

IN THE MATTER OF AN APPLICATION TO  
AN BORD PLEANÁLA

FOR APPROVAL OF THE FOYNES TO LIMERICK ROAD (INCLUDING  
ADARE BYPASS) COMPRISING:

- (I) FOYNES TO RATHKEALE PROTECTED ROAD SCHEME,  
2019;
- (II) RATHKEALE TO ATTYFLIN MOTORWAY SCHEME, 2019;
- (III) FOYNES SERVICE AREA SCHEME, 2019.

ABP Ref. ABP-306146-19 and ABP-306199-19

ORAL HEARING

Brief of Evidence  
**Hydrology and Hydrogeology**

By Anthony Cawley  
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February 2021

## 1. QUALIFICATIONS AND EXPERIENCE

- 1.1 My Name is Anthony Cawley, I am managing director of Hydro Environmental Ltd. I qualified with an honours degree in Civil Engineering and a post graduate master's degree in Engineering Hydrology from NUI Galway. I am a Chartered Civil Engineer with 29 years professional consulting experience in the water engineering field, in a wide variety of activities relating to hydrology, hydrogeology, flooding and hydrodynamic and water quality assessments. Over that period, I have carried out in excess of 100 flood risk assessment studies, which included groundwater, rivers, estuarine and coastal flooding throughout Ireland and also in the UK. I have over the past twenty years been involved in preparing the Hydrological Impact assessments for over 20 major road schemes throughout Ireland.
- 1.2 I have been an expert witness in the area of hydrology and flooding related issues at numerous Oral Hearings for major Infrastructure projects (such as the N6GCRR, M6, M20/M21 N23, Lansdowne Stadium redevelopment, Galway Harbour Development, Galway City Ring Road). I was also retained as an expert consultant to An Bord Pleanála for the Dublin Docks Gateway and Alexandra Basin projects in respect to flooding and hydrodynamic processes and I am experienced in the requirements of SEA, EIA and AA.

## 2. ROLE IN PROPOSED ROAD DEVELOPMENT

- 2.1 My role in the Foynes to Limerick Road (including Adare Bypass) involved undertaking the hydrogeological and hydrological appraisals in respect of the proposed road development. My responsibilities include:
- Managing the hydrogeology and hydrology team to ensure that potential impacts to surface and groundwater receptors are appropriately assessed in the EIAR;
  - Working within a multi-disciplinary team with other specialists (specifically, Soils and Geology, and Biodiversity and Engineering Design) to ensure that potential hydrogeological and hydrological interactions are appropriately considered.
- 2.2 This brief of evidence covers impacts of the proposed road development on Hydrology, as it relates to surface water bodies: lakes, rivers, streams and urban drainage networks and Hydrogeology as it relates to groundwater resources (Aquifers, karst features and groundwater features and its interaction with ecology.
- 2.3 Full details of the Hydrology and Hydrogeology assessments are presented in the relevant sections of the EIAR and NIS as follows:
- Hydrogeology impact assessment of the proposed road development for the EIAR, Chapter 9 of the EIAR,
  - Hydrology impact assessment of the proposed road development for the EIAR, Chapter 10 of the EIAR,
  - Hydrology and Hydrogeology assessment to inform the appropriate assessment in the Natura Impact Statement (NIS) (Appendix E and F of the NIS)

### 3. EXECUTIVE SUMMARY

- 3.1 Chapters 9 and 10 of the EIAR, together with Chapter 7 of the EIAR (Appendix B of the NIS), are to be taken as read and are not replicated here. To assist the Board in its consideration of this applications for approval, for the convenience of all participants at this hearing, and to set the context for responding to the objections and submissions, the key issues pertaining to the hydrological and hydrogeological appraisal of the proposed road development detailed in Chapters and 10 of the EIAR and Appendix B of the NIS are summarised briefly below.

#### Surface Hydrology

- 3.2 There are 21 watercourse crossings and 32 surface water outfalls proposed along the route. These are the Robertstown, Ahacronane discharging to the Shannon Estuary at Churchfield Creek near Foynes (Section A of the route), the Ballycullen Stream (in Section B), the River Deel in Section C, the Greanagh Rives A and B, the Clonshire River and the Maigne River.
- 3.3 The principal potential hydrological impacts to the character of the receiving waters are associated with the proposed road development crossing locations and drainage outfalls and the potential for sediment loading and associated road drainage pollutants entering such watercourses during both construction and operational phases.
- 3.4 A Flood Risk Assessment of the proposed road development has concluded that there will be no significant impacts on flooding or flood risk as a result of the proposed road development with the proposed culvert and bridge structures designed to meet OPW Section 50 requirements in respect to design flood, climate change allowance and freeboard. Engagement has taken place with the Office of Public Works in relation to Section 50 approvals under the Arterial Drainage Acts in relation to all proposed culverts and bridge crossing structures on the scheme. Storm water attenuation in form of surface ponds will be provided upstream of all storm outfalls to limit road drainage storm water runoff to the greenfield flood runoff rates. The associated road drainage network – that includes the road pavement drains, sub-surface, interceptor, collector and toe drains – has been designed to maintain the natural drainage regime of the land through which the road development passes in order to ensure that flooding problems are not exacerbated by the proposed road development.
- 3.5 In respect to potential pollution impact at drainage outfalls to receiving waters, a water quality HAWRAT assessment (Highways Agency Water Risk Assessment Tool) was carried out on all 32 outfalls along the proposed road development. Indeed, all 32 outfalls were found to pass representing potential low water quality impact to receiving surface waters. Included in this assessment was the proposed storm water treatment (sedimentation and filtering) measures within the drainage network and the attenuation ponds, which is designed to reduce the suspended heavy metal contaminants and suspended sediment from first flush road runoff events on the receiving watercourses.
- 3.6 A HGV accidental spillage risk assessment was carried out along the entire length of the proposed road development and for individual outfalls to quantify the risk of significant accidental spillage. This assessment showed very low risk of spillage impact to the receiving water environment. Notwithstanding this low risk, all outfalls

