high	-	+650m	Yes, but unintended	No
Culvert C07/02A	7+210	2.5m wide by 2.5m high	Knocknacarra Drain	N/A	No	No
Pipe C07/02B	7+290	1200mm	-	N/A	No	No

Structure	Location	Dimensions	Other Functions	Separation, from nearest western crossing point	Suitable for badger	Suitable for otter
Pipe C07/04	0+700 of N59 Link?	600mm	-	??	Yes	No
Pipe C07/01(b)	1+610 of N59 Link?	600mm	-	??	Yes	No
Culvert C08/01(a)	8+450	2.5m wide by 2.5m high	-	+1350m	Yes, but unintended	No
Culvert C08/04	8+570	2.5m wide by 2.5m high	-	+120m	Yes, but unintended	No
Culvert C08/05	8+643	2.5m wide by 2.5m high	-	+73m	Yes, but unintended	No
Culvert C08/02	8+760	2.5m wide by 2.5m high	-	+17m	Yes, but unintended	No
River Corrib bridge Structure S08/04	8+850 to 9+500	650m wide by 3 - 7m high	River Corrib crossing	+90m	Yes, but unintended	Yes
Culvert C09/01	9+525	5m wide by 4m high	Part of River Corrib crossing structure	+25m	Yes	No
Culvert C09/02	9+540	5m wide by 4m high	Part of River Corrib crossing structure	+15m	Yes	No
Culvert C09/03	9+560	5m wide by 4m high	Part of River Corrib crossing structure	+20m	Yes	No
Culvert C09/04	9+570	5m wide by 4m high	Part of River Corrib crossing structure	+10m	Yes	No
Culvert C09/05	9+580	5m wide by 4m high	Part of River Corrib crossing structure	+10m	Yes	No
Culvert C09/06	9+710	2.5m wide by 2.5m high	-	+130m	Yes, but unintended	No
Road Overbridge S09/01	9+730	9.6m wide by 5.3m high	Menlo Castle Bóithrín Road	+20m	Yes	No
Culvert C09/07	9+920	2.5m wide by 2.5m high	-	+190m	Yes, but unintended	No
Underpass C10/01	10+040	18m wide by 2.35m high	Local access underpass or Minor Drain	+120m	Yes	No

Structure	Location	Dimensions	Other Functions	Separation, from nearest western crossing point	Suitable for badger	Suitable for otter
			Coolagh 10+730			
Menlough Viaduct S10/01	10+100 to 10+420	320m wide by 1m - 19m high	Viaduct over limestone pavement	+60m	Yes, but unintended	
Road Overbridge S10/02		9.6m wide by 5.3m high	Seanbóthar Road	N/A	No	No
Culvert C10/02	10+730	?	Minor Drain Coolagh	N/A	Assumed listed in error for C10/02a	No
Pipe C10/02 ((a)?)	10+740	1200mm		+320m	Yes	No
Lakagh Tunnel S11/01	11+150 to 11+420.	270m wide	Under limestone pavement, badgers can pass over (not through!)	+410m	Yes	No
Pipe C12/01	12+130	600mm	-	+710m	Yes	No
Culvert C12/02	12+350	2.5m wide by 2.5m high	-	+220m	Yes, but unintended	No
Culvert C12/03	12+390	2.5m wide by 2.5m high	-	+40m	Yes, but unintended	No
Culvert C12/04	12+450	2.5m wide by 2.5m high	-	+60m	Yes, but unintended	No
Green bridge S12/02	12+700	30m	-	+250m	Yes	No
Culvert C13/01	12+980	2.5m wide by 1.5m high		+280m	Yes	No
Culvert 13/02	13+710	Not stated		+730m	unknown	No
Galway Racecourse Tunnel S14/02	14+950 to 15+190	240m wide	Under racecourse, badgers can pass over (not through!)	+1240m, then nil until end at Ch. 16+650 +1460m	Yes, but unintended	No

10.8 Bats

- Adherence to the bat derogation licence method statement which includes measures to protect bats during the demolition of buildings and felling of trees, SEC 8.24 and 8.25.
- Replacement artificial roosts installed prior to the start of site clearance, comprising five artificial building roosts (four newly constructed and purpose built, and one converted from a garage), 16 bat boxes and in addition one bat box per tree confirmed as a roost, EIAR Appendix A.8.25, SEC 8.24 and 8.25.
- Standard measures to prevent harm to bats during building demolition including, *where possible* (emphasis added), buildings with confirmed roosts will be demolished outside breeding and hibernation periods, pre-construction surveys, exclusion of bats from the roost prior to demolition, EIAR Appendix A.8.25, SEC 8.24 and 8.25.
- Standard measures to prevent harm to bats during felling of trees confirmed as bat roosts or with high potential to support roosting bats, including felling in September or October, pre-felling survey, push the tree to the ground with an excavator or section felling, EIAR Appendix A.8.25, SEC 8.24 and 8.25.
- Temporary 'fencing'/artificial crossing structure, to guide bats across the road, to be installed at "key" crossing locations which are to be determined post-consent with further bat surveys at potential crossing points in Area 1: North of Bearná Woods, Area 2: Aughnacurra, Area 3: River Corrib to Coolough Road, Area 4: West of N84 Headford Road and Area 5: Ballindooley to Castlegar EIAR p619-p621, EIAR Appendix A.8.25, SEC 8.24 and 8.25.
- The Castlegar Wildlife Overpass at Ch. 12+690 - Ch. 12+720, unlit, 30m wide and planted with a double hedgerow, linking Menlough to Cooper's Cave, providing a single crossing point at a known crossing point linking these two important areas for lesser horseshoe bats, plus pre- and post-construction monitoring EIAR p621, SEC 8.27.
- Culverts/underpasses at important crossing point areas aligned with existing landscape features that are known to be used by bats, many of these have other purposes but some are specifically designed for bats, there are 33 in total, (including over tunnels and under Menlough viaduct, see Table 12) at an average of 517m¹⁰ apart (max 2250, with the western and eastern ends least well served, western 2.85km has single crossing and eastern 3.7km also has just one) EIAR p621- p624 and Table 8.35, p627-p630, SEC 8.26, 8.28 and 8.73, for comparison, there are around 200 linear features which would be bisected by the road, at an average 90m apart.
- Pre-construction and post-construction surveys for five years at Menlo Castle, new roosts and bat boxes, location of crossing structures (underpasses in Area 1: North of Bearná Woods, Area 2: Aughnacurra, Area 3: River Corrib to Bothár Nua, Area 4: West of N84 Headford Road, Area 5: Ballindooley to Castlegar, including the Castlegar Wildlife Overpass) on four occasions each year before and for five years post-construction, and general diversity an abundance of bats along six transects (length not stated) before and for two seasons following construction EIAR p630-p633, SEC 8.29.

¹⁰ This is calculated by treating crossing points less than 50m apart as one crossing point

Table 12: Proposed crossing points for bats

Structure	Location	Dimensions	Other Functions	Separation from nearest crossing point westwards	Known use? Or reported nearby
Culvert C00/01	0+650	2.5m wide by 1.35m high	Sruthán na Libeirtí stream	+650m, single crossing point in 2,850m	6 spp. incl. LHB, Myotis
Culvert C02/01b	2+850	2.5m wide by 2.5m high	Trusky Stream	+2200m	Pip
Culvert C03/01	3+050	2.5m wide by 1.2m high	Trusky minor drain	+200m	Pip
Culvert C03/03	3+925	2.5m wide by 2.5m high	Bearna Stream Tributary	+875m	Pip, LHB, Myotis
Culvert C03/04	3+940	2.5m wide by 2.5m high	Bearna Stream Tributary	+15m	Pip, LHB, Myotis
Culvert C04/01	4+100	5m wide by 2.5m high	Bearna Stream	+60m	Pip, LHB, Myotis
Culvert C04/02	4+900	3.1m wide by 2.5m high	Tonabrocky Stream	+800m	Pip, BLE, Myotis
Underbridge S06/01	6+335	Proposed road underbridge	Rahoon Road with lighting to allow safe pedestrian access	+1435m, single crossing point in 2,235m	Pip
Culvert C06/00	6+450	2.5m wide by 2.5m high	-	+115m	Pip
Culvert C06/01	6+850	2.5m wide by 2.5m high	Knocknacarra Drain	+400m	-
Culvert C07/00	7+100	2.5m wide by 2m high	-	+250m	Pip BLE

Structure	Location	Dimensions	Other Functions	Separation from nearest crossing point westwards	Known use? Or reported nearby
Culvert C07/02A	7+210	2.5m wide by 2.5m high	Knocknacarra Drain	+110m	Pip BLE
Culvert C08/01A	8+450	2.5m wide by 2.5m high	-	+1240m	Pip LHB
Culvert C08/04	8+570	2.5m wide by 2.5m high	-	+120m	-
Culvert C08/05	8+643	2.5m wide by 2.5m high	-	+73m	-
Culvert C08/02	8+760	2.5m wide by 2.5m high	-	+117m	-
River Corrib bridge Structure S08/04	8+850 to 9+500	650m wide by 3 - 7m high	River Corrib crossing	+90m	Pip, LHB, BLE, DB
Culvert C09/01	9+525	5m wide by 4m high	Part of River Corrib crossing structure	+25m	-
Culvert C09/02	9+540	5m wide by 4m high	Part of River Corrib crossing structure	+15m	-
Culvert C09/03	9+560	5m wide by 4m high	Part of River Corrib crossing structure	+20m	-
Culvert C09/04	9+570	5m wide by 4m high	Part of River Corrib crossing structure	+10m	-
Culvert C09/05	9+580	5m wide by 4m high	Part of River Corrib crossing structure	+10m	-

Structure	Location	Dimensions	Other Functions	Separation from nearest crossing point westwards	Known use? Or reported nearby
Culvert C09/06	9+710	2.5m wide by 2.5m high	-	+130m	LHB
Road Underbridge S09/01	9+730	9.6m wide 5.3m high	Menlo Castle Bóithrín Road	+20m	LHB
Culvert C09/07	9+920	2.5m wide by 2.5m high	-	+190m	LHB
Underpass C10/01	10+040	18m wide by 2.35m high	Local access underpass or Minor Drain Coolagh 10+730	+120m	LHB
Menlough Viaduct S10/01	10+100 to 10+420	320m wide by 1m - 19m high	Viaduct over limestone pavement	+60m	-
Seanbóthar Road Underbridge S10/02	10+520	9.6m wide by 5.3m high	Seanbóthar Road	+100m	LHB
Lakagh Tunnel S11/01	11+150 to 11+420	270m wide	Under limestone pavement, bats can pass over (not through!)	+630m	-
Culvert C12/02	12+350	2.5m wide by 2.5m high	-	+930m	LHB, BLE
Culvert C12/03	12+390	2.5m wide by 2.5m high	-	+40m	LHB, BLE

Structure	Location	Dimensions	Other Functions	Separation from nearest crossing point westwards	Known use? Or reported nearby
Culvert C12/04	12+450	2.5m wide by 2.5m high	-	+60m	LHB, BLE
Castlegar Wildlife Overbridge S12/02	12+700	60m long x 30m wide	-	+250m	LHB
Culvert C13/01	Ch. 12+980	2.5m wide by 1.5m high	-	+280m	
Culvert C13/02	Ch. 13+700	Not stated	-	Not known if suitable	
Galway Racecourse Tunnel S14/02	14+950 to 15+190	240m wide	Under racecourse, bats can pass over (not through!)	+1970m Single crossing point in 3710m (+1460m to end at Ch. 16+650)	

Pip = pipistrelle, LHB = lesser horseshoe bat, BLE = brown-long-eared bat

10.9 Breeding Birds

General

- Vegetation clearance outside the bird breeding season or search for nests beforehand, EIAR p641, SEC 8.42.
- *Discounted mitigation:* Planting of woodland, hedgerow and grassland habitats along the proposed road, it is acknowledged by the applicant that some species will avoid this due to road noise and, I have discounted this measure because it will also increase the mortality risk for breeding birds, potentially becoming a population sink i.e. result in ongoing population declines, EIAR p643, SEC 8.43.
- Twenty nest boxes (in addition to those for barn owl and peregrine) to be provided, location and type to be decided, EIAR p643 SEC 8.44 however these are unlikely benefit the birds of conservation concern affected by the proposed road and obviously do not compensate for lost foraging habitats.

Peregrine

- Commencing works in Lackagh quarry prior to the start of the bird breeding season to displace breeding peregrine, EIAR p642, SEC 8.54 (as updated in March 2020).
- Rock-bolts will not be installed in the immediate vicinity of an active peregrine falcon nest site during the breeding bird season (1st March to 31st August), SEC 8.54.
- Install a nest box on Galway City Council owned lands to the south-east of Lackagh Quarry as indicated on drawing GCRR-SK-PP-067, to accommodate displaced birds, Biodiversity evidence Appendix A, SEC 8.54.
- Two artificial peregrine falcon nest boxes will be installed, one at each of the two former nest sites in Lackagh Quarry, Module 1 response p6 SEC 8.54 and monitored annually for three years post-construction SEC 8.58

Barn Owl

- Three barn owl nest boxes, EIAR p642, SEC 8.45.
- Tree and shrub planting will be used to discourage barn owl foraging, increase flight heights and reduce the risk of mortality from road traffic in the places shown on EIAR Figures 8.23.1 to 8.23.14 and on the landscape drawings (EIAR Figures 12.2.01 to 12.2.14). SEC 8.46, 8.47 and 8.48, this would however take five-ten years to develop, during which time the barn owl population would be at high risk.
- Monitoring of vegetation growth, barn owl carcasses on the road and breeding sites for two years post-construction, SEC 8.53.
- Providing barn owl foraging habitat in proximity to Menlo castle by (i) reducing grazing pressure on c.8ha of land in proximity to the Castle (ii) creating c.1.81ha of Calcareous grassland habitat at Menlough 6210.R1 and 6210.R2; and (iii) creating c.1.95ha of Dry heath habitat west of the River Corrib at receptor sites 4030.R18, 4030.R19, 4030.R20 and 4030.R21, all on currently grazed land, to give a total of c.11.76ha within 5km of Menlo Castle, module 1 response p3 -p4, SEC 8.49.
- *Discounted mitigation:* two of the three areas put forward as barn owl mitigation should be discounted (ii) c.1.81ha of Calcareous grassland habitat at Menlough 6210.R1 and 6210.R2; and (iii) c.1.95ha of Dry heath habitat west of the River Corrib at receptor sites 4030.R18, 4030.R19, 4030.R20 and 4030.R21 as barn owl habitat because the route that a barn owl might take to reach these areas is too perilous, which leaves the total created as c.8ha.

10.10 Wintering Birds

- Blasting during construction at Lackagh and Castlegar to take place April to September period (inclusive) only, to avoid disturbance of wintering birds at Ballindooley Lough, SEC 8.56 and 8.57.
- *Discounted mitigation:* hedgerow planting along the proposed development boundary at the locations shown on the landscape drawings EIAR Figures 12.1.01 to 12.1.15, as this is just or more likely to displace wintering birds as moving vehicles.

10.11 Amphibians and Reptiles

Smooth newt and Common frog

- Pre-construction survey of ponds and other waterbodies if these are to be removed during the amphibian breeding season, February to September, followed by translocation to the nearest available existing suitable habitat, with no effort to capture amphibians outside the breeding season or away from waterbodies, EIAR p645 SEC 8.58, 8.59, 8.60 and 8.62.
- Wildlife underpasses and overpasses as described for badger and bats, SEC 8.63.

Common lizard

- Habitat manipulation in areas of suitable habitat to persuade common lizard to vacate the construction site, EIAR p646, SEC 8.64.
- *Discounted mitigation:* Wildlife underpasses and overpasses as described for badger and bats, EIAR p646, as it is highly unlikely these will be used by common lizard (the culverts are dark and most in the western section where common lizard was recorded have the dual purpose of carrying water under the road), SEC 8.65.

10.12 Fish

- A 5m exclusion zone for construction works around rivers and streams during construction (apart from where culverts are to be installed), SEC 8.66.
- Construction works in streams will occur in the months of July and September (inclusive), and therefore construction works will not occur during the fish spawning season (November to January for salmon, for example)EIAR p647, SEC 8.67.
- New sections of river channel to be designed in accordance with Channels & Challenges. Enhancing Salmonid Rivers. (O'Grady, 2006), EIAR p647.
- Fish rescue in advance of culvert installation, EIAR p647, SEC 8.67.
- Temporary crossings during construction to be in accordance with IFI and TII guidelines, EIAR p648, SEC 8.68.

10.13 Biodiversity

- Results of the monitoring activities will lead to corrective action over the lifetime of the project if any aspects of the implementation of the ecological mitigation measures and monitoring commitments proposals are not effective, and this is to be reviewed by a professional ecologist, SEC 8.69 (March 2020 update).
- Establishment of a GIS to track the work and administer permits, SEC 8.70 (March 2020 update).

11. Predicted Residual Impacts

- 11.1.1** The mitigation measures should be sufficient to ensure that there is no significant negative effect on Moycullen Bogs NHA, otter, most wintering birds and fish species. The potential effects on Natura 2000 sites can also be reduced to insignificance with mitigation.
- 11.1.2** The mitigation measures have the effect of reducing the likelihood and/or severity of the impact on many of the key ecological receptors, but for many a likely significant impact remains. The applicant has acknowledged this in the EIAR and subsequently e.g. the biodiversity evidence. We differ for some features, with the applicant concluding significant effects unlikely where I consider significant effects likely, despite the implementation of the mitigation measures.
- 11.1.3** Table 13 attempts to quantify the potential residual impacts; the values are in many cases estimates however it gives an idea of the order of magnitude.
- 11.1.4** Generally, the most significant effects would occur in the western part of the route from the start to the route to the junction with the N59, with a further set at Menlough, which supports limestone pavement, red squirrel, pine marten, lesser horseshoe bat, Natterer's bat and barn owl. The impacts on designated local biodiversity areas and four red data book plants and one red data book mollusc are notable.

Table 13: Likely residual impacts with applicant's proposed mitigation and compensation

(see explanatory text at end of table, p86)

Feature	Direct Loss	At Risk (Un-mitigated)	Residual Risk (Mitigated)	Value	Significant Impact
Moycullen Bogs NHA	-	-	-	National	No
Cluster 1 Forramoyle	14.3ha	7ha?	21ha?	County	Yes
Cluster 2 Troscaigh	6.7ha	7ha?	14ha?	National	Yes
Cluster 3 Cloughscoltia (partly within an unnamed LBA 1)	13.9ha	15ha?	30ha?	County	Yes
Cluster 4 Ballymoneen Road to Cappagh Road (part of the Cappagh - Ballymoneen LBA)	7.3ha	9ha?	16ha	County	Yes
Cluster 5 East of Ballymoonen Road (part within an unnamed LBA 2)	2.2ha	2ha?	4ha?	County	Yes
Cluster 6 Knocknabrona/ Knocknafrosca (included in the Ballagh - Barnacranny Hill LBA),	6.0ha	8ha?	14ha?	County	Yes
Cluster 7 Menlough (included in the Menlough LBA)	5.4ha	8ha?	14ha?	Inter-national	Yes
Cluster 8 Lackagh (included in unnamed LBA 3)	1.8ha	4ha	6ha?	County	Yes

Feature	Direct Loss	At Risk (Un-mitigated)	Residual Risk (Mitigated)	Value	Significant Impact
Cluster 9 Ballindooley (included in the Ballindooley - Castlegar LBA)	1.0ha	1ha?	2ha?	National	Yes
Cluster 10 Castlegar (included in the Ballindooley - Castlegar LBA)	0ha	2ha?	2ha?	Inter-national	(No)
Cluster 11 Briarhill (not included in an LBA)	4.0ha	2ha?	6ha?	Inter-national	Yes
Cluster 12 Arduan (not included in an LBA)	0.7ha	1ha?	2ha?	County	Yes
Petrifying springs	1	0	1	Local	Yes
Sruthán na Libeirtí etc	255m	Down-stream to coast	170m	Local	Yes
Trusky Stream, etc	240m	To coast	175m	Local	Yes
Bearna Stream, etc	150m	To coast	150m	Local	Yes
Tonabrocky Stream	495m	To coast	245m	Local	Yes
Knocknacarra, etc	385m	To coast	385m	Local	Yes
Woodsy thyme moss <i>Plagiomnium cuspidatum</i>	1 locality	2 localities	3 localities	National	Yes
Lesser striated feather-moss <i>Plasteurhynchium striatulum</i>	1 locality	3 localities	4 localities	National	Yes
Imbricate bog-moss <i>Sphagnum affine</i>	1 locality	-	1 locality	National	Yes
Red bog-moss <i>Sphagnum capillifolium s. capillifolium</i>	1 locality	-	1 locality	National	Yes
Spring gentian <i>Gentiana verna</i>	-	3 localities	3 localities	Inter-national	(Yes)
Brown beak-sedge <i>Rhynchospora fusca</i>	-	1 locality	1 locality	National	(Yes)
Marsh Fritillary	4.7ha habitat	one 1km ²	one 1km ²	National	(Yes)
Marsh Whorl Snail	1 colony	3 colonies	1 colony	County	Yes
Lesser horseshoe bat	1 colony	2 colonies	3 colonies	County	Yes
Whiskered bat	-	1 colony	1 colony	National	(Yes)
Natterer's bat	-	1 colony	1 colony	National	(Yes)
Daubenton's bat	-	1 colony	1 colony	Local	(Yes)
Leisler's bat	-	-	-	Local	No

Feature	Direct Loss	At Risk (Un-mitigated)	Residual Risk (Mitigated)	Value	Significant Impact
Common Pipistrelle	1 colony?	1 colony	2 colonies	Local	(Yes)
Soprano Pipistrelle	2 colonies?	1 colony	2 colonies	Local	(Yes)
Nathusius' Pipistrelle		1 colony	1 colony	County	(Yes)
Brown long-eared bat	2 colonies	2 colonies	4 colonies	County	(Yes)
Irish hare	2 animals	Popn. South of road	Popn. South of road	Local	(Yes)
Pine Marten	1 (5ha habitat)	One population	One population	National	Yes
Red Squirrel	3-4 (5ha habitat)	One population	One population	County	Yes
Irish Stoat	In line with habitat	-	In line with habitat	Local	No
Badger	1 main sett	10 social groups	2 social groups	Local	(No)
Otter	-	3 or 4	-	Local	(No)
Other mammal populations	In line with habitat	-	In line with habitat	Negligible	No
Barn owl	-	One pair	One pair	National	(Yes)
Peregrine	-	One pair	One pair	National	(Yes)
Breeding Birds of Conservation Concern	88 territories	176 territories	264 territories	Local	Yes
Oystercatcher	-	1 flock ~30 birds	1 flock ~30 birds	Local	(Yes)
Curlew	-	<5 birds	<5 birds	Local	(Yes)
Other wintering birds	-	-	-	Various	(No)
Smooth newt	2 breed sites	2 popn.s	2 popn.s	Local	Yes
Common frog	10 breed sites	10 popn.s	10 popn.s	Local	Yes
Common lizard	200 animals	200 animals	-	Local	No
European eel	-	5 colonies	-	International	(No)
Brown trout	-	2 colonies	-	Local	(No)
Sea trout	-	1 colony	-	Local	(No)
Atlantic salmon	-	1 colony	-	Local	(No)

direct loss= the area or populations directly impacted,
at risk = an estimate of the area or population which could be subject to indirect effects without mitigation
mitigated risk = 'direct loss and 'at risk' added together adjusted for the proposed mitigation, if any
(Yes) = should the effect materialise it would be significant, occurrence not certain or less likely
(No) = conclusion of no significant effect dependent on mitigation

12. Cumulative Impact Assessment

12.1.1 The applicant provided an updated cumulative impact assessment at the oral hearing, 10th March 2020 and then again in November 2020. In summary, currently proposed or consented developments include:

- Road development schemes comprising the N6 Galway City Ring Road, M6 Motorway improvements, M17 Galway to Tuam, N18 Oranmore to Gort, N17 Tuam Bypass, N59 Maam Cross to Oughterard, N59 Moycullen Bypass and upgrades to the R336 Bearnna to Scrib;
- A motorway service area on the M6 at Oranmore;
- National University of Ireland Galway (NUIG) New Pitches;
- Cycle/greenway projects with start points in Galway City;
- Two coastal protection projects in Galway bay, plus an extension of Galway Harbour;
- More than 962 residential units;
- Student accommodation with a total of 1,120 student beds; and
- Galway West Water Supply Scheme (abstraction from the River Corrib).

12.1.2 Development plans are set out in the Galway County Development Plan and the Galway City Local Development Plan.

12.1.3 The Galway City Development Plan shows residential development planned within Cluster 4 Ballymoneen Road to Cappagh Road (part of the Cappagh - Ballymoneen LBA), Cluster 5 East of Ballymoneen Road (part within an unnamed LBA 2) and Cluster 8 Lackagh (included in unnamed LBA 3) and Cluster 11 (which includes the site for spring gentian), thereby potentially adding to the direct impacts on these areas from the proposed road.

12.1.4 Both plans included residential development elsewhere including at Bearnna, and it is clear from the two development plans that there is anticipated to be growth in the local population and continued or expanded tourism in the city and around.

12.1.5 The principal cumulative risk to biodiversity is degradation (or development) of the land of high biodiversity value that would be encapsulated in the urban environment by the proposed road and subject to increased urbanisation effects, for example, waste dumping, informal recreation, lack of traditional management, predation of wildlife by domestic cats, spread of non-native invasive species, together with the more isolated population of flora and fauna becoming more vulnerable to dying out. This risk applies to all of the features identified in Table 13 except Ballindooley Lough and barn owl.

13. Additional Mitigation

13.1 Approach

13.1.1 In the event that the proposed road is consented, I have identified some additional mitigation measures which would lessen the severity/likelihood of the impact but not change the significance of effects set out in Table 13. For each, I have made an assessment of ease of implementation (difficult, moderate, easy), level of benefit (high, medium, low) and whether required by law (yes, no) which follow each measure in the format (easy; moderate; no).

13.2 Designated Areas

- *Additional Mitigation:* The non-native species Fuchsia *Fuchsia* sp., winter heliotrope *Petasites fragrans*, Sitka spruce *Picea sitchensis*, European larch *Larix decidua*, Lodgepole pine *Pinus contorta* and Scots pine *Pinus Sylvestris* should be included in the invasive species management plan, as should the native species bracken *Pteridium aquilinum* and soft rush *Juncus effusus* to limit their spread from where they currently occur (easy, moderate, no).
- *Additional Mitigation:* The planting and sowing scheme should not include non-native tree species, especially those mentioned above, in proximity to Moycullen Bogs NHA. (easy, moderate, no).

13.3 Terrestrial Habitats

- *Additional mitigation:* Scots pine is an invasive non-native species in heathland and therefore this species should not be used for screening planting in the western section beyond the River Corrib (easy, moderate, no).
- *Additional mitigation:* screen planting to the west of the River Corrib should be minimised to make space for dry heath/acid grassland habitats to develop in the soft estate (easy, moderate, no).
- *Additional mitigation:* further details on the grassland seeding are needed, and it should be suitable for the soil types avoiding species that are negative indicators of Annex I habitats where these are not already abundant locally, aiming for dry heath/acid grassland in the west and calcareous grassland in the east from natural regeneration rather than seed mixes wherever soil erosion is not a major risk (and this could be mitigated by soil formation) (easy, moderate, no).
- *Additional mitigation:* see Moycullen Bogs and the appropriate assessment report for additional species to be included in the invasive species management plan (easy, moderate, no (but yes in proximity to Lough Corrib cSAC)).
- *Additional mitigation:* A clearer commitment to the management of peatland habitats and other translocated/created habitats within the soft estate, ideally in perpetuity or the lifetime of the project.

13.4 Aquatic Habitats

- None.

13.5 Flora

- *Additional Mitigation:* check the identification and map the extent of the six red data book plant species, plus measures to both minimise the loss and safeguard the retained areas by use of fencing, signs and ensuring workforce are aware (toolbox talks, etc), including the plants of *Plasteurhynchium striatum* at the Menlough mitigation area (easy, moderate (or high if all populations can be retained), no).
- *Additional mitigation:* if the *Plagiomnium cuspidatum* and *Plasteurhynchium striatum* plants directly impacted are growing on moveable substrates (rocks or logs) then these could be repositioned to retained vegetation, with precisely the same environmental conditions as where currently found, with follow-up monitoring to confirm success or failure (easy, moderate (or high if all populations can be retained), no).
- *Additional mitigation:* check the identification and native status of meadow oat-grass *Helictotrichion pratense* and marsh valerian *Valeriana dioica* and implement protection measures if appropriate (easy, moderate, no).

13.6 Invertebrates

- *Additional mitigation:* the retained part of the marsh at Castlegar to be protected during construction and measures put in place to maintain the existing hydrological regime as suitable for marsh whorl snail (easy, moderate, no).
- *Additional mitigation:* the infiltration basins at Castlegar to be planted with suitable vegetation for marsh whorl snail with hydrology adjusted to suit whilst maintaining the function of the basins (easy, moderate, no).
- *Additional mitigation:* management of all translocation sites for marsh fritillary to include management of an area at least equivalent in area to lost habitat for this species (loss is 4.7ha, while the applicant proposes to manage c1ha which is all in proximity to the road) to ensure long-term suitability for this species (difficult if on third party land, moderate, no).
- *Additional mitigation:* translocation of ant hills impacted by the road to a suitable receptor site within the soft estate (easy, low, no).
- *Additional mitigation:* provision of suitable habitat for nesting bees (patches of coarse grassland) within the soft estate (easy, low, no).

13.7 Bats

- *Additional mitigation:* two bat boxes to be installed on trees as close to each felled tree with potential for a bat roost, as close as possible but away from the carriageway of the proposed road and before the end of July in the year of felling, bat boxes to be a mixture of hollow (for Liesler's) and crevice types (for pipistrelles) in accordance with the potential roost that is lost (Kelleher & Marnell, 2006) (easy, low, no (or yes if bat roosts are present)).

- *Additional mitigation:* the land to the south of the Castlegar overbridge is earmarked for development in the Galway City development plan, which if implemented may render the overbridge ineffective, possible solutions include (i) change the development zoning for this land to open space, amenity or similar, (ii) ensuring the design of the development on this land accounts for lesser horseshoe bats (and other wildlife), or (iii) moving the over-bridge to a location where it would provide connectivity between high quality habitats on each side of the proposed road (difficult, moderate, no).
- *Additional mitigation:* clear commitments to safeguarding the new bat roosts including bat boxes, with replacements and repairs carried out as necessary for a period of ten years post-development (easy, low, no (or yes if bat roosts are present and required by the derogation licence)).
- *Additional mitigation:* monitoring for ten years post construction (easy, low, no (unless required by derogation licence)).

13.8 Mammals other than bats

- *Additional mitigation:* the provision of safe passage through the construction site during the hours of darkness alongside all watercourses crossed by the proposed road, including during the installation of culverts (easy, low, yes for otter otherwise no).
- *Additional Mitigation:* ledges to be installed in all other hydraulic culverts with a width greater than 2m to account for future range expansion or occasional use by otter as listed in EIAR p975 to p976, Table 11.20 which would be an additional eight structures, and to provide safe passage for badger (moderate, medium, yes for otter otherwise no).
- *Additional Mitigation:* monitoring “of the effectiveness of environmental commitments” requires further definition, for example, in accordance with TII guideline for otter which state quarterly monitoring for at least one year to check on the condition and effectiveness of the ledges installed in culverts; given the scale of the project, the monitoring should continue for at least three years and the maintenance of the ledges should be incorporated into the general road maintenance programme (easy, low, no).

13.9 Breeding Birds

- *Additional mitigation:* reduce screening planting width as much as possible and ideally screening on one side of the road only, to reduce likely mortality and the risk of creating a “population sink” along the road corridor, except in locations where planting is required to deter barn owls (easy, low, no).

13.10 Wintering Birds

- It is recommended that the Biodiversity Network to be established under the Galway City Development Plan includes a wet grassland management plan to help ensure that numbers of wintering curlew and oystercatcher are maintained (difficult, high, no).

13.11 Amphibian and Reptiles

- *Additional mitigation:* replace the ponds lost to the proposed road elsewhere in the soft estate, including at the barn owl/lesser horseshoe bat mitigation area at Menlo Castle (easy, moderate, no).
- *Additional mitigation:* structures which could be earth banks to guide amphibians towards the tunnels and culverts where these occur in proximity to ponds (easy, moderate, no).
- *Additional mitigation:* an alternative drainage solution without kerbs within minimum 100m of amphibian breeding ponds (easy, moderate, no).

13.12 Fish

- None

14. Conclusion

14.1.1 As acknowledged by the applicant, the road will have a significant effect on features, valued in accordance with TII guidelines, as being of international importance for nature conservation, including small areas of two types of irreplaceable habitats, wet heath and limestone pavement. The scale of the impact is generally greater in the western part, beyond the N59, however, impacts at Menlough are also significant.

14.1.2 Because the main impacts of habitat loss, fragmentation and isolation are only partially addressed, the mitigation and compensation are not enough to change the conclusions on impact significance. Notwithstanding, the mitigation and compensation measures do lessen the severity or likelihood of many of the identified impacts, and many of the measure such as the use of viaducts and tunnels, habitat creation and the provision of overpasses and underpasses are beneficial. The cumulative impacts work in the opposite direction and will also reduce the effectiveness of the mitigation measures for the proposed road, such as some of the artificial bat roosts and the wildlife overpass. Areas of habitat and species populations located between the proposed road and the City being most at risk.

14.1.3 It would be possible to achieve a better assessment through more ambitious commitment to the safeguarding and management of the retained parts of the local biodiversity areas and equivalent land of higher nature conservation interest in the city and the county, including areas at distance from the road. The loss of woodland at Menlough could also be addressed providing compensatory habitat elsewhere.

14.1.4 There is the point, made by the applicant, that the road causes small losses of habitats and species populations, which whilst internationally important, are abundant locally with plenty remaining after the road is constructed. This has some validity. However, the area through which the road would pass is unusual in several respects, firstly the twin geologies of the Galway area make it rich in plant species in a small area, secondly there are apparently five rare species present in in the footprint of the road and others nearby and finally, the edge of the city may be more important for bats than elsewhere due to the availability of roost sites near to high

quality foraging habitat. Moreover, in the context of Galway City, the loss of 100ha of higher value terrestrial habitats is equivalent to¹¹ 5 to 10% of the total present in the city boundary.

¹¹ "Equivalent to" because some of the habitat loss would be outside the city boundary.

15. References

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Appendix 1: NPWS Submissions

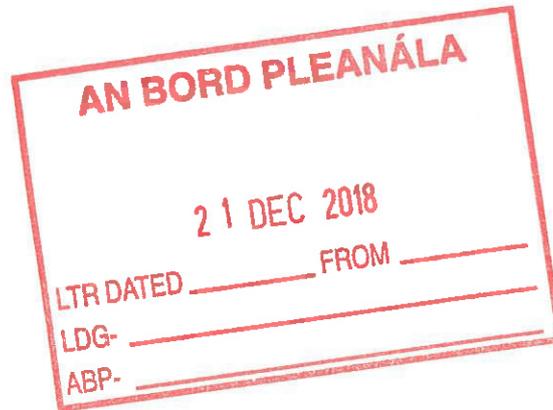


**An Roinn Cultúir,
Oidhreacht agus Gaeltachta**
Department of Culture,
Heritage and the Gaeltacht

Your Ref: ABP-302885-18
Our Ref: 177AE N6 Galway Ring Road

21 December 2018

The Secretary
An Bord Pleanála
64 Marlborough Street
Dublin 1
D01 V902
Via email to bord@pleanala.ie



Re: Notification to the Minister for Culture, Heritage and the Gaeltacht under the Planning and Development Act, 2000, as amended.

Proposed Development: Section 177AE application for Galway County Council on behalf of itself and on behalf of Galway City Council is proposing to develop the N6 Galway City Ring Road (GCRR) around Galway City.

A chara

On behalf of the Department of Culture, Heritage and the Gaeltacht, I refer to correspondence received in connection with the above.

Outlined below are heritage-related observations/recommendations of the Department under the stated heading(s).

Nature Conservation

The Department refers to the current application for the proposed N6 Galway City Ring Road development (and Motorway Scheme) in Galway City and County. Reference is also made to the EIA, Natura Impact Statement (NIS), associated volumes of figures and appendices, and other documentation that accompanies the application.

Context of observations

The following observations are made by the Department in its role as a prescribed body under planning legislation and as the authority with overarching responsibility for nature conservation and the implementation of the nature directives (i.e. the Birds and Habitats Directives) in Ireland. The observations are not exhaustive and are intended to assist An Bord Pleanála in its review and evaluation of the current proposal in the context of, among other things, obligations and commitments in relation to nature conservation, European sites, biodiversity and environmental protection, proper planning and sustainable development, and the undertaking of the environmental impact assessment (EIA) and the appropriate assessment (AA).

This submission is structured under a series of headings/topics, but should be read as a whole, noting that there are substantial overlaps, as well as key distinctions, between the implications of the proposed development for the conservation objectives and integrity of a European site or sites, for biodiversity and other aspects of the environment, and for the proper planning and sustainable

development of the area, taking relevant timeframes, past and future changes, and trends into account.

Consultations with NPWS

The Department acknowledges the series of pre-application meetings and consultations with NPWS (2013-2017) in relation to the proposed development, including meetings with the project team and with An Bord Pleanála. Submissions made by this Department (on a non-statutory basis) at pre-application stage are included in EIAR Appendix A.8.2. Draft documentation was reviewed by NPWS as an exceptional measure and this covered only the draft NIS and draft EIAR biodiversity chapter.

Consultations with NPWS regarding the related Galway Transport Strategy 2016-2036 are also acknowledged. This strategy was produced by the City and County Councils, and the National Transport Authority, and is given effect by Galway City and Galway County Development Plans, as varied. Submissions were made by this Department in relation to the Strategy, the Development Plans and Variations, and the associated environmental assessments, including the SEA Environmental Reports, Natura Impact Reports (NIRs) and NISs.

Scope of surveys and integration with design

The Department acknowledges the extent and detail of the surveys carried out in connection with the planning and design of the scheme, the consideration of constraints and alternatives, and the preparation of the EIAR and NIS, including as reported in appendices to main reports. The extent to which ecological and other data and information have informed and modified aspects of the design of the scheme to minimise adverse effects on biodiversity, as part of an iterative process, is also acknowledged.

Project outline and setting

The proposed road development is generally routed around the outskirts of Galway City, extending from the R336 west of Bearna, in the west, to the new N6/M6 motorway at Briarhill in the east. It passes through areas of granite and limestone geology, and through areas of marginal farmland and substantial areas of natural and semi-natural habitats on the urban fringe. The road crosses the main channel of the River Corrib, and passes through one European site, and close to (within 200m of) three other European sites (see below). All but the western end of the scheme drains to surface water or groundwater bodies that are hydrologically and/or hydrogeologically connected to European sites and the water-dependent habitats and species they support. The proposed development boundary also borders part of one Natural Heritage Area (NHA).

The description of the proposed development and its construction and operation, the project drawings, and other related reports (e.g. the CEMP in EIAR Appendix A.7.5) are noted. It is understood that the mainline of the proposed road is approximately 17.5km in length, and comprises 5.6km of single carriageway and 11.9km of dual carriageway. The latter, from the N59 Letteragh junction eastwards, will be motorway. The proposed development comprises many other elements, including two tunnels with maintenance buildings, two viaducts and one large bridge, and associated link roads, side roads, junctions, structures, earth works, accommodation works, drainage, demolitions, fencing, lighting, landscaping, and ecological mitigation (EIAR, NIS) and compensation measures (EIAR). The total 'area of the development boundary' is approximately 280ha; of this, about 180ha is required for the proposed road development and its construction. Construction, including advance project stages and enabling works, will take a number of years. Some enabling works may occur or extend outside the proposed development boundary, e.g. diversion or relocation of utilities.

The construction phase elements and aspects of mitigation are set out in the CEMP. This includes an Incident Response Plan, a Sediment Erosion and Pollution Control Plan, and a Non-native Invasive Species Management Plan. Chapters 20 and 21 of the EIAR are also noted, namely the Summary of mitigation measures and Schedule of environmental commitments. It is stated that the latter is an integral element of the application for approval. It is indicated that further work in

developing the design of the proposed road development (i.e. post-consent stage) will lead to no material change in the predicted significance of the adverse effects on the environment, and that opportunities may be identified to further reduce these effects and provide the optimum solution based on available construction techniques and technologies at the time of construction.

The commitment to having a Project Ecologist as part of the Employer's team for the duration of the construction phase of the proposed development is welcomed (CEMP section 1.1). For the avoidance of any doubt, the construction phase must be understood to mean all advance contracts and enabling works, as well as the main construction phase, as substantial ecological damage and disturbance can be caused during such early phases. To be effective, the mitigation measures and environmental commitments from the EIAR and NIS must apply to all stages and aspects of the development from the time that permission is granted. Furthermore, noting the volume and complexity of application documentation and the potential for conflicts in the mitigation and other measures specified, particular care and robust systems will be required to ensure their correct and timely implementation to safeguard European sites, NHAs, natural habitats and protected species, and to protect the environment. Where any uncertainties exist regarding the likely success or deliverability of the mitigation and compensation measures, or the significance of the ecological effects that will result, these should be reflected in the EIA and AA carried out for the proposed development.

Receiving environment – biodiversity/ecology

The proposed development passes through and close to sites with nature conservation designations, Annex I habitats, the habitats of Annex I (Birds Directive) and Annex II and IV (Habitats Directive) species, and the habitats of other protected species, as well as through wetlands, woodlands, ecological networks, and local biodiversity areas on the margins of an area of progressively expanding urban development, population and associated pressures. The new road will interconnect with a network of recently-developed motorways and national roads between Dublin and Galway, and Limerick and Tuam.

The proposed development and/or proposed development boundary:

- passes through parts of the European site, Lough Corrib SAC (site code 000297), and will, in part, drain towards that site;
- passes through, close to, under and over Annex I habitats and the habitats of Annex II species that are qualifying interests (QIs) of Lough Corrib SAC;
- passes within 200m of three other European sites, namely Lough Corrib SPA (site code 004042), Galway Bay Complex SAC (site code 00268) and Inner Galway Bay SPA (site code 004031);
- adjoins the boundary of part of Moycullen Bogs NHA (site code 002364), and will drain or drain towards that site (selected for the conservation of 'peatlands');
- passes through twelve Annex I habitats and 43 'Fossitt' habitat types;
- passes through the habitats and/or the breeding sites and resting places of Annex II and/or IV (Habitats Directive) species, including those of Lesser Horseshoe Bat, other bats, Otter and Marsh Fritillary;
- passes through the habitats of Annex I (Birds Directive) and other regularly occurring migratory bird species;
- passes through the breeding sites and resting places (and territories) of other protected species, e.g. badger and breeding birds.

In addition to the protection afforded to most of the above receptors under the Wildlife Acts, 1976-2000, and the European Communities (Birds and Natural Habitats) Regulations, 2011, they are also subject to protective objectives and policies in the Councils' Development Plans and other land use plans for the areas through which the proposed development passes.

1. LIKELY EFFECTS ON EUROPEAN SITES

Adequacy of NIS

There is a requirement to consider whether the NIS, which accompanies this application, complies with section 177T of the Planning and Development Act, 2000 as amended. Among other things, an NIS is defined as a statement, for the purposes of Article 6 of the Habitats Directive, of the implications of the proposed development for one or more European sites in view of its conservation objectives; an NIS must include a report of a scientific examination of evidence and data to identify and classify such implications. In the event that inadequacies or gaps in the NIS are covered by data and assessments from other sources, this should be made clear in the AA carried out. The final assessment and analysis should be with respect to the implications for the conservation objectives and integrity of the European site or sites in question.

Notwithstanding the detailed surveys and assessments undertaken, some aspects of the approach and scientific analyses in the NIS, and their sequencing and findings, are complex to follow. At the same time, it is acknowledged that there are challenges in preparing an NIS for a project of this size and complexity, and that no particular format for an NIS is prescribed in law.

Annex I habitats – QIs

The European site most affected by the proposed development is Lough Corrib SAC. Approximately 4ha of the proposed development and/or proposed development boundary overlap directly with this SAC in multiple small and mainly peripheral locations. The extent and nature of habitat impacts and/or changes within the SAC are, at present, difficult to ascertain. It could assist interpretation if a clearer account of the direct and residual effects on habitats within the SAC, with clearer drawings, was provided. Areas for the extents of the predicted effects and overlaps with i) the proposed development boundary, and ii) the proposed development, would also be beneficial in supporting interpretation and the conclusions of the NIS in relation to the absence of implications for habitats and the conservation objectives of the SAC. The relationship of the road to nearby qualifying interest Annex I habitats within the SAC is also difficult to ascertain.

SAC – hydrogeology

The application would benefit from clarity on the changes in hydrogeological regime the Lackagh Tunnel will have on the groundwater catchment area. Boreholes were drilled in the area, and groundwater level data collected, but spatial information is absent on directions of groundwater flow and hydraulic gradients. The tunnel is adjacent to the Lough Corrib Fen 1 (Lackagh) groundwater body (GWB) which contains groundwater-fed lakes and fens in the Lough Corrib SAC. The question of whether groundwater drainage associated with tunnelling construction work, during and post development, will not have an effect in Lough Corrib Fen 1 (Lackagh), may need interrogation. Whilst it is stated that the level of the tunnel will be below the groundwater table (and that “there will be no groundwater lowering within groundwater bodies that support groundwater dependant habitats within a European site”), it is also noted that groundwater seeps at the existing quarry face and base and that there are ‘perched’ water tables in local subsoil units above the limestone. The inclusion of ‘water-tight’ barriers is necessary for the operation, and this will divert groundwater flow. It is unclear what the hydrological connectivity between the groundwater dependent terrestrial ecosystems (GWDTEs) of the SAC are, particularly the habitats south of the proposed road.

Following this, it is not clear how the GWDTEs in the Lough Corrib SAC are working ‘hydrogeologically’ and if flow paths may change post-construction. It appears that the lakes are underlain by significant thicknesses of low permeability substrate, with the fens developing on their margins, presumably due to artesian conditions and spring inputs (it is suggested the lake is fed by the Western Coolagh Spring), as indicated by the recorded alkaline conditions. The road will traverse the ‘Lough Corrib Fen 1 (Menlough)’ groundwater body. The road intercepts recharge and whilst the change in infiltration and aquifer loss is reported as minimal, it may be important considering the small catchment area(s) that appear to support the fen habitats. Further elucidation could be beneficial.

Conservation objectives and scope of NIS

Lough Corrib SAC has site specific conservation objectives, and these specify whether the conservation objective is to maintain or to restore the favourable conservation condition of the individual qualifying interest habitats and species, as defined by certain attributes and targets that are listed, within that site. Substantial analyses in the NIS are (or appear to be) undertaken without reference to the conservation objectives, as they are detailed first in Table 9.16. In Tables 9.1 and 9.15, prior to this, the qualifying interests, Petrifying springs of the tufa formation (Cratoneurion) and Lesser Horseshoe Bat, appear not to have been recorded in the 'zone of influence' and/or are omitted from further consideration and assessment of the likely effects on European sites. The justifications for these findings are unclear in Section 9 of the NIS, but may be explained elsewhere and that should be clarified.

Otter

The proposed development passes through mapped areas of Otter habitat in Lough Corrib SAC, and close to parts of Galway Bay Complex SAC. The two SACs are interconnected and both have been selected for the conservation of Otter. Otter were widely recorded along the River Corrib corridor. Other watercourses and lakes within and connected to these SACs, e.g. Bearna Stream, are likely to form part of Otter territories and be used as commuting and foraging habitat.

No Otter breeding sites or resting places (holts or couches) were recorded along or within 150m of the proposed development, meaning disturbance and displacement effects should not result. However, increased human presence and/or noise and vibration associated with construction works, particularly associated with the construction of the proposed River Corrib bridge, have the potential to (at least temporarily) displace commuting or foraging Otter. Bankside works are required to install the drainage outfalls on both banks of the Corrib and this will result in the severance of the bankside habitat used by Otter, at least temporarily, during construction. Blasting at some locations over extended periods (e.g. approximately 9 months in Ballagh) will cause some level of disturbance to Otter using the Bearna and Tonabrocky Streams. Operation of the road has potential to result in the mortality of Otter through the increased risk of road traffic collisions and this could affect the Otter populations of the two SACs, and the conservation objectives and integrity of these European sites. In terms of longer term potential in combination effects resulting from disturbance and displacement, the commitments to having a greenway along the western bank of the River Corrib and the current application for the proposed Galway Harbour Extension (PA0033), should be noted in particular (see below in relation to in combination effects).

The potential effects on Otter are to be avoided and reduced to insignificant by a series of design and other mitigation measures that are specified in the NIS and EIAR. The conclusions reached in the NIS in relation to Otter are contingent on i) the effective and timely implementation of these mitigation measures at or prior to construction stage, ii) their continued effective functioning (e.g. in the case of mammal passage facilities and fencing) for the lifetime of the project, and iii) their safeguarding in any future projects and development planning. Monitoring and the taking of timely and effective corrective action if problems arise are integral to their success, and to the conclusions and predictions that may be reached as part of the AA and EIA.

Birds

The NIS determines that the River Corrib bridge is the only structure that is "of a scale to pose a collision risk to birds". The NIS subsequently concludes, having considered the design of the proposed structure and the low number of special conservation interest (SCI) species, and individuals, that pass along the river corridor, that the proposed structure is "not predicted to pose a collision risk of a magnitude that would have any long-term effects on the numbers, distribution, or the existing population trend for any SPA". The SPAs specifically mentioned in the NIS in this regard are Lough Corrib SPA and Inner Galway Bay SPA, and these SPAs are considered with the following references to SCIs. The risk of bird collisions with the bridge is given no further consideration beyond identifying potential impacts. The data considered on the number of SCI

species and individuals using the river corridor are from a previous proposal and different structure in a different location on the river (RPS report, 2006). The specifications for that structure stated the bridge height would be 6m above the river, while the current proposed bridge is a minimum of 8m above the river. Consideration of the range of flight heights for the SCI species known to use the corridor, or the potential interaction of these flight heights and the proposed bridge would be appropriate. The previous survey report did not assess the nocturnal movements of bird species, e.g. typically nocturnal species and species that are known to migrate at night, and this also needs to be considered. Therefore, the Board could consider if it is satisfied that the collision risk of birds with the proposed River Corrib bridge is adequate and complete if its Appropriate Assessment would be facilitated by further consideration and assessment.

The NIS concludes that the effects of habitat loss and fragmentation arising from the proposed development will not significantly negatively affect the SCIs for surrounding SPAs, and no mitigation measures for SCIs (breeding or wintering species) are provided. For breeding species, this is based on i) the absence of a spatial overlap between known SCI breeding sites and the proposed development area, and ii) aspects the SCI species' foraging ecology. The rationale and evidence to support the latter claim is not made clear (i.e. with respect to foraging ecology).

It is considered the above points should be addressed by presenting further information from, and rationale based upon, completed survey work, additional available data sources and published literature.

Matters relating to the AA

The AA has yet to be carried out, and should take the NIS and this submission into account. Any scientific uncertainties or discrepancies regarding the implications for the conservation objectives and integrity of European sites will need to be addressed and resolved.

2. LIKELY EFFECTS ON THE ENVIRONMENT

EIAR – biodiversity

The following additional matters should be taken into account and addressed in relation to the likely effects of the proposed development on biodiversity, including in the context of the EIA which has yet to be carried out. Likely significant effects on European sites are also a matter for the EIA.

NHA – hydrogeology

The location of the road adjacent to Moycullen Bogs NHA and the possible effects on bog ecohydrology. This peatland area is underlain by the 'Galway Granite Batholith', which will be dewatered (during construction and operation) within cutting areas. This could potentially result in a lowering of the peatland water table, peatland subsidence and a potential negative impact on bog ecology. Clarity may be needed on where dewatering/drainage are proposed in relation to the NHA area, together with a demonstration of the likelihood of impact (negligible or otherwise).

Habitats – general

The detailed habitat survey and mapping for the area of the proposed development and surrounds are noted. Text and tables in EIAR chapter 8 contain details of the areas and types of habitats that will be affected by the proposed development. Of the overall 280ha of the proposed development boundary, 196ha is habitat that is deemed to be of low ecological value, and about 84ha is of higher ecological value. Some of the habitats are linear habitats. In total, it appears that 43 'Fossitt' habitat types and twelve Annex I habitats were recorded within the proposed development boundary and/or will be impacted by the proposed development. Some of the habitat losses will be compensated by habitat creation or management measures within the proposed development boundary, and will be replacing pre-existing habitats or areas subject to temporary disturbance, including some sites used as 'material deposit areas'.

The combined length of linear habitats recorded (11.8km) includes hedgerows and treelines, but not stone walls (which are not the boundaries of properties). It is unclear if the figures represent the total resource of these habitats in the area of the proposed development, or those that will be affected. Based on figures quoted, it appears that the entire linear habitat resource, which was recorded, will be lost and further clarification would be useful in this regard.

It is unclear if abandonment of grazing and/or mowing, including because of fragmentation and isolation of land holdings, has been included among the potential significant effects on habitats that were considered and assessed. The habitats of species such as Marsh Fritillary could also be affected by such changes arising in connection with the development of the road and could lead to loss of habitat in 'favourable management'.

Annex I habitats

The losses of Annex I habitats (outside European sites) are presented in terms of losses resulting from the proposed development, and residual or permanent effects after the implementation of mitigation and compensation measures.

Some of the losses are to be compensated by translocating habitat from one location (donor site) to another location (receptor site) within the proposed development boundary. Some of the receptor sites are also identified as 'material deposit areas' where surplus inert materials will be recovered or disposed. The steps and methods to be followed in relation to habitat compensation are set out in EIAR Appendix A.8.26. It would assist interpretation if a table with the details of donor and receptor sites, including areas and habitat types present in each, was provided to clarify, among other things, what habitats will be lost in the receptor sites as a result of the compensation measures and what habitat gains are predicted to accrue. Future management of the compensatory habitats is likely to be required, and it should be clear how this will be achieved and delivered in the short- to long-term.

Otter

See above.

Bats

The EIAR, including appendices, documents one of the most detailed and comprehensive surveys for bats ever undertaken in Ireland. The bat survey work has identified and catalogued the diversity of bat species around Galway City. In summary, a total of 88 roost sites, and all nine Irish bat species, were recorded within the study area during the field surveys. All bat species occurring in Ireland are listed on Annex IV of the Habitats Directive and are strictly protected. Lesser Horseshoe Bat is also an Annex II species and qualifying interest of Lough Corrib SAC, primarily for the maternity roost at Ebor Hall, near Cong, to the north.

The EIAR provides a comprehensive and detailed assessment of the likely effects of the proposed development on bats, including with respect to loss and disturbance of roosts, loss and fragmentation of foraging and commuting habitat, barrier effects and collision risks with traffic. There is potential for short- and long-term effects on the favourable conservation status of Lesser Horseshoe Bat arising from the proposed development. Mortalities and ecological disruptions to other bats species (e.g. pipistrelles, Leisler's and Brown Long-eared) may also occur but these species are more widespread and abundant.

On the basis of the mitigation and compensation measures specified, the EIAR concludes that the predicted residual effects for Lesser Horseshoes will reduce from national to local significance. The predicted residual effects on all other bat species are also of local significance. The broad suite of mitigation and compensation measures specified in the EIAR is noted and includes the provision of new roosting sites (i.e. new buildings, buildings retrofitted to create roost sites, and bat boxes), underpasses, a 'green' bridge and habitat enhancement measures (e.g. hedgerow planting), among other things. The conclusions in the EIAR are contingent on i) the effective and timely implementation of these mitigation and compensation measures at or prior to construction stage, ii)

their continued effective functioning for the lifetime of the project, and iii) their safeguarding in any future projects and development planning. Monitoring and the taking of timely and effective corrective action if problems arise are integral to their success, and to the conclusions and predictions that may be reached.

Badger

Three badger setts will be lost as a result of the proposed development (setts 9, 11 and 14), and one replacement sett is to be constructed north of the new road (close to sett 9). There will be fragmentation and isolation of lands to the south, i.e. between the new road and the Lackagh tunnel, and the N84, in an area with no mammal underpass. Clearance of scrub and resurveys prior to construction may reveal other badger setts. In the case of impacts on badgers that are not considered and assessed as part of the current application, and covered by the consent for the proposed development, a licence may be required from the Minister of this Department under the Wildlife Acts, 1976-2000.

Animal passage

The general locations and details of the animal underpasses and the wildlife overbridge are noted. While not always clear from the scheme drawings, underpasses must extend as far as, and integrate with the boundary fencing to be effective and fit for purpose, and to mitigate fragmentation and the barrier effects of the proposed development. All relevant details and specifications for underpasses, fencing and guide planting in relevant TII/NRA guidance should be followed, and underpasses should be confirmed (by an ecologist) to be correctly installed and fully functional before the road becomes operational. Mammal-proof fencing should be installed to the minimum extent necessary for safety and to exclude animals from the road. All other fencing provided should allow the general passage of wild animals (e.g. sheep wire or larger mesh) so that the overall extent of fragmentation and barrier effects resulting from the road are reduced. In the case of the wildlife overbridge, the general configuration and planting, including guide planting, should facilitate and encourage its use by wildlife in general, including (but not only) bats.

Marsh Fritillary

Comprehensive surveys carried out for the Annex II species, Marsh Fritillary, recorded extensive areas of suitable habitat for Marsh Fritillary and the presence of the species in a number of locations within the area of the proposed development, mainly in the west. Breeding sites for Marsh Fritillary are mobile and can change, and are linked to the presence of suitable habitat containing the food plant, Devil's-bit Scabious (*Succisa pratensis*).

The proposed development will result in the loss of areas of occupied habitat in four locations, as well as other areas of suitable habitat for Marsh Fritillary. Of particular concern is the habitat area where the species was recorded in three survey years at Trusky More. Much of this area will be lost as a result of the proposed development. In addition to permanent losses of suitable Marsh Fritillary habitat, including habitat patches supporting larval webs, the proposed development will cause fragmentation of individual habitat patches and of the wider network of areas of suitable habitat for the species.

Details of mitigation measures could benefit from more clarity and consideration would need to be given to the extent to which they may be deliverable. A key element of mitigation is the translocation of larval webs that occur along the proposed development. Translocation sites need to contain suitable habitats and should also have good long-term prospects. In the case of any predictions made regarding the long-term survival of Marsh Fritillary, including in relation to the areas of habitat required within a network of sites, it should be clear that any figures quoted refer to habitat in favourable management (presumably meaning good or optimal condition) and with good long-term future prospects.

Further information on mitigation measures for Marsh Fritillary is available from the English Nature and Highways Agency publication: The Butterfly Handbook: General Advice Note on Mitigating the Impacts of Roads on Butterfly Populations (<http://publications.naturalengland.org.uk/file/130004>).

Birds

Barn Owl: the proposed development will reduce the extent of suitable foraging habitat for the local Barn Owl population. The Barn Owl mitigation measures proposed in the EIAR are primarily designed to reduce the risk of road traffic collision events, and include planting vegetation to deter owls from foraging alongside the proposed road margins, and installing barriers to force commuting birds to fly higher over the proposed road. These measures, which are necessary, will compound the likely reduction of foraging opportunities for the local Barn Owl population. To counterbalance this, Barn Owl foraging habitat should be conserved and enhanced in key areas close to the most suitable sites identified as active or potential nest sites for the species. The objective of such compensatory long-term habitat management would be to provide alternative foraging opportunities to the north and northwest of the proposed development, thereby further reducing the risk of road-related mortality events impacting the local population. Such long-term habitat management areas should dictate where the three Barn Owl nest boxes would be sited.

Peregrine Falcon: in the EIAR, there is a degree of uncertainty as to whether Lackagh Quarry will remain a suitable breeding site for Peregrine during and post-construction. No alternative breeding site for the Peregrine pair associated with this nest site is known locally. To counterbalance the potential loss of this breeding resource, a suitable alternative nest site(s) needs to be created, noting that the most recent National Peregrine Survey did not record any urban nesting pairs from Galway City. There may be opportunities to install artificial nesting platforms or boxes on other suitable features or buildings. Failing that, a bespoke nesting structure in an appropriate area should be constructed.

The EIAR could benefit from more clarity as to the efficacy of the mitigation measure to temporarily dissuade active breeding of Peregrine at Lackagh Quarry by commencing works from the Lackagh Tunnel to the N84 Headford Road Junction prior to mid-February. The appropriateness of potentially working in the vicinity of, and disturbing an active nest site to install rock bolts on the cliff face may be challenging. If an alternative suitable Peregrine nesting resource was created prior to any road development works being undertaken then the possibility of temporarily rendering the nesting ledges at Lackagh Quarry unavailable for Peregrine during the construction period as a mitigation measure to avoid the disruption of a breeding attempt could be considered.

Mitigation measures: as also noted below, there could be potential tensions between mitigation measures set out in the NIS and EIAR.

The NIS states that, in order to minimise disturbance to wintering birds at Ballindooley Lough, blasting at Lackagh Quarry (and Castlegar) will only be undertaken between the months of April to September (inclusive). The EIAR determines that construction activities at Lackagh Quarry, including rock breaking and rock blasting, have the potential to have long-term effects on the Peregrine population nesting in the quarry. Thus, the EIAR proposes mitigation measures specifying that works from the proposed Lackagh tunnel to the N84 Headford Road Junction commence prior to mid-February (i.e. wintering period). The EIAR does not specify whether the works proposed to begin in mid-February include blasting; if blasting was to be included in these works, this would contradict the mitigation approach outlined in the NIS for wintering birds.

It is important that the nature and extent of the proposed planting (likely to provide foraging habitat for general bird species) in close proximity to the proposed development does not act to attract foraging Barn Owl and thereby increase the risk of road collision mortality events.

It is proposed to install 20 nest boxes to further minimise the effects of breeding bird habitat loss. Post construction monitoring and reporting with regard to the rate of uptake of the boxes by birds and their breeding outcomes is recommended in order to determine the efficacy of this mitigation measure.

Mitigation measures – general

The following general observations are made in relation to mitigation measures:

- As outlined above, it should be clear that all relevant mitigation measures and commitments must apply, from the outset, to all parts of the development as permitted, including enabling works, site preparation and advance contracts, as well as at construction stage.
- Owing to the complexity and detail of the ecological or biodiversity mitigation measures specified, and the importance of knowing where, when and how these apply, competent ecologists will need to be involved directly at all project stages. There is a commitment to having a Project Ecologist as part of the Employer's team; references to an Ecological Clerk of Works are also noted in appendices. The main contractor will also require ecologists, and ecological supervision of other contractors will be necessary.
- The timings of many ecological mitigation measures are critical and, in many cases, are specified. Among these, some of the timings seem to be conflicting or competing (examples relating to birds above, and see also Common Lizard and vegetation clearance) and it needs to be clear how these discrepancies can be managed and resolved. Measures for other environmental topics could also be conflicting or competing, and will require review.
- Resurveys in advance of works being carried out may introduce additional and new considerations, and it should be clear how these will be addressed and managed.
- The scale of the documentation pertaining to this application and the range, specificity and detail of the mitigation measures to be delivered means that robust and interactive or real-time/live mapping systems will need to be developed, possibly in conjunction with 'permits to work' and sign off by the Project Ecologist of the correct completion and functioning of the measures.
- Consideration should be given to making reports on implementation and monitoring of measures available, including to NPWS, via a dedicated website.
- Locations of key ecological mitigation measures should be mapped with records kept that are able to interface with, for example, the Councils' GIS and planning systems, so they can be taken into account and safeguarded in future projects and plans.
- Any non-performance, non-compliances or other issues that arise should be addressed in a timely manner.

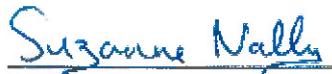
Monitoring/corrective measures

- A clearer schedule of monitoring commitments and responsibilities, including locations, methods and frequency, may be required for biodiversity in general, and for bats in particular. It is noted, for example, that the EIAR states that monitoring of artificial roosts "may be undertaken by NPWS staff, Galway bat group or others to be decided by the local authority". It should be noted that no such agreement has been discussed or reached with NPWS.
- Monitoring of certain measures, such as the wildlife overpass and hedgerow planting, is to continue for 5 years. It should be understood that, after the monitoring period, maintenance and management of various features will be required in the long-term.

You are requested to send further communications to this Department's Development Applications Unit (DAU) at manager.dau@chg.gov.ie (team monitored); if this is not possible, correspondence may alternatively be sent to:

The Manager
Development Applications Unit (DAU)
Department of Culture, Heritage and the Gaeltacht
Newtown Road
Wexford
Y35 AP90

Is mise, le meas

A handwritten signature in blue ink that reads "Suzanne Nally". The signature is written in a cursive style and is underlined.

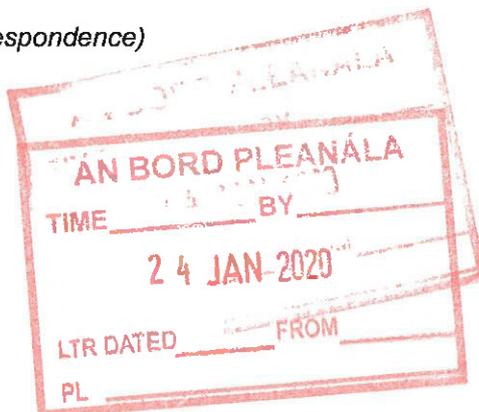
Suzanne Nally
Development Applications Unit



Your Ref: ABP-302848-18
(Please quote in all related correspondence)

24 January 2020

The Secretary
An Bord Pleanála
64 Marlborough Street
Dublin 1
D01 V902



Via email to sids@pleanala.ie

Re: Notification to the Minister for Culture, Heritage and the Gaeltacht under the Planning and Development (Housing) and Residential Tenancies Act 2016; Planning and Development (Strategic Housing Development) Regulations 2017

RE: Section 177AE (ABP Deciding Authority) - Galway County Council on behalf of itself and on behalf of Galway City Council is proposing to develop the N6 Galway City Ring Road (GCRR) around Galway City.

A chara

On behalf of the Department of Culture, Heritage and the Gaeltacht, I refer to correspondence received in connection with the above.

Outlined below are heritage-related observations/recommendations of the Department under the stated heading(s).

Nature Conservation

The Department refers to the current application for the proposed N6 Galway City Ring Road development (and Motorway Scheme) in Galway City and County, and to the accompanying Environmental Impact Assessment Report (EIAR), Natura Impact Statement (NIS), and associated documentation. Reference is also made to the significant additional information submitted by the applicants and notified to the Department on 4th December 2019. This includes the Request for Further Information Response Report (Volume 1) and Appendices (Volume 2) together with the Route Selection Report (Volume 3) and Design Report (Volume 4).

Context of observations

The following observations are made by the Department in its role as a prescribed body under planning legislation and as the authority with overarching responsibility for nature conservation and the nature directives (i.e. the Birds and Habitats Directives). The observations are not exhaustive and are intended to assist An Bord Pleanála in its review



and evaluation of the current proposal in the context of, among other things, obligations and commitments in relation to nature conservation, European sites, biodiversity and environmental protection generally. These observations are structured under a series of headings/topics, but should be read as a whole, together with our previous observations dated 21st December 2018.

1. Likely effects on European sites

Annex 1 habitats – Qualifying Interests (QIs)

The Department notes the significant additional information provided in relation to habitat surveying and mapping in Appendix A.3.1 (Annex 2 and Annex 3). This includes, *inter alia*, information in relation to habitats within the proposed development boundary¹, including Annex 1 habitats^{2,3} and QI habitats within Lough Corrib cSAC in close proximity to the boundary of the proposed development (Figure 2.9.01). The Department also notes the vegetation sampling (relevé data) which has been provided and which has informed the habitat mapping referred to above.

This additional information has resulted in some changes to habitat mapping which is described and evaluated in Section 4 of the Request for Further Information Response Report (Volume 1), and is noted. In particular, Section 4.1 of the Report identifies an additional small area of limestone pavement [*8240] habitat near Menlo (see Figure 2.7.01). The boundary of Lough Corrib cSAC at this location intersects the area of limestone pavement so that some is within the cSAC and some is located outside the cSAC. The area of limestone pavement within the cSAC would have been directly affected by a proposed access route to farmland at this location. The proposed access route is now proposed to be altered to avoid any impacts to this area of limestone pavement and therefore to avoid impacts to Lough Corrib cSAC.

The Department further notes that updates to the boundary of Lough Corrib cSAC are possible pending finalization of the objections process at this site pursuant to the requirements of the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended). The final objections relating to the boundary of Lough Corrib cSAC are currently being processed and an updated boundary map will be notified in the coming weeks, prior to the Oral Hearing. As part of this process a mapping error, at the location near Menlo described above, is under consideration. The correction of this minor mapping error will align the boundary to a small track to reflect the original survey intention. This will result in a larger area of the limestone pavement being located outside the Lough Corrib cSAC boundary. This is the only known alteration to the boundary of Lough Corrib cSAC which will interact with the proposed motorway and road scheme.

SAC – Hydrology

In the Department's previous observations it was noted that clarity was required in relation to changes in the hydrological regime and its impact on the groundwater catchment area as

¹ Figures 2.5.01 – Figure 2.5.15 inclusive (2019 Habitat Mapping with Fossitt (Level 3) Habitat Codes indicated)

² Figures 2.6.01 – 2.6.15 inclusive (2019 Habitat Mapping with Annex 1 Habitats indicated)

³ Figures 2.7.01 & 2.7.02 (Areas of limestone pavement habitat within the proposed development boundary and Lough Corrib cSAC)



a result of the Lackagh Tunnel. This matter is addressed in the Request for Further Information Response Report (Volume 1) in Section 4.12.1. The Report states that only one European Site (i.e. Lough Corrib cSAC) lies within the hydrogeological zone of influence of the proposed road development. The Department remains of the view that this statement needs more clarification. The groundwater flow map is quite general and would benefit from groundwater levels from boreholes for example being indicated together with groundwater head contours. The delineated groundwater catchment divides should also be indicated and the location/mapping of the Groundwater Dependent Terrestrial Ecosystems (GWDTEs), particularly the fen habitats within the Lough Corrib cSAC, should also be shown. The NIS and the Request for Further Information Response Report states that the GWDTEs rely on 'seasonal groundwater levels', but it is still not clear what these are (baseflows for example?), and what groundwater levels need to be maintained to avoid negatively impacting on the conservation status of all GWDTEs in the Lough Corrib cSAC complex.

The Department also sought clarification in relation to how the GWDTEs in the Lough Corrib cSAC are working hydrogeologically and if flow paths may change post-construction. This is addressed in Section 4.13.1 of the Request for Further Information Response Report. The Department remains of the view that this matter requires clarification, such as the presentation of a clearer hydrogeological conceptualisation of the groundwater regime of the GWDTEs, and the changes that may or may not occur following construction. Additional hydrogeological cross-sections would assist in this regard. The Department is of the view that without a clearer presentation of the groundwater regime of the GWDTEs, it is difficult to assess the potential impacts of the proposed scheme and the adequacy of the mitigation measures being proposed.

Conservation objectives and scope of NIS

The Department notes the clarification in relation to the matters raised under this heading in its previous observations in Section 4.15 of the Request for Further Information Response Report.

Birds

The Department raised issues in relation to the potential for the proposed River Corrib bridge to pose a collision risk to birds in its previous observations. This has been addressed in Section 5.2 of the Request for Further Information Response Report. While no nocturnal surveys were undertaken the Department considers that taking into account the fact that the bridge will not be lit, the available data from the previous and recent surveys, and the available published literature, sufficient information has been provided to assess potential impacts to SCI bird species of the adjacent SPAs. The Department is of the view that the proposed bridge is unlikely to present a threat to SCI bird species of the adjacent SPAs.

The Department also raised issues in relation to habitat loss and fragmentation and the potential for this to impact SCI bird species for surrounding SPAs. This is addressed in Section 5.1 of the Request for Further Information Response Report. The Department



notes the additional information provided and considers that the matter raised has been addressed.

2. Likely effects on the Environment

NHA – hydrology

The Department reiterates its concerns regarding Moycullen Bog NHA, that dewatering of the 'Galway Granite batholith' within cutting areas during construction and operation of the proposed scheme, may result in a lowering of the peatland water table with peat subsidence and a consequent negative impact on the ecology of the Bog. The potential for such impacts needs to be assessed and mitigation measures proposed to address this matter as appropriate.

Habitats

As stated above, the Department notes the additional information in relation to habitat mapping provided in Section 4 of the Request for Further Information Response Report (Volume 1). This has resulted in some changes to habitat mapping which has been described and evaluated in Section 4 of the Report and associated mapping, and is noted.

It is also noted that there will be a number of habitat types of local biodiversity importance which will be permanently lost and where significant residual impacts are likely, including calcareous springs, dry-humid acid grasslands, poor fen and flush, mixed broadleaved woodland, hedgerows and treelines. The Report states that for mixed broadleaved woodland, hedgerows and treelines an area greater than that which will be permanently lost is being provided for in the landscape design (see page 30). It would be useful if the area of woodland and the length of hedgerow and treeline to be provided can be clearly set out.

It remains unclear if abandonment of grazing and/or mowing, including because of fragmentation and isolation of land holdings, has been included among the potential significant effects on habitats that were considered and assessed. Species such as Marsh Fritillary could be affected by such changes arising in connection with the development of the road and could lead to loss of habitat in 'favourable management'. Further clarification should be provided.

Compensatory Habitat

The Department notes the summary of residual Annex 1 habitat loss after compensatory measures have been implemented which is set out in Table 4.1 of the Report and revises the information previously provided in the EIAR.

Some of these losses are to be compensated by translocating habitat from one location (donor site) to another location (receptor site) within the proposed development boundary. The Department re-iterates its view (as set out in previous observations) that it would assist interpretation if a table with the details of donor and receptor sites, including areas and habitat types present in each, was provided to clarify, among other things, what habitats will



be lost in the receptor sites as a result of the compensation measures and what habitat gains are predicted to accrue.

There have been some amendments proposed in the Request for Further Information Response Report to the Material Deposition Areas in Lackagh Quarry (areas DA23, DA24, DA25, DA28). It is noted also that a large volume of peat (52,000m³) – presumably removed from west of the River Corrib - will be deposited in this limestone quarry. While Tables 3.2 & 3.3 indicate that there will be no peat in area DA28, Table 6.2 indicates that there will 14,000m³ of peat in this area. This matter needs to be clarified.

Some of the Material Deposition Areas listed above are also earmarked for habitat compensation notably for calcareous grassland. It is not clear from the documentation how this habitat will be created and how the proposed alterations to the material deposition areas will impinge on the habitat compensatory areas. It appears that the major horizontal portions of the depositional areas will consist of peat. For example, area DA24 was identified as an area for calcareous grassland but yet its entire area appears to be covered in peat (see Annex 2, Figure 1.8.6). It is not clear from the documentation if it is intended to create peatland habitat here or whether the peat is simply being stored in this area. Clarity is required in relation to these matters.

The Department notes the information provided in Section 4.11 of the Request for Further Information Response Report in relation to the time required to establish compensatory habitats. Because the timeline in the Report for Alluvial forest [*91E0] is expressed as a worst case scenario, the Department considers that the lower limit of the range should be increased from 20 to 30 years. More generally the Department notes the long time periods required for the establishment of all the Annex 1 habitat-types as set out in Section 4.11 of the Report, and notes that donor and receptor sites should be well matched in terms of their environmental conditions (e.g. geology, soils, altitude, slope, aspect) in order to enhance the prospects of success in a reasonable time-frame. In all cases future management will be required and it should be clear how this will be achieved and delivered in the short- to long-term.

Birds

The Department re-iterates the matters raised in its previous observations in relation to the need for compensatory long-term habitat management for Barn Owls.

The Department also raised issues in relation to the potential for impacts to Peregrine Falcon and to wintering birds at Ballindooley Lough arising from blasting activity at Lackagh Quarry (and Castle gar), and the mitigation measures proposed to address such impacts. These matters are addressed in Section 5.3 of the Request for Further Information Response Report. In relation to Ballindooley Lough it is clear that there is no risk of disturbance to waterbirds because blasting will not take place during the wintering period. In relation to Peregrine the Department is of the view that in addition to the mitigation measure proposed (i.e. blasting to commence prior to mid-February) there need to be suitable high ledges for prospecting pairs available, and that any active Peregrine nest site/ledge must be left undisturbed. If these conditions are met then the proposed works should not prohibit Peregrine breeding at the



site. Peregrine are regarded as being able to withstand significant disturbance at active quarry sites. However, the frequency, the location and intensity of the blasting could influence the outcome in terms of success/failure. Therefore monitoring of Peregrine breeding activity at the site through the season should ideally be carried out to ascertain any nest success/failure of the pair and to determine if blasting is also affecting numbers of common prey species for Peregrine (i.e. Feral Pigeon).

Marsh Fritillary

The Department reiterates its concerns in relation to the mitigation measures proposed for this Annex II species which, as set out in the Department's previous observations, lacked sufficient detail. This matter needs to be addressed to ensure that the mitigation measures proposed are realisable.

Bats

The Department notes the clarification in relation to Lesser Horseshoe Bat populations set out in Section 6.1 of the Request for Further Information Response Report, and the information provided in relation to core sustenance zones (CSZ) for bats in Section 6.2 of the Report. As stated previously, the conclusions in the EIAR in relation to bats are contingent on i) the effective and timely implementation of these mitigation and compensation measures at or prior to construction stage, ii) their continued effective functioning for the lifetime of the project, and iii) their safeguarding in any future projects and development planning. Monitoring and the taking of timely and effective corrective action if problems arise are integral to their success, and to the conclusions and predictions that may be reached. Any uncertainties in any of these regards should be taken into account in the context of the EIA.

Habitat Connectivity

The Department notes the clarification in relation to habitat connectivity for pine martens, squirrels and common lizard set out in Section 7.1 of the Request for Further Information Response Report.

Drawing GCOB-1700-D-S12-02-001 shows the overpass/green bridge. Clarification is required in relation to the proposed planting for the overpass setting out what species are proposed to be planted. It would appear that there will be a bank at each side of the metaled route and perhaps an area of soil cover outside of this. In order for the overpass to function correctly it must be clear that a sufficient depth of soil cover will be in place to support an appropriate planting regime.

There does not appear to be provision for ledges for passage by mammals in the drawings for culverts (see drawing GCOB-1700-D-GEN-011). The Department recommends that where culverts are designed to allow water flows through them, provision for mammal ledges should be included.



You are requested to send further communications to this Department's Development Applications Unit (DAU) at manager.dau@chg.gov.ie (team monitored); if this is not possible, correspondence may alternatively be sent to:

The Manager
Development Applications Unit (DAU)
Department of Culture, Heritage and the Gaeltacht
Newtown Road
Wexford
Y35 AP90

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Connor Rooney
Development Applications Unit

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N6 Galway City Ring Road
Application for consent to An Bord Pleanála

Oral Hearing

Statement of Evidence

Gerry Clabby

National Parks and Wildlife Service

Department of Culture, Heritage and the Gaeltacht

21 February 2020

1. My name is Gerry Clabby and I am Head of Ecological Assessment, with the National Parks and Wildlife Service of the Department of Culture, Heritage and the Gaeltacht. I hold a BSc in Botany and a PhD in ecology from University College Dublin. In my current role I am responsible, among other things, for providing advice and guidance to the Department in relation to the discharge of its function as a statutory consultee in the planning code and in this regard I manage a team of ten Divisional Ecologists. Prior to this I was Heritage Officer with Fingal County Council for 15 years based in the Planning and Strategic Infrastructure Department of the Council. In this role I contributed to the development of natural heritage policy for statutory land-use plans and to the consideration of a wide range of planning applications by providing advice and guidance in relation to environmental assessment. I was also previously Heritage Officer with Westmeath and Longford Councils and a Lecturer in Botany at University College Dublin.
2. The Department has previously made observations dated 21st December 2018 and 24th January 2020 in relation to the proposed motorway and road scheme. These observations were made by the Department in its role as a prescribed body under planning legislation and as the authority with overarching responsibility for nature conservation and the nature directives (i.e. the Birds and Habitats Directives). The observations are intended to assist An Bord Pleanála in its review and evaluation of the current proposal in the context of Ireland's obligations and commitments in relation to nature conservation, European sites, biodiversity and environmental protection generally.
3. The Department wishes to acknowledge the series of pre-application meetings and consultations held by the applicants with the National Parks and Wildlife Service between 2013 and 2017 inclusive. Three submissions made by the Department (on a non-statutory basis) at pre-application stage are included in the Environmental Impact Assessment Report (EIAR) at Appendix A.8.2. This included review of draft documentation by NPWS, as an exceptional measure, which included the draft Natura Impact Statement (NIS) and the biodiversity chapter of the EIAR biodiversity chapter, only.
4. The Department also acknowledges the extent and detail of the surveys carried out in connection with the planning and design of the scheme and acknowledges the extent to which ecological and other data and information have informed and modified aspects of the design of the scheme in order to minimise adverse impacts on biodiversity.

