CHAPTER 8

WATER

JUNE 2025

QUARRY CONSULTING

Contents

List of Figures

List of Cross Sections

Cross-Section A - A' = West to East from Lough Corrib SAC and SPA, through Knockmaa & Mortimer's Belclare Quarry and on through River Clare, mapped as part of Lough Corrib SAC.

Cross-Section B - B' = South West to Northeast: Lough Corrib SAC and SPA and Uisce Eireann PWS Intake at Luimnagh > Through Belclare Quarry > Through River Clare and to North of Tuam.

Cross-Section C - C' = Lough Corrib SAC and SPA > GWDTE Lough Corrib Fens 3 and 4 SAC (SAC 000297) > Mortimer's Belclare Quarry > Belclare and Killtower pNHA Turloughs.

Cross-Section D - D' = Lough Corrib > Knockmaa Hill pNHA (001288), Mortimer's Belclare Quarry, > River Clare (Galway) [Lough Corrib SAC 000297] > Levally Lough SAC (000295).

Cross-Section E - E' = Lough Corrib > Knockmaa and Knockmaa Quarries (Mortimer's Belclare Quarry and McTigue) > pNHA Sites Belclare and Killtower Turloughs.

Cross-Section F - F' = pNHA Site Turlough O'Gall > Castlehacket > Knockmaa > Mortimer's Belclare Quarry > River Clare.

Cross-Section G - G' = Lough Corrib > Rostaff Turlough pNHA (000385) > Lough Hacket pNHA (001294) > Knockmaa and Mortimer's Belclare Quarry > River Clare (Galway) [Lough Corrib SAC 000297].

Cross-Section H - H' = Lough Corrib > Turloughcor pNHA (001788) > Turlough Monaghan pNHA (001322) > Knockmaa Hill pNHA (001288), Mortimer's Belclare Quarry > Belclare Turlough pNHA (000234) > Killower Turlough pNHA (000282) and River Clare (Galway) [Lough Corrib SAC 000297].

Cross-Section I - I' = North West to Southeast: Collapsing Karst Feature / Cave townland on R333 Road > Knockmaa and Mortimer's Belclare Quarry.

Cross-Section J - J' = River Clare (Galway) >> Mortimer's Belclare Quarry >> Millspond >> Bunatubber >> Luimnagh PWS Intake on Lough Corrib.

Cross-Section K - K' = Lough Corrib & Luimnagh Intake >> Doegheona Spr. OUTPUT Tracer site >> >> Millspond >> Mortimer's Belclare Quarry >> River Clare.

Cross-Section L – L' = Lough Corrib >> Knockmaa >> Mortimer's Belclare Quarry >> River Clare.

List of Appendices

CHAPTER 8: WATER

Statement of Authority

8.1 The evaluation of the Water (hydrological and hydrogeological) environment and the assessment of Effects and Potential Impacts, with Mitigation Measures and Residual Impacts, was completed by Dr. Pamela Bartley (Hydro-G) who is considered a karst hydrogeology and groundwater specialist with specific expertise in the assessments of quarries and Public Water Supply.

8.2 Pamela Bartley's Statement of Expertise is presented as **Appendix 8.1**.

8.3 This Water Chapter and the Lands, Soils & Geology Chapter were created by the same professional civil engineering hydrogeologist because understanding the science and engineering of quarries and the hydrogeological environment results in complimentary competencies in soils, geology and the interactions between hydrology and hydrogeology.

EIAR Structure

8.4 The Road Map for the EIAR was presented in Chapter 2.0 of this EIAR. Chapter 1.0 provided information on the Site location and Context, Chapter 3.0 provided the Description of the Proposed Development and Chapter 16.0 addresses the Interactionss.

8.5 This Chapter of the EIAR assesses the impact of the proposed development on the hydrological and hydrogeological environment.

Overview

8.6 Mortimer Quarries Ltd. is applying for continued use of the existing quarry (granted under Planning Ref. File No.: 06/2275 and ABP Ref.: PL07.222783) at Cartron, Belclare, Co. Galway. The layout of the quarry is shown on Figure 8.1 with its regional hydrogeological context illustrated in Plate 8.1 other Figures 8.2 – 8.7 in the context of water related features.

8.7 Residences within the general area typically consist of one-off rural houses and ribbon development along the local road network. There are no properties within 400m of the extraction area, the nearest properties comprise a detached farm house approximately 590m to the north of the site and a series of dwellings on the L2212 south-west of the site. There are approximately 56 dwellings within 1km of the quarry. The closest settlement to the site is the village of Belclare, which is situated approximately 1.2km north of the site.

8.8 The proposed total footprint of the site will be referred to as "the site" for ease of reference throughout this chapter. The area under consideration in this application is already part of the quarry, with permission, and the proposal is extend the duration of the already permitted excavation, which remains unworked at present. Refer to Figure 3.1 of the associated Drawing Series.

8.9 The proposed development includes continuation of extraction of materials previously permitted almost 20 years ago but still remaining in the ground. The proposal to continue quarrying bedrock includes drilling, blasting, crushing, processing, and stockpiling of materials within a total application area of 16.3hectares (ha) to the permitted depth of 33m OD. In addition, the development includes the creation of a new storage yard area to the east of the existing quarry. This will require minor enabling works, including the stripping and regrading of topsoil and subsoil to achieve the desired yard levels. The stripped material will be stockpiled for future use in restoration, in accordance with good practice and site management protocols.

8.10 The coordinates central to the overall quarry site are ITM 536903 E, 748293 N.

8.11 The natural land surface elevation of the entire quarry lands before excavations took place there was c. 95m OD in the west and c. 67m OD in the east, approximately. The quarry is excavating land on the base toe of the slope from Knockmaa Hill, which peaks at c. 160m OD, at a distance of c. 1km to the west of the Site's offices at their entrance.

8.12 The quarry is a closed hydrological system with no outfall. All rainfall and incident water are retained on-site for reuse in dust suppression and operational water management. As such, no discharge licence is required.Hydrologically and hydrogeologically the site is mapped as sitting within the Corrib Catchment [HA 30], the subcatchment of the river system named the Clare [Galway]_SC_060, Code 30_13 subcatchment and overlying the Clare Corrib Groundwater Body (GWB). The EPA and Water Framework Directive (WFD) teams have reported assessments for the area in EPA (2018; 2021a and 2024). All published data have been employed for the characterisation of the Baseline and the Assessment of Impacts, Required Mitigations and Residual Impacts.

8.13 Lough Corrib is designated as a European Site (Lough Corrib SAC, Site Code 000297; Lough Corrib SPA Site Code 004042). There are two Statutory Instruments associated: the European Communities Conservation of Wild Birds (Lough Corrib Special Protection Area 004042) Regulations 2012 and Lough Corrib Special Area of Conservation 000297 Regulations 2022. Other Conservation Objective sites are discussed in detail in the Biodiversity Chapter of this EIAR, the accompanying NIS and in more detail in the Desk Study section of this Water Chapter.

8.14 Given the mapped catchment association with Lough Corrib, the site is linked to the Uisce Eireann asset Public Water Supply (PWS) of Lough Corrib. The quarry is c.9.5km to the northeast of Lough Corrib's closest shore and this is in the vicinity of the Luimnagh WTP intake. However, given the distance to Lough Corrib (~9.5 km) and the topographic and hydrogeological separation of the site from surface or groundwater pathways to the lake, no hydrological linkage has been identified. While the site is within the broader mapped catchment of the Lough Corrib Public Water Supply, the separation distance and groundwater flow direction do not support a functional hydrological connection to the Luimnagh Water Treatment Plant intake.

8.15 In addition to water assets, Knockmaa Hill adjacent to the site is considered a Geoheritage Site (GY082), a landscape of Cultural Heritage, of importance to locals as a recreational area and a Tourism asset.

The Application Site

8.16 The application site is comprised of an existing operational quarry with an overall site area of 16.3 ha and is essentially an L shaped site. Refer to Figure 8.1. There is an adjacent quarry to the north and north west: McTigue's.

8.17 The site is located in the townland named Cartron near Belclare, Co. Galway. The site is situated 5.6km, approximately, south-west of Tuam and 10km north-east of Headford. Galway city is 20km to the south of the site. The site is located c. 5km to the south west of exit 20 to the M17 Motorway connecting Tuam to Galway.

8.18 The site is to the south of the R333 and west of the L2212 from which access is provided via an unnamed local road approximately 600m in length. In the vicinity of the site the L2212 comprises an unmarked single carriage road with an 80km/hr speed limit. The L2212 joins the R333 at a T-junction approximately 1.5km north-east of the site.

8.19 The site is permitted to work the floor to an elevation of 33m OD. Details of all associated Planning Permissions and Reference Numbers were provided in Chapter 1 of this EIAR. No lateral expansion is proposed outside the previously sanctioned area. No additional deepening of the floor is proposed that has not already been permitted in a 2006 permission (06/2275: for continued quarrying of pre-1963 limestone quarry, granted with Conditions 22/03/2007, appealed (*An Bord Pleanála reference PL.07.222783)* 10/04/2007 and approved 7/05/2008). This planning application is being made in order to continue extracting the bedrock that has previously been granted permission. Although the quarry floor has not yet reached the permitted extraction depth in all areas, the overlying subsoils have been stripped.

8.20 The application area 'Red Line' boundary of the application site is shown at the Regional scale in Plate 8-1. More detail and labels on water related features are presented in the associated Figure series: Figure 8.2 and others after.

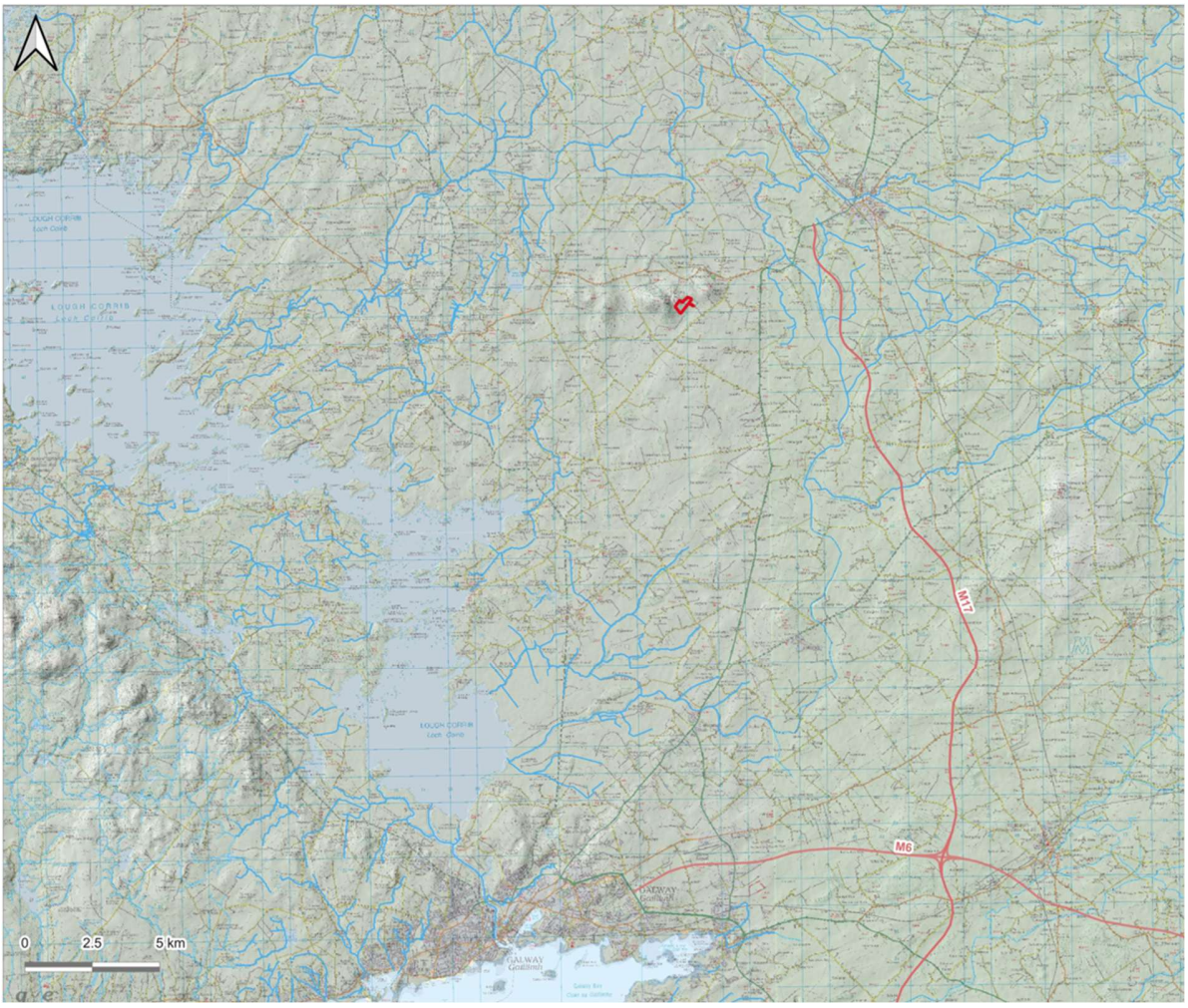

Plate 8-1 Mortimer Quarries overall Site with Red Line Planning Application and Regional features.

8.21 There are no rivers (surface water) features in the immediate vicinity of the site and no direct hydrological link exists between the site and any surface water. Detail for all rivers, turloughs, Conservation Objective Sites, pNHAs, hydrogeology and groundwater characteristics are presented in detail in the Desk Study element of this Chapter. Of most significance is that Lough Corrib is c.9.5km to the south west of the site at its closest point. Lough Corrib is the largest lake in the Republic of Ireland and the second largest lake, after Lough Neagh, on the island of Ireland.

8.22 The nearest coastal water body is Oranmore Bay, which is c.24km due south of the site.

8.23 Whilst there are no surface water features in the immediate vicinity of the site, there are Uisce Eireann and GWS Reservoir and Mains Assets in the vicinity. This chapter has a specific section on GWS Supply Wells.

8.24 With respect to the Uisce Eireann mains that runs under the access road to the quarry and the reservoirs at Knockacarigeen, 1km to the northeast of the site (Figure 8.4), Hydro-G consulted directly with Uisce Eireann personnel for the region in Assets (Eoin Hughes) and Operations (Ronan Mannion). Details relating to the infrastructure assets are presented in Scoping Responses **Appendix 8.4** in a discussion section dealing with Hydro-G's responses to the usual matters of importance to Uisce Eireann.

8.25 The applicant has provided information that this specific issue was addressed in the 2007 Grant of Permission (PL 062275 & ABP Reference PL 07.222783) and that Blast Monitoring data ensures that there are no vibration impacts that could affect the mains or reservoir (refer to EIAR Chapter 11: Noise and Vibration). The site has operated for almost 20 years and there is no communication from either Galway County Council or Uisce Eireann suggesting any impacts on the 1995 constructed mains and reservoir.

The Existing Development

8.26 The quarry, and associated facilities within it, cover an overall site of 16.3 ha, approximately, and the proposed development will be within the existing quarry site boundary. Details of the site layout shown on the Application's Drawing Series' Key Plan, which is reproduced here as Plate 8-2, which is direct copy of the associated Drawing Series presented by Quarry Consulting for the Key Plan. Details for all site infrastructure were presented in Chapter 3 of this EIAR.

8.27 The parent permission for the site granted continued quarrying of a pre-1963 limestone quarry (06/2275), granted with Conditions in 2007, appealed to An Bord Pleanála (PL.07.222783) and approved in May 2008. The parent permission is for a quarry floor level of 33m OD.

8.28 In addition to the parent permission, there are multiple sanctions of ancillary developments including the removal and replacement of an existing office and staff facilities building and the provision of a staff and visitors carpark to serve the existing quarry (17512).

8.29 The existing quarry operations comprise extraction of limestone using drilling, blasting techniques, processing (crushing, screening and stockpiling) of the fragmented rock to produce aggregates for the construction and agricultural markets. Since the original permission, the site has received additional consents for a number of developments including:

- An asphalt plant;

- A concrete batching plant;
- Material storage sheds and aggregate covers;
- An ESB substation;
- Wheel wash facilities and weighbridges;
- Other associated infrastructure ancillary to the primary quarrying activity.

8.30 The Concrete Batching Plant (PL 20419) has associated activities of relevance to water in that in this area are permitted Washdown/Surface Water Collection System and Washwater Recovery Tanks, Concrete Block Making and Storage Facility and all Associated Ancillary Site Services.

8.31 The potential for cumulative impacts from the existing limestone processing plant, concrete plant and asphalt plant have been assessed in this chapter of the EIAR.

8.32 To the north and northwest of the application site lies another quarry operated by McTigue Quarries Ltd., which has been taken into account in the cumulative assessment where relevant.

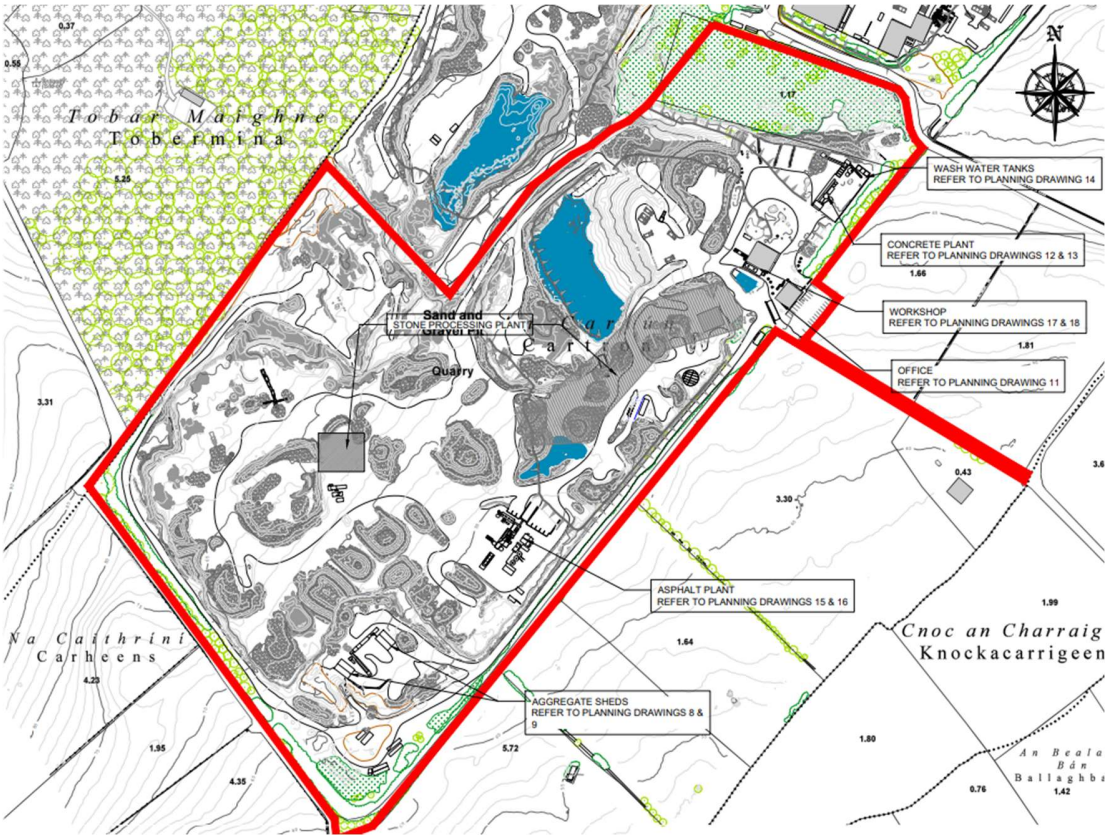

Plate 8-2 Mortimer Quarries overall site layout.

8.33 The site holds an active Waste Facility Permit (WFP-G-21-0007-02, granted 29/09/2022), which allows for the importation of permitted and controlled material for the purpose of progressive infilling and restoration of the bedrock void. This restoration strategy supports national and EU policy

objectives for the circular economy, whereby recovered materials such as soil and stone are used beneficially to restore previously worked land.

8.34 In addition to material accepted under the waste permit, the restoration plan may also include the use of material classified as by-product under Article 27 of the European Communities (Waste Directive) Regulations 2011 (as amended), subject to appropriate notifications and validation by the EPA. This dual approach—combining permitted waste and notified by-product—facilitates sustainable land rehabilitation, minimises the need for disposal to landfill, and aligns with resource efficiency principles set out in the National Waste Action Plan for a Circular Economy.

Water Management Systems (Existing)

8.35 Rainwater falls on the landscape surrounding the excavated void and enters the site by gravitational fall to a central sump on the existing quarry floor. Refer to Figure 8.1 for Site Layout.

8.36 The quarry operates a closed-loop water management system, utilising collected rainwater from the sump and supplementary water from an on-site borehole to support dust suppression, aggregate washing, and general site operations. There are no springs or groundwater ingress points within the site. Observations of the walls of limestone around the perimeter of the void show a solid competent mass of dry limestone. Therefore, only rainfall runoff must be managed within the quarry area.

8.37 For the purpose for dust suppression and other site uses, during dry periods the settlement tank is topped up from an existing on site bored well, which is located on the eastern boundary and to the south of the site offices. There is a storage tank beside the well. The well is also used to provide water to the concrete batching plant, supply the office supply and as a top-up for aggregate washing at the screening plant during dry periods and for production.

8.38 Class 1 hydrocarbon interceptors are in place where the potential exists for hydrocarbon pollution, *e.g.*, at refuelling points and at the site's garage.

Site Services - Water and Wastewater

8.39 With respect to water supply to the site, a Water Supply Borehole serves the site's offices, concrete batching plant and provides supplementary water for dust when there is not enough rainfall collected in the site's sump. The volume of water abstracted is <25m3/d and therefore does not legally require registration on the EPA Register of Abstractions.

8.40 The water supply borehole is close to the southeastern boundary and is shown on Figure 8.1, which is the first Figure of the Figure Series presented at the end of the Chapter. The ground elevation at the well is c.60m OD and it is to the south of the site offices. There is a storage tank beside the well and there is >250m3 storage capacity. The well was tested and results analysed by Hydro-G in 2019 as part of evaluating feasibility for the Concrete Batching Plant. The well is 114m deep and it is a 6" diameter well. The water level is c.45m below ground level (bgl) when resting before pumping and draws down only 3m when abstracting. Recovery is rapid and happens within an hour of cessation of pumping. Relative to the permitted and proposed 33m OD elevation of the quarry extraction area's floor, if one considers that ground level at the well is c.60m OD and the water level is c.45m bgl, it follows that the groundwater strike zone is at, or beneath, 15 m OD (60m OD – 45m bgl = 15m OD). The base depth of the well is at an elevation of -54m OD (60m OD – 114m bgl = -54m OD). In

simple terms, the well proceeds to c.55m below sea level. And the water strike is somewhere between the 15m OD elevation of the water in the well and the base of hole elevation of c.55m below sea level. Since the permitted quarry floor is at 33 m OD, it lies significantly above the regional groundwater flow system beneath the site, which begins at or below 15 m OD.

8.41 With respect to wastewater treatment, the site's staff are serviced by the wastewater treatment system and discharge zone that was granted permission in the parent permission for the site. The upgraded office and staff facilities granted under Permission Ref. 17512 continue to use the approved wastewater treatment and discharge system originally permitted for the quarry site.

The Proposed Development

8.42 The proposed development is within an overall application area of c. 16.3 hectares and is for a total period of 35 years (the extraction operational period is for 33 years and the importation of materials for restoration is for a further 2 years).

8.43 The proposed development will facilitate the continued operation and restoration of the site, with the operational life of the quarry ceasing upon resource exhaustion, followed by restoration to agricultural and natural uses using imported material.

8.44 As outlined in Chapter 3, the proposed development comprises the following:

- Continued use of the existing quarry (granted under Planning Ref. File No.: 06/2275 and ABP Ref.: PL07.222783), including drilling, blasting, crushing, processing, and stockpiling of materials within a total site area of 15.09 hectares to the permitted depth of 33m OD.
- Continued use of existing permitted structures and facilities, including:
    - Weighbridge and wheelwash with side and overhead spray bars.
    - Office and staff facilities building and carpark provision (Ref. 17512).
    - Asphalt plant (Ref. 15104), concrete batching plant (Ref. 20419), maintenance shed (Ref. 141295), aggregate shed, ESB substation (Ref. 191964), crushing and screening plant, and stock bays (Ref. 062275 & 21442).
    - Associated site infrastructure.
- Construction of a new quarry storage yard (c. 1.09 Ha.) to the east of the existing quarry.
- Relocation of the existing permitted sheds (Plan Ref File No. 141295) to area beside proposed storage yard area.
- Importation of soil and stone (both waste and non-waste) for site restoration purposes and selected construction and demolition waste for recycling to preserve natural aggregate resources, subject to the necessary authorisations.
- The proposed development will facilitate the continued operation and restoration of the site, with the operational life of the quarry ceasing upon resource exhaustion, followed by restoration to agricultural and natural uses using imported material.

8.45 The proposed development is within an overall application area of c. 16.3 hectares and is for a total period of 35 years (the extraction operational period is for 33 years and the importation of materials for restoration is for a further 2 years).

Assessment Objectives

8.46 Under the European Union's Environmental Impact Assessment (EIA) Directive (2011/92/EU as amended by 2014/52/EU), major building or development projects in the EU must first be assessed for their impact on the environment.

8.47 In Ireland, the EPA (2022) Guidance for Information to be Contained in Environmental Assessment is used to guide assessments and the preparation of an Environmental Impact Assessment Report (EIAR). EPA (2022) has been used in this assessment (refer to EIAR Chapter 2).

8.48 The objectives of this assessment are, as per the EIA Directive (2014/52/EU) and EPA Guidance (2022), to present an EIAR that contains all the relevant information for the Planning Authority's EIA, which includes, as follows:

- Baseline hydrogeological and hydrological conditions for the site & update previous assessments, which had a strong foundation in drilling and monitoring information.
- Potential impacts of the proposed development on the underlying groundwater body, associated surface water bodies and ecosystems.
- Potential for Cumulative Impacts and Transboundary Impacts.
- Appropriate mitigation measures for any identified potential impacts, as deemed necessary, with impacts and proposed mitigations reassessed and residual impacts defined for the convenience of the Planning Authority's EIA.

Guidance and Legislative Instruments

8.49 This report was prepared with consideration of Industry Guidance documents and ensuring compliance with European Legislation (Directives) and Irish Statutory Instruments and Regulations as listed in Appendix 8.2.

8.50 The author of this assessment hereby confirms that the assessment completed and reported adheres with EU EIA and EIAR Guidance and that the proposed project has been assessed in accordance with EPA (2022) Guidelines for EIA.

8.51 The author of this assessment hereby confirms that the assessment completed and reported has been completed with consideration of Irish Statutory legal instruments enacting the Water Framework Directive (WFD) and the Birds & Habitats Directive.

Data and Maps

8.52 This report was prepared using Desk Study available Data and Maps appropriate to the study site, and wider environment, and site-specific reports for the site as listed in Appendix 8.3. The data sources critical to the development of an understanding of the hydrology of the area are provided in full in Appendix 8.3.