are designed with a spillage contaminant volume of 50m<sup>3</sup> which can be shutoff in event of a spillage. These design measures were considered appropriate given the downstream presence and sensitivity of European sites.

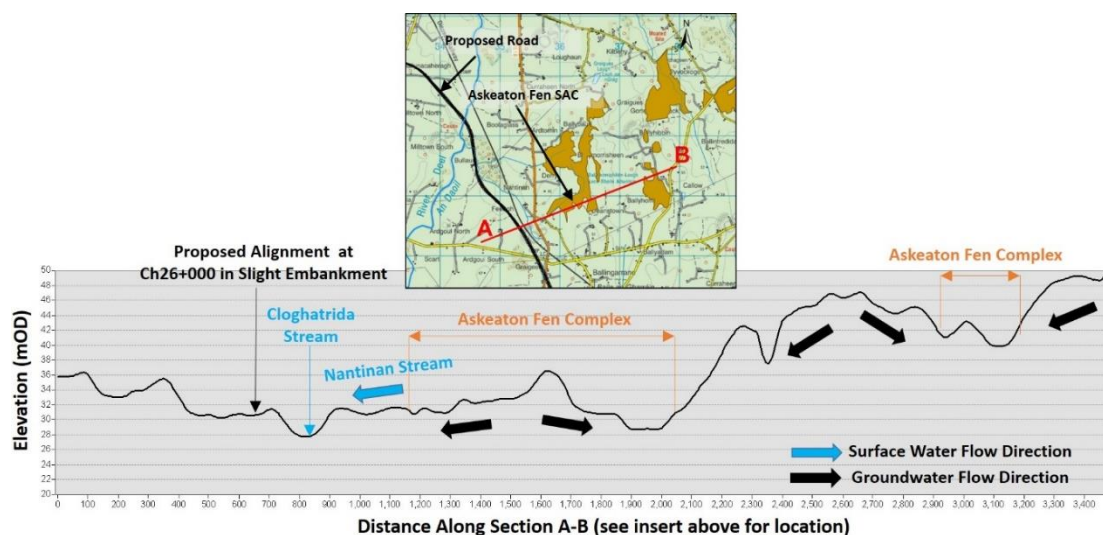
- 3.7 Potential construction phase impacts, primarily associated with construction site runoff and surface water contamination from accidental spillages of concrete, hydrocarbons (fuel and lubricating oils) from construction plant and storage depots, and other associated pollutants have the potential to significantly impact the receiving watercourse which in turn discharge to the Lower Shannon cSAC.
- 3.8 The proposed construction mitigation of potential polluting impacts will involve the implementation and adherence to the Environmental Operating Plan (EOP), which has been set out in Appendix 4.1 of the EIAR, and includes specific construction mitigation measures to limit the construction impact on receiving waters. Included in the EOP is an Emergency Response Plan that sets out the emergency procedures to be undertaken following the event of an accidental spillage of chemical, fuel or other hazardous waste and a Water Quality Management Plan that sets out the control, treatment and disposal of potentially contaminated construction surface waters. Further construction mitigation measures are set out in 10.5.2 of the EIAR.

### **Hydrogeology**

- 3.9 There are three general aquifer classifications along the proposed road alignment. These are a Regionally Important karstified conduit flow Bedrock Aquifer (Rkc), a Regionally Important karstified diffuse flow Bedrock Aquifer (Rkd), both of which are found in the Waulsortian Limestones, together with a locally important bedrock aquifer classification which is moderately productive only in local zones. The aquifer groundwater vulnerability to pollution which is based on the soil permeability, depth of the overburden and the unsaturated depth is primarily classified as high to extreme along the majority of the proposed route.
- 3.10 A number of surface karst features have been mapped in the southern section of the proposed road development within the Regionally important karstified conduit flow aquifer. These are turloughs at Lough Selleher, Tomdeely turloughs and Foley's turlough and a number of small karst springs located in the townlands of Tomdeely and Morgans North. Along the alignment of the proposed road development, geophysical investigations were carried out to identify possible subterranean karst features beneath the road alignment. For the majority of the areas investigated competent rock profiles were encountered.
- 3.11 Whilst the study area is primarily serviced by public water supply scheme a number of private group water schemes are also present namely Craggs-Barrigone at the north western end of the proposed road development, Cappagh and Croagh-Farrandonnelly schemes north and northwest of Rathkeale and Coshma-Killeen east of Adare. Only two of these sources are within the immediate vicinity of the proposed road development, namely, Craggs-Barrigone GWS at Mulderricksfield and Croagh-Farrandonnelly GWS near Croagh Village. The hydrogeological impact assessment of these sources concluded that, with the implementation of mitigation measures, the potential impact on the supply source would be slight.