5. The Department has recently revised the boundary of Lough Corrib SAC, following the finalization of the objections process at this site, pursuant to the requirements of the European Communities (Birds and Natural Habitats) Regulations, 2011. Revised Irish Grid maps (Map Version 1.33) were notified to An Bord Pleanála and other public authorities on Monday 17th February 2020. These updated maps include a correction of a minor mapping error near Menlo as described in the Department's observations dated 24th January 2020.
6. The applicants have submitted a number of briefs of evidence to the Oral Hearing including the following in relation to ecology and hydrogeology:
 - Responses to EIA Biodiversity Objection/Submissions
 - Responses to AA Objection/Submissions
 - Responses to Hydrology Objection/Submissions

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7. The Department has only had time to undertake an initial review of this new information and in light of the complex nature of this proposed motorway and road scheme, and the extensive documentation involved, would welcome the opportunity to put some questions to the applicants this morning. The Department is willing to provide further inputs to the Oral Hearing at a later date, should this be helpful to the Inspector and the Board.
8. While not wishing to repeat its previous observations, which are to be taken as read, I wish to highlight a number of areas where, in the Department's view, further clarification is required to ensure that sufficient information is available to the Board in its decision making in this case:
 - a. Further clarification is required in relation to the groundwater regime operating in the vicinity of the proposed Lackagh Tunnel. This is necessary in order to enable a full assessment of the potential impacts to Lough Corrib SAC, particularly Coolagh Lakes and Annex 1 Alkaline and Cladium fen habitats, as a result of the construction of the Tunnel and in order to ensure that the mitigation measures proposed will fully address potential impacts. ✓
7230. 7210.
 - b. Clarification is needed in relation to the catchment areas and groundwater flow regimes of the dependency of Ground Water Dependent Terrestrial Ecosystems (GWDEs) in the Lough Corrib cSAC; and whether groundwater flow paths may

change post-construction. Without this, it is difficult to assess the potential impacts of the proposed scheme and the adequacy of the mitigation measures being proposed.

- c. In relation to Moycullen Bog Natural Heritage Area (NHA) there remain concerns that dewatering of the 'Galway Granite Batholith' as a result of the construction and operation of the scheme may result in a lowering of the peatland water table, resulting in a negative impact on the ecology of the Bog. This matter needs to be addressed.
- d. Proposed mitigation measures for Marsh Fritillary should be clarified as set out in the Department's previous observations.
- e. The Department is of the view that further detail is required in order to ensure that the provision of Annex 1 compensatory habitat is successfully achieved. This includes i) further detail in relation to how such habitat is to be provided including the steps involved in the process, particularly in relation to dry heath habitat; ii) further provision for monitoring; and iii) clarification in relation to the measures in place should habitat provision be unsuccessful and the steps needed to be repeated until success is achieved.

- GA not AA.
- 9. The conclusions reached in the Natura Impact Statement (NIS) and the Environmental Impact Assessment Report (EIAR) with regard to the proposed scheme are contingent on mitigation measures and the provision of compensatory habitat. It is essential that provision is made for the effective and timely implementation of these measures at, or prior to, construction stage and, where applicable, during the operational stage. It is also essential that these measures are effective over the operational lifetime of the scheme and that they are safeguarded in any future project and development planning in the city and county. Monitoring and the making of provision for timely and corrective action should problems arise in relation to mitigation measures or compensatory habitat provision, is also a key element in ensuring success in this case. Any grant of permission in this case should ensure that these matters are fully addressed.

10. I am joined by my colleagues Dr Shane Regan, Dr David Tierney, Dr Ferdia Marnell and Dr Enda Mooney who wish to put some questions to the applicants with a view to clarifying some of the matters raised above.

a + b - AA + EIA

c - EIA

d + e less important.

comp. = focus - capable of being implemented

N6 Galway City Ring Road

Application for consent to An Bord Pleanála

Oral Hearing

Statement of Evidence

Gerry Clabby

National Parks and Wildlife Service

Department of Culture, Heritage and the Gaeltacht

11th March 2020

1. My name is Gerry Clabby and I am Head of Ecological Assessment, with the National Parks and Wildlife Service (NPWS) of the Department of Culture, Heritage and the Gaeltacht. I am responsible, among other things, for providing advice and guidance to the Department in relation to the discharge of its function as a statutory consultee in the planning code. I am joined today by my colleagues Dr Shane Regan and Dr Enda Mooney.
2. The Department made a Statement of Evidence to the Oral Hearing on 21st February 2020 and also put some questions in relation to the proposed development to the applicants which sought further information in relation to a number of matters. The Department indicated at the Hearing that a meeting with the applicants might be useful in relation to the matters raised by the Department and this course of action was agreed with the Inspector. The Department agreed that it would return to the Oral Hearing subsequent to such a meeting with the applicants.
3. Since 21st February 2020, the Department met with the applicants on 27th February 2020 and again, at the applicant's request, on 9th March 2020. The Minutes of these meetings are provided in an Appendix to this Statement of Evidence.
4. At the first meeting on 27th February the following matters were discussed:
 - a. Hydrogeological matters arising in relation to Lough Corrib cSAC
 - b. Hydrogeological matters arising in relation to Moycullen Bogs NHA
 - c. Compensatory habitat provision – calcareous grassland and dry heath
 - d. Mitigation measures in relation to Barn Owl and Peregrine Falcon
 - e. Mitigation measures in relation to Marsh Fritillary.
5. At the second meeting on 9th March the only matter discussed was the provision of compensatory dry heath habitat.
6. The Department is of the view that the additional information contained in the Statement of Evidence made to the Oral Hearing on 10th March 2020 by the applicants provides further relevant information to An Bord Pleanála which will assist it, in its assessment of the current proposal.
7. In addition, the Board's ecological advisor Mr Richard Arnold put a series of questions to the Department at the Hearing on 21st February to which I will now provide responses.

Question 1

As stated by the applicant, there will be a loss of c.1ha of 8240 LP outside the cSAC. In the department's view, is the direct loss of limestone pavement (*and other Annex 1 habitats*), outside the cSAC consistent with the objectives of the Habitats Directive?

This question addresses the protection afforded to Annex I habitats that occur outside Special Areas of Conservation (SACs). One of the objectives of the Habitats Directive is to designate Special Areas of Conservation (SACs) which are defined in Article 1(l) of the Directive as follows:

“special area of conservation means a site of Community importance designated by the Member States through a statutory, administrative and/or contractual act where the necessary conservation measures are applied for the maintenance or restoration, at a favourable conservation status, of the natural habitats and/or the populations of the species for which the site is designated;” [underlining added].

Annex I to the Directive lists natural habitat types whose conservation requires the designation of special areas of conservation. Limestone pavement is included in Annex I as a priority natural habitat, which means it is in danger of disappearance and is a habitat for which the European Union has a particular responsibility.

Article 6(2) requires that:

“Member States shall take appropriate steps to avoid, in the special areas of conservation, the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated, in so far as such disturbance could be significant in relation to the objectives of this Directive.” [underlining added].

The European Commission guidance¹ advises that measures implemented under Article 6(2) are only required to target species and habitats located in the SACs, unless external events may have an impact on the species and the habitats inside the SAC.

¹ Commission notice "Managing Natura 2000 sites The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC" (page 27-28):
https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/Provisions_Art_6_nov_2018_en.pdf

While the general provision, under Article 6(2), to conserve habitats for which a site has been designated applies at all times, Article 6(3) of the Directive applies only to plans and projects. Article 6(3) requires that:

“Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site’s conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.”

In *Holohan*², the Court of Justice of the European Union (CJEU) ruled that an appropriate assessment under Article 6(3) of the Habitats Directive must identify and examine the implications of the proposed project for habitat types to be found outside the boundaries of a SAC provided that those implications are liable to affect the conservation objectives of the site.

In summary, the Department is of the view that any proposals which involve the loss of Annex 1 habitat outside Special Areas of Conservation, must take fully into account the findings of the CJEU in the *Holohan* case cited above. In proposals where the loss of Annex 1 habitat does not affect habitats and/or species within SACs, the Department is of the view that while such habitat loss is undesirable and to be avoided wherever possible, it is not inconsistent with the requirements of the Habitats Directive. In such cases the Department expects, among other things, the requirements of the EIA Directive to be applied in relation to the assessment of potential impacts to biodiversity including the assessment of impacts to Annex 1 habitats.

I would hasten to add that this view does not in any way purport to be a legal opinion.

Should the subject matter of the question raised by the Board be considered by the Board to

² Case C-461/17, *Brian Holohan and ors. V. An Bord Pleanála* (para 70) <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:62017CJ0461&qid=1583427673419&from=EN>

be critical to its decision making in this case, it is respectfully suggested that the Board may wish to obtain legal advice in relation to this matter.

Question 2

With reference to the FIR response, section 4.3 and Figure 2.6.07 of the same; Why was the boundary of the cSAC drawn to include the woodland adjacent to Menlo Castle, Area 1f, in the applicant's mapping? To further clarify, this area lies immediately to the east of the proposed River Corrib bridge. Was this area considered in the recent revision to the cSAC boundary?

The reference to Figure 2.6.07 in this question is presumed to be a reference to Drawing 2.6.07 of the FIR. The area in question is also shown in Drawing 2.5.07 of the FIR which identifies the Fossitt habitat at this location as woodland (WD1). The boundary of the cSAC was surveyed in 1997 (see Figure 1 below). The rationale at the time was, *inter alia*, to include areas of semi-natural habitat within the boundary of the cSAC.

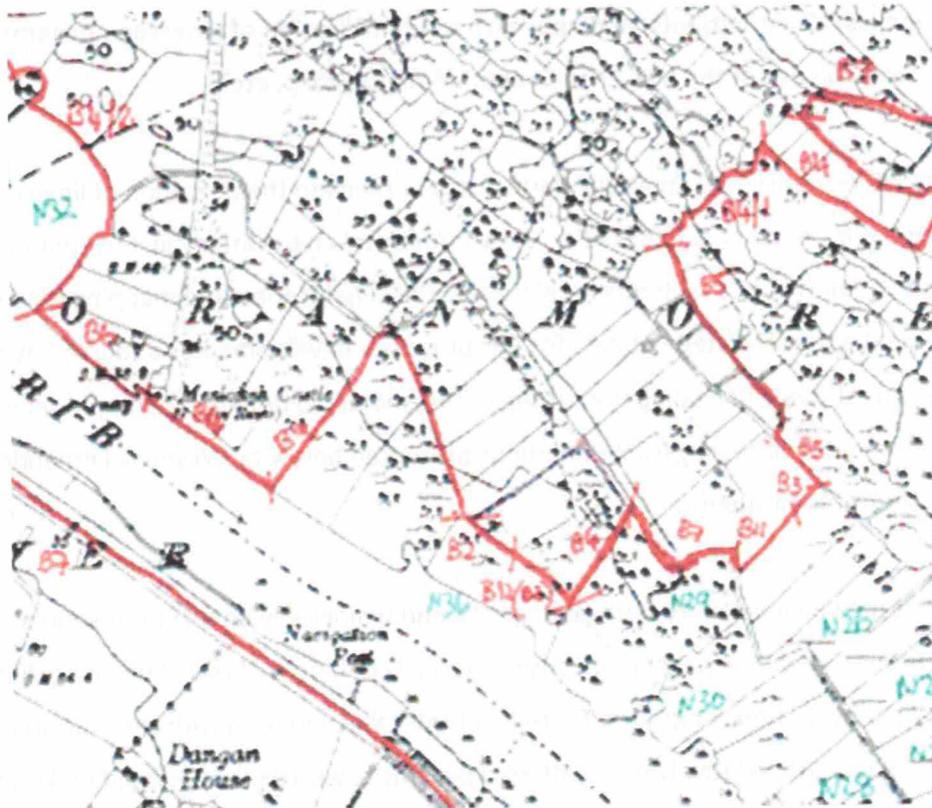


Figure 1: Scan of the 1997 surveyed boundary of the cSAC

While there are no specific target notes in the NPWS site file for the woodland area referred to as Area 1f, it is clear that this area was included on the basis that it was semi-natural woodland.

The boundary of the site was reviewed in 2003 but no amendments were proposed along this section of boundary and the woodland was retained within the cSAC. The Department has recently revised the Lough Corrib cSAC boundary. A revised boundary map for Lough Corrib cSAC was issued on Monday 17th February 2020 - Map Version 1.33. The revised map was issued following boundary changes recommended by the Designated Area Appeals Advisory Board (DAAAB) and approved by the Minister for Culture, Heritage and the Gaeltacht. A minor mapping error was also corrected on Map Version 1.33. None of the boundary changes to Map Version 1.33 related to the woodland south of Menlo Castle and this area was not assessed by the DAAAB in the recent revision of the cSAC boundary (i.e. this area was not subject to a formal appeal assessed by the DAAAB).

Question 3

With reference to the FIR response, section 4.5; What is the Department's impression of the applicant's definition(s) and approach to identification of limestone pavement in particular the use of the 50% criteria applied to polygons, etc?

In the FIR response, the applicant clarifies its approach to the definition of limestone pavement in Section 4.5 (page 32). The approach taken by Botanical, Environmental & Conservation (BEC) Consultants in relation to the classification and mapping of limestone pavement and associated habitats for this proposed development is endorsed by NPWS. It follows a rationale (including the setting of thresholds) to define this complex ecological mosaic and draws heavily from definitions presented below by Wilson & Fernandez (2013)³, on page 7 of their report:

“Limestone pavements are both geologically and biologically important resources. The structure of limestone pavement consists typically of blocks of rock, known as clints, separated by fissures, or grykes. There is considerable variation with some areas of massive blocks of smooth, relatively un-weathered pavement with well-developed grykes, to areas

³ Wilson, S & Fernández, F (2013) National Survey of limestone pavement and associated habitats in Ireland. Irish Wildlife Manuals, No 73. National Parks and Wildlife Service.
<https://www.npws.ie/sites/default/files/publications/pdf/IWM73%20Limestone%20pavement.pdf>

where the grykes are very narrow and shallow. Finely fractured pavements or shattered pavements where grykes are almost absent can also occur. The rock surface is almost devoid of overlying soils (considerably less than 50% cover) except for some patches of shallow skeletal soils, although more extensive areas of deeper soil occasionally occur (Anon. 2007). This morphology offers a variety of microclimates allowing the establishment of complex vegetation consisting of a mosaic of different communities. The vegetation in grykes is unusual as it is composed of woodland and shade species along with plants of rocky habitats (Osborne *et al.* 2003; Ward *et al.* 1976)."

The scale in terms of area at which the definition of limestone pavement is applied needs to be practical and common sense needs to be applied. Since limestone pavement is a geomorphological entity, this needs to be taken into account in applying definitions and it does not make sense to identify all areas that contain elements of water-worn limestone as limestone pavement. The Department's view is that the applicants have applied a justifiable approach to the mapping of limestone pavement and that the use of the 50% criteria relating to polygons is valid.

Question 4.

With reference to the FIR response, section 4.4, Figure 2.4-072, Figure 2.3.03 and Photograph for relevé 3734_R1 in Area. What is the Department's view on the habitat type, in accordance with EUR28? The photo is attached. In addition, it would helpful to have the same view for Relevé 1883_R1 also attached, refer to Figures 2.4-076 and Figure 2.3.04"

To assist with providing a response in relation to relevé 3734_R1, data for this relevé was inputted into ERICA (the Irish Vegetation Classification tool). ERICA is a web application which can be used to assign vegetation data to communities as defined by the Irish Vegetation Classification. Data can be uploaded, checked for errors and analysed and the results can then be downloaded. Further information in relation to this tool is available at the following link: <https://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/erica/>. Relevé 3734_R1 was identified as WL2A *Quercus robur* – *Circea lutetiana* woodland by ERICA. A full description of this community type is available at the following link for reference:

<https://www.biodiversityireland.ie/wordpress/wp-content/uploads/WL2A.pdf>. This describes a fairly species-poor woodland community with a very limited bryophyte flora. A small proportion of these stands (10.7%) may qualify as EU Annex I habitat 91A0 Old Oak Woodlands. Therefore the lack of assignment of this relevé to an Annex 1 habitat category appears appropriate.

ERICA identified relevé 1883_R1 as WL2E *Corylus avellana* – *Potentilla sterilis* woodland. A full description of this community type is available at the following link for reference: <https://www.biodiversityireland.ie/wordpress/wp-content/uploads/WL2E.pdf>. This is quite a species-rich woodland community with a fairly diverse bryophyte flora. Stands of this community-type do not qualify as any of the EU Annex I woodland habitats, but stands on thin soils occurring in association with karst limestone can be considered to be Annex 1 habitat 8240* Limestone pavement. In the case of relevé 1883_R1 the soil layer is thin, and blocky limestone has also been identified for this relevé. Therefore the assignment of this relevé to 8420* appears appropriate.

Question 5.

With reference to the FIR response, section 2.3, I understand that the Menlough viaduct will pass over 8240 Limestone Pavement outside the cSAC. In the Department's view, does the shading of limestone pavement under structures, for example beneath the Menlough viaduct, affect the conservation status of the Limestone Pavement?

In relation to shading, limestone pavement and its associated habitats and species occur across a spectrum of light levels, from open pavement to shaded grykes, through to scrub and woodland. As the proposed viaduct is generally orientated East -West, the impact of shading will be lessened. In addition, the main orientation of the grykes is North-South, meaning plants growing in grykes are already shaded in an East-West direction. The Department does not perceive there to be an issue with shading from the proposed viaduct.

APPENDIX

Minutes

Meeting between NPWS and N6 Galway City Ring Road Project Team

Location NPWS Office, 90 North King Street, Smithfield, Dublin 7. Time and date 11.00 am 27 February 2020

Purpose of meeting Clarifications sought by NPWS at N6GCRR Oral Hearing

Attendance	Gerry Clabby	NPWS
	Caitriona Douglas	NPWS
	Enda Mooney	NPWS
	Brian Nelson	NPWS
	Shane Regan	NPWS
	Enda Mullen	NPWS
	John Fitzgerald	NPWS
	Ciaran O’Keeffe	NPWS
	David Tierney	NPWS
	Aebhin Cawley	Scott Cawley (SC)
	Andrew Speer	Scott Cawley (SC)
	Catherine Buckley	Arup
	Les Brown	Arup
	Mary Hurley	Arup
	Eileen McCarthy	Arup

Apologies

Circulation Those present

		Action
1.	Overview	
1.1	NPWS outlined that the purpose of the meeting is to identify to the applicant for the N6 Galway City Ring Road what NPWS consider would be required in terms of additional clarification to be provided to An Bord Pleanála (ABP) so that ABP can undertake a full assessment of the scheme in possession of relevant information.	Note
1.2	The matters discussed related to the following topics: <ul style="list-style-type: none"> • Birds • Hydrogeological matters arising in relation to Lough Corrib cSAC • Hydrogeological matters arising in relation to Moycullen Bogs NHA • Marsh Fritillary • Compensatory habitat provision – calcareous grassland and dry heath 	
2.	Birds	
2.1	NPWS fully understand the principle of dissuading barn owls from foraging near the proposed road development for the	Note

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	majority of the scheme. However, NPWS queried the net loss/gain of habitat versus habitat provided for Barn owl around Menlo Castle.	
2.2	SC confirmed that the resultant loss of suitable Barn owl foraging habitat within a 5km radius of Menlo Castle is approximately 9.9ha, and the provision of replacement habitat in this same area is approximately 11.76ha.	Note
2.3	Confirmation that the grazing regime required to maintain the habitat will be implemented into the future is required.	Design Team
2.4	Clarification is required on what level of protection is provided for the existing two Peregrine falcon nests in Lackagh Quarry.	Design Team
2.5	SC have spoken with John Lusby (Bird Watch Ireland) following the NPWS query with respect to the existing Peregrine falcon nests sites in Lackagh Quarry and proposed that artificial nest boxes will be provided on the existing ledges in Lackagh Quarry. This will be added to the Schedule of Environmental Commitments and will be presented to ABP.	Design Team
3.	Hydrogeology at Lough Corrib	
3.1	Arup gave an overview of the hydrogeology of the 2km section from River Corrib to Ballindooey Lough using data as presented in various reports within the EIAR/NIS with a groundwater contour map and hydrogeological cross-section (Lackagh to Coolagh lakes) as had been requested by NPWS at the N6 GCRR oral hearing on 21 February 2020.	Note
3.2	<p>NPWS believe that the following clarifications should be made available to ABP:</p> <ul style="list-style-type: none"> • An additional hydrogeological cross-section through the Fens adjacent to Coolagh Lake following the groundwater path that supports these Fens and include piezometric heads in the limestone aquifer. • There is a significant amount of ecology and hydrogeology data in the EIAR and NIS but the reports are voluminous. NPWS request a concise integrated eco-hydrogeology response note that links together the ecology and hydrogeology aspects with an assessment of the potential impacts on the Lough Corrib cSAC conservation objectives with specific reference to the following qualifying interests - Alkaline Fen [7230] and Calcareous fen with <i>Cladium mariscus</i> and species of the <i>Caricion davalliana</i> [7210*]; and with a clear conclusion to inform the Appropriate Assessment being undertaken by ABP. 	Design Team
4.	Hydrogeology at Moycullen Bogs NHA	
4.1	NPWS noted that their main concern arose from a potential hydraulic connection via fractures in the granite between cuttings	Note

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<p>4.2</p> <p>4.3</p>	<p>of the proposed road development and Moycullen Bog NHA (Letteragh).</p> <p>Arup gave an overview of the hydrogeology in the area of the proposed road development relative to Moycullen Bog. The geophysical data presented (included in the EIAR) indicated that there are no fractures in the granite which may connect the bog to the proposed road development. The NPWS acknowledged that detailed mitigation measures were included in the EIAR to provide for remediation should any unforeseen fracture arise in the granite during construction.</p> <p>NPWS believe that the following clarifications should be made available to ABP:</p> <ul style="list-style-type: none"> • A hydrogeological cross-section from the proposed road development to Moycullen Bogs NHA (Letteragh). This should show groundwater table levels, geophysical information, bog water tables and an indication of likely bog depth. • Provide an eco-hydrogeological response for Moycullen Bogs NHA at Letteragh that links all ecology and hydrogeology assessments undertaken, with supporting information from hydrology and geology assessments. This should include relevant excerpts from the contingency measures outlined in the Construction Environmental Management Plan included within the EIAR. This summary report is requested by NPWS to assist ABP in assessing potential impacts to Moycullen Bogs NHA. 	<p>Design Team</p>
<p>5.</p> <p>5.1</p>	<p>Marsh Fritillary Butterfly</p> <p>NPWS request that the following clarifications to be made available to ABP:</p> <ul style="list-style-type: none"> • Detail the purpose of the mitigation for the Marsh fritillary • Provide detail on the proposed translocation site(s) and on the methodology for translocation • Provide detail on the timing of when these measures would be implemented with respect to the construction activities • Clarify how the new sites will be managed for the years ahead 	<p>Design Team</p>
<p>6.</p> <p>6.1</p>	<p>Compensatory Habitat: Dry Heath</p> <p>NPWS request that the following clarifications to be made available to ABP:</p> <ul style="list-style-type: none"> • Specific proposals for translocation of <i>Arctostaphylos uvi-ursi</i> and <i>Daboecia cantabrica</i>. • Confirmation that Annex 1 Dry heath habitat [4030] can be successfully re-created using the donor and receptor sites as set out in the EIAR and supporting documentation. In this regard NPWS noted that Appendix A.8.26 of the EIAR contained, within the Compensatory Habitat Management Plan, a 	<p>Design Team</p>

Minutes

<p>7. Compensatory Habitat: Calcareous Grassland</p> <p>7.1 NPWS request that the following clarifications to be made available to ABP:</p> <ul style="list-style-type: none"> • Confirmation of confidence in the ability to recreate Calcareous grassland on the MDAs in Lackagh Quarry including clarification in relation to the proposals for peat to be deposited in these MDAs. 	<p>Design Team</p>

Minutes

Meeting between NPWS and N6 Galway City Ring Road Project Team

Location NPWS Office, 90 North King Street, Smithfield, Dublin 7. Time and date 11.00 am 9 March 2020

Purpose of meeting Clarifications sought by NPWS at N6GCRR Oral Hearing

Attendance	Gerry Clabby	NPWS
	Caitriona Douglas	NPWS
	Enda Mullen	NPWS
	John Fitzgerald	NPWS
	Derek Pender	Galway County Council
	Aebhin Cawley	Scott Cawley (SC)
	Andrew Speer	Scott Cawley (SC)
	Mary Hurley	Arup
	Eileen McCarthy	Arup

Apologies

Circulation Those present

		Action
1. Overview		
1.1	The purpose of the meeting is to allow the applicant for the N6 Galway City Ring Road to report back on what NPWS considered would be required in terms of additional clarification to be provided to An Bord Pleanála (ABP) in respect of the compensatory habitat provision – dry heath – so that ABP can undertake a full assessment of the scheme in possession of relevant information.	Note
2. Compensatory Habitat: Dry Heath		
2.1	NPWS does not disagree with the concept of dry heath recreation. It was requested that the full bibliography citing examples of successful dry heath creation be made available to ABP.	Design Team
2.2	The following additional clarifications will be made available to ABP: <ul style="list-style-type: none"> • Specific proposals for translocation of <i>Daboecia cantabrica</i>. • Detailed information providing confirmation that Annex 1 Dry heath habitat [4030] can be successfully re-created using the proposed donor and receptor sites. • The information to be contained in the Ecology Site Management Plans referenced in the Compensatory Habitat Management Plan to be set out in the documentation to be provided to ABP. • Proposals for temporary storage of turves as part of the proposed compensatory habitat provision to ensure that turves 	

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are only watered with rainwater and are stored for as short a time as possible...

As part of proposed dry heath compensatory habitat provision:

- Monitoring to be undertaken after the turves are placed in the receptor sites every three weeks **and** after any heavy rainfall event(s) until such time as the dry heath is established, with adaptive management plans to be put in place on an ongoing basis as necessary if monitoring shows that establishment is not successful.
- Monitoring to be undertaken post establishment of the dry heath habitat by Galway County Council for the lifetime of the project.
- Steel Pegs of 500mm to be utilised to secure the geogrid, as part of habitat creation works.
- The top 400mm of all MDAs on top of which dry heath is to be created will have a pH of less than 6.5. A root barrier is required at DA 18 which is the only MDA which may have material of a higher pH beneath the upper 400mm layer.

2.3

NPWS expressed reservation about the use of bare peat at the receptor sites in addition to turves. Given the high rainfall amounts in the area, the use of bare peat increases the risks of erosion at the receptor sites and also creates a risk that undesirable plant species will be introduced to the receptor sites. The NPWS emphasised the need to create high quality dry heath habitat as compensatory habitat and queried whether proposals to create c. 7 ha of such habitat risked a reduction in the quality of the habitat created due to the need to use bare peat as part of compensatory habitat provision proposals.

Appendix 2 Responses to Submissions

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
1	S_018	DCHG/NPWS	<p>In their first submission the Department raises several topics which it considers important elements of the ecological impact assessment and mitigation in summary, these (in addition to those raised with respect to the NIS, are as follows:</p> <ol style="list-style-type: none"> 1. Moycullen Bogs - Potential effects from dewatering during construction and operation of the road 2. Linear Habitats - Clarification on the length and type of boundary features Including stone walls affected by the proposed road. 3. Changes in land use - The effect on habitats within retained parts of fields bisected by the proposed Rd 4. Loss of Annex I habitats - Requested a table showing the net loss or gain of annex one habitat, plus plans for management. 	<p>These comments were responded to directly by the applicant at the oral hearing in the EIAR biodiversity evidence and separately in meetings between the Department and the applicant. These topics have also been addressed explicitly in my ecological impact assessment report. I understand that the Department satisfied with the clarifications received in each case.</p> <p>In summary:</p> <ol style="list-style-type: none"> 1. The effect of dewatering on Moycullen Bogs NHA was assessed by Mr James Dodds and is assessment is that there is no risk of significant dewatering within the NHA as a result of the proposed road. 2. The quantity of linear habitats affected was clarified at the oral hearing with around 19 kilometres of stone wall affected plus 7.2 kilometres of hedgerows and 5.2 kilometres of tree lines. 3. The applicant has clarified that all land parcels will be accessible once the road is constructed, and therefore it will be possible for land management to continue as now. This does rather ignore that some fields will be smaller than before and therefore less useful for farming, a reduction in management could be both positive and negative football and diversity depending on the habitat president now. 4. The table showing losses and gains of annex I habitat has been provided by the applicant. This assumes that there would be 100% success rate in creating annex I habitats at the receptor site. There is a risk that the success rate is lower than this, especially on the material deposit areas in Lackagh quarry. Therefore, I would

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			<p>5. Mammal underpasses - Observes that, in relation to otter, the mammal passes need to be correctly installed, maintained and safeguarded in order to be effective and makes a similar point for other mammals.</p> <p>6. Impacts on bats and mitigation measures. Again, makes the point that the mitigation for bats needs to be implemented carefully and backed up by monitoring in order for the conclusions in the EIAR to remain sound.</p> <p>7. Badgers - A licence may be required for any new badger sets found during site clearance.</p> <p>8. Marsh fritillary mitigation measures - Observes that there will be impacts or Marsh fritillary populations and ask for more clarity on the mitigation proposed.</p>	<p>consider the net gain for calcareous grassland to be less than is indicated by this table.</p> <p>5. The need for the correct installation maintenance and safeguarding of otter underpasses is recognised by all parties, and this has been written into the mitigation commitments made by the applicant. In addition to those proposed by the applicant, I have identified the requirement for additional otter passage to be provided at other watercourses, and with these there should be adequate passage for otter across the proposed road both now and in the future.</p> <p>6. It is agreed by all parties that the bat mitigation needs to be carefully implemented. Critical to the maintenance or bat populations will be the long-term management of the created bat roosts, foraging habitat, and underpasses and overpasses. Without such management, I agree that the outcome will be worse than is set out in the EIAR. Even move the mitigation, there would still be a significant negative impact on bats due to the loss of foraging habitat and commuting corridors.</p> <p>7. Obtaining necessary licences for badger has been committed to by the applicant, see SEC 8.33</p> <p>8. The applicant's proposal includes the translocation of marsh fritillary larval webs from the road construction site to another area of suitable habitat. However, the mitigation may be partly reliant on the provision maintenance of Marsh fritillary habitat by other landowners plus around 1ha of suitable habitat to be maintained within the soft estate. See SEC 8.41 and biodiversity evidence p23. Given the likely net loss habitat for this species, this approach could</p>

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			<p>9. Barn owl mitigation measures - request that barn owl habitat is enhanced or created to replace that lost because of the proposed road and at this will determine the location of the barn owl nest boxes.</p> <p>10. Peregrine falcon mitigation measures - Requests that peregrine nest sites are provided in case the current location becomes unsuitable</p> <p>11. Wintering birds at Ballindooley Lough - Apparent contradiction between the mitigation set out in NIS and the EIAR and whether blasting is to take place in February and March in proximity to Ballindooley Lough.</p> <p>12. Breeding birds - nest boxes - The proposed nest boxes should be monitored and the success rate reported.</p> <p>13. Mitigation measures and monitoring - Makes general points on the need for properly managed and implemented mitigation measures coupled with</p>	<p>lead to a small but significant population decline in the vicinity of the road.</p> <p>9. The applicant increased its provision of barn owl habitat by essentially modifying the approach to land already set aside for bat mitigation, SEC 8.49 and identified other areas which would replace barn owl habitat, however, two of the three areas put forward as barn owl mitigation should be discounted because the route that a barn owl might take to reach these areas is too perilous, which leaves the total created as c.8ha.</p> <p>10. The applicant has offered an additional peregrine nest box site, to the south-east of Lackagh Quarry, see biodiversity evidence p26 and SEC8.54, which may be taken up by peregrine displaced from the quarry during construction.</p> <p>11. The applicant as clarified that since Lackagh quarry is greater than 800 metres from Ballindooley lough, blasting can take place at the quarry during the winter in bird season without impacts on wintering birds at Ballindooley lough, see Biodiversity evidence p28, the distance is a minimum of 900m.</p> <p>12. Annual monitoring now has been committed to be the applicant, for a period of three years post construction, SEC 8.50, although it must be noted that the provision of the boxes and their monitoring will do little to mitigate the effects of the proposed road on nesting birds and bird populations.</p> <p>13. I agree and have stressed that the conclusions reached in my report are contingent and the effective implementation of the mitigation.</p>

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			monitoring reporting and remedial actions.	
2	S_018.2	DCHG/NPWS	In its second submission the Department acknowledges some further information provided by the applicant but restates where it feels clarification is still required for: 1. dewatering at Moycullen bog NHA; 2. areas of habitats lost including for woodlands hedgerow and tree line; 3. abandoned fields fragmented by the proposed Rd; 4. Net gain or loss of annex I habitat types; 5 the use of peat In habitat creation areas for calcareous grassland; 5 the mitigation to offset loss of barn owl habitat 6. Blasting in February/March and effect on wintering birds at Ballindooley Lough 7. Mitigation measures for Marsh fritillary; 8. the need for effective mitigation for bats; 9. Planting measures on the Castlegar overbridge; 10. Mammal passage ledges within culverts	The points raised in the second submission are addressed above, except for planting measures on the Castlegar overbridge for which the applicant provided satisfactory details in the Biodiversity evidence p50. More fundamental is it location and the allocation of land to the south for development in the Galway City Development Plan, which if implemented would mean that the bridge leads to nowhere as far as the bats are concerned.
3	Ob_116	Peter and Michelle Connelly #1	Observe that there has been priority of biodiversity over impact on humans when selecting the route	The relative weight attached to private property and human wellbeing versus the environment and biodiversity is clearly an important and difficult topic.

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
				It is however a legal requirement for impacts on ecology and biodiversity to be described, assessed and considered during the route selection process and the determination of the planning application for the proposed route.
4	Ob_116.2	Peter and Michelle Connelly #2	Observes that priority has been given to ecology over people when selecting the route, noting that the habitats being avoided in the Barna area have been subjected to agricultural improvement which has only recently de-intensified and given rise to the habitats present today, also, given the proposal includes compensatory habitat creation of wet heath and dry heath, could more of this be done to facilitate a route further to the north and west, potentially making use of Article 6(4) of the Habitats Directive and citing the windfarm developments in Moycullen Bogs as evidence that development can be permitted there. Preference for the GCOB route.	<p>As above, with respect to priorities.</p> <p>I think it is understood that some of the habitats present today are developing from de-intensified land use, and perhaps reverting to what might have been present prior to intensification. The habitat types and the assessment of their value has been based upon their type and condition at the time of the survey, by both the applicant and me, as set out in Section 5.12 of my report.</p> <p>As a point of clarification, the applicant proposes to create only dry heath, considering wet heath too difficult to replace and therefore there would be a net loss of wet heath. A route to the north and west would presumably have similar impacts and requirements for compensation.</p> <p>And, in terms of designated sites, Moycullen Bogs is an NHA rather than an SAC or SPA and therefore the Habitats Directive does not apply to Moycullen Bogs, which may explain the presence of the windfarms.</p> <p>A route further to the north and west of Barna may well be plausible, subject to a greater or lesser degree of compensatory habitat creation, although I understand this option was rejected because it did not meet the objectives of the Galway Transport Strategy.</p>
5	Ob_220	Kevin Gill and others	The constraints study area is too small and did not consider all factors equally, focussing on ecology over human	<p>As for Peter and Michelle Connelly #1, in addition:</p> <p>It is correct that there will be habitat loss within the cSAC however the habitats affected are not part of the qualifying interest for the</p>

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			<p>habitat, the route selection process is also excessively focussed on flora and fauna to the detriment of impacts on humans, and despite this the route selected is still damaging to the SAC, bat habitats and allows pollutants into Galway Bay, apparent preference is for no road, rather than an alternative route.</p>	<p>cSAC, and the area affected is a very small proportion of the total area of the cSAC which means that the impacts of the N6GCRR route are not considered significant or an adverse effect on the integrity of the cSAC, unlike the GCOB route.</p> <p>It is also correct that the proposed road will have an impact on bat habitats including bat roost, commuting corridors and foraging habitat. This is addressed in both the EIAR and my ecological impact assessment report. The proposed road includes mitigation such as replacement bat roosts, underpasses for bats to cross the road and the provision of enhanced foraging habitat at Menlo Castle. These measures will go some way to addressing the impact on bats but there would still be an overall negative impact on the bat population, which is described in my report.</p> <p>The proposed road includes treatment of road run-off before it is discharged into Galway Bay, which will remove at least most of the pollutants and, in the short term, may lead to an improvement in water quality in Galway Bay as existing traffic diverts from roads without such treatment onto the N6GCRR. However, if there is an increase in traffic, and the water treatment wetlands, are not adequately maintained, then there is the potential for additional pollutants, such as microplastics from tyre wear, to reach Galway Bay. There is also the short-lived risk of suspended solid pollution arising from site run off during the construction phase this is however more of a risk to the rivers than to Galway Bay and would not be expected to have lasting significant effects.</p> <p>These three points have all been assessed in my report and will be considered when making the planning decision.</p>

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
6	Ob_152	Sean and Audrey Dineen	Observes that wildlife seems to be more important to Galway City Council than human beings when selecting the preferred route option, with respect to the Barna area.	As for Peter and Michelle Connelly #1, in addition: I can see that avoiding adverse effects on the integrity of Lough Corrib cSAC has been a key consideration in the selection of the preferred route however in other areas such as at Barna prioritisation of wildlife areas is not so apparent in the preferred route, except for the avoidance of Moycullen Bogs NHA.
7	Ob_517.11_1	Katie Hughes	Identified by the applicant but no objection relating to biodiversity?	N/A
8	Ob_519	Colm and Marie O'hEocha	Also observe that wildlife has been prioritised over people, with an apparent preference for the GCOB route and invoking IROPI under Article 6 (4) of the Habitats Directive, and with respect to the Dangan locality	As for Peter and Michelle Connelly #1, in addition: The proximity and layout of the cSAC has clearly influenced the route of the proposed road in the Dangan locality, with the designers avoiding an adverse effect on the integrity of the cSAC. When considering the GCOB route, and the use of IROPI, it is important to remember that Article 6(4) also includes consideration of alternatives; there must be no feasible alternative to a proposed route which damages a cSAC for IROPI to be applied. There has been a negative assessment of the GCOB under Article 6(3) of the Habitats Directive and it has been decided not to proceed to the next steps under Article 6(4). If an assessment of alternatives under Article 6(4) were to be done, the currently proposed route of the N6 GCRR, or something similar, may well be the feasible alternative and would immediately take precedence over the GCOB route. That said, tunnelling along the GCOB route may also have been a feasible alternative.

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
				<p>Moreover, I understand that the GCOB route has been rejected primarily because it does not meet with the objectives of the Galway Transport Strategy.</p>
9	Ob_521 517.14.01	Annette and Michael Kerin	<p>Also make the case that the consideration in the EIAR of alternatives did not adequately consider the effects on human beings and that, there being no real difference in terms of ecological impact between the routes, impacts on human beings would be the deciding factor.</p>	<p>As for Peter and Michelle Connelly #1, in addition:</p> <p>It is correct that consideration of alternatives is required under the EIA Directive, which states that the impact assessment must include “a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment” which includes the impact on human health and biodiversity. The EIA Directive does not give weight to either, nor requires prioritisation of one over the other, merely requiring a description. Other guidance makes clear that the depth and extent of the description should be proportionate to the impact in both cases.</p> <p>For a route options which would have an adverse effect on the integrity of the Lough Corrib cSAC, the law protecting the cSAC would prevent the use of such a route where feasible (in an engineering sense) alternatives exist, even if the impacts on flora and fauna are otherwise more or less equal between the Lough Corrib route and the alternative, see response to James McLoone for more detail.</p>
10	Ob_521	The Kerin family, per Ciaran Sudway and Associates	<p>Objects due to inadequate assessment of alternative routes nor given reasons for their rejection in compliance with the Habitats Directive, referencing case number C-461/17, that the EIA are did</p>	<p>As above.</p>

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			not specifically consider the impacts of the proposed Rd on the Kerin family, and that the EIAR for the proposed road did not give adequate attention to the impacts on the human environment.	
11	Ob_531.01	James McLoone	Makes similar points as Colm and Marie O'hEocha but goes further making the case that the N6 GCRR would not be found to be a reasonable alternative to the GCOB.	<p>As for Colm and Marie O'hEocha, in addition:</p> <p>The wording of the Directive is “the absence of alternative solutions”, with no qualifier, and the guidance is that this assessment of alternatives should be solely on the basis of ecological criteria i.e. the effects on the conservation objectives of the Natura 2000 sites, rather than economic/public interest criteria at that stage. In other words, the applicant had no choice but to choose an alternative option to one which damages the integrity Lough Corrib cSAC where such alternatives exist and are feasible (rather than reasonable) and without consideration of economics and public interest.</p> <p>Economic/public interest criteria only considered if no feasible alternatives are found to a development which results in the contravention of the conservation objectives.</p> <p>A full assessment has not been done because Article 6(4) has not been invoked however it does seem likely that the alternative assessment based upon the GCOB would point towards a solution like the N6GCRR or perhaps a tunnelling solution along the GCOB route, before IROPI would be invoked.</p> <p>See “Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC” (link)</p>

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12	Ob_531.02	Donal & Elizabeth Courtney	As for Colm and Marie O'hEocha, again with respect to the Dangan locality.	As for Colm and Marie O'hEocha
13	Ob_534	Paddy & Marina O'Malley	Makes the case that ecology has been prioritised over impacts on people's homes and the investigation of alternatives is inadequate, again with respect to the Dangan locality.	As for Colm and Marie O'hEocha
14	Ob_569	Paul and Anne Mulhern	As for Paddy and Marina O'Malley, making the case that there has been inadequate attention given to impact on humans in the EIAR, with respect to the Menlo area, and requesting an amendment to the route alignment which would take it close to or into the Lough Corrib cSAC.	As for Annette and Michael Kerin and James McCloone, in addition: A revised route amendment as suggested would require a fresh look at the effects on the Lough Corrib cSAC, if it infringed on Annex I habitats then it is most likely Article 6(4) of the Habitats Directive would be invoked in which case it would need to be demonstrated first that there is no alternative (which there is, in the form of the existing preferred route) and then that there are imperative reasons of over-riding public interest, or if it did not infringe on Annex I habitats, then the amendment may be possible under Article 6(3) of the Directive in the same way as the current proposed route.
15	Ob_612	Loreta Needham and Tom Rea	Also makes the case that protection of designated sites and wildlife has been prioritised over people in the route selection, stating preferences for the GCOB, including pursuit of the IROPI option	As for Annette and Michael Kerin and James McCloone.

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
16	Ob_613_657	Sharon Morris and Edward O'Reilly	Also makes the case that protection of wildlife has been prioritised over people, with reference to bat surveys and plans to relocate the bats when buildings are demolished.	As for Colm and Marie O'hEocha, in addition: The surveys and compensation measures for bats are a legal requirement and so must be done in the event that the road is constructed, provision for bats is a separate matter to consideration of the impact on private property.
17	Not listed?	Sean & Kathleen Martyn	Also makes the case that protection of wildlife has been prioritised over people, with reference to plans to relocate the bats when buildings are demolished receiving more consideration in the EIAR than homeowners. .	As for Sharon Morris and Edward O'Reilly
18	S_049	Michal and Trisha Murphy	Also makes the case that protection of wildlife has been prioritised over people, making the case for the original GCOB route and invoking IROPI under Article 6(4) of the Habitats Directive, although also refers to unacceptable impacts on designated sites at Cappagh/ Ballymoneen and the River Corrib	As for Annette and Michael Kerin and James McCloone, in addition: It is correct that the proposed road would have an impact on local biodiversity area at Cappagh/ Ballymoneen and this has been addressed in both the EIAR and in my ecological impact assessment report. The bridge however over the River Corrib should ensure no direct impacts here and subject to adequate maintenance the road run off will be treated and significant impacts on the River from pollution should be avoided
19	S_068	Galway N6 Action Group	Also make the case that the assessment of alternatives and route selection process was flawed, being excessively concerned with impacts on flora and fauna, SACs and SPAs, and avoiding the use of Article 6(4) of the	As for Annette and Michael Kerin and James McCloone,

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			Habitats Directive (the primary consideration) to the detriment of impacts on humans (a secondary consideration), with an apparent preference for no road at all, followed by a road to be located further north than currently proposed, potentially with tunnelling, or lastly, additional tunnelling along the current route at Dangan.	
20	S_070	Mary and Tom Kilgarriff	Also makes the case that protection of wildlife has been prioritised over people, and that the route selection process was not adequate, inferring that the environmental impact assessment and route selection should give more weight to human beings	As for Annette and Michael Kerin and James McCloone.
21	Ob_111	Pat Duane and Joy Bolster	Listed by the applicant but no specific points on ecology/biodiversity.	N/A
22	Ob_134	Gerard and Susan O'Dell	Makes the case that a proposed compensatory habitat area which would support dry heath will not be maintained and is inappropriate in this location, preferring a more managed amenity or agricultural land use for this plot.	The provision of compensatory habitat is necessary to offset the impacts of the proposed road on biodiversity, the site chosen for dry heath creation would need to be on relatively well drained acid soils which are prevalent to the west of the River Corrib. The exact location is a matter for the applicant's design, however the quantity created should be at least equal to that lost, and ideally several times more to account for risk. An alternative location on another person's land would be required if dry heath were not created here.

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
				<p>I would agree that fewer, larger areas of habitat creation than is proposed would give better results and be easier to manage.</p> <p>Management is essential for the maintenance of dry heath, it must be lightly grazed (which is not an option within the soft estate) or cut infrequently but regularly to prevent succession to woodland, and bracken may need to be controlled.</p> <p>The applicant has committed to preparing an ecological monitoring plan for each dry heath receptor site, including monitoring for at least 5 years and some management tasks presumably within the same period. There is a commitment to manage the calcareous grassland at Lackagh quarry in perpetuity, SEC 8.19, but I could find no such commitment to dry heath habitats, this needs to be addressed and I have specified additional mitigation to cover this point which may provide you with some reassurance.</p>
23	Ob_583	McHugh Property Holdings	<p>Whilst overall supportive of the proposed road, expresses concern about the extent of additional lands on their property, Lackagh quarry, being used to provide compensatory habitat to replace areas of Annex I habitat lost because of the proposed road and is therefore objecting. An alternative location at Kinvara is suggested, and the overall need for compensatory habitat and its quantum is not contested. .</p>	<p>The provision of compensatory habitat is necessary to offset the impacts of the proposed road however the location just needs to be in an area which has suitable geology and soils.</p> <p>It does appear as though the areas being used for deposition of excess material which cannot be used for road construction are also being used as convenient places for habitat creation even if these are not necessarily the most suitable areas for such habitat.</p> <p>A concern with the habitat creation at Lackagh quarry is that it is proposed to create dry calcareous grandstand upon material deposition areas containing peat and within an area which may occasionally flood. In my opinion, there is a reasonable prospect that some of the grasslands created here will not achieve the quality required to compensate for lost Annex I habitats. I have only been able to assess the proposal put forward by the applicant, but I could</p>

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				say that the use of an area of now agriculturally improved grassland that was the Annex I habitat in the past as a receptor site would give more certain results. The issue with compulsory purchase which not go away as clearly the compensatory habitat will need to be provided on somebody's land.
24	Ob_566_598	Sylvester McDonagh	Objects to the compulsory purchase of lands at Menlough for use as bat mitigation, indicating that there are lots of other places where the mitigation could be located which would be more suitable for bats.	Menlo Castle supports an important roost for Lesser Horseshoe Bats and therefore the lands around the castle are the best location to provide foraging habitat for this species, as set out by the applicant in the Biodiversity evidence p35-40, I agree with the applicant's assessment set out on these pages.
25	Ob_6 48	Mary Flattery	Objects to land being used to compensate for impacts on bats, making the case that existing designated areas (SAC) are more than adequate to provide habitats for bats.	As for Sylvester McDonagh, in addition: The SAC does not provide enough habitat on its own to sustain the local bat population. Therefore, compensatory habitat is required to offset losses that would be caused by the proposed road. Even with the proposed compensatory habitat, there is a risk that bat populations decline locally because of the proposed road.
26	Ob_481	Nora Keane	Objects to the loss of a stone wall (and replacement with a fence) and stone walls in general partly due to loss of habitat for animals and plants.	It is correct that the proposed road will result in a net loss of stone wall habitat with consequent effects on the wildlife which inhabits the walls as well as bats which may use the walls as features along which to commute. This is a relatively minor impact when compared to the loss of semi-natural habitats such as wet heath and limestone pavement but an impact, nevertheless.
27	Ob_480	John Feeney	Objects due to the loss of stone walls which is contrary to the Galway City and Council Development Plans.	It is Galway City Council's policy to encourage the retention of stone walls within new development where feasible. However, the council also has an overriding policy for the GCRR, which states that the

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				GCRR has priority over other plan policies, including that concerned with the protection of stone walls.
28	Ob_311	Matthew and Eileen Burke	As Nora Keane for stone walls (similar text), same property consultant, also object to the serious negative impact the proposed road will have on wildlife and whether any consideration was given to wildlife in the area (Rahoon).	As Nora Keane for stone walls. The applicant has addressed the effects of the proposed road on wildlife (biodiversity) in the EIAR and obviously my report also addresses the topic. It is correct that the proposed road will result in the loss of biodiversity, as set out in the conclusion of my report. The applicant has put forward measures to mitigate the impact, and I have suggested additional mitigation. There remains in the proposal an extensive loss of habitat, plus fragmentation and isolation of remaining habitats along the route corridor which will deplete wildlife, as set out in Table 13 of my ecological impact assessment report. The impacts on biodiversity will be considered as part of the planning application process.
29	Ob_246	Matthew and Mary Burke	As Nora Keane (similar text), same property consultant.	As Nora Keane.
30	Ob_201	Martina Concannon and Alan Giblin	Make an explicit observation with respect to the impact on wintering curlew at Cloughscoilte noting that 2.2 hectares of their habitat will be lost directly and that there will also be effects on curlew using the surrounding land and potentially those flying over the proposed road, reports a flock of around 15 curlew feeding daily in nearby fields.	The wintering population of curlew is primarily made up of migrants which breed outside of Ireland. This species does not have specific protection outside of the bird breeding season although the wintering population here could be part of population that forms the qualifying interest feature of the Inner Galway Bay SPA, if so this provides some protection i.e. the curlew population of the whole bay is to be maintained at a favourable conservation condition (it is currently in favourable condition). It is correct that a small number of curlew will be displaced by the construction and operation of the proposed road, both from the footprint of the road and up to 200m on either side. The birds may well find alternative habitat in which to forage. However, the

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			<p>Also request the use of evergreen species for screening planting including Scots pine and holly.</p>	<p>scientific evidence is that displaced wading birds do not fare well. Even so this may not cause any more than short-term decline in the population if there is ample alternative foraging habitat available, as the applicant asserts in the Biodiversity evidence p47. On balance, I would expect a change in distribution (birds moving away from the road) and a small decline in the population, which will be difficult to perceive (i.e. it would not cause appreciable population level effects). The observer's numbers are treble those reported by the applicant during its winter bird survey and they do not provide any supporting evidence or details of location (photos and maps) From their submission, I am not clear if these birds are habitually foraging within 200m of the route of the proposed road. Any impacts could be addressed by Galway City Council through the inclusion of wet grassland management in the Biodiversity Network for the city.</p> <p>The road would not be expected to present a barrier to the movement of the birds as this species readily crosses existing road infrastructure.</p> <p>Scots pine is unfortunately a non-native species which is invasive in sensitive habitats such as heathland therefore I suggest this species is not planted in proximity to heathland habitats. The same issue does not apply to holly and therefore a higher proportion of holly in the species mix would be acceptable.</p>
31	S_074	Menlough and Ballindooley Residents	Notes that the EIAR records 121 unidentified species and asks whether these species have subsequently been identified and for the list to be made available, make the point that these need to be considered.	I was not able to find a reference to unidentified species other than pipistrelle bats, which would be either common or soprano pipistrelle, which have a similar conservation status. Following the production of the EIAR, a Further Information Request was made of the applicant which included much more detailed vegetation surveys along the route of the proposed road with most species

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			<p>Notes that there will be significant losses of hedgerows which provides sanctuary to birds, requesting information on the legal position with regards to clearing bird nesting habitat during the nesting season.</p>	<p>identified fully, with a small number identified to genus only. I am satisfied that enough information has been gathered the plant and animal species present along the proposed road to make an informed ecological impact assessment and this has now been done and will be considered when determining the planning application for the proposed road.</p> <p>The applicant has confirmed that 7.2 kilometres of hedgerows and 5.2 kilometres of tree lines will be lost, which will be a significant impact. The applicant has committed to clearing the vegetation outside the bird breeding season, or having an ecologist supervise the works, SEC 8.42. This does quite amount to protection of the nests but is inferred that active nest would not be destroyed. And of course, this is only helpful during the construction period, after that a decline in the breeding bird population would be expected due to loss of habitat.</p> <p>The legal position is that all wild birds receive protection in Ireland, under the Wildlife Act 1976 as amended; the original exceptions in the Third Schedule of the Act all now receive protection as a result of amendments in 1980 (bullfinch) and 1985 (all the others). The law prohibits hunting (with exceptions); injury; wilfully taking, removing, destroying or mutilating eggs and nests; and wilfully disturbing protected species of birds on or near a nest containing eggs or young. Furthermore, Section 40 of the Act prohibits, with certain exceptions, the cutting, grubbing, burning or destruction of vegetation on uncultivated land between 1st March and 31st August, which covers the nesting and breeding season for most birds. The law includes a specific defence for those constructing a road or carrying out any other building and construction work, meaning that unintentional (NB this word was introduced in the</p>

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			<p>Observes that there is no reference in the EIAR to the many species of bees which inhabit the area, noting that there may be rare species of bees present and presenting photographs of nests from Lough Corrib cSAC and observing that there are similar nest sites in the adjoining areas. Also observes that there are ant hills which were not referred to in the EIAR.</p>	<p>1985 amendment) killing, injury, etc of any bird species is not an offence if it occurs as a result of such activity. This means that deliberate destruction of bird nests during construction would be an offence.</p> <p>The applicant responded specifically to the impact in bees in the statement of evidence on biodiversity, stating that the main habitats affected in Coolough area are woodland, scrub and improved grasslands, which are not good habitats for bees, while the proposed habitat creation within Lackagh quarry will provide good bee habitat, and provide a positive impact on bee populations. However, some bee species are found in woodland and can take advantage of woodland flowers in early spring, while woodland edge can also provide good foraging habitat for bees.</p> <p>Bee nests tend to occur in rough grassland, as shown in the photograph provided, with only a small patch needed. It is not clear whether any nest sites or suitable habitat for nest sites will be affected by the proposed road, nor what species of bee or bees would be affected if so. From your photographs, there may be three species of bumblebee present, possibly (i) <i>Bombus terrestris</i> or <i>B. lucorum</i>, (ii) unidentified species and (iii) a carder bee, most likely <i>Bombus pascuorum</i>, however it is hard to tell from the images exactly which species. If my identification is correct, these are common species, impacts on which would not be significant. However, perhaps more could be done in mitigation to provide habitat for bees within the soft estate for the proposed road.</p> <p>The ant hills are most likely of yellow meadow ant, which is also a common species, upon which impacts would not be significant. Although again, perhaps more could be done in mitigation if any significant ant hills are to be lost as a result of the proposed</p>

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			<p>Observes the presence of endangered orchids in the area</p> <p>Observes that there will be impacts on protected species including lesser horseshoe bat and that the bats are unlikely to occupy replacement roosts</p> <p>Requests that ash is not included in the tree planting mix to avoid the introduction of ash dieback disease.</p>	<p>including translocation of the ant hills which has been shown to be successful elsewhere, see Box, J. D. (1987). A simple technique for the translocation of anthills. <i>Field Studies</i>, 6(4), 617-618.</p> <p>The orchid species recorded in the route corridor by the applicant are pyramidal orchid <i>Anacamptis pyramidalis</i>, common spotted orchid <i>Dactylorhiza fuchsia</i>, O'Kelly's spotted orchid <i>Dactylorhiza fuchsii v. okellyi</i>, heath spotted-orchid <i>Dactylorhiza maculata</i>, a sub-species of heath spotted-orchid <i>Dactylorhiza maculata s. ericetorum</i>, a spotted orchid <i>Dactylorhiza sp.</i>, common helleborine <i>Epipactis helleborine</i>, a helleborine <i>Epipactis sp.</i>, fragrant orchid <i>Gymnadenia conopsea</i>, common twayblade <i>Listera (Neottia) ovata</i>, early purple orchid <i>Orchis mascula</i> and lesser butterfly-orchid <i>Platanthera bifolia</i>. These are all classified as being of least concern in Ireland however the variety <i>Dactylorhiza fuchsii v. okellyi</i> is found mainly in Ireland. At least some individuals of these are likely to be impacted during the road construction, although some may be included in areas of grassland to be translocated to the habitat creation areas. Translocation of orchid plants is possible and could be included in the mitigation, where not already included in grassland translocation.</p> <p>You are correct that there will be a negative impact on protected species such as lesser horseshoe bats. There is however good evidence that replacement roosts are used by bats if they are in the right place and well-designed, see for example case study 4.</p> <p>The use of ash and other tree species is governed by S.I. No. 459/2020 - European Union (Plant Health) Regulations 2020 which, if followed, should ensure that ash dieback disease is not imported to the locality, through the planting of ash trees, however the disease is now prevalent in Ireland and likely to cause the death of</p>

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			<p>Observes that the EIAR fails to consider the populations of hare present at Lackagh quarry, Lough Corrib SAC and the surrounding areas, or a feral goat population in the same area and the impacts on pine marten which live along the route.</p> <p>Observes the loss of Annex I and Annex I priority habitats, stating that this is ill-considered and reckless, stating that the loss of such habitat is irreplaceable, and that the mitigation measures mentioned in the EIAR are unrealistic.</p>	<p>the majority of ash trees over the next two decades (Ash dieback - Teagasc Agriculture and Food Development Authority), regardless of any planting. The applicant may decide not to plant this species given its likely demise, and this would be a sensible decision.</p> <p>The EIAR does consider the effects on hare and pine marten populations, and I have also assessed the impacts on these species in my ecological impact assessment report. Irish Hare is relatively common in Ireland and whilst there will be a localised impact, this is not considered to be significant by either the applicant or me. Pine marten, however, is one of the rarest native mammals in Ireland and the loss of one territory is predicted by me (but not the applicant) and therefore, in my view, the road would have significant impact on pine marten populations. Goats are not native to Ireland and therefore would not normally be considered of ecological value.</p> <p>It is acknowledged by the applicant that there will be a loss of Annex I habitat including small areas of two types which it considers irreplaceable: wet heath and limestone pavement. However, the applicant has proposed compensatory habitat creation for some Annex I types that it considers re-creatable. including dry heath and calcareous grassland. Therefore, while there will be a net loss of limestone pavement and wet heath, the compensatory habitat may go some way towards replacing lost areas of other Annex I habitats. I agree that there is however a risk that the replacement habitat does not achieve the quality or condition required, especially the calcareous grassland proposed for Lackagh Quarry, and this is acknowledged in my report.</p>

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			Notes the potential impact of road construction on curlew and lapwing Ballindooley Lough.	The proposed road would not result in direct impacts Ballindooley lough and blasting activity for the construction of the road will not occur during the winter months, when it would be expected that curlew and lapwing are present at the Lough, therefore these species populations should not suffer disturbance during the construction of the road.
32	S_039	Joseph Hynes	Objects to the proposed road due to impacts at the River Corrib including the ecological impact.	The River Corrib will be crossed by a bridge and therefore the river and its wildlife would not be affected directly during the construction and operation of the road, there are risks of pollution during construction and operation, but these can be fully mitigated (with maintenance), which should safeguard the fish, otters and mussels for example that inhabit the river. Perhaps the main ecological impacts here are partial loss of the woodland on the east bank, potential displacement of a regular oystercatcher flock from the NUIG fields, and risks to barn owl, bats and other mammals from road traffic when the road is operational. These impacts are of at least local significance and should be considered when the planning application is determined.
33	S_046	Mary Silke	Raised a concern about the effect on garden wildlife including bats, hedgehogs, foxes, rabbits and birds at her property which is c. 100m from the proposed road nr Galway Racecourse	Bird densities are lower in proximity to roads and this is addressed in paragraph 9.8.1 of my report and it may be that other wildlife is similarly affected. Given the location of the garden, it is possible that the number of breeding birds in and around are reduced in number in and around the garden, with the other species you list also potentially affected as well due to loss of habitat and mortality during the operation of the road.
34	S_062	Sarah Silke	Also raised a concern about damage to garden wildlife, especially that arising from dust during construction	As for Mary Silke, in addition: Construction dust would not result in the mortality of birds, rabbits, foxes and hedgehogs, such mortality is more likely to occur for birds

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				and fox when the road is operational due to collisions with traffic and could well result in a population decline, as you suggest. Mammal resistant fencing should prevent mortality (and decline from this cause) of the other mammal species that you mention. This has been accounted for in my impact assessment, see Table 13 for example, and will be considered during the planning application process.
35	S_066	Siobhan Silke	Also raised a concern about the effect on garden wildlife at her property	As for Mary Silke
36	Ob_136	Barbara Flaherty	Listed by the applicant in the Biodiversity evidence but no specific points on ecology/biodiversity?	N/A
37	Ob_141.2	Angela Silke	Mentions enjoyment of wildlife in proximity to her property, including swallow, ducks, cuckoo and fox which live in nearby hedges and trees, with part of the garden also lost to development. The property is located in Forramoyle East, Barna	It is the case that bird densities in proximity to the proposed road are likely to be lower than currently, although the effect may not be so pronounced in the western section where this property is located due to lower volumes of traffic. Foxes are also vulnerable to being killed by traffic, although the design does include underpasses which could be used by this species. The effect on birds and other wildlife will be considered when the planning application is determined.
38	Ob_199	Thomas Concannon	Objects for a variety of reasons including the negative impact on the general ecology of the area around CPO Ref 199, which has a vast array of flora and fauna.	It is the case that along the route of the proposed road there will be a significant loss of flora and fauna, and some areas of irreplaceable habitat, as set out in the EIAR and my ecological impact assessment report. This will be considered when the application for the proposed road is determined.
39	Ob_630	Geraldine Boyle	Objects to the proposed road for reasons including that it is contrary to	The reference in the Galway City Development Plan for the Castlegar area and biodiversity is to the outcome of a public

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			the Galway City Development Plan for the Castlegar area, which highlights protection biodiversity in the Castlegar area as a priority and the huge disruption that construction of the road what have on wildlife and habitat in the area	consultation, rather than a policy statement. However, parts of the Castelgar area are included in the Ballindooley - Castlegar Local Biodiversity Area which is protected through policies in the local plan; Policy 4.2. It may be that up to 1.0ha of this LBA is affected. There is however a policy for the N6 GCRR which appears to override Policy 4.2 for the purpose of constructing the road.
40	Ob_751	Tom Burke	Objects to the proposed road for a variety of reasons including significant adverse impacts on the environment, including flora and fauna, which will be irreparable.	As for Thomas Concannon
41	S_017	Derrick Hambleton	Does not make a specific point about biodiversity but makes the observation that all environmental impacts should be identified and mitigated by the applicant, with appropriate alternatives considered, and that any deficiency in the EIAR should be remedied by an information request and that the board should only grant consent for the project when it can be demonstrated that the direct and indirect impacts happen identified at any significant adverse effects mitigated.	The purpose of the EIAR and the further information response is to provide information on the likely significant effects of the proposed road on the environment, including biodiversity. Unlike the habitats Directive, the EIA directive does not require tests to be met in order for consent to be granted. Therefore, the identification of significant impacts, mitigated or otherwise, does not necessarily lead to the refusal of planning consent. You will see from the further information request, that I did consider there to be gaps in the information provided in the EIAR. However, these were remedied through the information supplied both in the further information request and presented by the applicant at the oral hearing and have allowed an adequate description of the significant effects, with respect to biodiversity, to be made.
42	S_022	Eve Daly and Laura Kennedy	Observes that Dangan offers opportunities to connect with nature including the biodiversity trail which takes the public through natural	The comments relate mainly to the effect on people however It is correct that there will be an impact on biodiversity in this area, particularly the woodlands at Menlough and the NUIG sports pitches. This is partly offset by the creation of enhanced habitats for

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			habitats which exist along the banks of the River Corrib and that this situation will be adversely affected when the proposed road is constructed.	bats around Menlo Castle and impacts on the riverbanks are largely avoided with the construction of the River Corrib bridge.
43	Ob_155	Finbarr And Margaret McCarthy	Objects to the proposed road including on the grounds that the surrounding rural countryside and ecology would be overwhelmed with extra pollution unhealthy fumes and noise which would affect humans and widespread wildlife including birds, bats and other ground creatures and flora, with respect to the Barna region.	It is correct that the proposed road would result in the loss of biodiversity in the Barna area, principally through the loss of habitat during the construction of the road, with effects from air pollution and noise pollution being quite limited. However, there is evidence that numbers of birds are reduced in proximity to roads, which may be partly to do with these factors. The same may apply to other species. This is addressed in my report and will be considered as part of the planning consent process.
44	Ob_216	Mr Shane Kelly	Objects for reasons including Badger disturbance and the subsequent spread of bovine TB and mitigation.	The proposed road would result in some disruption to badger social groups. This is however mitigated through the provision of replacement setts and badger crossing points underneath and over the road. These measures will limit the degree to which badger territories are disrupted and therefore limit the dispersal of badgers. Overall, with the proposed mitigation, I would expect a relatively minor perturbation which would settle once the road becomes operational, see the case study referred to be the applicant in its Biodiversity evidence p48, for example. The effect of the proposed road on badger dispersal would not be expected as much disruption as an area wide cull. The science on the spread of TB by badgers is complicated, however, there may be a very slight increased risk to cattle during construction and the first year of operation, and then returning to baseline levels of risk.
45	Oral hearing	The Department	Considers further detail is required in relation to the ecological impact	Other than the potential for de-watering Moycullen Bogs NHA, these points were addressed by the applicant in the module 1 response,

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
		of Culture, Heritage and the Gaeltacht	assessment (in addition to those required for the appropriate assessment under the Habitats Directive) these were (i) potential de-watering affecting the water table at Moycullen Bogs NHA; (ii) marsh fritillary mitigation; (iii) Annex I habitat creation including remedial actions; (iv) mitigation for peregrine falcon; (v) net effect on barn owl foraging habitat. The Department stressed the importance of effective and timely mitigation in order for the applicant's conclusions to hold.	65 pages plus appendices, which I understand meets the expectations, in terms of clarity, of the DCHG. The clarifications are welcomed and have based my assessment of the effects on the road on biodiversity based upon the responses provided by the applicant. In addition, all parties appear to be satisfied that the proposed road would not result in de-watering of the Moycullen Bogs NHA.
46	Oral hearing	Mrs Deidre Goggin	Raised points about the impacts on wildlife in and around homes and gardens at Castelgar and the links of a wildlife corridor to Ballindoooley wetlands which do not seem to have been considered by the applicant in the EIAR.	The points about impacts on garden wildlife have been raised by others previously; it seems likely that there would be a negative effect from the road on wildlife, including garden wildlife, in proximity to the road, and also that there would be a degree of isolation of habitats and wildlife populations to the south of the road. I have considered these points in my impact assessment.
47	Oral hearing	Mr Kevin Gill	Raised concerns about the apparent priority of ecology and biodiversity over the impact on humans, in particular the effect on private property, in the route selection process and the potential for the mitigation (monitoring and management) to fail, citing examples of other failures, and how long the commitment to manage mitigation	The points about priorities were also raised in Mr. Gill's written submission, and these are addressed in row 5 of this table. There is a risk of the failure of the mitigation measures; in my experience this all depends on the quality of the detailed design, and the commitment to post-construction management, informed by high quality monitoring. The habitat creation measures are feasible, although I have reservations about the quality of the design for the calcareous grassland at Lackagh Quarry and suggest this is discounted by 50% to account for the risk of failure. Fewer, larger

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			lasts, notes that the cost to people and the environment will be very high if the scheme is consented.	<p>areas of created habitat would make it easier to maintain, however, it is possible to manage small areas well. The applicant has stated its commitment to monitoring and management, and has committed to manage the calcareous grassland at Lackagh Quarry in perpetuity, but is vaguer about the time period for other habitats, I have proposed additional measures to address this point.</p> <p>I believe I have set out clearly the ecological impact that would be expected as a result of the proposed road and this will be considered during the planning application process, alongside the costs and benefits to the human population.</p>
48	Oral hearing	Mr Peter Connelly	Raised concerns about the apparent priority of ecology and biodiversity over the impact on humans, preferring a route to the north of the GCRR, such as the GCOB, noting that the land here has all been subject to farming and whether mitigation/compensation could be applied, and also the impact on stone walls with around 3000m of stone wall lost and only 1000m created, with post and rail fencing used instead, which would cause damage to soils etc during installation and re-installation.	Mr. Connelly makes similar points in his two written submissions and these are responded to rows 3 and 4 of this table. The point about net loss of stone walls is also addressed above; the habitat in the fields between the stone walls is generally more valuable for biodiversity, nevertheless the net loss of stone walls is one of the impacts of the proposed road which could perhaps be mitigated further as you have suggested.
49	Oral hearing	Mr Brendon Mulligan	Cites one planet living principles including biodiversity protection, and the general need for biodiversity protection in general, and the links between climate change and biodiversity loss, and the need to act	<p>Mr. Mulligan provides a good summary of the current state of biodiversity loss, climate change and the interaction between the two.</p> <p>Moreover, you are correct that the construction of the proposed road will contribute towards biodiversity loss and that there is some</p>

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			<p>now, in response to the climate and biodiversity emergency, with the N6 GCRR contributing significantly to the detriment of biodiversity in Ireland, and the actual implementation of the mitigation is uncertain, questioning if the resources needed will really be available for its successfully implemented, meaning the outcome may be even worse than described in the EIAR with increased carbon emissions making matters worse still.</p>	<p>uncertainty with respect to habitat creation, the net effect being between approximately 80ha and 100ha loss of higher value habitats, depending on the success of the habitat creation, plus the effects of fragmentation, isolation etc. The net loss of biodiversity was acknowledged by the applicant at the oral hearing and I have set out clearly in my ecological impact assessment report.</p> <p>That said, the Galway County and Galway City Development Plans contain measures which work in the opposite direction, such as the establishment of an ecological network in Galway City and a commitment to implement management plans for Natura 2000 sites in the County. The net effect on biodiversity has not been calculated. It would be possible, as set out in my conclusion, to go further than this and more directly offset the loss of biodiversity resulting from the proposed road through habitat restoration and enhancement elsewhere in the county. These measures could also assist with carbon sequestration.</p>
50	Oral hearing	Mr Patrick McDonagh	<p>Raised concerns about the effects of the flooding within Lackagh Quarry being exacerbated by material deposition in the quarry, the potential for polluted road run-off to reach Lough Corrib cSAC via ground water infiltration basins, the effect of material deposition within the quarry on petrifying springs within the quarry, the effect on carline thistle in Lackagh Quarry, potential loss of ant hills, foxes and the local hare population, which is substantial.</p>	<p>The points made by Mr. McDonagh were also made in his written submission, and are responded to above and in Appendix 3 of my appropriate assessment report. Additional points relate to petrifying springs and Carline thistle, which will be impacted during the construction of the proposed road.</p> <p>Carline thistle <i>Carlina vulgaris</i> is classified as Least Concern in the Ireland Red Data Book and is widespread in Leinster and Connaught; therefore impact on this species would not be significant beyond the local area.</p> <p>The impacts on petrifying springs are acknowledged by the applicant in the EIAR and subsequent documents and have been accounted for in my impact assessment see Table 13.</p>

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
51	Oral hearing	Mr. Michael O'Connor	Mr. Michael O'Connor makes points about the ability of the environment/ biodiversity to recover, citing the Mutton Island Waste Water Treatment, and that adequate account appears to have been made of ecology/biodiversity impacts by the applicant in order for the road to be consented.	I cannot comment on the Mutton Island impacts or effectiveness of the mitigation, but I can agree that it is possible to avoid, mitigate or compensate for impacts on biodiversity for some developments, and even provide a net gain. With respect to the proposed road, this would have an overall negative impact on biodiversity which would be partially mitigated in the applicant's proposals.
52	Oral hearing	Mr Tom Corr who represents Dermot and Sarah Harney	Mr Tom Corr who represents Dermot and Sarah Harney who raised concerns about the use of a nearby building as a replacement bat roost, preferring it to be elsewhere away from their property.	It will be a legal requirement to replace the bat roost somewhere in the vicinity of that being lost. I agree with the points made by the applicant's ecologist at the oral hearing that the presence of the bats in replacement roost with not be noticeable and that it will not attract predators or scavengers.
53	Oral hearing	Mr Stephen Dowds who represents of N6 Action Group	Mr Stephen Dowds who represents of N6 Action Group who mainly makes points relevant to impacts on Lough Corrib cSAC which is relevant to the appropriate assessment report, mainly but also sought clarification about the route selection process and avoidance of designated sites and development sites.	The clarification on the route selection process was provided by the applicant at the oral hearing, I believe to your (Mr Dowds) satisfaction.
54	Oral hearing	Mr Vincent Carragher	Raises concerns about animal corridors and the movement of species, the EIAR is flimsy and does not cover insects well enough, nor firm detail of corridors and how these will account for land-based invertebrates (as well as vertebrates), essentially the	It is correct that the proposed road will fragment some habitats and isolate those to the south of the road, this will be mitigated by the provision of underpasses, bridges, ledges in culverts, tunnels and overbridges, however the overall "permeability" of the landscape will be reduced from today particular for small land-based animals, but also bats. I have considered this point in my ecological impacts assessment and it has informed my conclusion. I agree that EIAR

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			assessment and mitigation is not adequate.	could have dealt with invertebrates more thoroughly, however, the value of invertebrate communities/populations is generally commensurate with the value of habitats and I have undertaken my assessment on that basis.
55	Oral hearing	Mr. Dermot Flanigan on behalf of McHugh Property Group	Mr. Dermot Flanigan on behalf of McHugh Property Group makes the case for material deposition areas and compensatory habitat to be other than in Lackagh Quarry, and for reduced quantity of grassland with a ratio of slightly greater than 1:1 being all that is required.	<p>It is necessary for compensatory habitat to offset losses of Annex I and other important habitats. The applicant has proposed the creation of compensatory habitat to replace some Annex I habitats affected by the proposed road but not other habitat types specifically. This means that there would be overall net loss of higher value habitats, rather than a gain.</p> <p>There is no standard ratio of gain to loss established in Ireland however in England the approach is set out in Natural England's Defra metric 2.0. Looking at calcareous grassland specifically, the ratio from this metric would be approximately 7ha to be created for every 1ha lost. Limestone pavement is regarded as irreplaceable and therefore no ratio is available from this source, but it could be assumed to be at least the same ratio.</p> <p>The proposed road would result in the loss of approximately 0.25ha calcareous grassland and 1ha of limestone pavement, so 1.25ha which when multiplied by 7 gives 8.75ha, which is above the amount proposed to be created. On that basis, and given the overall net loss of higher value habitats described above, I do not think there is an argument for reducing the level of compensatory habitat.</p> <p>The location of the created habitat would ideally be a restoration of where it occurred previously; the use of a highly engineered solution (including on buried peat) in the base of a quarry does not seem to be an ideal solution or location however it is the only one put</p>

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
				forward by the applicant and I have made my assessment on that basis.
56	Oral hearing	Galway Athletics Board	<p>Raised concerns the following points:</p> <p>(i) impacts on the River Corrib and surrounding area (including loss of access to nature by people) and its plant and animal life;</p> <p>(ii) impacts on badger, including the efficacy of badger/mammal underpasses,</p>	<p>The River Corrib is spanned by a bridge and the water being discharged into the river will be treated beforehand which means that significant direct and indirect effects on the river and its wildlife are not expected, provided that the construction works are well managed, to avoid run-off into the river, and the water treatment infrastructure is properly maintained when the road is operational. I could agree that the presence of the road would be detrimental to the enjoyment of nature in this locality by people however it should not preclude it altogether.</p> <p>There will be direct and indirect effects on badgers, as set out in the EIAR and my ecological impact assessment report. You make valid points about the need to install wildlife underpasses correctly and to have enough of these, coupled with fencing, to prevent or reduce traffic mortality of badgers and other mammals. If installed correctly, these underpasses are effective. My assessment is that more culverts need to be made suitable for otter (and therefore badger) and that with these the quantity of crossing points to be provided is adequate for these two species and other large mammals such as fox. Mammal resistant fencing (post and rail construction) is effective for badger but not fox or pine marten which can easily scale the fence. The fencing is to be installed along the entire route</p>

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			<p>(iii) impacts on kingfisher, other birds and the adequacy of the bird survey which did not detect kingfisher;</p> <p>(iv) impacts on bats, including loss of 14 roosts in buildings and two in trees, loss of foraging habitat, noise and light pollution,</p> <p>(v) risks to peregrine falcon, affecting one of only two nesting pairs in the whole of Galway.</p>	<p>except for small areas close to the junction with the existing N6. This should prevent most badger mortality.</p> <p>The bird survey work is borderline adequate for a scheme of this size and the number of visits is in accordance with TII guidelines. The survey has enabled the broad impact on bird species and numbers to be assessed. Nevertheless, more visits, the use of territory mapping and a broader survey area would have improved our understanding of the impacts of the proposed road on breeding birds.</p> <p>You are correct that the survey technique and effort used in the surveys would be unlikely to find kingfisher. However, it is also the case that the design of the road including a bridge over the Corrib and pollution control measures, should ensure that population of kingfisher on the River Corrib is not affected.</p> <p>It is correct that the proposed road, even with the proposed mitigation, is likely to have a negative impact on bat populations, I have set this out in my report, including in Table 13 and it has informed my conclusion.</p> <p>Again, it is correct that there is a risk to the local peregrine population because of the proposed road. They are long-lived birds and could cope with displacement from the quarry for a breeding season or two during construction however the presence of the road and the risk of mortality from traffic may make Lackagh quarry unsuitable in the long term. I have accounted for this in Table 13 and my conclusion.</p>

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			<p>(vi) NUIG new pitches application needs to be included in cumulative impact assessment.</p> <p>(vii) there has been lack of a biodiversity officer in Galway City to represent the views of local people.</p> <p>(vii) it is a fabrication in the EIAR to say that there will be no impact.</p> <p>(viii) and that there will be a disparity between proposed mitigation and what will actually be delivered and</p> <p>(ix) Development does not meet the objectives of the Galway City</p>	<p>Again, you are correct that the NUIG pitches must be considered in the cumulative impact assessment, along with a host of other proposed developments in Galway City, I have done this and once again it has informed my conclusions.</p> <p>As this is not directly part of the ecological impact assessment, I will not comment on this point.</p> <p>I think it is acknowledged that there will be a significant impact on biodiversity overall by all parties, including the applicant, although the detail varies. There are some instances, for example pine marten, where I would agree with you that there are significant impacts which have not been acknowledged by the applicant. I looked at all the applicant's data gain, and made my own assessment, in which I have been as objective as possible and I believe it represents a fair description of the likely significant effects of the proposed road on biodiversity.</p> <p>I agree with your point that for the proposed mitigation to be effective, it must be implemented properly, with adequate funding and so on. DCHG has also stressed this point repeatedly to the applicant and in its submissions to An Bord Pleanála. The applicant has committed to implementing the mitigation properly and if the road is consented then doing so would be a legal planning obligation, which may provide you with some reassurance.</p> <p>The Galway City Development Plan includes an over-riding policy in favour of the GCRR, which means it takes precedence over all other policies along its route. Without this over-riding policy, the</p>

NO.	Applicants Reference	Party	Summary of submission, points relevant to ecology only	Response
			Development Plan or the National Biodiversity Plan.	GCRR would be contrary to the objectives for biodiversity set out in Plan. As it would result in a net loss of biodiversity, the proposed road would clearly be contrary to the objectives of the national biodiversity Plan.

20.0 **Appendix 5: Hydrogeology report, prepared by James Dodd of Envireau Water**

N6 GALWAY CITY RING ROAD, CO. GALWAY

ABP-302848-18 & ABP-302885-18

HYDROGEOLOGY

REPORT BY

JAMES DODDS

BSc (Hons) DUC MSc CGeol FGS

On behalf of

An Bord Pleanála
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1 INTRODUCTION

1.1 My name is James Dodds and I am a UK Chartered Geologist specialising in Hydrogeology and Water Management. I hold a BSc (Honours) Degree in Geology from the University of London, a Diploma in Hydrogeology from University College London (DUC) and a MSc Degree in Hydrogeology from the University of London, which I gained in 1986. I am a Fellow of the Geological Society of London and gained Chartered Status from that body in 1992. My Fellowship number is 1001807.