Consultations

8.53 In relation to water, the site's agents have engaged with the Health Service Executive (HSE), Uisce Eireann and the Geological Survey of Ireland (GSI).

8.54 Scoping Responses of relevance to this Water Assessment presented as **Appendix 8.4**, in which Hydro-G responses are also provided.

8.55 Hydro-G hereby confirms that all resources and consideration requests returned by the GSI has been included in the assessment. And the water related requests of the HSE have been addressed.

8.56 The Impact Tables at the end of this Chapter incorporate all information required by statutory stakeholders and the public.

Overall Assessment Methodology

8.57 The methodology adopted for this assessment is as follows:

- Review of current Legislation and Guidance relating to EIA and EIAR, Quarry Assessment Guidance and Water and Habitats related Legislation.
- Review of the 'Subject' development currently under consideration and assessment.
- Review of the Project Scoping document's Responses from Statutory Bodies.
- Characterisation of the Receiving Environment (hydrology and hydrogeology).
    - Determination of the Baseline.
    - Evaluation of WFD Reported characterisations for the environment.
    - Evaluation of the site's own receiving environment.
- Review and analysis of Long-Term site monitoring data.
- Application of EPA (2022) and IGI (2013) Guidelines on the Assessment of Potential Effects. Identification of Potential Effects, Mitigation Measures, Assessment of Residual Impacts & Other Impacts, as specified in Guidance. (**Appendix 8.5**).
- Application of the UK Environment Agency's Hydrogeological Impact Appraisal Methodology for Dewatering at Quarries (**Appendix 8.6**).
- Consideration of PWS Protection Measures & Consideration of SAC Protection Measures, including the conservation objectives of designated Natura 2000 sites.
- Completion of the Water Framework Directive Assessment.

Desk Study Receiving Environment

Historic Land Use

8.58 Historical land uses, reviewed using maps and aerial photography, are detailed in Table 8.1.

Table 8.1 Historical Land-use at the Site and its Surroundings

Ordinance Survey Map Reference (Dates)	On Site	Immediate Surroundings
OS 6" colour (1837-1842)	Nothing at the site of the quarry or its adjacent quarry site.	Caislaun Feecul In Ruins to the west, on the eastern flank of Knockmaa
OS 6" Cassini (1845) & OS 25" Historic (1888-1913)	The site is mapped as uncultivated land.	As above. Castel Feecul Wood now mapped to the north of Caislaun Feecul. Tobermina is a marked spring to the north and it is a townland name in current mapping (2025).
Geohive MapGenie – 1995	Black and white aerial imagery enables view of rock outcrops on Knockmaa and similar bedrock exposure at Mortimer's Belclare Quarry site. Multiple residences exist on all roads north, south, east, west.	
Geohive MapGenie – 1996	Colour aerial imagery enables view of Mortimer's Belclare Quarry site established more in the north than south of eastern part of the application site but some subsoil stripping has occurred in the southern half of Mortimers. Lots of one off houses in the wider area.	
Geohive MapGenie – 2001	Mortimer's Belclare Quarry site well established in northern and southern halves of site. The site has been stripped of all subsoil and soil cover. All areas are Dry. Mc Tigue site, immediately north and to the northwest of Mortimer's is a quarry.	
Google Earth PRO Aerial Imagery 2010	The excavation in the centre holds rainfall and the southern half of the site is stripped only but not excavated significantly in depth.	
Geohive MapGenie – 2013	No significant changes at either quarry site or in the overall area. Dry quarry floors.	
Google Earth PRO Aerial Imagery 2018	As above. No significant changes. Rainfall ponding on the lowest elevations of both Knockmaa Quarries.	
Google Earth PRO Aerial Imagery 2019	No significant changes at the Mortimer site. Mc Tigue establishes a deep cut benching on the north west of the Mortimer site .	
Google Earth PRO Aerial Imagery 2021 - 2022	Infill (for restoration purposes) evident in the deepest part of the Mortimer Belclare Quarry site, which is close to the offices. Waste Permit Number WFP-G-21-0007-02. Seasonal rainfall ponding central in the site.	As previously described for the wider area – Ribbon development of single houses and no changes of significance in the wider area.
Land Direct	The site is divided in subsections.	Land Direct (2025) shows a pipeline from Tobermina to the R333, north of Knockmaa.

Conservation Objective Sites

8.59 Conservation Objective Sites and Designated Areas and the site are presented as Figure 8.2

8.60 Hydrologically and hydrologically the site is mapped as follows:

- Part of the Corrib Catchment [HA 30],
- Within the subcatchment of the river system named the Clare [Galway]_SC_060, whose ID Code is 30_13,
- Within the WFD sub basin named the BALLINDUFF STREAM_010 [EU_CD IE_WE_30B050100],
- Overlying the 'Clare Corrib' Groundwater Body (GWB) [IE_WE_G_0020], which is afforded WFD Protection Are Type 'Special Area of Protection-Conservation Objective' and EU EU Protection Area Type Article 7 Abstraction for Drinking Water.

8.61 Although the site is mapped within SAC/SPA/pNHA catchments, there is no direct hydrological or hydrogeological link to these Conservation Objective Sites. The quarry operates above the water table, has not intercepted groundwater, and does not discharge to any watercourse. As previously stated, within the mapped subcatchment of the quarry, the nearest surface water feature is a c. 3.6km due east of the site and this is named the GLENNAFOSHA [EPA Code 30G69; EU Code IE_WE_30C010700], which is a Tributary Stream that flows into the main channel of the Clare (Galway) River, which is c. 5km due east of the site. The Clare (Galway) River [EPA Code 30C01; EU Code IE_WE_30C010800] flows from north to south and travels a stream length distance of c.25km before entering Lough Corrib at a 'as the crow flies' distance of c. 17.5km to the south west of the site. The Clare River is mapped as part of the Lough Corrib SAC all the way as far as north of the north of the site. However, even though the site is sitting in the Subcatchment of the Clare River, it is mapped as draining into the basin of the Ballinduff_010 stream that discharges directly to Lough Corrib to the south west of the quarry. The closest rising of the Ballinduff_010 to the site is c. 6km to the south west of the quarry. There is a second rising of the Ballinduff_010 is c.7km to the southwest of the quarry. The Ballinduff_010 is not mapped as part of the Lough Corrib SAC.

8.62 The site sits between the River Clare and Lough Corrib and both the river and the lake are mapped as part of the European Site Lough Corrib (SAC Site Code 000297 & SPA Site Code 004042). There are two Statutory Instruments associated: the European Communities Conservation of Wild Birds (Lough Corrib Special Protection Area 004042) Regulations 2012 and Lough Corrib Special Area of Conservation 000297 Regulations 2022. Refer to Cross-Section A-A', which is presented at the end of the Figure Series, which presents the surface water systems and underground groundwater system. Cross-Section B-B' shows a slightly different orientation between the quarry and Lough Corrib – the Uisce Eireann Luimnagh Intake for PWS is shown on B-B'.

8.63 GWDTE-Lough Corrib Fens 3 & 4 (SAC 000297) is c. 12 Km to the south west of the quarry. This GWDTE is farther south than the Luimnagh Intake on Lough Corrib. Cross-Section C-C' presents a Cross-Section in the landscape in which the quarry's elevation is shown relative to the GWDTE Lough Corrib Fens to the south west, on the shores of Lough Corrib, and the Belclare and Killtower Turlough pNHAs to the north.

8.64 As previously introduced, the site is c.24km to the north of Oranmore Bay, which is part of Galway Bay Inner SAC, SPA and proposed NHA. Given that Galway Bay is mapped as Hydrometric Area 29

and the quarry site is mapped as part of Hydrometric Area 30, there is NO direct hydrological link to the Conservation Objective sites associated with Galway Bay. The Clare Corrib catchment (HA30)'s most significant water body is Lough Corrib and this discharges to Galway Bay. However, this is an indirect link between the site and Galway Bay. Galway Bay has designation as a European Site (Galway Bay Complex SAC 000268, Inner Galway Bay SPA 004031, Galway Bay Complex proposed NHA 000268) and also has two Statutory Instruments associated: European Union Habitats (Galway Bay Complex Special Area of Conservation 000268) Regulations 2021 [S.I. No. 548 of 2021] and European Union Conservation of Wild Birds (Inner Galway Bay Special Protection Area 004031) Regulations 2019 [S.I. No. 515 of 2019].

8.65 Shrule Turlough SAC (Site Code 000525) is 11.9km to the north-west of the quarry. There is no surface water connectivity between Mortimer's Quarry site and this SAC. The EPA map the Shrule Turlough as having its own Groundwater Body and it is specifically called a Groundwater Dependent Terrestrial Ecosystem GWDTE-Shrule Turlough (SAC000525). This means that the limits of impact are the limits of the GWDTE boundary because that is the flow path length that sustains the Shrule Turlough.

8.66 Cloughmoyne SAC (Site Code 000479) is also to the west to north west of the quarry and at a distance of c. 13.5km. Interestingly, Cloughmoyne SAC is bisected by the Clare Corrib GWB, in which the quarry sits, and the Cong Robe GWB, which flanks the northeastern shores of Lough Corrib. Cloughmoyne has its own Statutory Instrument (S.I. No. 222 of 2017) named the European Union Habitats (Cloughmoyne Special Area Of Conservation 000479) Regulations 2017. The site is a European Site because of its Qualifying Interest 'Limestone Pavement' and the site specific Conservation Objectives report (2019) states that "Limestone pavements* in Cloughmoyne SAC exhibits a good example of the shattered form of the habitat and occurs in intimate association with species-rich calcareous grassland, juniper (Juniperus communis) scrub and heath habitats." The Site Synopsis (NPWS, 2013) states that "The site lies on the south-west slope of a low limestone ridge and spreads southwards to include a fen and lake." The habitat of qualifying interest for Cloughmoyne SAC is limestone pavement, which is a habitat that **is not** a Groundwater Dependent Terrestrial Ecosystem (GWDTE).

8.67 Levally Lough SAC (Site Code 000295) is designated because it is a Turlough and it is 16km to the north east of the quarry. The River Clare is between the quarry and Levally Lough SAC. Refer to Cross-Section D-D', which shows the regional setting of Levally Lough SAC relative to the Quarry and Lough Corrib SAC and SPA.

8.68 Derrinlough (Cloonkeenleananode) Bog SAC (002197) is c. 22km to the north east of the quarry. This Bog SAC is a site designated for its habitat (7120) Degraded raised bogs still capable of natural regeneration. There is no surface water connectivity between Mortimer's Quarry site and this SAC.

8.69 Monivea Bog SAC (002352) is c.20.km to the south-east of the quarry and it is designated for (7110) Active raised bogs*, (7120) Degraded raised bogs still capable of natural regeneration and (7150) Depressions on peat substrates of the Rhynchosporion. There is no surface water connectivity between Mortimer's Quarry site and this SAC. Monivea Bog sits in the Clare Corrib GWB, similar to Mortimer's.

8.70 There are other SACs to the northwest and to the east and south east of Mortimer's Belclare Quarry. Given that all of these sites are located in separate groundwater bodies and/or distinct surface water

catchments, and with no mapped flow paths from the quarry, they can be excluded from further assessment in this hydrogeological context.. Details include as follows:

- To the east, in the Suck South GWB, SACs include as follows: Williamstown Turloughs SAC (002296) 27.1km to the north-east of the quarry; Coolcam Turlough SAC (000218); Croaghill Turlough SAC (000255); Carrownagappul Bog SAC (001242); Curraghlehanagh Bog SAC (002350); Camderry Bog SAC (002347); Shankill West Bog SAC (000326) & others. As stated, they are in a different Surface Water System and different GWB and there is therefore no connection to Mortimer's Belclare Quarry.
- To the northwest, in the Cong-Robe GWB, SACs include as follows: Mocorha Lough SAC (001536); Clyard Kettle-holes SAC (000480); Kilglassan/Caheravoostia Turlough Complex SAC (000504); Carrowkeel Turlough SAC (000475). As stated, they are in a different Surface Water System and different GWB and there is therefore no connection to Mortimer's Belclare Quarry.
- Skealoghan Turlough SAC (000541), at c.19km to the northwest, is within its own GWDTE [IE_WE_G_0103]. As stated, it is in a different Surface Water System and different GWB and there is therefore no connection to Mortimer's Belclare Quarry.

Proposed National Heritage Areas

8.71 Knockmaa Hill, adjacent to the site, is mapped as a pNHA and is also reported by the GSI (Meehan et al., 2019) as a Geoheritage Site (GY082). Its Geoheritage relates to geology and therefore it is discussed, with other geologically significant sites, in Chapter 7 of this EIAR.

8.72 There are many pNHA sites in the areas to the north and west and southwest of the quarry and these turloughs have significance to this Water Assessment. Although not mapped as SACs, the many local turloughs sustain priority habitats. With respect to the assessment of groundwater and the nature of the flow system, the turloughs provide evidence of where and at what elevation the groundwater flow system expresses itself.

8.73 There are many Turloughs mapped as pNHAs and these are listed with their distance from the site, and elevations, as follows:

- Belclare Turlough (pNHA 000234) @ 1.5km to the northeast of the boundary of the combined Belclare Quarries GSI mapped Geoheritage site. Distance is not as important as hydrological connections: there is no surface water connection. Refer to Cross-Section E-E' at the end of the Figure Series. The Cross-Section shows that the elevation of the Belclare Turlough pNHA is c. 26m OD. Given that the elevation of the floor of Mortimer's Quarry is partially worked to, and permitted to and proposed to be, 33m OD, it is confidently asserted that the quarry sits above the regional groundwater head elevation and therefore no potential exists to interact with, or be required to manage in the future, or affect groundwater.
- Killower Turlough (pNHA 000282) @ c. 3km at its closest to the northeast boundary of the combined Belclare Quarries GSI mapped Geoheritage site. Refer to Cross-Section E-E' at the end of the Figure Series. Similar to the Belclare Turlough pNHA, the elevation of Killtower Turlough pNHA is c. 29m OD and therefore the quarry sits above this groundwater expression at the Turlough. Again, given that the elevation of the floor of Mortimer's Quarry

is 33m OD, it is confidently asserted that the quarry sits above the regional groundwater head elevation and therefore no potential exists to interact with or affect groundwater.

- Turlough O'Gall (pNHA 000331) @ c.3km to the north west of Mortimer's Belclare Quarry. Turlough O'Gall is at 25m OD elevation. Refer to Cross-Section F-F' at the end of the Figure Series.
- Lough Hacket (pNHA 001294) @ 6.22km to the west of Mortimer's Belclare Quarry. Lough Hacket is at 26m OD elevation. Refer to Cross-Section G-G' at the end of the Figure Series. Again, the groundwater's system expression at land surface, and Lough Hacket, is at an elevation of c. 26m OD whereas the quarry is elevated above this elevation.
- Rostaff Turlough pNHA (000385) @ c. 11.5 km to the west of Mortimer's Belclare Quarry. Refer to Cross-Section G-G', at the end of the Figure Series, which shows that Rostaff expresses groundwater at the land's surface at an elevation of 11m OD.
- Turlough Monaghan pNHA (001322) @ c. 4km to the south west and Turloughcor pNHA (001788) @ c.7.5km to the south west of the site. Refer to Cross-Section H-H' at the end of the Figure Series.

Summary details, as presented in Table 8.2, demonstrate no potential for interaction.

Table 8.2: Summary of pNHA Turloughs and Relative Elevations

pNHA Name	Distance from Quarry	Elevation (OD)	Cross-Section Ref.	Potential for Interaction
Belclare Turlough	~1.5 km NE	~26 m	E–E′	None – quarry floor higher
Killower Turlough	~3.0 km NE	~29 m	E–E′	None – quarry floor higher
Turlough O'Gall	~3.0 km NW	~25 m	F–F′	None – quarry floor higher
Lough Hacket	~6.2 km W	~26 m	G–G′	None – quarry floor higher
Rostaff Turlough	~11.5 km W	~11 m	G–G′	None – quarry floor significantly higher
Turlough Monaghan	~4.0 km SW	~22 m	H–H′	None – quarry floor higher
Turloughcor	~7.5 km SW	~12 m	H–H′	None – quarry floor higher

Public Water Supply (PWS)

8.74 EPA Envision mapping presents Drinking Water Protection Area (DWPA) information, as shown in Table 8.3.

Table 8.3 Drinking Water Protection Area (DWPA) information (Envision Mapping Source)

Name	Drinking Protection Type	EU Priority Area (PA) Type	EU PA Code	Hydro-G Notes
Clare Corrib	Groundwater	Article 7 Abstraction for Drinking Water	IEPA1_WE_G_0020	NO Direct Hydro connection from the site to the Clare Corrib Groundwater System. There are no GWSs or PWSs between the site and the shore of Lough Corrib. Whilst Luimnagh PWS Intake is 9.5km to the south west of the quarry, the quarry is significantly elevated in the landscape and sits on the side of a hill. Rain percolates through the limestone beneath the rock. Therefore, there is a potential indirect link between the quarry and Lough Corrib.
GWDTE-Shrule Turlough (SAC000525)	GWDTE	Article 7 Abstraction for Drinking Water	IEPA1_WE_G_0102	There is no surface water connectivity between Mortimer's Quarry site and this SAC. The EPA map the Shrule Turlough as having its own Groundwater Body and it is specifically called a Groundwater Dependent Terrestrial Ecosystem GWDTE-Shrule Turlough (SAC000525). Therefore, the flow path length contributing to the Shrule GWDTE Turlough has been defined by the mapped boundary of its GWDTE and Mortimer's Quarry is significantly distant from it at a distance of c.10.5km. Therefore, there is no connectivity to the GWDTE Shrule Turlough SAC (000525).
GWDTE-Lough Corrib Fens 3 & 4 (SAC000297)	GWDTE	Article 7 Abstraction for Drinking Water	IEPA1_WE_G_0106	This GWDTE is farther south than the Luimnagh Intake on Lough Corrib. Given that Luimnagh is a significant abstraction point, it dominates local flow paths. It is highly unlikely that any flow from the quarry site would contribute to this GWDTE.

8.75 On the basis of Desk Study data and evaluation, as presented in Table 8-3, only the Lough Corrib GWB DWPA is brought forward for specific PWS Protection Measure evaluation. Whilst there is no direct hydrological link and no direct hydrogeological link, there is an indirect connection between the site and Lough Corrib because of the limestone between the two. That limestone has no primary porosity. However, the quarry sits in the BALLINDUFF_010 catchment, which drains to Lough Corrib in the vicinity of the Luimnagh Intake.

Rainfall & Recharge & Site Water Balance

8.76 The site is 27 km from the Synoptic Station at Claremorris and 22km from the Met Eireann Synoptic Station at Athenry. Therefore, data for each station is presented in Table 8.4 for the LTA and the last three years.

Table 8.4 Monthly rainfall values (mm) Claremorris & Athenry Met Eireann Synoptic Stations.

Total rainfall in millimetres for CLAREMORRIS													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
2025	106.3	116.3	41.7	72.2									
2024	115.9	131.2	124.3	91.5	85	51.4	65.7	180.6	54.1	109.7	111.4	113.3	**1,234**
2023	121.9	31.5	164.5	92.6	45.3	60.5	173	109	121.7	136.7	125.5	205.3	**1,388**
2022	65.4	150.7	57	58.7	85	101.4	43.1	45.4	93.1	190.9	185.4	112.8	**1,189**
LTA	**130.7**	**107.2**	**92.4**	**80.3**	**75.9**	**76.9**	**89.3**	**99.4**	**93.2**	**122.6**	**133.8**	**137.1**	**1,239**

Total rainfall in millimetres for ATHENRY													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
2025	57.5	93	33.2	74.8									
2024	92.4	159.1	130.5	100.7	59	58.9	71.5	159	46.6	112.7	88	82.2	**1,161**
2023	113.9	42	185.9	93.4	63.5	93.8	224.1	129.1	148.2	179.9	113.5	202.9	**1,590**
2022	56.9	143.1	39	51.6	78.9	79.4	66	79.6	114.2	199.3	156.2	114.3	**1,179**
LTA	**122.7**	**93.2**	**89.7**	**72.8**	**77.7**	**80**	**103**	**104.5**	**101.5**	**118**	**121.5**	**130.8**	**1,215**

8.77 The Long-Term Average Annual Rainfall amount reported by Met Eireann, for both the Claremorris and Athenry Stations for the 2022 to end of 2024 period, is c. 1.2m/yr.

8.78 The Geological Survey of Ireland provides Groundwater Recharge Data in which Annual Rainfall (RF) is reduced to ER [Effective Rainfall (ER) = RF - Evapotranspiration Et] as shown in Table 8.5.

Table 8.5 GSI reported Groundwater Recharge and Effective Rainfall Water Balance Components.

Effective Rainfall (mm/yr)	755.5
Recharge Coefficient (%)	85
Groundwater Recharge Pre Cap (mm/yr)	642.20
Recharge Cap Apply	N
Average Groundwater Recharge Range (mm/yr)	601-700
Hydrogeological Setting Description	E Vul: Areas where rock is at ground surface or karst feature
Vulnerability Category	X
Subsoil Type (Quaternary Sediment Code)	KaRck
Subsoil Description (Quaternary Sediment Description)	Bedrock outcrop and subcrop
Bedrock Aquifer Category & Description	Regionally Important Aquifer- Karstified (conduit)
Hydrostratigrahpic Rock Unit Group Name	Dinantian Pure Bedded Limestones

8.79 With reference to Table 8.5, the GSI data can be interpreted, as follows:

- Of the c.1.2m/yr Met Eireann average annual rainfall, 755.5mm/yr is reported as 'Effective'. This means that c.0.45m/yr is lost to the atmosphere by evapotranspiration or evaporation.
- The Groundwater Recharge co-efficient applied by the GSI is 85% because of the ability of a karst system to accept recharge.
- No 'Cap' is applied by the GSI and therefore the mapped amount of Groundwater Recharge is calculated to be 642.20mm/yr of the 1.2m /yr Met Eireann Rainfall.
- If the Effective Rainfall is 755.5mm/yr and the GSI mapped groundwater recharge is 642.20 mm/yr then the balance is what is lost to runoff and that value is (755.5 – 642.20) = 113.3mm/yr.

8.80 These values for rainfall, effective rainfall, groundwater recharge (and by balance, runoff) are important for the Site's Water Balance and conceptualisation of the way that rainfall moves through the site. In particular, the values can be used to rationalise the fact that the site does not require a Section 4 discharge licence.

8.81 For the total site area of 16.3ha and a value of 642.2mm/yr from the GSI for groundwater recharge, it follows that (16.3ha = 16,300m2) x 0.6422 m/yr = 104,646 m3/yr = c. 286m3/d being the volume of rainwater that is recharged to the underlying rock, on average each day, across the entire site area.

8.82 For the site area of 16.3 ha and a value of 113.3mm/yr for site runoff, it follows that (16.3ha = 16,300 m2) x 0.1133m/yr = 18,468 m3/yr = c.51m3/d being the volume of rainwater that runs off the site's surface, on average each day, across the entire site area.

8.83 Therefore, if the quarry were "operating below a regional groundwater table", then the average amount of waters arising should be at least (286m3/d plus 51m3/d) = 337m3/d arising from the Effective Rainfall components sending water to recharge the groundwater and to runoff at the site. However, if the quarry was actually 'below the Water Table' there would even be more groundwater volume brought in by the karst conduit system, if that karst conduit system did actually exist in the excavated depth of the quarry to 33m OD. However, the site is able to operate without a management system requiring pumps. Waters arsing in the central sump are used for dust suppression. There is no discharge. Therefore, it can be concluded that the site operates above the groundwater system because there is no groundwater at the site.

Hydrology

8.84 The site lies within the Corrib Catchment (HA30), which is the land mass area to the East of Lough Corrib.

8.85 The EPA (2024) Hydrometric Area Report for HA30 is presented in Appendix 8.8.

8.86 Regional Hydrology is presented in Figure 8.3 and Local Hydrology is shown as Figure 8.4.

8.87 The nearest surface water feature is the Bodaun River, which is c. 3km to the north. That river is part of the Shrule Turlough SAC (000525) and Black Shrule river system that are in a different drainage subcatchment to the quarry.

8.88 At a distance of c. 3.6km due east of the site the GLENNAFOSHA [EPA Code 30G69; EU Code IE_WE_30C010700], is a river that flows into the main channel of the Clare (Galway) River, which is c. 5km due east of the site. The Clare (Galway) River [EPA Code 30C01; EU Code IE_WE_30C010800], flows from north to south and travels a stream length distance of c.25km before entering Lough Corrib at a 'as the crow flies' distance of c. 17.5km to the south west of the site. The site is part of the Clare[Galway]_SC_060 drainage subcatchment but it is actually in the subbasin of the Ballinduff_010 stream, which rises at a distances of c.6 and 7km to the southwest of the site. The Ballinduff_010 is also referred to as the Grange River and it flows into Lough Corrib in the general vicinity of the same cove in which the Luimnagh WTP is situated.

8.89 The closest shore of Lough Corrib to the site is the cove in which the Luimnagh PWS Intake and WTP sits and abstracts from Lough Corrib. Luimnagh is c.9.5km from the quarry. Refer to Cross Sections A-A' and B-B' at the end of the Figure series.

8.90 EPA (2024) reports that the Corrib catchment (HA30) drains a total area of land of 3113.85km² into Lough Corrib. When the site is considered as having a total area of c.15.9ha, this is equivalent to c.0.16km2 and it is therefore 0.005% of the total catchment area. This has significance in terms of small scale and insignificant potential for impact.

8.91 The catchment profile of the Corrib Catchment (HA30) is described by the EPA (https://www.catchments.ie/), as follows:

- "This catchment includes the area drained by the River Corrib and all streams entering tidal water between Renmore Point and Nimmo's Pier, Galway, a total area of 3,112 km². The largest urban centre in the catchment is Galway City. The other main urban centres are Tuam, Ballinrobe, Claremorris and Ballyhaunis.
- The total population of the catchment is approximately 116,900 with a population density of 38 people per km².
- This catchment is characterised by a wide, relatively flat, limestone plain occupying the eastern two thirds of the catchment which terminates in the large lakes of Corrib and Mask that abut against the granites of west Galway and the metamorphic uplands of southwest Mayo.
- The entire area of this catchment east of these lakes is karstified limestone with groundwater and surface water highly interconnected in this region.
- The area to the east of Lough Corrib is dominated by karstic type drainage and there are numerous springs, swallow holes and turloughs in this area. The Kilmaine River rises near Kilmaine as a karst spring, flowing southwest and into Lough Corrib near Cross. The Black (Shrule) River drains flows through Shrule before entering Lough Corrib near Inchiquin Island.
- The area around Headford is drained by the Headford Stream, which flows into the southeastern shore of Lough Corrib.
- The eastern side of the catchment is drained by the Clare River and its tributaries. The Dalgan River rises near Ballyhaunis flowing south before meeting the Sinking River at Dalgin Bridge. The Sinking River, loses 80-85% of its flow over a 400-m long reach in summer low flow conditions. At the confluence of the 2 rivers, the system become the Clare River.