- 3.12 A number of hydrogeologically sensitive (Groundwater fed) ecological receptors within the Study area have been identified and assessed. These are
- Small Fen Wetland at Rincullia (KER 4)
  - Small Fen Wetland at Ballellinan (KER 7)
  - Small Fen Wetland at Lismakeery (KER 11)
  - Small Fen Wetland at Blossomhill (KER 21)
- 3.13 The potential impact (pre-mitigation) of the proposed road development, which is upgradient of these receptors may result in slight to moderate impact on groundwaters flows within these habitats, due to the road alignment both in cutting and embankment which potentially could capture groundwater flow in the road drainage and divert to surface flows. This potential impact is rated slight negative at KER4 and moderate negative at KER7, KER11 and KER21. Specific drainage measures under the road alignment is proposed for these KERs which is summarised in Table 9.19 of the EIAR. These measures vary from drainage neutral design, sealed road drainage, provision of drainage blankets under the road alignment, drainage links under the road alignment to maintain spring flow to the Fen, construction of impermeable bunds to prevent longitudinal flow along the Road alignment and away from the Fens. The residual impact rating with these measures in place is assessed as imperceptible.
- 3.14 The Lower River Shannon cSAC is hydrologically linked to the proposed road development as a downstream receptor both by surface watercourse and by groundwater flow northwards from the alignment of the proposed road development towards the Shannon Estuary. The impact of the road development on the hydrological regime of this European site is assessed as an imperceptible impact both on water balance and water quality.
- 3.15 The Askeaton Fen Complex SAC is a groundwater fed system that is located in close proximity to Section C of the proposed road development. At its closest point, it is located 0.5km downstream of the proposed road alignment near chainage 25+000. The impact assessment identified potential localised changes to groundwater and surface water flow regime and hydrochemistry as small adverse magnitude localised impacts representing an imperceptible impact on the SAC.

This is indicated graphically in Plate 9.5 of the EIAR which is reproduced below.



- 3.16 To protect the Regionally Important groundwater aquifers and associated water resources and hydrogeologically sensitive ecological receptor sites, the road pavement drainage has been designed as sealed drainage in areas underlain by Regionally Important karst Aquifers at high and extreme groundwater vulnerability, which is in accordance to the TII design guidelines (DN-DNG-03065) for use of permeable road drainage systems. This length of the alignment underlain by such Regionally Important karst Aquifers represents approximately 7km of the mainline road alignment (refer to Table 9.9 in the EIAR). Furthermore, there will be no road drainage outfalls that discharge directly to groundwater, as all storm outfalls will discharge to surface watercourses and will be subject to treatment.

## 4. RESPONSES TO SUBMISSIONS ON HYDROLOGY AND HYDROGEOLOGY

### Issues Raised in Submissions / Objections

- 4.1 Submission / objection FI-4 has raised issues in regard to the response to Item 6 of the FI request by An Bord Pleanála, in respect to the extent of dewatering and the supporting field surveys of sensitive locations. The submission also asserts that the response to the Irish Water submission in the RFI was “dismissive” as it just refers back to the EIAR.

### Response

- 4.2 Full details of the sensitive locations in respect to karst features, groundwater resources and ecological receptors are set out in Chapters 7, 9 and 10 of the EIAR and in the associated figures for these chapters. The dewatering extent is associated with the road alignment and this was evaluated using field surveys together with the site specific ground investigations which is referenced in sections 9.2.4 and 9.4.5. of the EIAR.
- 4.3 The response to An Bord Pleanála details the dewatering assessment and, as requested by the Board, identifies the chainages associated with road cut excavations that may result in drawdown and dewatering of the surrounding groundwater table.

The Sichardt formula was used to evaluate the potential drawdown / dewatering extents of the bedrock cuttings using site specific information from the ground investigation (groundwater Table logging and permeability testing results).

- 4.4 The drawdown radius of influence can be calculated using the Sichardt drawdown formula as follows:

$$R_o = C(H-h_w)^{3/2} / \sqrt{K}$$

where  $R_o$  Radius of influence measured in metres from the cutting,  $C$  an empirical coefficient (3000),  $H-h_w$  is the maximum drawdown depth at the excavation and  $K$  is the hydraulic conductivity (m/sec) of the various media considered (limestone bedrock or overburden soils). This formula combined with the site investigation borehole and water table monitoring data produced the zones of drawdown radial from the road that are summarised in Table 1 below and the zones of drawdown presented in Figures R6.1 to R6.5 of the RFI. Included in these figures is the road elevation longitudinal section and the borehole locations that informed the assessment. The following table presents the findings. The drawdown extent represents the dewatering influence imposed by the Road cutting on the limestone bedrock aquifer. In terms of distance from the cut face presented below in Table 1 it identifies the potential zone of water table reduction within the limestone bedrock from imperceptible reduction at the drawdown extent to a maximum drawdown depth at the road cut face associated with invert of the road cut drainage.