1.2 I have been working as a Consultant Hydrogeologist since 1987, gaining experience over the last 34 years in natural water related issues, in many parts of the world and in many different geological and topographical terrains. I have experience and expertise in karst hydrogeology and development in karst terrains. I worked on a large project in Ireland between 1992 and 1997, being based there for about two years in total, between those dates.

Background

1.3 The proposed development is for a Motorway Scheme and a Protected Road Scheme. It is referred to as the N6 Galway City Ring Road. The proposed road development is generally routed around the outskirts of Galway City extending from the R336 west of Bearna in the west, to the new N6/M6 motorway at Briarhill in the east.

1.4 In summary, the development or scheme comprises:

- Approximately 5.6km of single carriageway (Protected Road)
- Approximately 11.9km of dual carriageway (Motorway)
- A bridge over the River Corrib
- Two viaducts – one traversing NUIG Sporting Campus and the other across non-designated priority Annex I habitat at Menlough
- Two tunnels one beneath the Lough Corrib cSAC near Lackagh Quarry, and the other under part of the Galway Racecourse as well as tunnel maintenance buildings
- Four main Link Roads at N59 Link Road North, N59 Link Road South, Parkmore Link Road and City North Business Park Link
- Side Roads, junctions, roundabouts, pedestrian and cyclist facilities, lighting, fencing and noise barriers
- 10 underbridges and 7 overbridges
- Culverts and underpasses
- 29 Gantry Signs
- Drainage works
- Attenuation ponds
- Diversions of utilities

- Demolition of 44 residential properties and acquisition of 10
- Demolition of 2 industrial properties (1 comprising 4 buildings)
- Demolition of 2 commercial properties
- Acquisition of 17 farm buildings and modifications/revoking planning permissions
- Demolition of one protected structure
- Environmental measures including lands north of Menlo Castle to provide an enhancement of the core foraging habitat for the Lesser Horseshoe bat known to roost at Menlo Castle, and all other associated works
- Temporary site compounds
- Landscaping works
- Material Deposition Areas
- Utilities and services diversion works, and
- Associated works on lands.

1.5 With respect to planning history, a previous scheme known as the Galway City Outer Bypass (GCOB), was submitted for approval to An Bord Pleanála (the Board) on the 1st December 2006. The Board granted approval for the eastern part of the scheme on 28th November 2008. The Board was not satisfied that the part of the proposed road development between the N59 Moycullen Road and the R336 Road would not be prejudicial to the preservation of the Tonabrocky bog habitat or that significant adverse effects would not be avoidable or could not be avoided by an alternative route and considered this part of the route to be contrary to sustainable development.

1.6 Following a judicial review of the Board's decision on the basis that the Board erred in its interpretation of Article 6 of the Habitats Directive, the High Court upheld the Board's decision. A third party appealed this judgment to the Supreme Court who sought the opinion of the Court of Justice of the European Union (CJEU). The CJEU opinion delivered on the 11th April 2013 established that the loss of a small area of Priority Annex I habitat for which the Lough Corrib cSAC is selected would adversely affect the integrity of the cSAC and the provisions of Article 6(4) must apply in granting consent. Following this opinion, the Supreme Court quashed the earlier Board decision to grant approval of the eastern section of the GCOB under Article 6(3) of the Habitats Directive.

1.7 Following this decision and the Board's refusal to approve the western end of the project, the applicant decided to reassess the work to ensure all possible alternatives were investigated. The resulting project is the subject of these applications for approval now before the Board.

1.8 The current applications were submitted after pre-consultation with An Bord Pleanála.

Role & Responsibilities

- 1.9 My primary role is to advise on hydrogeological issues, based on a hydrogeological assessment undertaken as part of the submitted Environmental Impact Assessment Report (EIAR) and as part of the Natura Impact Assessment Statement (NIS), both of which are supported by a substantial number of appendices, maps and specific studies.
- 1.10 An Ecologist, Dr. Richard Arnold, was also appointed to assist with the assessment of the application and I have liaised with him, particularly with respect to assessing the impact of the various elements of the road (tunnel, Material Deposition Areas, over bridges, road surface, drainage system/discharge points) with respect to the water flow pathways through the limestone and potential effect on Ground Water Dependent Terrestrial Ecosystems (GWDTE).
- 1.11 The specific requirements of the role (my brief) are set out as follows:
- Review and consider the relevant documentation and observations submitted by the applicant, prescribed bodies and third parties at all stages of the process, focussing particularly on the relevant sections of the EIAR (with particular reference to Chapters 8, 9, 10 and 11, and associated figures and appendices), as well as the NIS and associated figures and appendices.
 - Liaise with the Ecologist in relation to GWDTE.
 - Carry out a site visit(s).
 - Attend relevant modules of the oral hearing (as advised by the Inspector), including questioning participants or seeking clarification of relevant issues as agreed with the Inspector.
 - Prepare and submit a report (this report) and make recommendations on:
 - a. the adequacy and robustness of the methodology used in the EIAR and NIS of the hydrogeological impact of the project, and the baseline information;
 - b. the likely impacts of the proposed development on the hydrogeology of the area, having regard to GWDTE, EIA, Habitats and Birds Directives.
 - c. the appropriateness of the responses and solutions proposed;
 - d. the report shall also contain advice on proposed mitigation measures, and on any additional mitigation measures and/or conditions considered necessary; and

- e. the report shall include a clear recommendation regarding consent for the development from a hydrogeological perspective including relevant conditions or reasons for refusal as appropriate.

Tasks Completed

1.12 To perform my brief, I undertook the following tasks:

- Review of documentation, provided to me by An Bord Pleanála, in both hard copy and digital format.
- Development of preliminary overview and identification of items requiring clarification.
- Site visit on 30th and 31st January 2020, to carry out a general visual assessment of the topography and setting of the proposed development, and to visit specific key features on foot, where appropriate. During part of the site visit I was accompanied by Niall Haverty (Planning Inspector).
- Attendance at Oral Hearing, G Hotel, Galway on the following dates 17th to 21st February 2020; 24th to 26th February 2020; and 10th to 11th March 2020.
- Preparation of this report.

Key Questions Addressed in my Assessment

1.13 Having reviewed the documentation and undertaken the site visit, I consider the following questions need to be addressed as part of my assessment.

- A. Did the applicant and its advisors commission and undertake appropriate investigations to adequately define the baseline hydrogeological conditions?
- B. Did the applicant and its advisors commission and undertake appropriate investigation and interpretation of the findings of these investigations to enable them to develop and present a robust conceptual model which demonstrates a sufficient understanding of the hydrogeological environment?
- C. Based on the conceptual model, did the applicant and its advisors provide sufficient analysis to rule out any potential impacts derived from changes of water quantity and quality on the integrity/conservation objectives of Natura 2000 sites including the River Corrib, GWDTE and including consideration of any supporting aquatic habitats outside the Natura 2000 sites, such as Coolagh Lakes, beyond all reasonable scientific doubt?

- D. In the case of non-Natura 2000 sites, are the baseline conditions and potential impacts adequately described and are the mitigation proposals put forward justifiable and reasonable?
- E. Assuming that the mitigation proposals put forward are justifiable and reasonable, are there any residual risks despite the mitigation, and if so what degree of risk remains and if impacts occurred, would it be sufficient to undermine the conservation objectives for the river and the lakes (or any other GWDTE in the cSAC or surrounding area)?
- F. With respect to the screening assessment for the Appropriate Assessment – is the applicant correct to screen out all but the Lough Corrib and Galway Bay Natura 2000 sites, or are there any impact pathways not considered that should have been?
- G. For the Environmental Impact Assessment (and to a lesser extent the Appropriate Assessment), in respect of bird populations also using Galway Bay and Lough Corrib, will there be a significant impact on water quality and in Ballindooey Lough and/or Moycollen Bogs, or other wet habitats such as wet heath?

Structure of this Proof of Evidence

- 1.14 Section 2 of this reports presents a summary review the hydrogeological setting of the proposed development, the features that are potentially at risk, and the conceptual model described by the applicant.
- 1.15 Section 3 presents an analysis of the key questions posed above. I answer each question in turn at the end of each analysis.
- 1.16 Section 4 presents a discussion of the points raised by objectors which relate to my evidence.
- 1.17 Section 5 presents clear conclusions and a recommendation regarding consent for the development from a hydrogeological perspective including relevant conditions or reasons for refusal as appropriate.

Submitted Reports

- 1.18 The following reports, or parts of reports, have been reviewed as part of my analysis.

Title	Reference	Chapter
Environmental Impact Assessment Report		Volume 1 – Non Technical Summary
N6 Galway City Ring Road Environmental Impact Assessment Report	GCOB-4.04-019 Issue 1 28 September 2018 Arup	10 Hydrogeology and Appendix A10
N6 Galway City Ring Road Environmental Impact Assessment Report	GCOB-4.04-019 Issue 1 28 September 2018 Arup	11 Hydrology and Appendix A11
N6 Galway City Ring Road Natura Impact Statement	GCOB-4.04-021 Issue 3 28 September 2018 Arup	Volume 2 – Main report
N6 Galway City Ring Road Natura Impact Statement	GCOB-4.04-021.2 Issue 3 26 July 2018	Appendix A – Hydrogeology Assessment Report
N6 Galway City Ring Road Natura Impact Statement	GCOB-4-04-021.003 Issue 3 26 July 2018	Appendix C - Construction Environmental Management Plan
N6 Galway City Ring Road Natura Impact Statement	GCOB-4.03-04.16 Issue 3 26 July 2018	Appendix F – Lackagh Tunnel Report
Statement of Evidence Responses to Hydrogeology Objection/Submissions	Dr Leslie Brown & Catherine Buckley	
Construction Environmental Management Plan	GCOB-4-04-021.003 Issue 3 26 July 2018	Sediment, Erosion & Pollution Control Plan (SEPCP)
		Appendix C – Karst Protocol
Request for Further Information Response	GCCR-4.03-36.2-001 Issue 1 30 August Arup	4.12 Clarification of Groundwater Impacts

Additional Information and Corrigenda

1.19 During the Oral Hearing a number of Corrigenda (Errata) and additional information reports were submitted. Those pertinent to this report are listed below, together with a comment on the content.

Title	Reference	Comment
Corrigendum	GCCR Issue 1 21 February 2020 Arup	Section 2 Hydrogeology, with associated drawings
Corrigendum	GCCR Issue 1 11 March 2020 Arup	EIAR A.10.4 & A.10.6
Response to queries raised in Module 2 of the N6 Galway City Ring Road – Oral Hearing	GCCR_4.03.34_001 10 March 2020	Biodiversity; Planning; Hydrogeology; Soils & Geology; Engineering
Appendix D	Groundwater Monitoring	Monitoring point locations, and groundwater level contours
Appendix E	Hydrographs	Comparison between groundwater & surface water levels and recharge; & cumulative rainfall

Title	Reference	Comment
Appendix F	EIAR Figures	Selected operational zone of influence drawings
Appendix G	Hydrogeological cross section – Castlegar Cut	Relationship between groundwater level and zone of dewatering at Castlegar Cut
Schedule of Additional Environmental Commitments (4 November 2020)	GCOB-4.03-034-12 Issue 2 Final 4 November 2020	21.11 Hydrogeology
Statement of Evidence	Gerry Clabby, National Parks and Wildlife Service – Dept. of Culture, Heritage & Gaeltacht	Paragraph 8
Statement of Evidence	Gerry Clabby, National Parks and Wildlife Service – Dept. of Culture, Heritage & Gaeltacht	11 March 2020 Appendix – Minutes of meeting on 27 February 2020
Eco-hydrogeology Summary Report for Lough Corrib cSAC	GCCR_4.03.34_002	
Eco-hydrogeology Summary Report for Moycullen Bogs NHA	GCCR_4.03.34_002	

Comments Made by Objectors

1.20 In reviewing the documents before me and during those parts of the Oral Hearing that I attended, I took notice of the comments made by objectors. Section 4 of the Statement OF Evidence by Dr Leslie Brown provides detailed responses to comments raised by 16 of the 296 submissions/objections made to ABP.

1.21 The list of objectors together with the topics that they raised are:

1.22 *Potential impacts to private domestic wells*

Ob_152: Sean and Audrey Dineen

Ob_239: Ann Codyre

Ob_311: Matthew and Eileen Burke

Ob_496: Michael Mullins

S_78: HSE

1.23 *Potential impacts to private commercial wells*

Ob_602_698_699_704.1, Ob_602_698_699_704.2: Clada Group Ltd.

Ob_691: Galway Race Committee

1.24 *Possible impacts to water supply quality*

S_008: Aughnacurra Residents association, Henry O. Bourke

S_36.2: Irish Water

1.25 *Potential impacts to private wastewater treatment systems*

Ob_602_698_699_704.1, Ob_602_698_699_704.2: Clada Group Ltd.

S_062: Sarah Patricia Silke

S_063: Sarah Silke

S_066: Siobhan Silke

Ob_134: Gerard & Susan O'Dell.

1.26 *Potential impact to a geothermal borehole*

S_063: Sarah Silke

S_066: Siobhan Silke

1.27 *Potential for groundwater flooding at Lackagh Quarry*

Ob_584.1, Ob_584.2: Linda Rabbitte

S_074: James & Cathleen Barrett, Menlo-Ballindooley Residents

1.28 *Potential for structural instability in areas of groundwater drawdown*

Ob_134: Gerard & Susan O'Dell.

1.29 *Potential for impacts to Lough Corrib cSAC through the hydrogeological interactions*

S_018, S_18.2: Development Applications Unit, Department of Culture, Heritage and the Gaeltacht

S_074: James & Cathleen Barrett, Menlo-Ballindooley Residents

1.30 *Potential for impact to Moycullen Bogs NHA through hydrogeological interactions*

S_018, S_18.2: Development Applications Unit, Department of Culture, Heritage and the Gaeltacht

S_074: James & Cathleen Barrett, Menlo-Ballindooley Residents

- 1.31 Subsequent to the hearing, Clada Group Ltd withdrew their objections (Ob_602_698_699_704.1, Ob_602_698_699_704.2).
- 1.32 A discussion of these points is presented in Section 4 of this report.

2 HYDROGEOLOGICAL SETTING

- 2.1. The fundamental aspect of the hydrogeological setting of this development is the contrasting geology between the western and eastern parts, essentially split by the N59 Moycullen Road and the concomitant linkages between the groundwater system and the European protected ecological areas.
- 2.2. The western part of the study area, from the R336 Coast Road west of Bearna Village to the N59 Moycullen Road, is underlain by granite; while the eastern part of the study area, from the N59 Moycullen Road to the N6 Junction at Coolough, is underlain by limestone.
- 2.3. These two different bedrock strata have entirely different geological, geotechnical and hydrogeological properties, which result in very different topography, drainage, ecological setting and hazards, being associated with them.
- 2.4. In essence, granite is characterised by its very low permeability and as a result its inability to store or transmit water, other than in isolated and infrequent fracture zones. The rock is hard, strong, and weathers slowly. As a result, the granite area is associated with a low undulating landscape, poor drainage leading to the development of pools and bogs, and numerous small ditches and streams draining small sub-catchments. The quantity of groundwater flow is very small compared to surface run-off and occurs in isolated and poorly connected fractures. The general rock mass is effectively impermeable.
- 2.5. In contrast, limestone is characterised by it being susceptible to relatively rapid chemical and physical weathering. This leads to the development of 'karst' which results from the dissolution of fractures and bedding planes in the limestone by slightly naturally acidic rainfall, which are further enlarged by the physical action and erosion of the fractures by the water running through them. Karst is therefore characterised by a bedrock that may contain no fractures, small unweathered fractures, all the way to large open conduits and ultimately caves. Where no fractures are present the rock mass is effectively impermeable and where large conduits are present groundwater flows are significant and very fast. This range in permeability and other properties is often termed 'the karst continuum', which is a useful way of considering the very large variation in properties. The open fractures and conduits are connected to the surface and allow rainfall and run-off to easily enter the ground, leading to the development of a topography which is devoid of surface streams on the higher ground and characterised by streams, rivers and lakes in low lying areas. In karst areas, the proportion of groundwater flow is very large compared to surface run-off.

2.6. In both the west and east areas, the bedrock is overlain by more recent geological materials associated with glaciation and post glacial process. These materials sit on top of an ancient (palaeo) land surface, which existed at and developed immediately after the last glaciation. Due to the different bedrock geologies, these palaeo-landforms were very different. The granite area would have had an undulating bare rock surface, with relatively low relief; while the limestone area would have been characterised by steep, and deep valleys and gorges draining a higher plateau. Glacial retreat and the deposition of clay held within the glaciers led to these valleys being filled, while the high run-off from the granite led to similar material being continually washed off.

2.7. The different geological and hydrogeological processes results in very different interactions between the hydrogeology and the environment in the east and west areas.

2.8. The groundwater system is divided into groundwater bodies (GWB) as defined by the Geological Survey of Ireland (GSI). In essence, the GWBs are groundwater catchment areas, taking account of the geology and topographic catchments. The GWBs are important for linking the groundwater system to the ecology at surface and GWDTE. In essence, if a development affects the groundwater system in a GWB it might affect a GWDTE connected to the same GWB, but not something in a different GWB. The locations of the relevant GWBs relative to the proposed road development and European sites are shown on EIAR Figures 10.1.1 and Figure 10.1.2. and are:

- Spiddal GWB Granite area
- Maam – Clonbur GWB Granite area
- Ross Lake GWB Limestone area
- Clare-Corrib GWB Limestone area
 - Clare-Corrib (Ballindooley West)
 - Clare-Corrib (Ballindooley East)
 - Clare-Corrib (Terryland)
- Clarinbridge GWB Limestone area

2.9. Associated with the GWBs are three GWDTE areas:

- Lough Corrib Fen 1 (Menlough) Limestone area
- Lough Corrib Fen 2 Limestone area
- Lough Corrib Fens 3 & 4 Limestone area

2.10. While apparently complicated, the important aspect in understanding impacts is whether the GWBs are in the granite or limestone areas, as that defines the magnitude of groundwater contribution, if any, to the protected habitats.

2.11. The River Corrib and Galway Bay form the local hydrological base in the area, and therefore the discharge points (via various routes) for groundwater. As such, all the GWBs are connected directly, or indirectly to Galway Bay Complex cSAC and Inner Galway Bay SPA; Lough Corrib cSAC and Lough Corrib SPA. However, only the Lough Corrib cSAC is directly traversed by the proposed development and as such is the only cSAC that has the potential to be directly impacted with respect to hydrogeology. The other protected areas can only be affected indirectly, by way of groundwater connectivity.

2.12. The Spiddal GWB and the Maam – Clonbur GWB theoretically contribute groundwater to Galway Bay Complex cSAC and Inner Galway Bay SPA (see EIAR Figure 10.1.1). However, both are in the granite area and almost all rainfall will run-off to streams and rivers, with only a very small component of groundwater discharging to Galway Bay.

2.13. The Ross Lake GWB contributes groundwater to the River Corrib, which in this area lies within Lough Corrib cSAC and Lough Corrib SPA (see EIAR Figures 10.1.1 and 10.1.2).

2.14. The Clare-Corrib GWB contributes groundwater to the River Corrib (Lough Corrib cSAC and Lough Corrib SPA), and the Terryland River which ultimately drains to Galway Bay and therefore the Galway Bay Complex cSAC and Inner Galway Bay SPA (see EIAR Figures 10.1.2 and 10.2.2). Clare-Corrib GWB includes Ballindooley Lough and the surrounding wetlands.

2.15. The Clarinbridge GWB also contributes groundwater to Galway Bay and hence Galway Bay Complex cSAC and Inner Galway Bay SPA (see EIAR Figures 10.1.2 and 10.2.2).

2.16. The GWDTE Lough Corrib Fen 1 extends east from the River Corrib to the townland of Coolough. Groundwater supports the Coolagh Lakes and the River Corrib. Site investigation work during the

development of this scheme has allowed the Lough Corrib Fen 1 GWDTE area to be re-defined, which is discussed in 2.25 Below.

2.17. The GWDTE Lough Corrib Fen 2 contributes groundwater to the River Corrib.

Proposed Development & the Hydrogeological Setting

2.18. Construction activities, and operation of the proposed road development, have the potential to interact with the hydrogeology and therefore receptors¹, by changing the quantity and/or quality of the groundwater upon which the receptor is dependent. The relationship between the proposed road development and the hydrogeological regime are discussed in the following paragraphs.

2.19. The aspects which determine the potential for hydrogeological impacts on receptors can be summarised as:

- The groundwater flow direction and speed (e.g. is the receptor downgradient, and where on the karst continuum does the local permeability lie).
- The degree of aquifer connectivity (e.g. is the receptor in the same groundwater body as the proposed road development, or is there a hydraulic divide between the two?).
- The requirement for dewatering, which depends on the excavation depth of the proposed road development relative to the seasonally fluctuating groundwater level.
- The proximity to the receptor (e.g. is the receptor within the drawdown zone of influence or areas of potential pollution?).
- The water chemistry associated with the receptor and how drainage from the proposed road development may change it.

¹ Receptors is being used as a generic term with respect to environmental risk and refers to any feature which by virtue of its connection to a groundwater system might be considered at risk from the development or scheme.

- Changes in the amount and location of recharge of rainfall to the GWBs, due to pavement construction and drainage arrangements.

Groundwater Levels

- 2.20. Groundwater levels are a fundamental data set because they define the location and extent of GWBs; the direction of groundwater flow; the requirement for dewatering of tunnels and cuttings; and together with permeability, the speed of groundwater flow.
- 2.21. Clarification on groundwater levels and hydraulic gradients was requested as part of the Request for Further Information. This was a strong theme of discussion during the Oral Hearing and formed parts of the errata submitted, also during the Oral Hearing.
- 2.22. Based on the information submitted, the responses to questioning and the corrections submitted, I am satisfied that the data collected and interpreted is sufficient to adequately understand the groundwater levels in and around the area; their seasonal variation; and their interaction with the proposed road development.

Groundwater Bodies (GWB)

- 2.23. The definition of GWBs is a fundamental part of assessing the impact of this proposed road development. The locations and boundaries of the GWBs determine which, if any, cSACs and SPA could be at risk. As discussed above the GSI have defined GWBs however, the site investigation work undertaken by the developer has collected data which shows that the Clare-Corrib GWB should be further sub-divided. The base evidence for this is the identification of deep clay filled palaeo valleys, which create hydraulic barriers to groundwater flow within the GWB. The evidence for such features comes from deep drilled boreholes and geophysical surveys; as well as confirmation from the interpretation of groundwater levels.
- 2.24. Based on the data and interpretation presented, I am satisfied that the deep buried valleys are present and that due to them the sub-division of the Clare-Corrib GWB is warranted.
- 2.25. The Clare-Corrib GWB has been divided into two areas, namely Lough Corrib Fen 1 (Menlough) and Lough Corrib Fen 1 (Lackagh). Lough Corrib Fen 1 (Menlough) lies north of Coolagh Lakes and Lough Corrib Fen 1 (Lackagh) forms a small GWB (<0.04km²) between Lough Corrib and Lackagh Quarry.

- 2.26. Groundwater flows westwards within the Lough Corrib Fen 1 (Menlough) to the Coolagh Lakes and the River Corrib and supports Western Coolagh Spring (K25²), a karst spring which provides groundwater flow to the upper lake of Coolagh Lakes.
- 2.27. Due to the compartmentalisation of the aquifer by the deep buried valleys, the groundwater in Lough Corrib Fen 1 (Lackagh) is largely contained and disconnected from the Western Coolagh Spring (K25). Instead, groundwater flow from Lough Corrib Fen 1 (Lackagh) is likely to flow eastwards to Lackagh Quarry during peak groundwater levels, where it either evaporates or overflows into the Clare-Corrib (Ballindooley West) GWB. During periods of low groundwater levels, the groundwater in Lough Corrib Fen 1 (Lackagh) is likely to be effectively pooled and cannot move eastwards.
- 2.28. There was much discussion in the technical reports regarding Eastern Coolagh Spring (K45³), which sits within Lough Corrib Fen 1 (Menlough). The functioning of this spring has been interpreted as a discharge from superficial deposits and not a karst spring, due to the low permeability and thickness of the clayey subsoil. This is based on evidence from groundwater levels and measured flow rates which are not synchronous. As such, I agree that, if present, seepages from the subsoil to the Eastern Coolagh Spring would represent a very small fraction of the groundwater contribution to Coolagh Lakes, when compared to the karst inflow at Western Coolagh Spring, and that the quantity and chemistry of the water in Coolagh Lakes is not materially affected by flows from the Eastern Coolagh Spring.
- 2.29. Further subdivisions of the Clare-Corrib GWB are:
- Clare-Corrib (Ballindooley West), which lies to the north of Lackagh Quarry and east of Lough Corrib Fen 2.
 - Clare-Corrib (Ballindooley East), which lies to the east of Lough Corrib (Ballindooley West) and is separated from it by a north - south trending buried valley.

² K25 is a reference to the spring number from the Karst Survey Report (Ref. Appendix A.10.2 of the EIAR)

³ K45 is a reference to the spring number from the Karst Survey Report (Ref. Appendix A.10.2 of the EIAR)

- Clare-Corrib (Terryland), which lies to the south of Lackagh Quarry and Clare-Corrib (Ballindooley East), and is separated from the Clarinbridge GWB by a north east - south west trending buried valley.
- The same north east - south west trending buried valley modifies the boundary between Clare-Corrib (Ballindooley East) GWB and Clarinbridge GWB.

2.30. The sub-divisions and changes presented in 2.29 do not materially affect the impact assessments as they are not connected to the Lough Corrib cSAC.

Dewatering

2.31. The proposed road development has the potential to cause an impact on groundwater levels in the receiving environment as it will require the lowering of groundwater levels by dewatering of bedrock aquifers during construction and operation, in excavations which are deeper than the local groundwater level, at any particular time of the year. Dewatering of the bedrock aquifer will lower water levels locally. This can have a direct impact on receptors which are within the Zone of Influence (Zoi) of the dewatering, and an indirect impact on receptors further away by diverting groundwater flows, if the dewatered water is discharged outside the receptors catchment area. In this case, the GWB is being taken as the catchment feeding a receptor, which is a reasonable conservative approach.

2.32. The extent of the Zoi of any dewatering is dependent on two fundamental aspects. The hydraulic conductivity (permeability⁴) and the drawdown⁵ imposed by the dewatering. The developer has used a simple analytical method to calculate the Zoi which in my experience overestimates the value of Zoi and therefore gives a conservative estimate.

2.33. The Zoi calculation is sensitive to the value of permeability used. I questioned the developer's representatives in some detail on the field testing and derived values of permeability, and errata were submitted during the Oral Hearing on this topic. The possible range of values of permeability for the

⁴ For the sake of this report hydraulic conductivity and permeability are used synonymously

⁵ Drawdown is the fall in water level from a natural (unstressed) level, to the level as a result of the stress – in this case the dewatering

granite area and the limestone area are very different. The methods that the developer has used to measure permeability in these terrains will by their nature, produce a relatively narrow range of values.

2.34. In the case of the granite area the measured permeability ranges from 9.7×10^{-7} m/s and 4.6×10^{-6} m/s (EIAR Appendix A.10.6 Hydraulic Calculations). Data presented in a standard text book⁶ provides a typical range of between 1×10^{-13} m/s and 1×10^{-10} m/s for unfractured igneous rock and range of between 1×10^{-9} m/s and 1×10^{-4} m/s for fractured igneous rock (granite is an igneous rock). The measured range will reflect permeabilities either associated with the test borehole construction or an isolated fracture in the granite. Testing the permeability of unfractured granite with a very low permeability is not possible in the field. Therefore, in the case of the granite area, I believe that the values obtained from field testing are an overestimate of the likely real values attributable to the rock mass, and are more representative for isolated fractures.

2.35. The discussion about granite permeability is important in that the calculation of the ZOI is based on the permeability value. The developers have used a value of 1×10^{-6} m/s in their calculation of ZOI in the granite area, as representative of the bulk rock mass. This is a highly conservative value. If a value of 1×10^{-8} m/s, which based on typical ranges is more realistic, the ZOI calculation would report answers that are 10x SMALLER.

2.36. Chapter 10 of the EIAR assesses the impact from the dewatering of cuttings within the granite area. The chapter concludes that there is a Large Adverse hydrogeology impact on Annex 1 habitats between chainages 0+650 to 0+750; 1+250 to 1+500; 1+850 to 2+400; 3+300 to 3+900; and 4+800 to 5+900 (Tables 10.24, 10.25 and 10.26). In all cases this is due to the habitat being within the calculated ZOI. The impact assessment must be viewed within the context that the surface water ponding within wetland sites in the granite area is not derived from groundwater, but rather it is caused by ponding above rock head where the rainfall and runoff is perched and trapped by basins in the bedrock topography. In addition, in my opinion the risk assessment is based on a ZOI calculation which is too conservative. Table 10.17 provides the calculated maximum ZOI for the cuttings, with the largest being 54m. In my opinion,

⁶ Freeze & Cherry. Groundwater. Chapter 2: Physical Properties and Principals.

Table 10.17 overestimates the Zol by up to a factor of 10. That is the largest Zol would more likely be between 5.4m and 27m.

2.37. While dewatering of the cuttings in the granite area will remove water from the granite, based on the likely functioning of the bogs and the smaller Zol, I believe that there will be no material impact on the Annex 1 habitats. Where higher permeability fractures are encountered the mitigation measures presented in the Construction Environmental Management Plan (CEMP) allow for the fractures to be grouted and sealed, thus preventing drainage.

2.38. In the case of the limestone area, the values obtained represent one part of the karst continuum. The karst continuum is recognised in the developer's assessment, and in this recognition and ultimately the design of the road and construction mitigation, the values used in the Zol calculation and the way that the resulting numbers have been used and interpreted are reasonable and conservative.

2.39. A critical aspect of development within a karst setting is the management of the unexpected. By its nature a karst terrain is unpredictable at the small and medium scales, that is the construction scale. It is therefore important that this uncertainty is managed through mitigation measures. The greatest risk with this development is the intersection of unknown and unknowable conduit flow systems, which could increase inflow to dewatering systems; greatly increase the Zol; and greatly increase the risk associated with contamination. Several design/mitigation measures have been incorporated into the scheme to protect the hydrogeological regime and minimise the risk to receptors, these include:

- No dewatering of the bedrock aquifer during construction at Menlough Viaduct or Lackagh Tunnel (and its approaches).
- The construction program for the scheme considers 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 in sensitive areas.
- Any groundwater intercepted will be collected and piped to the surface water receptor it would naturally have drained to within the granite area.
- In the limestone area, intercepted groundwater will be controlled and infiltrated back to the same groundwater body from which it is abstracted.

2.40. There will be no active (pumped) dewatering required during the operation phase but passive (gravity) dewatering of the bedrock aquifer will occur at a number of cutting locations along the

alignment, which will result in long term lowering of the groundwater levels, locally. This lowering has been assessed in a conservative manner, and it has been found that it will not impact directly on relevant receptors. In addition, all groundwater intercepted by the proposed road drainage will be discharged back to the same GWB thereby, maintaining the overall recharge rate to the local aquifer.

2.41. Point discharges to groundwater from the infiltration basins will lead to local increases in the groundwater level. This has been assessed conservatively, and it has been found that it will not impact directly on sensitive receptors.

2.42. Based on the conservative assessment of Zol in the granite area; the management of uncertainty in the limestone area; and the design and mitigation measures put in place, I consider that the risks associated with dewatering during the construction and operational phases have been approached and managed appropriately, and in the case of the granite area over state the potential impacts.

Groundwater Pollution

2.43. Groundwater pollution is an important aspect of any development, but particularly a development on or in karst where contaminants can be transported quickly and for long distances, if transported in a conduit system⁷. This risk is recognised in the assessment and is linked to the definition of GWBs and the management of uncertainty associated with the karst. The approach taken is based on the assessment of receptors in the downgradient part of any particular GWB below the development area. This is a reasonable, conservative approach, which is based both on the groundwater level data analysis and the re-definition of the GWBs.

2.44. During construction and operation, there is a risk of groundwater pollution from hazards such as, concrete/grout pours, accidental spillages, fines (silt and clay) being washed from construction areas during storm events; accidents, fuel and other spills; run-off from the final pavement; and placement of geological materials with a different provenance from the specific locality. These hazards pose a high risk to groundwater in the limestone areas, particularly where conduit pathways are present.

⁷ A conduit system refers to an interconnected network of solution weathered fractures, bedding planes and other discontinuities which effectively act as a pipe network in the limestone. It is a feature of karst flow systems.

2.45. The risks associated with groundwater pollution are mitigated by:

- The Construction Environmental Management Plan (CEMP), with the Sediment, Erosion & Pollution Control Plan (SEPCP) and the Karst Protocol being key components of the CEMP in this regard.
- The location, design and construction of wetland treatment and soakaway areas designed to Irish TR11 Standards.
- The drainage design, including the design of the infiltration basins, minimises the risk of a pollution event during operation affecting groundwater quality. Risk of spillage is low (<0.5%) and any impacts that do accidentally occur will be temporary.
 - All the infiltration basin designs include a containment area, a hydrocarbon interceptor and a wetland treatment component.
- The infiltration basins will promote settlement of fines and prevent entry of fines into the groundwater system.

2.46. The bedrock geology changes from the granite area in the west, to the limestone in the east. The two bedrock geology's have different chemical compositions. In simple terms the granite bedrock leads to base poor, low pH water, while the limestone water leads to base enriched neutral or high pH water. Therefore, if limestone derived material is placed over granite bedrock, surface water run-off and/or groundwater from the placed limestone has the potential to locally impact local areas of peatland habitats by changing the pH of the run-off and/or groundwater. I consider that, the consequence of such an impact on groundwater pH is likely to be imperceptible. Due to the largely chemically inert nature of granite (which produces base poor run-off and groundwater), if it is transported and used on embankments on limestone then there are no water chemistry concerns in terms of hydrogeology.

2.47. Risks of groundwater pollution are associated with all developments. The measures proposed to mitigate the risks within the context of this development are, in my opinion, concomitant with the nature and scale of the development and the level of the identified risks. As such the resultant risks associated with groundwater pollution and changes to water quality or chemistry at the European sites are, in my opinion, insignificant.

Groundwater Recharge

2.48. The construction and operation of the development will change the manner and potential for groundwater recharge⁸. As such there is a small, but real risk of an impact to receptors. Aspects of the proposed development which have the potential to affect recharge include:

- Vegetation and soil removal, which leads to an increase in the quantity of rainfall reaching the bedrock surface. In the granite area this is most likely to increase run-off rather than recharge; while in the limestone area this is likely to increase recharge.
- Pavement construction, which will lead to a loss of aquifer recharge area (zero recharge) along the alignment of the road, and diversion of rainfall to run-off.

2.49. The CEMP calls for all run-off to be discharged either to the same surface water catchment in the granite area, or the same GWB in the limestone area. As such, there will be minimal change to the quantity of water within the catchments, although there will be small differences in the distribution of recharge/run-off at the small (local) scale. These changes will quickly dissipate at the medium scale and in my opinion do not pose a material risk at the catchment or GWB scale, or on the cSAC/SPA scale.

2.50. The exception to this is where the road pavement directly crosses the Lough Corrib cSAC, south of Menlough Castle. In this location, the road pavement will prevent direct recharge to the underlying limestone. While the total quantity of groundwater reaching the cSAC will not change (due to the drainage arrangements), there will be a loss of rainfall reaching the bedrock surface directly under the pavement. This may have a negative impact on the flora below the elevated section of the pavement.

⁸ Groundwater recharge is that component of rainfall which passes through the soil superficial material and unsaturated bedrock to reach the 'water table' or saturated zone, to become part of the groundwater flow system.

3 ANALYSIS OF KEY QUESTIONS

3.1. This section provides an analysis of the questions posed at paragraph 1.14 of this report.

Q1 Did the applicant and its advisors commission and undertake appropriate investigations to adequately define the baseline hydrogeological conditions?

3.2. The applicant and its advisors based their investigations on a desk study, field investigations and baseline monitoring of groundwater level and chemistry.

3.3. In summary, the desk study included the review of:

- Current and historical Ordnance Survey maps available for the study area (1:2,500 and 1:10,560 scales)
- Aerial photography
- Aerial imagery from Google and Bing
- LiDAR elevation data commissioned by OPW (Office of Public Works)
- Geological and hydrogeological maps produced by and ground investigation reports held by the Geological Survey of Ireland (GSI)
- Internationally published scientific and technical papers on the local geology, hydrogeology, soil, construction practices
- Reports and documents produced as part of the N6 Galway City Outer Bypass Scheme (2000 - 2006)

3.4. The field studies included a number of surveys and walkovers, together with intrusive drilling and field-testing investigations, including:

- Geophysical surveys to provide additional detail on subsurface ground conditions along the route of the proposed development.
- A condition survey of existing monitoring wells which were installed as part of the 2006 Galway City Outer Bypass studies, which allowed historic monitoring points to be incorporated into the monitoring network for the proposed road development.

- A regional karst survey was completed for the constraints and route selection studies for the proposed road development in 2014 and was updated in July 2016 following completion of site walkovers and ground investigations.
- Integration with five geological, geotechnical and hydrogeological ground investigations which included boreholes, trial pits and window sampling, aquifer permeability testing, groundwater sampling and analysis and water level monitoring.

3.5. In summary, the hydrogeological field investigations comprised the following:

- 34 No. groundwater monitoring wells
- 16 No. groundwater level monitoring rounds
- 12 No. groundwater quality monitoring rounds
- 15 No. infiltration tests
- 16 No. small scale pumping test and variable head permeability tests
- 8 No. Packer tests
- 1 No. step pumping test

3.6. Groundwater monitoring was undertaken between February 2015 and April 2017. This included a total of 16 groundwater monitoring rounds. Measurements on individual wells were also taken during commissioning, well testing and spot checks. In total, 54 individual wells were regularly measured. While not all monitoring points were included in all monitoring rounds, the exceptionally high rainfall in the winter of 2015/16 resulted in high groundwater levels which were captured during the monitoring, allowing a groundwater high to be established in and around Lackagh Quarry.

3.7. All site specific investigation locations were sited based on the alignment and design of the proposed road development. Groundwater level, groundwater quality and aquifer testing in particular, was focused on locations of cuttings, structures and receptors.

3.8. Within the context of the Natura 2000 related groundwater dependent receptors, these locations were investigated either by direct investigation, e.g. water level monitoring, water sampling and analysis; or by inference from the wider surveys e.g. geophysics and groundwater level monitoring, to determine

the hydrogeological regime relevant to them. Due to the ecologically sensitive nature of the Natura 2000 sites, the investigation methodologies selected were those that would not impact directly on the European sites.

3.9. In terms of undertaking the impact assessment and designing mitigation, the key data required was the groundwater level, particularly high groundwater levels, and aquifer permeability. This data is fundamental to the definition of GWBs and the assessment of direct impacts as a result of dewatering. *In my professional opinion the applicant and its advisors did commission and undertake appropriate investigations to adequately define the baseline hydrogeological conditions.*

Q2 Did the applicant and its advisors commission and undertake appropriate interpretation of the findings of these investigations to enable them to develop and present a robust conceptual model which demonstrates a sufficient understanding of the hydrogeological environment?

3.10. The results of the investigations have been used to develop a conceptual hydrogeological model which describes the following key features:

- The differences between the granite area to the west of the development and the limestone area to the east.
- The hydraulic properties of the bedrock aquifers in the two areas, and in the context of the limestone area acknowledgment of the highly variable nature of the aquifer in terms of permeability (the karst continuum).
- The interpretation of ground investigation and geophysical results, as well as groundwater levels and their seasonality to be able to better define GWBs within the limestone area.
- The link between GWDTE and lakes and the underlying groundwater systems.

3.11. I challenged the conceptual model and its veracity during the Oral Hearing, which resulted in several errata and correction documents being produced, together with improved representation of the model. Those corrections and representations did not materially change the conceptual model but provided a more robust baseline data set to support the model and made the understanding of the data easier.

3.12. *In my professional opinion the applicant and its advisors have undertaken appropriate interpretation of the findings of the investigations, in a manner which enabled them to develop and present a robust*

conceptual model, and which demonstrates a sufficient understanding of the hydrogeological environment.

Q3 Based on the conceptual model, did the applicant and its advisors provide sufficient analysis to rule out any potential impacts derived from changes of water quantity and quality on the integrity/conservation objectives of Natura 2000 sites including the River Corrib, GWDTs and including consideration of any supporting aquatic habitats outside the Natura 2000 sites, such as Coolagh Lakes, beyond all reasonable scientific doubt?

3.13. Two important observations can be drawn from the conceptual model. The first is that the hydrogeology in the granite area is reasonably predictable, and the second is that in the limestone area there is always a degree of uncertainty due to the naturally highly variable nature of the ground.

3.14. With this in mind, the potential impacts in the granite area are well understood, and the analysis of the hydrogeological data within the context of the hydrogeological conceptual model and the proposed scheme, demonstrates that there is effectively zero risk derived from possible changes in water quantity or quality on the integrity/conservation objectives of Natura 2000 sites, beyond scientific doubt.

3.15. In the limestone area, it is acknowledged that residual risks remain due to the inherent uncertainty in the hydraulic properties in karst terranes. To this end, the design of the scheme has incorporated features which from a water management and hydrogeological perspective, will prevent potential impacts from occurring.

3.16. While Lough Corrib SPA is generally upstream of the proposed road development, a single outfall (the proposed drainage outfall for the N59 Link Road North) eventually discharges to a part of the River Corrib which falls within the SPA designation. It is also recognised that the proposed scheme also crosses GWBs that support groundwater dependent wetland habitats within European sites and traverses a number of watercourses that lie within or drain to a European site.

3.17. Therefore, the drainage of the scheme includes combined filter drains, carrier drains, surface water channels, narrow filter drains, cut-off and toe drains, attenuation ponds, grassed surface water channels, petrol and oil interceptors, wetlands and infiltration basins; in accordance with current TII Publications, guidance documents and industry best practice methods.

3.18. To maintain the existing water quality in receiving watercourses, flow control measures will be provided at all outfalls and discharge points along the length of the mainline of the scheme to ensure discharge does not cause any adverse effects on flow rates in the receiving watercourse or sewers, and

where appropriate to allow sufficient time for infiltration to discharge to the ground. As such, there will be 'no worsening' of flow rates outside of the site boundary up to the 1 in 100 year storm event.

- 3.19. Within the limestone area, a sealed drainage system is provided to protect the underlying sensitive aquifers, and the drainage design takes into account the distribution of groundwater bodies so that rainfall remains within the groundwater body to which it would naturally recharge.
- 3.20. Pollution control measures are provided on all networks on the mainline of the scheme prior to out-falling/discharging to ensure that receiving water bodies are not contaminated by run-off during the construction or operational phases.
- 3.21. To maintain the existing hydrogeological regime and minimise the risk of impacts to groundwater quality in receiving GWBs, there will be no groundwater lowering within groundwater bodies that support groundwater dependent habitats within a European site.
- 3.22. All infiltration basins include systems to remove floating hydrocarbons, dissolved metals in road run-off and suspended solids, by incorporating a hydrocarbon interceptor and an engineered wetland, and include a containment area to provide an appropriate holding time to contain accidental spillages. The basins will be over excavated by 2m to accommodate the provision of a minimum of 2m thickness of appropriate subsoil (as per TII definition in HD45/15), to provide a further attenuating layer for dissolved or suspended contaminants in the road run-off.
- 3.23. As such, the combination of the engineered wetlands with the infiltration basins and associated features, provides an appropriate level of protection to prevent contamination of groundwater from the road run-off.
- 3.24. The area around the Lackagh Tunnel and the Menlough Viaduct is, and has been recognised as, particularly sensitive, due to the potential for an impact on the Lough Corrib GWB and in turn on the Lough Corrib cSAC. Considerable effort has gone into the understanding of the hydrogeology in this area and the interactions between GWDTE, lakes, groundwater, and the development. As a result, the design of the scheme around Lackagh Quarry does not allow dewatering of the bedrock aquifer to be undertaken in association with Lackagh Tunnel and its western approach, and the Menlough Viaduct.
- 3.25. To avoid construction of the Lackagh Tunnel affecting QI Annex I habitats in Lough Corrib cSAC or affecting the existing hydrogeological regime supporting wetland habitats in Lough Corrib cSAC, the following designs and construction protocols have been put in place:

- The Lackagh Tunnel is a mined (drill and blast) twin bored tunnel within rock located beneath the Lough Corrib cSAC, with the following features:
 - each bore maintains at least 8m clear rock above the crown of the tunnel to the top of the Lough Corrib cSAC ground surface
 - a 7m wide pillar separating the twin bores
- Stabilisation of the western quarry face will be completed in advance of tunnelling works including a composite support system of rock bolts, rock dowels, steel mesh and sprayed concrete.
- Blast design and limitations are set out and include, a conservative design approach, and a vibration assessment which determined that a maximum vibration limit of 25mm/sec at the ground level will not pose a risk to habitats within Lough Corrib cSAC. A target construction blast vibration limit of 20mm/sec will be implemented ensuring the maximum vibration limit is not exceeded. A monitored trial blast will be undertaken in the same bedrock formation by the blasting contractor in a controlled location that will pose no risk to sensitive receptors, including habitats within Lough Corrib cSAC. The trial blast will not exceed the vibration limitations of the local sensitive receptors and therefore pose no impact. The information obtained from the trial blast will be used to calibrate and refine the blast design to a site-specific design.
- The infiltration basin in Lackagh Quarry has been designed to retain the natural recharge pattern by maintaining recharge to the groundwater body below.
- In order to maintain recharge catchments, any inflows into the tunnel during construction will be managed by designing them to infiltrate to the floor of the tunnel until their inflow is sealed off.
- All construction works will remain above the local groundwater level for the duration of the works to ensure that the groundwater is not intercepted, and dewatering of the bedrock aquifer is not required. The construction schedule will be tailored so that the excavation of the lower section will occur when the groundwater level is low and is below the construction level.
- The tunnel will be fully lined with concrete.

- On the western approach to Lackagh Tunnel a watertight seal will be installed on the underside of the road base and the cutting sides to protect against groundwater inflow and prevent contamination of groundwater.
- Retaining systems are included at pinch point locations to prevent encroachment on Annex I habitats.
- The retaining walls on the western approach will be watertight to a level of +17.7mOD to seal out any groundwater in the subsoil or bedrock and will prevent contamination of groundwater.

3.26. While other parts of the scheme within the limestone area have the potential to impact on the groundwater system, they are not in direct contact with Natura 2000 sites and only have weak connections, or pathways associated with the Inner Galway Bay SPA, and Galway Bay Complex cSAC and do not pose a direct risk to either.

3.27. *Based on the conceptual model the differences between the granite and limestone areas, the proposed scheme, and the design considerations included to protect Natura 2000 sites, it is my professional opinion that the applicant and its advisors have provided sufficient analysis to rule out any potential impacts derived from changes in groundwater quantity and quality on the integrity/conservation objectives of Natura 2000 sites, including the River Corrib, GWDTE and including consideration of any supporting aquatic habitats outside the Natura 2000 sites, such as Coolagh Lakes, beyond all reasonable scientific doubt.*

Q4 In the case of non-Natura 2000 sites, are the baseline conditions and potential impacts adequately described and are the mitigation proposals put forward justifiable and reasonable?

3.28. *As described in the previous sections, in my professional opinion the baseline conditions and potential impacts are adequately described.*

3.29. The Construction Environmental Management Plan (CEMP) is an important tool in managing risk. The CEMP summarises the overall environmental management strategy that will be adopted and implemented during the construction phase of the proposed road development. The purpose of the CEMP is to demonstrate how the proposed construction works can be delivered in a logical, sensible and safe sequence with the incorporation of specific environmental control measures relevant to construction works of this nature. The CEMP sets out the mechanism by which environmental protection

is to be achieved during the construction phase of the proposed road development. Implementation of the CEMP must ensure that disruption and nuisance are kept to a minimum.

- 3.30. The CEMP has been prepared in accordance with industry best practice guidance including:
- TII's Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan.
 - Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015).
- 3.31. The CEMP has been prepared with reference to the Environmental Impact Assessment Report (EIAR) and the Natura Impact Statement (NIS).
- 3.32. Of particular note with respect to water management is the Sediment, Erosion and Pollution Control Plan (SEPCP), which summarises the procedures and technical practices for implementing effective sediment, erosion and pollution control through a variety of delivery methods for the construction phase of the proposed road development. The SEPCP demonstrates that run-off from the construction site can be controlled so as not to impact any receptors.
- 3.33. With respect to the hydrogeology of the limestone area in particular, the Karst Protocol (contained within the CEMP) summarises the procedures and technical practices for the identification of karst conduits within the limestone during construction. Investigation and treatment is necessary to ensure that there is no, or effectively no, impact on the quantity or quality of groundwater either as a result of construction or operation of the proposed development.
- 3.34. *In summary, the full and proper implementation of the CEMP will ensure that any direct or indirect or ex-situ impacts on the non-Natura 2000 are avoided and on that basis, in my professional opinion, the mitigation proposals put forward are justifiable and reasonable.*

Q5 Assuming that the mitigation proposals put forward are justifiable and reasonable, are there any residual risks despite the mitigation, and if so what degree of risk remains and if impacts occurred, would it be sufficient to undermine the conservation objectives for the river and the lakes (or any other GWDTE in the SAC or surrounding area)?

- 3.35. The risks associated with hydrogeological related impacts manifest themselves via a reduction in water quantity or quality at any particular receptor. These risks have been assessed on an appropriately robust quantitative data set, which has been interpreted in a conservative manner. The assessment

within the granite area is particularly conservative, and the residual risks are in my professional opinion effectively zero. Within the karst area, residual risks remain due to the inherent, natural variation associated with the karst continuum. The residual risks relate to water quality, as the design of the scheme maintains the water balance within each GWB and dewatering will not be undertaken in those GWBs with a direct link to Natura 2000 sites.

3.36. The residual risks associated with water quality are mitigated by the CEMP and its associated SECP and the Karst Protocol. The SECP and Karst Protocol serve to reduce the risk of introduction and transport of polluting materials into the ground to an absolute minimum, and to ensure that karst conduits discovered during construction are investigated and treated appropriately.

3.37. The operational design of the scheme reduces the risk of contaminated water entering the ground by the provision of engineered treatment wetlands prior to soakaway areas and the incorporation of valves to hold back run-off from accidental spillages. The residual risks therefore result from an incident or sequence of occurrences which overwhelm the system and/or poor maintenance of the mitigation. In the case of the former, this risk cannot be ever reduced to zero, however the design of the systems is in line with government guidance and is robust. Failure due to natural events will be associated with high rainfall and run-off and therefore by definition will be short-lived and associated with high volumes of dilution.

3.38. It is important, that in order to provide ongoing mitigation, that the drainage systems, treatment wetlands and soakaways are well maintained, in perpetuity.

3.39. *Assuming that the CEMP is implemented in full and to a high standard, it is my professional opinion that residual risk is very low and insufficient to undermine the conservation objectives for the River Corrib and associated lakes (or any other GWDTE in the cSAC or surrounding area), and that in the unlikely event that impacts occurred, that they would it be short-lived and insignificant.*

Q6 With respect to the screening assessment for the Appropriate Assessment – is the applicant correct to screen out all but the Lough Corrib and Galway Bay Natura 2000 sites, or are there any impact pathways not considered that should have been?

3.40. The groundwater pathways or vectors that link the proposed road development with the wider environment are well understood. The technical basis for the screening assessment with respect to hydrogeology is the groundwater catchment (or in this case the GWB). The screening was carried out based on mapped surface water catchments and the GWBs mapped by the GSI. On that basis the

screening identified that the only at-risk receptors were the Lough Corrib and Galway Bay Natura 2000 sites, which in my professional opinion was correct. As part of the technical hydrogeological investigation the Clare-Corrib GWB was re-defined and split into several sub-catchments. This was based on good scientific data and did not alter the broader picture represented in the Appropriate Assessment.

3.41. *Given the hydrogeological setting in both the granite and limestone areas, and the technical hydrogeological investigations that have been undertaken it is my professional opinion that there are no other impact pathways which should have been considered.*

Q7 For the Environmental Impact Assessment (and to a lesser extent the Appropriate Assessment), in respect of bird populations also using Galway Bay and Lough Corrib, will there be a significant impact on water quality and in Ballindooley Lough and/or Moycollen Bogs, or other wet habitats such as wet heath?

3.42. There are two mechanisms by which the water quality at Ballindooley Lough and/or Moycollen Bogs, or other wet habitats such as wet heath, could be affected by the proposed road development. The first is due to contaminated run-off during the construction or operation entering watercourses or groundwater and entering the lakes or other wet habitats. The other is a change in the provenance of water entering the lake or other wet habitats of such magnitude that it affects the chemistry of the water and the ecology that relies upon it.

3.43. The conservative nature of the technical assessments, the design of the scheme and the mitigation that is proposed demonstrate, in my opinion, that the risks to the wet habitats in the granite area including Moycollen Bog are effectively zero.

3.44. In the limestone area, and in the area of Ballindooley Lough (and Lough Corrib) the technical assessment has shown that the lakes are effectively isolated from a significant groundwater flux, by virtue of thick underlying low permeability material, as such any small effect on groundwater flow (flux) as a result of the proposed road scheme would have no material effect on the provenance and mix of the water chemistry. The mitigation included in the design and management of the construction and operation of the scheme effectively reduces the risk of an impact on water quality in Ballindooley Lough and/or Moycollen Bogs, or other wet habitats such as wet heath, to essentially zero.

3.45. *Therefore in my professional opinion, the risk of an effect with respect to a groundwater pathway or vector, sufficient to impact on the bird populations using the Galway Bay and Lough Corrib SPAs, is effectively zero.*

4 OBJECTORS COMMENTS

4.1 A list of objectors and the topics that they raise are provided in Section 1. In summary the topics that have been raised are:

- Potential impacts to private domestic wells
- Potential impacts to private commercial wells
- Possible impacts to water quality
- Potential impacts to private wastewater treatment systems
- Potential impact to a geothermal borehole
- Potential for groundwater flooding and sediment mobilisation at Lackagh Quarry
- Potential for structural instability in areas of groundwater drawdown
- Potential for impacts to Lough Corrib cSAC through the hydrogeological interactions
- Potential for impact to Moycullen Bogs NHA through hydrogeological interactions

4.2 The hydrogeological assessment, presented in Chapter 10 of the EIAR and Appendix A of the NIS, includes detailed consideration of groundwater features located within the study area, assessment of changes to the hydrogeological environment from design elements and mitigation measures proposed in respect of the proposed road development.

4.3 I have reviewed these documents and consider that the applicant and its advisors commissioned and undertook appropriate investigations to adequately define the baseline hydrogeological conditions, and that they used the results from the investigations and analysed and interpreted them appropriately. This enabled them to develop and present a robust conceptual model which demonstrates a sufficient understanding of the hydrogeological environment, to allow potential impacts to have been evaluated.

4.4 In his Statement of Evidence submitted on 20 February 2020, Dr Leslie Brown responded to submissions/objections and provided further information and clarification on the assessments undertaken and put these in the specific context of the objections raised. During his oral evidence I

robustly challenged Dr Brown, resulting in erratum and additional clarification being submitted during the hearing.

- 4.5 As part of this four water supply wells that were not identified in the EIAR were assessed using the methods described in Chapter 10 of the EIAR. The assessment provides mitigation for impacts, and where necessary identifies those wells that will need to be decommissioned and replaced.
- 4.6 The four commercial wells identified in the objections will be impacted by the proposed road development and mitigation measures have been proposed to provide alternative replacement wells at the Galway Racecourse. As stated in Section 1 of this report Clada Group Ltd withdrew their objections after the hearing.
- 4.7 Mitigation measures have been incorporated to manage runoff of contaminated water during all the phases of the development, including construction. The mitigation takes account of the special risks associated with karst terrain.
- 4.8 Concerns about the impact of the development on private water treatment systems reliant on soakaways for treated effluent have been examined. In summary, the locations in question are adjacent to cuttings where groundwater is likely to be lowered, rather than raised. For this reason, the percolation areas highlighted in the submissions/objections are not at risk from the proposed road development.
- 4.9 The geothermal well referenced in two submissions is located outside the zone of influence of the proposed and therefore will not be impacted.
- 4.10 The concerns raised regarding the flooding of Lackagh Quarry relate to the level that the water level will rise and the mobilisation of suspended solids. The hydrogeology of the Lackagh Quarry area has been studied in detail and the design of the proposed development through all the phases takes account of the full range of seasonal groundwater levels including peak conditions experienced in the winter of 2015/2016, to ensure that the design is robust and does not alter the current groundwater regime. The mitigation measures put forward with respect to the design, construction and vegetation of the material deposition areas will prevent fines from being mobilised into the groundwater system.
- 4.11 An issue was raised in submission, Ob_134, regarding the structural stability of a house where groundwater levels are reported to be lowered adjacent to cuttings. This property is on the edge of the zone of influence created by drainage from the cutting, which means that in this area the

groundwater levels may be reduced, but only by a very small amount. The risk of settlement is very low, but the developers have agreed that a property condition survey will be undertaken.

- 4.12 The Department of Culture, Heritage and the Gaeltacht raised a number of concerns regarding groundwater interaction between Lackagh Tunnel, Lough Corrib Fen 1 GWB and Lough Corrib cSAC and whether groundwater flow paths would change post construction.
- 4.13 The Department of Culture, Heritage and the Gaeltacht also raised concerns regarding potential impacts to Moycullen Bogs NHA.
- 4.14 In response to these concerns Dr Brown provided further clarity and a comprehensive explanation describing the interaction between groundwater and surface water at the European sites, including the Lough Corrib cSAC, and NHA sites, including the Moycullen Bogs NHA at Letteragh. These topics were also discussed at the oral hearing and I spoke independently to representatives of the Department. Concerns were raised by the Department about high permeability pathways in the granite that may connect cuttings in the road alignment with the NHA.
- 4.15 In summary, Coolagh Lakes are fed primarily from one significant groundwater spring, Western Coolagh Spring. The habitat around the periphery of Coolagh Lakes is identified as being water dependant, and as such the habitats at Coolagh Lakes are GWDTE. Robust mitigation measures have been designed so flows to Western Coolagh Spring are not affected during any phase of the development. Furthermore, karst specific measures incorporated into the construction design will ensure that groundwater flow paths will not change post-construction.
- 4.16 With respect to Moycullen Bogs NHA, all areas of the Moycullen Bogs NHA are in separate catchments or sub-catchments to road cuttings for the proposed road development. Based on assessment of each cutting, the maximum drawdown reach will remain with its own sub-catchment extent and on this basis, the proposed road development will have no impact to the Moycullen Bogs NHA. The zone of influence calculations in the granite are robust and conservative and while high permeability fractures in the granite may occur, their extent and continuous permeability are highly likely to be restricted, and any transmission of ground water will as a result be very small in comparison to the overall water balance which is dominated by rainfall.

5 OVERALL CONCLUSIONS

- 5.1 In considering the documentation available to me, and the responses to questions posed at the Oral Hearing by myself and my colleagues, I draw the following overall conclusions.
- 5.2 The applicant and its advisors commissioned and undertook appropriate investigations to adequately define the baseline hydrogeological conditions.
- 5.3 The applicant and its advisors used the results from the investigations and analysed and interpreted them appropriately to enable them to develop and present a robust conceptual model which demonstrates a sufficient understanding of the hydrogeological environment, to allow potential impacts to have been evaluated, and reduced to an appropriate level through the design of construction and operation of the scheme and its associated mitigation measures.
- 5.4 Based on the conceptual model, the applicant and its advisors have provided sufficient analysis to rule out any potential impacts derived from changes of water quantity and quality on the integrity/conservation objectives of Natura 2000 sites including the River Corrib, GWDTEs and including consideration of any supporting aquatic habitats outside the Natura 2000 sites, such as Coolagh Lakes, beyond all reasonable scientific doubt.
- 5.5 In the case of non-Natura 2000 sites, the baseline conditions and potential impacts are adequately described and the mitigation proposals put forward are justifiable and reasonable.
- 5.6 Taking account of the design of the scheme and the proposed mitigation, there are no residual risks that would be sufficient to undermine the conservation objectives of the River Corrib and associated lakes, or any other GWDTE in the cSAC or surrounding area.
- 5.7 The applicant was correct to screen out all but the Lough Corrib and Galway Bay Natura 2000 sites in the Appropriate Assessment, and there are not any other impact pathways that should have been considered.
- 5.8 With respect to the bird populations using Galway Bay and Lough Corrib SPAs, there will not be a significant impact on water quality or quantity in Ballindooley Lough and/or Moycollen Bogs, or other wet habitats such as wet heath.
- 5.9 In my professional opinion, the comments and objections raised by the public, companies and the Department of Culture, Heritage and the Gaeltacht have been considered and answered in detail and fully.

- 5.10 An important part of the protection of both the Natura 2000 sites and other receptors is the implementation of the CEMP and associated SECP and Karst Protocol, to a very high standard; together with the continuous maintenance of the drainage systems, wetland treatment and soakaway areas, in perpetuity. Failure to do either of these could result in an unacceptable impact.
- 5.11 It is my considered view that with respect to hydrogeology and following the implementation of the mitigation measures prescribed in the design the proposed road development will not, by itself or in combination with other plans or projects, have any adverse effect on the integrity of any European sites in view of their conservation objectives and there is no reasonable scientific doubt as to that conclusion. On that basis and subject to other aspects outside my area of expertise, my recommendation would be to approve the planning application.

6 DECLARATION

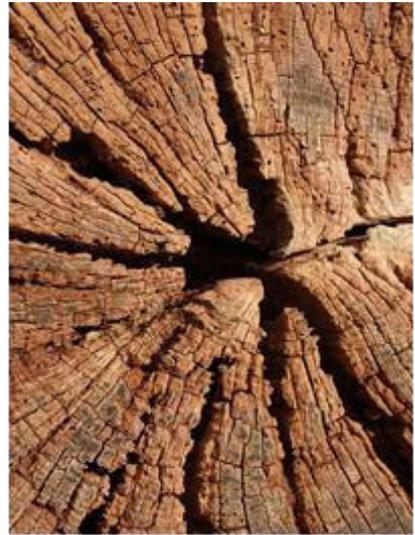
- 4.17 The report I have prepared and provide for this application references ABP 302848-18 & ABP 302885-18 is true and has been prepared and is given in accordance with the guidance of my professional institution, the Geological Society of London, and I confirm that the opinions expressed are my true and professional opinions.
- 4.18 I have objectively addressed all the issues pertaining to this hearing, to which I am professionally qualified to comment upon and required to address. I have also strived to ensure that the evidence in this report and related opinions are as informed, objective and accurate as possible, based on the tangible evidence which was available to me.
- 4.19 I confirm that I have not entered into any arrangement whereby the payment of my professional fees, charges or expenses is in any way dependent upon the decision of the Board. Consequently, all the professional judgements expressed in this report are my own and represent my true professional opinion of the matters under consideration.
- 4.20 It should be noted that if any aspect covered in this report does not specifically mention comments or issues raised by the applicant, there agents, third parties or consultees, it does not necessarily mean that I agree with such comments or issues.



James Dodds MSc DUC CGeol FGS
May 2021



**21.0 Appendix 6: Appropriate Assessment Report, prepared by
Richard Arnold of Thomson Environmental Consultants**



**Appropriate Assessment
Report**

**N6 Galway City Ring
Road**

For

An Bord Pleanála

ABP Ref. ABP-302848-18, ABP-
302885-18

Project No.: IABP106/001

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1. Summary

- 1.1.1** The N6 Galway City Ring Road (N6 GCRR) is a proposed road to the north of Galway, extending for approximately 18km from the R336 west of Bearna to a junction with the N6 at Briarhill, with a new crossing of the River Corrib. The proposed road is part Protected Road and part Motorway, and the subject of a single planning application. To inform the application, the proposed road is the topic of an Environmental Impact Assessment and Natura Impact Assessment, as required by the EIA Directive and the Habitats Directive, respectively. My brief, and the topic of this report, is to complete an independent assessment of the N6GCRR under the Habitats Directive, both screening and appropriate assessment stages, to facilitate the final assessment which will be undertaken by the Board of An Bord Pleanála.
- 1.1.2** There are 18 Natura 2000 sites within 15km of the proposed road, one of which, the Lough Corrib cSAC, would be crossed by the proposed road. Therefore, a screening assessment is required under the Habitats Directive (and associated national legislation). Galway County Council, on behalf of itself and Galway City Council, (the applicant) undertook its own screening assessment and concluded that “likely significant effects” could not be ruled out for two Natura 2000 sites; these were Lough Corrib, which is designated as a candidate Special Area of Conservation (cSAC) and a Special Protection Area (SPA), and Galway Bay which is also designated as a cSAC and SPA. In both cases, the areas covered by the two designations substantially overlap but differ.
- 1.1.3** I agree with the applicant’s conclusions in its screening assessment for these two Natura 2000 sites. However, I identified an additional three possible pathways for impact on these and other Natura 2000 sites, primarily in relation to potential cumulative or “in combination” effects. These pathways were (i) spillage/leakage of fluids and materials from construction related traffic when travelling along older roads immediately adjacent to Natura 2000 sites; (ii) loss and decline of populations of certain species outside the Natura 2000 network reducing the resilience of populations of the same or different species inside the Natura 2000 network; and (iii) increasing recreational pressure on certain Natura 2000 sites due to increased mobility of an expanding human population. Therefore, I concluded that “likely significant effects” could not be ruled out for 16 other Natura 2000 designations in the locality.
- 1.1.4** The applicant’s full assessment of the impact of the proposed road on Lough Corrib and Galway Bay is set out in the Natura Impact Statement (NIS) and subsequent documents. Eight types of potential impact were identified by the applicant which could affect the qualifying interest features and therefore the conservation objectives for Lough Corrib cSAC, plus four types for Galway Bay Complex cSAC, three for Lough Corrib SPA and three for Inner Galway Bay SPA; eleven potential impact types in total. The potential impacts identified include, variously, direct loss and damage of habitats, reduction in groundwater quality and quantity, reduction in surface water quality, smothering of vegetation by dust, disruption of otter movements, disturbance of birds from rock blasting and direct mortality of certain qualifying species during construction and operation. No potential in combination impacts were identified by the applicant. Avoidance, design and mitigation measures have been put forward by the applicant to address all of the identified impacts, which enabled the applicant to reach the conclusion that there would not be

an adverse effect on the integrity of any European site as a result of the construction and operation of the N6 GCRR.

1.1.5 Using the applicant's data and other sources, I have reassessed the potential effects on Natura 2000 sites. As previously mentioned, I identified a slightly broader range of potential impact pathways on a higher number of Natura 2000 sites, and the potential for in combination effects arising from the road in combination with other developments and the planned population growth for Galway. As well as the three identified in paragraph 1.1.3, those additional impact pathways are (i) habitat isolation of habitat parcels to the north and south of the proposed road and (ii) habitat degradation due to noise and light. On potential impacts associated with the reduction in groundwater quality and quantity (hydrogeology), the assessment was achieved with the support of Mr. James Dodds.

1.1.6 Re-consideration of the impact pathways led to the identification of a further set of mitigation measures which are needed to reduce the risk of undermining the conservation objectives of any Natura 2000 site to nil. At the project level, these additional mitigation measures are relatively minor amendments to the design and ways of working to reduce the risk of degrading habitats within Natura 2000 sites during both the construction and operation phases (measures to reduce noise, light, dust, invasive species etc.). In addition, broader mitigation measures are required to reduce the risk of 'in combination' effects. Most of these have already been identified as part of the appropriate assessment of the Galway County Development Plan and the Galway City Development Plan, of which the N6 GCRR is a major component, and therefore will be completed by Galway County Council and Galway City Council during the lifetime of the plans. Implementation of these measures will ensure that the risk of in combination effects on Natura 2000 sites is reduced to nil.

1.1.7 Of particular importance among the mitigation measures included in the Plans, are:

- Preparation and implementation of an Integrated Management Plans for Lough Corrib cSAC, Ross Lake and Woods cSAC, (Inner) Galway Bay (Complex) cSAC SPA (especially Rusheen Bay and Lough Atalia), the Twelve Bens/Garraun Complex and Maumturk Mountains cSAC;
- The development of an ecological network within Galway City, to include the protection of and the implementation of measures to control of non-native invasive species within the City; and
- Improvements in air and water quality.

1.1.8 Taking both the applicant's avoidance, design and mitigation measures into account, including those set out in the two development plans, and the additional mitigation measures that I have identified, it can be concluded that the conservation objectives of any Natura 2000 site would not be undermined and therefore the integrity of the Natura 2000 sites will be maintained. However, it must be stressed that this conclusion is dependent on the effective implementation of all the identified mitigation measures in this appropriate assessment report.

2. Introduction

2.1 Proposed Development

2.1.1 The N6 Galway City Ring Road is a proposed road to the north of Galway City, approximately 18km in length, extending from a new junction with the R336 at the western side of Bearna to the existing N6 to the east of Galway City at Coolagh, Briarhill. The proposed road comprises a single carriageway from the new junction with the R336 to the Ballymoneen Road (approximately 6km of the route) and a dual carriageway from the Ballymoneen Road to where it joins the existing N6 (approximately 12km of the route), including a junction with the N59 at Letteragh. The proposed road would be a Protected Road from the R336 as far as the junction with the N59 and then a motorway eastward from the N59 junction to the existing N6. The proposal includes a number of junctions, link roads, slip roads and associated infrastructure. The applicant is Galway County Council, on behalf of itself and Galway City Council.

2.1.2 The application for the N6 Galway City Ring Road follows a previous application for a new road to the north of Galway City, the N6 Galway City Outer Bypass. This was part consented however the decision was overturned in the Irish Supreme court following a ruling by the ECJ (European Union Court of Justice Case C-258/11). This was due to its direct impact (destruction) on approximately 1.47 hectares of a qualifying interest feature of the Lough Corrib candidate Special Area of Conservation (cSAC), namely 8240* Limestone Pavement, which is an Annex I priority habitat. The proposed N6 Galway City Ring Road follows a different route to the N6 Galway City Outer Bypass. However, it would pass through the same cSAC, with the proposed road mostly, but not completely, in a tunnel or on a bridge where it overlaps with the cSAC. The locality is rich in other sites designated for their nature conservation interest, which although not directly affected by the N6 Galway City Ring Road, could be indirectly affected.

2.2 Legislative Background

2.2.1 The applicant has provided a summary of the relevant legislation in the Natura Impact Statement (NIS) p3 to p6. This sets out the circumstances in which an assessment under the Habitats Directive and The European Communities (Birds and Natural Habitats) Regulations 2011, as amended, is required.

2.3 Natura Impact Statement

2.3.1 To support the planning application, the applicant has prepared a screening report and a Natura Impact Statement (NIS) for the N6 Galway City Ring Road, as follows:

- Provision of Information for Appropriate Assessment Screening for N6 Galway City Ring Road, Scott Cawley 2nd June 2017, **the "Screening Report"**; and
- N6 Galway City Ring Road Natura Impact Statement Vol. 2 Main Report, Arup September 2018, **the "NIS"**.

2.3.2 Following the production of these two documents, additional relevant information has been provided by the applicant at various stages of the planning process (as set out in section 2.5 below). This includes:

- Request for Further Information Response Vols 1- 3 in particular, responses to items 3a through to 3o, 4a to 4c and 5a to 5b, **the “RFI response”**;
- Statement of Evidence: Responses to Appropriate Assessment Objection/Submission dated 19th February 2020, **the “AA Statement of Evidence”**;
- Statement of Evidence: Responses to Hydrogeology Objection/Submissions dated 19th February 2020, **the “Hydrogeology Statement of Evidence”**;
- A Corrigenda dated 21st February 2020, and updated 11th March 2020, which corrects some details in previously submitted documents, **the “Corrigenda”**;
- Response to Queries raised in Module 2 [sic] of the N6 Galway City Ring Road Oral Hearing dated 10th March 2020, **the “Module 1 response”**;
- AA - In-combination Assessment Addendum Update Report (Dealing with proposed and permitted projects and plans since publication of the Natura Impact Statement) dated 10th March 2020, updated on 15th October 2020 and again on 3rd November 2020 and supplemented on 4th November, with the last two forming the complete assessment, **the “in-combination assessment update”**; and
- Additional Polygon 1f Data submitted as (i) 2017 Field Notes relating to Polygon 1f together with map and photograph; (ii) Soil Depth measurements of various transects in Polygon 1.f, dated 10 March 2020 and (iii) Composite Map of all Relevé Locations in Polygon 1.f, **the “Area 1.f update”**.

2.3.3 These documents together are taken to be information provided by the applicant in support of the appropriate assessment under the Habitats Directive and The European Communities (Birds and Natural Habitats) Regulations 2011, as amended. Additional information is provided in other planning documents including the Environmental Impact Assessment Report **the “EIAR report”** and **the “Design Report”** (submitted as part of the FIR response, Volume 4).

2.4 Submissions

2.4.1 The applicant refers to 17 submissions which relate to the NIS or appropriate assessment for the proposed N6 Galway City Ring Road prior to the oral hearing, of which nine are addressed by the applicant in the AA Statement of Evidence. In summary:

- The Department of Culture, heritage and the Gaeltacht/ National Parks and Wildlife Service (NPWS) made several detailed points over two submissions (21st December 2019 applicant’s reference S_018.1 **“NPWS1”**; 24th January 2020 S_018.2 **“NPWS2”**, see Appendix 1 of my report), the first of these submissions, *inter alia*, (i) advised detailed attention to be paid to mitigation from an early stage, (ii) asked for a clearer account of effects on the Lough Corrib cSAC (than presented in the NIS), (iii) asked for a clearer depiction of groundwater flows, (iv) asked for greater reference to the Conservation Objectives, (v) stressed the importance of effective mitigation for otter, (vi) identified the proposed River Corrib bridge as a potential

threat to Special Conservation Interest (SCI)¹ bird populations and (vii) made a procedural point on the appropriate assessment, while the second of these submissions, *inter alia*, (i) acknowledges the additional information provided, (ii) confirms that the Department no longer considers the proposed River Corrib bridge a threat to SCI bird populations, (iii) accepts that habitat loss and fragmentation for SCI bird species has been satisfactorily addressed but (iv) again seeks further clarification on the hydrogeology model;

- An Taisce (S_006) observed that the appropriate assessment must comply with recent case law, etc;
- Brian Burton (S_010) followed An Taisce with more detail, referencing Case-461/14 and specifically the need to consider species and habitats outside the designated site boundaries;
- Peter Sweetman and others (S_058), and Mary Nestor (Ob_451_489) state that the proposed road does not comply with the Habitats Directive, while Linda Rabitte (Ob584.2) and the Menlo Residents Association (S_048) imply the same; and
- Menlo and Ballindooley Residents (S_074) refer to impacts of tunnelling, blasting and pollution on the Lough Corrib cSAC, contrary to the Habitats Directive, and the loss of Annex I habitats generally.

2.4.2 These submissions were responded to by the applicant in the AA Statement of Evidence dated 19th February 2020. These submissions and those received at the oral hearing are addressed directly in Appendix 2 of my report.

2.5 Further Information Request and Oral Hearing

2.5.1 Following the submission of the screening report and the NIS, a request for further information (FIR) was made by An Bord Pleanála in April 2019 with a response received from the applicant on 30th August 2019.

2.5.2 An oral hearing for the proposed road took place between 18th February 2020 and 4th November 2020, the hearing having been interrupted by the Covid-19 pandemic. The applicant responded to written submissions on ecology and hydrology/geohydrology on 19th and 20th February 2020, respectively, as set out in its statements of evidence. Oral submissions from the prescribed bodies including the Department of Culture, Heritage and the Gaeltacht (NPWS), pertaining to ecology and hydrology/ geohydrology were made on 21st February 2020, while Module 1, which dealt specifically with ecology and hydrology/geohydrology, took place on 24th and 25th February 2020 and 10th and 11th March 2020. Module 1 was completed prior to the interruption caused by the pandemic. At the oral hearing, six submissions related to the AA assessment, or referred to potential effects on Natura 2000 sites. In summary these were:

- The Department of Culture, Heritage and the Gaeltacht on 21st February **NPWS3** which sought further clarification from the applicant on several points relevant, or potentially

¹ The bird species populations that are the reason for designation of a Special Protection Area are its Special Conservation Interest while the habitats and species that are the reason for the designation of a Special Area of Conservation are its Qualifying Interest; for convenience the term qualifying interest is generally applied to both types of designated site in this report.

relevant, to the appropriate assessment (a) the groundwater regime operating in the vicinity of the proposed Lackagh tunnel, (b) catchment areas and groundwater flow regimes of Ground Water Dependent Terrestrial Ecosystems (GWDTEs) in the Lough Corrib cSAC, (d) proposed mitigation for Marsh Fritillary and (e) further detail on the provision of compensatory Annex I habitat, the NPWS making clear that (e) is in relation to the general environmental impact assessment rather than the appropriate assessment². The statement goes on to note that the conclusions of the NIS are reliant on mitigation measures, supported by monitoring, and stresses the importance of making sure these are effective, timely, encompass the lifetime of the development and safeguarded from future development.

- Ms. Deidre Goggin who raised concerns about the tunnelling elements of the road, understanding this to be cut and cover construction, within the Lough Corrib cSAC. She also observed that the boundaries of the cSAC seem to have been drawn to accommodate the road development, with karst continuing beneath the road, and that the rulings of the ECJ have been ignored. She raised concerns about hydrogeology and the links provided by homes and gardens which would be lost to the development, she questioned whether a longer tunnel would be more appropriate.
- Mr McDonagh raised concerns about the potential for water quality effects on the River Corrib resulting from road discharges and existing pollution within Lackagh Quarry, stating that oil already leaks into the cSAC from here. He also made points about the loss of petrifying springs within the Lackagh Quarry including the difficulty of recreating these within the quarry (which are on the boundary of the cSAC and as possible Annex I habitat).
- Mr Dowds (a planning consultant) on behalf of the N6 Action Group, who challenged the applicants over the level of certainty in reaching the conclusions with the NIS, chiefly because there was a need for monitoring to inform the mitigation during construction, the need for monitoring being an indication of uncertainty. The two key areas were the monitoring of the rock mass at the western approach to the Lackagh tunnel, upon which there is limestone pavement included in the cSAC and monitoring of pollutants/contaminants during the construction process, with the potential for contaminated material entering the River Corrib and other parts of the cSAC. The remedial actions in both circumstances being unknown. In summary, Mr. Dowds questioned the credibility of applicant's case that building a motorway adjacent to an cSAC could be done without causing damage to the cSAC, due to predictable difficulties on construction sites, and therefore due to this risk, the application should be considered under Article 6(4) of the Habitats Directive, refer c641/17.
- Galway Athletics Board, which considered the project to be contrary to the Habitats Directive and prior court judgements on this topic, due to the loss of limestone pavement, and the potential impact on freshwater pearl mussels in the River Corrib,

² I have used the letters used by the NPWS for each item, and item (c) is not relevant to the appropriate assessment, hence not given here.

based on observations of a species of mussel observed in the River, as well as concerns about an attenuation pond close to River.

- Mr Dermot A Flanagan SC (a barrister) on behalf of McHugh Property Holdings who considered the proposed road to be in accordance with the provisions of the Habitats Directive, although this was not his main area of consideration.

2.5.3 These submissions were responded to by the applicant at the oral hearing, including a written response to the NPWS submission, which is included in the Module 1 response.

2.5.4 Further, Mr. Dodds and I put a series of questions to both the NPWS and the applicant to seek clarification on aspects of the NIS and associated information, and to inform this report. The questions and the answers were provided by the NPWS in its submission on 10th March 2020 **NPWS4** and by the applicant in the Module 1 response. The four NPWS submissions are gathered in Appendix 1.

2.6 Site Visits and Scope

2.6.1 In addition to the information, observations and responses described above, I undertook two site visits to gain a general understanding of the receiving environment, including the relevant parts of Lough Corrib cSAC, these were on 6th and 7th March 2019 and 12th and 13th November 2019. Mr. Dodds also made a site visit.

2.6.2 This Appropriate Assessment report provides an assessment of the N6 Galway City Ring Road (referred to by the applicant and here as ‘the proposed road (development)’) under the European Union Habitats Directive (Council Directive 92/43/EEC) and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended, which is a necessary step in the planning process. As described above, this follows an assessment under the same legislation that has been completed by the applicant, presented in the Natura Impact Statement (NIS) and subsequent documents. To reduce duplication between these assessments, I have referred to the applicant’s text where appropriate and then summarised, added to or re-assessed, as necessary. The various submissions mentioned above have also been drawn upon for the assessment.

2.6.3 This document contains measurements of areas which are either taken from the applicants work or measured by me using basic GIS tools but without undertaking detailed GIS work or the use of specialist GIS consultants. The areas that I have measured are therefore approximate and may not reconcile fully with the areas measured by the applicant.