- The Clare River continues south and is joined by the Nanny River, Grange River and the Abbert River, which drains the southeastern part of the catchment. The Clare River passes though Claregalway before entering the southern end of Lough Corrib.
- Three large scale drainage schemes were completed in this catchment by the OPW between 1951 and 1986 consist of the Corrib-Clare scheme (1951 to 1959), the Corrib-Headford scheme (1967 to 1973) and the Corrib Mask scheme (1979 to 1986). Flood relief works were completed at Belclare on the Clare River during 1995 and in the Maam Valley during 2001.
- The Corrib River flows out of the southern tip of the Lough, passing through the northern suburbs of Galway City before passing over a large weir near Galway Cathedral, where the river becomes tidal and flowing out to sea at Galway Bay past the Claddagh.
- There are two particularly distinguishing and unusual features of the catchment in the karstic limestone east side of Lough Corrib:
    - The River Clare is not a natural river; it is an aqueduct linking a series of pre-existing lakes, turloughs and reaches of stream. For instance, prior to arterial drainage in the 19th century, the River Abbert sank underground at Ballyglunin and the River Clare sank underground at Turloughmore.
    - A significant proportion of the river flow in the River Clare sinks underground and flows westwards beneath the topographic catchment divide with Lough Corrib, re-emerging as springs, such as Bunatober and Aughcloggeen on the eastern side of Lough Corrib."

8.92 EPA (2018) lists that the Corrib catchment comprises 19 subcatchments (Table 1, Figure 1 of EPA 2018) with 97 river water bodies, 31 lakes, one transitional water body, and 21 groundwater bodies. There are no heavily modified or artificial water bodies in the Corrib Catchment.

8.93 The nearest coastal water body is Oranmore Bay, which is an EPA mapped Transitional Waterbody, c.23km due south of the site.

8.94 EPA (2024) provides a useful image for the detail of HA30, and its constituent sub components of sub catchments and sub basins, and names of the other Hydrometric Areas (HAs) around the site. Refer to Plate 8.2.

8.95 Surface water features are wholly absent from the immediate area of the site: a tributary of the Clare (Galway) River is c.4km east of the site. The BALLINDUFF STREAM_010 rises at distances of 6km and 7km to the south west of the quarry. The site is mapped as being part of the Ballinduff Stream's sub basin.

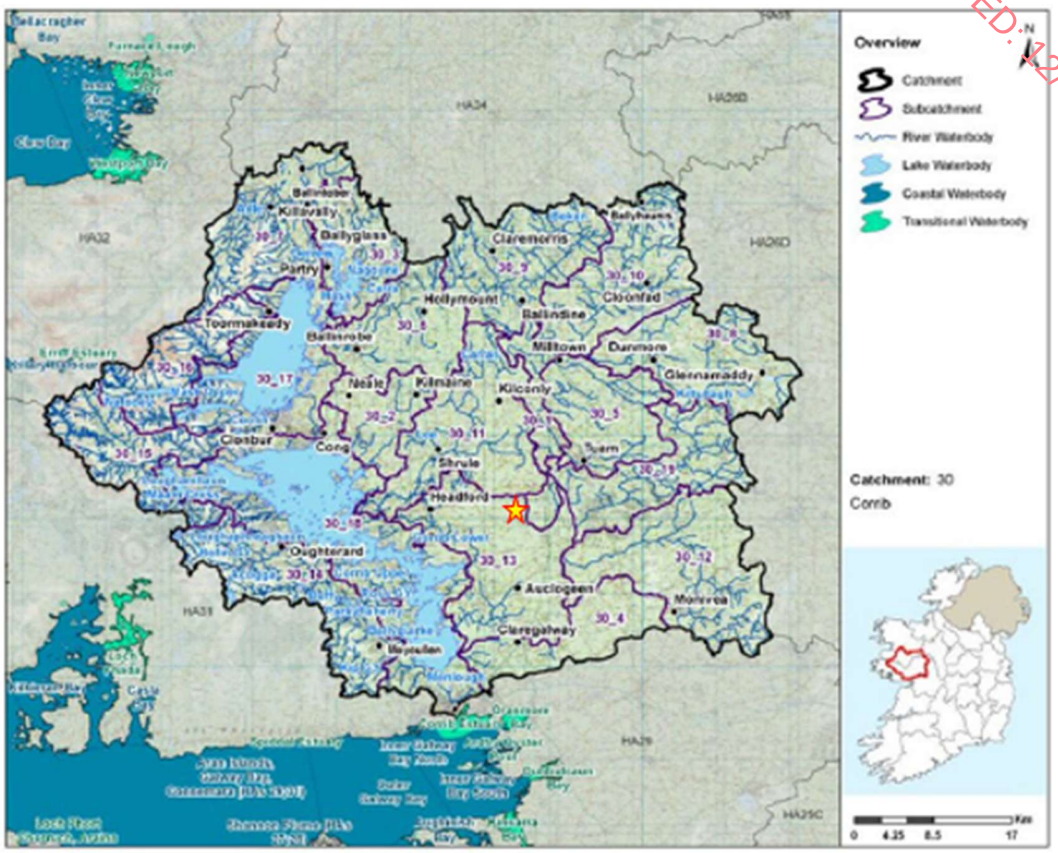

Plate 8-2 EPA (2024) presentation for the Corrib Catchment (HA30).

(Hydro-G Annotation for the approximate location of quarry ★ on the map).

Hydrometrics

8.96 Because there are no flowing surface waters, there are neither EPA nor OPW Hydrometric Stations applicable to the study of the site.

8.97 The site is mapped as sitting in the Sub Basin of the Ballinduff_010 stream, which discharges to Lough Corrib in the vicinity of the Luimnagh WTP's intake. However, even though the catchment for the Ballindauff_010 is mapped by the EPA as 48km2 (EPA Envision Mapping https://gis.epa.ie/EPAMaps/Water), there are no HydroTOOL model for flow nodes reported.

Hydrogeology

8.98 The Lands, Soils and Geology Chapter presented detail for the Soils, Subsoils and Bedrock environment at the site and in the surroundings.

8.99 In this chapter, the water related aspects of the geological systems are presented.

8.100 **Groundwater Vulnerability** is mapped by the GSI as 'X' Rock at or near Surface or Karst and the same vulnerability classification applies to Knockmaa beside the quarry. Refer to Figure 8.5. All quarries are essentially Extreme or Rock at Surface 'X' Groundwater Vulnerability because the concept relates to the depth of subsoil cover over bedrock and the whole aim of quarrying is to expose and extract bedrock for societal use.

8.101 **Aquifer Classification** is mapped by the GSI as Rkc - Regionally Important Karst Conduit. Refer to Figure 8.6. The area of this aquifer is reported by the GSI to be 7062.74 km2. Again, in terms of scale, the site represents 0.002% of the total mapped aquifer area. This has significance in terms of small scale and potentials for impact at the aquifer scale.

8.102 **Karstification** is the process whereby fissures, faults and joints in the purer units of limestone are enlarged by dissolution. Karstification can considerably enhance the permeability of limestone which has essentially no inter-granular permeability. The area is mapped to have numerous karst features such as turloughs (seasonal lakes), enclosed depressions, caves springs and mapped underground traced connections as shown in **Figure 8.7**. There is no documented detail of any caves in the vicinity of the quarry or Knockmaa in the comprehensive directory of caves for the area: the 340-page documentation and description book by the British Speleological society (Boycott *et al.,* 2019) does not provide any documentation or information for caves in the area. There is a road to the northwest of the site, and Knockmaa, that is reported in county media, as repeatedly collapsing and its location is shown on Cross-Section I - I', on the R333 road to the west of Castlehacket. The zone of the collapsing road is c. 2.7km to the north west of the quarry's central void, the collapse is at an elevation of 30m OD, and it is reasonable to assume some type of karst feature (collapse/cave) underneath it. Given that the quarry has partially excavated its site extent to 33m OD and proposes only to complete the previously sanctioned area that is not yet worked to the same 33m OD, it can be confidently asserted that the quarry sits above the elevation of the collapsing karst under the R333.

8.103 No conduit Karst has been encountered in the operational excavation of bedrock to the 33mOD elevation partially excavated as part of the previously sanctioned permission.

8.104 A **Karst Conduit Aquifer** classification is of significance to how groundwater might move through conduits, or pipelines or corridors of void space, in the bedrock mass. Limestone is a sedimentary rock that was formed as sediment settled on the beds of prehistoric oceans and was compressed. There is no primary porosity in limestone bedrock, which means that it is not porous like a sponge, there is no contiguous water content in this Karst Conduit limestone bedrock. Groundwater flow in karst conduit bedrock is conceptualised as the plumbing system pipe network of a town's water distribution or storm network or as the pipes connecting radiators in a home and this is well documented by researchers at Trinity College Dublin in their Gort Flood Risk body of work (*e.g., Gill 2010, Gill et al. 2016, McCormack et al. 2014, 2018, 2020, Morrissey et al. 2020, 2020, 2021,, Naughton 2011, Naughton et al., 2012, 2017, 2018a,b,c).*

8.105 The most important hydrogeological concept is where the groundwater will move to after it passes through conduits or corridors under the site. Hydro-G offers that the likely groundwater flow direction from the site will be in the general direction of Lough Corrib. Whilst there may be deflections and meanderings of conduits that influence groundwater flow direction along the way, ultimately all groundwater is trying to escape to the nearest and largest surface water system, which in this case is Lough Corrib.

8.106 As previously shown in Cross Sections Lough Corrib's shores sit at an elevation of c.5m OD. Therefore, Mortimer's bedrock excavation is significantly above Lough Corrib and the site is significantly above any possible conduits connecting to Lough Corrib.

8.107 The site is underlain by the Clare Corrib (GWB) [IE_WE_G_0020]. The GSI reports that the area of this GWB is 1,422km2. Again, in terms of scale, the site represents 0.01% of the total mapped GWB area. Refer to Appendix 8.8 for a copy of the Clare Corrib GWB Descriptor Sheet (GSI, 2004). Some significant points presented in GSI (2004) are as follows:

- "The land surface is characterised by small hills and low ridges, with ground elevations ranging from 10-160 mAOD. The topographic surface slopes gently westwards. Elevations are highest (100-160 mAOD) in the north (south of Ballyhaunis, west of Ballinlough) and south (just north of Monivea). To the west of a line running north-south from Claremorris to Athenry the elevation is 10-40 mAOD, and to the east of this line, the elevation is 40-70 mAOD.
- Karstification is widespread in this GWB. Recorded karst features number 219 but are considered to represent only a fraction of existing features.
- Overall, flow directions are to the southwest, with all groundwater discharging to L. Corrib.
- Both point and diffuse recharge occur in this GWB. Diffuse recharge occurs over the GWB via rainfall percolating through the permeable subsoil. Despite the presence of peat and till, point recharge to the underlying aquifer occurs by means of swallow holes and collapse features/dolines. Dolines have been recorded even in areas of thick peat deposits (Hickey et al, 2002). Point recharge occurs via many small sinks that are present in the low permeability till areas where the subsoil is breached. Recharge also occurs along 'losing' sections of streams. There are well defined stretches of the River Clare, Sinking River and Abbert River that are losing (Daly, 1985; Drew and Daly, 1993).
- Tracer tests indicate variable groundwater velocities. Furthermore, tracer test data illustrates anisotropy in the transmissivity, with higher east-west transmissivity. Groundwater velocities in the E-W domain are in the order of 100-450 m/hr. Groundwater velocities in the N-S domain are in the order of 6-35m/hr, as evidenced by the following tests: L.Hackett in a southerly direction to Kilcoona spring (35m/hr); to Bunatober spring (6m/hr).
- Groundwater storage in karstified bedrock is low."

8.108 Refer to Figure 8.7 and Cross-Sections J-J' and K-K' for elevations of the springs. Hydro-G notes the traced connection between Lough Hacket to Kilcoona Spring in a southerly direction and the trace to Bunatober spring (6m/hr). Each of these springs are downgradient of the quarry site. Each of the springs are significantly lower elevations than the quarry. The quarry sits above the groundwater conduit systems and this is shown in Cross-Sections J-J' and K-K'. Also, in relation to Bunatober Spring – as was outlined in the Section discussing Hydrology, preceding, the EPA (2018 and 2024) description of the Corrib Catchment stated that "A significant proportion of the river flow in the River Clare sinks underground and flows westwards beneath the topographic catchment divide with Lough Corrib, re-emerging as springs, such as Bunatober (13m OD) and Aughcloggeen (10m OD) on the eastern side of Lough Corrib." Hydro-G offers that this is further evidence that the groundwater flow

system operates between the elevation of the Clare River (29to 26m OD to the east of the quarry) and Bunatober Spring (13m OD) and the quarry sits above this.

8.109 With respect to Desk Study resources for hydrology and hydrogeology, also included in Appendix 8.8 are the Groundwater Body Descriptor Sheets for the GWB to the north, which is the mapped Clare–Corrib GWB. In addition, the EPA (2024) Hydrometric Area Reports for HA30, in which the site is mapped is also presented in Appendix 8.8.

Water Framework Directive Mapping, Status & Risk

8.110 EPA Envision mapping provides information on WFD names, codes, status, risk and report links for all cycles of the WFD, for which Ireland is currently in its 3rd Cycle of WFD assessment and reporting.

8.111 WFD data are available to all at https://gis.epa.ie/EPAMaps/Water and it is this mapping resource that has been used to populate the Desk Study baseline and WFD assessment, which is reported at the end of this Chapter.

8.112 All 3rd Cycle information for the Corrib catchment (HA30), and its associated waterbodies, is reported in a May 2024 3rd Cycle report available at https://www.catchments.ie/data/#/catchment/30.

8.113 With respect to groundwater (hydrogeology) underlying the application quarry, the Groundwater Body (GWB) underlying the site is reported by the EPA for WFD Compliance, as follows:

- Clare Corrib GWB [IE_WE_G_0020]:
  - Good Status (2016-2021) & 3rd Cycle NOT AT RISK.

8.114 With respect to hydrology, mapping for Corrib Catchment (HA30), which has been described earlier in the Section Heading name HYDROLOGY, is the macro scale of WFD assessment and reporting. On a Corrib Catchment Scale (HA30), the 3rd Cycle Report (EPA, 2024) suggests that a total of 69% of surface water bodies were at Good or High Ecological Status in the 2016-2021 monitoring period. Ninety-seven percent of groundwater bodies were at Good status.

8.115 With respect to the 69% of waterbodies currently meeting their environmental objectives, the 3rd Cycle Report (May, 2024) reports percentages by water body type as follows:

- Rivers: of the 97 mapped rivers, 58 are achieving objectives and that is 60%.
- Canals: reported as n/a.
- Lakes: of the 30 mapped lakes, 24 are achieving objectives and that is 80%.
- Transitional: of the 1 mapped Transitional water bodies, 0 (0%) are achieving WFD objectives.
- Coastal: reported as n/a.
- Groundwater: of the 31 mapped GWBs, 30 are achieving objectives and that is 97%.

8.116 With respect to the site under consideration and its associated water environment, the underlying GWB is one of the 97% achieving its Objectives.

8.117 The quarry has operated through all WFD Cycles and at no stage has it ever been reported by the EPA report as a Pressure.

8.118 Lough Corrib Upper [IE_WE_30_666b] is due west of the quarry and WFD Mapping is as follows:

- 3rd Cycle Status (2016 – 2021) = GOOD & 3rd Cycle Risk = NOT AT RISK.

8.119 Groundwater flow direction from the area around the quarry is most likely in the direction of Lough Corrib Lower [IE_WE_30_666a], which is to the south west of the quarry, and WFD Mapping is as follows:

- 3rd Cycle Status (2016 – 2021) = GOOD & 3rd Cycle Risk = NOT AT RISK.

8.120 On more local scales, *i.e.,* micro scales, the site is mapped by the EPA as being part of the sub catchments (SC) and sub basins named, as follows:

- Sub Catchment Clare[Galway]_SC_060 _SC_30_13 [SC ID]:
- Sub Basin BALLINDUFF STREAM_010 EU_CD IE_WE_30B050100 Area 48.3km2.
  - 3rd Cycle Status (2016 – 2021) = GOOD & 3rd Cycle Risk = NOT AT RISK.

8.121 EPA (2018) provides a useful image for the subcatchment in which the site sits. Refer to Plate 8.3.

Plate 8-3 Mortimer Quarries INDICATIVE location ★, as annotated by Hydro-G, within the EPA presentation for the sub catchment named (EPA, 2018).

8.122 There are no Transitional and no Coastal waterbodies in this catchment HA30.

8.123 At the time of writing this assessment, there are no areas near the site mapped as a Priority Area for Action (PAA) and there are no LAWPRO reports for the site. PAAs were downloaded in April 2025 from here: https://lawaters.ie/priority-areas-for-action/. Desk Studies for LAWPRO PAA's are

8.124 High Status Objective (HSO) waterbodies in HA30 are discussed and listed in EPA (2024), which states that "There are 12 waterbodies with a High Ecological Status Objective(HSO) in the Corrib Catchment, with seven currently not meeting their environmental objective of High." Hydro-G confirms that none of the designated HSO waterbodies are hydrologically or hydrogeologically linked to the Mortimer's Quarry site or its associated subcatchments.

EPA Long Term Monitoring Data

8.125 The location of EPA Monitoring Points on the surface water system, in relation to the quarry, are shown in Appendix 8.7 (Long term EPA Data at the end of the Appendix).

8.126 There is a 'Groundwater' Monitoring Point named Bunatobber Spring and this is representative of groundwater downgradient of the site and the monitoring record published spans from 2010 to October 2024.

8.127 Results for the Subcatchment 'Clare[Galway]_SC_060' in which the quarry sits have been downloaded from https://www.catchments.ie/data/ and summary results for parameters appropriate to the impact assessment for quarries and general hydrochemistry have been tabulated in Appendix 8.7. In summary, all parameters comply with the Groundwater Regulations (2010, as amended): Nitrates are lower than the national average, Ammonia-N and Nitrite values are low, ortho-P concentrations are low, the 0.2 K:Na ratio suggests that the water is unaffected by local sources of organic contamination, chlorides are low, the water is neutral pH and the Total Organic Carbon signature is a groundwater signature unaffected by soil or land surface influences.

8.128 There are no downgradient surface water monitoring points because, although listed as a SW Mon Point on EPA Envision, Ballinduff Stream_010 Station data are absent from the WFD Chemistry download for the 30_13 Clare[Galway]_SC_060 Subcatchment. Hydro-G has specifically confirmed with Local Authority Waters that there are no data available (Mr. Fergal Deery, *pers comm*) but the river is mapped as Good Status and 3rd Cycle Not at Risk.

8.129 The 'latest' Q Rating data for the Ballinduff_010 is from 1993 and therefore not current.

8.130 Lough Corrib hydrochemical data in the vicinity of Luimnagh is not published for the EPA Monitoring Points that are shown on Envision Mapping [LS300014303900450 M_6 or LS300014303900540 M_7]. A data request has been sent to the EPA and Galway County Council.

River Basin Plan & Programmes of Measures

8.131 In September 2024 the Department of Housing, Local Government and Heritage launched The Water Action Plan 2024 and its launch stated that the "*River Basin Management Plan for Ireland sets out the measures that are necessary to protect and restore water quality in Ireland. The overall aim of the plan is to ensure that our natural waters are sustainably managed and that freshwater resources are protected so as to maintain and improve Ireland's water environment. The principal causes of the decline in Ireland's water quality are the increasing loss into water of polluting phosphorus and nitrogen from farmland, inadequately treated waste water and physical impacts on water bodies, due to river barriers, and drainage of lands and rivers".*

8.132 The Water Action Plan 2024 is available at https://www.gov.ie/en/policy-information/8da54-river-basin-management-plan-2022-2027/ and there is an Appendix series: Appendix 2 sets out the Programme of Measures. However, there are no actual sites or practical measures outlined. The WAP and the POMs are management documents describing how civil servant departments will meet and manage groups.

8.133 There are no surface waters directly connected to the site. The quarry sits in the Sub Basin of the BALLINDUFF STREAM_010 [EU_CD IE_WE_30B050100], which is mapped as 3rd Cycle Status (2016 – 2021) = GOOD & 3rd Cycle Risk = NOT AT RISK.

8.134 The GWB associated with the site is Good Status and Not at Risk.

8.135 The WAP 2024 and the RBMP 2022 – 2027 concerns the attempt that will be made over the next few years to maintain Good Status water bodies and improve those that are not good status. Given that the site is connected to a Good Status GWB and that agriculture and nutrients are catchment pressures, nationally, the site poses no risk to the attainment of the WAP, RBMP or WFD.

Groundwater Supply Wells

8.136 There is the quarry's own water supply well on the eastern boundary of the site but it cannot be impacted because its water strike zone is significantly deeper than the proposed 33m OD floor elevation under consideration in this work. This was discussed above in a Section specifically dedicated to On Site Services in Water and Wastewater. Refer to Figure 8.9 for the location of the well.

8.137 There are no GSI mapped domestic wells within 4,000m of the quarry. On the basis of Separation Distances outlined in EPA 2021 Code of practice for Single Houses DWWTSs, it can be concluded that the quarry has no potential to affect private groundwater wells.

8.138 There is local information suggesting that farm and yard wells do exist, specifically on the local road that connects from the R333 to the north. However, the quarry is significantly elevated above any likely groundwater strike zones in any local wells.

EPA Register of Abstractions

8.139 The EPA Register of Abstractions documents all Abstractions > 25m3/d and all PWS & GWS Abstractions are usually of that magnitude, at least. Data have been extracted as Table 8.6, which presents EPA Registered Wells, Lakes, River Abstractions (December 2024, latest Abstraction Register). These data will be used in the WFD Quantitative Assessment later in the Impact Assessment section of this chapter. More Data are presented in Appendix 8.7.

Table 8.6 EPA Registered Wells in the Corrib GWB & Associated Surface Water Systems.

Reg No	Abstraction Point Code	Site Location	Abstraction Point Name	Licence Code	Abstraction Purpose	Primary Use	Abstraction Type	Maximum Daily Volume Estimate for Abstraction (m^3/d)	Total Annual Volume (m^3/yr)	County	Waterbody or Water Feature	Waterbody Code
R00079-01	APR000164	Feigh East & West GWS	Feigh East & West GWS	1200PRI0318	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	25	9,125	Galway	Clare-Corrib	IE_WE_G_0020
R00169-01	APR000299	Milltown GWS Treatment Plant	River Clare	1200PRI0444	Drinking Water	Group Water Scheme Supply	River	265	96,725	Galway	CLARE (GALWAY)_020	IE_WE_30C010300
R00177-01	APR000316	Liskeavy/Lisananey gws	Liskeavy/Lisnaney Borehole	1200PRI0415	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	38	456	Galway	Clare-Corrib	IE_WE_G_0020
R00195-01	APR000313	Cahermorris/Glenrevagh Group Water Scheme	Cahermorris /Glenrevagh Group Water Scheme GY	1200PRI0179	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	107	39,055	Galway	Clare-Corrib	IE_WE_G_0020
R00240-01	APR000427	Belclare Pumphouse	Belclare Pumphouse	1200PRI0151	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	175	54,750	Galway	Clare-Corrib	IE_WE_G_0020
R00278-01	APR000483	Cluide/Cahermorris GWS	Cluide/Cahermorris Borehole	1200PRI0248	Drinking Water	Group Water Scheme Supply	River	77	24,000	Galway	BALLINDUFF STREAM_010	IE_WE_30B050100
R00300-01	APR000542	Spring at Luimnagh	Spring at Luimnagh	1200PRI0178	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	1,142	324,850	Galway	Clare-Corrib	IE_WE_G_0020
R00304-01	APR000545	Danganbeg	Danganbeg	1200PRI1061	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	900	270,000	Galway	Clare-Corrib	IE_WE_G_0020
R00328-01	APR000591	Borehole at Balroebuck	Borehole at Balroebuck	1200PRI0145	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	120	43,800	Galway	Clare-Corrib	IE_WE_G_0020
R00396-01	APR000700	Boyounagh Ballyedmond GWS	Borehole at Woodfield	1200PRI1081	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	168	35,040	Galway	Clare-Corrib	IE_WE_G_0020
R00446-01	APR000774	Anbally & District GWS Borehole	Anbally & District GWS Borehole	1200PRI0104	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	67	18,250	Galway	Clare-Corrib	IE_WE_G_0020
R00465-01	APR000791	Harringtons Ardgaineen Galway Quarry	Galway Quarry Sump		Mining or Quarrying	Quarrying	Groundwater well / borehole	365	91,615	Galway	Clare-Corrib	IE_WE_G_0020
R00537-01	APR000879	Clough Cummer GWS	Clough Cummer GWS	1200PRI0286	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	61	20,075	Galway	Clare-Corrib	IE_WE_G_0020
R00550-01	APR000898	Carheenlea GWS	Carheenlea GWS	1200PRI0175	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	43	15,695	Galway	Clare-Corrib	IE_WE_G_0020
R00596-01	APR001059	Tuam RWSS	WAB0001947,L124765	1200PUB1047	Drinking Water	Public Water Scheme	Lake	44,121	14,179,754	Galway	Corrib Lower	IE_WE_30_666a
R00918-01	APR001575	Glenamaddy	WAB0001552,L124094	1200PUB1021	Drinking Water	Scheme Supply	Groundwater well / borehole	628	192,294	Galway	Clare-Corrib	IE_WE_G_0020
R01364-01	APR002247	Transitions Optical Ltd	Transitions Well		Industrial		Groundwater well / borehole	70	8,000	Galway	Clare-Corrib	IE_WE_G_0020
R01368-01	APR002253	Belmont Well	Belmont Well		Drinking Water	Group Water Scheme Supply	Groundwater spring	114	41,000	Galway	BLACK (SHRULE)_010	IE_WE_30B020200
R01379-01	APR002265	Brierfield and District Group Water Scheme	Brierfield and District GWS	1200PRI0161	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	91	28,888	Galway	Clare-Corrib	IE_WE_G_0020
R01381-01	APR002267	Kilconieron GWS	kilconieron GWS	1200PRI1029	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	110	26,280	Galway	Clare-Corrib	IE_WE_G_0020
R01412-01	APR002302	Rusheens Caherhugh GWS	Rusheens Caherhugh GWS	1200PRI0503	Drinking Water	Group Water Scheme Supply	Groundwater well / borehole	100	36,500	Galway	Clare-Corrib	IE_WE_G_0020
R01523-01	APR002476	Rinkippen	Rinkippen		Agriculture	Agriculture (Drinking consumption	Groundwater well / borehole	65	21,000	Galway	Clare-Corrib	IE_WE_G_0020
R01588-01	APR002604	Lough Corrib	Lough Corrib		Recreation	Agriculture (irrigation)	Lake	40	1,120	Galway	Corrib Lower	IE_WE_30_666a
R01610-01	APR002627	CLADA	CLADA		Drinking Water	Commercial – Beverages	Groundwater well / borehole	50	18,000	Galway	Clare-Corrib	IE_WE_G_0020

Group Water Scheme Supply Wells

8.140 The EPA December 2024 Register of Abstractions cites many Group Water Scheme (GWS) wells and groundwater abstractions in the Clare Corrib GWB.

8.141 GWS Groundwater Source Protection Area **Zone of Contributions** have been mapped by the NFGWS and the GSI and these are shown in the context of the application site in Figure 8.9.