**Table 1 Extent of Potential Dewatering by proposed Road Cut Excavations into the limestone bedrock**

Ch.	Representative Cutting Depth (m)	Representative cut Length (m)	Representative maximum Drawdown (m)	Stratum	Drawdown extent from cutting (m)
1+350 to 1+750	6 to 8	350	5 (Potentially dry)	Bedrock	106
3+950 to 4+300	6 to 8	300	0 (dry)	Bedrock	nil
5+150 to 6+400	15 to 17	1,100	11	Bedrock	233
52+400 to 56+000	6 to 7	3,400	6	Bedrock	127
60+000 to 60+500	7 to 8	250	0 (dry)	Bedrock	Nil

- 4.5 In response to the assertion that the Applicant's RFI document was "dismissive", it should be noted that the information required to respond to the query was already contained in the EIAR as submitted. For the sake of completeness, I confirm that the issue raised by Irish Water was addressed in the applicant response to the further

information request (issued 30<sup>th</sup> Sep 2020) in Sections 15.1 to 15.3 Section 15.1 focussed on issues previously raised by Irish Water, made specific reference to Sections 9.3.11 of Chapter 9 and 10.3.1 of Chapter 10 of the EIAR and to how these addressed the importance of the Water Framework Directive and outlined the current status of the groundwater and surface water of the area.

- 4.6 Section 15.2 of the Applicant Response to the Further Information Request. All road drainage will pass through pollution control and/or ponds, so no issue will arise during the operation stage.
- 4.7 Section 15.3 outlines how adherence to good construction practices, as fully outlined in the Environmental Operating Plan (EOP) will ensure protection of water quality in all drainage catchments and watercourses traversed by the proposed road development. Sections 6.6 and 6.7 of the EOP outline Erosion and Sediment Controls and Mitigation Measures which will be deployed in this regard.
- 4.8 It should be noted that in response to the above clarifications, Irish Water advised that they are satisfied that the applicant has provided information on mitigation measures to be in place to ensure protection of public drinking sources in the area. Irish Water is advised that after review of further information they have no objection in principal to the proposed development.

#### **Issues Raised in Submissions / Objections**

- 4.9 Submission SCH-121 by the Craggs Barrigone Group Water Scheme has raised a number of concerns regarding potential loss of water supply, ownership of, and access to, infrastructure in the event that the compulsory purchase of lands proceeds, the location for a new bore hole, continuity of supply, safety concerns at the new access roadway and costs if permanent supply from Irish Water is required.

#### **Response**

- 4.10 The hydrogeological assessment presented in Chapter 9 of the EIAR identified that the mapped groundwater Zone of Contribution (ZOC) of the Craggs/Barrigone Group Water Scheme borehole source will be intercepted by the proposed road alignment between Ch5+450 to Ch 6+300 at c. 900m upgradient of the borehole. This deep rock cutting, based on the borehole logs, has the potential to intercept the groundwater table and thus the potential contribution to this source. The potential hydrogeological impact to this source is a reduction in recharge to the supply well through interception by the road cutting of both groundwater, interflow and overland flow from its upgradient catchment. This represents 26% reduction in the overall mapped Zone of Contribution. The potential impact rating of this loss of ZOC is assessed as a moderate permanent adverse impact. There is also a potential for water quality impacts to this source both during construction and operation as works will take place within the zone of contribution. The water quality impacts will be reduced through the implementation of the EOP and the management of construction runoff during construction and minimised in the operation stage through sealed road drainage system and road outfalls to surface water only.
- 4.11 The mitigation set out in Table 9.18 of the EIAR proposes two alternate options:



- (i) Connection of the Public Water Supply to the Group Water Scheme Reservoir in advance of the main construction of the proposed road development, or
  - (ii) in the event of a significant impact to quality or yield of the source as a result of the proposed road development, a new suitably located replacement/additional borehole and pump system will be installed.
- 4.12 To ensure certainty of continued water supply and quality to the Craggs/Barrigone Group Water Scheme during the construction phase, in the unlikely event of hydrological impact, Limerick City and County Council have confirmed that a pipe connection to the Public Mains will be provided as a back-up supply. Such a temporary connection has been agreed with Irish Water and they have confirmed that the flow capacity is available to meet the existing demands of the group scheme with its 63 connections. The cost associated with the construction of this temporary connection from the Group Water Scheme Reservoir to the existing public water supply on the N69 at Clondrinagh will be covered by the Limerick City and County Council. It will be constructed before construction works commence on the proposed road development. This will ensure that the Group Water Scheme will have a guaranteed supply in the unlikely event it is required.
- 4.13 In the unlikely event that the Craggs/Barrigone source is permanently impacted through loss of well yield due to the construction works, and a suitable alternative borehole cannot be found, Limerick City and County Council have further confirmed that a permanent connection of the Public Water Supply to the Limerick City Regional Supply Scheme at Clarina will be facilitated. The cost of this permanent connection, in the unlikely case that it is required, will be borne by Limerick City and County Council / Irish Water. The temporary connection network will remain in place in the event of the permanent connection being required.
- 4.14 The routings for the proposed temporary and permanent connections are shown in Figures TWM and PWM attached to this brief of evidence. I refer also to the environmental appraisals which have been conducted in relation to the temporary and potential permanent water connections, for impacts on ecology, architecture and cultural heritage, noise and vibration, air quality and climate, landscape and human health. These appraisals are presented at Appendices A to F to this brief of Evidence.