3. Screening Assessment (Stage 1)

3.1 Applicant's Screening Assessment

3.1.1 As previously noted, the applicant completed a screening assessment which provides (i) a description of the project (ii) identifies potential impact pathways on European sites and those European sites which lie within the Zone of Influence of the projects; and (iii) identifies potential in-combination effects from other plans and projects. The applicants conclude that "*it is not possible to rule out the possibility of significant effects on four European sites; Lough Corrib cSAC, Lough Corrib SPA, Galway Bay Complex cSAC and Inner Galway Bay SPA*" and therefore the proposed road requires an Appropriate Assessment under the Habitats Directive. Eleven potential sources of impact on qualifying interest features were identified which can be summarised as habitat loss, fragmentation and degradation (from tunnelling, changes in hydrogeology, shading, reduction in air quality, reduction in water quality), and mortality, disturbance, displacement and disrupting the movement of fauna.

3.2 Screening Assessment Methodology

3.2.1 The screening assessment methodology I have followed is based on EC guidance, in particular Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (EC, 2001).

3.2.2 Other methodological guidance referred to includes:

- National Parks and Wildlife Service 'Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities'. (DEHLG, 2010); and
- Managing Natura 2000 sites The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (EC, 2018).

3.2.3 The applicant has provided a brief description of the methodology in the screening assessment p3-p4 and the NIS p5.

3.3 Step One: Management of the Site

3.3.1 The project is not 'directly connected with or necessary to the management of the site' and therefore it needs to be ascertained whether the development is likely to have significant effects on Natura 2000 sites, see screening assessment p3 (foot note).

3.4 Step Two: Description of the Project

3.4.1 The applicant provides a description of the project in Section 2 of the NIS and elsewhere in the application documents, especially the N6 Galway City Ring Road Design Report (Arup, February 2019). In summary, the project comprises:

- New single carriageway road from a new junction with the R336 Coast Road at in An Baile Nua on the western side of Bearna eastwards for approximately 5.6km to the Ballymoneen Road, where there will be a new junction;
- New dual carriageway from the Ballymoneen Road eastwards for approximately 11.9km to a new junction (the Coolagh Junction) with the existing N6;
- A series of other junctions with the existing road network, including a junction with the N59 Moycullen Road at Letteragh, the N84 Headford Road, and the N83 Tuam Road;
- Three link Roads, the N59 Link Road North, connecting to the N59 Moycullen Road, the N59 Link Road South, connecting to Letteragh Road, the Parkmore Link Road connecting to Ballybrit Business Park and the Parkmore Industrial Estate;
- An open span bridge over the River Corrib, 620m in length with eight spans, the main span of 153m is over the river and without supports in the river, the eastern approach is on a retained embankment with five culverts passing beneath the road, with the bridge having a sealed and isolated drainage system which discharges to a new wetland/ attenuation area, Design Report p248, RFI response appendix A.1.1;
- The Menlough viaduct which carries the road over an area of limestone pavement, with the viaduct 320m in length with eight spans of approximately 40m each, with some footings within the limestone pavement, with the viaduct having a sealed and isolated drainage system which discharges to a new wetland/ attenuation area, Design Report p250, RFI response appendix A.1.3;
- The 270m Lackagh Tunnel, which takes the road under (approximately 8.6m below) an area of limestone pavement, Design Report p251 to p255, RFI response Appendix A.1.4, and the 240m Galway Racecourse Tunnel, which takes the road under the racecourse, with both tunnels having a sealed and isolated drainage system, with collected water pumped to the nearest foul sewer, Design Report p255 to p258;
- Seven overbridges to standard design, four carrying roads over the proposed road, one for wildlife and two more at the Coolagh junction, Design Report p239 - p241 and FIR response Appendix A.1.7 , plus 10 underbridges which are all for roads, Design Report p242 - 244 and FIR response Appendix A.1.6.;
- Approximately twenty-eight culverts and underpasses, with two being suitable for otter, 19 being suitable for badger and approximately 26 being suitable for bats, with eight culverts in proximity to the cSAC (five being part of the River Corrib bridge structure and also mentioned above), Design Report p245 to p248, FIR response Appendix A.1.8 and the Module 1 response p26 and Appendix A;
- Ten Retaining walls between 6m and 288m in length, plus five strengthened slopes, three of which are in proximity of the Lough Corrib cSAC, Design Report p258 to 259;
- Drainage infrastructure, with flow rate and pollution controls, to collect and discharge rainwater which falls onto the new road surface and surface water flows (interceptor ditches), which discharge into watercourses, via attenuation ponds, to the west of the River Corrib (including, indirectly and directly, the River Corrib) and a combination of discharging to watercourses (again including the River Corrib, indirectly and directly) and into the ground,

via infiltration basins, to the east of the River Corrib, reflecting the underlying geology (Design Report p265 - p301);

- Road lighting, including along the main carriageway on the western and eastern approaches of the Lackagh tunnel in proximity to the Lough Corrib cSAC, Design Report p332 - 333 and drawings GCOB-1300-D-000 to -015;
- Noise barriers at various locations, including three locations in proximity to Lough Corrib cSAC (i) between Chainage³ (Ch.) 8+850 to 9+500 on both sides (this is the location of the River Corrib Bridge), (ii) between Ch. 9+990 to 10+100 on the eastbound side (this is in Area 2 (see paragraph 4.5.4), opposite side from the cSAC) and (iii) Ch. 10+420 to 10+780 on the westbound side (Area 3 (see paragraph 4.5.4), before descent to tunnel mouth), Design Report p261 - p264;
- Fencing of various types along the boundary, including timber post and rail, mammal proof fencing and palisade fencing (around ponds, etc.);
- Sign gantries, seven of which are in proximity to the Lough Corrib cSAC, Design Report p259- p260;
- Forty potential Material Deposition Areas, including one at Coolough (0.14ha) Ch. 10+675 (listed in EIAR, shown on Figure 8 of Appendix A.8.26 of EIAR but not shown on Figures 7.301 and 7.302, status unclear) and four at Lackagh Quarry (DA24, DA25, DA27 and DA28) see FIR response p13 to p15 and FIR response Appendix A1.11 (which supersedes the EIAR on this topic), the Module 1 response p38, p57-61 and ;"Responses to Queries raised in Module 2 ...Lackagh Quarry Material Deposition Areas", dated 19th Oct 2020.
- Compensatory habitat creation (or in some cases re-instatement), for lost Annex I habitats outside the cSAC, which includes:
 - *Area 6210 R1*⁴ to the south of the proposed road at Menlo, including within the Lough Corrib cSAC at Ch. 9+400 to 9+500 partly re-instatement of the existing habitat following construction with some additional habitat creation, see EIAR p 699, EIAR Figures 8.23.1 to 8.23.14 and EIAR Appendix A.8.26;
 - *Area 6210 R2* nearby and co-incident with Compound SC09/01 at Ch. 9+600 to 9+700 essentially re-instatement of the existing habitat after use of the area as a site compound, same references as Area 6210 R1;
 - *Area *91E0 R1*⁵ adjacent to the Lough Corrib cSAC at Ch. 9+850 to Ch. 9+900 same references as Area 6210 R1;
 - *Area 6210 R7* proximate to the Lough Corrib cSAC at Ch. 11+850 to Ch.12+000, same references as Area 6210 R1; and

³ Chainage or Ch. Refers to the position along the route of the road from west to east in km and metres, so 8,850m from the start of the road is Ch. 8+850.

⁴ The 6210 refers to the intended habitat to be created which in this case is the Annex I habitat type of Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)

⁵ *91E0 is alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*

- *Areas 6210 R5, R6 and R8* (replaces 6210 R3 and R4) within Lackagh Quarry (co-incident with the Material Deposition Areas DA24, DA25 and DA28, respectively) see FIR response Appendix A.1.11 p21 to p23 and “Responses to Queries raised in Module 2 ...Lackagh Quarry Material Deposition Areas”, dated 19th Oct 2020;
 - Other ecological mitigation areas, including an extensive area of land at Menlo (approximately 8ha) to the north of the proposed road for bat and barn owl mitigation, see EIAR p710 and EIAR Figure 8.23.7;
 - Landscaping of the soft estate to include screening planting (effectively woodland), boundary hedgerows and stone walls in specific locations and grassland sown with a low maintenance seed mix, with stones over 50mm removed or buried, potential for some exposed rock in cuttings, EIAR p1110 and p1111; and
 - (Up to) thirteen temporary construction compounds, including one at Menlo (East of River Corrib) (SC09/01) and one at Lackagh Quarry (SC11/01), with the Menlo compound approximately 100m from the River Corrib and less than 50m the Lough Corrib cSAC in general, and the Lackagh Quarry compound being adjacent to the Lough Corrib cSAC see Design Report p 387 and EIAR Figures 7.001 and 7.002.
- 3.4.2** The project will take approximately 36 months to construct, including archaeological trial trenching and ground investigation.

3.5 Step Three, part 1: Characteristics of the sites

Development Site

- 3.5.1** The receiving environment is described in the EIAR and the NIS, with Chapters 8 to 12, 16 and 17 of the EIAR and Chapter 5 of the NIS being of most relevance to the Appropriate Assessment. The habitats within the proposed road boundary are listed in the EIAR p495 to p497, then updated for some habitats in Appendix A.3.1. of the FIR Response, with some further corrections given in the Corrigendum p13 to p16. It is not always entirely clear from the applicant’s submission how much of each habitat is lost because sometimes the figure stated is the area within the road boundary rather than what is to be lost to the road development (with some areas potentially retained within the road boundary). In summary, and according to the applicant, the development site will directly affect approximately 280ha of land, comprising approximately the following, of which at least the majority in each case will be lost to the development (known quantities are indicated with the word ‘lost’):
- 85ha improved grassland comprising agricultural (76ha) and amenity grassland (9ha);
 - 60ha of developed land comprising buildings and artificial surfaces (32ha), spoil and bare ground (18ha) and residential properties (10ha);
 - 57.51ha of dry grassland comprising dry calcareous and neutral grassland (43.5ha), dry meadows and verges (9.50ha), dry humid acid grassland (4.51ha);

- 35.46ha (or more) of woodland and scrub comprising scrub (27.10ha), mixed broadleaved woodland (4.40ha), oak-ash-hazel woodland (3.9ha), riparian woodland (0.03ha) mixed broadleaved conifer woodland (0.03ha), hedgerows (10.2km) and treelines (5.2km);
- 15.56ha of wetland comprising wet grassland (15.23ha), poor fen and flush (0.25ha), reed and large sedge swamps (0.08ha) and calcareous springs (15no.);
- 14ha of bracken;
- 5.19ha of non-priority Annex I habitats comprising 1.89ha corrigendum p15 (with 2.47ha lost, corrigendum p13)⁶ of wet heath, 2.32ha (with 2.22ha lost) dry heath, 0.25ha (all lost) calcareous grassland, 0.73ha (with 0.07ha lost) of Molinia meadows and 0.001ha (all lost) of blanket bog;
- 2.95ha of Priority Annex I habitats comprising a small part of a turlough 0.1ha, a single (lost) petrifying spring, 0.14ha (all lost) of residual alluvial forest and 2.71ha (with 0.94ha lost) of limestone pavement;
- Watercourses comprising the River Corrib, four streams (955m) and ditches drainage ditches 0.08ha (to be bridged over or culverted); and
- Other small areas of habitat including of exposed calcareous rock (0.02ha), artificial lakes and ponds, flower beds and borders, ornamental/non-native shrubs.

3.5.2 The area of the development site in proximity to, and overlapping with, the Lough Corrib cSAC is between the west bank of the River Corrib and Lackagh Quarry. Here, the land along the route alignment is mainly dry neutral and calcareous grassland fields divided by hedgerows, treelines and stone walls, interspersed with woodland (mixed broadleaved, oak-ash-hazel and wet willow-alder-ash) and scrub. Other habitats present include a block of improved agricultural grassland, the river itself, wet grassland, part of a turlough and limestone pavement, some of which occurs beneath the woodland and scrub habitats already mentioned. The underlying geology is karst limestone and with surrounding habitats including ground water dependent terrestrial ecosystems (GWDTEs), see, for example, FIR response Figures 2.5.7 and 2.5.8 and 2.6.7 and 2.6.8.

Natura 2000 Sites

3.5.3 There are effectively two types of Natura 2000 site: Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). SPAs are designated for their bird interest and SACs are designated for their nature conservation interest other than birds. SACs which have not yet been fully adopted by the EC are described as candidate SACs (cSACs). The legal protection for SACs and cSACs is the same.

3.5.4 In selecting Natura 2000 sites for consideration of likely significant effects, the applicant initially chose a buffer of 15km from the proposed road and considered only the Natura 2000 sites within that buffer. There are a number of Natura 2000 sites within 15km of the development site.

⁶ The assessment is based upon the higher figure of 2.47ha being lost to the development.

These are listed and described briefly by the applicant in Appendix A of the Screening Report. A summary of each of these Natura 2000 sites is provided in Table 1 overleaf.

- 3.5.5** Setting a buffer at 15km is the starting point for this process and is consistent with existing guidance (DEHLG, 2010). However, this guidance also indicates that Natura 2000 sites beyond this distance should also be included in the initial selection of sites for consideration if these may be subject to *'direct, indirect or cumulative effects, taking a precautionary approach so that a site is included if doubt exists'*. The guidance also makes clear that the selection of sites for consideration should be an iterative process. In the screening report, the applicant did not consider the potential for the proposed road to act in combination with other plans and projects to boost tourism and recreation in Connemara, where there are two further Natura 2000 sites, both beyond 15km. These are also included in Table 1 overleaf.

Table 1: Natura 2000 sites identified for inclusion in the screening assessment.

Site Code SPA/ SAC	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to N6 GCRR Site (closest point)
000297	Lough Corrib cSAC	<p>Comprises Lough Corrib, River Corrib, twelve or more other rivers and the land surrounding the Lough, encompassing bog, heath, woodland, grassland and limestone pavement. Supporting important populations of stoneworts in the southern basin of Lough Corrib and a population of lesser horseshoe bats at Ebor Hall.</p> <p>Qualifying Interest: Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) [3110]; Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoeto-Nanojuncetea</i> [3130]; Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp. [3140]; Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [3260]; Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210]; <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) [6410]; Active raised bogs [7110]; Degraded raised bogs still capable of natural regeneration [7120]; Depressions on peat substrates of the <i>Rhynchosporion</i> [7150]; Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210]; Petrifying springs with tufa formation (<i>Cratoneurion</i>) [7220]; Alkaline fens [7230]; Limestone pavements [8240]; Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0]; Bog woodland [91D0]; <i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [1029]; <i>Austropotamobius pallipes</i> (White-clawed Crayfish) [1092]; <i>Petromyzon marinus</i> (Sea Lamprey) [1095]; <i>Lampetra planeri</i> (Brook Lamprey) [1096]; <i>Salmo salar</i> (Salmon) [1106]; <i>Rhinolophus hipposideros</i> (Lesser Horseshoe Bat) [1303]; <i>Lutra lutra</i> (Otter) [1355]; <i>Drepanocladus vernicosus</i> (Slender Green Feather-moss) [1393]; <i>Najas flexilis</i> (Slender Naiad) [1833]</p>	0 km (i.e., overlapping boundaries), to north and south
000268	Galway Bay Complex cSAC	<p>Inner part of Galway Bay including shallow, inter-tidal inlets and bays, small islands, coastal cliffs, lagoons and surrounding terrestrial habitats.</p> <p>Qualifying Interest: Mudflats and sandflats not covered by seawater at low tide [1140]; Coastal lagoons [1150]; Large shallow inlets and bays [1160]; Reefs [1170]; Perennial vegetation of stony</p>	0.16km, south

Site Code SPA/ SAC	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to N6 GCRR Site (closest point)
		banks [1220]; Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]; Salicornia and other annuals colonising mud and sand [1310]; Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]; Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]; Turloughs [3180]; <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130]; Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210]; Calcareous fens with <i>Cladium mariscus</i> and species of the Caricion davallianae [7210]; Alkaline fens [7230]; Limestone pavements [8240]; <i>Lutra lutra</i> (Otter) [1355]; <i>Phoca vitulina</i> (Harbour Seal) [1365]	
004042	Lough Corrib SPA	Lough Corrib. Qualifying Interest: Gadwall (<i>Anas strepera</i>) [A051]; Shoveler (<i>Anas clypeata</i>) [A056]; Pochard (<i>Aythya ferina</i>) [A059]; Tufted Duck (<i>Aythya fuligula</i>) [A061]; Common Scoter (<i>Melanitta nigra</i>) [A065]; Hen Harrier (<i>Circus cyaneus</i>) [A082]; Coot (<i>Fulica atra</i>) [A125]; Golden Plover (<i>Pluvialis apricaria</i>) [A140]; Black-headed Gull (<i>Chroicocephalus ridibundus</i>) [A179]; Common Gull (<i>Larus canus</i>) [A182]; Common Tern (<i>Sterna hirundo</i>) [A193]; Arctic Tern (<i>Sterna paradisaea</i>) [A194]; Greenland White-fronted Goose (<i>Anser albifrons flavirostris</i>) [A395]; Wetland and Waterbirds [A999]	0.2km
004031	Inner Galway Bay SPA	Inner Galway Bay, see description for Galway Bay Complex cSAC. Qualifying Interest: Great Northern Diver (<i>Gavia immer</i>) [A003]; Cormorant (<i>Phalacrocorax carbo</i>) [A017]; Grey Heron (<i>Ardea cinerea</i>) [A028]; Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046]; Wigeon (<i>Anas penelope</i>) [A050]; Teal (<i>Anas crecca</i>) [A052]; Shoveler (<i>Anas clypeata</i>) [A056]; Red-breasted Merganser (<i>Mergus serrator</i>) [A069]; Ringed Plover (<i>Charadrius hiaticula</i>) [A137]; Golden Plover (<i>Pluvialis apricaria</i>) [A140]; Lapwing (<i>Vanellus vanellus</i>) [A142]; Dunlin (<i>Calidris alpina</i>) [A149]; Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157]; Curlew (<i>Numerius arquata</i>) [A160]; Redshank (<i>Tringa totanus</i>) [A162]; Turnstone (<i>Arenaria interpres</i>) [A169]; Black-headed Gull (<i>Chroicocephalus ridibundus</i>) [A179]; Common Gull (<i>Larus canus</i>) [A182]; Sandwich Tern (<i>Sterna sandvicensis</i>) [A191]; Common Tern (<i>Sterna hirundo</i>) [A193]; Wetland and Waterbirds [A999]	1.1km

Site Code SPA/ SAC	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to N6 GCRR Site (closest point)
004142	Cregganna Marsh SPA	Primarily lowland wet grassland with other habitats including limestone pavement. Qualifying Interest: Greenland White-fronted Goose (<i>Anser albifrons flavirostris</i>) [A395]	4km, south-east
002034	Connemara Bog Complex cSAC	A very large site encompassing the majority of the south Connemara lowlands, underlain with granite and supporting areas of deep peat, with the main habitat being Atlantic blanket bog. The blanket bog is interspersed with a variety of base-poor terrestrial habitats and lakes, supporting a number of rare plant species. Qualifying Interest: Coastal lagoons [1150]; Reefs [1170]; Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) [3110]; Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoeto-Nanojuncetea</i> [3130]; Natural dystrophic lakes and ponds [3160]; Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [3260]; Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010]; European dry heaths [4030]; <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) [6410]; Blanket bogs (* if active bog) [7130]; Transition mires and quaking bogs [7140]; Depressions on peat substrates of the <i>Rhynchosporion</i> [7150]; Alkaline fens [7230]; Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0]; <i>Euphydryas aurinia</i> (Marsh Fritillary) [1065]; <i>Salmo salar</i> (Salmon) [1106]; <i>Lutra lutra</i> (Otter) [1355]; <i>Najas flexilis</i> (Slender Naiad) [1833]	6km west
004181	Connemara Bog Complex SPA	South Connemara lowlands, see description for Connemara Bog Complex cSAC. Qualifying Interest: Cormorant (<i>Phalacrocorax carbo</i>) [A017]; Merlin (<i>Falco columbarius</i>) [A098]; Golden Plover (<i>Pluvialis apricaria</i>) [A140]; Common Gull (<i>Larus canus</i>) [A182]	9km west
000606	Lough Fingall Complex cSAC	Within an area of flat, low-lying limestone and supporting a complex of calcareous habitats including limestone pavements, calcareous grassland and s series of turloughs. The grassland supports a variety of orchids and an additional feature of the site is an internationally important population of lesser horseshoe bats. Qualifying Interest: Turloughs [3180]; Alpine and Boreal heaths [4060]; <i>Juniperus communis</i>	9.5km south east

Site Code SPA/ SAC	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to N6 GCRR Site (closest point)
		formations on heaths or calcareous grasslands [5130]; Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]; Calcareous fens with <i>Cladium mariscus</i> and species of the Caricion davallianae [7210]; Limestone pavements [8240]; <i>Rhinolophus hipposideros</i> (Lesser Horseshoe Bat) [1303]	
001312	Ross Lake and Woods cSAC	Ross Lake is a medium size lake on limestone supporting a variety of stoneworts adjoined by a conifer plantation and some broadleaved woodland. Supports otter and a breeding population of common gull. Qualifying Interest: Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp. [3140]; <i>Rhinolophus hipposideros</i> (Lesser Horseshoe Bat) [1303]	10km north-west
000020	Black Head-Poulsallagh cSAC	Part of the Burren, including the shoreline, sand dunes at Fanore, limestone pavement and the Caher River. Qualifying Interest: Reefs [1170]; Perennial vegetation of stony banks [1220]; Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]; Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]; Alpine and Boreal heaths [4060]; <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130]; Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites) [6210]; Lowland hay meadows (<i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i>) [6510]; Petrifying springs with tufa formation (Cratoneurion) [7220]; Limestone pavements [8240]; Submerged or partially submerged sea caves [8330]; <i>Petalophyllum ralfsii</i> (Petalwort) [1395]	11km, south
000322	Rahasane Turlough cSAC	One of only two large turloughs in the country which still functions naturally, supporting two rare plant species including Fen Violet (<i>Viola persicifolia</i>), and is also the most important turlough in Ireland for its birdlife. Qualifying Interest: Turloughs [3180]	11.5km south east
004089	Rahasane Turlough SPA	Large turlough, see description for cSAC. Qualifying Interest: Whooper Swan (<i>Cygnus cygnus</i>) [A038]; Wigeon (<i>Anas penelope</i>) [A050]; Golden	12km south-east

Site Code SPA/ SAC	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to N6 GCRR Site (closest point)
		Plover (<i>Pluvialis apricaria</i>) [A140]; Black-tailed Godwit (<i>Limosa limosa</i>) [A156]; Greenland White-fronted Goose (<i>Anser albifrons flavirostris</i>) [A395]; Wetland and Waterbirds [A999]	
001285	Kiltiernan Turlough cSAC (A relatively dry turlough which is notable for the presence of two rare plant species; alder buckthorn (<i>Frangula alnus</i>) and fen violet (<i>Viola persicifolia</i>) Qualifying Interest: Turloughs [3180]	12km south east
000242	Castletaylor Complex cSAC	Complex of habitats on limestone including Caranavoodaun turlough, limestone pavement calcareous grassland, heath and woodland. Qualifying Interest: Turloughs [3180]; Alpine and Boreal heaths [4060]; <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130]; Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]; Limestone pavements [8240]	12km south east
001271	Gortnandarragh Limestone Pavement cSAC	Limestone pavement located on the south side of Lough Corrib, interspersed with heath, grassland and scrub, plus an area of bog, which the is only known locality for the endemic fungus <i>Entoloma jenny</i> . Qualifying Interest: Limestone pavements [8240].	12.5km north-west
002244	Ardrahan Grassland cSAC	Large flat limestone area with a mosaic of calcareous habitats plus Brackloon Lough, a small marl lake, with adjoining wetlands and two small turloughs. Qualifying Interest: Alpine and Boreal heaths [4060]; <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130]; Limestone pavements [8240]	13km south east
000054	Moneen Mountain cSAC	Part of the Burren, open limestone pavement, associated grassland and heaths, plus scrub and woodland. Qualifying Interest: Turloughs [3180]; Alpine and Boreal heaths [4060]; <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130]; Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]; Petrifying springs with tufa formation (Cratoneurion) [7220]; Limestone pavements [8240]; <i>Euphydryas aurinia</i> (Marsh Fritillary) [1065]; <i>Rhinolophus hipposideros</i> (Lesser Horseshoe Bat) [1303]	13km, south

Site Code SPA/ SAC	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to N6 GCRR Site (closest point)
001926	East Burren Complex cSAC	<p>All of the high ground in the eastern Burren area, comprising limestone pavement and associated calcareous grasslands and heath, scrub and woodland together with a network of calcareous lakes and turlough.</p> <p>Qualifying Interest: Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp. [3140]; Turloughs [3180]; Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation [3260]; Alpine and Boreal heaths [4060]; <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130]; Calaminarian grasslands of the Violetalia calaminariae [6130]; Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]; Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) [6510]; Calcareous fens with <i>Cladium mariscus</i> and species of the Caricion davallianae [7210]; Petrifying springs with tufa formation (Cratoneurion) [7220]; Alkaline fens [7230]; Limestone pavements [8240]; Caves not open to the public [8310]; Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) [91E0]; <i>Euphydryas aurinia</i> (Marsh Fritillary) [1065]; <i>Rhinolophus hipposideros</i> (Lesser Horseshoe Bat) [1303]; <i>Lutra lutra</i> (Otter) [1355]</p>	13km, south
002008	Maumturk Mountains cSAC	<p>A series of peaks over 600m above sea level and surrounding areas, with wet heath, dry heath and blanket bog.</p> <p>Qualifying Interest: Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) [3110]; Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010]; Alpine and Boreal heaths [4060]; Blanket bogs (* if active bog) [7130]; Depressions on peat substrates of the Rhynchosporion [7150]; Siliceous rocky slopes with chasmophytic vegetation [8220]; <i>Salmo salar</i> (Salmon) [1106]; <i>Najas flexilis</i> (Slender Naiad) [1833]</p>	34km, northwest
002031	The Twelve Bens/Garraun Complex cSAC	<p>A series of peaks over 500m above sea level and surrounding areas with heath and blanket bog, part of the Connemara National Park.</p> <p>Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) [3110]; Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or</p>	47km, northwest

Site Code SPA/ SAC	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to N6 GCRR Site (closest point)
		Isoeto-Nanojuncetea [3130]; Alpine and Boreal heaths [4060]; Blanket bogs (* if active bog) [7130]; Depressions on peat substrates of the Rhynchosporion [7150]; Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110]; Calcareous rocky slopes with chasmophytic vegetation [8210]; Siliceous rocky slopes with chasmophytic vegetation [8220]; Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0]; <i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [1029]; <i>Salmo salar</i> (Salmon) [1106]; <i>Lutra lutra</i> (Otter) [1355]; <i>Najas flexilis</i> (Slender Naiad) [1833]	

3.5.6 The conservation objectives for these SPAs and SACs are, in summary, to maintain or restore the favourable conservation condition of the qualifying interest of each site. The apparent conservation condition of the qualifying features for the relevant Natura 2000 sites is set out in Section 4.3 of this appropriate assessment report.

3.6 Step Three, part 2: Identification of Potential Impacts

3.6.1 As previously mentioned, the development partially overlaps the Lough Corrib cSAC and therefore it will be directly impacted by the proposed road. There is also the potential for indirect effects on this and other Natura 2000 sites. Several impact mechanisms have been identified by the applicant (p9 of its Screening Report) and the NPWS (NPWS1 and NPWS2).

3.6.2 The potential impact mechanisms (or pathways) on Natura 2000 sites are summarised below (those in italics were not explicitly identified by the applicant in its screening report or were discounted):

- Habitat loss directly within the footprint of the proposed development
- Habitat loss indirectly through changes in hydrology/hydrogeology (water supply);
- Habitat fragmentation with larger habitat parcels divided in two by the proposed development;
- *Habitat isolation of habitat parcels to the north and south of the proposed development;*
- Habitat degradation as a result of chemical pollution, *noise*, dust, *light*, shading, spread of invasive species *including from construction traffic and site workers travelling to/from the construction site* and changes in hydrology/hydrogeology (water supply);
- Mortality, disturbance, displacement and habitat loss for species of flora and fauna, resulting in declines or local extinction;

- Disruption of migration, commuting routes or loss of seasonally occupied habitats for species with large home ranges or which are migratory;
- *Loss or decline of supporting populations of flora and fauna within habitats lost or degrading with knock on effects on habitats and populations that are retained; and*
- *Increase in recreational pressure resulting in damage to habitats and disturbance of wildlife if improvements to the road network bring in additional tourists or indirectly increase the resident population.*

3.6.3 These potential impact mechanisms apply to both the proposed road and developments which are subsequently facilitated by the proposed road scheme by creating access for new developments, and other plans and projects which may act in combination with the proposed road.

3.7 Step four: Assessment of Significance

3.7.1 There are two possible conclusions for the screening assessment:

- 1. It can be objectively concluded that there are not likely to be significant effects on any Natura 2000 site; or
- 2. The information provided either suggests that significant effects are likely, or that sufficient uncertainty remains to indicate that an appropriate assessment should be carried out.

3.7.2 If the second conclusion is reached, the project should be subject to an appropriate assessment and that assessment should include consideration of all the Natura 2000 sites that could not be objectively screened out i.e., the first conclusion above cannot be reached.

3.7.3 The applicant reached the conclusion that an appropriate assessment was required because it was not possible to rule out the possibility of significant effects on Natura 2000 sites. I agree with the applicant that an appropriate assessment is required for the N6 Galway City Ring Road proposal. This is primarily because the proposed road will have a direct impact on the Lough Corrib cSAC, but also because of potential indirect effects on this and other Natura 2000 sites.

3.7.4 The applicant determined that such uncertainty existed for four Natura 2000 sites; Lough Corrib cSAC, Lough Corrib SPA, Galway Bay Complex cSAC and Inner Galway Bay SPA whereas it concluded that all other Natura 2000 sites were outside the Zone of Influence of the road (including the other fourteen identified within 15km) and therefore significant effects can be ruled out. The reasons for the excluding the other sites are similar across all sites; lack of hydrological or hydrogeological link; lack of other impact pathways and “no potential ‘ex situ’ impacts relevant to the European site”.

3.7.5 None of the Natura 2000 sites beyond Lough Corrib cSAC would suffer habitat loss or fragmentation as a result of the proposed road, equally none are isolated by the proposed road i.e., lying to the south of the route and north of Galway Bay. Further, there are no hydrological/hydrogeological links between the proposed road and the Natura 2000 sites beyond Inner Galway Bay Complex cSAC/Inner Galway Bay SPA, a point confirmed by Mr. Dodds in his Hydrogeology assessment (Dodds, 2020).

- 3.7.6** For four of the sites further away from the proposed road than Inner Galway Bay Complex cSAC/Inner Galway Bay SPA, the applicant considered in more detail whether the road development could affect species populations that are a qualifying interest. These were marsh fritillary butterfly and the Connemara Bog Complex cSAC, four bird species and the Connemara Bog Complex SPA, lesser horseshoe bat and Ross Lake and Woods cSAC and Greenland White-fronted goose and Cregganna Marsh SPA. In each case, the risk of an impact was considered by the applicant to be nil because no links were found to exist between these populations and any potentially affected by the proposed road.
- 3.7.7** There are three potential pathways which the applicant appears not to have considered fully, these are (i) the potential effects of construction traffic bringing materials and workers to and from the construction site; (ii) the loss of supporting populations of plants or animals (i.e., typical and positive indicator species of Annex I habitats) including via steppingstone populations; and (iii) increased recreational pressure created by improved transport links and a growing population. These are admittedly weak pathways when considering the proposed road alone.
- 3.7.8** The first of these pathways, effects of construction traffic, could affect Cregganna Marsh SPA Lough Fingall Complex cSAC, Lough Fingall Complex cSAC, Kiltiernan Turlough cSAC, Castletaylor Complex cSAC and Ardrahan Grassland cSAC if construction traffic takes a route from the south along the R458 and N67 or M18, since these sites are all 200m or less from the road network, Rahasane Turlough SPA also included because the same birds use this site and Cregganna Marsh SPA. The second, loss of supporting populations, could apply to all of the cSACs within 15km plus the Connemara Bog Complex SPA which share qualifying interest species with the project site. And the third, effects from tourism, could apply to Connemara Bog Complex cSAC, Connemara Bog Complex SPA, Ross Lake and Woods cSAC, Maumturk Mountains cSAC and The Twelve Bens/Garraun Complex cSAC as these include tourist or recreation destinations.
- 3.8 In combination Effects**
- 3.8.1** Since likely significant effects have been identified for the project alone, that is enough for this stage to determine whether an appropriate assessment is required.
- 3.8.2** At the oral hearing, and subsequently, the applicant provided an updated list of plans and projects for inclusion in the 'in combination' part of the appropriate assessment, which identifies 25 plans and projects with the potential for in-combination effects, see Table 3 of the applicant's November 2020 document and the Burkeway Bearna supplement. These include extensive allocations for new housing and development in Galway and it is clear from documents such as the Galway City Development Plan, Galway County Development Plan and the Regional Spatial and Economic Strategy that further growth in population, housing, economic activity, tourism and maritime activity is expected and encouraged in and around Galway City.
- 3.8.3** The combined effect of the growth and development including the proposed road could potentially exacerbate the pathways identified in paragraph 3.6.2.

3.9 Conclusion on Likely Significant Effects

3.9.1 There is broad agreement from all parties (the applicant, NPWS, etc.) that the project should be subject to an appropriate assessment. There is also broad agreement that the appropriate assessment should include consideration of the effects on Lough Corrib cSAC SPA, Galway Bay Complex cSAC and Inner Galway Bay SPA.

3.9.2 Considering the additional pathways and the potential for in combination effects, some further consideration should be given to all the other Natura 2000 sites identified in Table 1, as follows:

- With respect to construction traffic for the development alone and in combination with other plans and projects: Ardrahan Grassland cSAC, Kiltiernan Turlough cSAC, Lough Fingall Complex cSAC, Castletaylor Complex cSAC and Cregganna Marsh SPA, and by association Rasahane Turlough SPA.
- With respect to loss or decline of supporting populations of typical species and positive indicator species: Connemara Bog Complex cSAC, Connemara Bog Complex SPA, Lough Fingall Complex cSAC, Ross Lake and Woods cSAC, Black Head Poulsallagh cSAC, Rahasane Turlough cSAC, Kiltiernan Turlough cSAC, Castletaylor Complex cSAC, Gortnandarragh Limestone Pavement cSAC, Ardrahan Grassland cSAC, Moneen Mountain cSAC and East Burren Complex cSAC, with consideration restricted to flora and fauna affected by the proposed road and also a significant component of these sites.
- With respect to tourism and increased recreational pressure in combination with other plans and projects: Connemara Bog Complex cSAC, Ross Lake and Woods cSAC and Connemara Bog Complex SPA, Maumturk Mountains cSAC and The Twelve Bens/Garraun Complex cSAC with consideration restricted to qualifying interest which is exposed to impacts from recreation.

3.9.3 A summary of the screening assessment is provided in Table 2.

3.9.4 It is now not permissible to consider mitigation measures at the screening stage if mitigation is required specifically in relation to Natura 2000 sites. Therefore, any Natura 2000 site for which mitigation is proposed or could be required, must be screened in for appropriate assessment. This results in longer list of sites being screened in for assessment than might historically have been the case.

Table 2 AA Screening summary matrix

Summary Screening Matrix				
European Site	Distance to proposed development/ Source, pathway receptor	Possible effect alone?	Possible In combination effects?	Screening conclusions:
Lough Corrib cSAC	0 km (i.e., overlapping boundaries), to north and south	Yes, direct and indirect impacts will occur within the cSAC.	Yes, from other developments proposed in vicinity of cSAC.	Significant effects would occur in the absence of mitigation.
Galway Bay Complex cSAC	0.16km, south	Yes, potential for pollution to reach the cSAC via watercourses and the air.	As above.	As above.
Lough Corrib SPA	0.2km	Yes, potential to disturb and displace birds when foraging outside the SPA.	Yes, from other developments proposed in vicinity of SPA.	As above.
Inner Galway Bay SPA	1.1km	Yes, potential to disturb and displace birds when foraging outside the SPA, plus pollution.	As above.	As above.
Cregganna Marsh SPA	4km, south-east	Possible, as shares qualifying feature with Rahasane Turlough SPA (see below).	Yes, due to increasing construction traffic for development in Galway.	Possible significant effects cannot be ruled out without (simple) mitigation.
Connemara Bog Complex cSAC	6km west	Possible, due to impacts outside the cSAC on Annex I habitats and mobile Annex II species which are qualifying features of the cSAC e.g. marsh fritillary, salmon and otter and impacts within the cSAC from increased recreation resulting from improved access.	Yes, risk increased in combination with other developments to the west of Galway and within the region.	Possible significant effects cannot be ruled out without further analysis and assessment and mitigation.
Connemara Bog Complex SPA	9km west	Possible, due to impacts outside the	Yes, risk increased in combination with other	Possible significant effects cannot be

Summary Screening Matrix				
European Site	Distance to proposed development/ Source, pathway receptor	Possible effect alone?	Possible In combination effects?	Screening conclusions:
		SPA on mobile Annex I bird species (merlin, cormorant and common gull) which are qualifying features of the SPA and within the SPA with improved access for recreation/tourism.	developments around Galway.	ruled out without further analysis and assessment.
Lough Fingall Complex cSAC	9.5km south east	Very low risk of pollution from construction traffic as adjacent to main road leading to Galway. Effects at the project site on species which may be supporting populations for typical/qualifying interest populations in the cSAC e.g. typical species of limestone pavement and lesser horseshoe bat.	Risk increased with other developments around Galway arising from construction traffic and further development affecting typical/ qualifying interest species.	Possible significant effects cannot be ruled out without (simple) mitigation or further analysis and assessment.
Ross Lake and Woods cSAC	10km north-west	Effects at the project site on species which may be supporting populations for typical/qualifying interest populations in the cSAC e.g. typical species of limestone pavement and lesser horseshoe bat. Very low risk arising from increased tourism/travel associated with the proposed road.	Risk increased by further development affecting typical/qualifying interest species and population growth leading to increases in recreational pressure.	Possible significant effects cannot be ruled out without further analysis and assessment.
Black Head-Poulsallagh cSAC	11km, south	Effects at the project site on species which may be supporting populations of typical species in the cSAC	Risk increased by further development affecting typical species.	Possible significant effects cannot be ruled out without

Summary Screening Matrix				
European Site	Distance to proposed development/ Source, pathway receptor	Possible effect alone?	Possible In combination effects?	Screening conclusions:
		e.g. typical species of limestone pavement and petrifying springs.		further analysis and assessment.
Rahasane Turlough cSAC	11.5km south east	Effects at the project site on species which may be supporting populations for typical species populations in the cSAC e.g. typical species of turloughs.	Risk increased by further development affecting typical species.	Possible significant effects cannot be ruled out without further analysis and assessment.
Rahasane Turlough SPA	12km south-east	Very low risk of pollution from construction traffic as adjacent to main road leading Galway, affecting Greenland White-fronted goose.	Risk increased with other developments around Galway arising from construction traffic.	Possible significant effects cannot be ruled out without (simple) mitigation.
Kiltiernan Turlough cSAC	12km south east	Very low risk of pollution from construction traffic as adjacent to main road leading Galway. Effects at the project site on species which may be supporting populations for qualifying interest populations in the cSAC e.g. typical species of turloughs	Risk increased with other developments around Galway arising from construction traffic and further development affecting typical species of turloughs	Possible significant effects cannot be ruled out without (simple) mitigation or further analysis and assessment
Castletaylor Complex cSAC	12km south east	Very low risk of pollution from construction traffic as adjacent to main road leading Galway. Effects at the project site on species which may be supporting populations for typical species populations in the cSAC e.g. typical	Risk increased with other developments around Galway arising from construction traffic and further development affecting typical species.	Possible significant effects cannot be ruled out without (simple) mitigation or further analysis and assessment.

Summary Screening Matrix				
European Site	Distance to proposed development/ Source, pathway receptor	Possible effect alone?	Possible In combination effects?	Screening conclusions:
		species of limestone pavement.		
Gortnandarragh Limestone Pavement cSAC	12.5km north-west	Effects at the project site on species which may be supporting populations of typical species in the cSAC e.g. typical species of limestone pavement.	Risk increased by further development affecting typical species.	Possible significant effects cannot be ruled out without further analysis and assessment.
Ardrahan Grassland cSAC	13km south east	Very low risk of pollution from construction traffic as adjacent to main road leading Galway. Effects at the project site on species which may be supporting populations for typical species populations in the cSAC e.g. typical species of limestone pavement	Risk increased with other developments around Galway arising from construction traffic and further development affecting typical species.	Possible significant effects cannot be ruled out without (simple) mitigation or further analysis and assessment.
Moneen Mountain cSAC	13km, south	Effects at the project site on species which may be supporting populations for typical/qualifying interest populations in the cSAC e.g. typical species of limestone pavement, marsh fritillary, lesser horseshoe bat.	Risk increased due to increasing development around Galway.	Possible significant effects cannot be ruled out without further analysis and assessment and mitigation.
East Burren Complex cSAC	13km, south	Effects at the project site on species which may be supporting populations for typical/qualifying interest populations in the cSAC e.g. typical species of limestone pavement, marsh	Risk increased due to increasing development around Galway.	Possible significant effects cannot be ruled out without further analysis and assessment and mitigation.

Summary Screening Matrix				
European Site	Distance to proposed development/ Source, pathway receptor	Possible effect alone?	Possible In combination effects?	Screening conclusions:
		fritillary, lesser horseshoe bat, otter.		
Maumturk Mountains cSAC	34km, northwest	Very low risk that improved transport links could lead to additional recreational pressure on Annex I montane habitats within the cSAC.	Risk increased due to increased population arising from other developments in Galway City and around.	Possible significant effects cannot be ruled out without mitigation.
The Twelve Bens/Garraun Complex cSAC	47km, northwest	As for Maumturk Mountains cSAC	As for Maumturk Mountains cSAC	Possible significant effects cannot be ruled out without mitigation.

4. Appropriate Assessment (Stage 2)

4.1 Applicant's Assessment

4.1.1 In the NIS, the applicant completed a detailed assessment of the potential for the proposed road to undermine the conservation objectives for Lough Corrib and (Inner) Galway Bay Natura 2000 sites, covering nearly 400 pages in the main document, with associated mapping (16 Figures) and 15 appendices (mainly survey reports). The applicant concluded that, considering avoidance and mitigation measures, the proposed road, either alone or in combination, will not undermine the conservation objectives of any Natura 2000 site and therefore poses no risk to the integrity of any Natura 2000 site.

4.1.2 This conclusion was reached on the basis that, as a result of the N6 GCRR proposal, there is no loss of Annex I habitat within any Natura 2000 site and the potential indirect effects that have been identified are either not sufficient to undermine the conservation objectives of any Natura site or can be adequately mitigated through design and management with the same effect. In combination effects were discounted because all other plans and projects identified also include, where necessary, sufficient mitigation measures to avoid adverse effects on the integrity of any Natura 2000 site.

4.1.3 Clarification and additional information have been sought by the DCHG/National Parks and Wildlife Service, An Bord Pleanála and others which has resulted in the collection and provision of updated and new information relevant to the appropriate assessment by the applicant at various stages including during the oral hearing as listed in Section 1.3 of this report. The applicant's conclusion remains unchanged from that set out in the NIS.

4.2 Appropriate Assessment Methodology

4.2.1 The appropriate assessment methodology draws on the same guidance used in the screening assessment (see section 3.2 of this document).

4.3 Step One, part 1: Information on Natura 2000 Sites

Lough Corrib cSAC 000297 and SPA 004042

Brief Description

4.3.1 Lough Corrib cSAC and SPA is briefly described in Table 1 of this report and in more detail in the site synopsis included in Appendix 3.

Qualifying Features

4.3.2 The qualifying features and baseline reference values of the Lough Corrib cSAC and SPA are set out in Table 3 below. In many cases, the baseline data is poor or absent, with the best available presented for each qualifying interest feature.

Table 3: Conservation Condition and Objectives of the qualifying features of the Lough Corrib SPA and SAC

Annex I/II code	Qualifying Feature	'BRV'	Conservation Condition	Conservation Objective
3110	Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>)	497.5?	U	R
3130	Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoeto-Nanojuncetea</i>	11572.3?	U	R
3140	Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.	21460.7?	U	R
3260	Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation	252.5?	F	M
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites)	252.5?	F	M
6410	<i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>)	252.5?	F	M
7110	Active raised bogs	39.2?/ 78.8ha (CO)	U	R
7120	Degraded raised bogs still capable of natural regeneration	17.7?/ N/A (CO)	U	R to Annex I type 7110
7150	Depressions on peat substrates of the <i>Rhynchosporion</i>	1.7?/ Included in 7110 (CO)	U	R
7210	Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i>	252.5?	F	M
7220	Petrifying springs with tufa formation (<i>Cratoneurion</i>)	252.5?	F	M
7230	Alkaline fens	252.5?	F	M
8240	Limestone pavements	252.5?	F	M
91A0	Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	252.5?	F	M
91D0	Bog woodland	1.22ha	F	M
1029	<i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel)	1 million mussels over 9.1km in the Owenriff catchment	U	R
1092	<i>Austropotamobius pallipes</i> (White-clawed Crayfish)	Historic distribution, as mapped	F	M
1095	<i>Petromyzon marinus</i> (Sea Lamprey)	50% positive sample sites	U	R
1096	<i>Lampetra planeri</i> (Brook Lamprey)	5 ammocoetes/m ² in soft sediments	F	M
1106	<i>Salmo salar</i> (Salmon)	17 salmon fry/5 mins sampling	F	M
1303	<i>Rhinolophus hipposideros</i> (Lesser Horseshoe Bat)	100 bats in roost id. no. 217 (Ebor Hall)	U	R
1355	<i>Lutra lutra</i> (Otter)	88% positive sites	F	M

Annex I/II code	Qualifying Feature	'BRV'	Conservation Condition	Conservation Objective
1393	<i>Drepanocladus vernicosus</i> (Slender Green Feather-moss)	3,725m ² / 153,377,000 shoots	F	M
1833	<i>Najas flexilis</i> (Slender Naiad)	Historic distribution, as mapped	U	R
A051	<i>Anas strepera</i> (Gadwall)	48w	17w U	R
A056	<i>Anas clypeata</i> (Shoveler)	90w	8w U	R
A059	<i>Aythya ferina</i> (Pochard)	10182w	827w U	R
A061	<i>Aythya fuligula</i> (Tufted Duck)	5521w	2270w U	R
A065	<i>Melanitta nigra</i> (Common Scoter)	35pairs, r	26pairs, r U	R
A082	<i>Circus cyaneus</i> (Hen Harrier)	8 (SY)	ND	?
A125	<i>Fulica atra</i> (Coot)	14473w	1149w U	R
A140	<i>Pluvialis apricaria</i> (Golden Plover)	1727w	1996w F	M
A179	<i>Chroicocephalus ridibundus</i> (Black-headed Gull)	197w/856r	70w/? U	R
A182	<i>Larus canus</i> (Common Gull)	48w/181r	74w/? F	M
A193	<i>Sterna hirundo</i> (Common Tern)	37r	ND F (NF)	M
A194	<i>Sterna paradisaea</i> (Arctic Tern)	60r	ND F (NF)	M
A395	<i>Anser albifrons flavirostris</i> (Greenland White-fronted Goose)	62w	0 U	R
A999	Wetland and Waterbirds	ND	ND	?

BRV = Baseline Reference Value, taken from the Natura 2000 Standard Data Form, site synopsis (SY) or conservation objectives (CO) selecting the best available, see Appendix 3 for further information. ? = obviously inaccurate data, BRV is therefore unknown. w = wintering, r = reproducing/breeding.

Conservation Condition: F = Favourable, U = Unfavourable, for birds U if >25% below BRV, taken firstly from the detailed conservation objectives where available (usually habitats and species other than birds), secondly by comparison of recent data (Birdwatch Ireland 5 yr. mean) with the BRV where available (birds only) or thirdly from the data provided in the Natura 2000 Standard Data Form (NF). ND = No data

Conservation Objective: in accordance with condition M = maintain, R = restore, ? unknown assume R.

Conservation Condition

- 4.3.3** To summarise for the cSAC, the rivers and calcareous habitats are in favourable condition while the peatland habitats and standing waters are generally in unfavourable condition.

- 4.3.4** For the SPA, a comparison between the ‘Baseline Reference Value’ BRV and the five-year peak (Birdwatch Ireland data) mean indicates that most of the bird species populations, for example coot and black-headed gull have declined since the site was designated and are therefore likely to be in unfavourable condition, although a few remain in favourable condition, for example common gull.

Conservation Objectives

- 4.3.5** The conservation objectives, with targets for each Annex I habitat and each Annex II species for Lough Corrib cSAC set out in detail by the NPWS (NPWS, 2017), with targets for each Annex I habitat and each Annex II species. In summary the conservation objectives are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the cSAC has been selected, as shown in Table 3.
- 4.3.6** The conservation objectives for Lough Corrib SPA are generic (without an assessment of condition or targets for each species) and are as follows (NPWS, Conservation objectives for Lough Corrib SPA [004042]. Generic Version 7.0. , 2020):
- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA, as shown in Table 3.
 - To maintain or restore the favourable conservation condition of the wetland habitat at Lough Corrib SPA as a resource for the regularly occurring migratory waterbirds that utilise it.

Galway Bay Complex cSAC 000268 and Inner Galway Bay SPA 004031

Brief Description

- 4.3.7** Galway Bay Complex cSAC and Inner Galway Bay SPA are described in outline in Table 1 of this report and in more detail in the NPWS site synopses included in Appendix 3.

Qualifying Features

- 4.3.8** The qualifying features of the Galway Bay Complex cSAC and Inner Galway Bay SPA are set out in Table 4 below.

Table 4: Conservation Condition and Objectives for the qualifying features of the Galway Bay Complex cSAC and Inner Galway Bay SPA

Annex I/II code	Qualifying Feature	‘BRV’	Conservation Condition	Conservation Objective
1140	Mudflats and sandflats not covered by seawater at low tide	744ha	F	M
1150	Coastal lagoons	76.7ha	U	R
1160	Large shallow inlets and bays	10,825ha	F	M
1170	Reefs	2,773ha	F	M

Annex I/II code	Qualifying Feature	'BRV'	Conservation Condition	Conservation Objective
1220	Perennial vegetation of stony banks	0.6ha?	F	M
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts ⁷	18.85ha	F (NF)	M
1310	Salicornia and other annuals colonising mud and sand	1.35ha	F	M
1330	Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)	263.80ha	U	R
1410	Mediterranean salt meadows (<i>Juncetalia maritimi</i>)	19.89ha	U	R
3180	Turloughs	63.3ha/ 59ha (CO)	F	M
5130	<i>Juniperus communis</i> formations on heaths or calcareous grasslands	1.41ha	U	R
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites)	1440.9?	F	M
7210	Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i>	1440.9?	F	M
7230	Alkaline fens	1440.9?	F	M
8240	Limestone pavements	125.84	F (NF)	M
1355	<i>Lutra lutra</i> (Otter)	88% positive sites (CO)	U	R
1365	<i>Phoca vitulina</i> (Harbour Seal)	ND	F	M
A003	<i>Gavia immer</i> (Great Northern Diver)	83w	154 F	M
A017	<i>Phalacrocorax carbo</i> (Cormorant)	266w/ 300r	313w F	M
A028	<i>Ardea cinerea</i> (Grey Heron)	102 (CO)	F	M
A046	<i>Branta bernicla hrota</i> (Light-bellied Brent Goose)	676w	1130 F	M
A050	<i>Anas penelope</i> (Wigeon)	1157w	1749 F	M
A052	<i>Anas crecca</i> (Teal)	690w	999 F	M
A056	<i>Anas clypeata</i> (Shoveler)	88w	77 F (<25%)	M
A069	<i>Mergus serrator</i> (Red-breasted Merganser)	249w	200 F (<25%)	M
A137	<i>Charadrius hiaticula</i> (Ringed Plover)	335w	284 F (<25%)	M
A140	<i>Pluvialis apricaria</i> (Golden Plover)	2030w	1122 F?	M?
A142	<i>Vanellus vanellus</i> (Lapwing)	3969w	1782 F?	M?

⁷ Not included in the conservation objectives

Annex I/II code	Qualifying Feature	'BRV'	Conservation Condition	Conservation Objective
A149	<i>Calidris alpina</i> (Dunlin)	2149w	1378 F?	M?
A157	<i>Limosa lapponica</i> (Bar-tailed Godwit)	447w	467 F	M
A160	<i>Numenius arquata</i> (Curlew)	697w	604 F (<25%)	M
A162	<i>Tringa totanus</i> (Redshank)	505w	661 F	M
A169	Turnstone (<i>Arenaria interpres</i>)	182w	261 F	M
A179	Black-headed Gull (<i>Chroicocephalus ridibundus</i>)	1815w	3108 F	M
A182	<i>Larus canus</i> (Common Gull)	1011w	1215 F	M
A191	<i>Sterna sandvicensis</i> (Sandwich Tern)	81r	ND F	M
A193	<i>Sterna hirundo</i> (Common Tern)	99r	ND	M
A999	Wetland and Waterbirds	13,267ha	F	M

See legend for Table 3, noting that the BRV population for the Annex I bird species of the SPA on the Natura 2000 Standard Data Form differs from that in the detailed conservation objectives supporting document, with Standard Data Form data given in the table above.

Conservation Condition

- 4.3.9** The sub-tidal, lower intertidal habitats and most of the terrestrial habitats within the cSAC appear to be in favourable conservation condition, while the upper intertidal habitats and juniper scrub appear to be in unfavourable condition. The seal population is favourable, while the otter population is unfavourable.
- 4.3.10** The detailed conservation objectives indicate that all the qualifying interest of the SPA is in favourable condition however more recent data indicates that three of the bird species (all waders; golden plover, lapwing and dunlin) may have declined sufficiently to be in unfavourable condition (more explanation below).

Conservation Objectives

- 4.3.11** The conservation objectives for Galway Bay Complex cSAC (NPWS, 2013) mirror those of Lough Corrib, except that there are also detailed supporting documents available for some Annex I habitats within Galway Bay Complex cSAC.
- 4.3.12** For Inner Galway Bay SPA, the conservation objectives are, in summary, the same as for Lough Corrib SPA, however specific conservation objectives have been produced for the Inner Galway Bay SPA (NPWS, 2013) with a detailed supporting document (NPWS, 2013b). These documents provide targets for each species and set out for each species whether the relevant objective is to maintain or restore the population. However, these documents are now seven years old and so the relevant objective may have changed for three species (golden plover, lapwing and dunlin) from maintain to restore due to population declines.

Other Natura 2000 sites

- 4.3.13** The following Natura 2000 sites are all briefly described, along with their qualifying interest, in Table 1 and the site synopses, with more details, are provided in Appendix 3.

Cregganna Marsh SPA 004142 and Rahasane Turlough SPA 004089

- 4.3.14** The only qualifying feature of Cregganna Marsh SPA is A395 Greenland White-fronted Goose (*Anser albifrons flavirostris*) with a baseline reference population of 129 wintering birds, which, according to the standard data form, is in favourable condition (Cat. B). However, there is no I-Webs data with which to make a comparison and it is the same population which is associated with Rahasane Turlough SPA; this currently stands at 58 birds versus a baseline population of 218, which suggests the population may actually be in unfavourable condition. It is therefore assumed that the relevant objective is to restore the population. The other species of qualifying interest at Rahasane Turlough SPA are not known to be linked to either Cregganna Marsh or the project site.

Connemara Bog Complex cSAC 002034 and Connemara Bog Complex SPA 004181

- 4.3.15** The Connemara Bog Complex cSAC supports many of the same Annex I habitats as Lough Corrib cSAC and Galway Bay Complex cSAC, as well as the Annex II species marsh fritillary, salmon, otter and slender naiad, the last three of these are also shared with either Lough Corrib or Galway Bay. The Connemara Bog Complex SPA supports four qualifying interest species of bird, including cormorant (also qualifying interest for Inner Galway Bay) and common gull (also qualifying interest for Lough Corrib and Inner Galway Bay).
- 4.3.16** There is a set of detailed conservation objectives, with targets, for Connemara Bog Complex cSAC which indicates the peatland habitats, fens (4010, 4030, 7130, 7140, 7150, 7230) and the salmon population are in unfavourable condition while the coastal habitats, woodland, aquatic habitats and the remaining Annex II species are in favourable condition, with the relevant objectives being to restore and maintain, respectively (NPWS, 2015). The conservation objectives for the Connemara Bog Complex SPA are generic (NPWS, 2020) and the Natura 2000 standard data form indicates that all four species are in favourable condition with the objective to maintain.

Lough Fingall Complex cSAC 000606

- 4.3.17** Lough Fingall Complex cSAC shares three of its four qualifying interest Annex I habitats with Lough Corrib and/or Galway Bay Complex, including limestone pavement. Lesser horseshoe bat is also a qualifying interest feature for both Lough Fingall Complex cSAC and Lough Corrib cSAC. All of the qualifying interest features of the Lough Fingall Complex cSAC are in favourable condition except for turloughs, with the conservation objectives being to maintain and restore, respectively (NPWS, 2019).

Ross Lake and Woods cSAC 001312

- 4.3.18** Ross Lake and Woods has just two qualifying interest features, both of which it shares with Lough Corrib cSAC. The Annex I habitat 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. is in unfavourable condition while the lesser horseshoe bat population is in favourable condition, with the relevant objective being to restore and maintain, respectively. (NPWS, 2018).

Black Head-Poulsallagh cSAC 000020

- 4.3.19** Black Head-Poulsallagh cSAC shares many of the same Annex I habitats as Lough Corrib cSAC and/or Galway Bay Complex cSAC including 8240 Limestone Pavement and 7220 Petrifying springs with tufa formation (Cratoneurion). All are in favourable condition, with the relevant objective to being to maintain (NPWS, 2014).

Rahasane Turlough cSAC 000322 and Kiltiernan Turlough cSAC 001285

- 4.3.20** The only qualifying feature of the Rahasane Turlough cSAC and Kiltiernan Turlough cSAC is 3180 Turloughs, which is in favourable condition (Natura 2000 Standard Data Form) at both sites and therefore the relevant objective is to maintain.

Castletaylor Complex cSAC 000242

- 4.3.21** Castletaylor Complex cSAC supports five qualifying interest Annex I habitats including three (3180 Turloughs, 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) and 8240 Limestone Pavement) which it shares with Lough Corrib cSAC and Galway Bay Complex cSAC. The conservation objectives are generic (NPWS, 2020) however all Qualifying interest Annex I habitats are apparently in favourable condition (Natura 2000 Standard Data Form) and therefore the relevant objective is to maintain.

Gortnandarragh Limestone Pavement cSAC 001271

- 4.3.22** Gortnandarragh Limestone Pavement cSAC supports just one Annex I habitat as a qualifying interest, 8240 Limestone pavements, which it shares with Lough Corrib cSAC and Galway Bay Complex cSAC. It has detailed conservation objectives (NPWS, 2019) which indicate that the habitat is in unfavourable condition, perhaps as a result of land reclamation and quarrying which have occurred within the cSAC, and the relevant objective is to restore (NPWS, 2019).

Ardrahan Grassland cSAC 002244

- 4.3.23** Ardrahan Grassland cSAC has three (or four, depending on source) Annex I habitats as qualifying interest, including 8240 Limestone Pavement. There are detailed conservation objectives for this cSAC which indicate that one of the Annex I habitats is in unfavourable condition (5130 *Juniperus communis* formations on heaths or calcareous grassland) while the other two (4060 Alpine and Boreal heaths and 8240 Limestone Pavement) are in favourable condition, with the relevant objectives being to restore and to maintain, respectively.

Moneen Mountain cSAC 000054 and East Burren Complex cSAC 001926

4.3.24 The Moneen Mountain cSAC 000054 and East Burren Complex cSAC 001926 share several Annex I habitat types with each other and also Lough Corrib cSAC and/or Galway Bay Complex cSAC, including 3180 Turloughs, 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites), 7220 Petrifying springs with tufa formation (Cratoneurion) and 8240 Limestone Pavement. Qualifying interest Annex II species for Moneen Mountain cSAC and East Burren Complex include lesser horseshoe bat and marsh fritillary which are again shared with Lough Corrib cSAC and/or Galway Bay Complex cSAC. The Moneen Mountain cSAC qualifying interest features are all in favourable condition (Natura 2000 Standard Data Form) and all but two (6510 and 91E0) of the East Burren Complex cSAC qualifying interest features are in favourable condition (Natura 2000 Standard Data Form), with the conservation objectives being to maintain or restore accordingly (NPWS , 2020a) (NPWS, 2020b).

Maumturk Mountains cSAC 002008 and The Twelve Bens/Garraun Complex cSAC 002031

4.3.25 Maumturk Mountains cSAC and The Twelve Bens/Garraun Complex each support a variety of open water, peatland and rocky mountain Annex I habitats including 7130 Blanket Bog. For the Maumturk Mountains cSAC, the peatland and upland habitats are all in unfavourable condition (NPWS , 2017). From the associated documentation, it is not entirely clear why these habitats are in unfavourable condition, however erosion of peat soils is implied as a contributing factor (NPWS, 2017). Similarly, the peatland and upland habitats of the Twelve Bens/Garraun Complex cSAC are in unfavourable condition (NPWS, 2017b) with peat erosion implied as a contributing factor (NPWS, 2017c).

4.4 Step One, part 2: Potential effects on Conservation Objectives

4.4.1 For some of the cSACs listed above, detailed conservation objectives have been produced for each qualifying interest feature. This includes Lough Corrib and Galway Bay Complex cSACs. For each qualifying interest feature a series of attributes have been selected with a target against each one, which is a threshold for favourable conservation condition.

4.4.2 The project, either alone or in combination with other plans or projects, would undermine the conservation objectives for qualifying interest Annex I habitats within the cSACs if, for habitats in favourable condition, it resulted in either (i) a reduction of the area or distribution of an Annex I habitat within the cSAC; or (ii) reduced the quality of the habitat below the acceptable thresholds (targets), and, for habitats in unfavourable condition, it resulted in hindering the ability to restore either (i) the area and distribution of an Annex I habitat within the cSAC or (ii) the quality of the habitat to levels above the acceptable thresholds. Examples of attributes with thresholds (targets) relating to habitat quality are the number of positive indicator species, the number or cover of negative indicator species, the cover of non-native species, and the cover of scrub and bracken. It is important to note that for Annex I habitats in unfavourable condition, its past area and distribution (at the time that the site was designated) may be just as an important consideration as its current distribution.

- 4.4.3** The project, either alone or in combination with other plans or projects, would be contrary to the conservation objectives for the qualifying Annex II species within the cSACs if, for species populations in favourable condition, it (i) resulted in a reduction in the distribution of the population within the cSAC, (ii) negatively affected its population structure or ability to breed to below certain thresholds or (iii) resulted in the reduction in availability or quality of its habitat to below certain thresholds. For those classed as unfavourable, the project would be contrary to the conservation objectives if it hindered restoration of these same attributes to the level specified. Examples of thresholds (targets) include number of adults, numbers of juveniles, water quality, availability of spawning beds and levels of light pollution.
- 4.4.4** For other cSACs, detailed conservation objectives do not exist. For these sites, favourable condition is taken to be the extent and condition of the habitats and species populations when the site was designated. In these cases, the project, either alone or in combination, would be contrary to the conservation objectives if it brought the extent and condition down below these levels or hindered it from being restored to these levels.
- 4.4.5** The project could be considered contrary to the conservation objectives for the SPAs if it either (i) resulted in a reduction in the population or distribution of a qualifying species such that it fell below the 'Baseline Reference Value' at the SPA or (ii) prevented, or hindered the ability of, the population or distribution of a qualifying species returning to a level which was equal to the Baseline Reference Value. The potential mechanisms for impacts which could undermine the conservation objectives are as set out in paragraph 3.6.2.

4.5 Step Two, part 1: Impact Prediction 'Alone'

Applicant's Assessment

- 4.5.1** The applicant has provided an impact assessment in the NIS p74 to p277, although it is notable that much of the text is duplicated and the same information is often presented more than once in different formats. The assessment encompassed Lough Corrib cSAC SPA and Galway Bay Complex cSAC/Inner Galway Bay SPA, with the other Natura 2000 sites excluded. The potential impacts on qualifying interest features of these four designations that were identified by the applicant are summarised or replicated below. Other potential impacts were considered by the applicant but discounted.

Lough Corrib cSAC

- Direct habitat loss within the cSAC totalling about 2.9ha and comprising bramble scrub, rank grassland, a block of woodland, parts of two agricultural fields, part of a treeline along the River Corrib, plus small areas of scrub, oak-ash-hazel woodland, calcareous/neutral grassland and wet grassland habitat, plus 67m² of otter habitat (within 10m of the River Corrib), with the potential to accidentally damage or destroy small areas of retained qualifying interest Annex I habitat within the cSAC which overlap with the boundary for the proposed road. Potentially affecting 6210 calcareous grassland and 8240 limestone pavements.
- Potential habitat degradation through structural effects to the overlying/adjacent limestone bedrock associated with the proposed Lackagh Tunnel and approaches, in other words, blasting and tunnelling activities have the potential to cause damage to the Qualifying

Interest Annex I habitats of calcareous grassland and limestone pavement above the tunnel and adjacent to the tunnel approaches. Potentially affecting 6210 calcareous grassland and 8240 limestone pavements.

- Potential habitat degradation as a result of the proposed road affecting the functioning and quality of the existing hydrogeological regime; the construction of the Menlough viaduct, the approaches to the Lackagh tunnel and the Lackagh tunnel itself have the potential to interfere with conduits for groundwater in the limestone karst, with the risk that this affects the water supply, via the Western Coolagh Spring, to the Coolagh Lakes (which are included in the cSAC and support three qualifying interest Annex I habitats), and, during the construction and operation of the road, there is the potential for pollutants to enter the same karst system and reach the same waterbodies. Potentially affecting 3140 hard oligo-mesotrophic waters, 7210 *Cladium* fens, 7230 alkaline fens and 6410 *Molinia* meadows.
- Habitat degradation as a result of the proposed road affecting water quality in receiving watercourses during construction (however, not during operation); accidental spillage of fluids from construction machinery could wash into the River Corrib and therefore have an impact on the qualifying interest Annex II species that it supports. Potentially affecting otter, sea lamprey, brook lamprey and salmon, with indirect effects of freshwater pearl mussel.
- Habitat degradation as a result of air quality impacts; dust from construction activities taking place in proximity to the cSAC could settle on the vegetation and affect the vegetation composition of the habitats affected. Potentially affecting 6210 calcareous grassland and 8240 limestone pavements.
- Habitat degradation as a result of introducing/spreading non-native invasive plant species to habitat areas within Lough Corrib cSAC during construction works. Potentially affecting 6410 *Molinia* meadows, 6210 calcareous grassland and 8240 limestone pavements.
- Mortality risk to aquatic species in the River Corrib during construction of the proposed River Corrib Bridge during construction works, as a result of dropping materials into the river. Potentially affecting otter, sea lamprey, brook lamprey and salmon, with indirect effects on freshwater pearl mussel.
- Mortality risk to otter during operation through collisions with road traffic during the operation of the road.

Lough Corrib SPA

- Habitat degradation as a result of hydrogeological impacts - the proposed road has the potential to affect (i.e. reduce water supply and reduce the water quality of) the existing hydrogeological regime supporting groundwater dependant wetland habitats(at potential ex-situ sites), in other words, it has the potential to reduce the water supply and quality of Coolagh Lakes and Ballindooley Lough, which could affect populations of wintering black-headed gull and coot (both sites) and shoveler and tufted duck (Ballindooley only), which may form part of the wintering populations listed as SCIs of Lough Corrib SPA.
- Habitat degradation as a result of hydrological impacts - the proposed road has the potential to affect water quality in the receiving environment supporting aquatic and wetland habitats (within the SPA and at potential ex-situ sites) during construction which in turn support bird

species listed as SCIs of Lough Corrib SPA, the same sites and species as above, plus the River Corrib downstream of the proposed bridge where common tern, black-headed gull, common gull and coot have been recorded (although these areas are all outside the Lough Corrib SPA).

- Disturbance/displacement - disturbance during construction and/or operation could result in the displacement of SCI birds from important habitat areas outside of the SPA boundary (i.e. at potential ex-situ sites) arising from blasting and other construction activity where this takes place within 300m, or 800m for blasting; such important areas include Ballinoooley Lough, the River Corrib and the NUIG playing fields, although only blasting near Ballinoooley was considered to pose a population level risk and potentially affect black-headed gull, coot, shoveler and tufted duck.
- Habitat loss/fragmentation - the proposed road passes through and will result in habitat loss at potential "ex-situ" sites where SCI bird species were recorded, these were wintering bird sites identified by the applicant as WB01, WB02, WB03, WB07, WB08, WB10, WB16, WB23 and WB45, although the scale of the loss was not deemed sufficient to risk population level effects.

Galway Bay Complex cSAC

- Habitat degradation - as a result of the proposed road affecting water quality in receiving watercourses and Galway Bay during construction. Potentially affecting all coastal and marine qualifying interest Annex I habitats.
- Habitat degradation - as a result of introducing/spreading non-native invasive plant species to habitat areas within Galway Bay Complex cSAC. Potentially affecting 6210 calcareous grassland.
- Barrier effect - the installation of new culvert structures on watercourses within the Bearna Stream catchment has the potential to present a barrier to otter movement (the lower portion of the Bearna Stream catchment lies within Galway Bay Complex cSAC).
- Mortality risk - with new watercourse crossings on watercourses within the Bearna Stream catchment, the proposed road poses a mortality risk to otter through collisions with road traffic.

Inner Galway Bay SPA

- As for Lough Corrib SPA, although with additional species potentially affected, since the SCI species differ, with cormorant, grey heron, wigeon, teal, shoveler, lapwing, bar-tailed godwit, curlew, black-headed gull potentially affected by changes in water supply, water quality and blasting at Ballinoooley Lough (WB02); cormorant, grey heron, teal, and black-headed gull potentially affected by changes in water supply and quality at Coolagh Lakes, and cormorant, grey heron, common tern, common gull, black-headed gull potentially affected by water quality changes at the River Corrib (WB12); disturbance impacts for common gull and black-headed gull at NUIG playing fields (WB45) were ruled out.

Methodology

- 4.5.2** What follows is a re-examination, analysis and evaluation of the potential impacts of the proposed road on the qualifying interest features of the identified Natura 2000 sites, using the data provided by the applicant and informed by two site visits and information presented by others in written submissions and at the oral hearing. The objective is to independently identify, in the light of the best scientific knowledge in the field, all aspects of the development project which could adversely affect any Natura 2000 site in light of its Conservation Objectives. Any uncertainty in the assessment is also expressed (as a level of risk), to ensure that the conclusion is sound.

Lough Corrib cSAC and SPA

Construction Stage

Habitat loss directly within the Natura 2000 Sites

- 4.5.3** Direct loss of habitat within the cSAC is addressed by the applicant in the NIS p75, p98, p121-135 and p139-142, the FIR response, the corrigendum, the Module 1 response and polygon 1f data. These documents set out the types of habitats and the areas affected, supported by mapping of vegetation and associated photographs and data, Annex 3 of Appendix A.3.1 of the FIR response. The applicant's assessment is that there would be no loss of qualifying interest Annex I habitat within the Lough Corrib cSAC.
- 4.5.4** There are four main areas (total area 4ha) where the development boundary overlaps with the cSAC (but not the SPA). These four main overlap areas are:
- Area 1 (also referred to as area 2 on plate 2.2 of the NIS p9) at the site of the proposed River Corrib Bridge between Dangan and Menlough (Ch. 9+250 to Ch. 9+550), including some adjoining land to the east of the River Corrib, NIS p11, some of which is allocated as a receptor site (Area 6210 R1), which is part re-instatement of existing habitats and part a receptor site for grassland from elsewhere, EIAR p699, EIAR Figures 8.23.1 to 8.23.14 and EIAR Appendix A.8.26;
 - Area 2 (also area 3 on plate 2.2) to the north west of the Coolagh Lakes (Ch. 9+850 to Ch. 10+100), there are four locations here where the development boundary overlaps with the cSAC, EIAR Figure 8.15.7, NIS p12;
 - Area 3 (also area 4 on plate 2.2) to the west of Lackagh Quarry (Ch. 10+620 to Ch. 11+800), there are six places of overlap here with one being above the location of the proposed Lackagh tunnel, EIAR Figure 8.15.8, NIS p13; and
 - Area 4 (also area 1 on plate 2.2) at the termination of the proposed drainage outfall from the N59 Link Road North at Kentfield, NIS p10.
- 4.5.5** The proposed road design includes measures to reduce the loss of habitats within these four areas, including, in Area 1, an open span bridge at the River Corrib Ch. 8+850 to Ch. 9+500 which has no supports in the River Corrib; in Area 2, retaining wall to reduce land take at Ch. 9+880 to Ch. 10+050 (south -side only); in Area 3, retaining walls to reduce land take at Ch.

10+850 to Ch. 11+150 (both sides) and, also in Area 3, the Lackagh Tunnel Ch. 11+150 to Ch. 11+420 which takes the route of the road directly underneath the cSAC, NIS p9.

4.5.6 Even with these measures, loss of land to development within the cSAC will occur, as follows: 2.55ha at Area 1 (NIS p125), 0.13ha at Area 2 (p132 NIS), 0.2ha at Area 3 and 0.02ha at Area 4 (p 134 NIS), totalling 2.9ha (NIS p125). The applicant asserts that these areas do not include Annex I habitats that are qualifying interest of the Lough Corrib cSAC or indeed any Annex I habitats.

4.5.7 Within the four main areas where the overlap occurs, the applicant has set out in the NIS p125-p135 which polygons (areas of land attributed to a particular habitat by the applicant) overlap with both the cSAC and the proposed road boundary (27 polygons in total); these are polygons 1.a - 1.g in Area 1, 2.a- 2.j in Area 2, 3.a to 3.j. in Area 3 and 4.a to 4.d in Area 4. However, 15 of these merely touch the road boundary or are included in mitigation areas; these are polygons 1.a, 1.b, 1.e, 1.g, 2.b, 2.c, 2.f, 2.h, 2.j, 3.a, 3.d, 3.e, 3.g, 3.h and 3.i. The remaining 12 polygons have a greater degree of overlap and therefore need further consideration.

4.5.8 To further complicate matters, only part of each of the remaining 12 polygons overlap with the proposed road boundary and it is perhaps the part which overlaps or is lost/damaged which is of most relevance. I have identified the areas which overlap as areas A to M (see Table 5). Seven of these (B, F, G, H, I, J and M) appear to be directly impacted i.e., all or partly damaged or lost. Since these units are not used by the applicant there is no precise data on the areas damaged/lost in each although the total is known. It is critical to the assessment to know if any of these seven areas are Annex I habitats or could have been Annex I habitats when the site was designated for those habitats where the objective is restoration. This is assessed in Table 5 and subsequently.

Table 5: Assessment of the areas of Lough Corrib cSAC which overlap with proposed road boundary.

Ref. & location	Area damaged/lost	Polygon of which part	Relevés* within polygon, those in area lost in bold, those in brackets not listed by the applicant in FIR	Applicant's Assessment of polygon	My Assessment
A 9+250-9+400	0ha, but would experience shading	R. Corrib	None	Depositing/lowland river (FW2)	3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation, on the basis that the Annex I type applies to the whole watercourse, not just the areas with the relevant vegetation. No change since 1995/ 2000 according to aerial imagery
B 9+400-9+600	2.55ha	Area 1.c	4619_R1 4619_R2	Treeline (WL2)	Visited, checked relevé data and accepted. No change since 1995/ 2000

Ref. & location	Area damaged/ lost	Polygon of which part	Relevés* within polygon, those in area lost in bold, those in brackets not listed by the applicant in FIR	Applicant's Assessment of polygon	My Assessment
		Area 1.d	BEC175 4400_R1 4400_R2 4400_R3 4400_R4 4400_R5	<i>Cynosurus cristatus</i> - <i>Trifolium repens</i> grassland vegetation community (GS1_3b)	Visited, checked relevé data and applicant's assessment accepted. No change since 1995/ 2000
		Area 1.f	BEC174 3734_R1 3734_R2 3734_R3 3734_R4 3734_R5	Mixed broadleaved woodland (WD1) with 3734_R4 having 3% bare rock.	Visited, checked relevé data and accepted, but see discussion below. No change since 1995/ 2000
B1		Area 1.e (0.3 of 0.69ha in the cSAC)	4401_R1 4401_R2 4401_R3 4401_R4 4401_R5	Dry calcareous neutral grassland GS1, with a tendency towards 3a <i>Briza media</i> - <i>Thymus polytrichus</i> grassland vegetation community (<i>Briza media</i> being present in some relevés), there is also some exposed calcareous rock in this location EIAR A.8.26 p31	Checked relevé data and accepted. Semi-improved version of this grassland type, aerial images indicate that this was less improved in 1995 and so could have been Annex I habitat at the time of designation (it almost certainly was in earlier times, there is a strong association between GS1_3a and Annex I 6210 calcareous grassland).
C 9+900, south	0ha?	Area 2a	4422_R1 (4422_R3) (4422_R4)	Oak-ash-hazel woodland WN2, with relevé 4422_R4 7% bare rock	The relevant relevé seems to be 4422_R4 (rather than R1 as stated by the applicant p15 FIR App A.3.1) but R4 is also classified as oak-ash-hazel woodland WN2 by the applicant and is supported by the data. No change since 1995/ 2000
D 9+925, south	0ha?	Area 2.d	3941_R1	<i>Corylus avellana</i> - <i>Oxalis acetosella</i> community (WN2_2e) with relevé 3941_R1 0.3% bare rock	Checked relevé data and accepted. No change since 1995/ 2000
E 10+000, south	0ha	Retained habitat area at Ch. 10+100	3155_R1 5507_R1 3156_R1	8240 Limestone pavements with relevés 3155_R1 15% limestone, 5507_R1 3% limestone and 3156_R1 3% limestone	Checked relevé data and accepted, supported by aerial imagery (not visited) No change since 1995/ 2000
F 10+090, south	0ha	Area 2.e_1	(3790a_R1) 3790_R2	8240 Limestone pavements, overlain with oak-ash-hazel woodland (WN2) with relevé 3790a_R1 1% limestone.	Applicant gives relevé 3790_R2 however not on maps (Figure 2.4.073) or in dataset, relevant relevé is 3790a_R1. Visited but difficult to survey, checked relevé

Ref. & location	Area damaged/ lost	Polygon of which part	Relevés* within polygon, those in area lost in bold, those in brackets not listed by the applicant in FIR	Applicant's Assessment of polygon	My Assessment
					data and accepted assessment, however, cover of limestone in relevé 3790a_R1 is lower than expected for Limestone Pavement and other areas described as oak-ash-hazel woodland (see next row) No change since 1995/ 2000
	<0.13ha	Area 2.e_2	3790b_R1	oak-ash-hazel woodland (WN2) <i>Corylus avellana</i> - <i>Oxalis acetosella</i> community (WN2_2e) with relevé 3790b_R1 5% limestone	Checked relevé data and accepted, although limestone cover within the relevé 3790b_R1 is higher than in 3790a_R1, which as noted above, is in an area classified as Limestone Pavement. No change since 1995/ 2000
	<0.13ha	Area 2.i	-	Artificial surface (BL3), road surface	Artificial surface (BL3), road surface, the Coolagh Road No change since 1995/ 2000
G 10+620	<0.2ha	Area 3.b	3768_R1 3768_R2	Oak-ash hazel woodland (WN2)/ scrub (WS1) with relevé 3768_R1 10% bare rock and 3768_R2 7% bare rock	Visited, checked relevé data and accepted. No change since 1995/ 2000
H 10+850, south	<0.2ha	Area 3.f	4149_R1 4149_R2 4149_R3	Calcareous grassland Treeline Calcareous grassland	There is no relevé data from apparently impacted area (closest is 4149_R3). I assessed as scrub ; thick bramble and blackthorn on site visit. No change since 1995/ 2000
I 10+925, north	<0.2ha	Area 3.c	4541_R1 4541_R2 4541_R3 4541_R4 4541_R5	Oak-ash hazel woodland (WN2)/ scrub (WS1) with relevé 4541_R1 7% bare rock, 4541_R2 10% 4541_R3 10%, 4541_R4 3% and 4541_R5 7%	Visited, checked relevé data and accepted. No change since 1995/ 2000
J 11+000, south	<0.2ha	Area 3.h	4538_R1 4538_R2	Oak-ash hazel woodland (WN2)/ scrub (WS1) with relevé 4538_R1 0.3% bare rock	Visited, checked relevé data and accepted. No change since 1995/ 2000
K 11+200, north	0ha (above tunnel)	Area 3.j	4156_R1 4156_R2 4156_R3 4156_R4 (4156_R5)	scrub (WS1)/ Oak-ash hazel woodland (WN2) with relevé 4156_R2 4% bare rock, 4156_R3 0.1%, 4156_R4 10% and 4156_R5 5%	Checked relevé data and accepted, supported by aerial imagery. No change since 1995/ 2000

Ref. & location	Area damaged/ lost	Polygon of which part	Relevés* within polygon, those in area lost in bold, those in brackets not listed by the applicant in FIR	Applicant's Assessment of polygon	My Assessment
L 11+250- 11+375	0ha (above tunnel)	LP	3087_R1-R5 3088_R1-R4 3089_R1 3130_R1-R2 3322_R1-R5 3494_R1-R5 3513_R1-R2 3705_R1-R2 4155_R1-R3	8240 Limestone pavements, with relevé 3087_R1 70% bare rock, 3087_R2 55% bare rock etc Scrub (WS1)	Checked relevé data and accepted, supported by aerial imagery. No change since 1995/ 2000
M Outfall to R. Corrib	0.02ha	Area 4.a	3815_R1	Riparian woodland (WN5)	Visited, checked relevé data and accepted. Cover of trees has arisen since site was designated, previously a type of grassland.