8.142 Hydro-G has reviewed the detail in the Source Protection Zone of Contribution Reports of Conroy (2015a,b,c), O'Reilly (2014a, b, c) and Arup (2017) and the associated cross sections in the reports. Those reports are on file in Hydro-G. The information contained in those reports, which are referenced in full in Appendix 8.3, confirms that the quarry's 33m OD floor elevation sits above the groundwater elevation in all of the GWS abstraction boreholes and springs.

8.143 The closest GWS groundwater abstraction is the Belclare GWS. The Source Protection Area Zone of Contribution report (Conroy, 2015b) provides information on the location of the borehole on a T junction of the R333 and the minor road heading south towards the quarry's access route. The borehole is in the Townland of Knockacarigeen and it is 1.8km to the northeast of the centre of the application area. The Belclare GWS report (Conroy, 2015b) is detailed in its assessment of water quality and whether there are operational issues associated with the borehole: the quarry is not citied and neither are any issues that would suggest potential for impact. An important piece of information is that the Conceptual Model for the Belclare GWS borehole is that it is fed by a shallow groundwater inflow (epikarst) and the rest water level is c.17m OD. This is 16m below the 33m OD elevation of the quarry floor.

8.144 In overall conclusion, the quarry does not pose a threat to Group Water Scheme supply wells for reasons including, as follows:

- The quarry is significantly remote from the outer boundaries of all mapped GWS Source Protection Area Zones of Contributions,
- The quarry is elevated above the landscape of the GWS wells and their rest water levels.

Geoheritage Sites

8.145 As requested in the GSI's Response to Scoping (**Appendix 8.4**), County Geoheritage Sites (CGS) associated with the site and wider environment should be considered in all assessments.

8.146 As stated in the GSI's response to scoping (dated 26 August 2024) stated that Knockmaa [GY082] and Knockmaa Quarries [GY083] are associated with the application site.

8.147 In addition, Hydro-G offers that Lough Corrib [GY093] & Pollis relevant.

8.148 The GSI Geological Heritage Site map viewer presents mapping and information for Geoheritage sites with overview details as follows:

- **"Knockmaa**, Co. Galway (GR 134737, 247715), under IGH themes: IGH1 Karst, IGH3 Carboniferous to Pliocene Palaeontology, IGH7 Quaternary, IGH12 Mesozoic and Cenozoic. A large area of landscape between Headford and Tuam with thin glacial deposits which have only slightly modified a pre-Pleistocene karst landscape, developed on Carboniferous limestones, which contains late

Pliocene sediments. The site is of international importance and is recommended to NPWS for Geological NHA status. Link to Site Report: GY082."

- **"Pollnahallia,** Co. Galway and within Knockmaa (GR 133735, 246895), under IGH themes: IGH7, IGH12. Described as a deep, abandoned sand pit, on the southern footslopes of the hills west of Knockmaa Hill and providing an unprecedented view into an era of Ireland's past. The pit is set within an area of thick-bedded, pure Lower Carboniferous limestones of the Knockmaa Formation, but the sand within the feature which has been quarried out, was Pliocene in age (2.5-5.3 million years ago), from within the Cenozoic. Link to Site Report: GY116."

  Hydro-G notes that although it is mapped as part of the Knockmaa site, Pollnahallia is located on a much lower elevation of **29m OD and 3km** to the south west of Mortimers.

- **"Knockmaa Quarries**, Co. Galway (GR 136933, 248357), under IGH themes: IGH1 Karst, IGH8 Lower Carboniferous, IGH12 Mesozoic and Cenozoic. This site includes two large working quarries, side-by-side, on the southeastern slopes of Knockmaa Hill, about 7 km southwest of Tuam. These quarries provide a good representative site displaying the Carboniferous limestone bedrock geology of mid-Galway, with additional features of pre-glacial and karstic interest. Link to Site Report: GY083."

- **"Lough Corrib**, Co. Galway (118000, 244185), under IGH themes: 14, 2 and 7. It is described as "A large lake situated between County Galway's western acidic uplands and the limestone lowlands and is of international conservation importance, for its lakeshore karst assemblages". CGS, recommended for Geological NH. Lough Corrib is of international conservation importance, for its lakeshore karst assemblages.

8.149 Each of these sites are mapped for their contribution to geological understanding. The significance of the fact that the quarry under consideration in this assessment is mapped as a GHS is that its exposure of rock aids geological understanding and it is a positive rather than negative impact.

Desk Study Flood mapping

8.150 Hydro-G reviewed desk resources relating to mapped flooding. The site is not in any hydrological or groundwater flood risk mapped zones of the EPA, GSI or Galway County Council.

8.151 There are many mapped historic Groundwater Flood events but these are all associated with the Turloughs, which were shown in earlier sections to be at the c.25 to 28m OD elevation range.

8.152 It is reasonable and defensible to conclude that the quarry site is not at risk of flooding, nor does it pose a flood risk to the surrounding environment, for reasons as follows:

- The quarry operates as a closed system with no discharge.
- The site is situated on the sloped base of Knockmaa Hill, well above the flood-prone areas.

County Development Plan & Quarrying

8.153 To complete the Desk Study, the quarrying and extractive industry policy of the Galway County Development Plan 2022 – 2028 was reviewed.

8.154 The Galway County Development Plan (CDP) 2022 – 2028 "sets out a range of proposed policy objectives with supporting narrative for development up to 2028". The plan recognises the importance of the extractive industry to employment and economic development within the county.

8.155 Chapter 15 of the CDP sets out development management standards for the extractive industry, including details on the information that should accompany a planning application for extractive development. The detail specified in the CDP has been considered in the assessment of potential impacts in the EIA for the quarry.

8.156 As steered by Quarry Consulting, and outlined in the earlier chapters of this EIAR, assessors were alerted to the relevant policies of the Galway CDP 2022 – 2028, as follows:

- RD1-Rural Enterprise Potential: To facilitate the development of the rural economy through supporting a sustainable and economically efficient agriculture and food industry, together with forestry, fishing and aquaculture, energy and extractive industries, the bio-economy and diversification into alternative on-farm and off-farm activities, while at the same time noting the importance of maintaining and protecting the natural landscape and built heritage which are vital to rural tourism. Development of Cafes, Art Galleries, Hot Desk Facilities etc. which are important to the rural economy.
- MEQ1-Aggregate Resources: Ensure adequate supplies of aggregate resources to meet future growth needs within County Galway and the wider region and to facilitate the exploitation of such resources where there is a proven need and market opportunity for such minerals or aggregates and ensure that this exploitation of resources does not adversely affect the environment or adjoining existing land uses.
- MEQ2: Protection of the Environment: The Planning Authority shall require the following in relation to the management of authorised aggregate extraction.
- All quarries shall comply with the requirements of the EU Habitats Directive, the Planning and Development (Amendment) Act 2010 and by the guidance as contained within the DoEHLG Quarries and Ancillary Facilities Guidelines 2004, the EPA Guidelines 'Environmental Management in the Extractive Industry: Non-Scheduled Minerals 2006 (including any updated/superseding documents) and to DM Standard 19 of this Development Plan,
- Require development proposals on or in the proximity of quarry sites, to carry out appropriate investigations into the nature and extent of old quarries (where applicable). Such proposals shall also investigate the nature and extent of soil and groundwater contamination and the risks associated with site development works together with appropriate mitigation,
- Require Development Proposals to assess the potential impact of extraction in areas where geo-morphological interest, groundwater and important aquifers, important archaeological features and Natural Heritage Areas are located,
- Have regard to the Landscape Character Assessment of the County and its recommendations,
- Ensure that any quarry activity has minimal adverse impact on the road network and that the full cost of road improvements, including during operations and at time of closure, which are necessary to facilitate those industries are borne by the industry itself.
- Ensure that the extraction of minerals or aggregates does not adversely impact on residential or environmental amenity,

- Protect all known un-worked deposits from development that might limit their scope for extraction.
- MEQ4-Landscaping Plans: Ensure that all extractions shall be subjected to landscaping requirements and that worked out quarries should be rehabilitated to a use agreed with the Planning Authority which could include recreational, biodiversity, amenity or other end-of-life uses. The use of these rehabilitated sites shall be limited to permitted and controlled waste and sites shall be authorised under the appropriate waste regulations.

Long Term On-Site Monitoring Data

8.157 Results for the last 5 years (2020 – 2025) for all site monitoring are presented in Appendix 8.8 in Summary Tables (A) and (B) for the on-site well and the floor's settlement waters, respectively. Laboratory Certificates of Analysis are also presented for the 2024 – 2025 Quarterly Sampling. Older data is held at the site and is available.

8.158 Results can be summarised, as follows:

- The site's water supply well's quality: Summary Table (A) of Appendix 8.8 and commentary with respect to compliance with the Groundwater Regulation's (2010, as amended) Threshold Values (TVs) demonstrates that the site's groundwater quality is very good and in compliance for the >20 parameters analysed each quarter. Of particular note with respect to impact of the use of explosives in blasting, groundwater Nitrate concentrations range from <0.5 to 8.9 mg/l as NO3, which is a low value when compared to the TV of 37.5mg/l of the Groundwater Regulations. The same can be said for the very low Ammonia and Nitrite concentrations. Hydrocarbons are below the limit of detection of the laboratory analyser.
- The site's floor's accumulated water quality: Summary Table (B) of Appendix 8.8 and commentary with respect to compliance with Regulation demonstrates that the quality of the water on the floor is exceptionally good, with very low BOD and low COD, and complies with Regulation Threshold Values for the > 20 parameters analysed each quarter. Hydrocarbons are below the limit of detection of the laboratory analyser.

8.159 It is noted that the exceptionally high hydrochemical quality of the water accumulated on the floor of the quarry represents the zero impact of the infill accepted by the site under the active Waste Facility Permit (WFP-G-21-0007-02, granted 29/09/2022), which allows for the importation of permitted and controlled material for the purpose of progressive infilling and restoration of the bedrock void.

8.160 In addition, a zero impact conclusion is also demonstrated by the fact that the groundwater well on site is also exceptionally high quality and in compliance with the objectives of the Groundwater Regulations (2010, as amended).

Conceptual Understanding of the Site, the Proposed Development and Interactions

8.161 The Conceptual Understanding of how the site interacts with the environment is a crucial element of all EIAs. The understanding of how this site works with the environment was developed by Hydro-G on the basis of site visits, observations of how the walls of rock behave in different seasons, site investigation information and assessments by the GSI, EPA and others: detail for which is shared in the Appendix series of this EIAR. Key points are presented here.

8.162 The quarry is a large limestone bedrock quarry that has been in existence for decades with many permissions, as detailed elsewhere in this chapter and the overall EIAR.

8.163 The M17 Motorway is to the east of the site at a distance of c.6km.

8.164 The underlying Clare Corrib Groundwater Body is mapped by the EPA as Good Status (2016 – 2021) and 3rd Cycle Not At Risk.

8.165 There are no mapped surface waters in the immediate vicinity of the site. There is no direct link to any hydrological system, *i.e.,* surface waters.

8.166 Regionally, groundwater generally flows from north east to south west in the direction of Lough Corrib.

8.167 With respect to hydrogeology, the site is mapped as part of a limestone body that is a Regionally Important Karst (conduit) Aquifer. The macro scale environment in which the quarry sits is conceptualised by hydrogeologists as a subterranean world of karst caves and conduits and very large underground flow rates. Perception would be that this is a high risk location with respect to encountering conduits. However, the existing excavation of rock to 33m OD has not intercepted a groundwater flow system. There is no evidence of a groundwater flow system in the excavated open area of rock walls of the void. There are many turloughs around the site and these hold the key to understanding the hydrogeology of the area: groundwater can escape from underground flow paths to the land surface at elevations of 25 – 28m OD. Therefore, it will escape from underground at many Turlough locations and will not reach the 33m OD elevation of the floor of the quarry. The quarry sits on an eastern flank of a hill that is significantly elevated above the local land. Knockmaa peaks at 160m OD. The quarry excavates ground from an elevation of c. 90m OD on its western boundary to c. 65m OD on its eastern boundary. The quarry excavates into a hill. It is the lower level landscape in the 25 – 28m OD elevation range that is the groundwater head expression zone. The quarry is set above this. Refer to Cross Sections A-A' to J-J' at the end of the Figure Series of this chapter for pictorial representations conveying the conceptual understanding of the landscape, groundwater and how the quarry operates.

8.168 The fact that the quarry is able to operate in this hydrogeological environment is because the quarry has and would intend to continue excavating to an elevation of 33mOD, whereas the groundwater flow system is well expressed in the landscape at various locations through turloughs (both SACs and pNHAs) at elevations of 25 – 28m OD. The quarry is therefore operating above the groundwater flow system, and this is the correct terminology for groundwater in conduit karst aquifers: There is no 'Water Table' in this type of hydrogeological setting because karst limestone in the west of Ireland has no contiguous saturated pore space. There is no primary porosity in this type of limestone.

8.169 The best karst expertise for the area and bedrock/aquifer information suggests that the major karst flows could be 30 to 40 m below sea level (Drew, D., *pers. comm.,* 2015). Therefore, impacts are not an issue with respect to the 33m OD excavation depth proposed.

8.170 The site does not present Flood Risk and neither is it located in a mapped Flood Risk zone.

8.171 Ten Cross Sections (A-A' to J-J') have been presented and it is clearly demonstrated that the quarry's elevation is significantly above the groundwater head of the flow system, which at its highest is c. 28m OD, relative to the current and final proposed 33m OD floor elevation.

8.172 For the current and proposed 33m OD floor elevation, the quarry is and will remain above the groundwater flow system.

8.173 Applying the Conventional Source > Pathway > Receptor Model concept suggests, as follows:

- Source = Bedrock Excavation above the groundwater system. Potential Sources of Contamination are Hydrocarbons from Quarry Machinery and Quarry Vehicular movement. There is concurrent infill under Waste Facility Permit (WFP-G-21-0007-02, granted 29/09/2022), which allows for the importation of permitted and controlled material for the purpose of progressive infilling and restoration of the bedrock void.
- Pathway = Solid competent Limestone Bedrock, unsaturated for **at least** 8m beneath the 33m OD elevation of the quarry floor, and possibly 20m unsaturated depth: regional discharge elevations are Bunatober (13m OD), Aughcloggeen (10m OD) and Lough Corrib at 5m OD and the regional expression of groundwater **pressure head** elevation is 25 – 28m OD at multiple turloughs to the north of the quarry. The solidity of the bedrock and the safe nature of the infill practice are demonstrated by exceptionally high water quality in the floor waters sampled and the on site groundwater well's results.
- Receptor = Groundwater (Clare Corrib GWB) indirectly through solid unsaturated bedrock that has no primary porosity. Surface Water is not a Receptor because there is no direct hydrological link and the indirect link through the limestone, of no primary porosity, is extremely unlikely. Both the Clare Corrib GWB and Lough Corrib Lower are reported by the EPA as Good Status (2016 – 2021) and 3rd Cycle Not at Risk.

Envisaged Dewatering Volumes

8.174 No karst features and no water strikes have been encountered and none are expected as the quarry expands within its current site boundary with the purpose of extracting rock previously permitted to the previously permitted 33m OD.

8.175 The current experience of NO discharge volume is envisaged as the future scenario also.

Effects, Impact Assessment Methodology & Structure

8.176 This EIA and EIAR were completed in accordance with enacted EU and Irish legislation pertaining to Environmental Impact Assessment (Directive 2014/52/EU, meaning the EIA Directive and Irish EIA Regulations (2018, as amended 2020). As previously stated, the complete list of Guidance and Legislation employed in the completion of this work was presented in **Appendix 8.2**.

8.177 The Impact Assessment was completed with reference to Guidance relating to EIA and the preparation of EIA Reports, which includes the EU (2017), Department of Housing, Planning and Local Government (2018) and EPA (2022) on Guidelines on the information to be contained in Environmental Impact Assessment Reports.

8.178 Criteria for assessing importance of site attributes and their magnitude of importance were taken from the NRA Guidelines (NRA, 2008) and 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' (IGI, 2013).

8.179 The tools and structure of the assessment of Effects and Potential Impacts were detailed in **Appendix 8.5**, in which Industry Standard Tables for rating of the Importance of Environmental Criteria, Significance of Effects, Impacts, Mitigation Measures, Residual Impacts and more are presented.

8.180 In addition to the application of Irish Guidelines as outlined in EPA (2022) and NRA (2008), and in the absence of Irish Guidance specifically focussed on quarries and hydrogeology, the work presented in this EIAR Section has also applied UK practical guidance as published by the UK Environment Agency (the public body equivalent of the Irish EPA). The UK Guidance provides a 'Hydrogeological impact appraisal for dewatering abstractions' (Boak, R. et. al. (2007) and the approach is succinctly outlined in **Appendix 8.6**.

Development Phases Considered

8.181 The evaluation of Potential Effects and Impact Assessment completed usually considers phases as follows:

- Construction (enabling) Phase
- Operational Phase
- Landscaping, Restoration, Decommissioning & Aftercare.

Description of Likely Effects

8.182 The procedure for determination of potential impacts on the receiving hydrogeological environment was to identify potential receptors within the site boundary and surrounding environment and use the information gathered during the field work and desk study to assess the degree to which these receptors will be impacted upon.

8.183 The application site lies within and adjacent to the existing quarry void, and when considered as a cumulative site, will be of moderate to large size.

8.184 The site is therefore considered to be an attribute of high importance.

8.185 In line with best practice, the individual impacts will be considered with respect to the application site, plus the cumulative impacts with respect to the existing and application site.

8.186 Groundwater and Lough Corrib SAC, SPA & PWS are **potential** receptors. Group Water Scheme abstraction locations were ruled out for a variety of reasons including the facts that the quarry does not site within any mapped Source Protection Zone, of which there are many in the wider area, and the quarry sits elevated above the groundwater flow regime.

Potential Impacts

8.187 The main anticipated impact associated with the proposed development, in relation to hydrogeology, relates to the potential contamination of groundwater from quarrying activities and the subsequent risk posed to the underling groundwater, Lough Corrib SAC, SPA & PWS. As mentioned previously, no water is discharged from the site and there is no direct hydrological link to any surface water systems.

8.188 A detailed assessment of all Potential Effects associated with all phases of the proposed development, on different environmental components are presented in Table 8.7, Duration, Frequency and Type of Effect are presented.

8.189 The direct impacts identified as likely to occur during the enabling (construction) stage are deemed to be none because the site is ready to continue from its current state to deeper. The direct impacts identified as likely to occur during the operational stage are deemed to be slight to moderate and long-term in nature.

8.190 The restoration stage of the project describes the aftercare phase that follows the cessation of activities. The direct impacts identified as likely to occur during the restoration stage are deemed to be Significant to Moderate and permanent in duration.

8.191 Indirect impacts (or secondary impacts) are those which are not a direct result of the proposed activity, often produced away from the project site or because of a complex pathway. An example of a negative indirect impact is that silt deposition can impact surface water habitats. A positive indirect impact is that raw materials extracted and processed bring benefits to the progression of society housing and ensuring road safety by enabling the maintenance of roads.

8.192 Consideration has also been given to environmental impacts associated with unplanned events such as intense rainfall events, spillage, accidents, fire, trespassing, etc. The impacts identified as likely to occur due to unplanned events are deemed to be slight to significant and brief in duration.

8.193 The Importance of an Attribute was determined on basis of criteria from NRA (2008) and IGI (2013).

Table 8.7 Summary of Potential Effects

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
Construction (Enabling) Phase	There will be no Construction Phase because the site has already been enabled. For the areas proposed for further excavation, the stripping of natural soils and subsoils has taken place, as per Details Submitted with the previous Application. The current proposal is to continue into the bedrock within the existing site area, which is an overall operational quarry and ancillary areas. The proposed yard area is within the operational site and some movement of subsoils is likely, but the perimeter berms exist and no significant enabling works are anticipated.									
Operational Phase	Movement of aggregate stockpiles	Groundwater	Aquifer: Extremely High	Mobilisation and migration of suspended solids Sediment deposition in surface water features. Disruption of sensitive riverine habitats	Negative / Adverse	Significant	Clare Corrib GWB	Unlikely, the quarry is separate from the deep groundwater conduit flow system.	Rarely	Indirect
	Extraction of bedrock	Bedrock aquifer	Aquifer: Extremely High	Permanent removal of bedrock for society's use.	Negative / Adverse	Slight	Bedrock aquifer	Likely	Permanent	Direct
	Blasting of bedrock	Groundwater	Groundwater: Extremely High	Deterioration in groundwater quality	Negative / Adverse	Moderate	Clare Corrib GWB	Unlikely (Blast Technology is Advanced)	Temporary, Rarely	Direct
	Use of quarrying machinery and equipment – spillages during refuelling, use and storage of lubricants	Groundwater	Groundwater: Extremely High	Contamination of surface waters and groundwaters with hydrocarbons	Negative / Adverse	Moderate	Clare Corrib GWB	Likely	Temporary, Rarely	Direct

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
	Quarry dewatering – lowering of groundwater levels in surrounding area	Bedrock aquifer	Aquifer: Extremely High	Reduction in spring flows. Reduction in baseflow to surface waters.	Negative / Adverse	Moderate	Clare Corrib GWB	Unlikely	Temporary, Rarely	Direct
	Use of central sump and Lagoon.	Groundwater	Groundwater: Extremely High	Removal and entrapment of particulate matter entrained in waters leaving site	Positive	Significant	Clare Corrib GWB	Likely	Long-term, Constant	Direct
	Cleaning of settlement ponds.	Groundwater	Groundwater: Extremely High	Improves efficiency of settlement ponds & attenuation Mobilisation and migration of suspended solids	Neutral	Not Significant	Clare Corrib GWB	Unlikely	Long-term, Annual	Direct
	Use of wheelwash	Groundwater	Groundwater: Extremely High	Removal and entrapment of particulate matter attached to haulage vehicles	Positive	Slight	Clare Corrib GWB	Unlikely	Long-term, Constant	Direct
	Wheelwash maintenance	Groundwater	Groundwater: Extremely High	Improves wheelwash and reduces Mobilisation and migration of suspended solids	Neutral	Not Significant	Clare Corrib GWB	Unlikely	Long-term, Annual	Direct
	Use of hydrocarbon interceptors.	Groundwater	Groundwater: Extremely High	Entrapment of hydrocarbons lost during refuelling/discharge	Positive	Slight	Clare Corrib GWB	Likely	Long-term, Constant	Direct

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
	Use of Office Toilet Facilities, On-Site WWT Plant.	Groundwater	Groundwater: Extremely High	Discharge of treated wastewater to groundwater (nutrient and bacteriological)	Negative / Adverse	Imperceptible	Clare Corrib GWB	Unlikely	Long-term, Constant	Direct
	Pumped discharge of quarry waters.	Groundwater	Groundwater: Extremely High	Deterioration in surface water quality	Negative / Adverse	Slight	Clare Corrib GWB	Unlikely	Long-term, Constant	Direct
	Use of concrete batching plant to work materials from the quarry extraction area.	Groundwater	Groundwater: Extremely High	Contamination of Surface Waters and groundwaters with cementitious material	Negative / Adverse	Moderate	Clare Corrib GWB	Unlikely	Long-term, Constant	Direct
	Monitoring	Groundwater	Groundwater: Extremely High	Monitoring of discharge rates, suspended solids, discharge water quality, receiving surface water quality, groundwater quality	Positive	Not Significant to Imperceptible	On- and off-site	Unlikely	Long-term, hourly, quarterly, annually	Direct
Restoration Phase	Removal of semi-mobile and mobile plant (pumps, generators, etc.)	Groundwater	Groundwater: Extremely High	Elimination of hydrocarbon sources	Positive	Slight	Within site boundary	Likely	Permanent	Direct

Phases	Activity	Attribute	Importance of attribute	Nature and description of the effect	Quality	Significance	Extent & Context	Probability of effects (pre-mitigation)	Frequency & Duration	Type of effect
	Dismantling and removal of fixed plant & machinery (asphalt plant, batching plant, wheelwash, etc.)	Groundwater	Groundwater: Extremely High	Elimination of hydrocarbon sources	Positive	Slight	Within site boundary	Likely	Permanent	Direct
	Landscaping, movement of infrastructure	Groundwater	Groundwater: Extremely High	Mobilisation and migration of suspended solids	Negative / Adverse	Moderate	Clare Corrib GWB	Likely	Temporary, Occasional	Direct & Indirect
	Infill under Waste Permit Licence or Article 27.	Groundwater	Groundwater: Extremely High	Rainwater will accumulate with permitted and controlled infill in the excavated void.	Positive	Significant	Within site boundary	Likely	Permanent	Direct
Unplanned Events	Major Spillage	Groundwater	Groundwater: Extremely High	Hydrocarbon contamination	Negative / Adverse	Significant	Clare Corrib GWB	Likely	Temporary, Rarely	Direct
	Fire	Groundwater	Groundwater: Extremely High	Contamination of spent firefighting waters	Negative / Adverse	Significant	Within site boundary.	Likely	Brief, Rarely	Direct
	Intense Rainfall Events	Homes, Businesses, Village.	Groundwater: Extremely High	On-site & off-site flooding	Negative / Adverse	Moderate	Cartron, Ballaghbaun.	Unlikely	Brief, Rarely	Direct

Impact Assessment Blasting

8.194 Mass balance calculations are presented to demonstrate potential for effects of blasting to present nitrogen residues in the discharge waters, which has potential to impact groundwater quality. The risk to groundwater and surface water is assessed by quantifying the resultant concentrations for the potential residual nitrogen compounds Nitrate (NO3), Ammonia (NH4) and Nitrite (NO2). Peak activity rates of the extraction activities, blasting frequency and the type of explosives used were supplied to Hydro-G by the quarry manager.

8.195 The explosives contractor used by the quarry is Kemek and the explosives material used is Kemex 70, which is a site mixed bulk emulsion explosives produced from emulsion matrix. Emulsion matrix is essentially an aqueous solution of ammonium nitrate emulsified in oil. Kemex products may also contain ammonium nitrate prills, fuel oil, aluminium and/or gassing agents. The Technical Data Sheets (TDS's) and MATERIAL SAFETY DATA SHEET (MSDS's) for explosives, primers and detonators used at the site were used in this simulation.

8.196 Literature suggests that small percentages of N compounds can remain as residual coating on bedrock following blasting. This has the potential to be dissolved when it comes into contact with water, albeit potential concentrations are low. The study that is most referenced was completed by Environment Canada in 1988 (Ferguson & Leask, 1988). This study outlines a procedure for determining the residual N compounds for various mine site types. The stepwise procedure used in the 1988 study for predicting aqueous concentrations of N species, is as follows:

a) Calculate the annual leached nitrogen loading (kg/year) for the entire site based upon annual explosive mass usage and residual N fraction associated with explosive type.

b) Separate the leached nitrogen loading among quarry components (e.g. entering surface water, remaining on extracted rock etc.).

c) Separate into loadings of N compounds (Nitrate, Nitrite and Ammonia), and

d) Calculate the flow concentration.

8.197 The maximum concentrations of N species arising from the use of explosives when mixed with quarry recharge waters are calculated using this procedure. This is presented in Table 8.8, below.

8.198 The highest residual is for nitrate (99%), and upper limits of the ranges are used in all cases to determine the concentration of N species in pumped water. These are very conservative assumptions.