#### **Issues Raised in Submissions / Objections**

- 4.15 Submission SCH-84 states that a turlough is connected to underground drainage system. The submission also expresses concerns about construction and impact of flooding on the farm.

#### **Response**

- 4.16 There will be no impact on flooding of adjacent lands with all surface water drainage runoff from the proposed road subject to attenuation to pre-construction levels prior to discharge into receiving watercourses. Cut-off drainage is provided at the toe of embankments and heads of cuttings to intercept overland flows. Maintenance of existing drainage will be achieved through culverting under proposed road embankments. In certain cases provision of local drainage diversions has been proposed to maintain existing land drainage paths and thus avoid increased flooding conditions.

- 4.17 The proposed road alignment located almost 400m downgradient of a turlough at Ch 5500 will not impact its hydrogeological regime in terms of its recharge or its drainage and consequently will not result in any flood impact to surrounding lands.

#### **Issues Raised in Submissions / Objections**

- 4.18 Submissions SCH-31, 52, 74, 96 and 113 have raised concerns about wells located close to the compulsory land take and seek a commitment that the wells will be monitored both pre and post construction.
- 4.19 Submissions SCH-39 and 68 state that an existing well is being compulsorily acquired as part of the land take and that Limerick City and County Council has not made provision for the restoration of same.
- 4.20 Submissions SCH- 55, 57, 60, 62, 64, 73, 76, 87 and 115 raise concerns that Limerick City and County Council has not explained how it proposes to protect wells within the holdings.
- 4.21 Submission SCH-47 is also concerned that the location of the proposed road has not considered the impact on a private well.

#### **Response**

- 4.22 Section 5 of Chapter 9 of the EIAR provides mitigation measures for wells which were found to be at risk in the Hydrogeology assessment. With respect to well sources, the EIAR identifies the following measures:
- All groundwater supplies currently in use that are within the footprint of the proposed road development will be replaced either through the provision of a private supply or by providing a connection to an existing public or group water scheme;
  - All groundwater supplies identified in Table 9.18 and Figure 9.5 of the EIAR and any existing private wells within 300m of areas of road cuttings greater than 5m will be monitored (for water level and quality).
  - This monitoring will involve quarterly monitoring for 12 months pre-construction for 12 months, bi-monthly during construction and quarterly monitoring for 12 months post-construction, subject to the agreement of the relevant land/property owner.
- 4.23 Section 9.5.1.1 of Chapter 9 of the EIAR concludes that “Imported fill shall be in accordance with the requirements of the TII Specification for Road Works. Where water supply wells and springs are located underneath the proposed road development footprint, these will be sealed to prevent contaminants entering the aquifer (*Well Drilling Guidelines (IGI, 2007)*). The incorporation of such mitigation measures will ensure there will be no likely significant residual effects to any private or group groundwater supplies.”

#### **Issues Raised in Submissions / Objections**

- 4.24 Submission SCH-84 raises the concern that Craggs/Barrigone GWS will be redundant during construction. The submission states that water is vital to his housed animals

and has concerns for animal welfare on his farm. It is noted that a map is provided of the landowners current water supply.

- 4.25 Submissions SCH-91 and 94 also claim that an existing water supply is being severed by the proposed road development and no alternative supply has been discussed with the landowners.

#### **Response**

- 4.26 There is a high probability that the Craggs/Barrigone GWS will not be impacted by the road development either during construction or operation phases. An alternate supply option is proposed in the event of impact so as to guarantee security of supply as described earlier in my BOE under sections 4.8 and 4.9. In the case of interruption to the private water supply, alternate provision will be made in the form of a new well to be drilled as part of the scheme, or by diversion of existing public mains as required.

#### **Issues Raised in Submissions / Objections**

- 4.27 A number of submissions were received in relation to the level of detail provided on the drainage measures for agricultural and non-agricultural properties and the impact that the proposed development will have on existing drainage systems.

#### **Response**

- 4.28 These comments have been responded to in John Bligh's Brief of Evidence. All surface water drainage runoff from the proposed road is subject to attenuation to pre-construction levels prior to discharge into receiving watercourses. Cut-off drainage is provided at the toe of embankments and heads of cuttings to intercept overland flows. Maintenance of existing drainage will be achieved through culverting under proposed road embankments. In certain cases provision of local drainage diversions has been proposed to maintain existing land drainage paths and thus avoid increased flooding conditions.