* relevés (or quadrats) are used to survey vegetation, with all plant species within a given area, say 2m x 2m, recorded and assigned a level of abundance, plus other environmental characteristics also recorded. The relevés were given a unique reference code by the applicant for example 1234_R1 or BEC123. The complete dataset was submitted by the applicant as part of the FIR response.

4.5.9 Some further discussion is needed on the applicant's Area 1.f (included in my area B). Area 1.f is a beech woodland within which there is a limestone outcrop. Therefore, considerable attention, by the applicant, the DCHG/NPWS and myself, has been given as to whether this outcrop constitutes limestone pavement.

4.5.10 According to the Interpretation Manual of European Habitats EUR28 (EC, 2013), limestone pavement comprises "*Regular blocks of limestone known as "clints" with loose flags separated by a network of vertical fissures known as "grykes" or "shattered pavements", containing more loose limestone rubble. The rock surface is almost devoid of overlying soils (considerably less than 50% cover) except for some patches of shallow skeletal or loessic soils, although more extensive areas of deeper soil occasionally occur; sometimes there is encroachment of peat*".

4.5.11 The definition of limestone pavement is further explored in some detail in the "National survey of limestone pavement and associated habitats in Ireland" (Wilson & Fernández, 2013). This survey demonstrates that limestone pavements encompass a wide variety of rock structure, ranging from "massive blocks of smooth, relatively un-weathered pavement", with grykes ranging from well-defined to almost absent, to "finely fractured pavements or shattered pavements" which resemble rubble. The survey also demonstrated that a wide variety of vegetation types occurs within limestone pavement, ranging from only low growing plants in the grykes (which is referred to as exposed limestone pavement) to a low woodland canopy of species such as hazel and ash (which is referred to as wooded limestone pavement). The feature which unifies all this variety is the presence of more or less continuous cover of limestone rock with negligible soil covering. It is also implicit that this a landscape scale feature and could not apply to an individual rock or a collection of scattered rocks among, say, grassland. There is though the question of at what point does a collection of limestone rock tip

over from being not limestone pavement to being limestone pavement (akin to the bald man paradox).

- 4.5.12** This point was addressed, with respect to Area 1.f at the oral hearing which opinions sought from both the applicant and the National Parks and Wildlife Service; both were in agreement that the limestone rock outcrop in Area 1.f does not constitute Annex I limestone pavement and provided supporting evidence. To summarise, the NPWS in its statement to the oral hearing said that “the approach taken [by the applicant] to mapping and classification of limestone pavement is endorsed by the NPWS” and further clarified that “since limestone pavement is a geomorphological entity, this needs to be taken into account in applying definitions and it does not make sense to identify all areas of water-worn limestone as limestone pavement”, thereby confirming that smaller areas of water-worn limestone such as that under consideration would not qualify as limestone pavement. Moreover, the NPWS specifically agreed that classification of Area 1.f as a type of woodland, rather than limestone pavement, was appropriate. This statement is a definitive and conclusive view from the relevant statutory authority, with responsibility for designating Natura 2000 sites.
- 4.5.13** Based upon the above assessment, the seven areas (B, F, G, H, I, J and M) where direct habitat loss occurs are not Annex I habitat now.
- 4.5.14** It is also necessary to consider whether any of the areas subject to direct impacts were Annex I habitats at the time that the site was designated as a cSAC, which appears to have been 1998. This relates specifically to Annex I habitats for which the relevant objective is to restore favourable conservation condition. Examination of aerial imagery from 1995 and 2000 (<https://geohive.ie/>) which are the closest available to the year of designation was used to inform this assessment.
- 4.5.15** There are two areas where a change in the habitat type was evident or likely. The first of these is in my Area B1 which is the applicants Area 1e. This field is currently a semi-improved calcareous grassland, classified as GS1 but with some species indicating a tendency towards 3a *Briza media* - *Thymus polytrichus* grassland vegetation community (*Briza media* being present in two of five relevés). Aerial imagery indicates that this may have been unimproved grassland, and therefore potentially the Annex I type 6210, in 1995 but had been agriculturally improved, so in its current condition, by 2000. Despite this, the published conservation objectives for Lough Corrib indicate the objective is to maintain rather than restore this habitat type, which indicates there is no imperative to restore this area of grassland to the Annex I type 6210. This area is ‘lost’ as part of the proposed road but for the use as a receptor site (6210 R1) for translocated Annex I type 6210 or for creation of Annex I type 6210 from seed, a decision which is deferred by the applicant to the construction phase. It could therefore be argued that the proposed road includes the restoration of 6210 in Area 1.e.
- 4.5.16** The second area where a change in the habitat type was evident was in Area M/4.a where an increase in scrub or tree cover has occurred, replacing an unknown grassland type. This area is a disused railway embankment (the Midland Great Western Railway) and therefore most unlikely to have supported any Annex I grassland type at the time that the cSAC was designated.

- 4.5.17** The proposed road does not overlap with any part of the Lough Corrib SPA and therefore no habitat loss would occur within the SPA.

Habitat loss in Natura 2000 sites indirectly through changes in hydrology/hydrogeology

- 4.5.18** The Coolagh Lakes are included in the Lough Corrib cSAC (but not the SPA). These support several Annex I habitats which are qualifying interest. The lakes are fed mainly by groundwater in the Lough Corrib Fen 1 (Menlough) ground water body via the Western Coolagh Spring (NIS p59-62). Lough Corrib Fen 1 (Menlough) ground water body lies with a karst limestone system. The proposed road would be constructed above and through the karst and could therefore impact on water supply to the Lough Corrib Fen 1 (Menlough) ground water body and ultimately the Coolagh Lakes. This could result in the reduction and in the size of the lakes and therefore losses of the Annex I habitats. The potential for this to occur is assessed in detail in a separate hydrogeology report (Dodds, 2020).

- 4.5.19** The design for the proposed road includes several elements to capture, treat and then return at least most of the rainfall (the exception being water which makes its way into the Lackagh tunnel) to the ground water body to which it would have reached in the absence of the proposed road. In the karst area, this is by means of infiltration basins. This means that the water supply to the Western Coolagh Spring and the Coolagh lakes should be maintained despite the presence of the road (Dodds, 2020).

Habitat fragmentation in Natura 2000 sites with larger habitat parcels divided in two by the proposed development.

- 4.5.20** Habitat fragmentation of habitat parcels within the Lough Corrib cSAC was alluded to by the applicant in the NIS but not assessed directly.
- 4.5.21** The proposed road would divide just one habitat parcel within the cSAC into two separate parcels, which would combine with habitat loss to produce two smaller fragments of the existing habitat. This is the area of woodland known as Area 1.f, which is part of my area B. The likely effect of fragmentation would be to reduce the quality of retained areas of habitat, potentially reducing the numbers of woodland species present over time. The design of the proposed road however includes five culverts under the road which may partially mitigate the effects of fragmentation here. As previously assessed, Area 1.f is not considered to be Annex I habitat.

- 4.5.22** The proposed road does not fragment any part of the Lough Corrib SPA.

Habitat isolation of habitat parcels within Natura 2000 sites to the north and south of the proposed development

- 4.5.23** Isolation of the cSAC, or parts thereof, was not considered by the applicant in the NIS or elsewhere.
- 4.5.24** Most of Lough Corrib cSAC lies to the north of the proposed road, comprising Lough Corrib and its surroundings. However, there is an additional area to the south, which is separate from the Lough, including parts of the Menlough, Coolagh and Ballindooley Townlands and the River Corrib. Leaving aside the river, this additional area could be further subdivided into (i) an area of

limestone pavement to the north which overlaps with the Menlough and Ballindooley Townlands (the Menlough/Ballindooley area) and (ii) the Coolagh Lakes and surrounding areas, which include wetland and more limestone pavement, and overlaps the Menlough and Coolagh townlands (the Menlough/Coolagh area). The two are joined by a relatively narrow piece of designated land to the west of the Lackagh Quarry.

4.5.25 The proposed road passes through the Menlough/ Coolagh/ Ballindooley part of the cSAC more or less at this narrow point, leaving approximately half to the north (the Menlough/Ballindooley area) and half to the south (the Menlough/Coolagh area). The potential for fragmentation of the cSAC is avoided by the proposed Lackagh Tunnel, which would bring the road under the cSAC, and therefore maintaining the connection between the Menlough/Ballindooley and Menlough/ Coolagh areas of the cSAC at this location.

4.5.26 However, there are other potential functional connections between these two parts of the cSAC which are not included in the designated site. These most obviously include undesignated limestone pavement located between the Coolagh Road/Menlo Park and Monument Road (Bothar An Leachta) and hedgerows to the west of the Lackagh Quarry. The construction of the proposed road includes a viaduct (the Menlough viaduct) between the Coolagh Road/Menlo Park and Monument Road which passes over the limestone pavement in this location, thereby maintaining the potential connections between these two parts of the cSAC here (but see discussion on shading in paragraphs 4.5.90 to 4.5.96). However, the proposed road would result in the loss of the hedgerows to the west of the Lackagh Quarry. Of the three connections/ potential connections between these two parts of the cSAC, the hedgerows are certainly the least important, but their loss could reduce the exchange of plants with poor dispersal abilities and terrestrial (non-flying) fauna, such as ground beetles, isopods (woodlice) and molluscs, between these two parts of the cSAC. Given the differing habitats (hedgerow vs limestone pavement), any affected species could include some woodland species which also inhabit the grykes but are unlikely to be specialist species of limestone pavement or calcareous grasslands.

4.5.27 Despite the retained connections described above, the Menlough/Coolagh element of the cSAC would experience some additional degree of isolation; it is already abounded on two sides by the existing development extending along the N59 and along the N84, with the proposed road forming the third side of the triangle, thereby encapsulating this part of the cSAC.

4.5.28 The road development does not isolate any part of the Lough Corrib SPA from the remainder.

Habitat degradation within Natura 2000 sites as a result of chemical pollution, noise, dust, light and spread of invasive species including from construction traffic and site workers travelling to/from the construction site.

Chemical Air pollution

4.5.29 Air pollution during construction works is not considered a risk to the cSAC by the applicant and therefore not assessed in the NIS.

4.5.30 Construction machinery will result in emissions to air however the quantity of emissions would be much less than that generated by traffic during the operation of road and insufficient to result

in habitat degradation of any Annex I habitat within the Lough Corrib cSAC or habitats within the Lough Corrib SPA.

Chemical and Suspended Solids Water Pollution

- 4.5.31** Leaks from construction machinery and spillages of construction materials could result in chemical pollution of watercourses, either directly or through contamination of groundwater, and subsequent degradation of the habitat. However, this is unlikely to occur in any significant way on a well-managed construction site.
- 4.5.32** A greater risk arises from site run-off which is high in suspended solids (soil) which can enter watercourses and may smother gravels and potentially lead to eutrophication. This is addressed by the applicant in the NIS p83-84 and p149-150. The main risk for the Lough Corrib cSAC is such run-off reaching the River Corrib which is included in the cSAC. The applicant makes the case that this is not an Annex I habitat as the typical plant species are not present in this part of the river (see FIR response p41-43) however the site synopsis indicates that the River Corrib is the Annex I type of 3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation. Assuming that latter is correct, there is a risk that, without adequate mitigation, suspended solids wash into the river and cause damage to qualifying interest Annex I habitat. The risk is higher during prolonged periods of heavy rainfall in winter when the ground is saturated. This is obviously a common occurrence in Galway, which receives on average 1m of rain per annum, with September to January having average rainfall of above 100mm in each month. It is conceivable that standard mitigation measures would become overwhelmed during a wet winter resulting in discharge of insufficiently treated site run-off into the River Corrib.
- 4.5.33** The SPA is located upstream from the construction site and would therefore not be affected by water pollution.

Dust

- 4.5.34** The potential effect of dust emitted from construction activities, particularly transporting materials around the site, on habitats adjoining the road is addressed by the applicant in the NIS p151, p153, p161 and p168 in relation to limestone pavement and calcareous grassland, stating (on p168 and p184) "*Dust emissions during constructioncould result in the loss of Calcareous grassland habitat*" [and] "*reduce bryophyte cover on wooded Limestone pavement habitat, within Lough Corrib cSAC, and a reduction in [Limestone pavement] habitat distribution locally, where present adjacent to the construction works between Ch. 9+850 to Ch. 10+100*". In addition to the area stated by the applicant, the section of the cSAC between Ch.10+800 to Ch. 11+150 is also at risk from dust pollution during construction, as well as alongside haul roads (see paragraphs 4.5.41 to 4.5.43 below). With respect to calcareous grassland, habitat loss resulting from dust would be a worst-case scenario, with damage or degradation of the habitat being more likely, with likely recovery over time.
- 4.5.35** Rock blasting and the processing of rock could also generate dust. Rock blasting is to take place in proximity to the cSAC for construction of the Lackagh tunnel and a retaining wall (Ch. 9+850 to Ch.10+050). Dust from the blasting activities could make its way onto adjoining areas

of the cSAC with similar effects as described above. In addition, the Lackagh Quarry area is a construction site compound at which rock processing will take place (NIS p23), providing a further potential source of dust adjacent to the cSAC. The volume of dust generated during construction, from both blasting and processing, would most likely be considerably less than when the Lackagh Quarry was operational. The quarrying activities, which ceased 10 years ago, have apparently not resulted in any long-term detrimental effects on the flora of the cSAC, as indicated by the vegetation surveys completed by the applicant, suggesting the blasting dust etc from construction activities may be similarly benign.

- 4.5.36** The SPA is too distant from the construction area to be affected by dust.

Noise and Vibration

- 4.5.37** During construction, any noise and vibration would be of insufficient duration to result in habitat degradation with the cSAC or SPA.

Light

- 4.5.38** During construction, any lighting would be of insufficient duration to result in habitat degradation with the cSAC or SPA.

Invasive Plant Species

- 4.5.39** During construction, it is an easy matter to inadvertently spread invasive plant species around the construction site during earth moving operations, either as seeds or fragments of rhizomes. It is conceivable that such material can inadvertently be brought on site on dirty machinery. This is assessed in the NIS p156-157 and elsewhere. Japanese knotweed, Himalayan knotweed and Rhododendron are identified in the NIS as risks (as these are the species covered by the legislation). Of these, Japanese knotweed and Himalayan knotweed could affect limestone pavement and calcareous grassland in the cSAC. There are other species recorded in the locality (relevé data) such as *Buddleja davidii*, *Centranthus ruber*, *Cotoneaster horizontalis*, *Fuchsia* spp., *Petasites* spp if *fragrans*, and *Symphoricarpos albus* which may equally cause problems if introduced into semi-natural habitats. The first three of these are candidates for growing on or around limestone pavement, as is another non-native species, *Clematis vit-alba*, which was not recorded by the applicant but is known to occur locally (<https://database.bsbi.org/maps/?taxonid=2cd4p9h.8hq>). These could equally be spread during construction activity. The area of the cSAC that is most vulnerable is within 200m of the road at Ch. 9+850 to Ch. 10+150 and Ch.10+800 to Ch. 11+150.

- 4.5.40** The Lough Corrib SPA is too distant from the construction site to be at risk from invasive non-native plant species spread through construction activity.

Construction Traffic

- 4.5.41** In addition to the effects described above for the construction site, there will be vehicle movements to and from the construction site, to bring the workforce and materials and to take

away waste. These vehicle movements would create additional emissions, dust (and mud deposits), noise, vibration, light, as well as risks of spreading invasive species and accidental spillage of fluids. Haul routes will sometimes use public roads (EIAR p319), including the Coolough Road, Bother Nua and Sean Bothar between Ch. 9+400 and Ch. 11+750, known as haul road HR 09/01. Use of this route as a haul road would bring construction traffic immediately alongside the cSAC on the Coolough Road/Bother Nua but not Sean Bothar (as the haul road stops short of the cSAC). Table 7.6 of the EIAR indicates that there would be an additional 51 HGVs and a total of 110 additional vehicle movements per day in this area during the construction period of three years, although it may be that some of this takes place on the main route alignment in the later stages of construction. This would amount to c.12,800 HGVs and c.27,600 total movements per year (assuming 251 working days per annum).

- 4.5.42** The haul routes are described in the NIS p30, but the applicant only addresses the risks of spreading non-native invasive plant species NIS p89. Construction traffic would also need to cross the River Corrib on the existing bridge. As for within the construction site, air pollution, noise, vibration and light would be of insufficient duration to degrade habitats however construction traffic exposes an additional area of the cSAC (alongside HR 09/01) to risks from water pollution especially from suspended solids, dust/mud and invasive non-native plant species which could result in degradation of habitats within the cSAC.
- 4.5.43** Construction traffic in and around the construction site would generally be too distant from Lough Corrib SPA to result in negative impacts. The boundary of the SPA is adjacent to the N84 road (towards Headford) and therefore a slight risk exists here should this route be used to bring construction materials etc to the site.

Mortality, disturbance, displacement and habitat loss for species of flora and fauna which form part of the qualifying interest populations of Natura 2000, resulting in declines or local extinction.

Typical/positive indicator species of Annex I Habitats

- 4.5.44** Site clearance will obviously result in the loss of vegetation from within the cleared area, and as described above, this will include areas within the cSAC which are not considered to be qualifying interest Annex I habitats. Therefore, site clearance would not directly affect the occurrence of typical (as defined by the European Commission in EUR28) or positive indicator species (as defined by the NPWS) within Annex I habitats within the cSAC. However, these species are not all restricted to the relevant habitats and some will be affected by site clearance during construction, as set out below. For locally common and widespread species, small scale losses of individuals would not have a knock-on effect on the Annex I habitats however loss of individuals of a rare species might have such an effect by reducing the resilience of the population.
- 4.5.45** In EUR28, the typical species of 8240 limestone pavement, 6210 calcareous grassland, 6410 Molinia meadows and 7220 petrifying springs are all plants. There are records of seven or eight of these from within the development boundary: *Asplenium trichomanes* (8240), *Asplenium adiantum-nigrum* (8240), *Asplenium ruta-muraria* (8240), *Leontodon hispidus* (6210), *Carlina vulgaris* (6210), *Epipactus* sp. (8240), *Potentilla erecta* (6410) and *Gentiana verna* (8240). The total number depends on the (unknown) identity of the *Epipactus*.

- 4.5.46** *Asplenium trichomanes* was recorded from Area 3.c, or I, which is within the cSAC boundary and where there may be up to 0.2ha area of habitat lost. It is not clear if this loss would affect plants of this species in this locality. However, this species was recorded fairly widely by the applicant and is known to be widespread in Ireland and therefore the loss of a few plants would here not have a wider impact on the areas of limestone pavement within the cSAC. The other typical species were all recorded within the cSAC from above the location of the proposed Lackagh tunnel and so would not be directly impacted in the cSAC during construction works.
- 4.5.47** As set out in NPWS documentation, the positive indicator species are also all plants (Wilson & Fernández, 2013) (Lyons & Kelly, 2016) (O'Neill, Martin, Devaney, & Perrin, 2013). This documentation provides a much longer list of species for exposed limestone pavement (39 species), wooded limestone pavement (51 species) and calcareous grassland (59 species). The applicant's data indicates that approximately 47 of these positive indicator species occur or may occur within areas of the cSAC that will be impacted by construction works. These are *Arum maculatum*, *Asplenium trichomanes*, *Briza media*, *Calliergonella cuspidata*, *Carex flacca*, *Circea lutetiana*, *Corylus avellana*, *Cratageous monogyna*, *Eurhynchium hians*, *E. striatum*, *Fissidens bryoides*, *F. dubius*, *F. taxifolius*, *Frageria vesca*, *Fraxinus excelsior*, *Geranium robertianum*, *Geum urbanum*, *Hedera helix*, *Ilex aquifolium*, *Isothecium alopecuroides*, *Isothecium myosuroides*, *Lonicera periclymenum*, *Lotus corniculatus*, *Neckera complanata*, *Neckera crispa*, *Phyllitis (Asplenium) scolopendrium*, *Pilosella officinarum*, *Plagiomnium undulatum*, *Polystichum setiferum*, *Potentilla sterilis*, *Primula vulgaris*, *Prunus spinosa*, *Ranunculus bulbosus*, *Rhytidiadelphus squarrosus*, *Rhytidiadelphus triquetrus*, *Rosa spinosissima*, *Rubus fruticosus* ag., *Scapania aspera*, *Sesleria caerulea*, *Solidago virgaurea*, *Sorbus aucuparia*, *Thamnobryum alopecurum*, *Thuidium tamariscinum*, *Thymus polytrichus*, *Tortella tortuosa*, *Veronica chamaedrys* and *Viola* spp.. Assuming, as is most likely, that the *Viola* is one of the more common species, these species are all locally common and therefore the loss of a few plants within the affected areas would not have any effect on populations of these species within Annex I habitats within the cSAC.

Qualifying Interest Annex II species

- 4.5.48** The risk of direct mortality during construction of Annex II species is addressed by the applicant in the NIS, p157 to p162. All the qualifying populations of Annex II species are either aquatic (sea lamprey, brook lamprey, Atlantic Salmon), comprise few individuals (otter) or absent from the locality (freshwater pearl mussel, white-clawed crayfish, lesser horseshoe bat (qualifying population⁸), slender green-feather moss and slender naiad). The risk of direct mortality of these species populations during construction is near zero, and the risk of population level effects from direct mortality is even lower.
- 4.5.49** The risk of disturbance during construction of Annex II species is addressed by the applicant in the NIS p89 - 91. As described by the applicant, there is a risk of localised disturbance for sea lamprey, brook lamprey, Atlantic Salmon and otter populations associated with the cSAC when

⁸ As confirmed by the NPWS at the oral hearing, the relevant population of lesser horseshoe bats is associated with Ebor Hall, not the population occurring in proximity to the proposed road.

work takes place near to watercourses however this would not be of sufficient duration or extent to cause any population level effects on these species.

4.5.50 Displacement can arise from ongoing disturbance in a given area (known as effective habitat loss), habitat degradation (as described above) or actual habitat loss. Displacement is assessed alongside disturbance by the applicant in the NIS p89 -91. As any disturbance due to construction activity will be short-lived, any consequent displacement due to construction activity would be similarly short-lived and would not have any population level effects. Displacement of the aquatic species (sea lamprey, brook lamprey, Atlantic Salmon) could occur as a result of increased pollution in the River Corrib for example from suspended solids arising from construction activity washing into the river. Given the high velocity flows in this river any such effects from construction would be short lived and would be unlikely to have population level effects unless it affected a spawning or nursery ground, of which none are known in proximity to the proposed River Corrib bridge or downstream.

4.5.51 There is no loss of river habitat from within the Lough Corrib cSAC and no loss of otter holts or other terrestrial habitats used by otter. There would however be small scale loss of river habitat at the road crossing points of the Bearna Stream catchment (which includes the Bearna Stream, Tonabrocky Streams and An Sruthan Dubh) which may be used by the otter population associated with Lough Corrib cSAC. This would not affect food availability and would therefore have no impact on the otter population.

Qualifying Interest Annex I birds

4.5.52 Adult birds are not vulnerable to mortality during the construction phase however birds in the nest are vulnerable if construction activity is undertaken during the nesting season. Most of the Lough Corrib SPA qualifying interest species (SCI species) nest elsewhere, in other countries or in other habitats. However, black-headed gull and coot were recorded in the route corridor in the breeding season. The black-headed gull records are not of nesting birds. Coot was recorded during the breeding season at four localities within the route of the proposed road (between the River Corrib and Bóthar Nua, and once near Ballybrit). These could be breeding pairs at small waterbodies and may remain present locally during the winter to make up a small part of the Lough Corrib wintering population (most of this population comprising winter migrants). Loss of nests during the construction stage, if it were to occur, could therefore have a very small impact on the Lough Corrib cSAC wintering population of over 11,000 birds (although this is apparently in unfavourable condition).

4.5.53 The SPA is 700m from the main construction area but only 70m from an access road to be constructed at Menlough, as described by the applicant NIS p229. There is a small risk of short-term, construction-related disturbance of birds occurring in the vicinity of this location. There are no breeding colonies of the species which are qualifying interest for the SPA in this location, NIS p230, and so only wintering populations would be affected if the works are undertaken here during the winter. The applicant states that construction work here would take place in less than one month and therefore any disturbance/displacement of birds within the SPA would be of short duration.

- 4.5.54** Black-headed gull and coot could be displaced from the route corridor during the breeding season a result of construction activity, either through disturbance associated with construction activity or as their habitat is removed. The same applies to common gull during the winter. Susceptibility to disturbance varies from species to species, with some species affected by human activity up to 200m distant. Therefore, construction related disturbance could affect birds both inside the construction area and within a zone extending up to 200m away. However, none of the three species identified are particularly susceptible to disturbance and therefore only those within and immediately adjacent to the construction site are likely to be affected. The displacement will become permanent when the habitat is lost.
- 4.5.55** Direct loss of habitat outside the SPA could affect the qualifying interest of the SPA if the affected habitat is for some reason an important area for the birds concerned, referred to by the applicant as 'ex-situ' sites in the NIS. The applicant has addressed this in the NIS p237, with the analysis on the previous pages also relevant. Nine of the identified wintering bird areas are directly impacted by the proposed road, five in a minor way and four more significantly; WB03 (Balllymoneen), WB45 (NUIG sporting ground), WB16 (Lackagh Quarry) and WB01 (Arduan). The proposed road would divide the same wintering bird sites affected by habitat loss into two parts. Originally, it was proposed to relocate the NUIG sports pitches as part of the proposed road however this is now the subject of a separate planning application.
- 4.5.56** There were no qualifying interest bird species of the Lough Corrib SPA recorded during the winter at WB03 Balllymoneen and WB16 Lackagh Quarry. At WB01 Arduan, one such species was recorded, black-headed gull (peak count 21), while at WB45 NUIG, two such species were recorded, black-headed gull (peak count 47) and common gull (peak count 21). These populations would therefore experience direct habitat loss and fragmentation during construction of the proposed road. Losses of small waterbodies used by coot may also occur during construction of the proposed road.
- 4.5.57** Two outcomes from habit loss and fragmentation are possible, (i) the birds (and their descendants) simply relocate to other available habitat and there is no effect on the population or (ii) the birds are unable to find suitable alternative habitat and die, reducing the population. The outcome depends on whether the population is limited by the availability of habitat or another factor. The applicant makes the case that there is ample available alternative habitat for the birds, and they would simply relocate.
- 4.5.58** Black-headed gull and common gull make use of sports pitches and other short, improved grassland, while coot nests at small and large waterbodies, none of which are in short supply in the Lough Corrib/Galway area.
- 4.5.59** Black headed gull numbers have declined at Lough Corrib in line with the general decline and range contraction in Ireland and now apparently occur in numbers below the baseline value for Lough Corrib SPA. It is not known why this change has occurred, but it may be that as the population declines it is retreating from less favoured areas in the north and west of the country, and higher ground, which supports the case that there would be ample alternative habitat available for those remaining birds following construction of the proposed road.

- 4.5.60** Common gull is currently in favourable condition at Lough Corrib, the current population being comfortably above the baseline value. The population could be limited by the available habitat, however, any declines associated with losses of grassland would not be sufficient to bring the population down below the baseline level.
- 4.5.61** As noted above, the local breeding population of coot makes a marginal contribution to the qualifying wintering population, if any. Nevertheless, breeding bird populations are much more likely to be limited by available habitat than wintering birds, and a small decline in response to habitat loss is probable.
- 4.5.62** The records of all other qualifying interest species of bird of Lough Corrib SPA are more than 200m distant and are therefore unlikely to be disturbed or displaced by general construction activity, as explained by the applicant, NIS p231 to p238. The exception is those species which make use of Ballindooley Lough which would be 450m from the construction site where blasting of rock is to take place. The noise from blasting could disturb the birds and temporarily displace them from the Lough. The relevant species are black-headed gull, coot, shoveler and tufted duck which were qualifying interest species of bird of Lough Corrib SPA and have been recorded at Ballindooley Lough. The risk to the population arising from blasting would be greatest during severe winter weather.
- 4.5.63** It is also necessary to consider those populations for which the objective is 'to restore'; it is conceivable that an area of the construction corridor was important for a particular species and that its continued existence would be necessary for the restoration of the population. A review of the qualifying interest features and the habitats impacted or within 200m of the route corridor indicates that none of those species with an unfavourable population are likely to have made significant use of the construction corridor in the past (i.e., at the time the SPA was designated).

Disruption of migration, commuting routes or loss of seasonally occupied habitats for species with large home ranges or which are migratory and form part of the qualifying interest populations of Natura 2000.

Typical/Positive Indicator Species of Annex I Habitats

- 4.5.64** As set out above typical and positive indicator species of the relevant Annex I habitats are all plants. The construction period is of too short a duration to impact on plant dispersal.

Qualifying Interest Annex II species

- 4.5.65** Disruption of fish movement and migration up and down river could occur when construction works take place in or near the river channel. This could be when physical infrastructure is being constructed in the river, through noise and vibration from construction works or if water quality is adversely affected by e.g., suspended solid run-off. In order to affect migration, such works would obviously need to occur when fish are migrating. As described in the NIS p136, the River Corrib is an important salmonid watercourse, providing a migration route for salmon and also brook and sea lamprey. Works will be required next to and over the River Corrib during construction of the River Corrib Bridge. The potential effects are assessed in the NIS p143 p162. Given the lack of in channel construction works, the short duration of the construction works and the nature of the River Corrib crossing, the constructions work would not interfere

with fish migration in a way that would affect the population. There are other watercourses included in the cSAC however none of these are crossed by the route of the proposed road.

- 4.5.66** There are other watercourses outside the cSAC which are crossed by the proposed road, NIS p63 and p91, these are Sruthan na Libeirti, the Trusky Stream, the Bearna Stream, the Tonabrocky Stream and the Knocknacarragh stream. These are described in the EIAR p958 to p962 and shown on Figure 11.1.001. The importance for these streams for salmon is assessed in the EIAR p968 which indicates varying importance. None of these watercourses connect to Lough Corrib and therefore do not provide a migratory route for fish populations associated with the Lough Corrib cSAC.
- 4.5.67** Otter is present on the River Corrib, the adjoining Coolagh lakes and the Bearna Stream catchment (which includes the Bearna Stream, Tonabrocky Streams and An Sruthan Dubh), NIS p64. Since otter has a large home range and can move between catchments, both those occurring in the Lough Corrib cSAC and those at the Bearna Stream catchment could form part of the cSAC population or be linked populations, NPWS1. Construction works at the River Corrib is a bridge and for the other water courses the crossing will be a culvert. Since otters are mainly nocturnal, they would be moving around their home range at a time without construction activity and, in any event, may be relatively tolerant of such activity, NIS p90. The main risk therefore is from inadvertently creating barriers to otter movement with site fencing or stockpiled materials in proximity to water courses. Clearly this is not an issue at the River Corrib, but it could occur at other minor watercourses where a culvert is to be installed.

Qualifying Interest Annex I birds

- 4.5.68** Lough Corrib and other important sites for wetland birds, for example Ross Lake and WB02 Ballindooley Lough, lie to the north of the proposed development while Galway Bay lies to the south, with the River Corrib being a potential corridor connecting these sites. Several bird species which are a qualifying interest of the Lough Corrib SPA also make use of these other sites. These include teal, shoveler, lapwing, and black-headed gull which all use all three sites, and golden plover and common gull which also use Galway Bay. The degree of interchange between these sites is not known however grey heron, lapwing, black-headed gull and common gull were all recorded flying along the River Corrib in 2006 (RPS 2006). Regardless, these species would not be put off making the journey between wetland sites as a result of construction activity for the proposed road.

Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading, with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites.

Typical/Positive Indicator Species of Annex I Habitats

- 4.5.69** As set out in the EIAR p495, the proposed road will result in the loss of 280ha of habitat, including c.8.8ha of Annex I habitats, four of which are qualifying interest features for Lough Corrib cSAC although, as set out in paragraphs 4.5.3 to 4.5.17, none of the areas of lost Annex I habitats are within the cSAC itself. Nevertheless, site clearance for construction could theoretically result in the reduction in local populations of typical/positive indicator species of

Annex I Habitats which are qualifying interest features of the cSAC with possible knock-on effects (reduction in population resilience) for the cSAC itself. Effects on the cSAC would only be expected if it happened that a population of a locally rare species that is also a typical species of a qualifying Annex I habitat was lost or reduced during construction.

- 4.5.70** A review of the applicant's data suggests that the only candidate for limestone pavement/calcareous grassland is *Gentiana verna*, or spring gentian, which is a typical species of limestone pavement, recorded by the applicant and classified as near threatened in Ireland (Wyse Jackson, et al., 2016). It was recorded by the applicant in only three relevés and is therefore apparently uncommon locally. The records of *Gentiana verna* are (i) in the cSAC above the Lackagh tunnel location; (ii) outside the road boundary to the west of the existing N6 at Doughiska/Briarhill (EC56_R1); and (iii) outside the road boundary to the east of the existing R446 at Doughiska (EC56_R2). There were no records of this species in other relevés taken from areas of limestone pavement lost as a result of the road development which are all wooded limestone pavement. None would therefore be directly affected during construction and so it appears that there would be no supporting populations of *Gentiana verna* lost as a result of construction.
- 4.5.71** Species typical of petrifying springs also require consideration since this a rare habitat with distinct plant communities. Only two species typical of petrifying springs according to EUR28 were found by the applicant *Bryum pseudotriquetrum* and *Cratoneuron filicinum* both of which are classified as of least concern in Ireland (Lockhart, Hodgetts, & Holyoak, 2012) and are relatively common, occurring in a variety of habitats (not just petrifying springs). *Bryum pseudotriquetrum* was recorded in five places by the applicant (including LQ115 in Lackagh Quarry) while *Cratoneuron filicinum* was recorded in two places. The recorded populations would be directly impacted by construction (4 places and 1 place respectively) however given the widespread occurrence of these mosses, these losses are would not have indirect effects on the petrifying springs within the cSAC.
- 4.5.72** Finally, there are populations of three rare species/sub-species of peatland habitats which were recorded by the applicant and would or could be affected by the proposed road, these are *Sphagnum affine*, *Sphagnum capillifolium* s. *capillifolium* and *Rhynchospora fusca*. These species are, either as a genus or individually, included as typical species in EUR28 and included in the conservation objectives for Lough Corrib cSAC for 7110 Active raised bogs and 7150 Depressions on peat substrates of the Rhynchosporion. Specifically, *Sphagnum affine* (listed as *S. imbricatum* of which it is included as a sub-species *affine*) is a typical species of 7110 and *Rhynchospora fusca* is a typical species of 7110 and 7150. An adequate cover of *Sphagnum* mosses (encompassing *S. affine* and *S. capillifolium* s. *capillifolium*) is a conservation objective for 7110 in the raised bogs within Lough Corrib cSAC, while any species of *Rhynchospora* (counted separately) is a positive indicator for 7150 (Perrin, Barron, Roche, & O'Hanrahan, 2014). Given their rarity, the three species/sub-species listed do not make up a significant part of the flora within the Lough Corrib cSAC with perhaps only *Rhynchospora fusca* present and contributing towards the achievement of the conservation objectives (NPWS, 2013). It appears that *Rhynchospora fusca* population recorded by the applicant is outside the footprint for the road development. Ensuring this population is protected would therefore maintain any

supporting function that it may have for *Rhynchospora fusca* populations inside the Lough Corrib cSAC.

Qualifying Interest Annex II species

- 4.5.73** There are impacts on lesser horseshoe bats arising from the proposed road including loss of a roost and loss of foraging habitat during the construction stage, resulting in the potential loss of a colony of this species. The applicant undertook detailed bat surveys including radio-tracking and visits to roosts and found no direct link between the colonies affected by the proposed road and the relevant colony within Lough Corrib cSAC. This indicates that the affected population is not a supporting colony for that at Ebor Hall (which is the qualifying population), or at least that there is not a strong link between the two.
- 4.5.74** There would be no direct loss of any other supporting populations of the qualifying interest Annex II species of Lough Corrib cSAC during the construction stage.

Qualifying Interest Annex I birds

- 4.5.75** There would be no direct loss of supporting populations of qualifying interest Annex I bird species during the construction stage (it has been assumed that all populations recorded locally form part of the Lough Corrib SPA population).

Increase in recreational pressure on Natura 2000 sites if improvements to the road network bring in additional tourists and increase resident population.

- 4.5.76** There would be no increase in recreational pressure during the construction stage.

Operation Stage - Indirect impacts

Habitat loss directly within the Natura 2000 Sites and indirectly through changes in hydrology/hydrogeology.

- 4.5.77** There would be no further direct habitat loss during the operation phase.

Habitat fragmentation in Natura 2000 sites with larger habitat parcels within divided in two by the proposed development.

- 4.5.78** There would be no additional habitat fragmentation however the effects described for the construction phase in paragraphs 4.5.20 to 4.5.22 would endure.

Habitat isolation of habitat parcels within Natura 2000 sites to the north and south of the proposed development

- 4.5.79** As for habitat fragmentation, with the relevant paragraphs being 4.5.23 to 4.5.28.

Habitat degradation within Natura 2000 sites as a result of chemical pollution, noise, dust, light, shade and spread of invasive species.

Chemical Air pollution

- 4.5.80** It is possible that air quality in general would improve during the short term when the road becomes operational, with the same cars spending less time in queuing traffic due to the increased road space. It would however bring these cars closer to the Lough Corrib cSAC. Habitat degradation resulting from air pollution during operation is assessed in the NIS p150 to p153 and in more detail in Appendix L of the NIS. As described by the applicant, the maximum extent of such effects would be 200m, NIS p88. Most of the Lough Corrib cSAC is well beyond this distance, with only the areas of the cSAC between the eastern edge of the Lackagh Quarry and the western bank of the River Corrib within this distance, including sections where there is no separation between the proposed road boundary and the cSAC.
- 4.5.81** The traffic using the road would result in locally increased levels of contamination including compounds of nitrogen, which is the component of vehicle emissions most likely to result in changes in the vegetation. The applicant reports that according to its modelling the levels would approach the Air Quality Standard of NO_x 30 micrograms/m³ within 10m of the edge of the road but not exceed it, with concentrations falling with distance from the road. The applicant concludes that because the AQS will not be exceeded there will not be harmful effects on the vegetation. This is a legal critical level for the protection of vegetation generally and may not translate directly to no effect on the vegetation (Lee & Power, 2013) (Lee, Davies, & Power, 2012), indeed the no-effect level may be lower than NO_x 15 micrograms/m³ (WHO, 2000). However, the applicant also reports a background figure for Nitrogen dry deposition of 1 to 2.5 kg N ha⁻¹ (NIS Appendix L) and a maximum increase of approximately 1.2 kg N ha⁻¹ within 10m of the proposed road (NIS Appendix L). These figures combine to give a maximum of 3.7 kg N ha⁻¹ which is very much less than the critical load of 15 kg N ha⁻¹ (Henry & Aherne, 2014). This indicates that vehicle emissions associated with the proposed road would not be sufficient to cause an appreciable change in the vegetation within the cSAC.

Chemical Water Pollution

- 4.5.82** To the east of the River Corrib, in the vicinity of Lough Corrib cSAC, water collected in the road drainage system is proposed to be discharged in three ways (i) through infiltration basins which discharge to the groundwater body which would have received the rainwater in the absence of the road; (ii) to the River Corrib for rainwater collected on the River Corrib bridge; and (iii) to the city wastewater system for water collected in the Lackagh tunnel. The water running-off the road is likely to be contaminated with deposits derived from exhaust gases, oils, other vehicle fluids (screen wash etc), rubber particles from tyres, metals from vehicle brakes, plastic waste from litter and materials eroded from the road surface. Should an accident occur, then any material transported by road could be added to this list. Without adequate treatment, these substances would make their way into the groundwater water system which leads to the Coolagh Lakes and the River Corrib, both within the cSAC, NIS p86-87, p149-150.
- 4.5.83** The design for the proposed road includes the treatment for road run-off prior to discharge into the ground and surface water, to meet the standards set by Transport Infrastructure Ireland (TII).

Given the very sensitive nature of the receiving environment, the highest level of treatment is needed, and this requires pollution traps and a wetland system to treat the run-off, NIS p86. As with air quality, it may be that general water quality initially improves as the same cars move from old roads with no treatment of run-off onto the proposed road where the run-off would be treated. However, discharges would be directly into the groundwater and rivers in places where there is no such discharge now and the advantage gained by shifting transport patterns may be lost with subsequent traffic growth.

- 4.5.84** Moreover, to be effective these systems must be maintained with sediment removal expected every 25 years, plus other maintenance tasks required more frequently to ensure that the system is operating as it should. Mr. Dodds' assessment is that the systems proposed by the applicant will ensure that water entering the groundwater and River Corrib will not have an impact on water quality within the Lough Corrib cSAC i.e., the River Corrib and Coolagh Lakes but this conclusion is dependent on the proper maintenance of the water treatment system. It is also dependent on the dredged material from the wetland being completely removed from the locality; if placed on the ground then the collected pollutants may leach into the groundwater.

Noise and Vibration

- 4.5.85** As with air pollution, the majority of the Lough Corrib cSAC is well beyond the distance at which noise and vibration from operation of the road could have significant effects, which according to applicant's assessment is up to 150m from the road centreline. However, noise and vibration levels in parcels of qualifying habitat in proximity would increase during operation. This could influence the fauna community of these parcels by displacing species which are intolerant of such noise (and perhaps vibration), thereby favouring more tolerant species, with knock-on ecological consequences. Displacement of bird species by roads (due to noise or mortality, or both) has been well-studied (Rheindt, 2003) (Reijnen, Foppen, & Veenbaas, 1997) (Summers, Cunnington, & Fahrig, 2011), however, there is also some evidence or suggestion that species of invertebrate may be affected by traffic noise (Morley et al, 2013), plus evidence that changes in the invertebrate community can affect plant species diversity and ecosystem function (Mulder et al, 1999). There is a paucity of research on this topic however any changes in plant species composition /ecosystem function must be subtle and intertwined with other potential causes of effects on habitats in proximity to roads. The area of the cSAC that is most vulnerable is within 200m of the road at Ch. 9+850 to Ch. 10+150 and Ch. 10+800 to Ch. 11+150.
- 4.5.86** In the NIS, noise is addressed as a factor which may cause displacement/disturbance of qualifying interest species of fauna specifically otter (p90), Atlantic salmon, brook lamprey, sea lamprey (p91) and SCI birds (p91, p103 - 107), rather than a potential mechanism for habitat degradation.

Light

- 4.5.87** As with air pollution and noise, most of the Lough Corrib cSAC is well beyond the distance at which light levels would be elevated by lighting in the construction or operational stages. The proposed lighting is described in the design report (section 10.3, pages 332 - 333) and shown on drawings GCOB-1300-D-000 to -015. During operation, the mainline will be lit between the N84 Headford Road Junction and the eastern entrance of the Lackagh tunnel, meaning that the

carriageway will be lit up to the point where it reaches the boundary of the cSAC, and there is further lighting from the western entrance of the Lackagh tunnel westwards to approximately Ch. 10+920, with the cSAC immediately adjacent to the north and south. In both cases, the lighting will be on 10m high columns, with Type D (8500lm with backlight cowl) to the east and Type A to the west (9430lm). The drawings show light modelling in these localities extending out to 0.1 Lux to the east of the Lackagh Quarry and to 1.0 Lux to the west of the Lackagh Quarry. There is overlap with the light modelling and the cSAC to 1.0 Lux between Ch.10+900 to Ch. 11+025 on the south side and Ch. 10+900 to Ch. 10+690 on the north side, the 1.0 Lux isoline extends no more than 25m into the cSAC boundary in each case. There is no 0.1 Lux isoline shown so the degree of overlap is unknown, however this would also be expected to be within 25m of the road. 0.1 Lux is equivalent to illumination by the full moon, while 1.0 Lux is equivalent to candlelight.

- 4.5.88** Light from roads has been shown to affect the behaviour and distribution of invertebrates and so there is potential for this light influence invertebrate populations/distribution, with possible knock-on effects on the vegetation up to a short distance from the proposed road. This includes a small part of the cSAC.

Shading etc of habitats

- 4.5.89** As described by the applicant, NIS p88, structures included within the proposed road will create shade and therefore affect the vegetation communities beneath. The applicant identifies potential shading effects from the proposed River Corrib bridge (Ch. 9+250 to Ch. 9 + 600), around the bridge over Bothar Nua (Ch. + 850 to Ch. 10 + 150) and sections of embankment and retaining walls between the River Corrib and the proposed Menlough viaduct as locations where shading could affect land/water within the cSAC. In addition, the Menlough viaduct (Ch. 10+100 to Ch. 10+420) will shade an area of limestone pavement, which is outside of the cSAC but may provide connecting and supporting habitat for areas of the cSAC, as described in paragraphs 4.5.23- 4.5.28. As well as reducing light levels, bridges and viaducts will create drier, NIS p155, and cooler conditions, while walls and embankments could create drier or wetter and cooler or hotter conditions depending on the aspect, potentially changing the vegetation composition over a limited area.
- 4.5.90** The applicant assesses the potential effects of shading in the NIS p154 and in shading analysis study in NIS Appendix M. The diagrams included therein do not clearly show the boundary of the cSAC however it appears as though the only part of the cSAC subject to direct and significant shading (and rainfall reduction) is beneath the proposed River Corrib bridge. The Menlough viaduct would also result in direct and significant shading and rainfall reduction of an area of undesignated limestone pavement located outside but between two parts of the cSAC.
- 4.5.91** Moving east to west under the proposed River Corrib bridge, the base of the bridge deck would be approximately 4.6m above ground level in Area 1.f, increasing to 10.3m in Area 1.d (see NIS Figure 15.1) and then 13m to 15m above the River Corrib, with the bridge deck being a maximum of 24.9m wide (FIR response, Appendix A1.1). Assuming the maximum bridge width, this gives Height: Width (HW) ratios of 0.18, 0.41 and 0.52 to 0.60 (which are lower than those calculated by the applicant in the NIS). Using the applicant's reference (Broome, Craft, Struck, & San Clements, 2005), this indicates potentially the complete loss of vegetation within the

retained parts of Area 1.f and significant effects on plant growth, productivity and species composition in the retained parts of Area 1.d. However, as set out in paragraphs 4.5.3 to 4.5.16, these areas are not considered to be Annex I habitats, nor were they likely to have been when the cSAC was designated.

- 4.5.92** The applicant's view is that the River Corrib in this location is not Annex I habitat due to the lack of aquatic vegetation. This is at least debatable, with Article 17 reporting etc. indicating that it is a whole river which forms the Annex I habitat rather than just parts of the river where the listed vegetation types occur. There is limited aquatic vegetation at the location of the proposed River Corrib bridge (see NIS Appendix K, Site 5) and some fringing vegetation of trees and shrubs (as apparent from aerial imagery). The shading described could have limited effects on the little vegetation that is present, perhaps reducing its vigour. The 3260 water courses habitat within the cSAC are in favourable condition indicating that there is no requirement to restore aquatic vegetation to the River Corrib in this location but there is apparently a requirement to maintain the fringing vegetation of the river (NPWS, 2017).
- 4.5.93** The habitat/movement of qualifying Annex II species and Annex I birds would not be affected by shading of the River Corrib, as described by the applicant, NIS p155.
- 4.5.94** The base of the Menlough viaduct ranges from less than 1m above ground level to approximately 16.5m and an average of about 4.5m. It has a width of up to 26.3m (FIR response, Appendix A1.3). This gives H:W ratios of 0.3, 0.62 and 0.17 respectively, indicating large scale loss of the vegetation under this structure (Broome, Craft, Struck, & San Clements, 2005).
- 4.5.95** As mentioned previously, the typical species of the relevant Annex I habitats are all plants, some of which were recorded at the location of the Menlough viaduct (*Asplenium marinum*, *A. ruta-muraria*, *A. trichomanes* and *Leontodon hispidus*) and these individual plants could be lost here. The same is true of positive indicator species for limestone pavement/ calcareous grassland (*Asplenium trichomanes*, *Corylus avellana*, *Crataegus monogyna*, *Eurhynchium striatum*, *Fissidens dubius*, *Fissidens taxifolius*, *Frageria vesca*, *Fraxinus excelsior*, *Geranium robertianum*, *Hedera helix*, *Ilex aquifolium*, *Isoetes macrospora*, *Lonicera periclymenum*, *Lotus corniculatus*, *Neckera complanata*, *Phyllitis (Asplenium) scolopendrium*, *Prunus spinosa*, *Rhytidadelphus triquetrus*, *Rosa spinosissima*, *Rubus fruticosus* ag., *Sesleria caerulea*, *Solidago virgaurea*, *Sorbus aucuparia*, *Thamnobryum alopecurum*, *Thuidium tamariscinum*, and *Tortella tortuosa*).
- 4.5.96** Since these typical and positive indicator species are locally common, loss of the plants from under the Menlough Viaduct is not expected to have any knock-on effects for populations in the Lough Corrib cSAC. The shading in this location would have similar effects on plant dispersal as if the road were built at ground level; with only populations of species that have limited seed dispersal capabilities, or which primarily spread vegetatively potentially becoming isolated by the presence of the road. The four typical species recorded in the locality disperse by means of wind-borne spores or seeds and so populations on either side of the viaduct are not likely to become isolated. Most of the positive indicator species spread by wind borne spores and seeds, or fruits and nuts which can be dispersed by animals. The exceptions are *Geranium*

robertanum, *Lotus corniculatus* and *Sesleria caerulea*, which disperse only by dropping seed to the ground. However, these species are common and widespread locally, so that no appreciable effect on their populations would occur because of restricted dispersal.

Invasive Plant Species

4.5.97 During operation the seeds of non-native invasive species (and other species) can be spread in the airflow caused by passing vehicles (von der Lippe, Bullock, Kowarik, Knopp, & Wichmann, 2013). *Clematis vit-alba* seeds are windborne and are known to be susceptible to movement by vehicle airflow (von der Lippe et al, 2013), as is *Buddleia* (Von der Lippe & Kowarik, 2007). Once again, the area of the cSAC that is most vulnerable is within 200m of the road at Ch. 9+850 to Ch. 10+150 and Ch.10+800 to Ch. 11+150. The proposed road is mostly in a cutting in the latter locality which may mitigate the risk. The arrival and spread of these species in the cSAC would lead to a deterioration of the quality of the habitats over time.

Mortality, disturbance, displacement and habitat loss for species of flora and fauna which form part of the qualifying interest populations of Natura 2000, resulting in declines or local extinction.

Typical/Positive Indicator Species of Annex I Habitats

4.5.98 As previously mentioned, the typical and positive indicator species of the relevant habitats are all plants. Theoretically, these could suffer mortality, displacement and habitat loss as a result of chemical pollution, either air- or water-borne, arising from vehicles using the road. However as set out above, air and water pollution levels are not expected to be high enough to affect the vegetation.

Qualifying Interest Annex II species

4.5.99 The qualifying interest species most at risk during the operation of the road is otter. This is addressed in the NIS p93 and p157, with only low levels of mortality potentially resulting in population level effects. The design includes an open span bridge for the River Corrib and mammal tunnels alongside other watercourses combined with fencing, which will mitigate this risk.

4.5.100 The other qualifying interest Annex II species that occur in the vicinity are fish, which could be at risk of mortality arising from chemical pollution of water, as set out above in paragraph 4.5.82 and 4.5.84 levels are not expected to be high enough to result in fish mortality.

Qualifying Interest Annex I birds

4.5.101 There are three potential pathways for potential effects on bird species during the operation of the road; (i) collision with motor vehicles; (ii) collision with structures, the River Corrib bridge in particular; and (iii) displacement of birds from habitats adjacent to the new road.

4.5.102 As set out in paragraph 4.5.68, the qualifying interest bird species may move between waterbodies located to the north and south of the proposed development. Flight heights of the

qualifying interest species are likely to be well above the road along most of its length, meaning that the risk of collision is negligible. The exception is the proposed River Corrib bridge, at which point flight heights could coincide with the traffic. The bridge design includes 2m high noise barriers along its length which are likely to force flying birds above the traffic, so once again the risk is minimal.

4.5.103 The potential for collisions of qualifying interest bird species with the bridge itself is addressed by the applicant in the NIS p93 to p96 and in response to concerns raised by the NPWS in NPWS1. The final position of the NPWS was that the bridge would pose a minimal risk to flying birds, as it is unlit and has a low profile, NPWS2. I agree that there is little prospect of bird collisions with the bridge occurring to a level which would result in population level effects of any qualifying interest bird species.

4.5.104 Some bird species favour open habitats, avoiding land in proximity to built structures and human activity. As set out in paragraph 4.5.56, three of the qualifying interest bird species have been recorded in proximity to the proposed road; black-headed gull, common gull and coot. These species are relatively tolerant of built structures and human activity in general. Therefore, displacement of these three species from the areas in proximity to the road is expected to be minimal and largely confined to the footprint of the road itself. The other qualifying interested species are more sensitive however the habitat in proximity to the proposed road is not suitable for these species.

Disruption of migration, commuting routes or loss of seasonally occupied habitats for species with large home ranges or which are migratory and form part of the qualifying interest populations of Natura 2000.

Typical/Positive Indicator Species

4.5.105 The typical positive indicator species are all plants, which obviously do not migrate or commute. However, there is potential for the proposed road to affect plant dispersal. The only species likely to be of concern is *Gentiana verna*. This species is pollinated by bees, spreads vegetatively (when grazed) and by seed, which are dispersed over short distances (Hedley, 2015). The known position in the cSAC is above the location of the proposed Lackagh tunnel. The provision of the Lackagh tunnel should ensure continued ability to of this species to disperse within the cSAC.

Qualifying Interest Annex II species

4.5.106 The construction of an open span bridge at the River Corrib crossing would ensure that there was no interruption to otter movements or fish migration within the cSAC, while the culvert designs include features to allow otters to pass under the road at other locations where these are provided.

Qualifying Interest Annex I birds

4.5.107 As for construction phase, the presence of the proposed road would not affect bird movements in the locality.

Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites.

4.5.108 As for construction phase.

Increase in recreational pressure on Natura 2000 sites if improvements to the road network bring in additional tourists and increase resident population.

4.5.109 The road may serve to increase accessibility of Lough Corrib as a recreational destination; boating and fishing being popular activities at the Lough. The Lough condition is currently unfavourable due to mainly to agricultural activities in the lake catchment, however boating development is also cited as a current threat.

Galway Bay Complex cSAC 000268 and Inner Galway Bay SPA 004031

Construction Stage - Direct impacts

- 4.5.110** There are no direct impacts on Galway Bay Complex cSAC and Inner Galway Bay SPA as a result of the construction of the proposed road, NIS p199 and p254, with the nearest point to the cSAC (Barna Woods) being 160m distant and the nearest point to the SPA (Rusheen Bay) being 1.1km distant. Therefore, direct loss of habitat and habitat fragmentation can be discounted as potential impacts on both Galway Bay Complex cSAC and Inner Galway Bay SPA.

Construction Stage - Indirect impacts

Habitat loss in Natura 2000 sites indirectly through changes in hydrology/hydrogeology

- 4.5.111** There would be no habitat loss indirectly through changes in hydrology/hydrogeology within the (Inner) Galway Bay (Complex) cSAC SPA (Dodds, 2020).

Habitat isolation of habitat parcels within Natura 2000 sites to the north and south of the proposed development

- 4.5.112** Much of the area and habitats within the Galway Bay Complex cSAC are marine and coastal and would therefore not be isolated from similar habitats by the construction of the road. There are however a few terrestrial habitat parcels which lie to the north of the coast and south of the proposed road. There is therefore the potential for these to be isolated by the proposed road from similar habitats or supporting habitats located to the north of the proposed road, with possible knock-on effects for the typical/positive indicator flora, if these are present. The principal area within the cSAC which would become more isolated as a result of the proposed road is a parcel of land to the east of Bearna, which includes the Barna Woods, a section of the Bearna Stream and an area of grassland. Barna Woods is already isolated from other areas of woodland however other semi-natural habitats occur in proximity and direct connections between these areas would be lost on construction of the road.
- 4.5.113** This area of the cSAC was not mapped by the applicant and there is no detail or assessments provided in the NIS as to whether this is Annex I habitat or what type. However, there is published detailed ecological information; Barna Woods is known to support a small area of the Annex I habitat 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) plus other types of woodland which are not of an Annex I type (Browne, et al., 2009). 91E0 Alluvial forests is not a qualifying interest feature of the Galway Bay Complex cSAC (nor Lough Corrib cSAC). This indicates that any effects of isolation would not affect a qualifying interest Annex I habitat in this location.
- 4.5.114** The proposed road would not isolate any two parts of the Inner Galway Bay SPA, nor put off qualifying interest bird species from using other sites located to the north of the proposed road.

Habitat degradation within Natura 2000 sites as a result of chemical pollution, noise, dust, light, shading and spread of invasive species including from construction traffic and site workers travelling to/from the construction site.

- 4.5.115** The road construction site is just over 100m from Galway Bay (undesigned area, at Knocknagreana) at its nearest point, with most of the construction activity occurring at a much greater distance. Therefore, additional chemical air pollution, noise, dust and light within and around Galway Bay resulting from the proposed road would be minimal during the construction phase, NIS p200. As with Lough Corrib cSAC there is a risk of potential pollution of watercourses during the construction phase, both chemical and, more likely, suspended solids due to site run-off entering the watercourses which feed into the Bay. Construction work at and near the Sruthan na Libeirti, the Trusky Stream, the Bearna Stream, the Tonabrocky Stream and the Knocknacarragh Stream, which are all crossed by the proposed road and feed into the Bay, poses a particular risk of suspended solid pollution, NIS p200. This could affect qualifying interest Annex I coastal habitats where these streams discharge into the Bay and potentially affect food availability for otter, a qualifying interest Annex II species of Galway Bay Complex cSAC.
- 4.5.116** The potential introduction and spread of non-native species into Galway Bay Complex cSAC are addressed by the applicant in the NIS p202 to p203. The majority of the Galway Bay Complex cSAC is too distant to be at risk immediately however there is a very low risk to the cSAC where construction takes place in and around the Barna Woods area (100m distant) and close to watercourses (which may transport plant material downstream to the cSAC), The main risk is Japanese knotweed, which is known to occur locally.
- 4.5.117** An assessment of construction traffic is provided in the EIAR and NIS, which is rightly focussed on the construction traffic in and around the proposed road. However, the CEMP states that the construction of the proposed road will require considerable movements of materials to, from and around the site. This is quantified in Table 7.6 of the EIAR p329 which includes all vehicle movements with deliveries to site not separated out from the total. Concrete and paving will be among the materials delivered to site however it is unclear how many vehicle movements this would entail, and which routes will be used for site deliveries. Use of a route from the south into Galway which includes the M18, R458 and N67 would bring construction traffic directly alongside parts of Galway Bay cSAC, with an increase in emissions and the risks of accidental spillage of vehicle fluids and spread of non-native invasive species on vehicle wheels, albeit that these risks are very low.
- 4.5.118** A risk of habitat degradation affecting qualifying interest bird species of the Inner Galway Bay SPA and waterbird habitat arises from suspended solid pollution, as described in paragraph 4.5.115, and NIS p257.

Mortality, disturbance, displacement and habitat loss for species of flora and fauna which form part of the qualifying interest populations of Natura 2000, resulting in declines or local extinction.

Typical/positive indicator species of Annex I Habitats

- 4.5.119** There is no risk of mortality, disturbance, displacement and habitat loss during construction for typical/positive indicator species of Annex I habitats within the Galway Bay Complex cSAC (supporting populations are addressed in paragraph 4.5.126).

Qualifying Interest Annex II species

- 4.5.120** The risk to the Annex II species is limited to otter when ranging outside of the Galway Bay Complex cSAC and potentially reaching the construction site, at the watercourse crossings, NIS p199, p203 - p204. The risks to this species population are as set out for the Lough Corrib cSAC. In summary, the risk of mortality is very low to negligible, disturbance of otter could occur, and minor habitat loss (and therefore displacement) will occur. However, any disturbance and loss of habitat would not have an impact on the otter population.

Qualifying Interest Annex I birds

- 4.5.121** Three of the significantly impacted wintering bird survey sites WB03 (Ballymoneen), WB45 (NUIG sporting ground), and WB01 (Arduan) supported qualifying bird species of the Inner Galway Bay SPA, with WB03 (Ballymoneen) supporting grey heron and curlew, WB45 (NUIG sporting ground) supporting black-headed gull and common gull and WB01 (Arduan) supporting black-headed gull. Recorded numbers were low in each case but nevertheless there will be a loss of habitat for these species in these locations. As already discussed for the Lough Corrib SPA, it seems likely that there is ample alternative habitat for the gulls with no risk of a population level effect (black-headed gull), or a decline which would reduce numbers below baseline levels (common gull).
- 4.5.122** For whatever reason, the applicant does not assess the impacts on grey heron and curlew at WB03 in the NIS, p259-60 and p263-264. Grey heron is associated with rivers and streams and so may have been recorded along the Tonabrocky stream which passes through WB03 and is bisected by the proposed road. The construction of the road and associated loss of stream-side habitats would not have an impact on the grey heron population as it would not alter the availability of food (fish) for this species. Curlew makes use of wet grassland in winter and there are several patches of this habitat type within WB03 and some small areas within the footprint of the proposed road. Given their small size, these would not be of importance for the curlew population. There is also potential for curlew to be displaced from other areas of wet grassland within 200m of the proposed road during construction (and then during operation), with the applicant's data indicating that a small number less than 5 would be affected. These birds may well find alternative habitat nearby, although there is evidence that displaced wading birds do not fare well. Any resulting population decline would not be appreciable in the context of the SPA population.

Disruption of migration, commuting routes or loss of seasonally occupied habitats for species with large home ranges or which are migratory and form part of the qualifying interest populations of Natura 2000.

Typical/positive indicator species of Annex I Habitats

- 4.5.123** Typical/positive indicator species of the terrestrial qualifying interest Annex I habitats are all plants and their lifecycles within the Galway Bay Complex cSAC would not be interrupted by the proposed road. The marine species would equally be unaffected.

Qualifying Interest Annex II species

- 4.5.124** There is potential for movement of the otter population along the watercourses crossed by the proposed road to be interrupted during construction works, especially when the culverts are being installed, but also inadvertently by fencing, NIS p203-p204. This is unlikely to be of sufficient duration to have population level effects but could temporarily exclude an otter from part of its territory outside the cSAC.

Qualifying Interest Annex I birds

- 4.5.125** As set out in paragraph 4.5.68, important sites for wintering birds lie to the north and south of the proposed road. Several bird species which are a qualifying interest of the Inner Galway Bay SPA also make use of these other sites. These include grey heron, cormorant, wigeon, teal, lapwing, curlew and black-headed gull which all use Galway Bay, Lough Corrib and Ballindooley Lough, bar-tailed godwit which also uses Ballindooley Lough, and golden plover, ringed plover, redshank and common gull which also use Lough Corrib (NIS Figure 9, Appendix I, Irish Wetland Bird Survey). The degree of interchange between these sites is not known however grey heron, cormorant, lapwing, curlew, black-headed gull and common gull were all recorded flying along the River Corrib in 2006 (RPS 2006). As for the Lough Corrib birds, these species would not be put off making the journey between wetland sites as a result of construction activity for the proposed road.

Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites.

Typical/positive indicator species of Annex I Habitats

- 4.5.126** As noted above, the typical/positive indicator species of the terrestrial Annex I habitats are all plants. The proposed road will result in the loss of plants of these species outside of the Galway Bay Complex cSAC, particularly but not exclusively due to losses of undesignated limestone pavement and calcareous grassland. However, as described for Lough Corrib cSAC, the impacted typical/positive indicator species of these habitats are locally common or not rare, and so these losses would not be expected to have an appreciable effect on the populations within

the Galway Bay Complex cSAC. There would clearly be no impact on supporting populations of marine species.

Qualifying Interest Annex II species

- 4.5.127** The otter population around Galway is assumed to be a single population spanning both the River Corrib and the southern parts of Lough Corrib cSAC and the northern parts of Galway Bay Complex cSAC, with no impacts likely on other otter populations outside this region.

Qualifying Interest Annex I birds

- 4.5.128** Similarly, the individual birds of qualifying interest species recorded outside the Inner Galway Bay SPA are assumed to be part of the Inner Galway Bay SPA. Any impacts would therefore be on the qualifying population, as described above.

Operation Stage - Indirect impacts

Habitat isolation of habitat parcels within Natura 2000 sites to the north and south of the proposed development

- 4.5.129** As for construction stage, with the conclusion that there would be no appreciable effect on qualifying interest Annex I habitats within Galway Bay Complex cSAC arising from habitat isolation.

Habitat degradation as a result of chemical pollution, noise, dust, light, shading and the spread of invasive species.

- 4.5.130** Galway Bay is too distant from the proposed road to experience negative effects from chemical air pollution, noise, dust, light, spread of invasive species during the operation of the road. However, there is the potential for road run-off containing chemical pollutants from vehicles (arising from deposits of exhaust gasses, leaking fluids, screen wash, tyre rubber, brake dust, accidental spillage and erosion of the road surface) to make its way into Galway Bay via the watercourses crossed by the proposed road. The design includes measures to control pollution and the applicant asserts that these will be adequate to prevent impacts on the qualifying interest of the Galway Bay Complex cSAC (NIS p202), and this has been independently assessed as adequate (Dodds, 2020), but the efficacy of these measures is dependent on maintenance.

Disruption of migration, commuting routes or loss of seasonally occupied habitats for species with large home ranges or which are migratory and form part of the qualifying interest populations of Natura 2000.

Typical/positive indicator species of Annex I Habitats

- 4.5.131** As for construction stage, with the conclusion that there would be no appreciable effect on qualifying interest Annex I habitats within Galway Bay Complex cSAC arising from disruption etc of qualifying interest populations.

Qualifying Interest Annex II species

- 4.5.132** The only Annex II species vulnerable to disruption is the otter, where the potential impacts would be the same as set out for Lough Corrib cSAC as assessed by the applicant NIS p204.

Qualifying Interest Annex I birds

- 4.5.133** As for construction stage, with the conclusion that there would be no appreciable effect on qualifying interest bird species within Inner Galway Bay SPA arising from disruption etc of qualifying interest populations.

Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites.

- 4.5.134** As for construction stage, with the conclusion that there would be no appreciable effect on qualifying interest habitats and populations of (Inner) Galway Bays (Complex) cSAC and SPA arising from loss of supporting populations.

Increase in recreational pressure if improvements to the road network bring in additional tourists and increase resident population.

- 4.5.135** The new road would improve access to parts of Galway Bay, potentially making it easier for those in the east of the city and beyond to reach the Barna Woods, Rusheen Bay and adjoining coastal areas within the cSAC and SPA. These last two areas support qualifying Annex I habitats, including 1220 perennial vegetation of stony banks (favourable condition), otter and Annex I bird species black-headed gull, common gull and redshank recorded by the applicant (NIS Appendix I WB52), and suitable habitat for others. If ease of access increases the use of these areas, on foot or on watercraft, then it could lead to greater disturbance of these habitats and species. The 1220 perennial vegetation of stony banks is perhaps the most vulnerable habitat since the vegetation is vulnerable to trampling.

Other Natura 2000 sites

Construction Stage - Indirect impacts

Habitat degradation within Natura 2000 sites as a result of chemical pollution, noise, dust, light, shading and spread of invasive species including from construction traffic and site workers travelling to/from the construction site.

- 4.5.136** As set out in paragraph 4.5.117, the proposed road will require considerable movements of materials to the site. Use of a route from the south into Galway which includes the M18, R458 and N67 would bring construction traffic within 200m of Ardrahan Grassland cSAC, Kiltiernan Turlough cSAC, Lough Fingall Complex cSAC, and Cregganna Marsh SPA, while using an M18 only route would bring the traffic within 200m of Ardrahan Grassland cSAC, and Castletaylor Complex cSAC.
- 4.5.137** Construction traffic along these routes would increase emissions to air and increase the risks of spillage/leakage of fluids and materials. The air quality in the region is good (Aherne, Henry, & Wolniewicz, 2017) with low levels of nitrogen deposition, well below the critical load for the Annex I habitats in these designated sites, and therefore the additional emissions from the construction related traffic would not cause the critical load to be exceeded.
- 4.5.138** The M18 is a modern road and likely to include modern standards of pollution control which would deal with spillages either from leaking vehicles or in the event of an accident. However, the R458 and N67 are older roads which do not/may not reach the same standards of pollution control potentially leaving the Natura 2000 sites alongside at risk from pollution, albeit a very small risk that any pollution arising specifically from construction traffic would have any appreciable effect on the qualifying interest of these Natura 2000 sites.
- Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites.*
- 4.5.139** Connemara Bog Complex cSAC, Connemara Bog Complex SPA, Lough Fingall Complex cSAC, Ross Lake and Woods cSAC, Black Head Poulsallagh cSAC, Rahasane Turlough cSAC, Kiltiernan Turlough cSAC, Castletaylor Complex cSAC, Gortnandarragh Limestone Pavement cSAC, Ardrahan Grassland cSAC, Moneen Mountain cSAC and East Burren Complex cSAC all include qualifying interest features and typical/positive indicator species which are also found within the route corridor. Similarly, Connemara Bog Complex SPA has qualifying interest bird species that have been recorded in the route corridor.
- 4.5.140** Therefore, individuals and populations of these species would be negatively affected by the proposed road. Theoretically, rare or locally uncommon typical/positive indicator species, Annex II species or Annex I bird species population lost to proposed development could leave the remaining populations within the designated sites listed here more vulnerable to extinction and genetic isolation.
- 4.5.141** As set out for Lough Corrib cSAC, the candidates for typical/positive indicator species are *Gentiana verna*, *Rhynchospora fusca*, *Sphagnum affine*, *Sphagnum capillifolium* s. *capillifolium*.

The first two of these appear to be in locations not affected by road construction and the latter two do not appear to contribute towards the attainment of favourable condition at the cSACs.

- 4.5.142** For the Annex II species, the candidates are marsh fritillary and lesser horseshoe bats.
- 4.5.143** The applicant reports a direct loss of 5.2ha of Marsh fritillary habitat, all in the western part of the route corridor. A population decline commensurate with the habitat loss would be expected, with the possibility, when combined with other impacts, of losing this species from one location in which it currently occurs. The nearest cSAC to this location is Connemara Bog Complex which is approximately 6-8km away. The applicant considered potential links in the screening report p15, concluded that there is no link due to the sedentary nature of the species, nevertheless, erosion of the marsh fritillary population outside of the cSAC may eventually reduce the resilience of the population within, but this could not be attributed to the proposed road specifically.
- 4.5.144** As previously noted, there are impacts on lesser horseshoe bats arising from the proposed road including loss of a roost and loss of foraging habitat during the construction stage, resulting in the potential loss of a colony of this species. The applicant found no direct link between the colonies affected by the proposed road and any colonies in the nearest cSAC; Ross Lake and Woods (nor the relevant colony within Lough Corrib cSAC). However, as with marsh fritillary population, declines of lesser horseshoe bats outside the cSAC network may eventually result in effects on those within, although again, this could not be attributed to the road scheme specifically.
- 4.5.145** The qualifying interest species of the Connemara Bog Complex SPA are cormorant, merlin golden plover and common gull. The proposed road is either not predicted to have population level effects on any of these species, or to have an effect which would reduce the population below the baseline values for the SPAs and would therefore not affect the supporting populations for the qualifying interest populations of this SPA.

Operation Stage - Indirect impacts

Increase in recreational pressure on Natura 2000 sites if improvements to the road network bring in additional tourists and increase resident population.

- 4.5.146** As the proposed road could ease access to Natura 2000 sites located to the west of Galway which, if it resulted in an increase in tourism, or recreation could result in damage to sensitive habitats. The Connemara Bog Complex cSAC and SPA, Ross Lake and Woods cSAC, Maumturk Mountains cSAC and The Twelve Bens/Garraun Complex cSAC all have areas which are already popular with tourists or for recreation. Examples include the mountain paths in the Twelve Bens which may pass through qualifying interest Annex I habitats that are in unfavourable condition.

4.6 Step Two, part 2: Impact Prediction 'In combination'

Applicant's Assessment

- 4.6.1 The applicant provided an 'in combination' assessment in the NIS p329-p380. This considered approximately 33 plans, 9 specific projects and other projects generically. The assessment in the NIS was mainly pairwise, looking at the effect of the proposed road and one other plan or project at a time, however, in section 12.2 the total effect of all plans and projects was considered and this is expanded upon in the FIR response, p62 to p64.
- 4.6.2 The applicant considered the potential for in combination effects on Lough Corrib cSAC and (Inner) Galway Bay (Complex) cSAC and SPA to arise from water pollution, air quality, disturbance of otter, disturbance of wintering birds and the introduction of invasive non-native species.
- 4.6.3 The applicant determined that the possibility of in combination effects leading to adverse effects on site integrity (or undermining the conservation objectives) is ruled out because all other plans and projects would also need to comply with the Habitats Directive, the associated Regulations and the policies designed to protect Natura 2000 sites set out in the various Development Plans in proximity to the relevant Natura 2000 sites. The applicant also makes the case that, even if this were wrong, and there were in combination effects arising from other plans and projects, the proposed road would not contribute to such effects, as when considered alone the effects arising from the proposed road are imperceptible.
- 4.6.4 The applicant's assessment was updated in the light of new projects during the oral hearing, with an updated assessment provided in the AA - In combination assessment addendum update report, dated 10th March 2020, was then replaced 3rd November 2020, with a supplement to this covering Burkeway Bearna on 4th November 2020, these last two form the "**2020 in-combination update**". This included seven new or updated plans and sixteen new projects, as set out in Table 1 and Table 2, respectively, plus the supplement. The applicant's conclusion remains unchanged despite the new information.

Summary of Plans and Projects

- 4.6.5 According to EC guidance, the in-combination effects assessment should consider existing plans and projects, extant permissions not yet completed (e.g., phases of development), extant permissions not yet started, current applications for permission under consideration, any known unregulated projects, ongoing projects subject to regulatory review, policies and proposals not yet fully implemented and draft plans being brought forward. The effects of completed plans and projects is to be considered as part of the baseline conditions. The effects of completed plans and projects were not explicitly identified by the applicant in its in-combination assessment however such effects can be inferred from the condition assessments for qualifying interest of Natura 2000 sites (e.g., poor water quality in Lough Atalia).
- 4.6.6 From the information provided by the applicant in the NIS and the 2020 in combination update, it is clear that there are substantial plans to develop the city of Galway and the surrounding area, plus projects recently completed, underway or about to start.

4.6.7 The key plans are Galway County Development Plan 2015-2021 and Galway City Council Development Plan 2017-2023. Also relevant are the associated plans of national and local authorities which sit above and below the county and city development plans, and the plans of adjoining counties where these adjoin Galway Bay and Lough Corrib, and perhaps other Natura 2000 sites. These have all been subject to an appropriate assessment and the conclusion of each must have been that the policies contained therein would not, have an adverse effect on the integrity of any Natura 2000 site including (Inner) Galway Bay (Complex) cSAC and SPA and Lough Corrib cSAC and SPA. The conclusion in each case may be subject to the implementation of mitigation measures.

Galway County Development Plan 2015-2021

4.6.8 The Galway County Development Plan sets out, for the County, strategic aims and policies and objectives for *inter alia* settlements, housing, economic, tourism and retail development, roads and transport, water, wastewater and waste management, climate change, and natural heritage and biodiversity. The strategic aims include promoting regional development and growth in a sustainable and environmentally sensitive manner. It envisages population growth of around 2,600 people per annum in Galway County, with 7% of this directed to the town of Tuam, and lists the opportunity to “position Galway as the Outdoor and Recreational Capital of Ireland”. The original development plan did not include the proposed road, however it was added to the Plan, along with the rest of the Galway Transport Strategy (GTS) with Variation No. 1, which was published April 2017.

4.6.9 The Galway County Development Plan and Variation No. 1 have been subject to an appropriate assessment with the conclusion that Plan and the Variation would not adversely affect the integrity of any European site. The conclusion on both counts is contingent on the implementation of mitigation measures, which are written into the Plan and the GTS (which are replicated in the Natura Impact Report for Variation No. 1.).

4.6.10 The same consultants prepared the Natura Impact Report for Variation No. 1 as prepared the NIS for the N6GCRR, and two documents appear consistent, thus the mitigation measures identified at the Plan level for the N6GCRR have made their way down to the project level, where these are specific to the N6GCRR. For the conclusion on in combination effects, it is essentially reliant on all other projects which come under the plan not being permitted unless it can demonstrate that they will have no adverse effect on the integrity of a European site. This appears to miss the point of an in combination or cumulative assessment. However, the assessment does make clear that the conclusion is also reliant upon “adherence to the overarching policies and objectives of the Galway County Development Plan 2015-2021” without identifying any policy or objective in particular, so this is assumed to be a reference to the mitigation measures identified in the original appropriate assessment for the Galway County Development Plan.

Galway City Development Plan 2017-2023

- 4.6.11** The Galway City Development Plan 2017-2023 sets out the strategic vision, core strategy and detailed policies for Galway City. It includes objectives for growth and development, as well as policies to protect the environment. Targets for new housing equate to approximately 770 new households (or 2,100 people, so 80% of the County target) every year from 2017 to 2023, with supporting infrastructure, including the proposed road, and employment and recreation opportunities. The plan includes, for example, new residential areas to the south of the proposed road and west of the N84, in proximity to the Lough Corrib cSAC.
- 4.6.12** The appropriate assessment of the Galway City Development Plan identified the potential for impacts on Natura 2000 sites to arise from (i) discharge of wastewater and run-off into groundwater bodies, the River Corrib and Galway Bay both during the construction and operation of new developments, adding to existing discharges (ii) recreational activities, leading to trampling in Annex I habitats and disturbance of Annex II species (ii) incremental habitat loss and fragmentation. It does not explicitly list air pollution as a potential pathway however air quality measures are identified as a mitigation requirement.
- 4.6.13** The appropriate assessment of the Galway City Development Plan reached a conclusion of no adverse effect on the integrity on any Natura 2000 site however this was subject to mitigation measures which were or have subsequently been written into the Plan. These are set out in Tables 4.1 and Table 4.2 of the AA for the Galway City Development Plan, and include various measures within policies to help protect biodiversity both inside and outside designated sites, improve coastal and freshwater quality, reduce greenhouse gas emissions and maintain air quality in line with EU standards. It follows that the development elements of the plan and the environmental protection and improvement elements of the plan listed as mitigation measures, must both be progressed equally for the conclusion of the appropriate assessment to hold.

Projects

- 4.6.14** In summary, the projects identified in the NIS and subsequently by the applicant include:
- Road development schemes comprising the N6 Galway City Ring Road, M6 Motorway improvements, M17 Galway to Tuam, N18 Oranmore to Gort, N17 Tuam Bypass, N59 Maam Cross to Oughterard, N59 Moycullen Bypass and upgrades to the R336 Bearnna to Scrib;
 - A motorway service area on the M6 at Oranmore;
 - National University of Ireland Galway (NUIG) New Pitches;
 - Cycle/greenway projects with start points in Galway City;
 - Two coastal protection projects in Galway bay, plus an extension of Galway Harbour;
 - More than 962 residential units;
 - Student accommodation with a total of 1,120 student beds; and
 - Galway West Water Supply Scheme (abstraction from the River Corrib).
- 4.6.15** Also of relevance is that Irish Water have upgraded the Mutton Island Wastewater Treatment facility under the Capital Investment Plan 2014-2016 (Galway Sewerage Scheme Phase 3 -

Network Upgrade Contract No.1 Volume D). The upgrade increases the capacity of the plant from 92,000 to 170,000 population equivalent (PE)⁹.

4.6.16 Of the two strategic housing developments that were refused consent during the period covered by the oral hearing, one of these (306413-19/20, Rosshill Road) was refused at least partly on the basis of potential adverse effects on the integrity of Inner Galway Bay SPA, however, this could be more to do with a lack of information (wintering bird surveys) than actual adverse effects on the integrity of the SPA.