8.199 The calculation also assumes that 100% of residual N is dissolved all waters arising at the site and will be available to the water environment. The results of calculations presented in Table 8.8 clearly show that the residual N compounds would have low concentrations. Specifically, resultant concentrations in waters within the quarry, if impacted by explosives within the entire quarry site area, would be: 7.07 mg/l NO3, 0.11 mg/l NH4 (or 120 ug/l) and 0.184 mg/l NO2 (or 184 ug/l in comparison with the same ug/l units of the 375 ug/l Nitrite Threshold Value of the Groundwater Regulations).

Table 8.8 Maximum N Compound Residual Explosives Concentrations in Quarry Recharge Waters

EXPLOSIVE MASS BALANCE		
16.3	Total Quarry area	ha
9	BLAST EXPOSURE AREA REMAINING	ha
90,000	BLAST EXPOSURE area	m2
30	Rock Depth to be blasted	m
2,700,000	Volume of rock to be exposed to BLASTING	m3
2,295,000	Rock Volume accounting for 15% losses	m3
0.4	Explosive Mass Required (Generally, at any quarry)	kg/m3
918,000	Explosives Mass Required	kg
45,900	Explosives Mass Required per year	kg/yr
NITROGEN MASS BALANCE		
94%	% Explosive mass as Ammonium Nitrate	%
35%	% Ammonium Nitrate as N	%
15,101	Mass of N	kg/yr
0.06	Residual Fraction	
906	Residual N	kg/yr
N COMPOUNDS**		
870	Residual NO_3 *(75-99% of Residual N value of 604 kg/yr)*	kg/yr
14	Residual NH_4 *(0.5 - 24% of Residual N value of 604 kg/yr)*	kg/yr
23	Residual NO_2 *(0-6% of Residual N value of 604 kg/yr)*	kg/yr
WATER BALANCE		
337	GSI & Met Eireann Rainfall Runoff + Groundwater Recharge	m^3/day
123,005,000	GSI & Met Eireann Groundwater Recharge	litres/yr
NITROGEN COMPOUND CONCENTRATIONS***		
Residual NO_3	***7.07***	***mg/L***
Residual NH_4	***0.110***	***mg/L***
Residual NO2	***0.184***	***mg/L***
*** Calculation of Residual Concentrations = (kg/yr*10^6 = mg/yr)/(litres/yr)		

8.200 Overall, the residual N Compound concentrations meet the requirements of the Threshold Values (TVs) of the Groundwater Regulations (2010), which prescribe TVs of 37.5 mg/l of NO3, 65 to 175 ug/l as Ammonium and 375 ug/l as Nitrite. Therefore, the residuals calculated for all N Species are a fraction of the TVs defined in the Groundwater Regulations. The calculated resultant concentrations also comply with the requirements of the Drinking Water Regulations (2023). The calculated masses are lower than the concentrations in the site's monitoring data for the on-site well, which are <0.5 to 8.9 mg/l NO3. There is no expected exceedance for Regulatory Threshold Values specified in the Groundwater Regulations (2010, as amended). Neither are exceedances predicted for the likely ultimate receiving environment of regional groundwater, which is Lough Corrib. The calculated residual for Ammonia is compliant, in itself, with the Good Status (95%tile) Environmental Quality Objective specified in the Surface Water Regulations (2009, as amended). **The risk of impact to local and regional water quality arising from the use of explosives at the site is therefore negligible. These calculations are based on PEAK abstraction rates and no risk is determined.**

Impact Assessment - Groundwater, WFD & Quantitative (Abstraction)

8.201 The Clare Corrib GWB is reported to have an approximate area of 375 km2 (GSI, 2004) and the GSI assigns a whole GWB area weighted average groundwater recharge value of c.431 mm/yr.

8.202 The volume of groundwater associated with this groundwater body is therefore 159,375,000 m3/yr, approximately.

8.203 Table 8.9 presents the WFD quantitative impact assessment water balance for the Groundwater Body.

Table 8.9 WFD Groundwater Quantitative Impact Assessment Water Balance

Mortimer's Belclare Quarr WFD QUANTITATIVE Water Balance	
GSI assigned area for 'Clarinbridge Groundwater Body' (km2)	1,422
Groundwater Body Area (m2)	1,422,000,000
AVERAGE Across Region GSI Effective Rainfall (mm/yr)	704
AVERAGE Across Region GSI Groundwater Recharge Mapped as 401- 450 Range (mm/yr)	505
GSI Groundwater Recharge (m/yr)	0.505
Groundwater Recharge to GWB = [Recharge m x m2 area] (m3/yr)	718,110,000
AVERAGE Groundwater Recharge PER DAY (m3/d)	1,967,425
Groundwater Abstraction MAX BH usage (m3/d)	10
Annual Discharge based on MAX daily discharge from the quarry (m3/yr)	3,650
Hydro-G Calculation	
Proportion of Quarry's interception waters / discharge volume as a % of GWB's annual rechange amount to groundwater from rain falling on its catchment (%)	**0.001**
Other REGISTERED ABSTRACTIONS IN THIS GWB : EPA Register December 2024 - Lough Corrib, Clare Corrib GWB, Milltown, River Clare (Galway), Ballinduff Stream.	
AllRegistered Abstractions cumulative (m3/d)	**48,942**
Total Registered Abstractions + Quarry's Usuage Volume as a % of GWB's annual recharge amount to groundwater from rain falling on its catchment (%)	**2.49**

8.204 The significance of the water balance information presented in Table 8.9 is that the groundwater abstracted from the site's well, when related to groundwater volume in the underlying GWB, would represent only 0.001 % of groundwater flowing through the GWB. This is a miniscule proportion of the groundwater resource. Therefore, the data in Table 8.9 provides further verification that the site essentially has no groundwater component.

8.205 WFD Working Group Guidance GW5 (2004b) assigns a rating of **'No Potential for Impact'** for a <1% result and the quarry itself is three orders of magnitude lower than '**No Potential for Impact'.**

8.206 With reference to the EPA (December 2024) Register of Abstractions there are many other groundwater abstractions in the GWB and the cumulative abstraction registered is an additional 48,942 m^3/d. When the Mortimer Quarries abstraction and other abstractions are added the total volume abstracted relative to the calculated available groundwater recharge flow through value the cumulative resultant Impact Potential is 2.49%. Values in the < 5% or 2 to 10% range present **'Low Potential for Impact'** on the basis of WFD Working Group Guidance GW5 on Abstraction Impact (2004b).

Impact Assessment Discharge

8.207 There is no discharge from this quarry.

Impact Assessment Flooding

8.208 There is no Flood risk at the site or at the elevation of the floor, 33m OD, in the landscape.

Mitigation Measures

8.209 The significant potential Effects identified in Table 8.7, above, are resolved under the mitigation measures set out under Table 8.10, below.

8.210 The key principles of avoidance, prevention, reduction and remedy/off-set have been adhered to in this regard.

8.211 The key mitigation measure for the site is that the site is elevated above the landscape with no connectivity to water in either its surface (hydrological) or subsurface form (hydrogeological).

8.212 As stated, the site holds an active Waste Facility Permit (WFP-G-21-0007-02, granted 29/09/2022), which allows for the importation of permitted and controlled material for the purpose of progressive infilling and restoration of the bedrock void. This restoration strategy supports national and EU policy objectives for the circular economy, whereby recovered materials such as soil and stone are used beneficially to restore previously worked land.

8.213 Also previously stated, in addition to material accepted under the waste permit, the restoration plan may also include the use of material classified as by-product under Article 27 of the European Communities (Waste Directive) Regulations 2011 (as amended), subject to appropriate notifications and validation by the EPA. This dual approach—combining permitted waste and notified by-product—facilitates sustainable land rehabilitation, minimises the need for disposal to landfill, and aligns with resource efficiency principles set out in the National Waste Action Plan for a Circular Economy.

8.214 The quarry will return to a natural landscape as per Quarry Consulting Drawing 6 and the associated Cross Section's Drawing 7.

Residual Impacts

8.215 Residual Impacts, following Mitigation Measures, are also presented in Table 8.10.

8.216 There are no anticipated residual impacts on the hydrological or hydrogeological environment as a result of the proposed continued use of the existing permitted quarry and the site's standard mitigation measures. The mass of solid bedrock, beneath the epikarst layer of more weathered

rock at the subsoil bedrock interface, has little porosity and this has been proven by field measurement in the course of this work. No groundwater will be encountered at the site because the conduits are not there in the zone between ground level and the 33mOD permitted and proposed. The site has been managing its rainfall allotment for years and no impacts have been detected in any surrounding Groundwater Body or Lough Corrib.

8.217 Following the implementation of the mitigation measures proposed, residual impacts on the hydrological and hydrogeological environment during all phases are assessed to be unlikely and imperceptible.

Table 8.10 Summary of Mitigation Measures & Residual Effects

Phases	Potential Impact			Mitigation Measure	Residual Effect (following Mitigation)	
	Activity	Attribute/ Receiving Environment	Character of Potential Impact	Description of Mitigation	Significance or Quality of Effect	Probability
Construction (Enabling) Phase	Mitigation Measures for the Construction Phase are not required because the site has already been enabled, and therefore there is no Construction Phase. For the areas proposed for further excavation, the area is mostly stripped of subsoil but there will be a requirement to lower ground levels and remove overlying subsoils from the proposed yard area in the eastern part of the application site. Perimeter Berms already exist. Minimal movement of natural soils, subsoils and stockpiling will take place, as per Details Submitted with the previous Application. Good Work Practices will continue and are the only mitigation necessary. The current proposal is to continue laterally working out from the current floor into the bedrock within the existing site area.					
Operational Phase	Extraction of bedrock	Bedrock aquifer	Removal of Bedrock for society's use.	No Mitigation Measures are possible, and neither are they necessary. The same Extreme Groundwater Vulnerability remains, as it was before the quarry operated: the Region is mapped as Extreme because of the naturally thin soil cover and exposed limestone. The proposed extraction of bedrock over the relatively small lateral area and a relatively small depth compared to the likely thickness of the limestone is inconsequential in terms of the regional resource of bedrock remaining *in situ*.	Imperceptible	Unlikely
	Blasting of bedrock	Groundwater	Deterioration in groundwater and surface water quality	Bedrock blasting at all sites is Gardai controlled and can only be completed by Industry specialists. In the EIAR, a sequence of calculations was presented to estimate the residuals of all nitrogen species (Nitrate, Ammonia, Nitrite) in all site waters after blasting. The results of the calculations show that the simulated resultant concentrations all N Species are very low and satisfy the relevant Threshold Values of the Groundwater Regulations and the Environmental Quality Standards (EQSs) of the Surface Water Regulations. It is surmised that the risk of impact to local water quality is imperceptible.	Imperceptible	Unlikely
	Use of quarrying machinery and equipment – spillages during refuelling, use and storage of lubricants	Groundwater	Contamination of surface waters and groundwaters with hydrocarbons	Excavations of rock will follow best management practices for maintenance of machinery. Fuelling, lubrication and storage areas and site offices are remote from surface water features, remote from the floor sump and settlement lagoons. ALL fuel tanks and other site activities (e.g. fuel storage, refuelling, adding hydraulic oils, etc) will be bunded and stored at elevations above any potential for interaction with water. ALL Refuelling vehicles will carry Standard Operating Procedure Spill Kits. All bunded storage tanks will have Standard Operating Procedure Spill Kits in immediate proximity. Waste and fuel materials will be stored in designated areas that are isolated. Hazardous wastes such as waste oil, chemicals and preservatives, will be stored in sealed containers. All waste containers (including all ancillary equipment such as vent pipes and refuelling hoses) will be stored within a secondary containment system (e.g. a bund for static tanks or a drip tray for mobile stores and drums). The bunds will be capable of storing 110% of the tank capacity. Where more than one tank is stored, the bund must be capable of holding 110% of the largest tank of 25% of the aggregate capacity (whichever is greater). Drip trays used for drum storage must be capable of holding at least 25% of the drum capacity. Where more than one drum is stored the drip tray must be capable of holding 25% of the aggregate capacity of the drums stored. Regular monitoring of water levels within drip trays and bunds due to rainfall will be undertaken to ensure sufficient capacity is maintained at all times.	Imperceptible	Unlikely

Phases	Potential Impact			Mitigation Measure	Residual Effect (following Mitigation)	
	Activity	Attribute/ Receiving Environment	Character of Potential Impact	Description of Mitigation	Significance of Quality of Effect	Probability
				Oil which accumulates within the petrol interceptor shall be regularly removed by an appropriately licensed contractor. In addition, the petrol interceptor shall be appropriately maintained in accordance with the manufacturer's specification. Regular visual monitoring of the floor sump and settlement tank will be undertaken to ensure no visual oil or fuel contamination is present.		
	Quarry dewatering – lowering of groundwater levels in surrounding area	Bedrock aquifer	Reduction in third party well yields Reduction in spring flows Reduction in baseflow to surface waters	There are no mapped domestic wells in proximity to the site because the application area under consideration is serviced by GWS mains water supply. There is local evidence that farm and yard wells exist but the groundwater strike zone is significantly deeper than the floor elevation of the quarry and the limestone mass between the quarry's floor and the groundwater conduit flow elevations. There will be no significant net loss or gain in the GWB system because volume used at the site represents, by calculated water balance, to be <0.001% of the regional groundwater volume. WFD Working Group Guidance GW5 (2004b) assigns a rating of 'No Potential for Impact' for a <1% result. There is no potential to impact surface waters because the volume of water managed at the quarry is infinitesimally small relative to the scale of the groundwater body contributing to any surface water systems. There are no flowing surface waters that could be affected by the quarry. A cumulative Water Balance was completed using the EPA (December 2024) Register of Abstractions. All abstractions from the Clare Corrib GWB, Lough Corrib, The River Clare (Galway) and local streams were considered. The cumulative impact is 2.49% of the regionally available groundwater resource. This a classified as a 'Low Potential for Impact' by the WFD Working Group Guidance GW5 (2004b). Therefore, no impact is predicted.	Imperceptible	Unlikely
	Use of settlement ponds	Groundwater	Removal and entrapment of particulate matter entrained in waters leaving site	The site's Water management Systems are established, in use and have the benefit of prior planning. The Mitigation Measure is in place. The quarry sump has sufficient volumetric capacity to accommodate all waters.	Imperceptible	Unlikely
	Cleaning of settlement ponds	Groundwater	Improves efficiency of settlement ponds, attenuation Mobilisation and migration of suspended solids	Although this has never been needed to date, particulate matter captured in settlement ponds can be transferred to bunds.	Imperceptible	Unlikely
	Use of wheelwash	Groundwater	Removal and entrapment of particulate matter attached to haulage vehicles	A wheel wash facility exists near the site offices and the roads have sprinkler systems. Regular monitoring and maintenance of the wheel wash's tank and silt traps will be undertaken in accordance with the manufacturer's specifications.	Imperceptible	Unlikely
	Wheelwash maintenance	Groundwater	Mobilisation and migration of suspended solids	The wheelwash is to be maintained in accordance with manufacturer's specifications.	Imperceptible	Unlikely
	Use & maintenance of hydrocarbon interceptors	Groundwater	Entrapment of hydrocarbons lost during refuelling/discharge	The site's infrastructure is already in place to manage solids and interception of oils.	Imperceptible	Unlikely

Phases	Potential Impact			Mitigation Measure	Residual Effect (following Mitigation)	
	Activity	Attribute/ Receiving Environment	Character of Potential Impact	Description of Mitigation	Significance of Quality of Effect	Probability
Restoration Phase	Pumped discharge of quarry waters	Groundwater	Increase flood risk to receptors	The void on the floor of the quarry is large enough to accommodate and holdback all extreme rainfall events. NO WATER IS PUMPED from the site and this will continue as a SOP.	Imperceptible	Unlikely
	Pumped discharge of quarry waters	Groundwater	Deterioration in groundwater quality	NO WATER IS PUMPED from the site and this will continue as a SOP.	Imperceptible	Unlikely
	Use of concrete batching plant to work materials from the quarry extraction area	Groundwater	Contamination of groundwaters with cementitious material	Concrete and other cement-based products are highly alkaline and can have a significant Negative / Adverse impact on water quality. The water system at the concrete batching plant is a closed loop system with all wash waters recirculated. Hence there will be no entry of cement based products into adjacent surface waters, mitigating the risk to the aquatic environment.	Imperceptible	Unlikely
	Monitoring	Groundwater	Monitoring of the onsite well and the settlement lagoon.	There is no Mitigation needed. The action is Positive.	Imperceptible	Unlikely
	Removal of semi-mobile and mobile plant (pumps, generators, etc.)	Groundwater	Elimination of hydrocarbon sources	Positive impact. No mitigation required.	None	None
	Dismantling and removal of fixed plant & machinery (asphalt plant, batching plant, wheelwash, etc.)	Groundwater	Elimination of hydrocarbon sources	Positive impact. No mitigation required.	None	None
	Landscaping and movement of overburden stockpiles necessary to facilitate site restoration.	Groundwater	Mobilisation and migration of suspended solids Sediment deposition in channels disrupting sensitive riverine habitats	Site restoration will take place on a phased basis as extraction is completed in defined areas of the site. In the final restoration of boundaries with adjoining lands levels will be graded to harmonise with the surrounding landscape. Perimeter silt fence to be installed at the toe of any overburden stockpiles. Restored areas to be vegetated to enhance stability.	Imperceptible	Unlikely
	Cessation of Operations.	Groundwater	Infill under Waste Permit Licence.	The site has a Waste Permit (Number WFP-G-21-0007-02, 29/9/22) for infill, this is the restoration plan for the bedrock void that will be created. This is the essence of a circular economy. The Licence is for permitted and controlled waste. Therefore, no potential for impact interaction on a cumulative basis exits. Site monitoring data for the central settlement sump and the on-site well confirms that there are no polluting materials in the infill.	None	None
Unplanned events	Major Spillage	Groundwater	Hydrocarbon contamination	As specified above, Spill Kits are SOP and all Refuelling vehicles will carry those Spill Kits, bunded tanks, drip trays, appropriate containers in appropriate locations will be ensured.	Imperceptible	Unlikely

Phases	Potential Impact			Mitigation Measure	Residual Effect (following Mitigation)	
	Activity	Attribute/ Receiving Environment	Character of Potential Impact	Description of Mitigation	Significance of Quality of Effect	Probability
	Fire	Groundwater	Contamination of spent firefighting waters	Used firefighting water which may be potentially contaminated may be contained via shutoff valves at the hydrocarbon interceptors. Contained firefighting water will be disposed of appropriately by a licensed contractor.	Imperceptible	Unlikely
	Intense Rainfall Events	Homes, Businesses	On-site & off-site flooding.	The floor of the quarry is large and this is the mitigation measure.	Imperceptible	Unlikely

Cumulative Effects / Synergistic Effects

8.218 A search of Galway County Council's and An Bord Pleanála's online planning search facilities indicates that there are no other **developments in the planning system** in the vicinity of the application site that have the potential to have any significant cumulative effects with the proposed development.

8.219 The cumulative impact assessment considered proposed and permitted activities within the Corrib Hydrometric Area. Discretion has been used to select those activities most likely to have **an in-combination effect** with the application site.

8.220 The application area forms part of an overall working quarry where processing, manufacturing plant and associated ancillary facilities are located along with extraction areas. There is also an adjoining quarry to the north and northwest, currently under separate ownership. While this third-party quarry is not operational at present, it forms part of the wider land parcel historically used for mineral extraction in the Cartron/Belclare area. No specific hydrogeological or operational details are publicly available for this adjoining quarry on the Galway County Council or An Bord Pleanála planning portals. However, based on its current non-operational status, lack of active water management infrastructure, and absence of any current discharge licence or groundwater abstraction registration, it is not considered likely to contribute cumulatively to any water-related impacts at this time.There is a limestone quarry at 8km to the south, southeast: The Harrington Group's Galway Quarry at Ardgaineen, Claregalway. There is no surface water connectivity between Harringtons and Mortimer's. The two sites sit in the same GWB but that is where the similarity ends for reasons including but not limited to, as follows:

- Mortimer's quarry floor elevation sits significantly elevated above the natural ground level at Harringtons, which is c. 20m OD.
- Mortimer's quarry floor is significantly elevated above Harrington's floor.
- Mortimer's is elevated above the local landscape but Harrington's is on a plane of level land.
- Harrington's discharge waters arising, under Section 4 Licence, whereas Mortimer's do not need to.
- There is no potential for interaction in the water or geological environment, or in general, between these two quarries.

8.221 The application site is self-contained, and a groundwater monitoring programme is already in place to quantify the hydrogeological regime within the site and in the surrounding environs.

8.222 The site has a Waste Permit (Number WFP-G-21-0007-02, 29/9/22) but it is for permitted and controlled waste that is not contaminated. Therefore, no potential for impact arises from the waste imported. Therefore, no potential for impact interaction on a cumulative basis exits. Site monitoring data for the central settlement sump confirms that there are no polluting materials in the infill.

8.223 With reference to the EPA (December 2024) Register of Abstractions there are other groundwater abstractions in the GWB and the cumulative abstraction registered is an additional 48,942 m3/d. When the Mortimer Quarries abstraction and other abstractions are added, the total volume abstracted relative to the calculated available groundwater recharge flow through value the resultant Impact Potential is 2.49%. That value remains within the **'Low Potential for Impact' classification rating of the** WFD Working Group Guidance GW5 (2004b).

Transboundary Impacts

8.224 EIA Directive 2014-52-EU invokes the Espoo Convention on Environmental Impact Assessment in a Transboundary Context (1991) and applies its definition of transboundary impacts.

8.225 Given the location of the site at c.110 km, approximately, at its closest position to the border with Northern Ireland, which is to the north east of the site, the nature, size and scale of the proposed development, and the fact that water from the catchment flows in a south westerly direction towards Lough Corrib, it is expected that the development will not have any significant transboundary effects with respect to water bodies.

Do Nothing Scenario

8.226 This item requires consideration of the effect on the environment as it would be in the future should the proposed works not be carried out.

8.227 If the development did not proceed, the site of the proposed development would remain an exposed quarry floor and quarry void in the southern half of the site and scrubland in the elevated north-eastern half of the site, as per the current site status. Thus, it would be expected that the application site would not undergo any changes in a 'do-nothing' scenario.

8.228 In this work, the site has been assessed as having no evidence of groundwater conduits carrying groundwater. The site's volumes of waters arising are relatively small considering its size and relative to other limestone quarries in other locations. The waters arising at the site are primarily driven by rainfall.

8.229 Interception of waters and discharge of same from the site will not significantly change the groundwater dynamics component of the site in its current condition because there is no significant net loss of water arising from the operation of the site but there would eventually be a lake if the Do Nothing Scenario were adopted.

8.230 When planning consents at the site expire, the restoration phase would involve the removal of all infrastructure and the restoration of the site to greenfield. The site's Waste Permit is for permitted and controlled waste that is not contaminated. Therefore, no potential for impact arises from the waste imported. Therefore, no potential for impact interaction on a cumulative basis exists. Site monitoring data for the central settlement sump and on-site well confirms that there are no polluting materials in the infill.

8.231 If the proposed development did not proceed, the aggregate resource would remain unused *in situ*, and the local supply of quality aggregates and concrete products would be more restricted, the availability of materials for road maintenance would be constrained until another large company filled the need. There would be increased traffic and increased cost of materials at the alternative site, due to the nuances of the market and material's availability.

8.232 If the proposed development did not proceed, there would be an increase in heavy goods vehicles from a wider extent in the county and from a different hub.

8.233 It is expected that the site would not undergo any changes in terms of surface and groundwater under a 'do-nothing' scenario, and that the interception and discharge from the site will not significantly change the groundwater dynamics component of the site.

8.234 The nature of the void and on-site water management lagoon system provides significant attenuation capacity, which has a positive effect of reducing flood risk when compared with the pre-development regime. The proposed activities include restoration of the site following completion of targeted bedrock extraction.

8.235 Quarrying in the local area is established and has been integrated into the local environment. It is therefore considered more appropriate to continue activities at the current application site, as opposed to opening a new quarry on a greenfield site to meet the demands of the construction industry.

8.236 The demand for rock resources continues to be driven by the ongoing need for housing, roads, shopping centres, data centres, and industrial parks. The 'Do-Nothing' scenario would create a temporary supply shortfall in the construction market, which would eventually restore itself, but likely at a higher cost to the consumer. With respect to this water assessment, and water dependent habitats and species, given that the quarry has been in operation for many decades and there is no observable environmental or ecological effect there is no reason to enter the Do Nothing Scenario.

Monitoring Measures

8.237 Mortimer Quarries operates an Environmental Management System based on the Quarry Guidelines (2004), EPA Guidelines (2006) and specific requirements the site's 2009 permission. Quarry management have comprehensive Standard Operation Procedures in place for all components of its activities at the site.

8.238 With respect to groundwater monitoring, there is routine monitoring of Groundwater Quality and Levels and Quality on a Quarterly basis for the on-site Supply Well and that will continue.

8.239 Monitoring measures will continue as usual and they verify whether the development is impacting on the hydrological and/or hydrogeological, and that the mitigation measures are effective.

8.240 The site's Standard Operation Management Plan addresses all potentially polluting activities and includes an emergency response procedure.

8.241 All personnel working on the site are trained in the implementation of the procedures. As a minimum, the manual is formulated in consideration of the standard best international practice including but not limited to:

- EPA (2006) Environmental Management Guidelines for the Extractive Industry (Non-Scheduled Minerals).
- CIRIA, 2011. Control of Water Pollution from Construction Sites, Guidance for Consultants
- CIRIA, 2005. Environmental Good Practice on Site (C650).
- EI, 2005. Oil Storage Guidelines (BPGCS005).
- Environment Agency, 2004. UK Pollution Prevention Guidelines (PPG).

8.242 Hydrocarbon and silt interceptors are serviced and maintained on a regular basis by an independent licensed contractor.

8.243 Regular inspections of the site infrastructure (settlement ponds, hardstanding, drainage infrastructure, on site WWTP and discharge zone, etc.) are undertaken by a designated person.

8.244 The quarry manager understands that it is part of his work and overall responsibility to ensure that all operations are carried out in such a way as to minimise potential impacts water receptors. The quarry manager is in constant communication, and works in the same office, as the operative monitoring the performances of pollution control measures adopted to ensure that the proposed development is not impacting on the environment.

Interaction with Other Measures

8.245 The EIAR guidelines (EPA, 2022) highlight that the interaction of impacts to the hydrological and hydrogeological environment arising from the proposed activities, with potential receptors identified in other EIAR chapters, must be given due consideration.

8.246 Ecology, Land, Soils and Geology and Water are the only components of the EIA that have any potential to be connected. Each of these EIA components and the mitigation measures that are proposed are addressed in detail in the relevant chapters of the EIAR. Considering the conclusions and residual impact assessment of the Water Chapter, there are no negative impacts to interact with each other.

Application of Dewatering Impact Appraisal Methodology (UK EA, 2007)

8.247 In addition to the usual impact assessment, description of likely impacts, mitigation measures and residuals presented above, Hydro-G now presents an additional and complimentary assessment methodology. The UK Environment Agency's (Boak, R. et. al., 2007) 'best practice' approach to a hydrogeologically focussed assessment is explained in detail in **Appendix 8.7**. As previously outlined, the UK EA's approach suggests a stepwise thought-process. Following on from the completed desk and site data. Hydro-G answers to each of the UK EA Questions in each of the Steps are as follows:

- ***Step 1:*** Establish the regional water resource status:

  Groundwater is mapped as a Regionally Important Karst Conduit Aquifer, named the Clare Corrib Groundwater Body, assigned EPA WFD Good Status (EPA 2016-2021) & 3rd Cycle Not At Risk.