#### **Issues Raised in Submissions / Objections**

- 4.29 Five submissions / objections state that a private septic tank soakaway is in close proximity to the works and the landowner seeks a commitment that it will be monitored pre and post construction: The relevant submission numbers are SCH-31, 33, 52, 58 and 82.

#### **Response**

- 4.30 In respect to private waste treatment units and associated percolation areas adjacent to the development, there is no proposal to monitor these facilities as such systems – which are located in the unsaturated soil zone for suitable percolation and treatment – would generally only be impacted in the event of a local rise in the groundwater table or from surface flooding. These effects will be prevented through the provision of suitable road construction material in the formation layers and the provision of drainage channels either as cut-off, interceptor and collector drains that avoid ponding or flooding of adjacent lands or the potential for the local increase the groundwater table. There are no proposed soakaways for disposal of road pavement storm waters to groundwater. In areas of cutting there will be a reduction in the groundwater table local

to the road cut where it intercepts the water table and will not impact negatively on any adjacent septic tank systems.

### **Issues Raised in Submissions / Objections**

- 4.31 Submission SCH-47 also raises a concern that the location of the proposed road has not considered the impact on a septic tank and percolation area which may well now not comply with the new regulations given the proximity of the proposed road.

### **Response**

- 4.32 Any soakway, percolation area, domestic wastewater treatment plant or soakaway within the set-back distances outlined in Table 6.1 of the EPA "Code of Practice for Wastewater Treatment Systems for Single Houses" (2010) of the proposed road development will be decommissioned and relocated elsewhere on the affected property and designed in accordance with the EPA Code of Practice.
- 4.33 A summary of the EPA required set-back distances for the Septic tank, intermittent filters, packaged systems, percolation area, polishing filters of the waste system are 5m from other Soakaways, 10m from open drains and watercourses, 4m from roads, 3m from site boundaries, 4m from sloped embankments and cuts and 10m from Dwelling houses (for septic tank unit) and 7m for percolation area.
- 4.34 No such incident of this occurs along the proposed road development and where it does potentially occur the dwelling house is being acquired as part of the proposed road development.
- 4.35 In respect to impact on performance of the treatment system, this has been outlined in previous paragraph as unlikely given that the road is in embankment with associated embankment toe drainage to drain the embankment and convey flow to its natural outfall points.

### **Issue raised in submissions / objections**

- 4.36 The following seven submissions raise concerns regarding the impact on watercourses and the risk of flooding as a result of the proposed road development: ENV-34; SCH-17, 84, 33, 49, 82 and 115; FI 2 and 8.

### **Response**

- 4.37 The drainage system for the proposed road development is designed in accordance with Transport Infrastructure Ireland (TII) current design standards, TII Publications and the Manual of Road Works documents (MCRW) which incorporates best practice, including climate change allowance and robust precautionary principle design to avoid any unacceptable impacts on flood risk both to the development and to third party lands and to avoid any unacceptable pollution impact on receiving surface waters and groundwaters from the proposed road drainage discharges.
- 4.38 All surface water drainage runoff from the proposed road is subject to attenuation to pre-construction levels prior to discharge into receiving watercourses. Cut-off and interceptor drains are provided at the toe of embankments and heads of cuttings to intercept overland flows. Detailed flooding assessments of all watercourse culvert and bridge crossing have been carried out as part of the OPW Section 50 process of

engagement. Detailed flood risk modelling assessment has also been undertaken for the larger bridge crossings of the Maigue and Greanagh Rivers to ensure that the proposals do not cause any worsening to current flooding regime.

- 4.39 In response to concerns raised about existing flooding conditions at Lismakeery, a flood model was developed as part of Section 50 approval process for culverts in the area so careful consideration has been made of the existing flood regime. No worsening of existing flood conditions will arise as a result of the construction of the scheme at this location.
- 4.40 A concern was raised about flooding of the River Deel, and that attenuation ponds and parts of the scheme would be submerged in conditions of flood. I can confirm that the ponds within the Deel flood plain are bunded to prevent inundation during flood events, up to the 1% AEP condition plus allowance for climate change as required by the relevant standards. Measures for dealing with the risk of flooding during the construction stage at watercourse crossings are dealt with in section 8.2 of the Environmental Management Plan (EMP).

#### **Issues Raised in Submissions / Objections**

- 4.41 The following submission states that clearance of the Greanagh River at Kilknockan is excessive: ENV-9.

#### **Response**

- 4.42 The level of the motorway at the Greanagh River crossing is governed by a combination of minimum headroom requirement at the nearby underbridge UB09 to the west (Blackabbey Road) and design limitations on the vertical curve of the road alignment.

#### **Issue raised in submissions / objections**

- 4.43 Submission ENV-16 by Irish Water raises concern relating to the impact on an Irish Water Drinking Water Source at the Foynes/Shannon Estuary extraction point. Details to be provided of measures to be taken to ensure no negative impact. The abstraction point for this water supply scheme is approximately 2.3km downstream of RVB01 and has not been identified in the EIAR.