Assessment

4.6.17 The Plans identified above include a range of environmental objectives and policies. However, it is notable that the projects presented by the applicant all have a development focus (roads, housing and urban regeneration) although these do, where appropriate, include mitigation to avoid adverse effects on the integrity of any European site. In combination effects are relevant when a series of minor impacts arising from more than one project, and which are insufficient to result in an adverse effect on site integrity on their own, combine to have such an effect.

4.6.18 It is clear from the Plans that the proposed road is an integrated part of wider plans to manage existing traffic issues and accommodate population growth and further development in Galway City and therefore the County. It will help people move from east to west (and vice versa) more easily and could accommodate more road users than the current network.

4.6.19 As identified by the assessors for the appropriate assessments referred to above, there are risks of in combination effects arising from the proposed road and other projects in the Galway area. These are:

- Biodiversity loss including of Annex I habitats outside Natura 2000 sites, individuals/populations of typical/positive indicator species of Annex I habitats outside Natura 2000 sites and undesignated habitats of Annex II species, which could reduce the resilience of such habitats/populations inside Natura 2000 sites;
- Isolation of important sites for biodiversity by the road network in particular, which again could reduce the resilience of species populations inside Natura 2000 sites;
- Recreational activities, leading to trampling in terrestrial Annex I habitats, damage to marine and freshwater Annex I habitats resulting from boat traffic and disturbance of Annex II species and Annex I bird species;
- Reductions in air quality arising from increases in vehicle emissions and other sources associated with an increased population and new roads in proximity to Natura 2000 sites;
- Reductions in water quality arising from increased water use, road run-off into watercourses and construction activity; and

⁹ population equivalent is a measure of the pollution equivalent to that produced by one person in their household over a 24hour period

- Spread of invasive non-native species through human activity, including construction but also dumping of garden waste around new developments and inappropriate plantings.

4.6.20 For all of these, it is possible to reduce the potential impact through mitigation measures at the project level and it is expected that this will be done in line with the policies set out in the relevant Plan. However, these measures are unlikely to have eliminated the potential impact completely and there remains, without broader mitigation measures or environmental improvements, a risk that incremental losses or worsening of environmental conditions would eventually combine to either hinder restoration or have a significant impact on qualifying interest features of a cSAC or SPA.

4.7 Step Three: Conservation Objectives

Applicant's Assessment

4.7.1 The applicant has provided an assessment of the effect of the development in relation to the conservation objectives for the site in Tables 9.16 p163 of the NIS. This assessment identified the potential, without mitigation, for the impacts of the proposed road to undermine the conservation objectives of Lough Corrib cSAC SPA and (Inner) Galway Bay (Complex) cSAC and SPA.

Approach

4.7.2 My assessment of the identified potential impact pathways is summarised Tables 6 to 9, along with consideration of the risks that conservation objectives (COs) would be undermined both for the proposed road alone and in combination with other plans and projects. I have based the assessment on the proposed road as designed including designed in or embedded mitigation but only where active management and maintenance is not required for this type of mitigation to function.

Lough Corrib cSAC

Table 6: Risks of undermining the conservation objectives of Lough Corrib cSAC in the absence of mitigation.

Impact Pathway	Predicted without mitigation	Contravention of COs Alone?	Contravention of COs in combination
Habitat loss directly within the Natura 2000 Sites	Yes, as listed in Table 5.	Habitat loss would not change the area or distribution of any Annex I habitat, or prevent restoration where this is an objective, however, the applicant proposes removing the treeline/fringing vegetation along the River Corrib (NIS p140), whereas the COs for 3260 watercourses have a target of "Maintain the area and condition of fringing habitats necessary to support the habitat and its sub-types".	No, the other known projects would not result in direct habitat loss within the cSAC, or fringing vegetation along the River Corrib.
Habitat loss in Natura 2000 sites indirectly through changes in hydrology/hydrogeology	No, the design of the development ensures continued water supply to the Coolagh Lakes.	No	No

Impact Pathway	Predicted without mitigation	Contravention of COs Alone?	Contravention of COs in combination
Habitat fragmentation in Natura 2000 sites with larger habitat parcels within divided in two by the proposed development	Yes, in Area 1.f	No, there are no specific conservation objectives relating to habitat fragmentation, the impacted habitat parcel is not Annex I habitat and therefore any changes in species composition resulting from fragmentation would not affect the conservation objectives	No, there are no other proposed projects which result in habitat fragmentation
Habitat isolation of habitat parcels within Natura 2000 sites to the north and south of the proposed development	Yes, although this has been mitigated through design (Lackagh Tunnel)	No, there are no specific conservation objectives relating to habitat isolation, therefore habitat isolation would need to negatively affect the vegetation composition to undermine the COs and the degree of connectivity under/over the road is sufficient to avoid such an effect.	Low risk in Menlough/Coolagh area, (south N6 GCRR, from River Corrib eastwards to the cSAC boundary at Lackagh) due to increasing isolation of plant species populations, e.g., <i>Gentiana verna</i> , as a result of additional development to the west of the N84 and east of the R. Corrib, in proximity to the cSAC as shown in the GCDP
Habitat degradation within Natura 2000 sites as a result of chemical pollution, noise, dust, light, shading and spread of invasive species including from construction traffic and site workers travelling to/from the construction site	Yes, during construction and operation	Low risk, from chemical pollution of water, noise, dust (construction stage only), light, spread of invasive species, in proximity to the road there is the potential to negatively affect the vegetation composition, with a decrease in positive indicator species and an increase in negative indicator species for 8240 limestone pavement, 6210 calcareous grassland, the Coolagh Lakes (3140 lakes, 7210* fens) and 3260 watercourses within the cSAC, and	Medium risk, resulting from the additional proposed development described above, with same area of the cSAC most at risk (Menlough/Coolagh)

Impact Pathway	Predicted without mitigation	Contravention of COs Alone?	Contravention of COs in combination
		reducing fish biomass for Otter, reducing water quality for Salmon, and reducing clean gravel spawning habitat for Lampreys in the River Corrib.	
Mortality, disturbance, displacement and habitat loss for species of flora and fauna which form part of the qualifying interest populations of Natura 2000, resulting in declines or local extinction	Yes, construction would result in the loss of individual plants of typical and positive indicator species within the cSAC, and Annex II species populations could be affected by habitat degradation, if severe, during construction and operation	Loss of individual plants of typical and positive indicator species within the cSAC is outside Annex I habitats so would not undermine the COs. However, low risk of undermining the COs through a serious pollution event of the River Corrib either during construction or operation of the road, or long-term habitat degradation during operation, affecting the extent/ population structure of the three Annex II fish species and fish biomass availability for otter in the River Corrib	Other developments would not result in direct loss of typical or positive indicator species within the cSAC, however, there is potential for other developments to affect water quality in the lower reaches of the River Corrib, increasing the risk that the conservation objectives for Annex II species are undermined
Disruption of migration, commuting routes or loss of seasonally occupied habitats for species with large home ranges or which are migratory and form part of the qualifying interest populations of Natura 2000	No, the open span bridge over the River Corrib would ensure that passage for otter and the three Annex II fish species would be maintained	No	No
Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites	Yes, the development will result in the loss of individual plants of typical and positive indicator species outside the cSAC however none are rare enough for these losses to have an appreciable effect on the populations within the cSAC	No, as the species affected are either locally common or do not contribute to maintaining the favourable condition	Low risk arising from a greater loss from all proposed development combined, as shown on GCDP map.

Impact Pathway	Predicted without mitigation	Contravention of COs Alone?	Contravention of COs in combination
<p>Increase in recreational pressure on Natura 2000 sites if improvements to the road network bring in additional tourists and increase resident population</p>	<p>Possible, if the road enables easier access to Lough Corrib</p>	<p>No</p>	<p>Low risk that increased boating activity resulting from increased population in Galway City and County on Lough Corrib and easier access provided by the N6 GCRR and other road developments could hinder the ability to restore the three Annex I habitats to favourable condition.</p>

Lough Corrib SPA

Table 7: Risks of undermining the conservation objectives of Lough Corrib SPA in the absence of mitigation.

Impact Pathway	Predicted without mitigation	Contravention of COs	Contravention of COs in combination
Habitat loss directly within the Natura 2000 Sites	No, there would be no habitat loss within the SPA	No	No
Habitat loss in Natura 2000 sites indirectly through changes in hydrology/hydrogeology	No, there are no GWDTE within the SPA linked to the proposed road	No	No
Habitat fragmentation in Natura 2000 sites with larger habitat parcels within divided in two by the proposed development	No, there would be no habitat fragmentation within the SPA	No	No
Habitat isolation of habitat parcels within Natura 2000 sites to the north and south of the proposed development	No, movement of birds would not be interrupted by the proposed road	No	No
Habitat degradation within Natura 2000 sites as a result of chemical pollution, noise, dust, light, shading and spread of invasive species including from construction traffic and site workers travelling to/from the construction site	No, SPA lies upstream of the N6 GCRR	No	No
Mortality, disturbance, displacement and habitat loss for species of flora and fauna which form part of the qualifying interest populations of Natura 2000, resulting in declines or local extinction	There will be some loss disturbance, displacement and habitat loss for three of the qualifying interest species of bird	Very low risk of hindering restoration of wintering coot population due to potential small decline in breeding pairs, but would not hinder restoration of black-headed gull population, or reduce common gull population below baseline levels.	Low risk if further losses of breeding sites for coot occurs, and also if additional losses of short, improved grassland, including agricultural land, used for winter foraging by gulls hinders the restoration of the black-headed gull population, or reduces the common gull population below baseline levels.
Disruption of migration, commuting routes or loss of seasonally occupied habitats for species with large home ranges or which are migratory and form part of the qualifying interest populations of Natura 2000	No, the proposed road would not interrupt the movement of bird species	No	As above, due to loss of seasonally occupied areas outside the SPA

Impact Pathway	Predicted without mitigation	Contravention of COs	Contravention of COs in combination
Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites	Not applicable as all birds assumed to be part of the qualifying interest population	-	-
Increase in recreational pressure on Natura 2000 sites if improvements to the road network bring in additional tourists and increase resident population	Possible, if the N6 GCRR enables easier access to Lough Corrib	Low risk, disturbance from recreational activities much less likely in winter when most of the qualifying interest is present, however breeding common scoter may be more vulnerable to disturbance, and this may hinder restoration of the breeding population	Low risk, but increased by population growth in e.g., Galway City, Tuam and Bearnna, which may lead to increased visits to Lough Corrib and associated recreational activity.

Galway Bay Complex cSAC

Table 8: Risks of undermining the conservation objectives of Galway Bay Complex cSAC in the absence of mitigation.

Impact Pathway	Predicted without mitigation	Contravention of COs	Contravention of COs in combination
Habitat loss directly within the Natura 2000 Sites	No, there would be no habitat loss within Galway Bay Complex cSAC	No	No
Habitat loss in Natura 2000 sites indirectly through changes in hydrology/ hydrogeology	No there are no GWDTE within the cSAC linked to the proposed road	No	No
Habitat fragmentation in Natura 2000 sites with larger habitat parcels within divided in two by the proposed development	No, the proposed road would not fragment any part of Galway Bay Complex cSAC	No	No
Habitat isolation of habitat parcels within Natura 2000 sites to the north and south of the proposed development	Yes, Barna Woods and adjoining land within the cSAC would become more isolated from undesignated terrestrial habitats to the north	No, there are no qualifying interest Annex I terrestrial habitats within Barna Woods and adjoining areas of the cSAC	No, for the same reason as 'alone' (although new residential development proposed as part of the GCDP and, to a lesser extent, the Bearna Local area Plan (part of the GCDP) may increase isolation of Barna Woods)
Habitat degradation within Natura 2000 sites as a result of chemical pollution, noise, dust, light, shading and spread of invasive species including from construction traffic and site workers travelling to/from the construction site	Yes, due to chemical water pollution and suspended solid pollution, arising from construction work, construction traffic and the operation of the road, unless trapped and treated all waterborne pollution arising from the construction and operation of the road will make its way into Galway Bay	Low risk for water quality objectives for restoration of 1150 coastal lagoon (Lough Atalia IL052 and Renmore Lough IL052A), and low risk for maintenance of community structure for 1160 large shallow inlets and bays, which applies to the whole bay, and 1170 reefs, with several located near to Galway City, and low risk for vegetation composition of 1330 and 1410 salt meadows at. Rusheen Bay (White Strand)	Medium risk, additional population growth and associated construction work and water consumption/ wastewater discharge increase the risks, particularly of the ability to restore the water quality of 1150 coastal lagoons, Lough Atalia and Renmore Lough are in unfavourable condition due to water pollution and therefore any additional pollution will hinder restoration (NPWS, 2013)

Impact Pathway	Predicted without mitigation	Contravention of COs	Contravention of COs in combination
		which is already being affected by sewage (NPWS, 2013b)	
Mortality, disturbance, displacement and habitat loss for species of flora and fauna which form part of the qualifying interest populations of Natura 2000, resulting in declines or local extinction	Possible disturbance and minor habitat loss of otter when outside the cSAC, not enough for a population decline	No, the COs apply within the cSAC only	No
Disruption of migration, commuting routes or loss of seasonally occupied habitats for species with large home ranges or which are migratory and form part of the qualifying interest populations of Natura 2000	Possible for otter when ranging outside the cSAC during the construction period, however crossing points will be provided along streams during operation, so migration routes will be maintained	No, as above	No
Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites	Yes, as for Lough Corrib cSAC, loss of individual plants but not enough to have an appreciable effect on the populations of Natura 2000 sites	No	Low risk, as for Lough Corrib cSAC, terrestrial Annex I habitats only
Increase in recreational pressure on Natura 2000 sites if improvements to the road network bring in additional tourists and increase resident population	Possible slight effect through trampling of vegetation if the road alone encourages more people to visit the coastline around Barna through improved access to the west of the city	Low risk, trampling could affect the maintenance of habitat area, distribution and vegetation of 1220 Vegetated stony banks at Barna and the vegetation cover, height and composition of 1330 and 1410 salt meadows at e.g., Rusheen Bay (White Strand) hindering the ability to restore these habitats, could also affect supporting habitats, and typical and positive indicator species located	Risk increased but still low with increased population and mobility, saltmarsh currently unfavourable due to over-grazing with limited or no impact due to current recreation levels, however, increased recreation in this area could hinder the ability to restore the saltmarsh in the future. Possible increase in disturbance of otter along the shoreline.

Impact Pathway	Predicted without mitigation	Contravention of COs	Contravention of COs in combination
		outside the cSAC (NPWS, 2013b).	

Inner Galway Bay SPA

Table 9: Risks of undermining the conservation objectives of Inner Galway Bay SPA in the absence of mitigation.

Impact Pathway	Predicted without mitigation	Contravention of COs alone	Contravention of Cos in combination
Habitat loss directly within the Natura 2000 Sites	No	No	No
Habitat loss in Natura 2000 sites indirectly through changes in hydrology/hydrogeology	No	No	No
Habitat fragmentation in Natura 2000 sites with larger habitat parcels within divided in two by the proposed development	No	No	No
Habitat isolation of habitat parcels within Natura 2000 sites to the north and south of the proposed development	No	No	No
Habitat degradation within Natura 2000 sites as a result of chemical pollution, noise, dust, light, shading and spread of invasive species including from construction traffic and site workers travelling to/from the construction site	As for Galway Bay Complex cSAC, water pollution only	Low risk that any pollution would have an impact on bird populations and/or distribution	Risk increased by potential in combination effects, noting that Rusheen Bay/ Lough Rusheen 0G031 and Lough Atalia 0G032 are both important foraging and roosting sites for several qualifying interest bird species, with Rusheen Bay/ Lough Rusheen being the most important sub-site in the whole of the SPA. Rusheen Bay/ Lough Rusheen is important for dunlin and Lough Atalia is important for lapwing, species for which the restore objective may apply.
Mortality, disturbance, displacement and habitat loss for species of flora and fauna which form part of the qualifying interest populations of Natura 2000, resulting in declines or local extinction	Some habitat loss, disturbance and displacement for common gull, black-headed gull, curlew and grey heron outside the SPA but not enough to	No, as no discernible effect on SPA populations or none which result in declines below the baseline population (common gull)	Risk slightly increased by potential additional losses of wintering bird site WB03 outside the SPA due to residential development to the south of the N6 GCRR,

Impact Pathway	Predicted without mitigation	Contravention of COs alone	Contravention of Cos in combination
	cause appreciable population declines		potentially affecting small numbers of wintering curlew and heron, however, not sufficient to result in discernible population level effects, see also the assessment for Lough Corrib cSAC with respect to common gull and black-headed gull
Disruption of migration, commuting routes or loss of seasonally occupied habitats for species with large home ranges or which are migratory and form part of the qualifying interest populations of Natura 2000	As above due to loss of seasonally occupied habitat by gulls	No, as above	As above
Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites	Not applicable, as all birds assumed to be part of the qualifying interest population	-	-
Increase in recreational pressure on Natura 2000 sites if improvements to the road network bring in additional tourists and increase resident population	Possible, as result of easier access to Barna and Rusheen Bay/Lough and associated bird disturbance (low levels of disturbance recorded here in 2009/10)	Low risk of hindering restoration of the dunlin population and possibly the maintenance of other species populations, risk lowered as birds are present in winter	Risk heightened through bird disturbance along the coast as a result of increased population of Galway City facilitated by new development, including new residential development in the west of the city (GCDP) and in Bearna (Bearna LAP/GCDP).

Other Natura 2000 Sites

- 4.7.3** Three potential pathways have been identified for impacts on other Natura 2000 sites, these are (i) effects on qualifying interest Annex I habitats arising from recreational activities potentially affecting Ross Lake and Woods, the Maumturk Mountains, the Twelve Bens/Garraum Complex cSAC, and Connemara Bog Complex cSAC SPA; (ii) spillage/leakage of fluids and materials

from construction vehicles travelling in proximity to Natura 2000 sites; and (iii) losses of supporting populations of Annex II species such as marsh fritillary and lesser horseshoe bat. These pose a very low risk to the conservation objectives to these sites when the road is considered alone. However, the risk is elevated but still low when the road is considered in combination with other plans and projects, especially those leading to population growth and additional construction.

4.7.4 Specific risks to the conservation objectives include:

- hindering the restoration of lake habitats 3140 where these are used for boating and fishing through potential impacts on water quality, although the effects arising from land management practices (use of fertilisers etc) outweigh the risks from recreation, applies to Ross Lake and Woods cSAC;
- hindering the restoration of montane habitats (4060, 8110, 8210 and 8220) as a result of trampling influences on the vegetation composition (all four montane Annex I types) and the extent of bare ground (4060), although again the effects from land management practices (over-grazing, burning etc) far outweigh the potential risk posed by recreation, applies to Twelve Bens/Garraum Complex cSAC and Maumturk Mountains cSAC;
- affecting the maintenance or restoration of water quality in turloughs (3180) as a result road run-off, including accidental spills which occur in proximity to the older road network, applies to for example Lough Fingall Complex cSAC and Kiltiernan Turlough cSAC; and
- Erosion of the populations of Annex II species outside the cSAC network may eventually reduce the resilience of the populations of those same species within the network and subsequent decline below the baseline population.

4.8 Step Four: Mitigation Measures

4.8.1 The applicant describes the relevant design requirements and mitigation measures in the NIS p278 to p302, which is supported by the Construction Environmental Management Plan, provided in Appendix C of the NIS, and the Schedule of Environmental Commitments (SEC) originally submitted with the EIAR, as Chapter 21, and then added to, the additions being last updated in November 2020. The relevant measures are summarised below, with references to further detail.

Avoidance and mitigation measures included in the Applicant's Design.

4.8.2 Clearly, potential impacts on the Natura 2000 sites have been considered as part of the design of the proposed road, including the route alignment. Leaving that aside, designed in measures are the following with those in parentheses included in the design but not itemised by the applicant in the NIS:

- No permanent fencing within the Annex I habitats within the Lough Corrib cSAC, SEC 8.18;
- Clear span bridge over the River Corrib which will avoid direct impacts on the River Corrib and maintain connectivity up- and down-stream, including along the riverbanks;

- (Viaduct over the limestone pavement at Menlough which will help maintain connectivity between two parts of the cSAC);
- (Culverts in the retained embankments on the eastern approach to the River Corrib bridge which will also help maintain connectivity within the cSAC);
- Attenuation, flow control and pollution treatment of road run-off in accordance with TII standards, which requires maintenance to function in the medium- to long-term;
- Drainage design which delivers most rainwater to the groundwater body or watercourse which would have received it in the absence of the road, the exception being that brought into the Lackagh tunnel on vehicles;
- Construction methodology for the Lackagh tunnel which according to the applicant ensures that the structural integrity of the Limestone pavement above will not be affected; and
- No lighting along the proposed River Corrib bridge and 2m high noise barriers along the bridge sides.

Mitigation at the Project Level

4.8.3 Considering the project with the inclusion of the design features listed above in paragraph 4.8.2, the applicant identified further mitigation measures which were required to reduce the impact on the qualifying features of Natura 2000 sites. Following my assessment of the impacts of the project, I have identified some further mitigation measures which are required at the project level to reduce impacts on Natura 2000 sites, in the light of their conservation objectives, these are identified as “*additional mitigation*”. Both are listed below under the heading of the impacts that they seek to address.

Habitat loss directly within the Natura 2000 Sites

- Minimise habitat loss in Lough Corrib cSAC and to [completely] avoid loss of Qualifying Interest Annex I habitats within the cSAC, SEC 8.2, with the latter being fenced off during the construction period SEC 8.4, 8.6, 8.16;
- Measures to maintain the structural integrity of the bedrock in Lough Corrib cSAC included in the design and monitoring of rock movement above and around the Lackagh tunnel and the implementation of additional physical support to the rock mass if instability is detected, with an upper limit for vibration during blasting of 25mm/sec, NIS p284;
- Ongoing monitoring during the operation of the road of the rock mass in the Lough Corrib cSAC above and around the Lackagh tunnel, with additional support measures for the rock if instability is detected NIS p284; and
- *Additional mitigation*: the area fenced off from construction to include the River Corrib and its fringing vegetation, as this may also be Annex I habitat, with the fringing vegetation maintained.

Habitat loss in Natura 2000 sites indirectly through changes in hydrology/hydrogeology

- (Included in the design is the infiltration basins to deliver (treated) rainwater to the same groundwater body as would have received it in the absence of the road); and
- Implementation of the 'Karst Protocol, NIS Appendix C, CEMP Appendix C, which sets out measures to deal with any karst features found during the construction process, designed to prevent groundwater contamination and reduce impacts on groundwater flow paths from construction.

Habitat fragmentation in Natura 2000 sites with larger habitat parcels within divided in two by the proposed development.

- (Included in the design for the eastern approach to the River Corrib bridge are a series of five culverts which will provide some link between the two retained parts of the one habitat parcel within the cSAC divided into two by the proposed road.)

Habitat isolation of habitat parcels within Natura 2000 sites to the north and south of the proposed development

- (Included in the design is the Menlough viaduct and the Lackagh tunnel which will help reduce isolation of habitat parcels within the cSAC to the north and south of the road.)

Habitat degradation within Natura 2000 sites as a result of chemical pollution, noise, dust, light, shading and spread of invasive species including from construction traffic and site workers travelling to/from the construction site.

- All construction works will be carried out in accordance with best practice construction guidance and as such "will eliminate the risk of spillage to the River Corrib", SEC 11.1;
- Measures to control construction site run-off entering the River Corrib, including working areas set back a minimum of 5m from the River Corrib, "drainage ponds and interceptor ditches to collect, treat and discharge all surface water run-off during construction" and /or "reserved grass buffer areas, timber fencing with silt fences, earthen berms or similar", NIS p296 and Appendix C (CEMP);
- *Additional mitigation:* The mitigation area 6210 R1 should be restored by management, using the existing seed bank, rather topsoil stripping or translocation of turves to reduce the risk of suspended solid pollution of the River Corrib from this location;
- *Additional mitigation:* install, the highest standard of treatment facilities specified in the TII guidelines, suitable for discharge directly into an SAC watercourse, for road run-off during the operation of the road, with regular maintenance of silt traps, including dredging and removal of trapped silt for disposal in sealed landfill;
- Low noise road surface to be installed in proximity to Lough Corrib cSAC from Ch. 9+100 to Ch. 11+400 i.e., the currently specified Polymer Modified Stone Mastic Asphalt or better;
- Measures to control dust during the construction period, including a 2m high dust screen at locations adjacent to the Lough Corrib cSAC, sweeping and watering of roads, speed limits of 20kph on unsurfaced roads, wheel washing facilities at greater than 50m from a Natura 2000

site, material handling and stockpiling at least 50m a Natura 2000 site and trucks transporting materials to be covered with tarpaulin, plus monitoring to ensure the measures are followed;

- *Additional mitigation:* ensuring mud is not allowed to build up on haul roads and public roads where it could wash in to the cSAC including the River Corrib;
- *Additional mitigation:* dust control during blasting events and dust monitoring within the cSAC during construction, especially following blasting events, and with revisions to working methods/frequency of blasting if required;
- *Additional mitigation:* reduction of lighting on the western approach to the Lackagh tunnel to the absolute legal minimum to maintain existing light levels within the Lough Corrib cSAC;
- Management of invasive plant species in accordance with a non-native invasive species management plan (NISMP), covering those species listed in the Third Schedule of the EC (Birds and Natural Habitats) Regulations 2011, as amended, that occur locally: Japanese knotweed, Himalayan knotweed and Rhododendron. NIS p 292 - 294 and Appendix C. SEC 8.11, 8.12, 8.13, 8.14, 8.15;
- *Additional mitigation:* the scope of the NISMP must be broadened to include species which are a potential threat to limestone pavement and other Annex I habitats, including, cotoneaster (all species), buddleia, red valerian and wild clematis;
- *Additional mitigation:* the seed/planting mix not to include negative indicator species for limestone pavement or calcareous grassland within 250m of the cSAC including perennial rye grass, white clover, sycamore, beech and conifers, plus control of other negative indicator species within 100m of the cSAC as listed by Wilson and Fernandez (2013), such as creeping thistle and ragwort, while the vegetation is establishing on the soft estate (for two years post-seeding);
- *Additional mitigation:* monitoring and management of non-native invasive species along the route corridor in proximity to Lough Corrib cSAC between Ch. 9+100 and Ch. 11+400 during the operation of the road, including the additional species listed above;
- *Additional mitigation:* construction traffic travelling to/from Galway to primarily use recently constructed roads with a modern drainage design (pollution control) or avoiding the R458, N67 and N84 where these pass Natura 2000 sites.

Mortality, disturbance, displacement and habitat loss for species of flora and fauna which form part of the qualifying interest populations of Natura 2000, resulting in declines or local extinction.

- Suspended net beneath the River Corrib bridge to avoid dropping materials into the River Corrib during bridge construction NIS p 26;
- Pre-construction surveys for otters [to ensure no holts impacted during construction] SEC 8.20; and
- Blasting of rock to in the vicinity of Ballindooley Lough (Ch. 11+800 to Ch 12+100 and Ch. 12+550 to Ch. 13+650) take place between April and September, avoiding months when wintering bird numbers are at their peak. NIS p 295.
- *Additional mitigation:* add a pond within the barn owl/lesser horseshoe bat habitat enhancement area in proximity to Menlo Castle which will be suitable for breeding coot.

Disruption of migration, commuting routes or loss of seasonally occupied habitats for species with large home ranges or which are migratory and form part of the qualifying interest populations of Natura 2000.

- Raised ledges within culverts constructed in accordance with the Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes (National Roads Authority, 2008) or 600mm dry culverts to facilitate otter passage will be provided at the Bearna Stream (C04/01 Ch. 4+100) and Tonabrocky Streams (C04/02 Ch. 4+950) SEC ref 8.21, plus mammal fencing either side of the Bearna Stream (Ch. 4+050 to Ch. 4+200) and either side of the Tonabrocky Stream (Ch. 4+825 to Ch. 5+300) and in proximity to the River Corrib and Coolagh Lakes (Ch. 9+750 to Ch. 10 +040, where no retaining wall) NIS p298, SEC 8.21 and 8.22.
- *Additional mitigation:* ensure that safe passage exists for otters along all watercourses bisected by the proposed road during construction, to include mammal ledges within the culvert or two dry 600mm culverts parallel to the watercourse, one each side.

Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites.

- The petrifying spring feature location 25m north of the proposed road (LQ102) will be retained SEC 8.9
- *Additional mitigation:* the population of *Rhynchospora fusca* should be identified, mapped and protected during the construction phase.

Increase in recreational pressure on Natura 2000 sites if improvements to the road network bring in additional tourists and increase resident population.

- None at the project level.

Mitigation at the Plan Level

- 4.8.4** The proposed road is a major and integrated component of the Galway City Development Plan and the Galway County Development Plan. As set out above, these Plans have also been subject to an appropriate assessment and include mitigation measures in their policies to enable the conclusion of no adverse effect on the integrity of any Natura 2000 site. These policies are, in the main, not specifically linked to any one project and are to be delivered or implemented through the Plans. It so happens that in this case the applicant is also the owner of the Plans and therefore has control of the mitigation at the both the project level and the plan level.
- 4.8.5** Relevant Plan level mitigation measures from the Galway County Development Plan are:
- It is the policy of Galway County Council to support the protection, conservation and enhancement of natural heritage and biodiversity, Policy NHB 1, and ecological connectivity within the Plan Area...., Objective NHB 2;

- Galway County Council shall seek to engage with and support the National Parks & Wildlife Service to ensure Integrated Management Plans are prepared for all Natura 2000 sites and ensure that such plans are fully integrated with all land use and water management plans in the county Objective NHB13;
- Protect, conserve and enhance all existing and potential water resources of the County, in accordance with the EU Water Framework Directive, Objective WS 2; and
- Ensure that all wastewater generated is collected, treated and discharged after treatment in a safe and sustainable manner, having regard to the standards and requirements ...Objective WW 1.

4.8.6 Relevant measures from the Galway City Development Plan are:

- Co-operate with the NPWS, landowners and stakeholders in the preparation of management plans for designated sites, Policy 4.1 and 4.2;
-support the restoration of European ..sites including Galway Bay and Lough Corrib SACs..., Policy 4.2;
-support the development of an ecological network throughout the city which will improve the ecological coherence of the Natura 2000 network, Policy 4.2;
-support and implement measures to control and manage alien/invasive species within the city boundary, Policy 4.2;
- Achieve a sustainable balance between meeting future recreational needs (both passive and active) and the protection of the city's ecological heritage, Policy 4.2;
- Protect the ecological integrity ...of Annex I habitats, Policy 4.2;
- Protect and manage water resources effectively and improve coastal and freshwater quality;
-promote and achieve a restoration of good status [of open waters], reduce chemical pollution and prevent deterioration of surface, coastal and groundwater quality, Policy 9.6;
-ensure that new developments have and are provided with satisfactory drainage systemsto avoid the pollution of the ground and surface waters, Policy 9.7;
- maintain air quality to a satisfactory standard by regulating and monitoring atmospheric emissions in accordance with EU policy directives....by promoting and supporting initiatives to reduce air pollution, Policy 9.10; and
- ensure the design of external lighting minimises the incidence of light pollution ...into the surrounding environment, Policy 9.11.

4.8.7 The combined effect of these measures is that background air quality, water quality, biodiversity and the management of recreation in sensitive areas will be improving or at least not worsening. Key areas for these mitigation measures in relation to the potential in combination effects of the proposed road are the Menlough/Coolagh part of the Lough Corrib cSAC, the River Corrib, Lough Atalia and Rusheen Bay and Connemara National Park.

4.8.8 Of particular importance among the mitigation measures included in the Plans, are:

- Preparation and implementation of an Integrated Management Plans for Lough Corrib cSAC, Ross Lake and Woods cSAC, (Inner) Galway Bay (Complex) cSAC SPA (especially Rusheen Bay and Lough Atalia), the Twelve Bens/Garraun Complex and Maumturk Mountains cSAC;
- The development of an ecological network within Galway City, to include the protection of and the implementation of measures to control of non-native invasive species within the City; and
- Improvements in air and water quality, including water quality at Lough Atalia.

4.9 Conclusions on Site Integrity

- 4.9.1** Without mitigation, there is a risk but not a certainty that the conservation objectives for several Natura 2000 sites would be undermined, with the highest risk being for Lough Corrib cSAC and (Inner) Galway Bay (Complex) cSAC and SPA, both during construction and operation of the proposed road. Through proper implementation of the mitigation at the project level, undermining of the conservation objectives can be avoided for the project 'alone'.
- 4.9.2** Despite the mitigation at the project level, the proposed road would still result in the loss of biodiversity, light pollution, noise pollution, emissions to air and release of other materials from vehicles into the environment in proximity to Lough Corrib cSAC and with potential for the last two to reach (Inner) Galway Bay (Complex) cSAC. These could combine with the effects from other proposed developments and associated population growth, to create a further risk that the conservation objectives would be undermined. Added to this would be the increased mobility of the enlarged population, which expose parts of the same and other Natura 2000 sites in the vicinity of Galway City to the risk of unintentional damage from recreational activities. The risk of undermining the conservation objectives is heightened because some of the Annex I habitats exposed to risk are in unfavourable condition.
- 4.9.3** The risks of undermining the conservation objectives through in combination effects can also be fully mitigated, as provisionally indicated in the appropriate assessment for the two most relevant development plans. With the implementation of the Project and Plan level mitigation, a conclusion of no adverse effect on the integrity of any Natura 2000 site can be reached with respect to the proposed road, both alone and in combination with other plans and projects.

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Appendix 1: NPWS Submissions

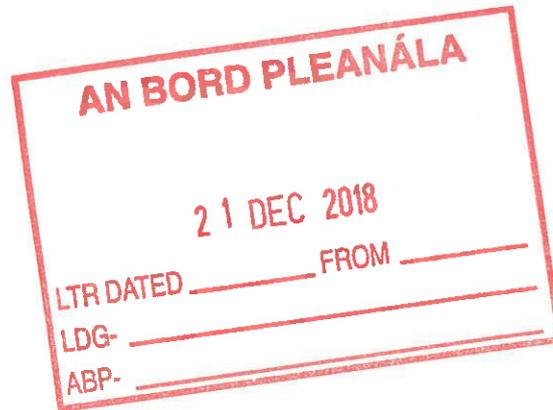


**An Roinn Cultúir,
Oidhreacht agus Gaeltachta**
Department of Culture,
Heritage and the Gaeltacht

Your Ref: ABP-302885-18
Our Ref: 177AE N6 Galway Ring Road

21 December 2018

The Secretary
An Bord Pleanála
64 Marlborough Street
Dublin 1
D01 V902
Via email to bord@pleanala.ie



Re: Notification to the Minister for Culture, Heritage and the Gaeltacht under the Planning and Development Act, 2000, as amended.

Proposed Development: Section 177AE application for Galway County Council on behalf of itself and on behalf of Galway City Council is proposing to develop the N6 Galway City Ring Road (GCRR) around Galway City.

A chara

On behalf of the Department of Culture, Heritage and the Gaeltacht, I refer to correspondence received in connection with the above.

Outlined below are heritage-related observations/recommendations of the Department under the stated heading(s).

Nature Conservation

The Department refers to the current application for the proposed N6 Galway City Ring Road development (and Motorway Scheme) in Galway City and County. Reference is also made to the EIA, Natura Impact Statement (NIS), associated volumes of figures and appendices, and other documentation that accompanies the application.

Context of observations

The following observations are made by the Department in its role as a prescribed body under planning legislation and as the authority with overarching responsibility for nature conservation and the implementation of the nature directives (i.e. the Birds and Habitats Directives) in Ireland. The observations are not exhaustive and are intended to assist An Bord Pleanála in its review and evaluation of the current proposal in the context of, among other things, obligations and commitments in relation to nature conservation, European sites, biodiversity and environmental protection, proper planning and sustainable development, and the undertaking of the environmental impact assessment (EIA) and the appropriate assessment (AA).

This submission is structured under a series of headings/topics, but should be read as a whole, noting that there are substantial overlaps, as well as key distinctions, between the implications of the proposed development for the conservation objectives and integrity of a European site or sites, for biodiversity and other aspects of the environment, and for the proper planning and sustainable

development of the area, taking relevant timeframes, past and future changes, and trends into account.

Consultations with NPWS

The Department acknowledges the series of pre-application meetings and consultations with NPWS (2013-2017) in relation to the proposed development, including meetings with the project team and with An Bord Pleanála. Submissions made by this Department (on a non-statutory basis) at pre-application stage are included in EIAR Appendix A.8.2. Draft documentation was reviewed by NPWS as an exceptional measure and this covered only the draft NIS and draft EIAR biodiversity chapter.

Consultations with NPWS regarding the related Galway Transport Strategy 2016-2036 are also acknowledged. This strategy was produced by the City and County Councils, and the National Transport Authority, and is given effect by Galway City and Galway County Development Plans, as varied. Submissions were made by this Department in relation to the Strategy, the Development Plans and Variations, and the associated environmental assessments, including the SEA Environmental Reports, Natura Impact Reports (NIRs) and NISs.

Scope of surveys and integration with design

The Department acknowledges the extent and detail of the surveys carried out in connection with the planning and design of the scheme, the consideration of constraints and alternatives, and the preparation of the EIAR and NIS, including as reported in appendices to main reports. The extent to which ecological and other data and information have informed and modified aspects of the design of the scheme to minimise adverse effects on biodiversity, as part of an iterative process, is also acknowledged.

Project outline and setting

The proposed road development is generally routed around the outskirts of Galway City, extending from the R336 west of Bearna, in the west, to the new N6/M6 motorway at Briarhill in the east. It passes through areas of granite and limestone geology, and through areas of marginal farmland and substantial areas of natural and semi-natural habitats on the urban fringe. The road crosses the main channel of the River Corrib, and passes through one European site, and close to (within 200m of) three other European sites (see below). All but the western end of the scheme drains to surface water or groundwater bodies that are hydrologically and/or hydrogeologically connected to European sites and the water-dependent habitats and species they support. The proposed development boundary also borders part of one Natural Heritage Area (NHA).

The description of the proposed development and its construction and operation, the project drawings, and other related reports (e.g. the CEMP in EIAR Appendix A.7.5) are noted. It is understood that the mainline of the proposed road is approximately 17.5km in length, and comprises 5.6km of single carriageway and 11.9km of dual carriageway. The latter, from the N59 Letteragh junction eastwards, will be motorway. The proposed development comprises many other elements, including two tunnels with maintenance buildings, two viaducts and one large bridge, and associated link roads, side roads, junctions, structures, earth works, accommodation works, drainage, demolitions, fencing, lighting, landscaping, and ecological mitigation (EIAR, NIS) and compensation measures (EIAR). The total 'area of the development boundary' is approximately 280ha; of this, about 180ha is required for the proposed road development and its construction. Construction, including advance project stages and enabling works, will take a number of years. Some enabling works may occur or extend outside the proposed development boundary, e.g. diversion or relocation of utilities.

The construction phase elements and aspects of mitigation are set out in the CEMP. This includes an Incident Response Plan, a Sediment Erosion and Pollution Control Plan, and a Non-native Invasive Species Management Plan. Chapters 20 and 21 of the EIAR are also noted, namely the Summary of mitigation measures and Schedule of environmental commitments. It is stated that the latter is an integral element of the application for approval. It is indicated that further work in

developing the design of the proposed road development (i.e. post-consent stage) will lead to no material change in the predicted significance of the adverse effects on the environment, and that opportunities may be identified to further reduce these effects and provide the optimum solution based on available construction techniques and technologies at the time of construction.

The commitment to having a Project Ecologist as part of the Employer's team for the duration of the construction phase of the proposed development is welcomed (CEMP section 1.1). For the avoidance of any doubt, the construction phase must be understood to mean all advance contracts and enabling works, as well as the main construction phase, as substantial ecological damage and disturbance can be caused during such early phases. To be effective, the mitigation measures and environmental commitments from the EIAR and NIS must apply to all stages and aspects of the development from the time that permission is granted. Furthermore, noting the volume and complexity of application documentation and the potential for conflicts in the mitigation and other measures specified, particular care and robust systems will be required to ensure their correct and timely implementation to safeguard European sites, NHAs, natural habitats and protected species, and to protect the environment. Where any uncertainties exist regarding the likely success or deliverability of the mitigation and compensation measures, or the significance of the ecological effects that will result, these should be reflected in the EIA and AA carried out for the proposed development.

Receiving environment – biodiversity/ecology

The proposed development passes through and close to sites with nature conservation designations, Annex I habitats, the habitats of Annex I (Birds Directive) and Annex II and IV (Habitats Directive) species, and the habitats of other protected species, as well as through wetlands, woodlands, ecological networks, and local biodiversity areas on the margins of an area of progressively expanding urban development, population and associated pressures. The new road will interconnect with a network of recently-developed motorways and national roads between Dublin and Galway, and Limerick and Tuam.

The proposed development and/or proposed development boundary:

- passes through parts of the European site, Lough Corrib SAC (site code 000297), and will, in part, drain towards that site;
- passes through, close to, under and over Annex I habitats and the habitats of Annex II species that are qualifying interests (QIs) of Lough Corrib SAC;
- passes within 200m of three other European sites, namely Lough Corrib SPA (site code 004042), Galway Bay Complex SAC (site code 00268) and Inner Galway Bay SPA (site code 004031);
- adjoins the boundary of part of Moycullen Bogs NHA (site code 002364), and will drain or drain towards that site (selected for the conservation of 'peatlands');
- passes through twelve Annex I habitats and 43 'Fossitt' habitat types;
- passes through the habitats and/or the breeding sites and resting places of Annex II and/or IV (Habitats Directive) species, including those of Lesser Horseshoe Bat, other bats, Otter and Marsh Fritillary;
- passes through the habitats of Annex I (Birds Directive) and other regularly occurring migratory bird species;
- passes through the breeding sites and resting places (and territories) of other protected species, e.g. badger and breeding birds.

In addition to the protection afforded to most of the above receptors under the Wildlife Acts, 1976-2000, and the European Communities (Birds and Natural Habitats) Regulations, 2011, they are also subject to protective objectives and policies in the Councils' Development Plans and other land use plans for the areas through which the proposed development passes.

1. LIKELY EFFECTS ON EUROPEAN SITES

Adequacy of NIS

There is a requirement to consider whether the NIS, which accompanies this application, complies with section 177T of the Planning and Development Act, 2000 as amended. Among other things, an NIS is defined as a statement, for the purposes of Article 6 of the Habitats Directive, of the implications of the proposed development for one or more European sites in view of its conservation objectives; an NIS must include a report of a scientific examination of evidence and data to identify and classify such implications. In the event that inadequacies or gaps in the NIS are covered by data and assessments from other sources, this should be made clear in the AA carried out. The final assessment and analysis should be with respect to the implications for the conservation objectives and integrity of the European site or sites in question.

Notwithstanding the detailed surveys and assessments undertaken, some aspects of the approach and scientific analyses in the NIS, and their sequencing and findings, are complex to follow. At the same time, it is acknowledged that there are challenges in preparing an NIS for a project of this size and complexity, and that no particular format for an NIS is prescribed in law.

Annex I habitats – QIs

The European site most affected by the proposed development is Lough Corrib SAC. Approximately 4ha of the proposed development and/or proposed development boundary overlap directly with this SAC in multiple small and mainly peripheral locations. The extent and nature of habitat impacts and/or changes within the SAC are, at present, difficult to ascertain. It could assist interpretation if a clearer account of the direct and residual effects on habitats within the SAC, with clearer drawings, was provided. Areas for the extents of the predicted effects and overlaps with i) the proposed development boundary, and ii) the proposed development, would also be beneficial in supporting interpretation and the conclusions of the NIS in relation to the absence of implications for habitats and the conservation objectives of the SAC. The relationship of the road to nearby qualifying interest Annex I habitats within the SAC is also difficult to ascertain.

SAC – hydrogeology

The application would benefit from clarity on the changes in hydrogeological regime the Lackagh Tunnel will have on the groundwater catchment area. Boreholes were drilled in the area, and groundwater level data collected, but spatial information is absent on directions of groundwater flow and hydraulic gradients. The tunnel is adjacent to the Lough Corrib Fen 1 (Lackagh) groundwater body (GWB) which contains groundwater-fed lakes and fens in the Lough Corrib SAC. The question of whether groundwater drainage associated with tunnelling construction work, during and post development, will not have an effect in Lough Corrib Fen 1 (Lackagh), may need interrogation. Whilst it is stated that the level of the tunnel will be below the groundwater table (and that “there will be no groundwater lowering within groundwater bodies that support groundwater dependant habitats within a European site”), it is also noted that groundwater seeps at the existing quarry face and base and that there are ‘perched’ water tables in local subsoil units above the limestone. The inclusion of ‘water-tight’ barriers is necessary for the operation, and this will divert groundwater flow. It is unclear what the hydrological connectivity between the groundwater dependent terrestrial ecosystems (GWDTEs) of the SAC are, particularly the habitats south of the proposed road.

Following this, it is not clear how the GWDTEs in the Lough Corrib SAC are working ‘hydrogeologically’ and if flow paths may change post-construction. It appears that the lakes are underlain by significant thicknesses of low permeability substrate, with the fens developing on their margins, presumably due to artesian conditions and spring inputs (it is suggested the lake is fed by the Western Coolagh Spring), as indicated by the recorded alkaline conditions. The road will traverse the ‘Lough Corrib Fen 1 (Menlough)’ groundwater body. The road intercepts recharge and whilst the change in infiltration and aquifer loss is reported as minimal, it may be important considering the small catchment area(s) that appear to support the fen habitats. Further elucidation could be beneficial.

Conservation objectives and scope of NIS

Lough Corrib SAC has site specific conservation objectives, and these specify whether the conservation objective is to maintain or to restore the favourable conservation condition of the individual qualifying interest habitats and species, as defined by certain attributes and targets that are listed, within that site. Substantial analyses in the NIS are (or appear to be) undertaken without reference to the conservation objectives, as they are detailed first in Table 9.16. In Tables 9.1 and 9.15, prior to this, the qualifying interests, Petrifying springs of the tufa formation (Cratoneurion) and Lesser Horseshoe Bat, appear not to have been recorded in the 'zone of influence' and/or are omitted from further consideration and assessment of the likely effects on European sites. The justifications for these findings are unclear in Section 9 of the NIS, but may be explained elsewhere and that should be clarified.

Otter

The proposed development passes through mapped areas of Otter habitat in Lough Corrib SAC, and close to parts of Galway Bay Complex SAC. The two SACs are interconnected and both have been selected for the conservation of Otter. Otter were widely recorded along the River Corrib corridor. Other watercourses and lakes within and connected to these SACs, e.g. Bearna Stream, are likely to form part of Otter territories and be used as commuting and foraging habitat.

No Otter breeding sites or resting places (holts or couches) were recorded along or within 150m of the proposed development, meaning disturbance and displacement effects should not result. However, increased human presence and/or noise and vibration associated with construction works, particularly associated with the construction of the proposed River Corrib bridge, have the potential to (at least temporarily) displace commuting or foraging Otter. Bankside works are required to install the drainage outfalls on both banks of the Corrib and this will result in the severance of the bankside habitat used by Otter, at least temporarily, during construction. Blasting at some locations over extended periods (e.g. approximately 9 months in Ballagh) will cause some level of disturbance to Otter using the Bearna and Tonabrocky Streams. Operation of the road has potential to result in the mortality of Otter through the increased risk of road traffic collisions and this could affect the Otter populations of the two SACs, and the conservation objectives and integrity of these European sites. In terms of longer term potential in combination effects resulting from disturbance and displacement, the commitments to having a greenway along the western bank of the River Corrib and the current application for the proposed Galway Harbour Extension (PA0033), should be noted in particular (see below in relation to in combination effects).

The potential effects on Otter are to be avoided and reduced to insignificant by a series of design and other mitigation measures that are specified in the NIS and EIAR. The conclusions reached in the NIS in relation to Otter are contingent on i) the effective and timely implementation of these mitigation measures at or prior to construction stage, ii) their continued effective functioning (e.g. in the case of mammal passage facilities and fencing) for the lifetime of the project, and iii) their safeguarding in any future projects and development planning. Monitoring and the taking of timely and effective corrective action if problems arise are integral to their success, and to the conclusions and predictions that may be reached as part of the AA and EIA.

Birds

The NIS determines that the River Corrib bridge is the only structure that is "of a scale to pose a collision risk to birds". The NIS subsequently concludes, having considered the design of the proposed structure and the low number of special conservation interest (SCI) species, and individuals, that pass along the river corridor, that the proposed structure is "not predicted to pose a collision risk of a magnitude that would have any long-term effects on the numbers, distribution, or the existing population trend for any SPA". The SPAs specifically mentioned in the NIS in this regard are Lough Corrib SPA and Inner Galway Bay SPA, and these SPAs are considered with the following references to SCIs. The risk of bird collisions with the bridge is given no further consideration beyond identifying potential impacts. The data considered on the number of SCI

species and individuals using the river corridor are from a previous proposal and different structure in a different location on the river (RPS report, 2006). The specifications for that structure stated the bridge height would be 6m above the river, while the current proposed bridge is a minimum of 8m above the river. Consideration of the range of flight heights for the SCI species known to use the corridor, or the potential interaction of these flight heights and the proposed bridge would be appropriate. The previous survey report did not assess the nocturnal movements of bird species, e.g. typically nocturnal species and species that are known to migrate at night, and this also needs to be considered. Therefore, the Board could consider if it is satisfied that the collision risk of birds with the proposed River Corrib bridge is adequate and complete if its Appropriate Assessment would be facilitated by further consideration and assessment.

The NIS concludes that the effects of habitat loss and fragmentation arising from the proposed development will not significantly negatively affect the SCIs for surrounding SPAs, and no mitigation measures for SCIs (breeding or wintering species) are provided. For breeding species, this is based on i) the absence of a spatial overlap between known SCI breeding sites and the proposed development area, and ii) aspects the SCI species' foraging ecology. The rationale and evidence to support the latter claim is not made clear (i.e. with respect to foraging ecology).

It is considered the above points should be addressed by presenting further information from, and rationale based upon, completed survey work, additional available data sources and published literature.

Matters relating to the AA

The AA has yet to be carried out, and should take the NIS and this submission into account. Any scientific uncertainties or discrepancies regarding the implications for the conservation objectives and integrity of European sites will need to be addressed and resolved.

2. LIKELY EFFECTS ON THE ENVIRONMENT

EIAR – biodiversity

The following additional matters should be taken into account and addressed in relation to the likely effects of the proposed development on biodiversity, including in the context of the EIA which has yet to be carried out. Likely significant effects on European sites are also a matter for the EIA.

NHA – hydrogeology

The location of the road adjacent to Moycullen Bogs NHA and the possible effects on bog eco-hydrology. This peatland area is underlain by the 'Galway Granite Batholith', which will be dewatered (during construction and operation) within cutting areas. This could potentially result in a lowering of the peatland water table, peatland subsidence and a potential negative impact on bog ecology. Clarity may be needed on where dewatering/drainage are proposed in relation to the NHA area, together with a demonstration of the likelihood of impact (negligible or otherwise).

Habitats – general

The detailed habitat survey and mapping for the area of the proposed development and surrounds are noted. Text and tables in EIAR chapter 8 contain details of the areas and types of habitats that will be affected by the proposed development. Of the overall 280ha of the proposed development boundary, 196ha is habitat that is deemed to be of low ecological value, and about 84ha is of higher ecological value. Some of the habitats are linear habitats. In total, it appears that 43 'Fossitt' habitat types and twelve Annex I habitats were recorded within the proposed development boundary and/or will be impacted by the proposed development. Some of the habitat losses will be compensated by habitat creation or management measures within the proposed development boundary, and will be replacing pre-existing habitats or areas subject to temporary disturbance, including some sites used as 'material deposit areas'.

The combined length of linear habitats recorded (11.8km) includes hedgerows and treelines, but not stone walls (which are not the boundaries of properties). It is unclear if the figures represent the total resource of these habitats in the area of the proposed development, or those that will be affected. Based on figures quoted, it appears that the entire linear habitat resource, which was recorded, will be lost and further clarification would be useful in this regard.

It is unclear if abandonment of grazing and/or mowing, including because of fragmentation and isolation of land holdings, has been included among the potential significant effects on habitats that were considered and assessed. The habitats of species such as Marsh Fritillary could also be affected by such changes arising in connection with the development of the road and could lead to loss of habitat in 'favourable management'.

Annex I habitats

The losses of Annex I habitats (outside European sites) are presented in terms of losses resulting from the proposed development, and residual or permanent effects after the implementation of mitigation and compensation measures.

Some of the losses are to be compensated by translocating habitat from one location (donor site) to another location (receptor site) within the proposed development boundary. Some of the receptor sites are also identified as 'material deposit areas' where surplus inert materials will be recovered or disposed. The steps and methods to be followed in relation to habitat compensation are set out in EIAR Appendix A.8.26. It would assist interpretation if a table with the details of donor and receptor sites, including areas and habitat types present in each, was provided to clarify, among other things, what habitats will be lost in the receptor sites as a result of the compensation measures and what habitat gains are predicted to accrue. Future management of the compensatory habitats is likely to be required, and it should be clear how this will be achieved and delivered in the short- to long-term.

Otter

See above.

Bats

The EIAR, including appendices, documents one of the most detailed and comprehensive surveys for bats ever undertaken in Ireland. The bat survey work has identified and catalogued the diversity of bat species around Galway City. In summary, a total of 88 roost sites, and all nine Irish bat species, were recorded within the study area during the field surveys. All bat species occurring in Ireland are listed on Annex IV of the Habitats Directive and are strictly protected. Lesser Horseshoe Bat is also an Annex II species and qualifying interest of Lough Corrib SAC, primarily for the maternity roost at Ebor Hall, near Cong, to the north.

The EIAR provides a comprehensive and detailed assessment of the likely effects of the proposed development on bats, including with respect to loss and disturbance of roosts, loss and fragmentation of foraging and commuting habitat, barrier effects and collision risks with traffic. There is potential for short- and long-term effects on the favourable conservation status of Lesser Horseshoe Bat arising from the proposed development. Mortalities and ecological disruptions to other bats species (e.g. pipistrelles, Leisler's and Brown Long-eared) may also occur but these species are more widespread and abundant.

On the basis of the mitigation and compensation measures specified, the EIAR concludes that the predicted residual effects for Lesser Horseshoes will reduce from national to local significance. The predicted residual effects on all other bat species are also of local significance. The broad suite of mitigation and compensation measures specified in the EIAR is noted and includes the provision of new roosting sites (i.e. new buildings, buildings retrofitted to create roost sites, and bat boxes), underpasses, a 'green' bridge and habitat enhancement measures (e.g. hedgerow planting), among other things. The conclusions in the EIAR are contingent on i) the effective and timely implementation of these mitigation and compensation measures at or prior to construction stage, ii)

their continued effective functioning for the lifetime of the project, and iii) their safeguarding in any future projects and development planning. Monitoring and the taking of timely and effective corrective action if problems arise are integral to their success, and to the conclusions and predictions that may be reached.

Badger

Three badger setts will be lost as a result of the proposed development (setts 9, 11 and 14), and one replacement sett is to be constructed north of the new road (close to sett 9). There will be fragmentation and isolation of lands to the south, i.e. between the new road and the Lackagh tunnel, and the N84, in an area with no mammal underpass. Clearance of scrub and resurveys prior to construction may reveal other badger setts. In the case of impacts on badgers that are not considered and assessed as part of the current application, and covered by the consent for the proposed development, a licence may be required from the Minister of this Department under the Wildlife Acts, 1976-2000.

Animal passage

The general locations and details of the animal underpasses and the wildlife overbridge are noted. While not always clear from the scheme drawings, underpasses must extend as far as, and integrate with the boundary fencing to be effective and fit for purpose, and to mitigate fragmentation and the barrier effects of the proposed development. All relevant details and specifications for underpasses, fencing and guide planting in relevant TII/NRA guidance should be followed, and underpasses should be confirmed (by an ecologist) to be correctly installed and fully functional before the road becomes operational. Mammal-proof fencing should be installed to the minimum extent necessary for safety and to exclude animals from the road. All other fencing provided should allow the general passage of wild animals (e.g. sheep wire or larger mesh) so that the overall extent of fragmentation and barrier effects resulting from the road are reduced. In the case of the wildlife overbridge, the general configuration and planting, including guide planting, should facilitate and encourage its use by wildlife in general, including (but not only) bats.

Marsh Fritillary

Comprehensive surveys carried out for the Annex II species, Marsh Fritillary, recorded extensive areas of suitable habitat for Marsh Fritillary and the presence of the species in a number of locations within the area of the proposed development, mainly in the west. Breeding sites for Marsh Fritillary are mobile and can change, and are linked to the presence of suitable habitat containing the food plant, Devil's-bit Scabious (*Succisa pratensis*).

The proposed development will result in the loss of areas of occupied habitat in four locations, as well as other areas of suitable habitat for Marsh Fritillary. Of particular concern is the habitat area where the species was recorded in three survey years at Trusky More. Much of this area will be lost as a result of the proposed development. In addition to permanent losses of suitable Marsh Fritillary habitat, including habitat patches supporting larval webs, the proposed development will cause fragmentation of individual habitat patches and of the wider network of areas of suitable habitat for the species.

Details of mitigation measures could benefit from more clarity and consideration would need to be given to the extent to which they may be deliverable. A key element of mitigation is the translocation of larval webs that occur along the proposed development. Translocation sites need to contain suitable habitats and should also have good long-term prospects. In the case of any predictions made regarding the long-term survival of Marsh Fritillary, including in relation to the areas of habitat required within a network of sites, it should be clear that any figures quoted refer to habitat in favourable management (presumably meaning good or optimal condition) and with good long-term future prospects.

Further information on mitigation measures for Marsh Fritillary is available from the English Nature and Highways Agency publication: The Butterfly Handbook: General Advice Note on Mitigating the Impacts of Roads on Butterfly Populations (<http://publications.naturalengland.org.uk/file/130004>).

Birds

Barn Owl: the proposed development will reduce the extent of suitable foraging habitat for the local Barn Owl population. The Barn Owl mitigation measures proposed in the EIAR are primarily designed to reduce the risk of road traffic collision events, and include planting vegetation to deter owls from foraging alongside the proposed road margins, and installing barriers to force commuting birds to fly higher over the proposed road. These measures, which are necessary, will compound the likely reduction of foraging opportunities for the local Barn Owl population. To counterbalance this, Barn Owl foraging habitat should be conserved and enhanced in key areas close to the most suitable sites identified as active or potential nest sites for the species. The objective of such compensatory long-term habitat management would be to provide alternative foraging opportunities to the north and northwest of the proposed development, thereby further reducing the risk of road-related mortality events impacting the local population. Such long-term habitat management areas should dictate where the three Barn Owl nest boxes would be sited.

Peregrine Falcon: in the EIAR, there is a degree of uncertainty as to whether Lackagh Quarry will remain a suitable breeding site for Peregrine during and post-construction. No alternative breeding site for the Peregrine pair associated with this nest site is known locally. To counterbalance the potential loss of this breeding resource, a suitable alternative nest site(s) needs to be created, noting that the most recent National Peregrine Survey did not record any urban nesting pairs from Galway City. There may be opportunities to install artificial nesting platforms or boxes on other suitable features or buildings. Failing that, a bespoke nesting structure in an appropriate area should be constructed.

The EIAR could benefit from more clarity as to the efficacy of the mitigation measure to temporarily dissuade active breeding of Peregrine at Lackagh Quarry by commencing works from the Lackagh Tunnel to the N84 Headford Road Junction prior to mid-February. The appropriateness of potentially working in the vicinity of, and disturbing an active nest site to install rock bolts on the cliff face may be challenging. If an alternative suitable Peregrine nesting resource was created prior to any road development works being undertaken then the possibility of temporarily rendering the nesting ledges at Lackagh Quarry unavailable for Peregrine during the construction period as a mitigation measure to avoid the disruption of a breeding attempt could be considered.

Mitigation measures: as also noted below, there could be potential tensions between mitigation measures set out in the NIS and EIAR.

The NIS states that, in order to minimise disturbance to wintering birds at Ballindooley Lough, blasting at Lackagh Quarry (and Castlegar) will only be undertaken between the months of April to September (inclusive). The EIAR determines that construction activities at Lackagh Quarry, including rock breaking and rock blasting, have the potential to have long-term effects on the Peregrine population nesting in the quarry. Thus, the EIAR proposes mitigation measures specifying that works from the proposed Lackagh tunnel to the N84 Headford Road Junction commence prior to mid-February (i.e. wintering period). The EIAR does not specify whether the works proposed to begin in mid-February include blasting; if blasting was to be included in these works, this would contradict the mitigation approach outlined in the NIS for wintering birds.

It is important that the nature and extent of the proposed planting (likely to provide foraging habitat for general bird species) in close proximity to the proposed development does not act to attract foraging Barn Owl and thereby increase the risk of road collision mortality events.

It is proposed to install 20 nest boxes to further minimise the effects of breeding bird habitat loss. Post construction monitoring and reporting with regard to the rate of uptake of the boxes by birds and their breeding outcomes is recommended in order to determine the efficacy of this mitigation measure.

Mitigation measures – general

The following general observations are made in relation to mitigation measures:

- As outlined above, it should be clear that all relevant mitigation measures and commitments must apply, from the outset, to all parts of the development as permitted, including enabling works, site preparation and advance contracts, as well as at construction stage.
- Owing to the complexity and detail of the ecological or biodiversity mitigation measures specified, and the importance of knowing where, when and how these apply, competent ecologists will need to be involved directly at all project stages. There is a commitment to having a Project Ecologist as part of the Employer's team; references to an Ecological Clerk of Works are also noted in appendices. The main contractor will also require ecologists, and ecological supervision of other contractors will be necessary.
- The timings of many ecological mitigation measures are critical and, in many cases, are specified. Among these, some of the timings seem to be conflicting or competing (examples relating to birds above, and see also Common Lizard and vegetation clearance) and it needs to be clear how these discrepancies can be managed and resolved. Measures for other environmental topics could also be conflicting or competing, and will require review.
- Resurveys in advance of works being carried out may introduce additional and new considerations, and it should be clear how these will be addressed and managed.
- The scale of the documentation pertaining to this application and the range, specificity and detail of the mitigation measures to be delivered means that robust and interactive or real-time/live mapping systems will need to be developed, possibly in conjunction with 'permits to work' and sign off by the Project Ecologist of the correct completion and functioning of the measures.
- Consideration should be given to making reports on implementation and monitoring of measures available, including to NPWS, via a dedicated website.
- Locations of key ecological mitigation measures should be mapped with records kept that are able to interface with, for example, the Councils' GIS and planning systems, so they can be taken into account and safeguarded in future projects and plans.
- Any non-performance, non-compliances or other issues that arise should be addressed in a timely manner.

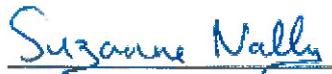
Monitoring/corrective measures

- A clearer schedule of monitoring commitments and responsibilities, including locations, methods and frequency, may be required for biodiversity in general, and for bats in particular. It is noted, for example, that the EIAR states that monitoring of artificial roosts "may be undertaken by NPWS staff, Galway bat group or others to be decided by the local authority". It should be noted that no such agreement has been discussed or reached with NPWS.
- Monitoring of certain measures, such as the wildlife overpass and hedgerow planting, is to continue for 5 years. It should be understood that, after the monitoring period, maintenance and management of various features will be required in the long-term.

You are requested to send further communications to this Department's Development Applications Unit (DAU) at manager.dau@chg.gov.ie (team monitored); if this is not possible, correspondence may alternatively be sent to:

The Manager
Development Applications Unit (DAU)
Department of Culture, Heritage and the Gaeltacht
Newtown Road
Wexford
Y35 AP90

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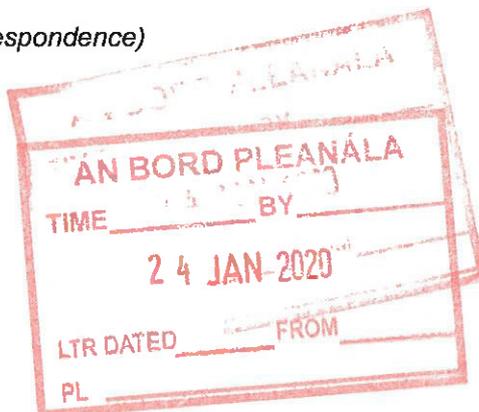
Suzanne Nally
Development Applications Unit



Your Ref: ABP-302848-18
(Please quote in all related correspondence)

24 January 2020

The Secretary
An Bord Pleanála
64 Marlborough Street
Dublin 1
D01 V902



Via email to sids@pleanala.ie

Re: Notification to the Minister for Culture, Heritage and the Gaeltacht under the Planning and Development (Housing) and Residential Tenancies Act 2016; Planning and Development (Strategic Housing Development) Regulations 2017

RE: Section 177AE (ABP Deciding Authority) - Galway County Council on behalf of itself and on behalf of Galway City Council is proposing to develop the N6 Galway City Ring Road (GCRR) around Galway City.

A chara

On behalf of the Department of Culture, Heritage and the Gaeltacht, I refer to correspondence received in connection with the above.

Outlined below are heritage-related observations/recommendations of the Department under the stated heading(s).

Nature Conservation

The Department refers to the current application for the proposed N6 Galway City Ring Road development (and Motorway Scheme) in Galway City and County, and to the accompanying Environmental Impact Assessment Report (EIAR), Natura Impact Statement (NIS), and associated documentation. Reference is also made to the significant additional information submitted by the applicants and notified to the Department on 4th December 2019. This includes the Request for Further Information Response Report (Volume 1) and Appendices (Volume 2) together with the Route Selection Report (Volume 3) and Design Report (Volume 4).

Context of observations

The following observations are made by the Department in its role as a prescribed body under planning legislation and as the authority with overarching responsibility for nature conservation and the nature directives (i.e. the Birds and Habitats Directives). The observations are not exhaustive and are intended to assist An Bord Pleanála in its review



and evaluation of the current proposal in the context of, among other things, obligations and commitments in relation to nature conservation, European sites, biodiversity and environmental protection generally. These observations are structured under a series of headings/topics, but should be read as a whole, together with our previous observations dated 21st December 2018.

1. Likely effects on European sites

Annex 1 habitats – Qualifying Interests (QIs)

The Department notes the significant additional information provided in relation to habitat surveying and mapping in Appendix A.3.1 (Annex 2 and Annex 3). This includes, *inter alia*, information in relation to habitats within the proposed development boundary¹, including Annex 1 habitats^{2,3} and QI habitats within Lough Corrib cSAC in close proximity to the boundary of the proposed development (Figure 2.9.01). The Department also notes the vegetation sampling (relevé data) which has been provided and which has informed the habitat mapping referred to above.

This additional information has resulted in some changes to habitat mapping which is described and evaluated in Section 4 of the Request for Further Information Response Report (Volume 1), and is noted. In particular, Section 4.1 of the Report identifies an additional small area of limestone pavement [*8240] habitat near Menlo (see Figure 2.7.01). The boundary of Lough Corrib cSAC at this location intersects the area of limestone pavement so that some is within the cSAC and some is located outside the cSAC. The area of limestone pavement within the cSAC would have been directly affected by a proposed access route to farmland at this location. The proposed access route is now proposed to be altered to avoid any impacts to this area of limestone pavement and therefore to avoid impacts to Lough Corrib cSAC.

The Department further notes that updates to the boundary of Lough Corrib cSAC are possible pending finalization of the objections process at this site pursuant to the requirements of the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended). The final objections relating to the boundary of Lough Corrib cSAC are currently being processed and an updated boundary map will be notified in the coming weeks, prior to the Oral Hearing. As part of this process a mapping error, at the location near Menlo described above, is under consideration. The correction of this minor mapping error will align the boundary to a small track to reflect the original survey intention. This will result in a larger area of the limestone pavement being located outside the Lough Corrib cSAC boundary. This is the only known alteration to the boundary of Lough Corrib cSAC which will interact with the proposed motorway and road scheme.

SAC – Hydrology

In the Department's previous observations it was noted that clarity was required in relation to changes in the hydrological regime and its impact on the groundwater catchment area as

¹ Figures 2.5.01 – Figure 2.5.15 inclusive (2019 Habitat Mapping with Fossitt (Level 3) Habitat Codes indicated)

² Figures 2.6.01 – 2.6.15 inclusive (2019 Habitat Mapping with Annex 1 Habitats indicated)

³ Figures 2.7.01 & 2.7.02 (Areas of limestone pavement habitat within the proposed development boundary and Lough Corrib cSAC)



a result of the Lackagh Tunnel. This matter is addressed in the Request for Further Information Response Report (Volume 1) in Section 4.12.1. The Report states that only one European Site (i.e. Lough Corrib cSAC) lies within the hydrogeological zone of influence of the proposed road development. The Department remains of the view that this statement needs more clarification. The groundwater flow map is quite general and would benefit from groundwater levels from boreholes for example being indicated together with groundwater head contours. The delineated groundwater catchment divides should also be indicated and the location/mapping of the Groundwater Dependent Terrestrial Ecosystems (GWDTEs), particularly the fen habitats within the Lough Corrib cSAC, should also be shown. The NIS and the Request for Further Information Response Report states that the GWDTEs rely on 'seasonal groundwater levels', but it is still not clear what these are (baseflows for example?), and what groundwater levels need to be maintained to avoid negatively impacting on the conservation status of all GWDTEs in the Lough Corrib cSAC complex.

The Department also sought clarification in relation to how the GWDTEs in the Lough Corrib cSAC are working hydrogeologically and if flow paths may change post-construction. This is addressed in Section 4.13.1 of the Request for Further Information Response Report. The Department remains of the view that this matter requires clarification, such as the presentation of a clearer hydrogeological conceptualisation of the groundwater regime of the GWDTEs, and the changes that may or may not occur following construction. Additional hydrogeological cross-sections would assist in this regard. The Department is of the view that without a clearer presentation of the groundwater regime of the GWDTEs, it is difficult to assess the potential impacts of the proposed scheme and the adequacy of the mitigation measures being proposed.

Conservation objectives and scope of NIS

The Department notes the clarification in relation to the matters raised under this heading in its previous observations in Section 4.15 of the Request for Further Information Response Report.

Birds

The Department raised issues in relation to the potential for the proposed River Corrib bridge to pose a collision risk to birds in its previous observations. This has been addressed in Section 5.2 of the Request for Further Information Response Report. While no nocturnal surveys were undertaken the Department considers that taking into account the fact that the bridge will not be lit, the available data from the previous and recent surveys, and the available published literature, sufficient information has been provided to assess potential impacts to SCI bird species of the adjacent SPAs. The Department is of the view that the proposed bridge is unlikely to present a threat to SCI bird species of the adjacent SPAs.

The Department also raised issues in relation to habitat loss and fragmentation and the potential for this to impact SCI bird species for surrounding SPAs. This is addressed in Section 5.1 of the Request for Further Information Response Report. The Department



notes the additional information provided and considers that the matter raised has been addressed.

2. Likely effects on the Environment

NHA – hydrology

The Department reiterates its concerns regarding Moycullen Bog NHA, that dewatering of the 'Galway Granite batholith' within cutting areas during construction and operation of the proposed scheme, may result in a lowering of the peatland water table with peat subsidence and a consequent negative impact on the ecology of the Bog. The potential for such impacts needs to be assessed and mitigation measures proposed to address this matter as appropriate.

Habitats

As stated above, the Department notes the additional information in relation to habitat mapping provided in Section 4 of the Request for Further Information Response Report (Volume 1). This has resulted in some changes to habitat mapping which has been described and evaluated in Section 4 of the Report and associated mapping, and is noted.

It is also noted that there will be a number of habitat types of local biodiversity importance which will be permanently lost and where significant residual impacts are likely, including calcareous springs, dry-humid acid grasslands, poor fen and flush, mixed broadleaved woodland, hedgerows and treelines. The Report states that for mixed broadleaved woodland, hedgerows and treelines an area greater than that which will be permanently lost is being provided for in the landscape design (see page 30). It would be useful if the area of woodland and the length of hedgerow and treeline to be provided can be clearly set out.

It remains unclear if abandonment of grazing and/or mowing, including because of fragmentation and isolation of land holdings, has been included among the potential significant effects on habitats that were considered and assessed. Species such as Marsh Fritillary could be affected by such changes arising in connection with the development of the road and could lead to loss of habitat in 'favourable management'. Further clarification should be provided.

Compensatory Habitat

The Department notes the summary of residual Annex 1 habitat loss after compensatory measures have been implemented which is set out in Table 4.1 of the Report and revises the information previously provided in the EIAR.

Some of these losses are to be compensated by translocating habitat from one location (donor site) to another location (receptor site) within the proposed development boundary. The Department re-iterates its view (as set out in previous observations) that it would assist interpretation if a table with the details of donor and receptor sites, including areas and habitat types present in each, was provided to clarify, among other things, what habitats will



be lost in the receptor sites as a result of the compensation measures and what habitat gains are predicted to accrue.

There have been some amendments proposed in the Request for Further Information Response Report to the Material Deposition Areas in Lackagh Quarry (areas DA23, DA24, DA25, DA28). It is noted also that a large volume of peat (52,000m³) – presumably removed from west of the River Corrib - will be deposited in this limestone quarry. While Tables 3.2 & 3.3 indicate that there will be no peat in area DA28, Table 6.2 indicates that there will 14,000m³ of peat in this area. This matter needs to be clarified.

Some of the Material Deposition Areas listed above are also earmarked for habitat compensation notably for calcareous grassland. It is not clear from the documentation how this habitat will be created and how the proposed alterations to the material deposition areas will impinge on the habitat compensatory areas. It appears that the major horizontal portions of the depositional areas will consist of peat. For example, area DA24 was identified as an area for calcareous grassland but yet its entire area appears to be covered in peat (see Annex 2, Figure 1.8.6). It is not clear from the documentation if it is intended to create peatland habitat here or whether the peat is simply being stored in this area. Clarity is required in relation to these matters.

The Department notes the information provided in Section 4.11 of the Request for Further Information Response Report in relation to the time required to establish compensatory habitats. Because the timeline in the Report for Alluvial forest [*91E0] is expressed as a worst case scenario, the Department considers that the lower limit of the range should be increased from 20 to 30 years. More generally the Department notes the long time periods required for the establishment of all the Annex 1 habitat-types as set out in Section 4.11 of the Report, and notes that donor and receptor sites should be well matched in terms of their environmental conditions (e.g. geology, soils, altitude, slope, aspect) in order to enhance the prospects of success in a reasonable time-frame. In all cases future management will be required and it should be clear how this will be achieved and delivered in the short- to long-term.

Birds

The Department re-iterates the matters raised in its previous observations in relation to the need for compensatory long-term habitat management for Barn Owls.

The Department also raised issues in relation to the potential for impacts to Peregrine Falcon and to wintering birds at Ballindooley Lough arising from blasting activity at Lackagh Quarry (and Castle gar), and the mitigation measures proposed to address such impacts. These matters are addressed in Section 5.3 of the Request for Further Information Response Report. In relation to Ballindooley Lough it is clear that there is no risk of disturbance to waterbirds because blasting will not take place during the wintering period. In relation to Peregrine the Department is of the view that in addition to the mitigation measure proposed (i.e. blasting to commence prior to mid-February) there need to be suitable high ledges for prospecting pairs available, and that any active Peregrine nest site/ledge must be left undisturbed. If these conditions are met then the proposed works should not prohibit Peregrine breeding at the



site. Peregrine are regarded as being able to withstand significant disturbance at active quarry sites. However, the frequency, the location and intensity of the blasting could influence the outcome in terms of success/failure. Therefore monitoring of Peregrine breeding activity at the site through the season should ideally be carried out to ascertain any nest success/failure of the pair and to determine if blasting is also affecting numbers of common prey species for Peregrine (i.e. Feral Pigeon).

Marsh Fritillary

The Department reiterates its concerns in relation to the mitigation measures proposed for this Annex II species which, as set out in the Department's previous observations, lacked sufficient detail. This matter needs to be addressed to ensure that the mitigation measures proposed are realisable.

Bats

The Department notes the clarification in relation to Lesser Horseshoe Bat populations set out in Section 6.1 of the Request for Further Information Response Report, and the information provided in relation to core sustenance zones (CSZ) for bats in Section 6.2 of the Report. As stated previously, the conclusions in the EIAR in relation to bats are contingent on i) the effective and timely implementation of these mitigation and compensation measures at or prior to construction stage, ii) their continued effective functioning for the lifetime of the project, and iii) their safeguarding in any future projects and development planning. Monitoring and the taking of timely and effective corrective action if problems arise are integral to their success, and to the conclusions and predictions that may be reached. Any uncertainties in any of these regards should be taken into account in the context of the EIA.

Habitat Connectivity

The Department notes the clarification in relation to habitat connectivity for pine martens, squirrels and common lizard set out in Section 7.1 of the Request for Further Information Response Report.

Drawing GCOB-1700-D-S12-02-001 shows the overpass/green bridge. Clarification is required in relation to the proposed planting for the overpass setting out what species are proposed to be planted. It would appear that there will be a bank at each side of the metaled route and perhaps an area of soil cover outside of this. In order for the overpass to function correctly it must be clear that a sufficient depth of soil cover will be in place to support an appropriate planting regime.

There does not appear to be provision for ledges for passage by mammals in the drawings for culverts (see drawing GCOB-1700-D-GEN-011). The Department recommends that where culverts are designed to allow water flows through them, provision for mammal ledges should be included.



You are requested to send further communications to this Department's Development Applications Unit (DAU) at manager.dau@chg.gov.ie (team monitored); if this is not possible, correspondence may alternatively be sent to:

The Manager
Development Applications Unit (DAU)
Department of Culture, Heritage and the Gaeltacht
Newtown Road
Wexford
Y35 AP90

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A handwritten signature in blue ink, appearing to read 'Connor Rooney'.

Connor Rooney
Development Applications Unit

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N6 Galway City Ring Road
Application for consent to An Bord Pleanála

Oral Hearing

Statement of Evidence

Gerry Clabby

National Parks and Wildlife Service

Department of Culture, Heritage and the Gaeltacht

21 February 2020

1. My name is Gerry Clabby and I am Head of Ecological Assessment, with the National Parks and Wildlife Service of the Department of Culture, Heritage and the Gaeltacht. I hold a BSc in Botany and a PhD in ecology from University College Dublin. In my current role I am responsible, among other things, for providing advice and guidance to the Department in relation to the discharge of its function as a statutory consultee in the planning code and in this regard I manage a team of ten Divisional Ecologists. Prior to this I was Heritage Officer with Fingal County Council for 15 years based in the Planning and Strategic Infrastructure Department of the Council. In this role I contributed to the development of natural heritage policy for statutory land-use plans and to the consideration of a wide range of planning applications by providing advice and guidance in relation to environmental assessment. I was also previously Heritage Officer with Westmeath and Longford Councils and a Lecturer in Botany at University College Dublin.
2. The Department has previously made observations dated 21st December 2018 and 24th January 2020 in relation to the proposed motorway and road scheme. These observations were made by the Department in its role as a prescribed body under planning legislation and as the authority with overarching responsibility for nature conservation and the nature directives (i.e. the Birds and Habitats Directives). The observations are intended to assist An Bord Pleanála in its review and evaluation of the current proposal in the context of Ireland's obligations and commitments in relation to nature conservation, European sites, biodiversity and environmental protection generally.
3. The Department wishes to acknowledge the series of pre-application meetings and consultations held by the applicants with the National Parks and Wildlife Service between 2013 and 2017 inclusive. Three submissions made by the Department (on a non-statutory basis) at pre-application stage are included in the Environmental Impact Assessment Report (EIAR) at Appendix A.8.2. This included review of draft documentation by NPWS, as an exceptional measure, which included the draft Natura Impact Statement (NIS) and the biodiversity chapter of the EIAR biodiversity chapter, only.
4. The Department also acknowledges the extent and detail of the surveys carried out in connection with the planning and design of the scheme and acknowledges the extent to which ecological and other data and information have informed and modified aspects of the design of the scheme in order to minimise adverse impacts on biodiversity.

5. The Department has recently revised the boundary of Lough Corrib SAC, following the finalization of the objections process at this site, pursuant to the requirements of the European Communities (Birds and Natural Habitats) Regulations, 2011. Revised Irish Grid maps (Map Version 1.33) were notified to An Bord Pleanála and other public authorities on Monday 17th February 2020. These updated maps include a correction of a minor mapping error near Menlo as described in the Department's observations dated 24th January 2020.
6. The applicants have submitted a number of briefs of evidence to the Oral Hearing including the following in relation to ecology and hydrogeology:
 - Responses to EIA Biodiversity Objection/Submissions
 - Responses to AA Objection/Submissions
 - Responses to Hydrology Objection/Submissions

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7. The Department has only had time to undertake an initial review of this new information and in light of the complex nature of this proposed motorway and road scheme, and the extensive documentation involved, would welcome the opportunity to put some questions to the applicants this morning. The Department is willing to provide further inputs to the Oral Hearing at a later date, should this be helpful to the Inspector and the Board.
8. While not wishing to repeat its previous observations, which are to be taken as read, I wish to highlight a number of areas where, in the Department's view, further clarification is required to ensure that sufficient information is available to the Board in its decision making in this case:
 - a. Further clarification is required in relation to the groundwater regime operating in the vicinity of the proposed Lackagh Tunnel. This is necessary in order to enable a full assessment of the potential impacts to Lough Corrib SAC, particularly Coolagh Lakes and Annex 1 Alkaline and Cladium fen habitats, as a result of the construction of the Tunnel and in order to ensure that the mitigation measures proposed will fully address potential impacts. ✓
7230. *7210.*
 - b. Clarification is needed in relation to the catchment areas and groundwater flow regimes of the dependency of Ground Water Dependent Terrestrial Ecosystems (GWDEs) in the Lough Corrib cSAC; and whether groundwater flow paths may

change post-construction. Without this, it is difficult to assess the potential impacts of the proposed scheme and the adequacy of the mitigation measures being proposed.