  Surface Waters: there are no surface waters in proximity to the site. There is no direct hydrological link between the site and any surface waters. However, it is generally accepted (GSI, 2004) that all groundwaters in the Clare Corrib GWB will discharge to Lough Corrib: Lough Corrib Upper and Lower are each assigned EPA WFD Good Status (EPA 2016-2021) & 3rd Cycle Not At Risk. The micro scale context of the site is that it lies within the Ballinduff_010 Sub Basin, which is assigned EPA WFD Good Status (EPA 2016-2021) & 3rd Cycle Not At Risk. The Ballinduff_010 river enters Lough Corrib Lower in the vicinity of cove in which the Luimnagh WTP abstracts water for PWS.

- ***Step 2:*** Develop a conceptual model for the abstraction and the surrounding area:

  Answer = Recharge to the site is rainfall. No evidence of groundwater exists at the site. Water quality results for the site's sump waters suggest a rainfall signature for hydrochemistry. The site's well struck groundwater at an elevation of, or beneath, 15m OD. The site will be extracted down to the same final proposed floor level of 33m OD. The conceptual model, based on the elevation of all local turloughs is that no groundwater will be encountered at the quarry because it sits elevated above the 25m OD elevation that is the surface expression of groundwater head in the region. The site does not need a Section 4 Discharge Licence because the magnitude of waters it encounters is low. The site's water balance accounts for <0.001% of the WFD mapped Groundwater Body's available resource. This is a miniscule, and NO POTENTIAL FOR IMPACT, value when GW5 (WFD WG 2004) is applied. There is no 'Water Table' in karst conduit groundwater environments. Whist the groundwater flow system moves towards Lough Corrib, whose shores are at 5m OD, the quarry is operating above the groundwater flow system. If there are any groundwater fed wells currently in use, the quarry has no potential to Interact with them because the quarry

is set above their groundwater feed elevations and the mass of limestone is a massive, low permeability material, between the void of the quarry and any receptors.

- ***Step 3:*** Identify all potential water features that are susceptible to flow impacts:
  - Clare Corrib GWB
  - Ballinduff_010 Stream
- ***Step 4:*** Apportion the likely flow impacts to the water features.

  Answer = None, because the interception and usage amount at the quarry represents 0.001% of the Clare Corrib Groundwater Body's available groundwater resource. In addition, the excavation of bedrock at the quarry is completely independent of the groundwater flow system's elevation.
- ***Step 5:*** Allow for the mitigating effects of any discharges, to arrive at net flow impacts:

  Answer *= there is no discharge from the site. Therefore, mitigating effects are not needed. There is natural percolation of rain into bedrock in the region. Site Procedures relating to management of spoil, hydrocarbons and refuelling will remain in place as they always have.*
- ***Step 6:*** Assess the significance of the net flow impacts.

  Answer = Negligible significance. There is no net loss.
- ***Step 7:*** Define the search area for drawdown impacts.

  Answer = The groundwater flow mechanism is Karst Conduit flow, which is a 'secondary porosity' system, in bedrock with extremely low bedrock matrix hydraulic conductivity. Drawdown, being a primary porosity bedrock media concept, **is not applicable to the site**.
- ***Step 8:*** Identify all features in the search area that could be impacted by drawdown.

  Answer = Refer to comment at Step 7, above. An extending drawdown radius concept does not apply to the karst conduit nature of local area. Groundwater has not been encountered within the bedrock excavation zone of the void that is currently partially excavated across some of the site to 33m OD. Neither it is at all possible that groundwater could be encountered in the proposal to finish working out the previously permitted area of the site to the same 33m OD. This is a confident assertion when one considers that 10 Cross Sections presented in this work (A-A' to J-J'): there are many turloughs in the local area and all of them enable groundwater to escape to the land surface when the land surface is 25m OD. Given that the quarry excavates into the eastern side of a hill, to a final proposed elevation of 33m OD, the excavation will always be above the groundwater system.
- **Step 9:** For all these features, predict the likely drawdown impacts: **Answer = None predicted.**
- ***Step 10:*** Allow for the effects of measures taken to mitigate the drawdown impacts: ***Answer = Not relevant.***
- ***Step 11:*** Assess the significance of the net drawdown impacts: ***Answer = Not applicable.***
- ***Step 12:*** Assess the water quality impacts: ***Answer =*** Calculations have been completed with respect to explosives residues and no water quality impact is predicted. The residual Nitrate, Ammonia and Nitrite concentrations are all well below the Threshold Values of the Groundwater Regulations (2010, as amended). In addition, Site Monitoring data suggests that there is no impact on either the onsite water supply well or the sump in the centre of the site that collects rainfall runoff.

- ***Step 13:*** If necessary, redesign the mitigation measures to minimise the impacts: ***Answer =*** Not necessary.
- ***Step 14:*** Develop a monitoring strategy: ***Answer =*** Quarterly sampling of the onsite well and central sump will continue.

Conservation Objective Site Protection Measures (NATURA 2000)

8.248 The quarry is c.9.5km to the northeast of the closest shore of Lough Corrib SAC, SPA and pNHA, in the vicinity of the Luimnagh PWS intake.

8.249 Conservation Objective Sites and Designated Areas and the site were presented as Figure 8.2.

8.250 Hydrologically and hydrologically the site is mapped as follows:

- Part of the Corrib Catchment [HA 30],
- Within the subcatchment of the river system named the Clare [Galway]_SC_060, whose ID Code is 30_13,
- Within the WFD sub basin named the BALLINDUFF STREAM_010 [EU_CD IE_WE_30B050100],
- Overlying the 'Clare Corrib' Groundwater Body (GWB) [IE_WE_G_0020], which is afforded WFD Protection Are Type 'Special Area of Protection-Conservation Objective' and EU Protection Area Type Article 7 Abstraction for Drinking Water.
- As stated earlier, in the section of this chapter that listed all Conservation Objective (CO) sites in the region, only those sites that are in the Clare Corrib GWB were brought forward for assessment because GWB boundaries are conceptualised as essentially 'no flow' boundaries. Therefore, the CO sites that are mapped as their own GWDTE or CO sites in the Cong Robe GWB to the north west and the Suck GWB to the east are concluded as having no connectivity to the application site. Only sites that are in the same Clare Corrib GWB are considered.

8.251 Both the Clare (Galway) river, Ballinduff Stream and Clare Corrib groundwater body are mapped as part of Lough Corrib SAC, SPA and proposed National Heritage Area (pNHA).

8.252 There is no direct hydrological or hydrogeological link between the site or any of the mapped SACs, SPAs or pNHAs because the site has not intercepted groundwater, there is no discharge from the site and flowing rivers or streams are absent in the vicinity of the site.

8.253 Within the mapped subcatchment of the quarry, the nearest surface water feature is a c. 3.6km due east of the site and this is named the GLENNAFOSHA [EPA Code 30G69; EU Code IE_WE_30C010700], which is a Tributary Stream that flows into the main channel of the Clare (Galway) River, which is c. 5km due east of the site. The Clare (Galway) River [EPA Code 30C01; EU Code IE_WE_30C010800] flows from north to south and travels a stream length distance of c.25km before entering Lough Corrib at a 'as the crow flies' distance of c. 17.5km to the south west of the site. The Clare River is mapped as part of the Lough Corrib SAC all the way as far as north of the north of the site. However, even though the site is sitting in the Subcatchment of the Clare River, it is mapped as draining into the basin of the Ballinduff_010 stream that discharges directly to Lough Corrib to the south west of the quarry. The closest rising of the Ballinduff_010 to the site is c. 6km to the south west of the quarry. There is a second rising of the Ballinduff_010 is c.7km to the southwest of the quarry. The Ballinduff_010 is not mapped as part of the Lough Corrib SAC.

8.254 The site sits between the River Clare and Lough Corrib and both the river and the lake are mapped as part of the European Site Lough Corrib (SAC Site Code 000297 & SPA Site Code 004042). There are two Statutory Instruments associated: the European Communities Conservation of Wild Birds (Lough Corrib Special Protection Area 004042) Regulations 2012 and Lough Corrib Special Area of Conservation 000297 Regulations 2022.

- Refer to Cross-Section A-A', which is presented at the end of the Figure Series. It is clear that Mortimer Quarries sits elevated above the surface water systems that are connected by the underground groundwater system. Therefore, no potential for impact is concluded.
- Cross-Section B-B' shows a slightly different orientation between the quarry and Lough Corrib – the Uisce Eireann Luimnagh Intake for PWS is shown on B-B' and it is clear that there is no mechanism for the quarry to interact with the underlying groundwater system conveying regional groundwater to the Luimnagh intake.

8.255 GWDTE-Lough Corrib Fens 3 & 4 (SAC 000297) is c. 12 Km to the south west of the quarry. This GWDTE is farther south than the Luimnagh Intake on Lough Corrib. The draw of Luimnagh will trump any groundwater flow direction and therefore it is highly unlikely that the quarry has any connectivity to the Corrib Fens.

- Cross-Section C-C' presents a Cross-Section in the landscape in which the quarry's elevation is shown relative to the GWDTE Lough Corrib Fens to the south west, on the shores of Lough Corrib, and the Belclare and Killtower Turlough pNHAs to the north. **The Cross-Section shows that the quarry sits elevated above the water system and there in NO potential for connectivity to CO sites.**

8.256 As previously introduced, the site is c.24km to the north of Oranmore Bay, which is part of Galway Bay Inner SAC, SPA and proposed NHA. Given that Galway Bay is mapped as Hydrometric Area 29 and the quarry site is mapped as part of Hydrometric Area 30, **there is NO direct hydrological link to the Conservation Objective sites associated with Oranmore Bay or Galway Bay.** The Clare Corrib catchment (HA30)'s most significant water body is Lough Corrib and this discharges to Galway Bay. However, this is an indirect link between the site and Galway Bay. Galway Bay has designation as a European Site (Galway Bay Complex SAC 000268, Inner Galway Bay SPA 004031, Galway Bay Complex proposed NHA 000268) and also has two Statutory Instruments associated: European Union Habitats (Galway Bay Complex Special Area of Conservation 000268) Regulations 2021 [S.I. No. 548 of 2021] and European Union Conservation of Wild Birds (Inner Galway Bay Special Protection Area 004031) Regulations 2019 [S.I. No. 515 of 2019].

8.257 Shrule Turlough SAC (Site Code 000525) is 11.9km to the north-west of the quarry. There is no surface water connectivity between Mortimer's Quarry site and this SAC. The EPA map the Shrule Turlough as having its own Groundwater Body and it is specifically called a Groundwater Dependent Terrestrial Ecosystem GWDTE-Shrule Turlough (SAC000525). Therefore, the flow path length contributing to the Shrule GWDTE Turlough SAC has been defined by the mapped boundary of its GWDTE and Mortimer's Quarry is significantly distant from it at a distance of c.10.5km. **Therefore, there is no connectivity to the Shrule Turlough SAC (000525).**

8.258 Cloughmoyne SAC (Site Code 000479) is also to the west to north west of the quarry and at a distance of c. 13.5km. Interestingly, Cloughmoyne SAC is bisected by the Clare Corrib GWB, in which the quarry sits, and the Cong Robe GWB, which flanks the northeastern shores of Lough Corrib. Cloughmoyne has its own Statutory Instrument (S.I. No. 222 of 2017) named the European Union Habitats (Cloughmoyne Special Area Of Conservation 000479) Regulations 2017. The site is a European Site because of its Qualifying Interest 'Limestone Pavement' and the site

specific Conservation Objectives report (2019) states that "Limestone pavements* in Cloughmoyne SAC exhibits a good example of the shattered form of the habitat and occurs in intimate association with species-rich calcareous grassland, juniper (Juniperus communis) scrub and heath habitats." The Site Synopsis (NPWS, 2013) states that "The site lies on the south-west slope of a low limestone ridge and spreads southwards to include a fen and lake." **The habitat of qualifying interest for Cloughmoyne SAC is limestone pavement, which is a habitat that is not a Groundwater Dependent Terrestrial Ecosystem (GWDTE). Therefore this European Site will not be affected by any groundwater interactions at Mortimer's Quarry site.** Similarly, given the facts that the quarry has not intercepted the groundwater body and there are no surface waters in the vicinity of the site, Mortimer's quarry has no potential to affect the lake or fen associated with Cloughmoyne SAC. **Overall, Mortimer's quarry has no potential to affect limestone pavement at a distance of 13.5km.**

8.259 Levally Lough SAC (Site Code 000295) is designated because it is a Turlough and it is 16km to the north east of the quarry. The River Clare is between the quarry and Levally Lough SAC. Given the north eastern location of the Turlough, in combination with the facts that groundwater will be flowing towards Lough Corrib in a North east to south east direction and that the quarry sits above the groundwater system, there is no potential for interaction or impact between the quarry and Levally Lough SAC. Refer to Cross-Section D-D', which shows the regional setting of Levally Lough SAC relative to the Quarry and Lough Corrib SAC and SPA. **It is, again, clear that the quarry sits above the hydrological and hydrogeological systems and there is no potential for interaction.**

8.260 Derrinlough (Cloonkeenleananode) Bog SAC (002197) is c. 22km to the north east of the quarry. This Bog SAC is a site designated for its habitat (7120) Degraded raised bogs still capable of natural regeneration. There is no surface water connectivity between Mortimer's Quarry site and this SAC. The preferential groundwater flow directions of the Clare – Corrib Groundwater Body underlying the site are to the southwest, with all groundwater discharging to Lough Corrib. Lough Corrib is located to the south-west of the quarry site, therefore groundwater flow paths in the vicinity of the quarry are likely to be to the south-west and away from this European Site. **Therefore, this European Site will not be affected by development at Mortimer's Quarry site.**

8.261 Monivea Bog SAC (002352) is c.20.km to the south-east of the quarry and it is designated for (7110) Active raised bogs*, (7120) Degraded raised bogs still capable of natural regeneration and (7150) Depressions on peat substrates of the Rhynchosporion. There is no surface water connectivity between Mortimer's Quarry site and this SAC. Groundwater flow direction of the Clare – Corrib Groundwater Body underlying the site are to the southwest. **Therefore groundwater flow paths in the vicinity of the quarry are likely to be to the south-west and away from this European Site and it will not be affected by development at Mortimer's Quarry site.**

8.262 Williamstown Turloughs SAC (002296) is designated because it is a (3180) Turlough that is 27.1km to the north-east of the quarry. Similar to previous, given that there is no surface water connectivity between Mortimer's Quarry site and this SAC and that groundwater will flow from north east to Lough Corrib, **there is no potential for interaction between activities at Mortimer quarry and Williamstown Turloughs SAC.**

8.263 Knockmaa Hill, adjacent to the site, is mapped as a pNHA and is also reported by the GSI (Meehan et al., 2019) as a Geoheritage Site (GY082). Its Geoheritage relates to geology and therefore it is discussed, with other geologically significant sites, in Chapter 7 of this EIAR.

8.264 There are many pNHA sites having significance to this Water Assessment and it has previously been explained (Cross Sections E-E' to H-H') that groundwater manifests at these turloughs at land surface elevations of 25 m OD to 29m OD. Given that the elevation of the floor of Mortimer's

Quarry is partially worked to, and permitted to and proposed to be, 33m OD, it is confidently asserted that the quarry sits above the regional groundwater head elevation and therefore no potential exists to interact with, or be required to manage in the future, or affect groundwater. This applies to the turloughs considered as follows and referenced Cross Sections, which are presented at the end of the Figure Series:

- Belclare Turlough (pNHA 000234) @ 1.5km to the northeast of the boundary of the combined Belclare Quarries GSI mapped Geoheritage site. Refer to Cross-Section E-E'.
- Turlough O'Gall (pNHA 000331) @ c.3km to the north west of Mortimer's Belclare Quarry. Turlough O'Gall is at 25m OD elevation. Refer to Cross-Section F-F'.
- Lough Hacket (pNHA 001294) @ 6.22km to the west of Mortimer's Belclare Quarry. Lough Hacket is at 26m OD elevation. Refer to Cross-Section G-G'.
- Turlough Monaghan pNHA (001322) @ c. 4km to the south west and Turloughcor pNHA (001788) @ c.7.5km to the south west of the site. Refer to Cross-Section H-H'.

PWS Protection Measures

8.265 EPA Envision mapping, as tabulated earlier in this report, presented Drinking Water Protection Areas. Upon integration of all assessment information, by completing Cross Sections, it is concluded that the 33m OD floor of the quarry sits above the groundwater flow system and above the 5m OD elevation of the Luimnagh PWS Intake. Given the low permeability bedrock and the lack of direct connection, no special protection measures are required for the PWS intakes on Lough Corrib other than those already in place at the quarry. Site Monitoring data suggest exceptional groundwater and sump water quality at the site. Therefore, site monitoring data suggests that no risk is presented.

8.266 As previously stated, with respect to the Uisce Eireann mains that runs under the access road to the quarry and the reservoirs at Knockacarigeen, 1km to the northeast of the site (Figure 8.4), Hydro-G consulted directly with Uisce Eireann personnel for the region in Assets (Eoin Hughes) and Operations (Ronan Mannion). Details relating to the infrastructure assets are presented in Scoping Responses **Appendix 8.4** in a discussion section dealing with Hydro-G's responses to the usual matters of importance to Uisce Eireann. The applicant has provided information that this specific issue was addressed in the 2007 Grant of Permission (PL 062275 & ABP Reference PL 07.222783) and that Blast Monitoring data ensures that there are no vibration impacts that could affect the mains or reservoir. The site has operated for almost 20 years and there is no communication from either Galway County Council or Uisce Eireann suggesting any impacts.

Water Framework Directive Compliance Assessment

8.267 A WFD Compliance Assessment is reported in full in a separate report accompanying this application and associated EIAR. Summary points are presented here.

8.268 There is no direct hydrological link between the site and any surface water or Conservation Objective system. Earlier in this EIAR, the Desk Study WFD information section dealt with each mapped element of the Hydrometric Area and the reasons supporting the conclusion of **No Interaction Potential** were presented.

8.269 The only direct connection that the quarry has with any water body the underlying mapped Clare Corrib GWB (IE_WE_G_0008), which is assigned Good Status (2016 – 2021) and 3rd Cycle Not At Risk. This is a mapping / administration connection because site investigations suggest that the quarry is separated from the underlying deep conduit groundwater flow system. Notwithstanding that, the quarry has operated through all 3 Cycles of the WFD and there has been no identified risk or deterioration in Status. Given that nothing new is presented for the site, continued compliance with the Objectives of the WFD are envisaged.

8.270 Further, with respect to **Quantitative Groundwater Body Status and Risk**, a numerical water balance has been completed for the underlying Clare Corrib GWB (IE_WE_G_0008) and reported in this work and the result is that use of waters from the site's sump and on site water supply well accounts for 0.001% of the available groundwater resource volume. When the site's abstraction is considered in combination with all other EPA (2024) registered abstractions from the GWB the result is that 2.49% of the available groundwater resource volume is affected by ALL REGISTERED USERS of groundwater, lake water and river water. The cumulative quantitative impact value is within the **'Low Potential for Impact'** category of the WFD (2004b) Working Group GW5 Guidance Document on Groundwater Abstractions. On its own, the quarry's operation is in the **'NO Potential for Impact'** category of the WFD (2004b) Working Group GW5 Guidance Document on Groundwater Abstractions.

List of Figures

List of Cross Sections

Cross-Section A - A' = West to East from Lough Corrib SAC and SPA, through Knockmaa & Mortimer's Belclare Quarry and on through River Clare, mapped as part of Lough Corrib SAC.

Cross-Section B - B' = South West to Northeast: Lough Corrib SAC and SPA and Uisce Eireann PWS Intake at Luimnagh > Through Belclare Quarry > Through River Clare and to North of Tuam.

Cross-Section C - C' = Lough Corrib SAC and SPA > GWDTE Lough Corrib Fens 3 and 4 SAC (SAC 000297) > Mortimer's Belclare Quarry > Belclare and Killtower pNHA Turloughs.

Cross-Section D - D' = Lough Corrib > Knockmaa Hill pNHA (001288), Mortimer's Belclare Quarry, > River Clare (Galway) [Lough Corrib SAC 000297] > Levally Lough SAC (000295).

Cross-Section E - E' = Lough Corrib > Knockmaa and Knockmaa Quarries (Mortimer's Belclare Quarry and McTigue) > pNHA Sites Belclare and Killtower Turloughs.

Cross-Section F - F' = pNHA Site Turlough O'Gall > Castlehacket > Knockmaa > Mortimer's Belclare Quarry > River Clare.

Cross-Section G - G' = Lough Corrib > Rostaff Turlough pNHA (000385) > Lough Hacket pNHA (001294) > Knockmaa and Mortimer's Belclare Quarry > River Clare (Galway) [Lough Corrib SAC 000297].