#### **Response**

- 4.44 This issue was responded to in the Further Information Response Document submitted to An Bord Pleanála on 30<sup>th</sup> September 2020. The mitigation measures proposed in Chapter 9 (Section 9.5) and Chapter 10 (Section 10.5.) of the EIAR for the protection of surface waters and groundwater during both construction and operation stages, will ensure that the quality of drinking water sourced at the Foynes/Shannon Estuary Public supply abstraction point near Askeaton will not be compromised by the proposed development. All road drainage will pass through pollution control and/or ponds, so no issue will arise during the operation stage. Adherence to good construction practices, as fully outlined in the Environmental Operating Plan (EOP) (Appendix 4.1 of the EIAR), will ensure protection of water quality in all drainage catchments and watercourses traversed by the proposed road development. Given the sensitivity of the watercourses along the road alignment discharging to the Lower River Shannon cSAC, the Askeaton Fen SAC and the Irish Water abstraction point 2.3km

downstream, water quality impact modelling using the HAWRAT model was carried out on the proposed storm outfalls from the proposed road development. The conclusion reached at all of the proposed outfalls both independent and in combination will result in slight to imperceptible impacts on the ambient water quality and in respect to the IW abstraction point results in a very low risk and magnitude of impact.

#### **Issues Raised in Submissions / Objections**

- 4.45 Submission SCH-5 raises concerns regarding damage to property as a result of surface water run-off from construction on CPO lands.

#### **Response**

- 4.46 The Environmental Operating Plan (EOP) referenced in Section 10.5.2 of the EIAR and presented in Appendix 4.1 sets out construction measures to prevent uncontrolled runoff of soiled construction site water with a requirement that all soiled site runoff water is collected and passed through settlement ponds for sediment treatment prior to release to its natural drainage outfall. Some of these measures will involve providing pre-earth work drains to intercept clean runoff water entering the construction works area so as to minimise the potential volume of site runoff water. Spillage containment and preventative measures are also set out including the use of silt fences near sensitive watercourses.

#### **Issues Raised in Submissions / Objections**

- 4.47 Submission SCH-15 raises concern regarding drainage problem on existing N21.

#### **Response**

- 4.48 The N21 at this location is remote from the proposed road development and so will not be impacted and alleviation of such pre-existing drainage problems is not within the remit of this road project.

#### **Issues Raised in Submissions / Objections**

- 4.49 Submission SCH-21 includes a copy of a letter of the 28<sup>th</sup> August 2017 expressing the landowner's concerns at the time. The submission claims that the issues raised in this letter were ignored. Since then, the submission claims that changes have been made to the proposed road development which have exacerbated the impact on our client's lands - most noticeably by the addition of a very large kidney shaped drainage pond.

- 4.50 Submission SCH-55 objects that the location of the pond is unsuitable.

#### **Response**

- 4.51 The selection of the location of attenuation ponds takes a number of factors into consideration, including the proposed vertical alignment of the road, the road drainage run and the proximity to the drainage outfall and topographical levels. The provision of attenuation ponds are required for the treatment of road pavement runoff in order to protect against water quality impact and against flooding impact in the receiving watercourse. All attenuation pond facilities will be securely fenced and planted with appropriate scrubs, hedgerows and or screening planting to minimise any visual impact and the facility will be maintained by the local authority.

### **Issues Raised in Submissions / Objections**

- 4.52 Submission SCH-46 raises a concern that the existing water supply to the holding is via a group water scheme. The inlet to same is within the line of the proposed road. No detail on a replacement supply has been discussed with the Limerick City and County Council.

### **Response**

- 4.53 I have addressed mitigation measures to ensure guarantee of ongoing supply earlier in this brief of evidence.

### **Issues Raised in Submissions / Objections**

- 4.54 Submission SCH-60 seeks information on how it is proposed to protect the property from the risk of flooding in the future, particularly from the new realigned County road.

### **Response**

- 4.55 The proposed road development has, through its drainage design, been designed not to worsen flooding by ensuring that all surface water drainage runoff from proposed road is subject to attenuation to pre-construction levels prior to discharge into receiving watercourses. Cut-off drainage is provided at the toe of embankments and heads of cuttings to intercept overland flows.

### **Issues Raised in Submissions / Objections**

- 4.56 Submission SCH-62 raises concern that access is required to the river for maintenance via culverts etc. Clarification is also sought by the landowner that the adjoining river and stream, in which the adjoining attenuation pond is out-falling will be maintained by Limerick City and County Council into the future.

### **Response**

- 4.57 No access to culverts or structures within the area of the compulsory acquisition of the Protected Road will be available to the landowner or his agents for any purpose whatsoever. All maintenance within the CPO boundary will be carried out by Limerick City and County Council, or in agreement with the Office of Public Works, where applicable.
- 4.58 All streams, culverts etc. within the compulsory acquisition area will be subject to a maintenance programme agreed with the Office of Public Works as appropriate. All watercourses outside the compulsory purchase area will not be included in such maintenance programmes and will remain the responsibility of the relevant landowner or either the Office of Public Works or Limerick City and County Council, as the case may be.