- c. In relation to Moycullen Bog Natural Heritage Area (NHA) there remain concerns that dewatering of the 'Galway Granite Batholith' as a result of the construction and operation of the scheme may result in a lowering of the peatland water table, resulting in a negative impact on the ecology of the Bog. This matter needs to be addressed.
- d. Proposed mitigation measures for Marsh Fritillary should be clarified as set out in the Department's previous observations.
- e. The Department is of the view that further detail is required in order to ensure that the provision of Annex 1 compensatory habitat is successfully achieved. This includes i) further detail in relation to how such habitat is to be provided including the steps involved in the process, particularly in relation to dry heath habitat; ii) further provision for monitoring; and iii) clarification in relation to the measures in place should habitat provision be unsuccessful and the steps needed to be repeated until success is achieved.

- GA not AA.
- 9. The conclusions reached in the Natura Impact Statement (NIS) and the Environmental Impact Assessment Report (EIAR) with regard to the proposed scheme are contingent on mitigation measures and the provision of compensatory habitat. It is essential that provision is made for the effective and timely implementation of these measures at, or prior to, construction stage and, where applicable, during the operational stage. It is also essential that these measures are effective over the operational lifetime of the scheme and that they are safeguarded in any future project and development planning in the city and county. Monitoring and the making of provision for timely and corrective action should problems arise in relation to mitigation measures or compensatory habitat provision, is also a key element in ensuring success in this case. Any grant of permission in this case should ensure that these matters are fully addressed.

10. I am joined by my colleagues Dr Shane Regan, Dr David Tierney, Dr Ferdia Marnell and Dr Enda Mooney who wish to put some questions to the applicants with a view to clarifying some of the matters raised above.

a + b - AA + EIA

c - EIA

d + e less important.

Comp. = focus - capable of being implemented

N6 Galway City Ring Road

Application for consent to An Bord Pleanála

Oral Hearing

Statement of Evidence

Gerry Clabby

National Parks and Wildlife Service

Department of Culture, Heritage and the Gaeltacht

11th March 2020

1. My name is Gerry Clabby and I am Head of Ecological Assessment, with the National Parks and Wildlife Service (NPWS) of the Department of Culture, Heritage and the Gaeltacht. I am responsible, among other things, for providing advice and guidance to the Department in relation to the discharge of its function as a statutory consultee in the planning code. I am joined today by my colleagues Dr Shane Regan and Dr Enda Mooney.
2. The Department made a Statement of Evidence to the Oral Hearing on 21st February 2020 and also put some questions in relation to the proposed development to the applicants which sought further information in relation to a number of matters. The Department indicated at the Hearing that a meeting with the applicants might be useful in relation to the matters raised by the Department and this course of action was agreed with the Inspector. The Department agreed that it would return to the Oral Hearing subsequent to such a meeting with the applicants.
3. Since 21st February 2020, the Department met with the applicants on 27th February 2020 and again, at the applicant's request, on 9th March 2020. The Minutes of these meetings are provided in an Appendix to this Statement of Evidence.
4. At the first meeting on 27th February the following matters were discussed:
 - a. Hydrogeological matters arising in relation to Lough Corrib cSAC
 - b. Hydrogeological matters arising in relation to Moycullen Bogs NHA
 - c. Compensatory habitat provision – calcareous grassland and dry heath
 - d. Mitigation measures in relation to Barn Owl and Peregrine Falcon
 - e. Mitigation measures in relation to Marsh Fritillary.
5. At the second meeting on 9th March the only matter discussed was the provision of compensatory dry heath habitat.
6. The Department is of the view that the additional information contained in the Statement of Evidence made to the Oral Hearing on 10th March 2020 by the applicants provides further relevant information to An Bord Pleanála which will assist it, in its assessment of the current proposal.
7. In addition, the Board's ecological advisor Mr Richard Arnold put a series of questions to the Department at the Hearing on 21st February to which I will now provide responses.

Question 1

As stated by the applicant, there will be a loss of c.1ha of 8240 LP outside the cSAC. In the department's view, is the direct loss of limestone pavement (*and other Annex 1 habitats*), outside the cSAC consistent with the objectives of the Habitats Directive?

This question addresses the protection afforded to Annex I habitats that occur outside Special Areas of Conservation (SACs). One of the objectives of the Habitats Directive is to designate Special Areas of Conservation (SACs) which are defined in Article 1(l) of the Directive as follows:

“special area of conservation means a site of Community importance designated by the Member States through a statutory, administrative and/or contractual act where the necessary conservation measures are applied for the maintenance or restoration, at a favourable conservation status, of the natural habitats and/or the populations of the species for which the site is designated;” [underlining added].

Annex I to the Directive lists natural habitat types whose conservation requires the designation of special areas of conservation. Limestone pavement is included in Annex I as a priority natural habitat, which means it is in danger of disappearance and is a habitat for which the European Union has a particular responsibility.

Article 6(2) requires that:

“Member States shall take appropriate steps to avoid, in the special areas of conservation, the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated, in so far as such disturbance could be significant in relation to the objectives of this Directive.” [underlining added].

The European Commission guidance¹ advises that measures implemented under Article 6(2) are only required to target species and habitats located in the SACs, unless external events may have an impact on the species and the habitats inside the SAC.

¹ Commission notice "Managing Natura 2000 sites The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC" (page 27-28):
https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/Provisions_Art_6_nov_2018_en.pdf

While the general provision, under Article 6(2), to conserve habitats for which a site has been designated applies at all times, Article 6(3) of the Directive applies only to plans and projects. Article 6(3) requires that:

“Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site’s conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.”

In *Holohan*², the Court of Justice of the European Union (CJEU) ruled that an appropriate assessment under Article 6(3) of the Habitats Directive must identify and examine the implications of the proposed project for habitat types to be found outside the boundaries of a SAC provided that those implications are liable to affect the conservation objectives of the site.

In summary, the Department is of the view that any proposals which involve the loss of Annex 1 habitat outside Special Areas of Conservation, must take fully into account the findings of the CJEU in the *Holohan* case cited above. In proposals where the loss of Annex 1 habitat does not affect habitats and/or species within SACs, the Department is of the view that while such habitat loss is undesirable and to be avoided wherever possible, it is not inconsistent with the requirements of the Habitats Directive. In such cases the Department expects, among other things, the requirements of the EIA Directive to be applied in relation to the assessment of potential impacts to biodiversity including the assessment of impacts to Annex 1 habitats.

I would hasten to add that this view does not in any way purport to be a legal opinion.

Should the subject matter of the question raised by the Board be considered by the Board to

² Case C-461/17, *Brian Holohan and ors. V. An Bord Pleanála* (para 70) <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:62017CJ0461&qid=1583427673419&from=EN>

be critical to its decision making in this case, it is respectfully suggested that the Board may wish to obtain legal advice in relation to this matter.

Question 2

With reference to the FIR response, section 4.3 and Figure 2.6.07 of the same; Why was the boundary of the cSAC drawn to include the woodland adjacent to Menlo Castle, Area 1f, in the applicant's mapping? To further clarify, this area lies immediately to the east of the proposed River Corrib bridge. Was this area considered in the recent revision to the cSAC boundary?

The reference to Figure 2.6.07 in this question is presumed to be a reference to Drawing 2.6.07 of the FIR. The area in question is also shown in Drawing 2.5.07 of the FIR which identifies the Fossitt habitat at this location as woodland (WD1). The boundary of the cSAC was surveyed in 1997 (see Figure 1 below). The rationale at the time was, *inter alia*, to include areas of semi-natural habitat within the boundary of the cSAC.

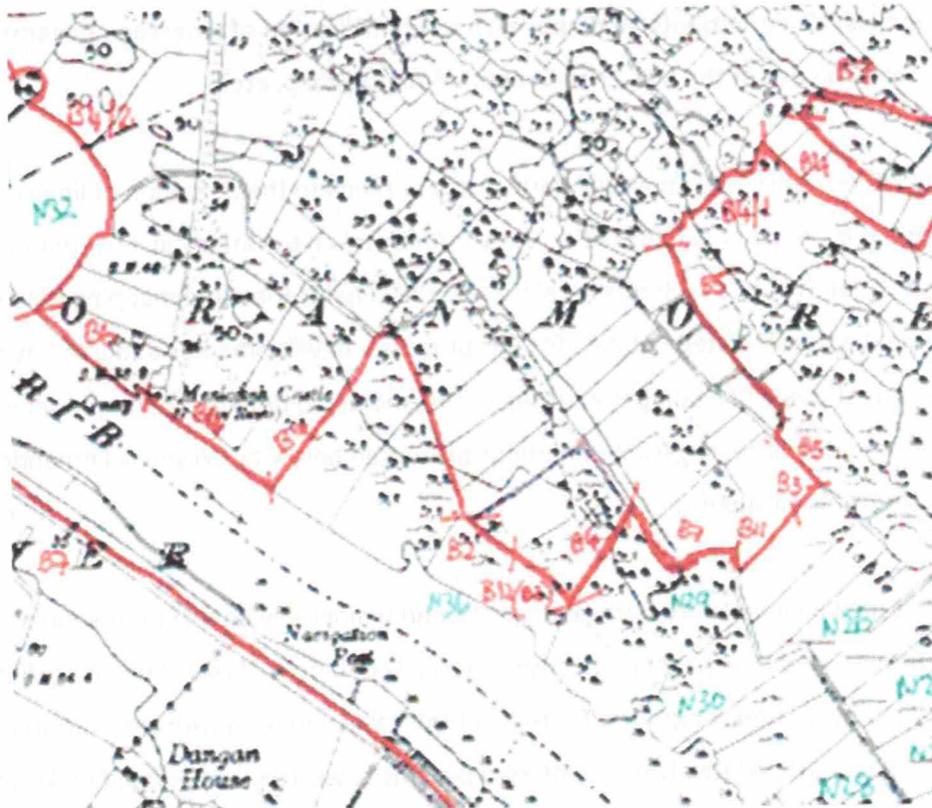


Figure 1: Scan of the 1997 surveyed boundary of the cSAC

While there are no specific target notes in the NPWS site file for the woodland area referred to as Area 1f, it is clear that this area was included on the basis that it was semi-natural woodland.

The boundary of the site was reviewed in 2003 but no amendments were proposed along this section of boundary and the woodland was retained within the cSAC. The Department has recently revised the Lough Corrib cSAC boundary. A revised boundary map for Lough Corrib cSAC was issued on Monday 17th February 2020 - Map Version 1.33. The revised map was issued following boundary changes recommended by the Designated Area Appeals Advisory Board (DAAAB) and approved by the Minister for Culture, Heritage and the Gaeltacht. A minor mapping error was also corrected on Map Version 1.33. None of the boundary changes to Map Version 1.33 related to the woodland south of Menlo Castle and this area was not assessed by the DAAAB in the recent revision of the cSAC boundary (i.e. this area was not subject to a formal appeal assessed by the DAAAB).

Question 3

With reference to the FIR response, section 4.5; What is the Department's impression of the applicant's definition(s) and approach to identification of limestone pavement in particular the use of the 50% criteria applied to polygons, etc?

In the FIR response, the applicant clarifies its approach to the definition of limestone pavement in Section 4.5 (page 32). The approach taken by Botanical, Environmental & Conservation (BEC) Consultants in relation to the classification and mapping of limestone pavement and associated habitats for this proposed development is endorsed by NPWS. It follows a rationale (including the setting of thresholds) to define this complex ecological mosaic and draws heavily from definitions presented below by Wilson & Fernandez (2013)³, on page 7 of their report:

“Limestone pavements are both geologically and biologically important resources. The structure of limestone pavement consists typically of blocks of rock, known as clints, separated by fissures, or grykes. There is considerable variation with some areas of massive blocks of smooth, relatively un-weathered pavement with well-developed grykes, to areas

³ Wilson, S & Fernández, F (2013) National Survey of limestone pavement and associated habitats in Ireland. Irish Wildlife Manuals, No 73. National Parks and Wildlife Service.
<https://www.npws.ie/sites/default/files/publications/pdf/IWM73%20Limestone%20pavement.pdf>

where the grykes are very narrow and shallow. Finely fractured pavements or shattered pavements where grykes are almost absent can also occur. The rock surface is almost devoid of overlying soils (considerably less than 50% cover) except for some patches of shallow skeletal soils, although more extensive areas of deeper soil occasionally occur (Anon. 2007). This morphology offers a variety of microclimates allowing the establishment of complex vegetation consisting of a mosaic of different communities. The vegetation in grykes is unusual as it is composed of woodland and shade species along with plants of rocky habitats (Osborne *et al.* 2003; Ward *et al.* 1976)."

The scale in terms of area at which the definition of limestone pavement is applied needs to be practical and common sense needs to be applied. Since limestone pavement is a geomorphological entity, this needs to be taken into account in applying definitions and it does not make sense to identify all areas that contain elements of water-worn limestone as limestone pavement. The Department's view is that the applicants have applied a justifiable approach to the mapping of limestone pavement and that the use of the 50% criteria relating to polygons is valid.

Question 4.

With reference to the FIR response, section 4.4, Figure 2.4-072, Figure 2.3.03 and Photograph for relevé 3734_R1 in Area. What is the Department's view on the habitat type, in accordance with EUR28? The photo is attached. In addition, it would helpful to have the same view for Relevé 1883_R1 also attached, refer to Figures 2.4-076 and Figure 2.3.04"

To assist with providing a response in relation to relevé 3734_R1, data for this relevé was inputted into ERICA (the Irish Vegetation Classification tool). ERICA is a web application which can be used to assign vegetation data to communities as defined by the Irish Vegetation Classification. Data can be uploaded, checked for errors and analysed and the results can then be downloaded. Further information in relation to this tool is available at the following link: <https://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/erica/>. Relevé 3734_R1 was identified as WL2A *Quercus robur* – *Circea lutetiana* woodland by ERICA. A full description of this community type is available at the following link for reference:

<https://www.biodiversityireland.ie/wordpress/wp-content/uploads/WL2A.pdf>. This describes a fairly species-poor woodland community with a very limited bryophyte flora. A small proportion of these stands (10.7%) may qualify as EU Annex I habitat 91A0 Old Oak Woodlands. Therefore the lack of assignment of this relevé to an Annex 1 habitat category appears appropriate.

ERICA identified relevé 1883_R1 as WL2E *Corylus avellana* – *Potentilla sterilis* woodland. A full description of this community type is available at the following link for reference: <https://www.biodiversityireland.ie/wordpress/wp-content/uploads/WL2E.pdf>. This is quite a species-rich woodland community with a fairly diverse bryophyte flora. Stands of this community-type do not qualify as any of the EU Annex I woodland habitats, but stands on thin soils occurring in association with karst limestone can be considered to be Annex 1 habitat 8240* Limestone pavement. In the case of relevé 1883_R1 the soil layer is thin, and blocky limestone has also been identified for this relevé. Therefore the assignment of this relevé to 8420* appears appropriate.

Question 5.

With reference to the FIR response, section 2.3, I understand that the Menlough viaduct will pass over 8240 Limestone Pavement outside the cSAC. In the Department's view, does the shading of limestone pavement under structures, for example beneath the Menlough viaduct, affect the conservation status of the Limestone Pavement?

In relation to shading, limestone pavement and its associated habitats and species occur across a spectrum of light levels, from open pavement to shaded grykes, through to scrub and woodland. As the proposed viaduct is generally orientated East -West, the impact of shading will be lessened. In addition, the main orientation of the grykes is North-South, meaning plants growing in grykes are already shaded in an East-West direction. The Department does not perceive there to be an issue with shading from the proposed viaduct.

APPENDIX

Minutes

Meeting between NPWS and N6 Galway City Ring Road Project Team

Location NPWS Office, 90 North King Street, Smithfield, Dublin 7. Time and date 11.00 am 27 February 2020

Purpose of meeting Clarifications sought by NPWS at N6GCRR Oral Hearing

Attendance	Gerry Clabby	NPWS
	Caitriona Douglas	NPWS
	Enda Mooney	NPWS
	Brian Nelson	NPWS
	Shane Regan	NPWS
	Enda Mullen	NPWS
	John Fitzgerald	NPWS
	Ciaran O’Keeffe	NPWS
	David Tierney	NPWS
	Aebhin Cawley	Scott Cawley (SC)
	Andrew Speer	Scott Cawley (SC)
	Catherine Buckley	Arup
	Les Brown	Arup
	Mary Hurley	Arup
	Eileen McCarthy	Arup

Apologies

Circulation Those present

		Action
1.	Overview	
1.1	NPWS outlined that the purpose of the meeting is to identify to the applicant for the N6 Galway City Ring Road what NPWS consider would be required in terms of additional clarification to be provided to An Bord Pleanála (ABP) so that ABP can undertake a full assessment of the scheme in possession of relevant information.	Note
1.2	The matters discussed related to the following topics: <ul style="list-style-type: none"> • Birds • Hydrogeological matters arising in relation to Lough Corrib cSAC • Hydrogeological matters arising in relation to Moycullen Bogs NHA • Marsh Fritillary • Compensatory habitat provision – calcareous grassland and dry heath 	
2.	Birds	
2.1	NPWS fully understand the principle of dissuading barn owls from foraging near the proposed road development for the	Note

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	majority of the scheme. However, NPWS queried the net loss/gain of habitat versus habitat provided for Barn owl around Menlo Castle.	
2.2	SC confirmed that the resultant loss of suitable Barn owl foraging habitat within a 5km radius of Menlo Castle is approximately 9.9ha, and the provision of replacement habitat in this same area is approximately 11.76ha.	Note
2.3	Confirmation that the grazing regime required to maintain the habitat will be implemented into the future is required.	Design Team
2.4	Clarification is required on what level of protection is provided for the existing two Peregrine falcon nests in Lackagh Quarry.	Design Team
2.5	SC have spoken with John Lusby (Bird Watch Ireland) following the NPWS query with respect to the existing Peregrine falcon nests sites in Lackagh Quarry and proposed that artificial nest boxes will be provided on the existing ledges in Lackagh Quarry. This will be added to the Schedule of Environmental Commitments and will be presented to ABP.	Design Team
3.	Hydrogeology at Lough Corrib	
3.1	Arup gave an overview of the hydrogeology of the 2km section from River Corrib to Ballindoooley Lough using data as presented in various reports within the EIAR/NIS with a groundwater contour map and hydrogeological cross-section (Lackagh to Coolagh lakes) as had been requested by NPWS at the N6 GCRR oral hearing on 21 February 2020.	Note
3.2	<p>NPWS believe that the following clarifications should be made available to ABP:</p> <ul style="list-style-type: none"> • An additional hydrogeological cross-section through the Fens adjacent to Coolagh Lake following the groundwater path that supports these Fens and include piezometric heads in the limestone aquifer. • There is a significant amount of ecology and hydrogeology data in the EIAR and NIS but the reports are voluminous. NPWS request a concise integrated eco-hydrogeology response note that links together the ecology and hydrogeology aspects with an assessment of the potential impacts on the Lough Corrib cSAC conservation objectives with specific reference to the following qualifying interests - Alkaline Fen [7230] and Calcareous fen with <i>Cladium mariscus</i> and species of the <i>Caricion davalliana</i> [7210*]; and with a clear conclusion to inform the Appropriate Assessment being undertaken by ABP. 	Design Team
4.	Hydrogeology at Moycullen Bogs NHA	
4.1	NPWS noted that their main concern arose from a potential hydraulic connection via fractures in the granite between cuttings	Note

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<p>4.2</p> <p>4.3</p>	<p>of the proposed road development and Moycullen Bog NHA (Letteragh).</p> <p>Arup gave an overview of the hydrogeology in the area of the proposed road development relative to Moycullen Bog. The geophysical data presented (included in the EIAR) indicated that there are no fractures in the granite which may connect the bog to the proposed road development. The NPWS acknowledged that detailed mitigation measures were included in the EIAR to provide for remediation should any unforeseen fracture arise in the granite during construction.</p> <p>NPWS believe that the following clarifications should be made available to ABP:</p> <ul style="list-style-type: none"> • A hydrogeological cross-section from the proposed road development to Moycullen Bogs NHA (Letteragh). This should show groundwater table levels, geophysical information, bog water tables and an indication of likely bog depth. • Provide an eco-hydrogeological response for Moycullen Bogs NHA at Letteragh that links all ecology and hydrogeology assessments undertaken, with supporting information from hydrology and geology assessments. This should include relevant excerpts from the contingency measures outlined in the Construction Environmental Management Plan included within the EIAR. This summary report is requested by NPWS to assist ABP in assessing potential impacts to Moycullen Bogs NHA. 	<p>Design Team</p>
<p>5.</p> <p>5.1</p>	<p>Marsh Fritillary Butterfly</p> <p>NPWS request that the following clarifications to be made available to ABP:</p> <ul style="list-style-type: none"> • Detail the purpose of the mitigation for the Marsh fritillary • Provide detail on the proposed translocation site(s) and on the methodology for translocation • Provide detail on the timing of when these measures would be implemented with respect to the construction activities • Clarify how the new sites will be managed for the years ahead 	<p>Design Team</p>
<p>6.</p> <p>6.1</p>	<p>Compensatory Habitat: Dry Heath</p> <p>NPWS request that the following clarifications to be made available to ABP:</p> <ul style="list-style-type: none"> • Specific proposals for translocation of <i>Arctostaphylos uvi-ursi</i> and <i>Daboecia cantabrica</i>. • Confirmation that Annex 1 Dry heath habitat [4030] can be successfully re-created using the donor and receptor sites as set out in the EIAR and supporting documentation. In this regard NPWS noted that Appendix A.8.26 of the EIAR contained, within the Compensatory Habitat Management Plan, a 	<p>Design Team</p>

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<p>7. Compensatory Habitat: Calcareous Grassland</p> <p>7.1 NPWS request that the following clarifications to be made available to ABP:</p> <ul style="list-style-type: none"> • Confirmation of confidence in the ability to recreate Calcareous grassland on the MDAs in Lackagh Quarry including clarification in relation to the proposals for peat to be deposited in these MDAs. 	<p>Design Team</p>

Minutes

Meeting between NPWS and N6 Galway City Ring Road Project Team

Location NPWS Office, 90 North King Street, Smithfield, Dublin 7. Time and date 11.00 am 9 March 2020

Purpose of meeting Clarifications sought by NPWS at N6GCRR Oral Hearing

Attendance	Gerry Clabby	NPWS
	Caitriona Douglas	NPWS
	Enda Mullen	NPWS
	John Fitzgerald	NPWS
	Derek Pender	Galway County Council
	Aebhin Cawley	Scott Cawley (SC)
	Andrew Speer	Scott Cawley (SC)
	Mary Hurley	Arup
	Eileen McCarthy	Arup

Apologies

Circulation Those present

		Action
1.	Overview	
1.1	The purpose of the meeting is to allow the applicant for the N6 Galway City Ring Road to report back on what NPWS considered would be required in terms of additional clarification to be provided to An Bord Pleanála (ABP) in respect of the compensatory habitat provision – dry heath – so that ABP can undertake a full assessment of the scheme in possession of relevant information.	Note
2.	Compensatory Habitat: Dry Heath	
2.1	NPWS does not disagree with the concept of dry heath recreation. It was requested that the full bibliography citing examples of successful dry heath creation be made available to ABP.	Design Team
2.2	The following additional clarifications will be made available to ABP: <ul style="list-style-type: none"> • Specific proposals for translocation of <i>Daboecia cantabrica</i>. • Detailed information providing confirmation that Annex 1 Dry heath habitat [4030] can be successfully re-created using the proposed donor and receptor sites. • The information to be contained in the Ecology Site Management Plans referenced in the Compensatory Habitat Management Plan to be set out in the documentation to be provided to ABP. • Proposals for temporary storage of turves as part of the proposed compensatory habitat provision to ensure that turves 	

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are only watered with rainwater and are stored for as short a time as possible...

As part of proposed dry heath compensatory habitat provision:

- Monitoring to be undertaken after the turves are placed in the receptor sites every three weeks **and** after any heavy rainfall event(s) until such time as the dry heath is established, with adaptive management plans to be put in place on an ongoing basis as necessary if monitoring shows that establishment is not successful.
- Monitoring to be undertaken post establishment of the dry heath habitat by Galway County Council for the lifetime of the project.
- Steel Pegs of 500mm to be utilised to secure the geogrid, as part of habitat creation works.
- The top 400mm of all MDAs on top of which dry heath is to be created will have a pH of less than 6.5. A root barrier is required at DA 18 which is the only MDA which may have material of a higher pH beneath the upper 400mm layer.

2.3

NPWS expressed reservation about the use of bare peat at the receptor sites in addition to turves. Given the high rainfall amounts in the area, the use of bare peat increases the risks of erosion at the receptor sites and also creates a risk that undesirable plant species will be introduced to the receptor sites. The NPWS emphasised the need to create high quality dry heath habitat as compensatory habitat and queried whether proposals to create c. 7 ha of such habitat risked a reduction in the quality of the habitat created due to the need to use bare peat as part of compensatory habitat provision proposals.

Appendix 2: Responses to Submissions

Table A2.1. Submissions received prior to the oral hearing.

NO.	Applicants Reference	Party	Summary of submission	Response
1	S_018.2	DCHG/NPWS	Observed that detailed attention to be paid to mitigation from an early stage, asked for a clearer account of effects on the Lough Corrib cSAC (than presented in the NIS), asked for a clearer depiction of groundwater flows, asked for greater reference to the Conservation Objectives, stressed the importance of effective mitigation for otter, identified the proposed River Corrib bridge as a potential threat to Special Conservation Interest (SCI) bird populations and made a procedural point on the appropriate assessment.	<p>The point on timely and effective mitigation is understood and agreed with, with emphasis on this also given in my appropriate assessment report.</p> <p>The effects on Lough Corrib cSAC were subsequently explored in the FIR and response, as well as at the oral hearing, which has led to a clearer understanding than that presented in the NIS and therefore enabled a conclusion to be reached. This applies to both Annex I habitats and groundwater flows.</p> <p>My assessment in Table 6 provides a summary comparison of the effects of the proposed road and the detailed conservation objectives, where these are available, considering whether the objective is to maintain or restore the qualifying interest feature.</p> <p>There is agreement between the applicant, the NPWS and I that there needs to be adequate mitigation to protect the otter population during the construction and operation stages; to that effect I identified some additional mitigation which I believe is required to achieve this outcome.</p> <p>In subsequent correspondence, DCHG/NPWS reached a conclusion that the bridge did not pose a threat to SCI bird populations and I agree with this conclusion.</p>
2	S_018.1	DCHG/NPWS	Acknowledges the additional information provided following the FIR, confirms that the Department no longer considers the proposed River Corrib bridge a threat to SCI bird populations, accepts that habitat loss and	Further clarification of the effects of the proposed road on hydrogeology was made at the oral hearing, with responses from the applicant, including further data, to queries raised by both DCHG/NPWS and Mr. Dodds. This topic is addressed by Mr. Dodds in his report, with the conclusion that enough information was received to confidently assess the impacts with mitigation.

NO.	Applicants Reference	Party	Summary of submission	Response
			fragmentation for SCI bird species has been satisfactorily addressed but again seeks further clarification on the hydrogeology model.	
3	S_058	Peter Sweetman and others	The proposed road does not comply with the Habitats Directive.	No express reason is given for non-compliance; however, an assessment of compliance is set out in my report with the conclusion that the proposed road could comply with the Directive subject to the effective implementation of the mitigation proposed by the applicant and the additional mitigation set out in my report.
4	S_006	An Taisce	The appropriate assessment must comply with recent case law, etc.	I agree compliance with recent case law is essential, and this has been considered in my report, including Case-461/14 (see below).
5	S_010	Brian Burton	The appropriate assessment must comply with recent case law, etc; referencing Case-461/14 and specifically the need to consider (i) species and habitats other than those for which the site is designated and (ii) species and habitats outside the site boundary, if impacts on these species and habitats could undermine the conservation objectives of a site.	The effect on these species and habitats has been expressly examined in my report, under the headings of <i>Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites</i>
6	Ob_451_489	Mary Nestor	The proposed road does not comply with the Habitats Directive.	As for Peter Sweetman and others
7	S_074	Menlo and Ballindooley Residents	The impacts of tunnelling, blasting and pollution on the Lough Corrib cSAC would be contrary to the Habitats	The Lackagh tunnel would take the road under the cSAC and is therefore a measure to avoid impacts on the cSAC. There is a risk that blasting from the tunnel construction generates dust and

NO.	Applicants Reference	Party	Summary of submission	Response
			<p>Directive, and there would be a loss of Annex I habitats generally.</p>	<p>consequential effects on the vegetation however this can be controlled through mitigation.</p> <p>During construction, pollution affecting the cSAC could arise from dust (from blasting and other sources), suspended solids in site run-off (affecting the River Corrib) and accidental spillage of fluids, however these can all be controlled through good construction practice to avoid undermining the conservation objectives for the cSAC.</p> <p>During operation, pollution affecting the cSAC could arise from vehicle emissions, contaminated road run-off, noise and light with all occurring closer to the cSAC than now. Modelling of air quality, light and noise confirms that their effects on the vegetation of the road alone would be too low to undermine the conservation objectives for the cSAC, while the road run-off would be treated before discharge, with the same effect, provided that these treatments are properly maintained. Background improvements in air and water quality set out in the development plans will ensure potential in combination effects are mitigated.</p> <p>The loss of Annex I habitats outside Natura 2000 sites requires consideration under Article 6 (which provides the requirement for this appropriate assessment report) only if such losses result in an effect sufficient to undermine the conservation objectives for those within Natura 2000 sites. I considered this possibility but was not able to identify an effect which could be attributable to the road alone or in combination with the other plans and projects. I posed the question to DCHG/NPWS as to whether such losses would be contrary to Article 2 of the Directive and their view is that losses of undesignated Annex I habitat are not contrary to this Article. See also my ecological impact assessment report to which such losses are certainly relevant.</p>

NO.	Applicants Reference	Party	Summary of submission	Response
8	S_048	Menlo Residents Association	The proposed road does not comply with the Habitats Directive, referencing air pollution within the [Lough Corrib] Special Area of Conservation.	The potential effects of air pollution discussed for example in paragraph 4.5.81 of my report, with the conclusion that the modelled levels would not be enough to drive change in the vegetation over a wide enough area to undermine the conservation objectives and therefore result in an adverse effect on the integrity of the cSAC.
9	Ob_584 Ob_584.2	Linda Rabitte	The proposed road does not comply with the Habitats Directive.	As for Peter Sweetman and others.
10	S_068.1 S_068.2	The Galway N6 Action Group	Avoiding adverse effects on the integrity of Natura 2000 sites has been prioritised whereas the use of Article 6(4) would have enabled a better route to have been chosen.	The use of Article 6(4) for an alternative route which resulted in adverse effect on the integrity of the Lough Corrib cSAC is a possibility, however, the first consideration under Article 6(4) is whether there is a satisfactory alternative i.e., a version of the project which had the same benefits, but which did not have an adverse effect on site integrity, for which the current route of the proposed road may well have been the answer. This has not been tested as there has been no formal assessment of alternative routes under Article 6(4) (and no requirement to undertake such an assessment).
11	Ob_521_ O_517.14_ 01/02/04/05	The Kerin Family	Alternative routes have not been assessed in accordance with the Habitats Directive, as considered in case no. C-461/17 of the European Court	The question of alternatives in this judgement relates to the EIA Directive rather than the Habitats Directive i.e., it is something to be considered in the Environmental Impact Assessment under the EIA Directive rather than the appropriate assessment under the Habitats Directive. Under Article 6(3) of the Habitats Directive, it is only required to demonstrate whether the project, however defined, would have an adverse effect on the integrity of Natura 2000.
12	Ob_116.2	Peter and Michelle Connelly	Suggest that articles 6(3) and 6(4) of the Habitats Directive could be explored with respect to the provision of compensatory habitat and allow the road to follow an alternative route	The designated site lying to the north and west of Barna is a Natural Heritage Site, Moycullen Bogs, to which the Habitats Directive does not directly apply. Therefore, compensation of habitat losses here could be explored without invoking Article 6(4) of the Directive

NO.	Applicants Reference	Party	Summary of submission	Response
			further to the north and west in the locality of Forramoyle West, Barna	(although any new route would still require assessment under Article 6(3) in the same way as set out in this report). As above, it is only necessary under Article 6(3) to consider the proposed project, rather than alternatives.
13	Ob_528_541_543_557	NUI Galway	Considers the valuation of Annex I habitats on its campus to be incorrect, as each polygon/ area of Annex I habitat was simply assigned international value without proper reference to the TII guidelines and overstating the value in many cases. Unclear why tunnelling under the Lough Corrib cSAC, the River Corrib and the NUIG campus was rejected as an option	The submission is correct in that TII guidelines were not followed in relation to the valuation of individual habitat parcels, and I put forward an alternative approach in my ecological impact assessment report. This point is relevant to the EIAR rather than the NIS, as correctly stated in the submission. As above, it is only necessary under Article 6(3) to consider the proposed project, rather than alternatives.
14	Ob_583	McHugh Property Holdings	Raised concerns about the provision of compensatory Annex I habitat on its land holdings at Ballindooley [Lackagh] Quarry and suggested an alternative location for these at Kinvarra.	The compensatory habitat is to be provided in response to losses of Annex I habitats outside of Natura 2000 and not in response to adverse effects on the integrity of Natura 2000. It is therefore more relevant to the EIAR as correctly stated in the submission. As above, it is only necessary under Article 6(3) to consider the proposed project, rather than alternatives.
15	Ob_648	Mary Flattery	Objects to the compulsory purchase of her land (Ref. 648) for the protection of bats given that the designated [Lough Corrib] Special Area of Conservation is more than adequate for this purpose.	The use of the land is in response to impacts on populations of bats which are not an interest feature of the Lough Corrib cSAC and therefore not in response to an adverse effect on the integrity of the cSAC. There is however an obligation under the Habitats Directive to maintain the favourable conservation status of bats when a derogation licence to allow development is issued. This means that

NO.	Applicants Reference	Party	Summary of submission	Response
				there is requirement for compensatory habitat in response to losses due to the proposed road.
16	Ob_220	Kevin Gill	Considers that ecology considerations have been given more weight than human, despite this the project is still damaging to the Lough Corrib cSAC and allows pollutants to run-off into Rusheen Bay/Galway Bay cSAC	The ecology considerations are required by law, although there are provisions to allow for over-riding public interest, these have not been invoked by the applicant with respect to an alternative route and impacts on Natura 2000 sites, and it is only the proposed project which requires consideration under Article 6(3) of the Directive. There are habitat losses within the Lough Corrib cSAC and discharges to Galway Bay however, the proposed road would not undermine the conservation objectives for these cSACs when all the mitigation and additional mitigation is properly implemented.
17	S_041	Karen McGuire and John Newell	Refers to the re-appearance of the marsh fritillary butterfly at Menlo and asserts that this EU protected species habitat must be protected from the proposed road.	The marsh fritillary butterfly is listed on Annex II of the Directive as a species for which the designation of cSACs is required. It is not a strictly protected species under Annex IV and it is also not a qualifying interest feature of the Lough Corrib cSAC. This means that its habitat in this location is not strictly protected for the presence of this species. The nearest locality to which strict protection applies to this species is in the Connemara Bog Complex cSAC.

Table A2.2 Submissions made at the Oral Hearing.

	Applicants Reference	Party	Summary of submission	Response
18		DCHG/NPWS	<p>Sought further clarification from the applicant on several points relevant, or potentially relevant, to the appropriate assessment (a) the groundwater regime operating in the vicinity of the proposed Lackagh tunnel, (b) catchment areas and groundwater flow regimes of Ground Water Dependent Terrestrial Ecosystems (GWDTEs) in the Lough Corrib cSAC, (d) proposed mitigation for Marsh Fritillary and (e) further detail on the provision of compensatory Annex I habitat, the NPWS making clear that (e) is in relation to the general environmental impact assessment rather than the appropriate assessment. The statement goes on to note that the conclusions of the NIS are reliant on mitigation measures, supported by monitoring, and stresses the importance of making sure these are effective, timely, encompass the lifetime of the development and safeguarded from future development.</p>	<p>The clarifications were responded to by the applicant in the oral hearing in its module 1 response, and further at meetings between the applicant and DCHG/NPWS. It is understood that a point of sufficient clarity was achieved between these two parties. Moreover, the information provided in response has been considered by Mr. Dodds in his report and informed his conclusion, and therefore my conclusion, on the effect of the project on site integrity with respect to hydrogeology.</p>
19		Ms Deidre Goggin	<p>Raised concerns about the tunnelling elements of the road, understanding this to be cut and cover construction, within the Lough Corrib cSAC. She also</p>	<p>The new tunnel will be of bored construction, underneath a part of the cSAC so would not result in loss of Annex I limestone pavement from within the CSAC.</p>

	Applicants Reference	Party	Summary of submission	Response
			<p>observed that the boundaries of the cSAC seem to have been drawn to accommodate the road development, with karst continuing beneath the road, and that the rulings of the ECJ have been ignored. She raised concerns about hydrogeology and the links provided by homes and gardens which would be lost to the development, she questioned whether a longer tunnel would be more appropriate;</p>	<p>The boundaries of the CSAC were drawn before the road was conceived and so they could not have taken the proposed road in to account. Rather the applicants have taken the route which would impact on the cSAC the least, taking advantage of a gap between two areas of limestone pavement etc provided by a prehistoric valley which has been filled over geological time with clay and soil. The karst does continue beneath the road in this locality, however.</p> <p>There is one recent ruling Case-461/14 which the applicant's may not have fully addressed, however, I considered it in my assessment under the headings of <i>Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites</i>. I could not find an effect on populations within Natura 2000 sites which would be attributable to the road alone and mitigation measures in the Development Plan would deal with potential in combination effects.</p> <p>A longer tunnel would reduce impacts on the environment, including the cSAC, however, it is not necessary to achieve compliance with Article 6 of the Habitats Directive.</p>
20		Mr McDonagh	<p>Raised concerns about the potential for water quality effects on the River Corrib resulting from road discharges and existing pollution within Lackagh Quarry, stating that oil already leaks into the cSAC from here. He also made points about the loss of petrifying springs within the Lackagh Quarry including the difficulty of recreating these within the quarry (which are on</p>	<p>The discharges from the completed road will be treated in line with TII standards, which require maintenance to remain effective, Due to the maintenance requirement, the highest standard of water treatment specified in the TII guidelines is recommended to give certainty that water discharged to the River Corrib has been adequately treated. In the short term, water quality in the river would be expected to improve, as the same cars divert from old roads with no treatment of run-off to the new one.</p> <p>There is no evidence that oil leaking from the quarry is having a significant effect on the cSAC, or impacting its conservation</p>

	Applicants Reference	Party	Summary of submission	Response
			the boundary of the cSAC and a possible Annex I habitat);	<p>objectives, with both the groundwater body and the River Corrib have a good status. It may be that the leaking oil is of insufficient quantity to have an appreciable effect.</p> <p>I agree that proposals to recreate springs are not well thought through, however, the springs in this location are not a qualifying interest feature of the cSAC, nor do they provide a supporting function for those that are, and therefore recreation of these springs is not required for compliance with the Habitats Directive.</p>
21	N/A	Mr Dowds (a planning consultant) on behalf of the N6 Action Group	<p>Challenged the applicants over the level of certainty in reaching the conclusions with the NIS, chiefly because there was a need for monitoring to inform the mitigation during construction, the need for monitoring being an indication of uncertainty. The two key areas were the monitoring of the rock mass at the western approach to the Lackagh tunnel, upon which there is limestone pavement included in the cSAC and monitoring of pollutants/ contaminants during the construction process, with the potential for contaminated material entering the River Corrib and other parts of the cSAC. The remedial actions in both circumstances being unknown. In summary, Mr. Dowds questioned the credibility of applicant's case that building a motorway adjacent to an cSAC could be done without causing damage to the cSAC, due to predictable</p>	<p>To not comply with Article 6 of the Habitats Directive, the proposed road would need to bring about a change that could undermine the conservation objectives for the cSAC, meaning that it is either certain or uncertain the change would undermine the objectives. Changes, either certain or uncertain, which would not undermine the conservation objectives are permissible. In the key areas given by Mr. Dowds, the mitigated potential change would not be sufficient to undermine the conservation objectives, with or without the proposed monitoring. To undermine the conservation objectives for the limestone pavement, there would need to be a collapse of the pavement or part thereof, so as to cause its loss, whereas there is no doubt that this can be avoided. For the pollutants affecting the River Corrib, the discharge can be mitigated through good construction practice however in the event of a mitigated accidental release of, for example, suspended solids, it would be a temporary discharge which would not be of sufficient quantity or duration to have population level effects on the relevant fish populations or otter, so again, there is no doubt. Notwithstanding, the conclusion that the project would not undermine the conservation objectives are dependent on the effective implementation of the applicant's mitigation and my additional mitigation during the construction stage; this is not an ordinary</p>

	Applicants Reference	Party	Summary of submission	Response
			difficulties on construction sites, and therefore due to this risk, the application should be considered under Article 6(4) of the Habitats Directive, refer c641/17.	environment and therefore more than the usual amount of care is required to implement the mitigation measures.
22	N/A	Galway Athletics Board	Considered the project to be contrary to the Habitats Directive and prior court judgements on this topic, due to the loss of limestone pavement, and the potential impact on freshwater pearl mussels in the River Corrib, based on observations of a species of mussel observed in the River, as well as concerns about an attenuation pond close to River.	<p>The proposed road will result in the loss of Annex I limestone pavement outside of Natura 2000 sites. An assessment under Article 6 of the Directive will only consider such habitats outside of Natura 2000 sites if they provide a supporting function to those within, and would only reach a conclusion of no adverse effect on site integrity if the loss of that supporting function was enough to undermine the conservation objectives e.g., loss of positive indicator species within Natura 2000. I have assessed this under the headings of <i>Loss or decline of supporting populations of flora and fauna (not part of the qualifying interest population) within habitats lost or degrading with knock on effects on the qualifying interest habitats and populations of Natura 2000 sites</i> and was unable to identify a loss of supporting function which would undermine the conservation objectives for any Natura 2000 site that could be attributed to the proposed road alone or in combination with the other plans and projects identified in the assessment.</p> <p>I have reviewed the environmental information on the River Corrib supplied by the applicant, the assessment provided by Dr Moorkens and the known ecological requirements of the freshwater pearl mussel and agree with the applicant that the River Corrib is not suitable habitat for freshwater pearl mussel, the most likely species present in the River Corrib is the swan mussel <i>Anodonta cygnea</i>.</p> <p>The attenuation pond is, as I understand it, a necessary measure to reduce pollution entering the River Corrib.</p>

	Applicants Reference	Party	Summary of submission	Response
23	N/A	Mr Dermot A Flanagan SC	Considered the proposed road to be in accordance with the provisions of the Habitats Directive, referring to both Article 6 and Article 2.	This is also my conclusion with respect to Article 6(3), subject to the effective implementation of mitigation measures. Article 2 considerations are beyond the scope of an appropriate assessment however I did put this question to the DCHG/NPWS who concurred that the proposed road did not have an effect that was not contrary to Article 2.

Appendix 3: Site Synopsis

Site Name: Lough Corrib SAC

Site Code: 000297

Lough Corrib is situated to the north of Galway city and is the second largest lake in Ireland, with an area of approximately 18,240 ha (the entire site is 20,556 ha). The lake can be divided into two parts: a relatively shallow basin, underlain by Carboniferous limestone, in the south, and a larger, deeper basin, underlain by more acidic granite, schists, shales and sandstones to the north. The surrounding lands to the south and east are mostly pastoral farmland, while bog and heath predominate to the west and north. A number of rivers are included within the cSAC as they are important for Atlantic Salmon. These rivers include the Clare, Grange, Abbert, Sinking, Dalgan and Black to the east, as well as the Cong, Bealanabrack, Failmore, Cornamona, Drimneen and Owenriff to the west. In addition to the rivers and lake basin, adjoining areas of conservation interest, including raised bog, woodland, grassland and limestone pavement, have been incorporated into the site.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [3110] Oligotrophic Waters containing very few minerals
- [3130] Oligotrophic to Mesotrophic Standing Waters
- [3140] Hard Water Lakes
- [3260] Floating River Vegetation
- [6210] Orchid-rich Calcareous Grassland*
- [6410] *Molinia* Meadows
- [7110] Raised Bog (Active)*
- [7120] Degraded Raised Bog
- [7150] Rhynchosporion Vegetation
- [7210] *Cladium* Fens*
- [7220] Petrifying Springs*
- [7230] Alkaline Fens
- [8240] Limestone Pavement*
- [91A0] Old Oak Woodlands
- [91D0] Bog Woodland*

- [1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)
- [1092] White-clawed Crayfish (*Austropotamobius pallipes*)
- [1095] Sea Lamprey (*Petromyzon marinus*)

- [1096] Brook Lamprey (*Lampetra planeri*)
- [1106] Atlantic Salmon (*Salmo salar*)
- [1303] Lesser Horseshoe Bat (*Rhinolophus hipposideros*)
- [1355] Otter (*Lutra lutra*)
- [1393] Slender Green Feather-moss (*Drepanocladus vernicosus*)
- [1833] Slender Naiad (*Najas flexilis*)

The shallow, lime-rich waters of the southern basin of Lough Corrib support one of the most extensive beds of stoneworts (Charophytes) in Ireland, with species such as *Chara aspera*, *C. hispida*, *C. delicatula*, *C. contraria* and *C. desmacantha* mixed with submerged pondweeds (*Potamogeton perfoliatus*, *P. gramineus* and *P. lucens*), Shoreweed (*Littorella uniflora*) and Water Lobelia (*Lobelia dortmanna*). These *Chara* beds are an important source of food for waterfowl. In contrast, the northern basin contains more oligotrophic and acidic waters, without *Chara* species, but with Shoreweed, Water Lobelia, Pipewort (*Eriocaulon aquaticum*), Quillwort (*Isoetes lacustris*), Alternate Water-milfoil (*Myriophyllum alternifolium*) and Slender Naiad (*Najas flexilis*). The last-named is listed under the Flora (Protection) Order, 2015, and is an Annex II species under the E.U. Habitats Directive.

Large areas of reedswamp vegetation, dominated by varying mixtures of Common Reed (*Phragmites australis*) and Common Club-rush (*Scirpus lacustris*), occur around the margins of the lake. Reedswamp usually grades into species-rich marsh vegetation characterised by Slender Sedge (*Carex lasiocarpa*), Water Mint (*Mentha aquatica*), Water Horsetail (*Equisetum fluviatile*) and Bogbean (*Menyanthes trifoliata*). Of particular note are the extensive beds of Great Fen-sedge (*Cladium mariscus*) that have developed over the marly peat deposits in sheltered bays, particularly in the south-east corner of the lake. Alkaline fen vegetation is more widespread around the lake margins and includes, amongst the typically diverse range of plants, the Slender Cottongrass (*Eriophorum gracile*), a species protected under the Flora (Protection) Order, 2015. Wet meadows dominated by Purple Moor-grass (*Molinia caerulea*) occur in seasonally flooded areas close to the lake shore. These support species such as Sharp-flowered Rush (*Juncus acutiflorus*), Jointed Rush (*J. articulatus*), Carnation Sedge (*Carex panicea*), Devil's-bit Scabious (*Succisa pratensis*), Creeping Bent (*Agrostis stolonifera*) and Tormentil (*Potentilla erecta*), amongst others.

This large site contains four discrete raised bog areas and is selected for active raised bog, degraded raised bog, Rhynchosporion and bog woodland. Active raised bog comprises areas of high bog that are wet and actively peat-forming, where the percentage cover of bog mosses (*Sphagnum* spp.) is high, and where some or all of the following features occur: hummocks, pools, wet flats, *Sphagnum* lawns, flushes and soaks. Degraded raised bog corresponds to those areas of high bog whose hydrology has been adversely affected by peat cutting, drainage and other land use activities, but which are capable of regeneration. The Rhynchosporion habitat occurs in wet depressions, pool edges and erosion channels where the vegetation includes White Beak-sedge (*Rhynchospora alba*) and/or Brown Beak-sedge (*R. fusca*), and at least some

of the following associated species, Bog Asphodel (*Narthecium ossifragum*), sundews (*Drosera* spp.), Deergrass (*Scirpus cespitosus*) and Carnation Sedge.

At Addergoole, on the eastern shores of Lough Corrib, there is an important area of western raised bog. This bog area is one of the most westerly, relatively intact raised bogs in the country. There are also other substantial areas of raised bog along various tributaries of the Corrib in east Co. Galway, namely Slieve Bog, Lough Tee Bog and Killaclogher bog. The active parts of these bogs mostly correspond to the wettest areas, where there are well-developed surface features with hummocks, lawns and pools. It is in such areas that Rhynchosporion vegetation is best represented. The dominant species is the aquatic bog moss *Sphagnum cuspidatum*, which is usually accompanied by Bogbean, White Beak-sedge, Bog Asphodel, Common Cottongrass (*Eriophorum angustifolium*), Bog Sedge (*Carex limosa*) and Great Sundew (*Drosera anglica*). Brown Beak-sedge, a locally rare plant of wet bog pools, has been recorded from a number of the bog areas within the site. At Addergoole a substantial bog lake or soak occurs and this is infilling with large rafts of Rhynchosporion vegetation at present. This area is associated with an important area of wet bog woodland dominated by Downy Birch (*Betula pubescens*).

The largest part of the uncut high bog comprises degraded raised bog. Degraded bog is dominated by a raised bog flora which tends to be rather species-poor because of disturbance and/or drying-out. The most conspicuous vascular plant species are usually Carnation Sedge, Heather (*Calluna vulgaris*), Cottongrasses, Cross-leaved Heath (*Erica tetralix*), Bog Asphodel and Deergrass. Bog-rosemary (*Andromeda polifolia*) and Cranberry (*Vaccinium oxycoccos*), two species indicative of raised bog habitat, are frequent on both degraded and active areas of raised bog. *Sphagnum* cover is generally low within degraded areas due to a combination of drying-out and frequent burning.

Limestone pavement occurs along much of the shoreline in the lower Corrib basin, and supports a rich and diverse flora, including Herb-Robert (*Geranium robertianum*), Bloody Crane's-bill (*G. sanguineum*), Carline Thistle (*Carlina vulgaris*), Spring Gentian (*Gentiana verna*), Wild Thyme (*Thymus praecox*), Rustyback (*Ceterach officinarum*), Wood Sage (*Teucrium scorodonia*), Slender St. John's-wort (*Hypericum pulchrum*), Quaking-grass (*Briza media*) and Blue Moor-grass (*Sesleria albicans*). Areas of Hazel (*Corylus avellana*) scrub occur in association with exposed limestone pavement and these include species such as Hawthorn (*Crataegus monogyna*), Buckthorn (*Rhamnus catharticus*), Spindle (*Euonymus europaeus*), with occasional Juniper (*Juniperus communis*). Three Red Data Book species are also found in association with limestone scrub - Alder Buckthorn (*Frangula alnus*), Shrubby Cinquefoil (*Potentilla fruticosa*) and Wood Bitter-vetch (*Vicia orobus*), the latter is also protected under the Flora (Protection) Order, 2015.

Open areas of orchid-rich calcareous grassland are also found in association with the limestone exposures. These can support a typically rich vegetation, including many orchids such as Pyramidal Orchid (*Anacamptis pyramidalis*), Common Spotted-orchid (*Dactylorhiza fuchsii*), Early-purple Orchid (*Orchis mascula*), Frog Orchid (*Coeloglossum*

viride), Fragrant Orchid (*Gymnadenia conopsea*), Marsh Helleborine (*Epipactis palustris*), Greater Butterfly-orchid (*Platanthera chlorantha*) and Irish Lady's-tresses (*Spiranthes romanzoffiana*). The latter is protected under the Flora (Protection) Order, 2015.

The Hill of Doon, located in the north-western corner of the lake, is a fine example of a Sessile Oak (*Quercus petraea*) woodland. The understorey is dominated by Sessile Oak, Holly (*Ilex aquifolium*) and occasional Juniper. There are occasional Yew (*Taxus baccata*) and Ash (*Fraxinus excelsior*), and a well-developed ground layer dominated by Bilberry (*Vaccinium myrtillus*), Hard Fern (*Blechnum spicant*) and Wood Rush (*Luzula sylvatica*). Woodland also occurs on some of the islands in the lake.

A number of the rivers in the site support submerged and floating vegetation of the Ranunculion fluitantis and Callitriche-Batrachion, including mosses. For example, in the River Corrib species such as Shining Pondweed (*Potamogeton lucens*), Perfoliate Pondweed (*Potamogeton perfoliatus*), Small Pondweed (*P. berchtoldii*), Yellow Water-lily (*Nuphar lutea*), White Water-lily (*Nymphaea alba*) and stoneworts (*Chara* spp.) occur.

The rare and Annex II-listed Slender Green Feather-moss (*Drepanocladus [Hamatocaulis] vernicosus*) is found at the fen at Gortachalla, north-east of Moycullen. Here it is widespread around the margins, and this constitutes a large and significant population in the national context. A very large population of another rare moss, *Pseudocalliergon trifarium*, is also found in this area.

The lake is rated as an internationally important site for waterfowl. Counts from 1984 to 1987 revealed a mean annual peak total of 19,994 birds. In the past a maximum peak of 38,281 birds was recorded. The lake supports internationally important numbers of Pochard (average peak 8,600) and nationally important numbers of the following species: Coot (average peak 6,756), Mute Swan (average peak 176), Tufted Duck (average peak 1,317), Cormorant (average peak 110) and Greenland White-fronted Goose (average peak 83). The latter species is listed on Annex I of the E.U. Birds Directive. The Coot population is the largest in the country and populations of Tufted Duck and Pochard are second only to Lough Neagh. Breeding pairs of Common Scoter on the lake number 30-41 (1995 data), as well as breeding populations of Arctic Tern and Common Tern. Other bird species of note recorded from or close to the lake recently include Hen Harrier, Whooper Swan, Golden Plover and Kingfisher. All of these species are listed on Annex I of the E.U. Birds Directive.

Otter and Irish Hare have been recorded regularly within this site. Both of these species are listed in the Red Data Book and are legally protected by the Wildlife Act, 1976. Otter is also listed on Annex II of the E.U. Habitats Directive. Lough Corrib is considered one of the best sites in the country for Otter, due to the sheer size of the lake and associated rivers and streams, and also the generally high quality of the habitats. Atlantic Salmon (*Salmo salar*) use the lake and rivers as spawning grounds. Although this species is still fished commercially in Ireland, it is considered to be

endangered or locally threatened elsewhere in Europe and is listed on Annex II of the E.U. Habitats Directive. Lough Corrib is also a well-known fishing lake with a very good Trout (*Salmo trutta*) fishery. The lake has a population of Sea Lamprey (*Petromyzon marinus*), a scarce, though probably under-recorded species listed on Annex II of the E.U. Habitats Directive. Brook Lamprey (*Lampetra planeri*), also listed on Annex II, are also known from a number of areas within the site.

A population of Freshwater Pearl Mussel (*Margaritifera margaritifera*), a species listed on Annex II of the E.U. Habitats Directive, occurs within the site. White-clawed Crayfish (*Austropotamobius pallipes*), also listed on Annex II, is well distributed throughout Lough Corrib and its in-flowing rivers over limestone. A summer roost of Lesser Horseshoe Bat, another Annex II species, occurs within the site - approximately 100 animals were recorded here in 1999.

The main threats to the quality of this site are from water polluting activities resulting from intensification of agricultural activities on the eastern side of the lake, uncontrolled discharge of sewage which is causing localised eutrophication of the lake, and housing and boating development, which is causing the loss of native lakeshore vegetation. The raised bog habitats are susceptible to further degradation and drying out due to drainage and peat cutting and, on occasions, burning. Peat cutting threatens Addergoole Bog and already a substantial area of it has been cut away. Fishing and shooting occur in and around the lake. Introduction of exotic crayfish species or the crayfish fungal plague (*Aphanomyces astaci*) could have a serious impact on the native crayfish population. The bat roost is susceptible to disturbance or development.

Despite these ongoing issues, however, Lough Corrib is one the best examples of a large lacustrine catchment system in Ireland, with a range of habitats and species still well represented. These include 15 habitats which are listed on Annex I of the E.U. Habitats Directive, six of which are priority habitats, and nine species which are listed on Annex II. The lake is also internationally important for birds and is designated as a Special Protection Area.

Site Name: Galway Bay Complex SAC

Site Code: 000268

Situated on the west coast of Ireland, this site comprises the inner, shallow part of a large bay which is partially sheltered by the Aran Islands. The Burren karstic limestone fringes the southern sides and extends into the sublittoral. West of Galway city the bedrock geology is granite. There are numerous shallow and intertidal inlets on the eastern and southern sides, notably Muckinish, Aughinish and Kinvarra Bays. A number of small islands composed of glacial deposits are located along the eastern side. These include Eddy Island, Deer Island and Tawin Island. A diverse range of marine, coastal and terrestrial habitats, including several listed on Annex I of the E.U. Habitats Directive, occur within the site, making the area of high scientific importance.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [1140] Tidal Mudflats and Sandflats
- [1150] Coastal Lagoons*
- [1160] Large Shallow Inlets and Bays
- [1170] Reefs
- [1220] Perennial Vegetation of Stony Banks
- [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts
- [1310] *Salicornia* Mud
- [1330] Atlantic Salt Meadows
- [1410] Mediterranean Salt Meadows
- [3180] Turloughs*
- [5130] Juniper Scrub
- [6210] Orchid-rich Calcareous Grassland*
- [7210] *Cladium* Fens*
- [7230] Alkaline Fens
- [8240] Limestone Pavement*
- [1355] Otter (*Lutra lutra*)
- [1365] Common (Harbour) Seal (*Phoca vitulina*)

Galway Bay South holds a very high number of littoral communities (12). They range from rocky terraces, to sandy beaches with rock or sand dunes behind. The intertidal sediments of Galway Bay support good examples of communities that are moderately exposed to wave action. A well-defined talitrid amphipod zone in the

upper shore gives way to an intertidal, mid shore zone with sparse epifauna or infauna. On the lower, flat part of the shore, the tubes of the deposit-feeding terebellid worm, *Lanice conchilega*, are common on the surface. Nereid and cirratulid polychaete worms (*Hediste diversicolor*, *Arenicola marina*), small crustaceans and bivalves (*Angulus tenuis*, *Cerastoderma edule* and *Macoma balthica*) are present. The area has the country's only recorded example of the littoral community characterized by *Fucus serratus* with sponges, ascidians and red seaweeds on tide-swept lower eulittoral mixed substrata. This community has very high species richness (85 species), as do the sublittoral fringe communities on the Finavarra reef (88 species). The rare Purple Sea Urchin *Paracentrotus lividus* and the foliose red alga *Phyllophora sicula* are present at Finavarra, whereas the red alga *Rhodomyenia delicatula* and the rare brown alga, *Ascophyllum nodosum* var. *mackii*, occur in Kinvarra and Muckinish Bays. Sublittorally, the area has a number of distinctive and important communities. Of particular note is that Ireland's only reported piddock (bivalve mollusc) bed thrives in the shallows of Aughinish Bay. The rare sponge, *Mycale contarenii*, is also found here. There is further interest in an extensive maerl bed of *Phymatolithon calcareum* which occurs in the strong tidal currents of Muckinish Bay. There is also maerl off Finavarra Point and in Kinvarra Bay (*Lithothamnion corallioides*, *Lithophyllum dentatum* and *Lithophyllum fasciculatum*). An oyster bed in Kinvarra Bay and seagrass (*Zostera* spp.) beds off Finavarra Point are also important features. Other significant habitats which occur include secondary maerl beds and communities strongly influenced by tidal streams.

Saltmarshes are frequent within this extensive coastal site, with both E.U. Habitats Directive types, 'Atlantic Salt Meadow' and 'Mediterranean Salt Meadow' well represented. Most of the saltmarshes are classified as the bay type, with the substrate being mud or mud/sand. There is one lagoon type and one estuary type. Lagoon saltmarshes are the rarest type found in Ireland. The best examples of saltmarsh are located in inner Galway bay, east of a line running between Galway city and Kinvarra. In this area the coastline is highly indented, thus providing the sheltered conditions necessary for extensive saltmarsh development. Common saltmarsh species include Thrift (*Armeria maritima*), Red Fescue (*Festuca rubra*), Common Scurvygrass (*Cochlearia officinalis*), Lax-flowered Sea-lavender (*Limonium humile*), Common Saltmarsh-grass (*Puccinellia maritima*), Saltmarsh Rush (*Juncus gerardi*) and Sea Rush (*Juncus maritimus*). On the lower levels of the saltmarshes and within pans there occurs Glasswort (*Salicornia europaea* agg.). A noteworthy feature of the saltmarsh habitat within this site is the presence of dwarfed brown seaweeds in the vegetation. These are also known as "turf fucoids" and typical species include *Fucus* spp., *Ascophyllum nodosum* and *Pelvetia canaliculata*. A number of locally rare vascular plant species also grow in saltmarsh areas within the site. These include Reflexed Saltmarsh-grass (*Puccinellia distans*) and Sea-purslane (*Halimione portulacoides*), which are both relatively rare in the western half of the country.

Shingle and stony beaches can be found throughout the site, with the best examples along the more exposed shores to the south and west of Galway city and to the north and east of Finavarra, Co. Clare. In general, these shingle shorelines are sparsely vegetated and frequently occur interspersed with areas of sandy beach and/or

bedrock shore. The associated flora is dominated by plant species of frequently disturbed maritime habitats. To the south and west of Galway city, typical plants include Curled Dock (*Rumex crispus*), Common Couch (*Elymus repens*), Sea Sandwort (*Honkenya peploides*), Sea Beet (*Beta vulgaris* subsp. *maritima*), Sea Mayweed (*Matricaria maritima*), Silverweed (*Potentilla anserina*) and Oraches (*Atriplex* spp.). Two rare plant species are associated with the habitat: Henbane (*Hyoscyamus niger*), a threatened species listed in the Irish Red Data Book, grows on shingle beach to the south of Lough Atalia; there are also old records for the threatened plant species Seakale (*Crambe maritima*).

Soft coastal cliffs reaching heights in excess of 10m occur at Rusheen. These support coastal grassland with very sparse vegetation cover. Species recorded include Sea Plantain (*Plantago maritima*), Creeping Bent (*Agrostis stolonifera*), False Oat-grass (*Arrhenatherum elatius*), Cock's Foot (*Dactylis glomerata*), Red Fescue, Common Bird's-foot-trefoil (*Lotus corniculatus*), and the lichens *Ramalina* sp. and *Xanthoria parietina*. They are considered highly representative of the rarer soft type of sea cliffs in Ireland.

An excellent range of lagoons of different types, sizes and salinities occurs within the site. This habitat is given priority status on Annex I of the E.U. Habitats Directive. One unusual type of lagoon, karstic rock lagoon, is particularly well represented. This type of lagoon is common on the Aran Islands, but on mainland Ireland, all but one are confined to this site. Additionally, the best example of all karstic lagoons in the country, Lough Murree, is found at this site. The flora of the habitat is rich and diverse, reflecting the range of salinities in the different lagoons. It is typically brackish, with two species of Tasselweed (*Ruppia* spp.), two Red Data charophytes *Chara canescens* and *Lamprothamnion papulosum*, and *Chaetomorpha linum*, an alga (all lagoonal specialists). The fauna of the lagoon is also rich, diverse and lagoonal. At least 10 lagoonal specialist species were recorded in 1996 and 1998 from the combined habitat of all the lagoons, which is one of the highest number for any lagoonal habitat in the country. Many of the species appear to be rare. The lagoons within this site are excellent examples of the habitat type and of high conservation importance.

Other terrestrial habitats within this site which are of conservation importance include Great Fen-sedge (*Cladium mariscus*)-dominated fen and Black Bog-rush (*Schoenus nigricans*)-dominated alkaline fen at Oranmore, a turlough of moderate size at Ballinacourty, limestone pavement at Ballyconry, Gleninagh North and Newquay, dry calcareous grassland with orchids (best examples occurring west of Salthill), Juniper (*Juniperus communis*) scrub formations at Oranmore, wet grassland and an area of deciduous woodland at Barna. The orchid-rich grassland occurs on a series of small drumlin hills found to the west of Galway City, and is largely confined to the sides of the hills. Calcicole species such as Kidney Vetch (*Anthyllis vulneraria*), Harebell (*Campanula rotundifolia*), Spring Gentian (*Gentiana verna*), Common Spotted-orchid (*Dactylorhiza fuchsii*), Lesser Twayblade (*Listera ovata*), Pyramidal Orchid (*Anacamptis pyramidalis*), Yellow-wort (*Blackstonia perfoliata*) and Greater Knapweed (*Centaurea scabiosa*) are found here, among others. Juniper is also found in this area.

Areas of alkaline and *Cladium* fen as best represented near Oranmore, and species such as Great Fen-sedge, Common Reed (*Phragmites australis*), Purple Moor-grass (*Molinia caerulea*), Bogbean (*Menyanthes trifoliata*) and Long-stalked Yellow-sedge (*Carex lepidocarpa*) are found along with the usually dominant, Black Bog-rush. The turlough at Ballinacourty floods to about 25 ha in winter, and has vegetation with a typical zonation. Wetland species such as Amphibious Bistort (*Polygonum amphibium*), Common Marsh-bedstraw (*Galium palustre*) and Marsh Cinquefoil (*Potentilla palustris*) are found near the swallow-hole, with species of wet grassland close to the flood limit (e.g. Silverweed, *Potentilla anserina*, Water Mint, *Mentha aquatica* and Creeping Bent, *Agrostis stolonifera*). Sedges (*Carex* spp.) dominate in between.

Inner Galway Bay provides extensive good quality habitat for Common Seal (maximum count of 317 in the all-Ireland survey of 2003). This species is listed on Annex II of the E.U. Habitats Directive. The seals use a range of haul-out sites distributed through the bay - these include inner Oranmore Bay, Rabbit Island, St. Brendan's Island, Tawin Island, Kinvarra Bay, Aughinish Bay and Ballyvaughan. The site provides optimum habitat for Otter, also an Annex II-listed species.

Galway Bay is a very important ornithological site. The shallow waters provide excellent habitat for Great Northern Divers (35), Black-throated Divers (28), Scaup (39), Long-tailed Duck (27) and Red-breasted Merganser (232). (Figures given are peak average maxima over the 3 winters 1994/95 to 1996/97). All of these populations are of national importance. The intertidal areas and shoreline provides feeding and roosting habitat for wintering waterfowl, with Brent Goose (517) having a population of international importance and a further 11 species having populations of national importance. Four of the regular wintering species are listed on Annex I of the E.U. Birds Directive - Golden Plover, Bar-tailed Godwit and the two diver species. Breeding birds are also of importance, with significant populations of Sandwich Terns (81 pairs in 1995) and Common Terns (99 pairs in 1995), both also being listed on Annex I of the E.U. Birds Directive. A large Cormorant colony (approx. 300 pairs in 1989) occurs on Deer Island.

Fishing and aquaculture are the main commercial activities within the site. A concern is that sewage effluent and detritus of the aquaculture industry could be deleterious to benthic communities. Reef and sediment communities are vulnerable to disturbance or compaction from tractors accessing oyster trestles. The *Paracentrotus lividus* populations have been shown to be vulnerable to over-fishing. Extraction of maerl in Galway Bay is a threat. Owing to the proximity of Galway city, shoreline and terrestrial habitats are under pressure from urban expansion and recreational activities. Eutrophication is probably affecting some of the lagoons and is a continued threat. Drainage is a general threat to the turlough and fen habitats. Bird populations may be disturbed by aquaculture activities.

This large coastal site is of immense conservation importance, with many habitats listed on Annex I of the E.U. Habitats Directive, four of which have priority status

(lagoon, *Cladium* fen, turlough and orchid-rich calcareous grassland). The examples of shallow bays, reefs, lagoons and saltmarshes found within this site are amongst the best in the country. The site supports an important Common Seal colony and a breeding Otter population (Annex II species), and six regular Annex I E.U. Birds Directive species. The site also has four Red Data Book plant species, plus a host of rare or scarce marine and lagoonal animal and plant species.

SITE SYNOPSIS

SITE NAME: LOUGH CORRIB SPA

SITE CODE: 004042

Lough Corrib is the largest lake in the country and is located, for the most part, in County Galway, with a small section in the north extending into County Mayo. The lake can be divided into two parts: a relatively shallow basin in the south, which is underlain by Carboniferous limestone, and a larger, deeper basin to the north, which is underlain by more acidic granite, schists, shales and sandstones. The main inflowing rivers are the Black, Clare, Dooghta, Cregg, Owenriff and the channel from Lough Mask. The main outflowing river is the Corrib, which reaches the sea at Galway City.

The shallow, lime-rich waters of the southern basin of the lake support one of the most extensive beds of Stoneworts (Charophytes) in Ireland. These *Chara* beds are a very important source of food for waterfowl. In contrast, the northern basin contains more oligotrophic and acidic waters. Large areas of reedswamp vegetation, dominated by varying mixtures of Common Reed (*Phragmites australis*) and Common Club-rush (*Scirpus lacustris*) occur around the margins of the lake. The lake has numerous islands, which range from relatively bare rocky islets to larger islands with grassland or woodland.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Greenland White-fronted Goose, Gadwall, Shoveler, Pochard, Tufted Duck, Common Scoter, Hen Harrier, Coot, Golden Plover, Black-Headed Gull, Common Gull, Common Tern and Arctic Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetlands & Waterbirds.

Lough Corrib is an internationally important site that regularly supports in excess of 20,000 wintering waterbirds including an internationally important population of wintering Pochard (10,107) – except where indicated all figures are five year mean peaks for the period 1995/96 to 1999/2000. The site also supports nationally important populations of wintering Greenland White-fronted Goose (160 - five year mean peak for the period 1994/95 to 1998/99), Gadwall (48), Shoveler (90), Tufted Duck (5,486), Coot (14,426) and Golden Plover (1,727). Other species which occur include Mute Swan (182), Whooper Swan (35), Wigeon (528), Teal (74), Mallard (155), Goldeneye (74), Lapwing (2,424) and Curlew (114).

In winter nationally important numbers of Hen Harrier (8 - four year mean peak count between 2006 and 2009) also utilise the site as a communal roost.

Lough Corrib is also a traditional breeding site for gulls and terns, with various islands being used for nesting each year. There are important colonies of Common Tern (37 pairs in 1995) and Arctic Tern (60 pairs in 1995). The site supports substantial colonies of Black-headed Gull (431 pairs in 2000) and Common Gull (186 pairs in 2000), these representing 3% and 11% of the respective all-Ireland totals. Small numbers of Lesser Black-backed Gull, Great Black-backed Gull and Herring Gull have also been recorded breeding within the site.

The site supports approximately half of the national population of nesting Common Scoter (30 pairs in 1995); Lough Corrib was colonised by this rare, Red Data Book species only as recently as the late 1970s/early 1980s.

Lough Corrib SPA is an internationally important site which supports in excess of 20,000 wintering waterbirds, including a population of Pochard that is, itself, of international importance. A further six species of wintering waterfowl have populations of national importance. The site also contains a nationally important communal roost site for Hen Harrier. Lough Corrib is the most important site in the country for breeding Common Scoter. Its populations of breeding gulls and terns are also notable, with nationally important numbers of Black-headed Gull, Common Gull, Common Tern and Arctic Tern occurring. It is of note that several species which regularly occur are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Greenland White-fronted Goose, Hen Harrier, Golden Plover, Common Tern and Arctic Tern. Lough Corrib is a Ramsar Convention site.

7.7.2014

SITE SYNOPSIS

SITE NAME: INNER GALWAY BAY SPA

SITE CODE: 004031

Inner Galway Bay SPA is a very large, marine-dominated site situated on the west coast of Ireland. The inner bay is protected from exposure to Atlantic swells by the Aran Islands and Black Head. Subsidiary bays and inlets (e.g. Poul-na-clough, Aughinish and Kinvarra Bays) add texture to the patterns of water movement and sediment deposition, which lends variety to the marine habitats and communities. The terraced Carboniferous (Viséan) limestone platform of the Burren sweeps down to the shore and into the sublittoral. The long shoreline is noted for its diversity, and comprises complex mixtures of bedrock shore, shingle beach, sandy beach and fringing salt marshes. Intertidal sand and mud flats occur around much of the shoreline, with the largest areas being found on the sheltered eastern coast between Oranmore Bay and Kinvarra Bay. A number of small islands and rocky islets in the Bay are included within the site.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Great Northern Diver, Cormorant, Grey Heron, Light-bellied Brent Goose, Wigeon, Teal, Shoveler, Red-breasted Merganser, Ringed Plover, Golden Plover, Lapwing, Dunlin, Bar-tailed Godwit, Curlew, Redshank, Turnstone, Black-headed Gull, Common Gull, Sandwich Tern and Common Tern. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Inner Galway Bay supports an excellent diversity of wintering wetland birds, with divers, grebes, cormorants, dabbling duck, sea duck and waders all well represented. There are internationally important wintering populations of Great Northern Diver (88) and Light-Bellied Brent Goose (676) and nationally important wintering populations of an additional sixteen species i.e. Cormorant (266), Grey Heron (102), Wigeon (1,168), Teal (700), Shoveler (88), Red-breasted Merganser (249), Ringed Plover (335), Golden Plover (2,030), Lapwing (3,969), Dunlin (2,155), Bar-tailed Godwit (447), Curlew (697), Redshank (505), Turnstone (182), Black-headed Gull (1,941) and Common Gull (1,066) - all figures given are five year mean peaks for the seasons 1995/96 to 1999/2000. Of note is that the populations of Red-breasted Merganser and Ringed Plover represent 6.8% and 2.3% of the respective all-Ireland totals. Other species which occur in notable numbers include Black-throated Diver (36), Little Grebe (35), Long-tailed Duck (21), Scaup (44) and Herring Gull (216). In addition, the following species also use the site: Great Crested Grebe (16), Mallard (200), Common Scoter (87), Oystercatcher (576), Grey Plover (60), Black-tailed Godwit (46), Mute Swan (150) and Great Black-backed Gull (129). The site provides both feeding and roost sites for most of the species. Little Egret, a species which has recently colonised Ireland, also occurs at this site.

The site has several important populations of breeding birds, most notably colonies of Sandwich Tern (81 pairs in 1995) and Common Tern (98 pairs in 1995 on Green Island and 46 pairs in 2001 on Mutton Island). A large Cormorant colony occurs on Deer Island - this had 200 pairs in 1985 and 300 pairs in 1989.

Inner Galway Bay SPA is of high ornithological importance with two wintering species having populations of international importance and a further sixteen wintering species having populations of national importance. The breeding colonies of Sandwich Tern, Common Tern and Cormorant are also of national importance. Also of note is that six of the regularly occurring species are listed on Annex I of the E.U. Birds Directive, i.e. Black-throated Diver, Great Northern Diver, Golden Plover, Bar-tailed Godwit, Sandwich Tern and Common Tern. Inner Galway Bay is a Ramsar Convention site and part of the Inner Galway Bay SPA is a Wildfowl Sanctuary.

SITE SYNOPSIS

SITE NAME: CREGGANNA MARSH SPA

SITE CODE: 004142

Cregganna Marsh is situated about 3 km south of Oranmore, to the west of the Galway - Ennis road. The predominant habitats on the site are lowland wet grassland and improved grassland, but areas of limestone pavement and other exposed rock, Hazel (*Corylus avellana*) scrub, freshwater marsh, drainage ditches and dry grassland are also represented.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Greenland White-fronted Goose.

The site is of major conservation importance as a feeding site for a nationally important flock of Greenland White-fronted Goose (157 – 5 year mean peak between 1994/95 and 1998/99). The birds using this site form part of the Rahasane flock.

Cregganna Marsh SPA is of ornithological importance because it is regularly utilised by a nationally important flock of Greenland White-fronted Goose, a species listed on Annex I of the E.U. Birds Directive.

Site Name: Connemara Bog Complex SAC

Site Code: 002034

The Connemara Bog Complex SAC is a large site encompassing the majority of the south Connemara lowlands in Co. Galway. The site is bounded to the north by the Galway–Clifden road and stretches as far east as the Moycullen–Spiddal road. The site supports a wide range of habitats, including extensive tracts of western blanket bog, which form the core interest, as well as areas of heath, fen, woodlands, lakes, rivers and coastal habitats.

The site is underlain predominantly by various Galway granites, with small areas along the northern boundary of Lakes Marble, schist and gneiss. The Roundstone Bog area has a diverse bedrock geology composed mainly of the basic intrusive rock, gabbro. An area of rock, possibly Cambrian in age, called the Delaney Dome Formation occurs in the north-west of this area. Gabbro also occurs in the Kilkieran peninsula and near Cashel. The whole area was glaciated in the last Ice Age which scoured the lowlands of Connemara.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [1150] Coastal Lagoons*
- [1170] Reefs
- [3110] Oligotrophic Waters containing very few minerals
- [3130] Oligotrophic to Mesotrophic Standing Waters
- [3160] Dystrophic Lakes
- [3260] Floating River Vegetation
- [4010] Wet Heath
- [4030] Dry Heath
- [6410] *Molinia* Meadows
- [7130] Blanket Bogs (Active)*
- [7140] Transition Mires
- [7150] Rhynchosporion Vegetation
- [7230] Alkaline Fens
- [91A0] Old Oak Woodlands

- [1065] Marsh Fritillary (*Euphydryas aurinia*)
- [1106] Atlantic Salmon (*Salmo salar*)
- [1355] Otter (*Lutra lutra*)

The Connemara Bog Complex is characterized by areas of deep peat surrounded by rocky granite outcrops covered by heath vegetation. However, the main habitat within this site is lowland Atlantic blanket bog, as most of the area is covered by blanket peat greater than 1 m in depth. A mosaic of different communities exists in association with the blanket bog, including hummock/hollow systems, inter-connecting bog pools, flushes, transition and quaking mires, freshwater marshes, lakeshore, lake and river systems. The key plant species of lowland blanket bog are Black Bog-rush (*Schoenus nigricans*), Purple Moor-grass (*Molinia caerulea*), Cross-leaved Heath (*Erica tetralix*), Deergrass (*Scirpus cespitosus*), Common Cottongrass (*Eriophorum angustifolium*), Bog Asphodel (*Narthecium ossifragum*), White Beak-sedge (*Rhynchospora alba*) and bog moss species (*Sphagnum* spp.). Rhynchosporion vegetation is found on the blanket bog by lake and pool margins, in wet hollows and in quaking areas. Species such as White Beak-sedge, Common Cottongrass, Bogbean (*Menyanthes trifoliata*), sundews (*Drosera* spp.) and bog mosses are common. Areas of wet heath are widespread throughout this site, where blanket peat becomes shallower. There is a limited amount of dry heath, with species such as Western Gorse (*Ulex gallii*), St. Dabeoc's Heath (*Daboecia cantabrica*) and Bell Heather (*Erica cinerea*) recorded.

Both oligotrophic and dystrophic lakes are found within Connemara Bog Complex SAC, with the greatest concentration in the west of the site. The latter type are generally smaller, have a mainly peaty bottom and there is generally an abrupt transition from blanket bog to open water. Oligotrophic lakes in this site typically have shallow margins, with a mixed rocky/peaty bottom. Typical plant species of the lake edges include Water Lobelia (*Lobelia dortmanna*), Pipewort (*Eriocaulon aquaticum*), Shoreweed (*Littorella uniflora*), Many-stalked Spike-rush (*Eleocharis multicaulis*) and Bulbous Rush (*Juncus bulbosus*). The rare species Slender Naiad (*Najas flexilis*) and Pillwort (*Pilularia globulifera*) have both been recorded from oligotrophic lakes at this site. Species commonly encountered in dystrophic lakes/pools include the bog mosses *Sphagnum auriculatum* var. *auriculatum* and *S. cuspidatum*, along with White Beak-sedge, Lesser Bladderwort (*Utricularia minor*), Pipewort and Bogbean.