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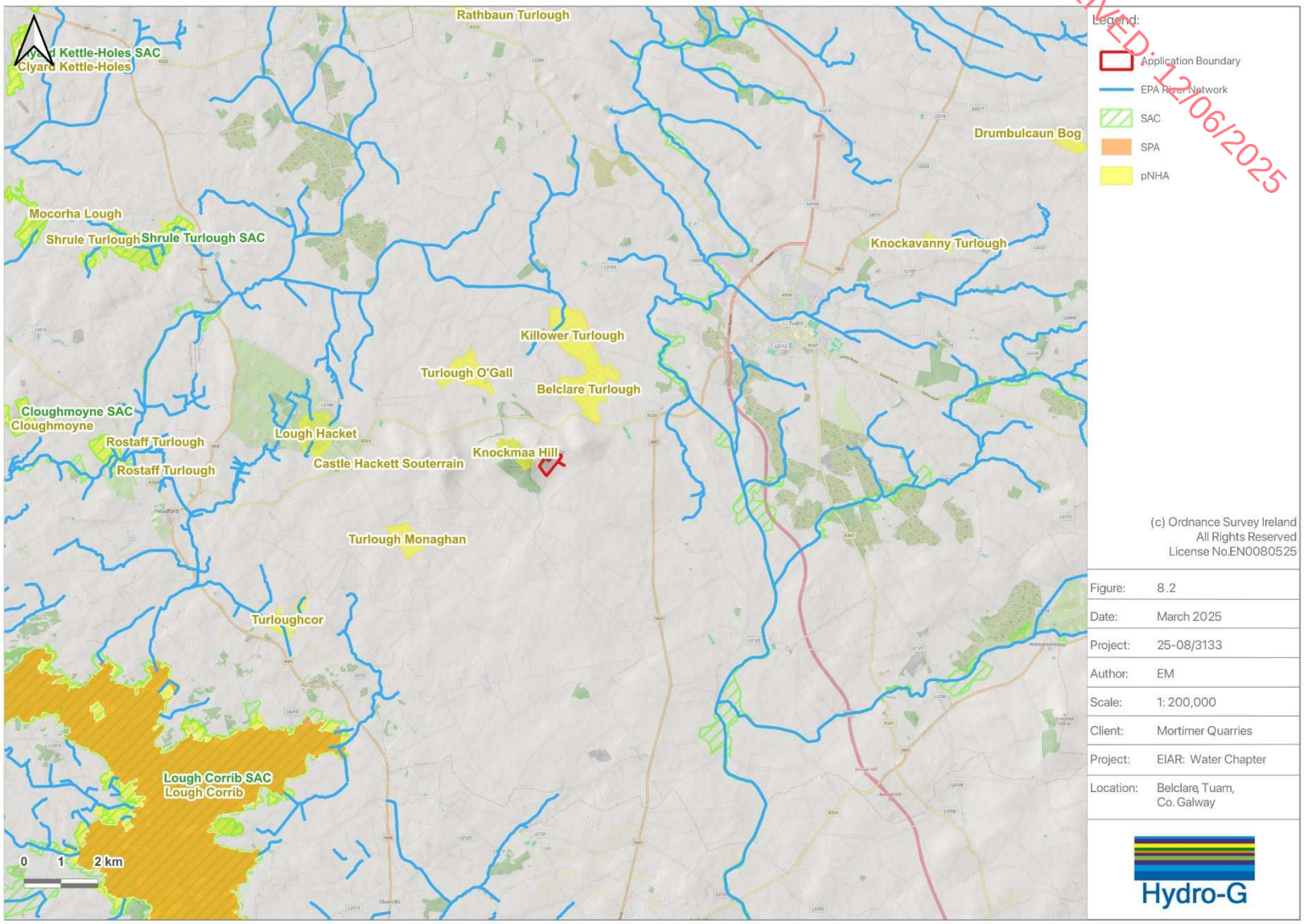
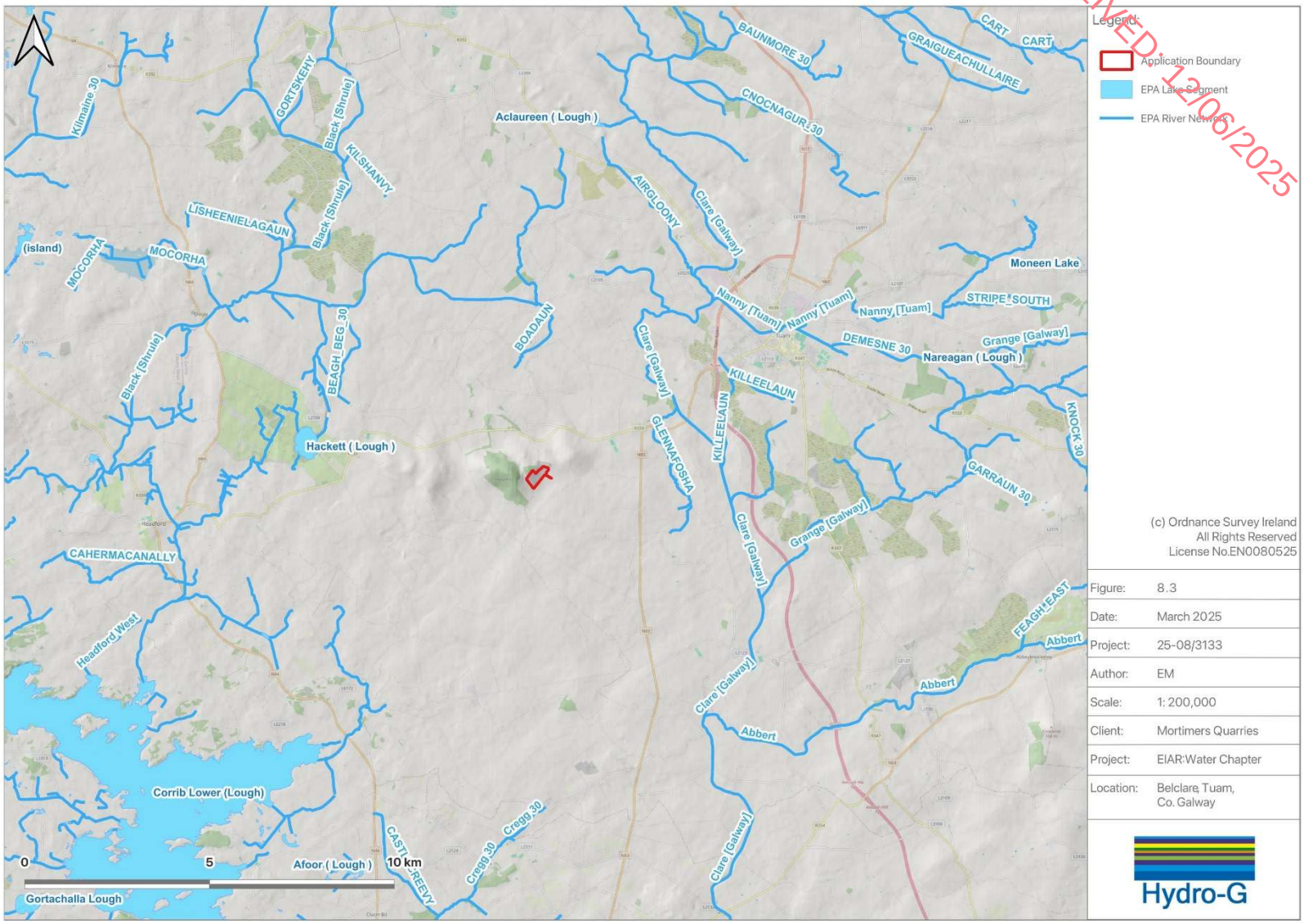
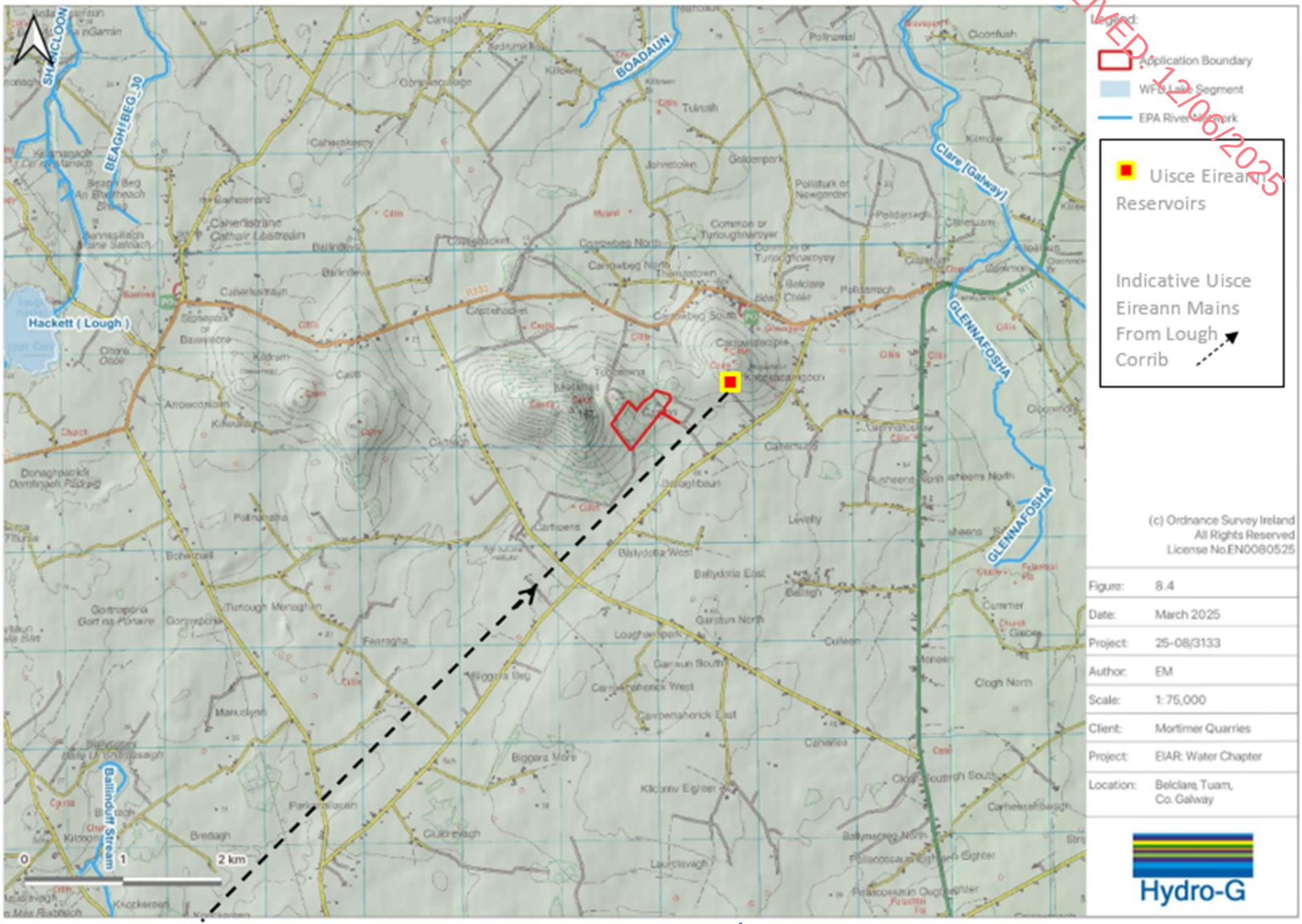
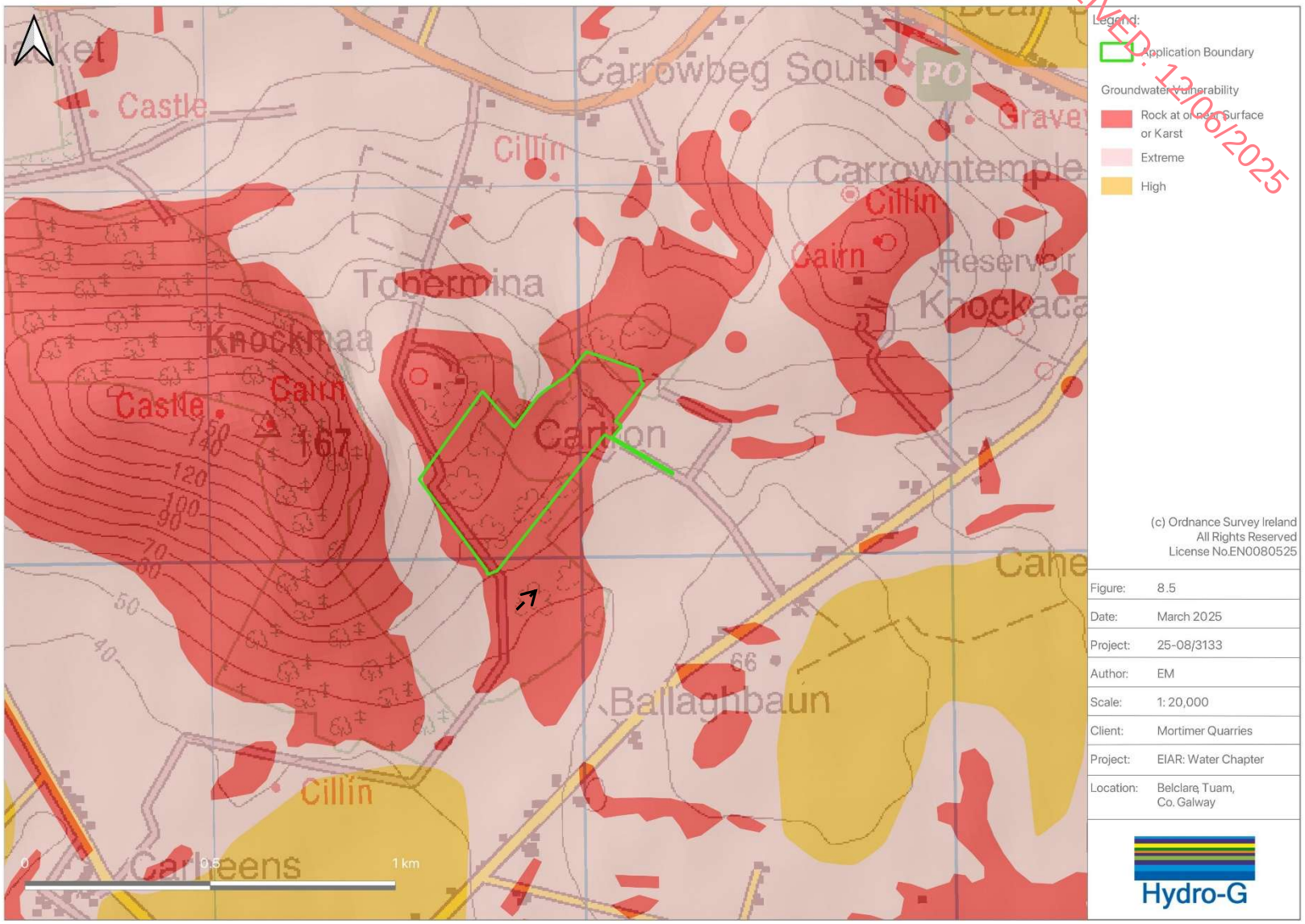
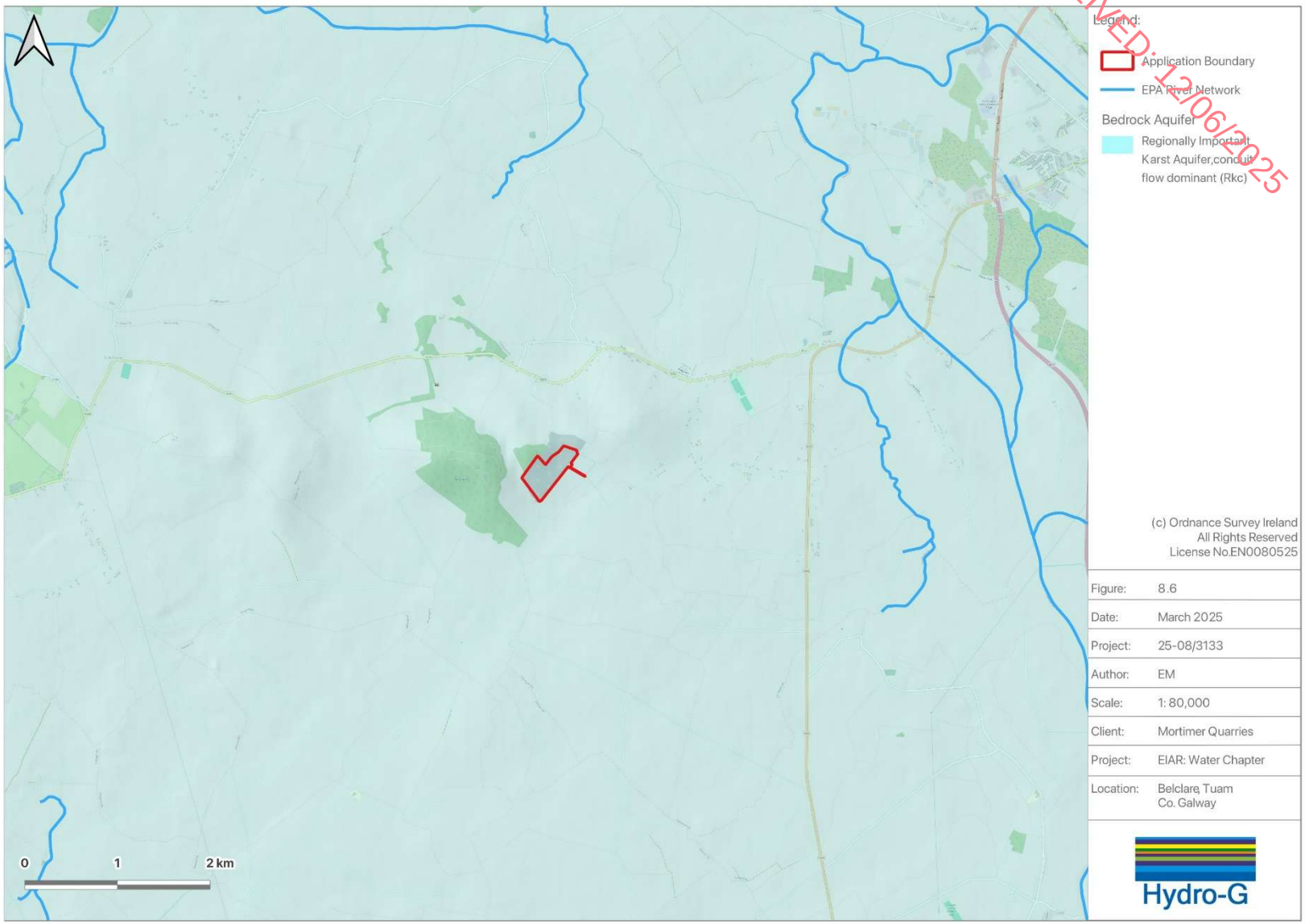
Cross-Section L – L' = Lough Corrib >> Knockmaa >> Mortimer's Belclare Quarry >> River Clare.