### **Issues Raised in Submissions / Objections**

- 4.59 Submission SCH-64 raises concerns re. pollution risk to ground water, the effect on hydrology, water courses and rivers.
- 4.60 Submissions SCH- 28 and 44 are concerned that the EIAR does not adequately contain sufficient design information in relation to potable water supplies, and preserving water quality.

### **Response**

- 4.61 Sections 9.5 and 10.5 and the EOP in Appendix 4.1 of the EIAR describe in detail the protection of groundwater and surface waters and the risk of pollution from the construction and operational phases of the road project. Pollution control measures have been included for in the design of the permanent road drainage network for the operational stage (Chapter 10 of the EIAR) and in the Environmental Operating Plan or construction stage.
- 4.62 A spillage risk assessment and outfall pollution impact assessments have been carried for all road drainage outfalls, refer to Sections 10.4.8 and 10.4.10 of the EIAR.
- 4.63 Importantly, in order to protect potable water supplies from pollution there will be no direct road drainage discharges via soakaway or percolation fields to groundwater throughout the entire road alignment. Furthermore, it is proposed in areas of high and extreme groundwater vulnerability that all road pavement drainage will be sealed so as to avoid any source of contaminant infiltration to groundwater. All road pavement discharges to surface waters will undergo treatment upstream of the outfalls as follows:
- Oil/petrol interceptors
  - Wetland forebay area
  - Spillage contaminant area with cut-off valves upstream of outfall
  - Attenuation pond sized to achieve greenfield flood runoff rates and retain first flush pollutant events.

### **Issues Raised in Submissions / Objections**

- 4.64 Submission SCH-76 raises concern that the stream is being diverted within the CPO on the Rathkeale holding but has not been discussed. It is also stated that “*access to a natural water supply will now be removed and the County Council have not provided any detail on how this water supply will be replaced*”. A commitment is also sought that lands will not become flooded.

### **Response**

- 4.65 The stream is being diverted and is shown in Figure 10.15 of the EIAR Volume 3. Details of stream realignments are provided in Section 7.5.3 Mitigation for Aquatic Sites of Chapter 7 in the EIAR. All surface water drainage runoff from the proposed road is subject to attenuation to pre-construction levels prior to discharge into receiving watercourses. Cut-off drainage is provided at the toe of embankments and heads of cuttings to intercept overland flows. Detailed flood risk assessment including modelling for the watercourse was undertaken to ensure that the proposals do not cause any worsening to current flooding regime.

### **Issues Raised in Submissions / Objections**

- 4.66 Submission SCH-29 states that there is a substantial stream between the HGV rest area and owner's lands which forms a natural boundary.

### **Response**

- 4.67 This stream has been accounted for in the assessments undertaken in the EIAR. The landowners concern is that drainage capacity in the boundary stream is not affected



by the proposed works. I confirm that no alterations to the stream are proposed as part of the scheme works.

#### **Issues Raised in Submissions / Objections**

- 4.68 Submission SCH-83 states that an existing stream and a natural spring are being acquired within the CPO area.

#### **Response**

- 4.69 The small stream at c. Ch 62+400 is to be straightened and culverted under the proposed road alignment. The spring located under the road alignment just to the west of the proposed culvert and which currently discharges to the stream will to be piped into the realigned and culverted stream. This ensures that both the stream and small spring are retained and continue to supply the same downstream watercourse channel.

#### **Issues Raised in Submissions / Objections**

- 4.70 Submission SCH-108: The construction of the underpass will result in excessive over-elevation of the road and additional flood risk to adjacent lands. Removing the underpass will mitigate this.

#### **Response**

- 4.71 Cut-off drainage is provided at the toe of embankments and heads of cuttings, to intercept overland flows. Drainage design has been considered as part of the underpass design and a gravity pathway identified to the north.

## **5. CONCLUSION**

- 5.1 The conclusion of the EIAR in relation to Hydrology and Hydrogeology is that there will be no significant adverse impacts as a result of the construction or operation of the proposed road development. Elimination of potential significant impacts from the road project on hydrology and hydrogeology has been achieved through the proposed engineering design of avoidance, good construction practice and specific mitigation measures. There will be no adverse effects from the proposed road development during construction or operation on the hydrology or hydrogeology of any European Sites or other designated conservation areas, or on any groundwater dependent habitats listed under Annex II of the Habitats Directive. There will be no significant in-combination impacts on hydrology or hydrogeology from the proposed development and other plans and projects.

## Figures

**Figure TWM:**            **Barrigone Group Water Scheme – Temporary Connection**

**Figure PWM:**            **Barrigone Group Water Scheme – Permanent Connection  
on N69**

## **Appendices**

**Environmental Appraisals relating to provision of temporary and potential permanent water main connections in relation to the Craggs Barrigone Group Water Scheme.**

- A: Ecology**
- B: Architecture and Cultural Heritage**
- C: Noise and Vibration**
- D: Air Quality and Climate**
- E: Landscape and Visual**
- F: Human Health**