The main river systems within the site are the Owenmore (Ballynahinch) river, the Glashanasmearany and Derrygauna rivers (to the south of Lough Bofin), the Cashla river (which flows out of Glenicmurrin Lough), the Glengawbeg river (which connects Lough Agraffard and Lettercraffoe Lough) and the Owenboliska river and its tributaries (north of Spiddal). Vegetation associated with some of these waterways includes Alternate Water-milfoil (*Myriophyllum alternifolium*), Bulbous Rush, Floating Club-rush (*Scirpus fluitans*), water-lilies, Great Fen-sedge (*Cladium mariscus*), Bog Pondweed (*Potamogeton polygonifolius*), Broad-leaved Pondweed (*P. natans*), Water Horsetail (*Equisetum fluviatile*) and the liverwort *Scapania undulata*.

Within this site, areas of transition mire occur mainly along the margins of lakes and bog streams. The surface of such areas is typically quaking and there is often evidence of base-enrichment. Typical plant species include Bog-sedge (*Carex limosa*), Slender Sedge (*C. lasiocarpa*), Bog Pondweed, Bogbean, Blunt-flowered Rush (*Juncus subnodulosus*), Common Cottongrass, Purple Moor-grass and White Beak-sedge. Locally there may be some Great Fen-sedge or Black Bog-rush. The rare and legally protected species Slender Cottongrass (*Eriophorum gracile*) occurs in this habitat. Moss cover is variable.

Areas of *Molinia* meadow at this site contain species such as Purple Moor-grass, Meadow Thistle (*Cirsium dissectum*), Sharp-flowered Rush (*Juncus acutiflorus*) and Tormentil (*Potentilla erecta*). The community occurs on wet acid soils.

There are a number of areas of old oak woodland, but the woodland at Shannawoneen, north of Spiddal, is the best known. This woodland lies in the valley of the Owenboliska river. It provides a good example of a Sessile Oak (*Quercus petraea*) dominated canopy woodland, although there is also a lot of Downy Birch (*Betula pubescens*). Other examples of this habitat at the site are found at Ballynahinch, Glendollagh, Derrywaking Lake, as well as on some of the lake islands. The invasive alien shrub Rhododendron (*Rhododendron ponticum*) is found in some areas of woodland.

There are some limited, but nonetheless well developed, examples of alkaline fen at this site. These fens are often species-rich, and support species not typically found in association with blanket bog areas - e.g. Dioecious Sedge (*C. dioica*), Black Bog-rush, Broad-leaved Cottongrass (*E. latifolium*), the moss *Campyllum stellatum* and Lesser Clubmoss (*Selaginella selaginoides*).

Four main lagoons occur within this site: Lough Ahalia, Doire Bhanbh, Lough Aconeera and Salt Lake. All four are regarded as saline lake lagoons and they range in size from 1–90 ha. The smallest (Doire Bhanbh) is quite shallow and surrounded by Common Reed (*Phragmites australis*) swamp, while the three larger lagoons are relatively deep and are surrounded by moorland and exposed granite. Salt Lake contains a serpulid worm reef. Lough Ahalia consists of a series of basins, and these are deep in places, with an unusual salinity structure. The lowest lake is relatively shallow (0–4 m) and brackish throughout, while the middle lake is deep (13 m) and permanently stratified, with water below 3 m depth measuring 14 ppt. The flora and fauna of this lagoon system are extremely diverse, with many communities found. This, along with Lough Aconeera, is the only known site in Ireland for the Red Data Book stonewort *Chara balthica*. Another Red Data Book plant, *Lamprothamnium papulosum*, also occurs, as well as *Chara aspera* and *C. virgata*. An unusual form of Fennel Pondweed (*Potamogeton pectinatus*) occurs in high salinity water. There are a number of other notable records of plant and animal from this lagoon. Lough Aconeera is less remarkable in terms of flora and fauna, but nonetheless supports a sizeable number of lagoonal specialists.

Nine species protected under the Flora (Protection) Order, 2015, occur within this site: Forked Spleenwort (*Asplenium septentrionale*), Parsley Fern (*Cryptogramma crispa*), Bog Hair-grass (*Deschampsia setacea*), Slender Cottongrass, Bog Orchid (*Hammarbya paludosa*), Slender Naiad, Heath Cudweed (*Omalotheca sylvatica*), Pillwort and Pale Dog-violet (*Viola lactea*). Rare and threatened species such as Dorset Heath (*Erica ciliaris*), Mackay's Heath (*Erica mackaiana*) and Green-winged Orchid (*Orchis morio*) also occur within this site. All of the above species are listed in the Irish Red Data Book, and Slender Naiad is listed on Annex II of the E.U. Habitats Directive.

The Annex II butterfly species, Marsh Fritillary, is known to occur at this site.

Atlantic Salmon, a species listed under Annex II of the E.U. Habitats Directive, occurs in many of the rivers within the site. The Cashla and Ballynahinch systems are good examples of western acidic spate rivers which support the species. Good spawning and nursery grounds for the species occur in these systems. Arctic Char occurs in a number of lakes within the site: Ballynahinch Lake, Glenicmurrin Lough and Lough Shindilla. The species has also been reported from Lough Oorid and Lough Glendollagh in the past, but has not been recorded from these lakes in recent years. Arctic Char is listed as threatened in the Irish Red Data Book.

Otter have been recorded as occurring in the Connemara Bog Complex. Irish Hare, another mammal listed in the Red Data Book, occurs on the site. Common Frog breeds on the site.

The site is of national importance for wintering populations of Greenland White-fronted Goose. Small flocks (up to 30) are found on Roundstone Bog and also use the bogs between Recess and Maam Cross. In April 1989 a synchronised ground and air census of the Connemara bogs located 7 flocks of Greenland White-fronted Goose, totalling 134–137 birds. In 1991/93 wintering numbers were considered to be approximately 60 birds.

There is an internationally important breeding area for Cormorants at Lough Scannive with 218 pairs present in 1985 in a colony which is known to have existed pre-1968. Golden Plover, a species listed on Annex I of the E.U. Birds Directive, nests at up to four locations in the site, with a maximum of two pairs noted at any one location. Another Annex I species known to be present in the site is Merlin. Lough Naskanniva is an important inland breeding site for Common Terns (up to 60 pairs in 1977 and 1992) and Choughs, both of which are also Annex I species under the E.U. Birds Directive.

The main damaging operations and threats in the Connemara Bog Complex are peat cutting, over-grazing and afforestation. Extensive peat extraction using 'Difco' machines has become common in the region in recent years, and cutting by excavator and hopper is also increasing. The hand-cutting of peat is less threatening as it is usually on a much smaller scale, but nonetheless it should be controlled within the site. Over-grazing and poaching by sheep and cattle is a widespread problem within the site, with erosion of peat ensuing. The above operations are the most extensive

but other threats and potentially damaging operations include land drainage and reclamation, fertilization, quarrying and dumping.

In summary, the Connemara Bog Complex encompasses a large area of relatively undamaged lowland Atlantic blanket bog of high conservation significance both in Ireland and at a European level. The site also contains good examples of at least 13 other habitats listed on Annex I of the E.U. Habitats Directive, as well as four species listed in Annex II. Further, the site supports a number of threatened and protected plant species. The site is internationally important for Cormorant and nationally important for Greenland White-fronted Goose, and contains nesting sites for Golden Plover.

SITE SYNOPSIS

SITE NAME: CONNEMARA BOG COMPLEX SPA

SITE CODE: 004181

The Connemara Bog Complex SPA is a large site encompassing much of the south Connemara lowlands of Co. Galway. The site consists of three separate areas - north of Roundstone, south of Recess and north-west of Spiddal. It is underlain predominantly by a variety of igneous and metamorphic rocks including granite, schist, gneiss and gabbro. The whole area was glaciated during the last Ice Age which scoured the lowlands of Connemara.

The Connemara Bog Complex SPA is characterized by areas of deep peat surrounded by heath-covered rocky outcrops. The deeper peat areas are often bordered by river systems and the many oligotrophic lakes that occur, resulting in an intricate mosaic of various peatland/wetland habitats and vegetation communities; these include Atlantic blanket bog with hummock/hollow systems, inter-connecting pools, Atlantic blanket bog pools, flushes, transition and quaking mires, as well as freshwater marshes, lakeshore, lake and river systems.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Merlin, Golden Plover and Common Gull.

Lough Scannive, located within Roundstone Bog, supports a nationally important breeding population of Cormorant (160 breeding pairs in 2001). Other breeding birds using the site include Merlin and Golden Plover. A partial survey in 2009 recorded 8 pairs of Merlin at various locations throughout the site; 15 breeding locations for this species were recorded at the site in an earlier survey undertaken in 1985/86. A survey of upland birds in 2004 recorded 27 pairs of Golden Plover within the site. The numerous lakes scattered throughout the site provide suitable breeding locations for Common Gull (45 pairs in 2000); a survey in 2010 recorded 40 pairs of this species at the site.

The site is also utilised by a wintering population of Greenland White-fronted Goose; small flocks of up to 30 birds have been recorded at various locations within the site.

Connemara Bog Complex SPA is of high ornithological importance, in particular for its nationally important breeding populations of Cormorant, Merlin, Golden Plover and Common Gull. It is of note that three of the regularly occurring species, Greenland White-fronted Goose, Merlin and Golden Plover, are listed on Annex I of the E.U. Birds Directive.

30.11.2010



Site Name: Lough Fingall Complex SAC

Site Code: 000606

This site is situated immediately south-east of Ballindeereen in Co. Galway, and within 2-3 km of Galway Bay. It is within the stretch of flat low-lying bare limestones known as the Ardrahan limestones, which extend from the foot of the Burren hills northwards towards Craughwell. The site comprises a complex of habitats, the dominant being turloughs and limestone pavement.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[3180] Turloughs*
[4060] Alpine and Subalpine Heaths
[5130] Juniper Scrub
[6210] Orchid-rich Calcareous Grassland*
[7210] <i>Cladium</i> Fens*
[8240] Limestone Pavement*
[1303] Lesser Horseshoe Bat (<i>Rhinolophus hipposideros</i>)

The turloughs at this site are oligotrophic (nutrient-poor) and calcareous in character. Their catchment areas are relatively small and water tends to remain in them for considerable periods of time. The surface waters usually occupy distinct separate basins in most years but during extreme floods these can be linked together as one large expanse of open water. Taken together these turloughs represent one of the largest expanses of oligotrophic turlough vegetation in the country.

Ballinderreen turlough occupies a flat limestone pavement basin and supports extensive areas of Black Bog-rush (*Schoenus nigricans*) and sedge (*Carex* spp.) fen vegetation. Marl ponds occur in the lower lying parts, with Shoreweed (*Littorella uniflora*), Bulbous Rush (*Juncus bulbosus*), Many-stalked Spike-rush (*Eleocharis multicaulis*), Alternate Water-milfoil (*Myriophyllum alternifolium*), along with a little Horned Pondweed (*Zannichellia palustris*) and stonewort (*Chara hispida* var. *major*). Rare plants found at this turlough include Fen Violet (*Viola persicifolia*), a Red Data Book species, Water Germander (*Teucrium scordium*) and Marsh Fern (*Thelypteris palustris*).

A smaller area to the south-east of Ballinderreen, Frenchpark turlough, contains a Black Bog-rush/Purple Moor-grass (*Molinia caerulea*) stand with patches of Great Fen-sedge (*Cladium mariscus*) within it. Cuildoosh turlough is of linear shape with a high

central section. It has level limestone pavement forming its eastern side and is aligned and lies parallel with Lough Fingall, which is effectively also a turlough. There is much Buckthorn (*Rhamnus catharticus*) scrub here and at the northern end of the main lake. Carraghadoo turlough has a shallow basin without standing water in summer and with less peat. Creeping Willow (*Salix repens*) and Common Sedge (*Carex nigra*) are the main species here. The shores of Tullaghnafrankagh Lough flood during winter and have a similar, if slightly more eutrophic (nutrient-rich), vegetation. Alder Buckthorn (*Frangula alnus*), a Red Data Book species, grows on sloping limestone pavement close to the limit of winter flooding in several places.

Limestone pavement occurs throughout the site. It varies from the classic bare open pavement, with little vegetation, to pavement and shattered limestone blocks interspersed with calcareous grassland, heath, turlough and scrub. A rich and diverse flora occurs, with many of the typical Burren species represented - Bloody Crane's-bill (*Geranium sanguineum*), Herb-Robert (*G. robertianum*), Rustyback (*Ceterach officinarum*), Burnet Rose (*Rosa pimpinellifolia*) and Wood Sage (*Teucrium scorodonia*), along with some rarer species such as Spring Gentian (*Gentiana verna*) and Mountain Avens (*Dryas octopetala*).

Orchid species present in areas of calcareous grassland at the site include Fly Orchid (*Ophrys insectifera*), Lesser Butterfly-orchid (*Platanthera bifolia*), Early-purple Orchid (*Orchis mascula*) and several *Dactylorhiza* species. In the past, the scarce Dense-flowered Orchid (*Neotinea maculata*) has been recorded from the site.

Lough Fingall, Cloghballymore Lough and Cahernalinsky Lough are shallow infilling lakes with stands of Great Fen-sedge and other fen and wetland vegetation such as Common Reed (*Phragmites australis*) and Tufted-sedge (*Carex elata*).

Juniper scrub and lowland alpine heath occur in close association with one another. The juniper scrub is dominated by Juniper (*Juniperus communis*), with Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*) and rose (*Rosa* spp.) species. Lowland alpine heath is characterised by Bearberry (*Arctostaphylos uva-ursi*) and Mountain Avens, a rare vegetation type known from a few areas in the Burren, the Lough Fingall area and the Moycullen area near Lough Corrib.

Cloghballymore House provides a summer breeding site for the Lesser Horseshoe Bat, a species listed on Annex II of the E.U. Habitats Directive. The bats use the large roof space, although a smaller number roost in a boiler house, gaining access by means of gaps around the pipes. The surrounding mixed woods provide suitable foraging habitat within a short radius of the day roost site. In 1993 more than 200 bats were counted at this site, which makes it of international importance.

The site is of local importance for wintering waterfowl, particularly Lapwing (max. count 381 in 1995/96), with 6 breeding pairs recorded in 1996. Some scarce invertebrate species have been recorded from the Lough Fingall area.

The main land use in the site is cattle grazing, which is mostly of light to moderate intensity. Clearance of limestone pavement and scrub has taken place in the past and burning is a threat to the heath habitats. A drainage scheme to relieve exceptional flooding has been implemented recently. There are no immediate threats facing the bat population.

This site is of great conservation importance for the presence of six E.U. Habitats Directive habitats, including four priority habitats. The transitions and gradations between habitats, for example between turloughs, lakes and limestone pavement, gives rise to a range of physical conditions that favour many uncommon species. In addition, the site supports an internationally important population of Lesser Horseshoe Bats.

Site Name: Ross Lake and Woods SAC

Site Code: 001312

Ross Lake and Woods is located approximately 4 km north-west of Moycullen on the west side of Lough Corrib in Co. Galway. The area is underlain by limestone.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[3140] Hard Water Lakes

[1303] Lesser Horseshoe Bat (*Rhinolophus hipposideros*)

The main habitat on the site is a medium-sized lake, Ross Lake, which has a limestone bed covered by deposits of precipitated marl and a shoreline of marl-encrusted limestone boulders. It is a good example of a hard water lake, and supports beds of stoneworts, including *Chara globularis* var. *virgata*, *C. pedunculata* and *C. curta*. The last two species in particular are characteristic of marl lakes. The open water also supports Yellow Water-lily (*Nuphar lutea*) and Broad-leaved Pondweed (*Potamogeton natans*).

Most of the shoreline is fringed by wetland vegetation of reedswamp, freshwater marsh, fen, wet woodland and wet grassland. Reedswamp vegetation is dominated by Common Reed (*Phragmites australis*) and Common Club-rush (*Scirpus lacustris*), with Great Fen-sedge (*Cladium mariscus*) also occurring. The rocky limestone shore mostly supports fen-type vegetation characterised by Black Bog-rush (*Schoenus nigricans*). This grades into areas of wet grassland dominated by Purple Moor-grass (*Molinia caerulea*) and species-rich marsh, characterised by species such as Slender Sedge (*Carex lasiocarpa*), Marsh Pennywort (*Hydrocotyle vulgaris*) and Water Mint (*Mentha aquatica*). Also found around the lake edge is well-developed wet woodland, with Alder (*Alnus glutinosa*) and willows (*Salix* spp.) occurring commonly, accompanied by Spindle (*Euonymus europaeus*), Buckthorn (*Rhamnus catharticus*), Guelder-rose (*Viburnum opulus*) and Bog-myrtle (*Myrica gale*).

A small lake, Lough Parkyflaherty, is separated from the main lake by an overgrown railway embankment.

The site contains a large block of coniferous plantation, consisting largely of spruce (*Picea* sp.) and larch (*Larix* sp.) species, on the site of a former mixed-deciduous woodland, Annagh Wood. There are also areas of broadleaved woodland and scrub, dominated variously by Beech (*Fagus sylvatica*), Ash (*Fraxinus excelsior*) or Hazel (*Corylus avellana*).

A breeding colony (not less than 155 individuals counted in 1994) of Lesser Horseshoe Bat occurs in an out-building beside Ross House. This species is threatened within the EU and the population at this site is rated of international importance. The woodlands and lakeside vegetation on the site provide foraging habitat within a small radius of the roost site. The woodlands in particular are very important to this species in providing shelter to reach foraging habitats and seasonal roosts as it does not fly across open areas.

The presence on the site of Otter, a species also listed on Annex II of the E.U. Habitats Directive, and of a small colony of Common Gull (10 individuals breeding in 1992) is notable.

The main land uses within the site are angling, commercial forestry, and grazing of the woodland and wetland areas.

The site is of importance because it contains a good example of a hard water lake, a habitat listed on Annex I of the E.U. Habitats Directive, and for the internationally important population of Lesser Horseshoe Bat, a species listed on Annex II of this Directive, which occurs. The presence of Otter and breeding Common Gull is also of note.

Site Name: Black Head-Poulsallagh Complex SAC

Site Code: 000020

The Black Head-Poulsallagh complex encompasses a complete range of rocky Burren habitats from coastal, glacially planed limestone pavements to high level heaths. The Caher River, the only river found in the high Burren, and Fanore dunes, one of the best dune systems in Clare, are included in the site. The shoreline, littoral and sublittoral areas are also interesting because of the rock type, physical exposure, and flora and fauna communities.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [1170] Reefs
- [1220] Perennial Vegetation of Stony Banks
- [2130] Fixed coastal dunes with herbaceous vegetation (grey dunes)
- [3260] Floating River Vegetation
- [4060] Alpine and Subalpine Heaths
- [5130] Juniper Scrub
- [6210] Orchid-rich Calcareous Grassland*
- [6510] Lowland Hay Meadows
- [7220] Petrifying Springs*
- [8240] Limestone Pavement*
- [8330] Sea Caves
- [1395] Petalwort (*Petalophyllum ralfsii*)

The shoreline of this site has the best examples in Ireland of an important biogeographical variation of intertidal reefs extremely exposed to wave action, and these shores have been described as some of the most interesting open coast shores of both Britain and Ireland. The shores are gently sloping, stepped limestone pavements over most of the site, but at Black Head the shore is narrow and very steeply stepped.

There are numerous shallow rockpools on the shore. These frequently support large numbers of the Purple Sea Urchin, *Paracentrotus lividus*, that have burrowed into the limestone so that each urchin sits in a well-defined hollow. The pools also support the Beadlet Anemone *Actina equina*, the top shells *Gibbula magus*, *G. cineraria* and *G. umbilicalis*, and the coralline algae *Corallina officinalis*. A variety of algae may be found in the pools, including the red algae *Chondrus crispus*, *Plocamium cartilagineum*

and *Palmaria palmata*, and the brown algae *Dictyota dichotoma* and *Bifurcaria bifurcata* where the pools are deep enough. Of particular ecological importance is that both the Purple Sea Urchin and the brown alga *Bifurcaria bifurcata* are close to the northern limits of their distribution.

Marine caves are a feature of the site and this is probably the best known extensive network of caves that are connected to the sea in Ireland. Their occurrence on a very exposed coast with difficult access gives very limited opportunities for biological survey work. It is known, however, that the caves are well scoured and it can be assumed that they exist in a very natural state.

The limestone pavement includes smooth, blocky and shattered types, and is particularly well represented in the Poulsallagh area. Erratics of Galway granite occur within the site, especially around Black Head. The bare pavement is interspersed with fine examples of species-rich, dry calcareous grassland. Limestone heath is also well developed, particularly on the higher areas to the north and north-east, where Bearberry (*Arctostaphylos uva-ursi*) occurs.

The rare Intermediate Wintergreen (*Pyrola media*) occurs on the high heaths. Other rare plants of limestone heaths are Hoary Rock-rose (*Helianthemum canum*) and Pyramidal Bugle (*Ajuga pyramidalis*), both of which occur in the Poulsallagh area.

The Caher River is a shallow, spring-fed stream approximately 5 km long, which flows underground for some of its course during dry periods. The upper section is heavily shaded by Hazel (*Corylus avellana*) scrub, which in the vicinity of the channel bears a luxuriant lichen flora. The lower section of river is on limestone bedrock and periodically dries out. This part of the river is dominated by mosses and algal crusts, both of which are heavily calcified, and in some places form tufa deposits of considerable thickness.

Fanore dunes, located south of Black Head, are formed over limestone. The bedrock can be seen outcropping in the low-lying areas. As a result, the sand is highly calcareous in nature and the dune vegetation comprises a number of calcicolous (calcium-loving) species. These include Pyramidal Orchid (*Anacamptis pyramidalis*), Thyme-leaved Sandwort (*Arenaria serpyllifolia*), Squinancywort (*Asperula cynanchica*) and Hairy Rock-cress (*Arabis hirsuta*). The parasitic Dodder (*Cuscuta epithimum*) grows in abundance and the profusion of orchid species including Pyramidal Orchid, Fragrant Orchid (*Gymnadenia conopsea*) and a range of *Dactylorhiza* species is noteworthy. Species recorded from the high dunes include Sea-holly (*Eryngium maritimum*), Sea Spurge (*Euphorbia paralias*) and Marram Grass (*Ammophila arenaria*). A small population of the rare liverwort *Petalophyllum ralfsii*, a species is listed on Annex I of the E.U. Habitats Directive, occurs within a damp, grassy area of the dunes.

A superb and extensive example of a highly exposed vegetated shingle bank occurs at Poulsallagh, with substrate ranging from large limestone boulders to pebbles. Species present include Thrift (*Armeria maritima*), Common Scurvygrass (*Cochlearia*

officinalis), Sea Samphire (*Crithmum maritimum*), Red Fescue (*Festuca rubra*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Sea Plantain (*Plantago maritima*), Buck's-horn Plantain (*Plantago coronopus*) and Sea Mayweed (*Matricaria maritima*). The population of Sea Samphire is considered the best in the region. Lichen cover is particularly well developed.

The northern part of Black Head hosts approximately 25 breeding pairs of Black Guillemot while up to 15 Black-throated Divers winter there (this species is listed in Annex I of the E.U. Birds Directive).

Most of the terrestrial part of the site is grazed by cattle and sheep, particularly in winter, and by goats throughout the year, sometimes resulting in over-grazing. Scrub clearance and intensification of agriculture has caused damage to parts of the site and is a threat to the water quality of the Caher River. Some agriculturally improved areas in the Caher River catchment have been included within the site for hydrological reasons. Leisure activities, including the construction of a caravan park, in the Fanore area has led to erosion and a deterioration of the quality of the dune area.

Due to the presence of fine examples of Burren habitats, the site is of international scientific interest. The limestone pavement and heath and the marine component are particularly noteworthy, while the plant communities contain a high density of rare and interesting species.



Site Name: Rahasane Turlough SAC

Site Code: 000322

Rahasane Turlough lies in gently undulating land, approximately 2 km west of Craughwell, Co. Galway. It consists of two basins which are connected at times of flood but separated as the waters decline. The larger of these, the northern basin, takes the Dunkellin River westwards.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[3180] Turloughs*

Rahasane Turlough was formerly the natural sink of the Dunkellin River, but now an artificial channel takes some of the water further downstream. Water escapes the artificial channel to sweep around the northern basin, and again in the west, where it flows into an active swallow-hole system. The main swallow-holes here are constantly changing, but reach 5 m in diameter and 2-3 m deep. Some minor collapses are found elsewhere in the turlough, as well as a small number of more permanent pools. Mostly, the edges of the turlough rise gradually into the surrounding land, but in places, rocks mark a more sudden transition. The southern basin is an impressive feature, with high rocky sides above an undulating base, strewn with boulders. There is a low hill on the south side of the main basin, and another on the north-east, near Shanbally Castle, where smooth limestone pavement is evident. The major part of the turlough is open, flat and grassy, with occasional depressions and dry channels. The substrate consists largely of silty clay with shell fragments, reaching over 3 m in thickness. Locally in the main basin there are signs of marl, but peat is absent everywhere. Like the southern basin, the eastern end of the main (northern) basin is distinguished by the presence of large rocks scattered over the floor.

The vegetation of Rahasane is divided between dry and wet communities. Because of its large catchment, the turlough is naturally eutrophic and this, together with a lack of peat, limits the sedges (*Carex* spp.) which are usually abundant in turlough vegetation. In places with outcropping limestone, the vegetation is predominantly dry grassland with Red Fescue (*Festuca rubra*) and Crested Dog's-tail (*Cynosurus cristatus*), among a generally calcicole community. Large areas in the drier parts of the turlough are covered by a community characterised by an abundance of Creeping Cinquefoil (*Potentilla reptans*), with Common Sedge (*Carex nigra*), Silverweed (*Potentilla anserina*) and Creeping Bent (*Agrostis stolonifera*). Where the soil is less well-drained, Creeping Cinquefoil disappears from this community and the

rare species, Fen Violet (*Viola persicifolia*), which is listed in the Irish Red Data Book, occurs. In these areas, the presence of Common Spike-rush (*Eleocharis palustris*) suggests that water is close to the surface.

Wet communities are associated with the river channels and pools. Fully aquatic communities include such species as Fan-leaved Water Crowfoot (*Ranunculus circinatus*), Fennel Pondweed (*Potamogeton pectinatus*), Lesser Pondweed (*P. pusillus*), Fat Duckweed (*Lemna gibba*), Whorled Water-milfoil (*Myriophyllum verticillatum*) and Needle Spike-rush (*Eleocharis acicularis*). Semi-aquatic communities fringe the main channel of the river and colonise muddy pools in the basin. Species such as Lesser Water-parsnip (*Berula erecta*), Fool's Water-cress (*Apium nodiflorum*), River Water-dropwort (*Oenanthe fluviatilis*) and Amphibious Bistort (*Polygonum amphibium*) occur, along with the rare species, Northern Yellow-cress (*Rorippa islandica*), which is listed in the Irish Red Data Book. There are also some narrow fields with Yellow Iris (*Iris pseudacorus*).

There are small areas of scrub on the southern and north-western sides of the turlough, but the area of flooded woodland is small. The scrub is made up of Buckthorn (*Rhamnus cathartica*), Ash (*Fraxinus excelsior*) and Hazel (*Corylus avellana*). The trees support a range of epiphytic mosses such as *Leskea polycarpa*, *Amblystegium riparium*, *Isopterygium elegans*, *Isothecium myosuroides* and *Thuidium tamariscinum*.

Rahasane Turlough is renowned for its wintering wildfowl populations, but it also supports nesting waders in summer, which include Lapwing, Redshank, Snipe and Dunlin. Figures stated in the following account represent mean (and peak) counts obtained during the three seasons, 1984/85 to 1986/87. Internationally important numbers of Whooper Swan 179, Golden Plover 17680, Wigeon 7760 and Shoveler 498 are found. The first two species, together with Bewick's Swan, below, are listed on Annex I of the E.U. Birds Directive. Species recorded in nationally important numbers are Bewick's Swan 132, Mute Swan 125, Teal 3005, Mallard 777, Pintail 102, Pochard 356, Tufted Duck 381, Coot 1289, Lapwing 3995, Dunlin 3569 (5653), Black-tailed Godwit 170 and Curlew 1205. Small numbers of the internationally important Greenland White-fronted Goose regularly overwinter at Rahasane (average count, as above, 59), but numbers have been declining over the years.

There is a small run of Atlantic Salmon (*Salmo salar*) through the Dunkellin River when it is flowing overground. The fish pass through the turlough but do not use it for spawning. This species is listed on Annex II of the E.U. Habitats Directive.

The Fairy Shrimp (*Tanymastix stagnalis*, Class Crustacea) was first recorded in Ireland from the southern basin at Rahasane, though it has since been recorded elsewhere. It requires isolation from predators to grow to reproductive age and so cannot occur in permanent waterbodies.

The turlough is closely grazed by cattle, sheep and horses. Grazing is a critical factor in maintaining a balance between open swards and woodland development at the edges of the turlough. Drainage is a major threat to turloughs, but the Dunkellin

River has not been arterially drained. The river was straightened many years ago where it crosses the turlough, and the artificial channel was dredged again in 1992, but this does not appear to have affected winter flooding. Some degree of artificial enrichment of the basin is occurring from the farming areas upstream, and local enrichment is associated with grazing practices. Eutrophication is among the major threats to turlough systems in general.

Rahasane Turlough is of major ecological significance as one of only two large turloughs in the country which still function naturally. It is the most important turlough in Ireland for birdlife. In a relatively recent national survey, it was also rated very highly for its vegetation, and supports two rare species listed in the Irish Red Data Book. Turloughs are a rare habitat type and are given priority status under Annex I of the E.U. Habitats Directive.

SITE SYNOPSIS

SITE NAME: RAHASANE TURLOUGH SPA

SITE CODE: 004089

Rahasane Turlough lies in gently undulating land, approximately 2 km west of Craughwell, Co. Galway. It consists of two basins which are connected at times of flood but separated as the waters recede. The larger of these, the northern basin, takes the Dunkellin River westwards. Rahasane was formerly the natural sink of the Dunkellin River, but now an artificial channel takes some of the water further downstream. Water escapes the artificial channel to sweep around the northern basin, and again in the west, where it flows into an active swallowhole system. Some minor collapses are found elsewhere in the turlough, as well as a small number of more permanent pools. The substrate consists largely of silty clay.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation importance for the following species: Whooper Swan, Greenland White-fronted Goose, Wigeon, Golden Plover and Black-tailed Godwit. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Rahasane is a traditional site for Greenland White-fronted Goose, and supports a population of national importance (157 individuals - five year mean peak for the period 1994/95 to 1998/99). It is of international importance for Black-tailed Godwit (437 - all figures are five year mean peaks for the period 1995/96 to 1999/2000). It also has nationally important populations of Whooper Swan (165), Wigeon (3,430), and Golden Plover (6,613). The site has the largest inland population of Dunlin (864) in the country and also supports Mute Swan (57), Teal (307), Mallard (142), Pintail (19), Shoveler (28), Tufted Duck (32), Grey Heron (31), Lapwing (2,220), Curlew (197), Redshank (134) and Black-headed Gull (280). Little Egret, a species which has recently colonised Ireland, also occurs at this site.

Rahasane Turlough SPA is of high ornithological importance; it supports nationally important populations of four species and an internationally important population of one. The Wigeon and Golden Plover populations are of particular note as they each represent approximately 4% of the All-Ireland totals of these species. The regular occurrence of Greenland White-fronted Goose, Whooper Swan and Golden Plover is of note as these species are listed on Annex I of the E.U. Birds Directive.

9.7.2014

Site Name: Kiltiernan Turlough SAC

Site Code: 001285

Kiltiernan Turlough lies in a linear depression running south-westwards from the main Galway-Limerick road, north-west of Ardrahan in Co. Galway. It has a flattish basin which lies approximately 2 m below road level, and includes about eight further depressions which are joined in times of high water. The site includes a low ridge on the south-eastern side. Towards the west the topography becomes flatter and the basin breaks into separate hollows.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[3180] Turloughs*

This site comprises a relatively dry turlough with a limited, though regular, flood in winter. The vegetation is mostly species-poor grassland dominated by White Clover (*Trifolium repens*), Silverweed (*Potentilla anserina*) and Creeping Bent (*Agrostis stolonifera*), with some areas of species-rich grassland found in the western half. Beside the road, the rocky outcrops support limestone grassland and there are narrow fringes of scrub along each side of the basin. The scrub is predominantly of Blackthorn (*Prunus spinosa*), but some Buckthorn (*Rhamnus catharticus*) and Alder Buckthorn (*Frangula alnus*), a rare Red Data Book species, also occur.

The grassland occurring in the main depressions of this site have been modified by trampling and over-grazing. Here the main species found are Northern Bedstraw (*Galium boreale*) and Creeping Cinquefoil (*Potentilla reptans*), which grow in clumps with much Silverweed and Greater Plantain (*Plantago major*). Hollows in this vegetation contain Common Sedge (*Carex nigra*) and Amphibious Bistort (*Polygonum amphibium*). In the less intensified eastern section of the site the Red Data Book species Fen Violet (*Viola persicifolia*) occurs.

Lapwing, Pochard, Teal and Wigeon have been recorded at the site, and other bird species may visit from the nearby Tullaghnafrankagh Lough.

Land use on the site comprises grazing, particularly in the eastern half, with some areas of tillage found in the west.

Kiltiernan Turlough is an example of a partly modified, relatively dry turlough, without any accumulation of peat. It includes a variety of typical dry turlough vegetation types and is notable for the presence of the rare plant species, Alder

Buckthorn and Fen Violet. Turloughs are important habitats that are listed with priority status on Annex I of the E.U. Habitats Directive and, as such, are of considerable conservation significance.



Site Name: Castletaylor Complex SAC

Site Code: 000242

The Castletaylor Complex is situated approximately 4 km south-east of Kilcolgan in Co. Galway and lies in a gently undulating limestone topography. Although relatively small in area, the site contains a diverse range of habitats.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [3180] Turloughs*
- [4060] Alpine and Subalpine Heaths
- [5130] Juniper Scrub
- [6210] Orchid-rich Calcareous Grassland*
- [8240] Limestone Pavement*

Caranavoodaun turlough dominates the north-western half of the site. It occupies a shallow basin set among ridges of limestone outcrop and thin glacial drift and is an excellent example of a calcareous and extremely oligotrophic (nutrient-poor) turlough. It has a limited throughput of water, with a considerable precipitation of marl and some accumulation of peat. Some stands of Black Bog-rush (*Schoenus nigricans*), with sparse Variegated Horsetail (*Equisetum variegatum*), occur at the upper levels, surrounded by patches of Buckthorn (*Rhamnus catharticus*) and Hawthorn (*Crataegus monogyna*) scrub. To the south-east the scrub includes Ash (*Fraxinus excelsior*), Yew (*Taxus baccata*), Whitebeam (*Sorbus aria*) and Irish Whitebeam (*Sorbus hibernica*). Below this there is an extensive area of sedge fen vegetation with species such as Tawny Sedge (*Carex hostiana*), Carnation Sedge (*C. panicea*), Purple Moor-grass (*Molinia caerulea*), Meadow Thistle (*Cirsium dissectum*) and Devil's-bit Scabious (*Succisa pratensis*). Along the western and south-western sides the low-lying ground supports a community of Shoreweed (*Littorella uniflora*), Spike-rushes (*Eleocharis palustris* and *E. multiflora*) and Bulbous Rush (*Juncus bulbosus*) growing in shallow water that persists into June. The deeper pools are colonised by Pondweeds (*Potamogeton gramineus*, *P. polygonifolius* and *P. coloratus*).

North of the turlough and to the south of the site there is a mosaic of other habitats. The limestone pavement occurs mainly as scattered boulders with no extensive areas of flat pavement. It has a rich flora with species such as Bloody Crane's-bill (*Geranium sanguinum*), Herb-Robert (*G. robertianum*), Burnet Rose (*Rosa pimpinellifolia*), Wood Sage (*Teucrium scordonia*), Quaking-grass (*Briza media*) and the scarce species Spring Gentian (*Gentiana verna*) and Mountain Avens (*Dryas*

octopetala). Limestone pavement breaks through the turlough floor in places, and supports scrub vegetation with Dewberry (*Rubus caesius*), Dog Rose (*Rosa canina*), stunted Ash and Blackthorn (*Prunus spinosa*). The Red Data book species Alder Buckthorn (*Frangula alnus*) occurs amongst this community. Limestone outcrops also occur within the wooded area of the site.

The dry calcareous grassland that occurs amongst the limestone pavement and heath is species-rich, particularly with orchids, including Autumn Lady's tresses (*Spiranthes spiralis*), Early Marsh-orchid (*Dactylorhiza incarnata*), Lesser Butterfly-orchid (*Platanthera bifolia*), Fragrant Orchid (*Gymnadenia conopsea*), Broad-leaved Helleborine (*Epipactis helleborine*) and the scarce Dense-flowered Orchid (*Neotinea maculata*).

The heath at this site is characterised by the presence of Juniper (*Juniperus communis*) and Mountain Avens. The presence of Bearberry (*Arctostaphylos uva-ursi*) indicates that some of the heath is similar to the Arctostaphylos-Dryas vegetation of the Burren limestone area, a rare lowland alpine type heath.

The eastern and much of the southern parts of the site are dominated by dry broadleaved woodland. Species present include Downy Birch (*Betula pubescens*), Ash, Yew, Hazel (*Corylus avellana*), Holly (*Ilex aquifolium*) and Spindle (*Euonymus europaeus*). Some mature planted conifers are found to the south of the road.

The turlough does not hold any significant wintering populations of birds, owing to the extreme oligotrophic conditions. Three pairs of Lapwing bred at the site in 1996.

The main land use within the open areas of the site is light grazing by cattle. Some clearance of scrub within parts of the woodland has caused some damage and is a further threat. This site is of high conservation interest, in particular for the presence in a relatively small area of good examples of five habitats that are listed on Annex I of the E.U. Habitats Directive. The transition from the wetland to the surrounding habitats is particularly well shown.

Site Name: Gortnandarragh Limestone Pavement SAC

Site Code: 001271

Gortnandarragh Limestone Pavement is located on the southern side of Lough Corrib, about 7 km south-east of Oughterard in Co. Galway. The site consists of an exposed limestone plateau which slopes down on its eastern side to cut-over fen and bog. Parts of the pavement exhibit a well-developed system of clints and grykes, while other parts are shattered, with much loose rock. The pavement forms a mosaic with heath, grassland and scrub. Much of the central part is open but the eastern side contains enclosures and is grazed by cattle.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[8240] Limestone Pavement*

The limestone pavement at the site supports a typical flora, including Blue Moor-grass (*Sesleria albicans*), Burnet Rose (*Rosa pimpinellifolia*), Wood Sage (*Teucrium scorodonia*), Wild Thyme (*Thymus praecox*), Spring Gentian (*Gentiana verna*), Carline Thistle (*Carlina vulgaris*), Mouse-ear Hawkweed (*Hieracium pilosella*) and ferns (*Asplenium ruta-muraria*, *A. trichomanes* and *Ceterach officinarum*). Scattered Juniper (*Juniperus communis*), Yew (*Taxus baccata*), Blackthorn (*Prunus spinosa*), Hazel (*Corylus avellana*), Ash (*Fraxinus excelsior*) and Rowan (*Sorbus aucuparia*) occur but most are browsed, and the Yew in particular exhibits the effects of severe browsing pressure.

The heath at the site is species-rich and is dominated by a mixture of Heather (*Calluna vulgaris*), Bell Heather (*Erica cinerea*) and Bracken (*Pteridium aquilinum*). Other species present include Blue Moor-grass, Sweet Vernal-grass (*Anthoxanthum odoratum*), Common Bent (*Agrostis capillaris*), Quaking-grass (*Briza media*), Purple Moor-grass (*Molinia caerulea*), fescue (*Festuca* sp.), Devil's-bit Scabious (*Succisa pratensis*), Juniper, Tormentil (*Potentilla erecta*), Wood Sage *Teucrium scorodonia*, Cat's-ear (*Hypochoeris radicata*), St. John's-wort (*Hypericum* sp.), eyebrights (*Euphrasia* spp.), Common Knapweed (*Centaurea nigra*), Meadow Vetchling (*Lathyrus pratensis*), Lady's Bedstraw (*Galium verum*), Goldenrod (*Solidago virgaurea*), Wild Strawberry (*Fragaria vesca*), Harebell (*Campanula rotundifolia*) and Wild Madder (*Rubia peregrina*). There are numerous ant hills which are characterised by the presence of Wild Thyme and Fairy Flax (*Linum catharticum*). The heath appears to be under-grazed and scrub is invading. However, there are signs of goats present (droppings and skull noted).

The grassland is dominated by Blue Moor-grass, with many of the same species present as in the heath, but with additional species such as Mountain Everlasting

(*Antennaria dioica*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Primrose (*Primula vulgaris*), Ribwort Plantain (*Plantago lanceolata*), violet (*Viola* sp). On the eastern side the land is grazed by cattle and here there are additional species such as Oxeye Daisy (*Leucanthemum vulgare*), Red Clover (*Trifolium pratense*), Yarrow (*Achillea millefolium*) and Wild Carrot (*Daucus carota*). Juniper is particularly abundant here, especially on the area sloping to the bog and this is likely to correspond to the E.U. Habitats Directive category 'Juniper formations'. Small wet patches also occur here with fen species, e.g. Lesser Spearwort (*Ranunculus flammula*), Water Mint (*Mentha aquatica*), and Silverweed (*Potentilla anserina*). Where the habitats grade into peatland, Purple Moor-grass, Grass-of-parnassus (*Parnassia palustris*), Meadow Thistle (*Cirsium dissectum*), Black Bog-rush (*Schoenus nigricans*) and Bog Asphodel (*Narthecium ossifragum*) occur, and this community grades into cut-away blanket-bog type vegetation.

There is a large area of oak-Ash-Hazel woodland and scrub on rocky limestone on the south side of the site. Small stature Hazel dominates the woodland canopy, overtopped frequently by Ash. Mature Hawthorn (*Crataegus monogyna*) is abundant. The field layer is particularly species-rich, composed chiefly of Wild Strawberry, Wood Anemone (*Anemone nemorosa*), Lords-and-ladies (*Arum maculatum*), Pignut (*Conopodium majus*), Wood-sorrel (*Oxalis acetosella*), Lesser Celandine (*Ranunculus ficaria*), Glaucous Sedge (*Carex flacca*) and False Brome (*Brachypodium sylvaticum*). The rocks are covered mainly by the mosses *Hylocomium brevirostre* and *Thuidium tamariscinum*. *Rhytidiadelphus triquetrus* is abundant on the soil whilst *Neckera crispa* clothes many of the tree boles.

An area of cut-away bog to the east contrasts with the limestone habitats dominating the rest of the site. This is the only known locality for the endemic fungus *Entoloma jennyi*.

The main land use on the site is extensive grazing by cattle and goats. Threats to the site include over-grazing, land reclamation and quarrying, the latter two already occurring to a small extent within the site.

Gortnandarragh is valuable as an example of limestone pavement, an internationally important habitat which is listed with priority status, on Annex I of the E.U. Habitats Directive. It is also notable because the bog on the site is the type locality and only known station for *Entoloma jennyi*. Furthermore, there are interesting and diverse areas of heath, grassland, scrub and woodland, all contributing to a valuable site of considerable conservation interest.

Site Name: Ardrahan Grassland SAC

Site Code: 002244

This site lies immediately west and north of Ardrahan in south Co. Galway. It is dominated by a large flat limestone area with a mosaic of calcareous habitats including limestone pavement, alpine heath, Juniper scrub and species rich dry grasslands. In contrast, the south-west of the site consists of a small marl lake and adjoining fens and marshes, with Juniper heath frequent on the higher ground. Soils associated with limestone pavement are generally thin rendzina; deeper pockets are more mineral rich and support limestone grassland and scrub in places.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[4060] Alpine and Subalpine Heaths
[5130] Juniper Scrub
[6210] Orchid-rich Calcareous Grassland*
[8240] Limestone Pavement*

The site contains a good example of limestone pavement, a priority habitat listed on Annex I of the E.U. Habitats Directive, a small though excellent example of the Annex I habitat alpine heath, areas of the Annex I priority habitat orchid-rich calcareous grassland, along with one other Annex I habitat, Juniper scrub. Of particular note is the abundance of Bearberry (*Arctostaphylos uva-ursi*) and Juniper (*Juniperus communis*) in association with a typical Burren flora including species such as Mountain Avens (*Dryas octopetala*), Spring Gentian (*Gentiana verna*) and various orchid species including Fly Orchid (*Ophrys insectifera*). The southern and western part of the area is of significant interest due to the low intensity of management in the area. Both Mountain Avens and Bearberry alpine heaths occur at this site, where they form a mosaic with Juniper scrub, limestone pavement and calcareous grasslands.

This site contains a relatively small but fine example of limestone pavement, which occurs in a mosaic with other habitats. Common species include Blue Moor-grass (*Sesleria albicans*), Wild Thyme (*Thymus praecox*), Flea Sedge (*Carex pulicaris*), Quaking-grass (*Briza media*), Devil's-bit Scabious (*Succisa pratensis*) and Heather (*Calluna vulgaris*). Pockets of Hazel (*Corylus avellana*) scrub have developed, and there are lesser amounts of Blackthorn (*Prunus spinosa*), Bracken (*Pteridium aquilinum*) and Hawthorn (*Crataegus monogyna*).

At the north of the site Juniper scrub forms a dense mat over limestone pavement along with Bearberry and Mountain Avens. Further south it occurs on higher undulating ground over a species rich calcareous heath with Wild Thyme, Carlina Thistle (*Carlina vulgaris*), Tormentil (*Potentilla erecta*), Bloody Cranesbill (*Geranium sanguineum*), Black Bog-rush (*Schoenus nigricans*), Heather and occasional Bearberry.

Areas of orchid-rich calcareous grassland are found across the site, interspersed with areas of scrub, pavement and less species-rich grassland. At least eleven orchid species have been recorded from the site, many in good numbers. The best areas of grassland are very species rich, and support an excellent suite of calcareous indicators. Species such as Kidney Vetch (*Anthyllis vulneraria*), Squinancywort (*Asperula cynanchica*), Spring-sedge (*Carex caryophyllea*), Glaucus Sedge (*Carex flacca*), Common Knapweed (*Centaurea nigra*), Eyebright (*Euphrasia officinalis* agg.), Lady's Bedstraw (*Galium verum*), Juniper, Rough Hawkbit (*Leontodon hispidus*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Sea Plantain (*Plantago maritima*), Yellow-rattle (*Rhinanthus minor*), Blue Moor-grass, Devil's-bit Scabious and Red Clover (*Trifolium pratense*) have been commonly recorded. Species such as Mountain Avens and Spring Gentian are also present, and the Flora (Protection) Order, 2015 species Wood Bitter-vetch (*Vicia orobus*), has been recently documented. Many areas of orchid-rich grassland are however becoming swamped and overtaken by Purple Moor-grass (*Molinia caerulea*).

Brackloon Lough occurs in the south of the site and is a fine example of a small shallow marl lake, one of very few in this locality. This open lake has a pronounced whitish appearance and a flora of lime-encrusted Thread-leaved Water-crowfoot (*Ranunculus trichophyllus*) and a little Curled Pondweed (*Potamogeton crispus*) occurs. Shoreweed (*Littorella uniflora*) is locally abundant on the shoreline, where it grows with Many-stalked Spike-rush (*Eleocharis multicaulis*), Pink Water-speedwell (*Veronica catenata*), Lesser Water-plantain (*Baldellia ranunculoides*) and some Amphibious Bistort (*Polygonum amphibium*). Although small, the lake seems in a relatively natural state.

There are two small turloughs present within the site. Both are well grazed and consist of a short-turf peaty vegetation with Common Sedge (*Carex nigra*), Lesser Spearwort (*Ranunculus flammula*), Creeping Buttercup (*Ranunculus repens*) (turlough form), Lesser Marshwort (*Apium inundatum*), Cuckooflower (*Cardamine pratensis*), Marsh Pennywort (*Hydrocotyle vulgaris*) and Water Mint (*Mentha aquatica*), along with Common Marsh-bedstraw (*Galium palustre*), Creeping Bent (*Agrostis stolonifera*), Jointed Rush (*Juncus articulatus*) and Common Spike-rush (*Eleocharis palustris*).

Bird species recorded from the site include Snipe, Mute Swan and Curlew.

Land use at this site consists mainly of the traditional practise of winter grazing by cattle. This is a low intensity farming practise generally confined to the Burren in Ireland and one that is vital to the maintenance of the high scientific interest of this site. However, recent agricultural improvement has damaged the scientific interest of part of the site through loss of habitat in the turlough and limestone pavement areas.

Intensification of the land usage around Brackloon Lough could lead to a deterioration in the water quality of the lake. A modification of the current grazing regime is needed to help deal with the spread of Purple Moor-grass in the best of the grassland areas of the site.

Ardrahan Grassland contains a mosaic of calcareous habitats including good examples of four habitats listed on Annex I of the E.U. Habitats Directive - limestone pavement, alpine heath, orchid-rich calcareous grassland and Juniper scrub. The presence of a relatively unpolluted marl lake adds further diversity and interest of this important site.

Site Name: Moneen Mountain SAC

Site Code: 000054

Moneen Mountain is a large, composite site situated in north County Clare. It encompasses a complete range of inland Burren habitats, from open limestone pavement and its associated calcareous grasslands and heaths, to dense Hazel (*Corylus avellana*) scrub and patches of Ash (*Fraxinus excelsior*) woodland. The site extends inland from Muckinish Point and includes all of the higher ground between Ballyvaughan and Bell Harbour in a southerly direction for approximately 20 km. The underlying rock type is Carboniferous limestone, which rises into a series of rounded hills, intersected by deep and often steep-sided valleys to the north of the site (max. altitude 307 m) before levelling out towards the south. Traces of Galway Granite are found within the site, particularly to the north. Soil cover is shallow and the soil type most common in the area is rendzina.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- | |
|---|
| [3180] Turloughs* |
| [4060] Alpine and Subalpine Heaths |
| [5130] Juniper Scrub |
| [6210] Orchid-rich Calcareous Grassland* |
| [7220] Petrifying Springs* |
| [8240] Limestone Pavement* |
| [1065] Marsh Fritillary (<i>Euphydryas aurinia</i>) |
| [1303] Lesser Horseshoe Bat (<i>Rhinolophus hipposideros</i>) |

The bulk of the site is made up of limestone pavement, a priority habitat listed on Annex I of the E.U. Habitats Directive and its associated calcareous grasslands, juniper scrub and heaths. The limestone pavement includes smooth, blocky and shattered types. Common species typically associated with the shattered type include Burnet Rose (*Rosa pimpinellifolia*), Wood Sage (*Teucrium scorodonia*), Blue Moor-grass (*Sesleria albicans*), Blackthorn (*Prunus spinosa*) and Wild Thyme (*Thymus praecox*). The smooth, blocky type is deeply fissured and provides a good habitat for a variety of ferns and mosses. The bare pavement is interspersed with fine examples of species-rich dry calcareous grassland. On the higher ground of the uplands to the north and north-east of the site, heath with Bearberry (*Arctostaphylos uva-ursi*) is well developed. The main plants of the heath communities are Mountain Avens (*Dryas octopetala*), Heather (*Calluna vulgaris*), Crowberry (*Empetrum nigrum*), Blue Moor-grass, Juniper (*Juniperus communis*) and sedges (*Carex* spp.).

Petrifying springs, a priority habitat listed on Annex I of the E.U. Habitats Directive, occurs within the site. Although the area covered by the petrifying springs is relatively small, the habitat is nonetheless important. The springs are generally intact in nature at this site, and often support a rich bryophyte community. They are often found in secluded and inaccessible areas such as inland cliffs, where disturbance is minimal.

Expanses of low Hazel scrub interspersed with bare limestone pavement and calcareous grasslands dominate much of the southern part of the site. Along the lower slopes of some of the hills to the north, Hazel and Ash have reached a sufficiently significant height to be considered as woodland, a rare habitat in the context of the Burren.

Many inland cliffs occur throughout the site, generally unvegetated but in places supporting a thick scrub cover with Hazel, Ivy (*Hedera helix*), Blackthorn and wild roses (*Rosa* spp.). These provide good sites for small breeding birds. Exposed outcrops of granite support a rich lichen flora.

Muckinish Lough, which occurs close to Pooldoody Bay, is a small but important example of a turlough. This appears to be a transitional system from a turlough to a natural rock lagoon in karst. It receives seawater that probably enters through fissures in the limestone. The lake becomes very shallow in summer and may dry out completely at times. Aquatic vegetation includes Tassleweed (*Ruppia* spp.) and Fennel Pondweed (*Potamogeton pectinatus*). This is considered an extreme in the range of turlough types in Ireland

The rare plant species, Intermediate Wintergreen (*Pyrola media*), occurs among heath vegetation on higher ground within the site. This species is listed in the Irish Red Data Book.

A breeding colony of Lesser Horseshoe Bats occurs within the site. More than 60 individuals were counted in 1998. The bats inhabit a semi-derelict cottage and a nearby out-building. Lesser Horseshoe Bat is listed on Annex II of the E.U. Habitats Directive. The dense hazel scrub provides ideal cover for mammals. Both Pine Marten and Badger have been recorded from this site. Both species are listed in the Red Data Book as threatened in Europe.

The scarce butterfly, Marsh Fritillary (*Euphydryas aurinia*), has been reported from the site; this species is mostly found in areas where its food plant, Devil's-bit Scabious (*Succisa pratensis*), occurs commonly. Marsh Fritillary is listed on Annex II of the E.U. Habitats Directive.

Breeding Cuckoo and Whitethroat are plentiful in this area, as are Yellowhammer, Stonechat and Wheatear. The area is very rich in entomological terms, with a number of species of butterfly and moth which are known in Ireland only from the Burren.

Most of the site is grazed by cattle (particularly in the winter) and also by sheep and goats. The effects of both over-grazing and under-grazing are visible in places. Intensification of agriculture has caused damage to parts of the site, while clearance of scrub and limestone pavement represent the main threat to the remainder. The practice of winter grazing at appropriate stocking levels and of suitable duration must be maintained to preserve the species richness and diversity of these grasslands. Large silage pits and cattle feeding rings situated in sensitive areas directly on the pavement pose a threat to the water quality of the area.

This site is of international scientific importance owing to the presence of fine examples of typical Burren habitats, including several habitats listed on Annex I of the E.U. Habitats Directive. The limestone pavement and heath are particularly noteworthy. The presence of a substantial summer colony of Lesser Horseshoe Bat is also of note and the site is, furthermore, of high amenity and scenic value.

Site Name: East Burren Complex SAC

Site Code: 001926

This large site incorporates all of the high ground in the east Burren in Counties Clare and Galway, and extends south-eastwards to include a complex of calcareous wetlands. The area encompasses a range of limestone habitats that include limestone pavement and associated calcareous grasslands and heath, scrub and woodland together with a network of calcareous lakes and turloughs. The site exhibits some of the best and most extensive areas of oligotrophic limestone wetlands to be found in the Burren and in Europe.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [3140] Hard Water Lakes
- [3180] Turloughs*
- [3260] Floating River Vegetation
- [4060] Alpine and Subalpine Heaths
- [5130] Juniper Scrub
- [6130] Calaminarian Grassland
- [6210] Orchid-rich Calcareous Grassland*
- [6510] Lowland Hay Meadows
- [7210] *Cladium* Fens*
- [7220] Petrifying Springs*
- [7230] Alkaline Fens
- [8240] Limestone Pavement*
- [8310] Caves
- [91E0] Alluvial Forests*

- [1065] Marsh Fritillary (*Euphydryas aurinia*)
- [1303] Lesser Horseshoe Bat (*Rhinolophus hipposideros*)
- [1355] Otter (*Lutra lutra*)

The limestone pavement at this site includes smooth blocky and shattered types. The bare pavement is interspersed with species-rich calcareous vegetation communities. Typical grassland species found on or near the pavement include Blue Moor-grass (*Sesleria albicans*), Mountain Everlasting (*Antennaria dioica*), Bloody Crane's-bill (*Geranium sanguineum*) and Wild Thyme (*Thymus praecox*). Where soil cover is more

extensive purer grassland communities are found, and these are often orchid-rich. Species such as Pyramidal Orchid (*Anacamptis pyramidalis*), Frog Orchid (*Coeloglossum viride*), Fragrant Orchid (*Gymnadenia conopsea*), Bee Orchid (*Ophrys apifera*), Fly Orchid (*Ophrys insectifera*), Butterfly Orchid (*Platathera chlorantha*) and Dense-flowered Orchid (*Neotinea maculata*) have all been recorded.

Limestone heath is well developed in parts of the uplands where Heather (*Calluna vulgaris*) and Bell Heather (*Erica cinerea*) are common, along with St. John's-wort species (*Hypericum* spp.) and Tormentil (*Potentilla erecta*). Two rare plant species found in this habitat are the Hoary Rock-rose (*Helianthemum canum*) and Pyramidal Bugle (*Ajuga pyramidalis*); both species are listed in the Red Data Book. To the south-east around the western shores of Lough Bunny an interesting alpine heath community occurs. Here Bearberry (*Arctostaphylos uva-ursi*) is found at one of its few inland, lowland locations in the Burren. Juniper scrub is sometimes found associated with areas of heath at this site, with Juniper (*Juniperus communis*) and Crowberry (*Empetrum nigrum*) both found here.

Ballyeigher Loughs complex to the east is a large network of calcareous hardwater lakes and turloughs with associated fen, cut-away bog and calcareous marsh habitats. The complex contains many species of plant and animal that are found in areas of fluctuating water levels. The alkaline fen flora is well developed and large areas of Great Fen-sedge (*Cladium mariscus*) and Black Bog-rush (*Schoenus nigricans*) occur, along with a diverse complement of associated species. Some of the best and most extensive calcareous swamp fen communities in the country occur within this complex and further north-east around the shores of Lough Bunny. Between this lake and the Coole-Garryland turlough complex to the north-east of the site, another area of oligotrophic limestone wetlands occurs. This type of ecosystem is now very rare in Europe and many of the habitats found are listed on Annex I of the E.U. Habitats Directive.

The site has an excellent array of turloughs, with at least eight known examples including those at Carran, Knockaunroe, Lough Mannagh, Castle Lough, Lough Aleenaun, Turloughmore, Tulla and Roo. These turloughs represent some of the best examples of this habitat type found in Ireland and display a wide diversity in trophic status, water fluctuations, water retention and vegetation types. The aquatic plant communities are well developed and the rare, Red Data Book species, Mudwort (*Limosella aquatica*), occurs here. This species is listed in the Flora (Protection) Order, 1999.

Most of the lakes in the southern part of this site are considered examples of hard water lakes, a type listed in Annex II of the E.U. Habitats Directive. These are classic marl lakes, often surrounded by limestone pavement and scrub. They range from extreme oligotrophic types, such as Lough Bunny, to more mesotrophic or even eutrophic systems. Stonewort (*Chara* spp.) beds are common in Lough Inchiquin (and at Lough Bunny), along with pondweeds (*Potamogeton* spp.). *Nitella tenuissima*, a rare species found in calcareous fens, has been recorded in the Ballyeigher Loughs. A

number of other interesting *Chara* species have been recorded from waterbodies in the area.

The River Fergus is the only major overground river within the site. Between Lough Inchiquin and Lough Atedaun the river is slow moving and meanders through an area with wet grassland. Here the water-crowfoot *Ranunculus peltatus-pencillatus* is found, along with the moss *Fontinalis antipyretica*.

The occurrence of petrifying springs at this site is of note. Good examples of this rare habitat type are found at the cliffs at Slieve Carran. Well developed bryophyte and lichen communities are found in association with the springs.

Another uncommon habitat type found at this site is lowland hay meadow. These grasslands typically have a low, open sward dominated by herbs and poor-yield grasses, and are mown rather than grazed. Some common species include Oxeye Daisy (*Leucanthemum vulgare*), Yellow-rattle (*Rhinanthus minor*), eyebrights (*Euphrasia* spp.) and Common Knapweed (*Centaurea nigra*). A well-developed metallophyte plant community, ascribable to the Annex I habitat type Calaminarian Grassland, is present over an area of about 180 m² at an old mine site in Shesodonnell (East), with indicator bryophytes *Cephaloziella stellulifera* and *Weissia controversa* var. *densifolia*.

Scrub cover is relatively good in this area of the Burren, with large expanses of Hazel (*Corylus avellana*) intermixed with Spindle (*Euonymus europaeus*), Guelder-rose (*Viburnum opulus*) and Blackthorn (*Prunus spinosa*). An interesting scrub community of Alder Buckthorn (*Frangula alnus*), a Red Data Book species, Buckthorn (*Rhamnus catharticus*) and Shrubby Cinquefoil (*Potentilla fruticosa*), also a Red Data Book species, fringes the shores of some of the lakes and turloughs to the east.

Ballyeighter Wood to the east is an unusual scrub community on limestone, with regenerating oak (*Quercus* sp.) amongst Hazel, Ash (*Fraxinus excelsior*), Holly (*Ilex aquifolium*) and Hawthorn (*Crataegus monogyna*). This is an example of a woodland type that is rare in the Burren region. The eastern edge of Slieve Carran is dominated by steep cliffs and scree slopes over which Ash and Hazel wood is developed. This represents one of the few remaining woodland habitats in the Burren.

A narrow band of alluvial woodland occurs along the karstic stream at the north-east corner of Lough Gortlecka. This is considered to be a unique variant of this uncommon woodland type. The wood is dominated by Hazel, Ash, Wych Elm (*Ulmus glabra*) and Rusty Willow (*Salix cinerea* subsp. *oleifolia*), with Ramsons (*Allium ursinum*) and a variety of other herbs occupying the flooded areas of the woodland floor.

Caves are a feature of this site, with four known natural limestone caves showing a variety of formations and passage types. Vigo Cave has one of the best undisturbed cave entrance facies in Ireland and is considered a valuable karst heritage landform. Glencurrane Cave shows some fine phreatic solution features and one passageway, known as "Crinoid Tower" shows an abundance of crinoids which have been etched

out by splashing water. Gortlecka Cave and a series of small caves above Lough Inchiquin are other fine examples of this habitat.

In the east Burren wetlands Mute Swan and Whooper Swan occur in internationally important concentrations, while Wigeon, Lapwing, Dunlin, Black-tailed Godwit and Goldeneye are also very numerous. Also found in wetlands on the site (e.g. Lough Atedaun, Carran Turlough, Lough Aleenaun, Lough Inchiquin, Lough Bunny, Lough Cullaun, Muckanagh Lough) are Bewick's Swan, Teal, Mallard, Gadwall, Shoveler, Tufted Duck, Curlew, Golden Plover, Coot and Little Grebe. The site also supports a flock of Greenland White-fronted Goose. Several of these species are listed in the Red Data Book and on Annex I of the E.U. Birds Directive.

A nesting pair of Peregrine Falcon, a species listed on Annex I of the E.U. Birds Directive, occur on Glasgeivnagh Hill. The east Burren wetlands are frequented by Sparrowhawk, Kestrel and Hen Harrier, a rare species which is also listed on Annex I of the E.U. Birds Directive. Pine Marten and Otter have been recorded regularly within the site - both are listed in the Red Data Book as they are considered threatened in Europe, the latter also on Annex II of the E.U. Habitats Directive.

The site supports an internationally important population of Lesser Horseshoe Bat, with an estimated 400 individuals. There are two known nursery roosts, a transition roost and four known winter sites, the latter all in natural limestone caves. Pipistrelle and Brown Long-eared Bats also occur. All of these species are listed in the Red Data Book, the former also on Annex II of the E.U. Habitats Directive. The Lesser Horseshoe Bat is a small, delicate bat which is confined to six western counties, Mayo, Galway, Clare, Limerick, Kerry and Cork. It forages close to woodland and at the edges of water. The Irish population of this species is estimated to be about 12,000 individuals and may be the largest national population in Europe. The Pipistrelle Bat is the smallest bat to occur in Ireland and is the commonest and most widespread species. Pipistrelle Bats forage where small insects gather, in gardens, along hedgerows and trees, over ponds and along rivers. The Brown Long-eared Bat is the second most common bat in Ireland and is easily identified by its long ears which are nearly as long as its body. The Brown Long-eared Bat forages in and along woodland where they glean insects off foliage.

The site includes a large population of Marsh Fritillary, a species of butterfly listed on Annex II of the E.U. Habitats Directive. The site also supports the only known populations of Slow Worm (*Anguis fragilis*) in Ireland - this lizard is believed to have been introduced in about 1970. Arctic Char (*Salvelinus alpinus*), a Red Data Book fish species, has been recorded from Lough Inchiquin.

Most of the site is grazed by cattle and sheep, and in some areas, particularly the uplands, by feral goats. Slieve Carran is a Statutory Nature Reserve, while some 750 square km within the region of Mullaghmore makes up the Burren National Park. Clearance and intensification of agriculture has caused damage to some parts of the site. This threatens the heath and scrub communities and may cause eutrophication (nutrient enrichment) of the lakelands to the east. Drainage and land reclamation

have occurred in places around the edges of wetlands, while some marginal fen areas have been afforested. Areas of agriculturally-improved land have been included within the site in order to protect the hydrology and nutrient status of the wetland system.

The East Burren Complex is of international scientific interest owing to the presence of fine examples of typical Burren habitats, together with an oligotrophic wetland complex of lakes, turloughs, fen, cut-over bog and calcareous marsh. The Ballyeigher complex represents an excellent example of a nutrient-poor calcareous lake and fen system, of European significance. Some of the only remaining woodland habitats to be found in the Burren occur within the site. The site contains fourteen habitats that are listed on Annex I of the E.U. Habitats Directive (six of which have priority status) and three species of animal listed on Annex II of this Directive and, as such, is of major conservation significance. The occurrence of many rare plants and animals within the site adds considerably to its scientific and conservation value. The site is of high ornithological interest too, for the internationally and nationally important numbers of waterfowl that use it.



Site Name: Maumturk Mountains SAC

Site Code: 002008

The Maumturk Mountains are situated east of the Twelve Bens and west of the Maumtrasnas, between the Inagh Valley and the Leenaun/Maam road in Co. Galway. The site is bounded to the north by Killary Harbour and to the south by the Galway/ Clifden road. Most of the mountains exceed 600 m in height and about half of the land within the site lies above an altitude of 250 m. In addition many rivers criss-cross the site. The main bedrock is quartzite in the south, which forms impressive cliffs but little mineral soil, and shales and slates in the northern area, which weather more easily. Bands of metamorphosed limestone (Lakes Marble Formation) occur at Lissoughter, Maumeen Gap at Knocknagur and Maamturkmore.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [3110] Oligotrophic Waters containing very few minerals
- [4010] Wet Heath
- [4060] Alpine and Subalpine Heaths
- [7130] Blanket Bogs (Active)*
- [7150] Rhynchosporion Vegetation
- [8220] Siliceous Rocky Slopes
- [1106] Atlantic Salmon (*Salmo salar*)
- [1833] Slender Naiad (*Najas flexilis*)

Wet heath is widespread within this site on the margins of areas of blanket bog and on the lower slopes of mountains where peat depth is less than 1m. The vegetation is typically dominated by Purple Moor-grass (*Molinia caerulea*), with Cross-leaved Heath (*Erica tetralix*) and Heather (*Calluna vulgaris*) locally sub-dominant. Other frequent species include Tormentil (*Potentilla erecta*), Heath Milkwort (*Polygala serpyllifolia*), Many-stalked Spike-rush (*Eleocharis multicaulis*), Bog Asphodel (*Narthecium ossifragum*) and the sedges *Carex echinata* and *C. panicea*. On drier, more steep slopes, dry heath is present with Bell Heather (*Erica cinerea*) a typical frequent species. Over-grazing by sheep has greatly modified the structure and composition of the heath communities, with a reduction in Heather cover and in places the initiation of soil erosion.

Blanket bog also occurs within this site, some of which is intact and of good quality, with a particularly good example at Caher. Typical bog species are found, including Heather, Purple Moor-grass, Black Bog-rush (*Schoenus nigricans*), Bog Asphodel,

Cross-leaved Heath, Common Cottongrass (*Eriophorum angustifolium*), Carnation Sedge (*Carex panicea*), the moss *Racomitrium lanuginosum* and locally frequent hummocks of the bog mosses *Sphagnum fuscum* and *S. imbricatum*. In addition, the lichen flora is locally luxuriant and includes the rare *Cladonia rangiferina*. Flushes occur in some areas of the bog, such as on the south slope of Knocknagur. Here, species such as Bog Pondweed (*Potamogeton polygonifolius*), Bulbous Rush (*Juncus bulbosus*), Jointed Rush (*Juncus articulatus*), Many-stalked Spike-rush (*Eleocharis multicaulis*) and various sedges (*Carex panicea*, *C. demissa* and *C. hostiana*) are found. At this location, the scarce Brown Beak-sedge (*Rhynchospora fusca*) is common in the surrounding bog.

Rhynchosporion vegetation is associated with the blanket bog in a few areas of the site. It is characterised by well developed inter-connecting pool systems with quaking carpets of *Sphagnum*. The pool areas are typically dominated by *Sphagnum cuspidatum* and *S. auriculatum*, with Common Cottongrass, Bogbean (*Menyanthes trifoliata*), and sundews (*Drosera anglica* and *D. intermedia*). The quaking flat areas are dominated by White-beaked Sedge (*Rhynchospora alba*), Bog Asphodel and Common Cottongrass.

Oligotrophic lakes are well represented in this site, occurring mainly in the south-east near Maam Cross. The principal lakes are Lough Shindilla, Loughanillaun, Lough Nambrackboy, Lough Shannagrena, Maumwee Lough and Lehanagh Lough. Most of these are small to medium sized systems and are of good quality. Typical oligotrophic aquatic species occur, including Quillwort (*Isoetes lacustris*), Pipewort (*Eriocaulon aquaticum*), Water Lobelia (*Lobelia dortmanna*), Shoreweed (*Littorella uniflora*) and Alternate Water-milfoil (*Myriophyllum alterniflorum*). Spawning salmon and trout occur in Maumwee Lough, and perhaps others.

Other habitats present include lowland blanket bog, siliceous quartzite scree, exposed rock, upland grassland on peaty and mineral substrates, river valleys and streams, lakes, and woodland on lake islands.

In areas where base-rich rocks occur at altitude, e.g. Maumeen Gap and Lissoughter, scarce plant species such as Mountain Avens (*Dryas octopetala*), Alpine Meadow-rue (*Thalictrum alpinum*) and the Red Data Book species, Purple Saxifrage (*Saxifraga oppositifolia*), are found. The site supports a range of other scarce arctic-alpine/mountain plants, including Green Spleenwort (*Asplenium viride*), Brittle Bladder-fern (*Cystopteris fragilis*), Holly Fern (*Polystichum lonchitis*), Beech Fern (*Phegopteris connectilis*), Starry Saxifrage (*Saxifraga stellaris*), Roseroot (*Rhodiola rosea*), Cowberry (*Vaccinium vitis-idaea*), Mountain Sorrel (*Oxyria digyna*), Dwarf Willow (*Salix herbacea*), Lesser Twayblade (*Listera cordata*), Stiff Sedge (*Carex bigelowii*) and Juniper (*Juniperus communis*).

Several other Red Data Book plant species are also found on the site, including Slender Cottongrass (*Eriophorum gracile*) and Slender Naiad (*Najas flexilis*), both occurring in just single locations. There is an old record from near Maam Cross for Wood Bitter-vetch (*Vicia orobus*), but this has not been seen on the site in recent years.

The threatened species Marsh Clubmoss (*Lycopodiella inundata*) also occurs within the site. All of these species are legally protected under the Flora (Protection) Order, 1999, and Slender Naiad is also listed on Annex II of the E.U. Habitats Directive.

The site is very important for salmon, a species listed on Annex II of the E.U. Habitats Directive. The rivers and lakes, and especially the Bealnabrack system, provide high quality spawning and nursery rivers.

Arctic Char has been recorded in Derrynen Lough and Lough Shindilla. However, only in Lough Shindilla are there recent records for this species. This fish species is listed in the Irish Red Data Book as being threatened in Ireland. The Irish Hare has been recorded from the site and is probably widespread; this endemic subspecies is also listed in the Red Data Book as being threatened. Common Frog, also a Red Data Book species, breeds on the site.

Bird species recorded from the site include Dipper, Heron, Kestrel, Meadow Pipit, Raven, Snipe, Stonechat, Wheatear and Woodcock. Peregrine, a species listed on Annex I of the E.U. Birds Directive, occurs within the site.

The main damaging activities and threats to the Maumturk Mountains are over-grazing, peat cutting and afforestation. Grazing, in particular by sheep, is widespread and quite severe within the site. This has resulted in the erosion of both lowland and mountain blanket bog, and in the modification and destruction of heath communities, particularly in the southern half of the site. Peat cutting, both by hand and by machine, has become more of a problem in recent years but is largely confined to areas of deep, lowland blanket bog. The above activities are the most extensive, but other threats and potentially damaging activities include land drainage and reclamation, fertilization, quarrying and dumping.

This site is of conservation interest as it is a good example of an extensive mountain landscape, containing blanket bog, large areas of heath, siliceous rocky vegetation, oligotrophic lakes and upland grassland. The areas of blanket bog at Teernakill and Caher are largely unaffected by over-grazing and are in very good condition. The presence of rare and protected plant species and of the scarce Arctic Char adds to the interest of the site.

Site Name: The Twelve Bens/Garraun Complex SAC

Site Code: 002031

This is an extensive site situated in the north-west of Connemara in Co. Galway and dominated by mountainous terrain. The site is bounded to the south by the Connemara Bog Complex, to the east by the Maumturk Mountains and to the north by Killary Harbour. Included within the site are the Twelve Bens mountain range, the mountains to the north of Kylemore (Doughruagh, Garraun and Benchoona), rivers including the Ballynahinch and Owenglin systems and an area of coastal heath and machair near Glassilaun. The site also includes some extensive tracts of lowland blanket bog which are continuous with the mountains. Most of the mountain summits reach a height in excess of 500 m, the highest being Ben Baun in the Twelve Bens which reaches 730 m. The site includes a large portion of the Connemara National Park and a Statutory Nature Reserve at Derryclare Wood.

Geologically, the site can be divided into two distinct parts. The Twelve Bens are composed of resistant quartzite with schists in the valleys, while the mountains north of Kylemore are composed of gneiss and various types of sandstones and mudstones. There are also areas of gabbro (Doughruagh and Currywongaun), mica schist (Muckanaght) and marble outcrops (south of Kylemore Lough). The main soil type within the site is peat.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

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| <p>[3110] Oligotrophic Waters containing very few minerals
[3130] Oligotrophic to Mesotrophic Standing Waters
[4060] Alpine and Subalpine Heaths
[7130] Blanket Bogs (Active)*
[7150] Rhynchosporion Vegetation
[8110] Siliceous Scree
[8210] Calcareous Rocky Slopes
[8220] Siliceous Rocky Slopes
[91A0] Old Oak Woodlands</p> <p>[1029] Freshwater Pearl Mussel (<i>Margaritifera margaritifera</i>)
[1106] Atlantic Salmon (<i>Salmo salar</i>)
[1355] Otter (<i>Lutra lutra</i>)
[1833] Slender Naiad (<i>Najas flexilis</i>)</p> |
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The predominant vegetation type at this site is upland blanket bog/heath dominated by Heather (*Calluna vulgaris*), Deergrass (*Scirpus cespitosus*), Cross-leaved Heath (*Erica cinerea*) and the mosses *Racomitrium lanuginosum* and *Sphagnum capillifolium*. In places this vegetation can be rich in liverworts, with species such as *Adelanthus lindenbergianus* and *Bazzania pearsonii*. This unusual type of species-rich dwarf shrub heath is almost confined to the mountains of the west of Ireland and Scotland, and is particularly well developed in the Twelve Bens. Close to the mountain summits this blanket bog/heath is often developed on a very thin peat with a high proportion of outcropping bedrock.

Another important and widespread habitat is lowland blanket bog dominated by Purple Moor-grass (*Molinia caerulea*), Black Bog-rush (*Schoenus nigricans*), Cross-leaved Heath and the liverwort *Pleurozia purpurea*. These areas of lowland blanket bog usually occur in the valleys between the mountains, e.g. the Gleninagh Valley. Rhynchosporion vegetation is well represented around pools, in wet hollows and in quaking and flush areas associated with the lowland blanket bog. White Beak-sedge (*Rhynchospora alba*) occurs in association with such species as Common Cottongrass (*Eriophorum angustifolium*), Bogbean (*Menyanthes trifoliata*), Black Bog-rush and a range of bog mosses, including *Sphagnum auriculatum* and *S. cuspidatum*.

The site contains a large range of other habitats, including upland grassland dominated by Sheep's-fescue (*Festuca ovina*) and Mat-grass (*Nardus stricta*), oak woodland, scree, oligotrophic (nutrient-poor) lakes, rivers, reedbeds, freshwater marshes, coastal heath, machair, sand dune and saltmarsh.

A number of rare, Red Data Book plant species are found within the site, many of which are associated with rocky scree habitats. These include Alpine Saw-wort (*Saussurea alpina*), Holly Fern (*Polystichum lonchitis*), Purple Saxifrage (*Saxifraga oppositifolia*), and the legally protected (Flora (Protection) Order, 2015) Parsley Fern (*Cryptogramma crispa*). These are generally confined to mountains cliffs above 400 m, where a number of other scarce plant species are also found (for example, Alpine Meadow-rue, *Thalictrum alpinum*). Other Red Data Book species have also been recorded from the site, including Corncockle (*Agrostemma githago*) and the legally protected species Marsh Clubmoss (*Lycopodiella inundata*) and Heath Cudweed (*Omalotheca sylvatica*). St. Dabeoc's Heath (*Daboecia cantabrica*), a species which in Ireland is restricted to Connemara and south Mayo, occurs commonly within the site.

Alpine and subalpine heaths are found in association with exposed rock and scree at high altitudes at this site. Typical species include Heather, Bilberry (*Vaccinium myrtillus*), Crowberry (*Empetrum nigrum*), Juniper (*Juniperus communis* subsp. *nana*), Bearberry (*Arctostaphylos uva-ursi*), Bell Heather (*Erica cinerea*), Tormentil (*Potentilla erecta*), Great Wood-rush (*Luzula sylvatica*), Tufted Hair-grass (*Deschampsia cespitosa*) and Common Bent (*Agrostis capillaris*). The community also holds important assemblages of oceanic montane bryophytes.

The suite of lowland lakes that encircle the mountains represent some of the finest oligotrophic lakes in the country and two rare, Red Data Book plant species, Slender Naiad (*Najas flexilis*) and Pillwort (*Pilularia globulifera*), occur. Slender Naiad is rare in Europe and is listed on Annex II of the E.U. Habitats Directive. Both of these species are listed on the Flora (Protection) Order, 2015.

The site contains several small areas of Sessile Oak (*Quercus petraea*) woodland, a habitat which is particularly rare in Connemara. The best examples on the site of this habitat are found at Kylemore and on the north shore of Derryclare Lough. Derryclare Wood, a Statutory Nature Reserve, has been particularly well studied. It is composed mostly of Sessile Oak, with some Rowan (*Sorbus aucuparia*), Downy Birch (*Betula pubescens*) and occasional Ash (*Fraxinus excelsior*) forming the canopy layer. There is a well-developed lichen and fungus flora present. The fungal parasite, *Hemigrapha astericus*, a native of Australia and South America, was first recorded in the northern hemisphere from this wood. The Kylemore woods, though heavily infested by Rhododendron (*Rhododendron ponticum*), still retain a diverse flora and support interesting communities of mosses and liverworts, including such species as *Radula voluta*, *Lejeunea holtii*, *L. hibernica*, *L. flava* subsp. *moorei*, *Cephalozia hibernica*, *Teleranea nematodes*, *Campylopus setifolius*, *Oxystegus hibernicus*, *Grimmia hartmanii* and *G. funalis*.

Irish Hare, Common Frog, Otter and Freshwater Pearl Mussel and have been recorded from the site. These species are protected under the Wildlife Act, 1976, and the latter two are listed on Annex II of the E.U. Habitats Directive. The Owenglin River supports an important population of Salmon, another Annex II species. Arctic Char, a species listed in the Irish Red Data Book as threatened in Ireland, has been recorded from Lough Inagh, Kylemore Lough, Lough Muck and Lough Fee.

Bird species reported from the site include Raven, Wheatear, Stonechat, Meadow Pipit, Red Grouse (a declining species of heather moorland), Snipe, Curlew, Woodcock, Hooded Crow, Twite, Ring Ouzel (the latter two both Irish Red Data Book species) and the E.U. Birds Directive Annex I species: Peregrine, Merlin, Golden Plover and Chough. The site provides excellent habitat for Peregrine and this species has traditionally bred at several locations within it.

The upland vegetation of the site is most threatened by over-stocking with sheep and by afforestation with coniferous species.

The Twelve Bens/Garraun Complex includes a wide variety of habitat types, nine of which are listed on Annex I of the E.U. Habitats Directive (including one with priority status), and populations of many rare or scarce plant and animal species. It is one of the largest and most varied protected sites in Ireland and so is of high conservation interest.