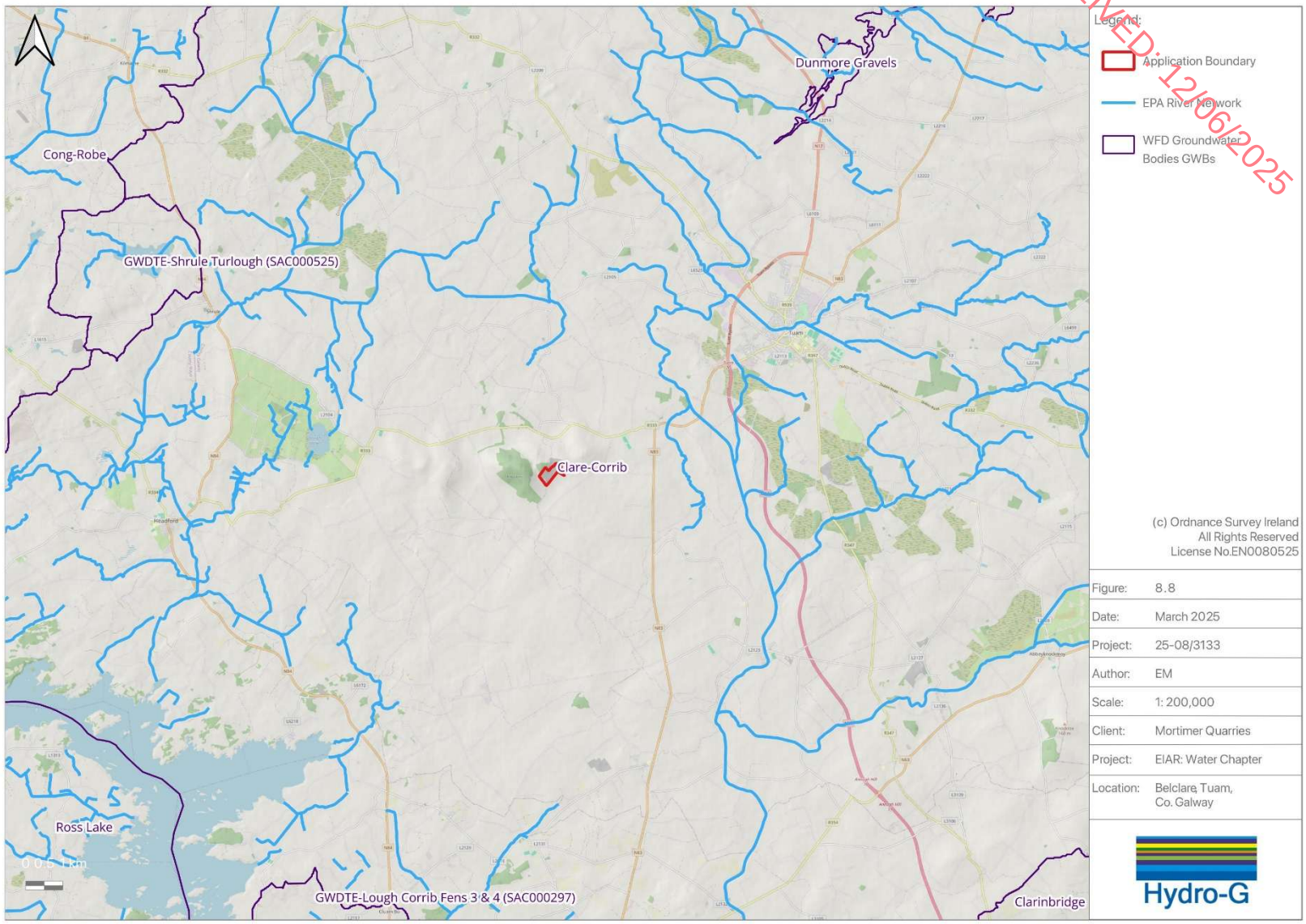


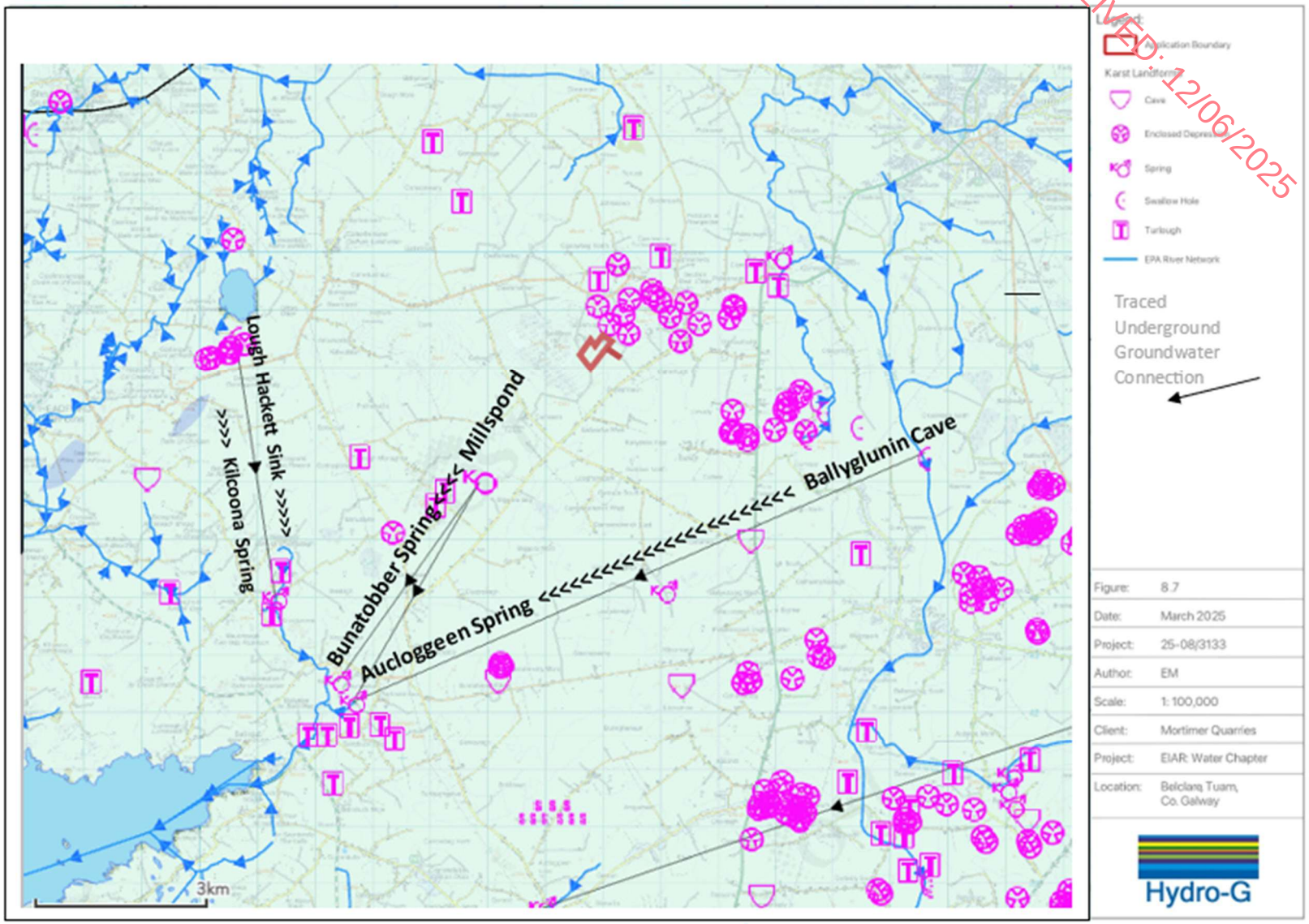


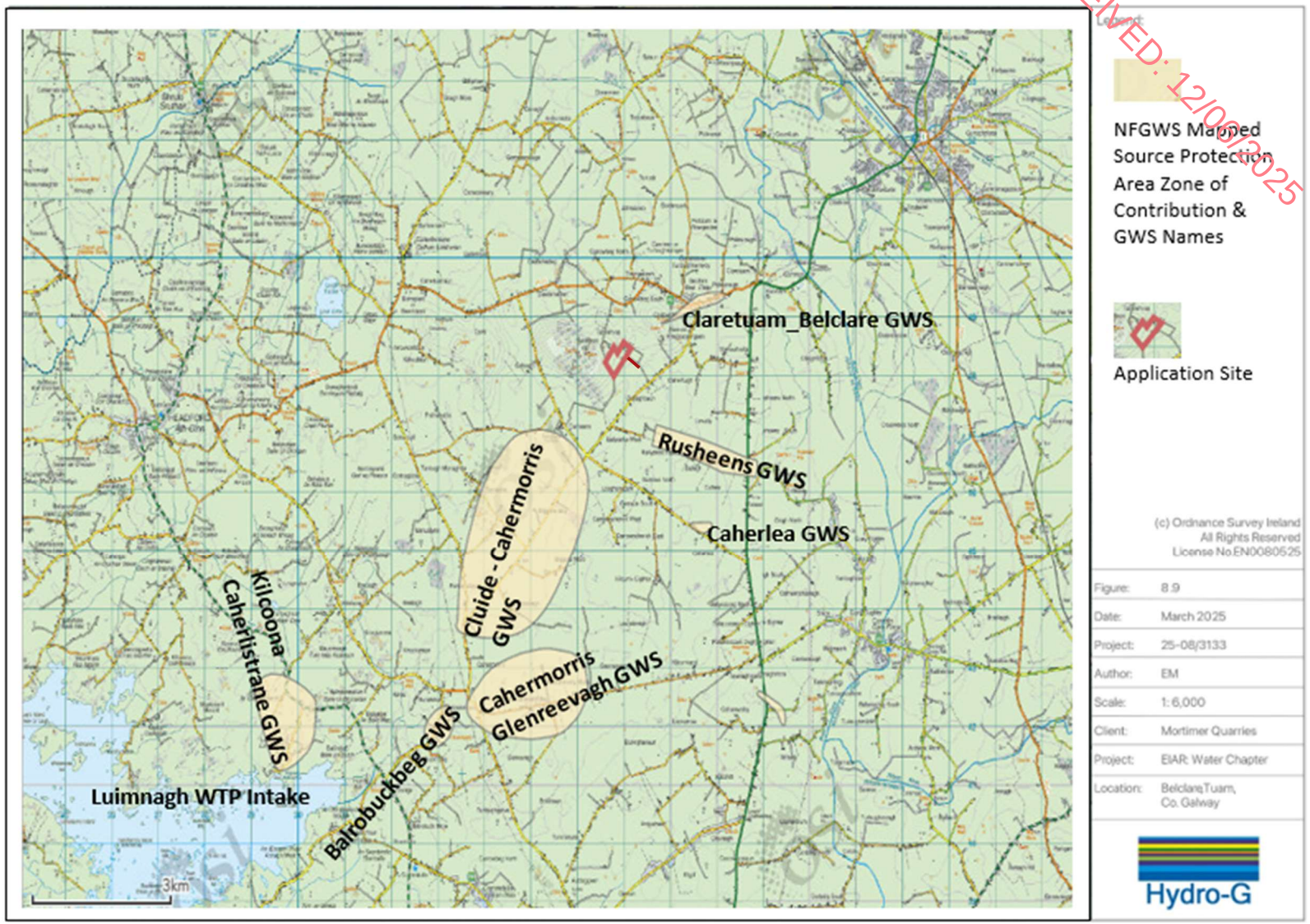


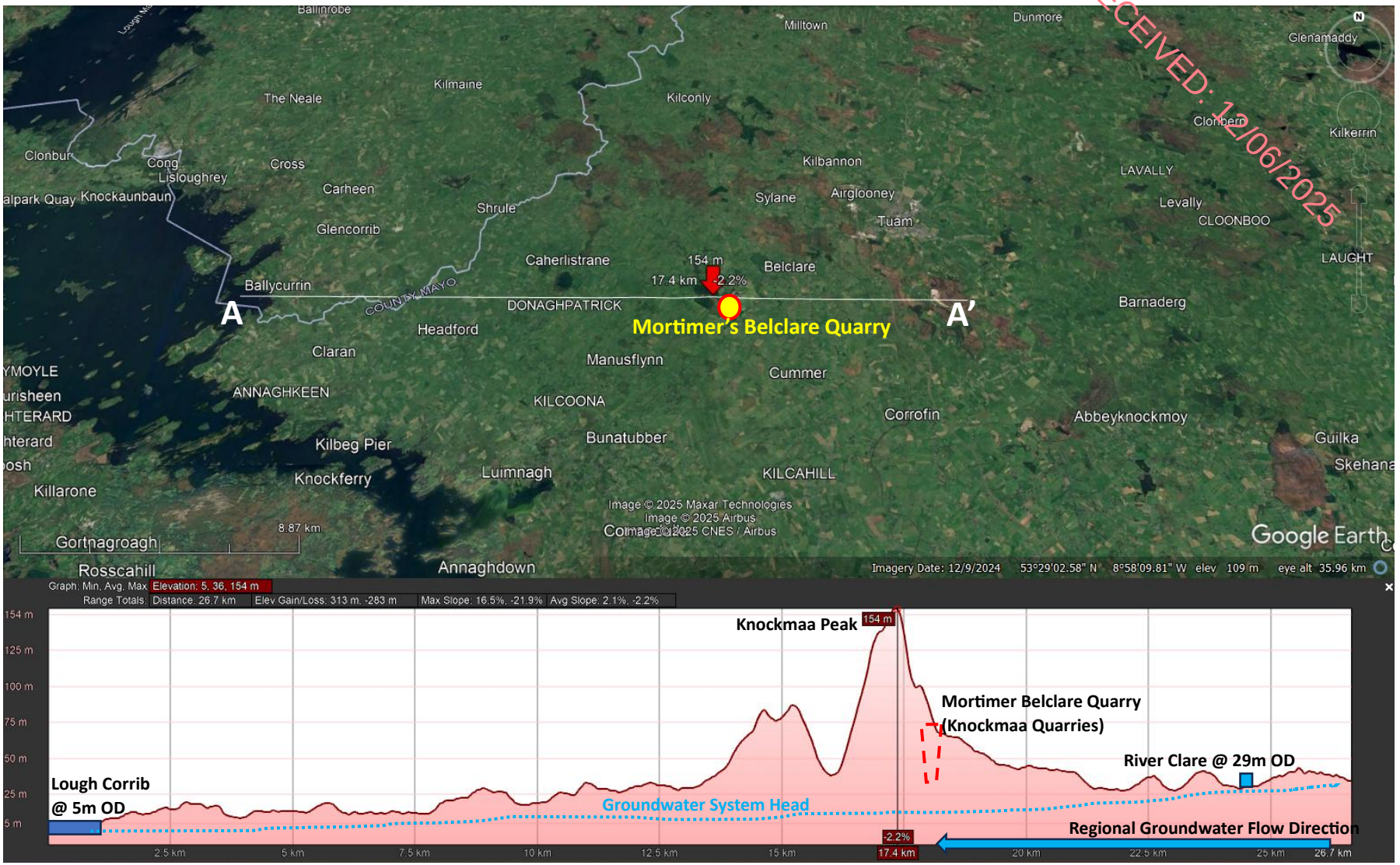












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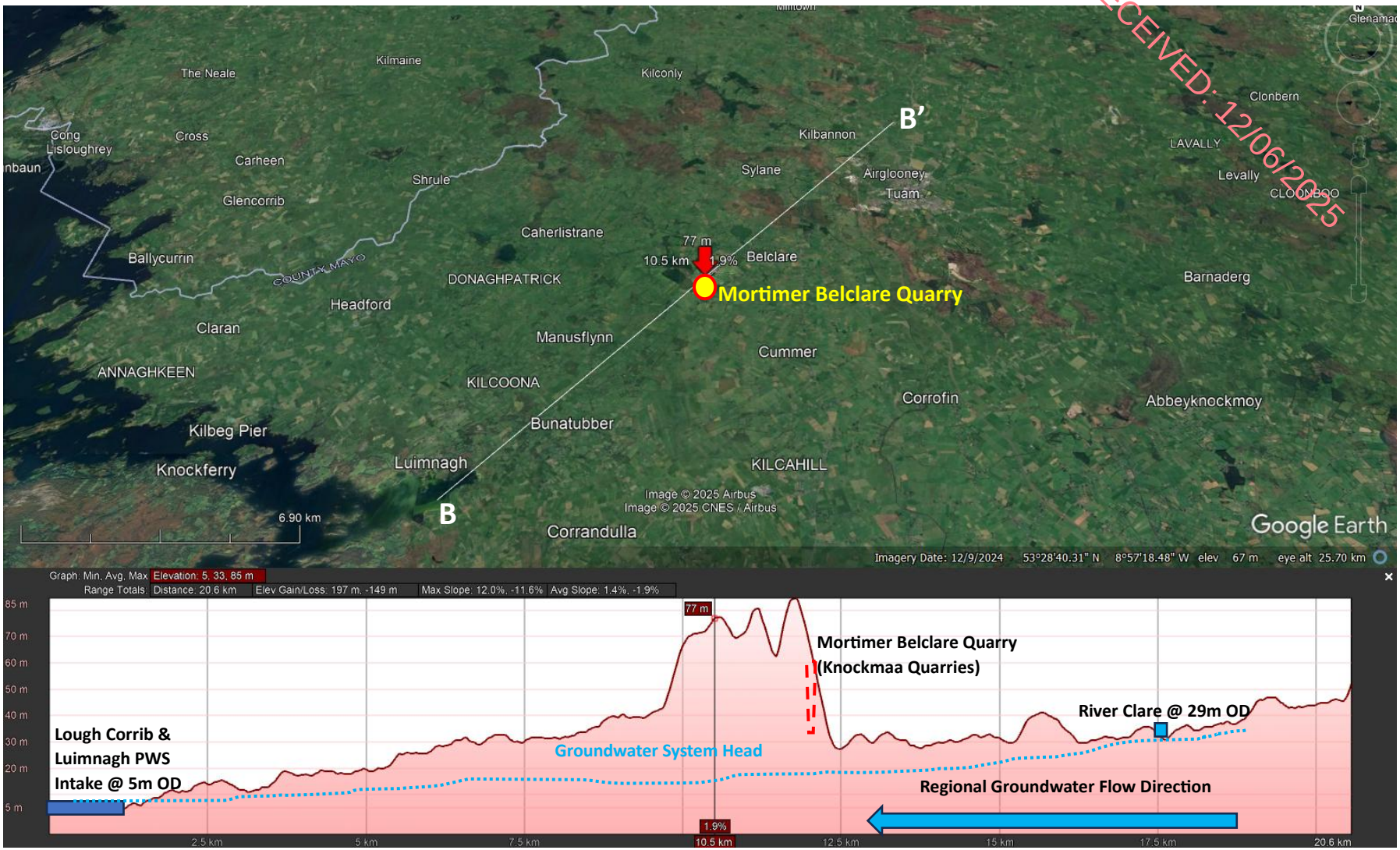

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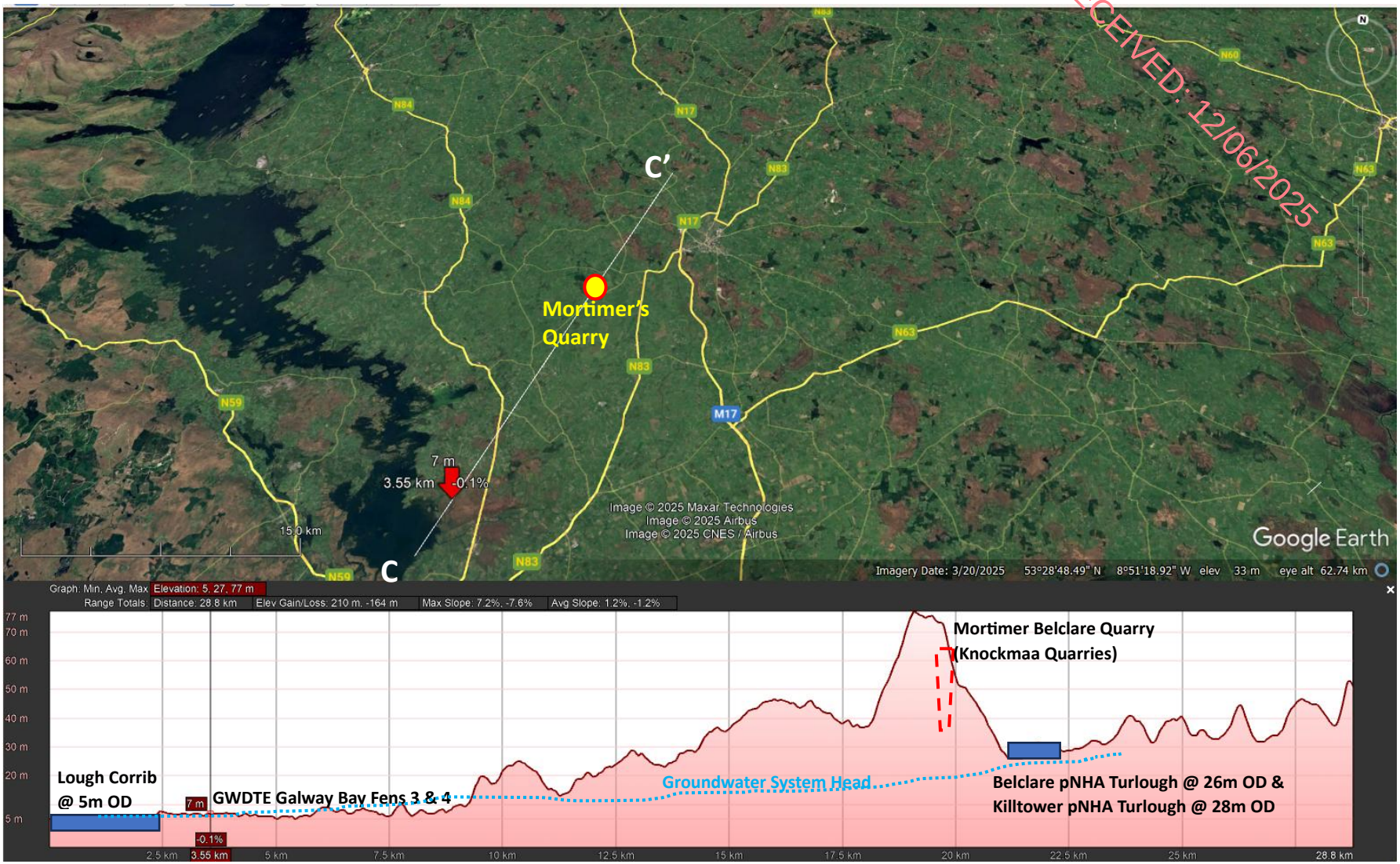

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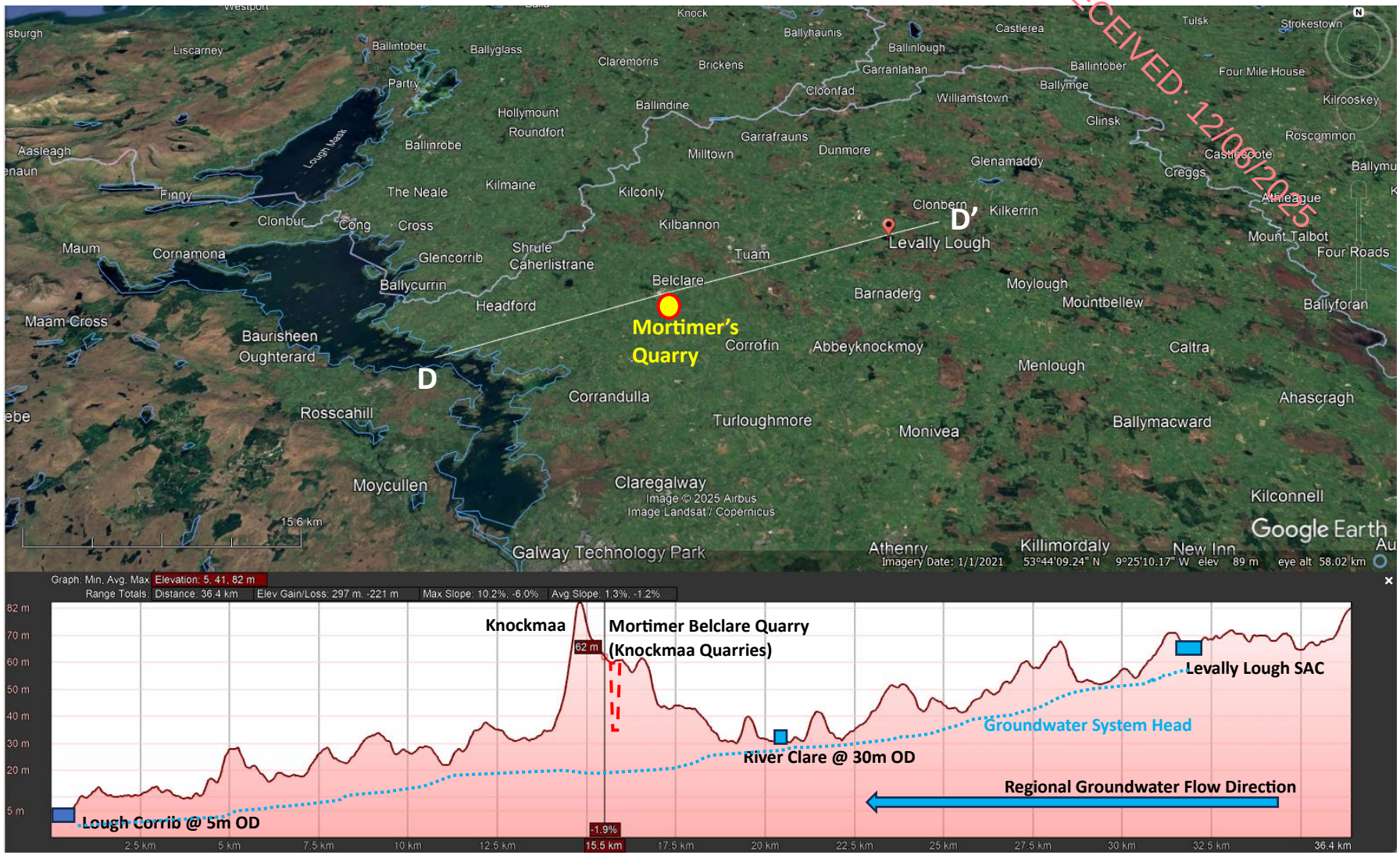

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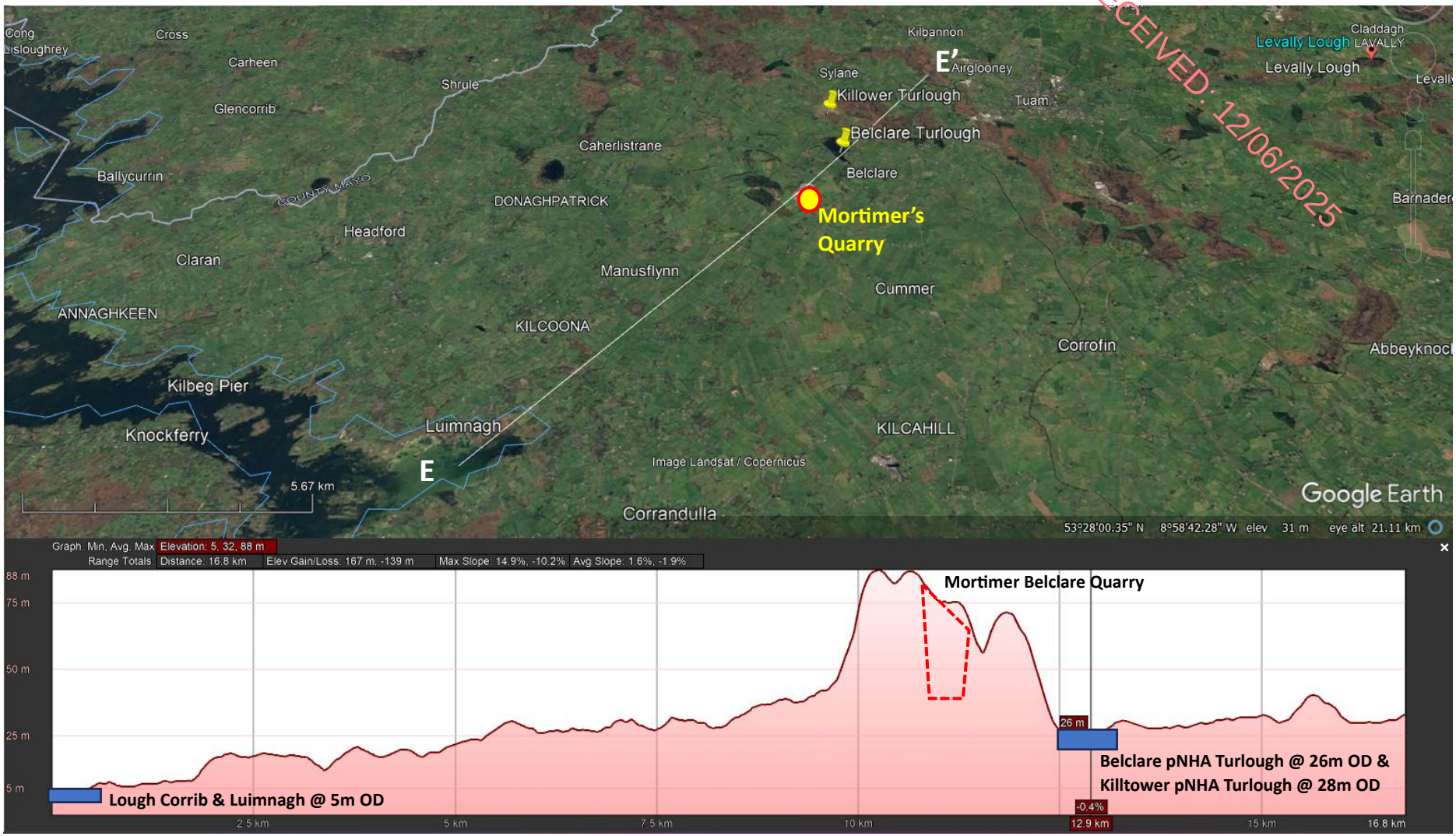

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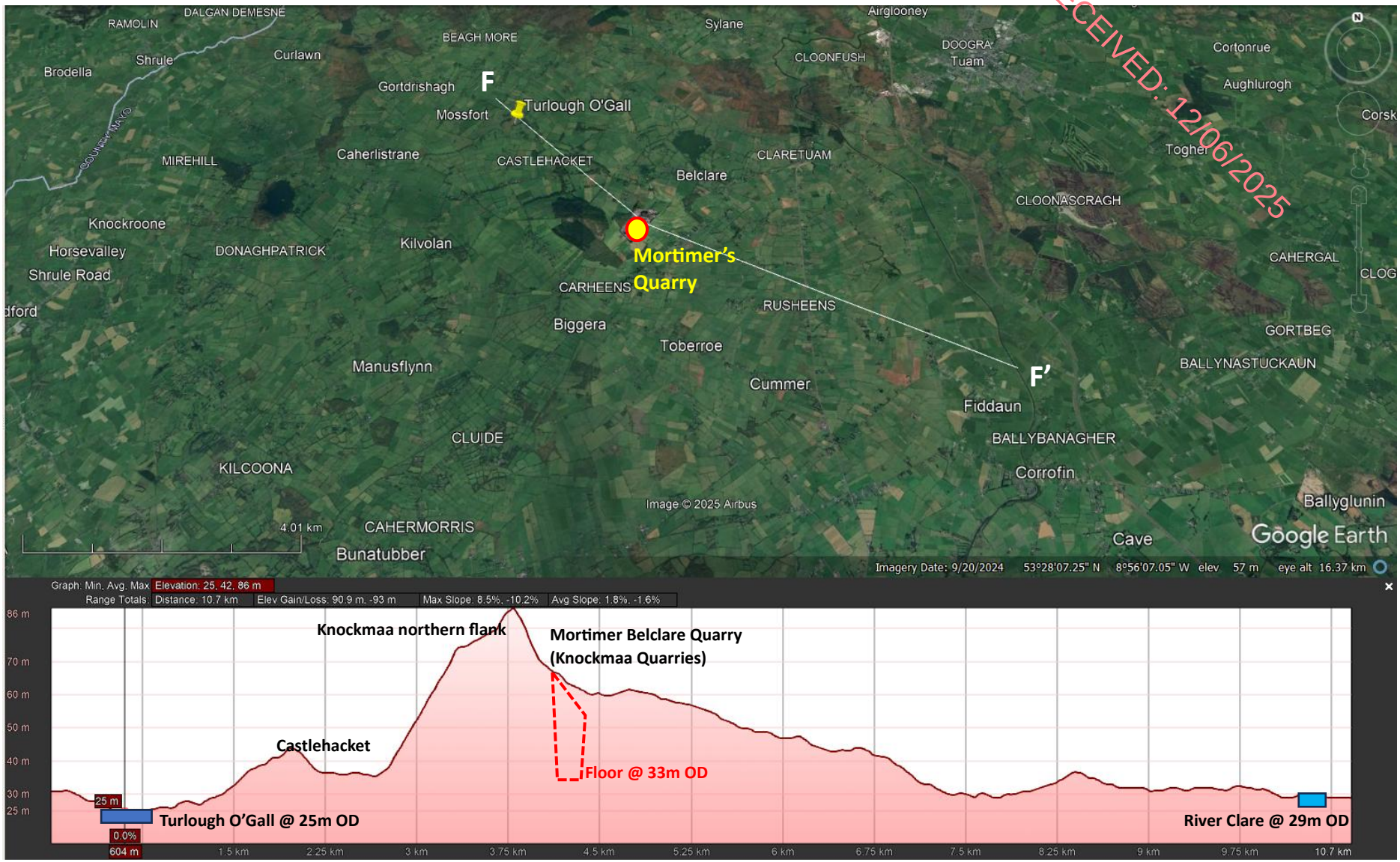

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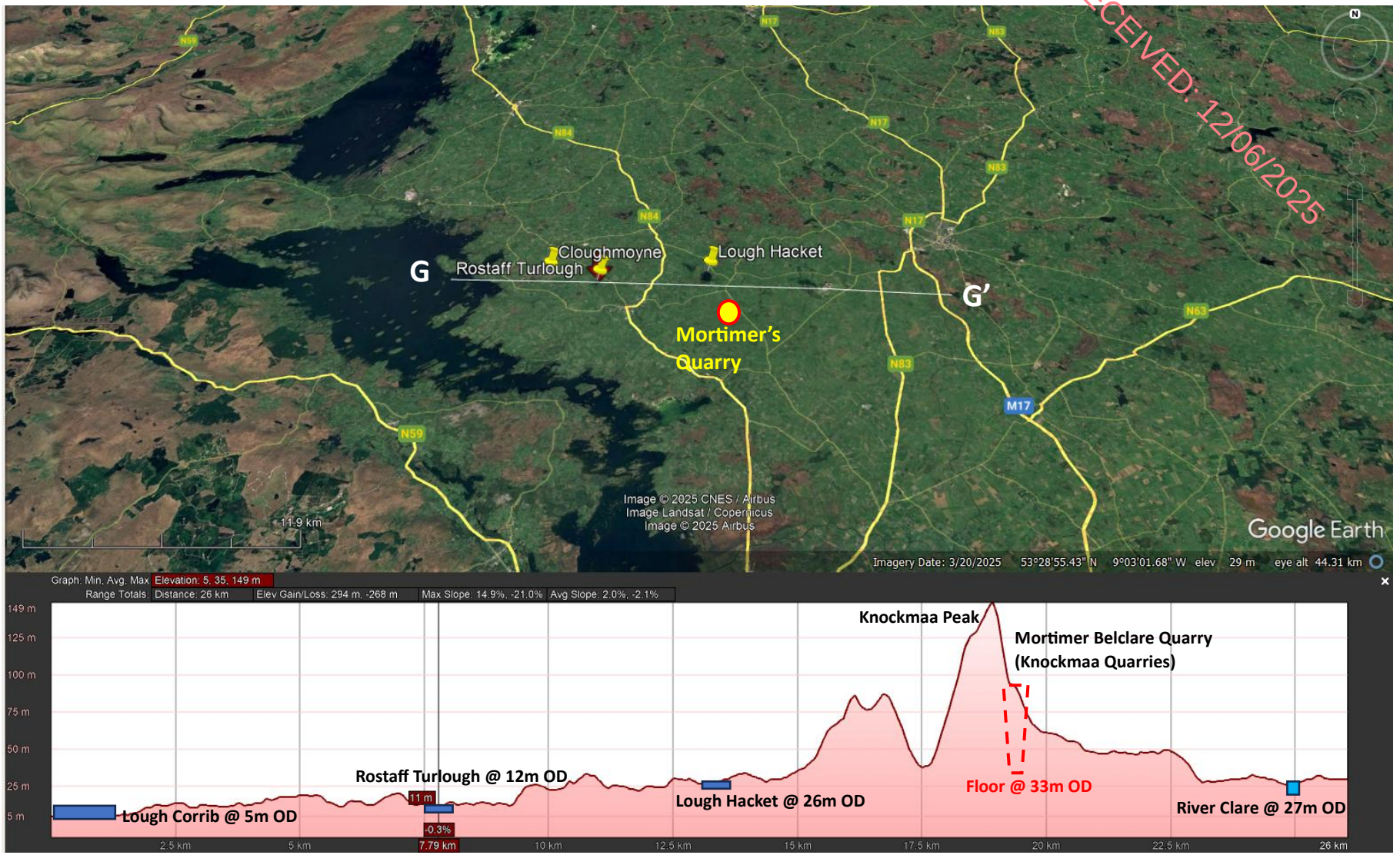

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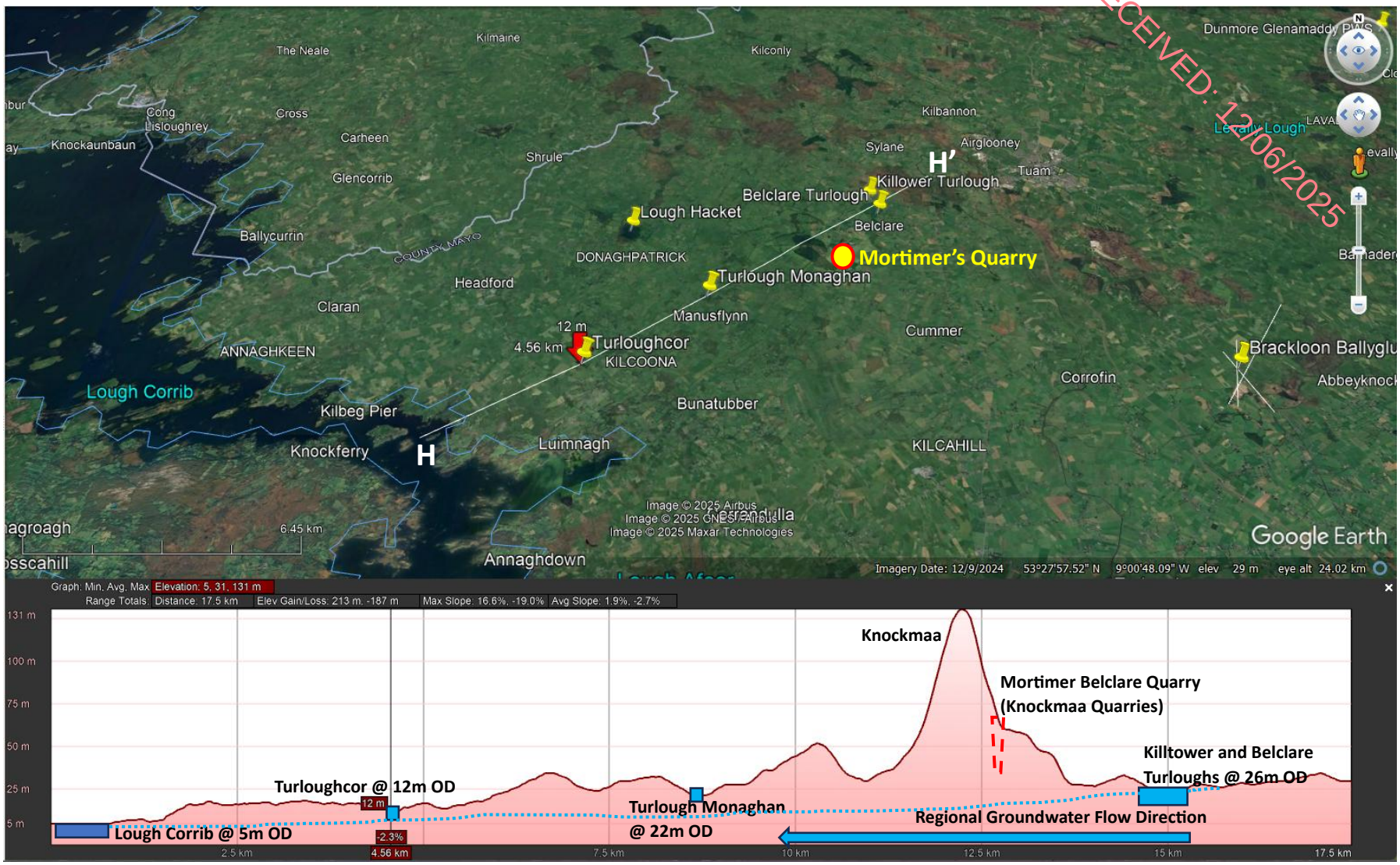

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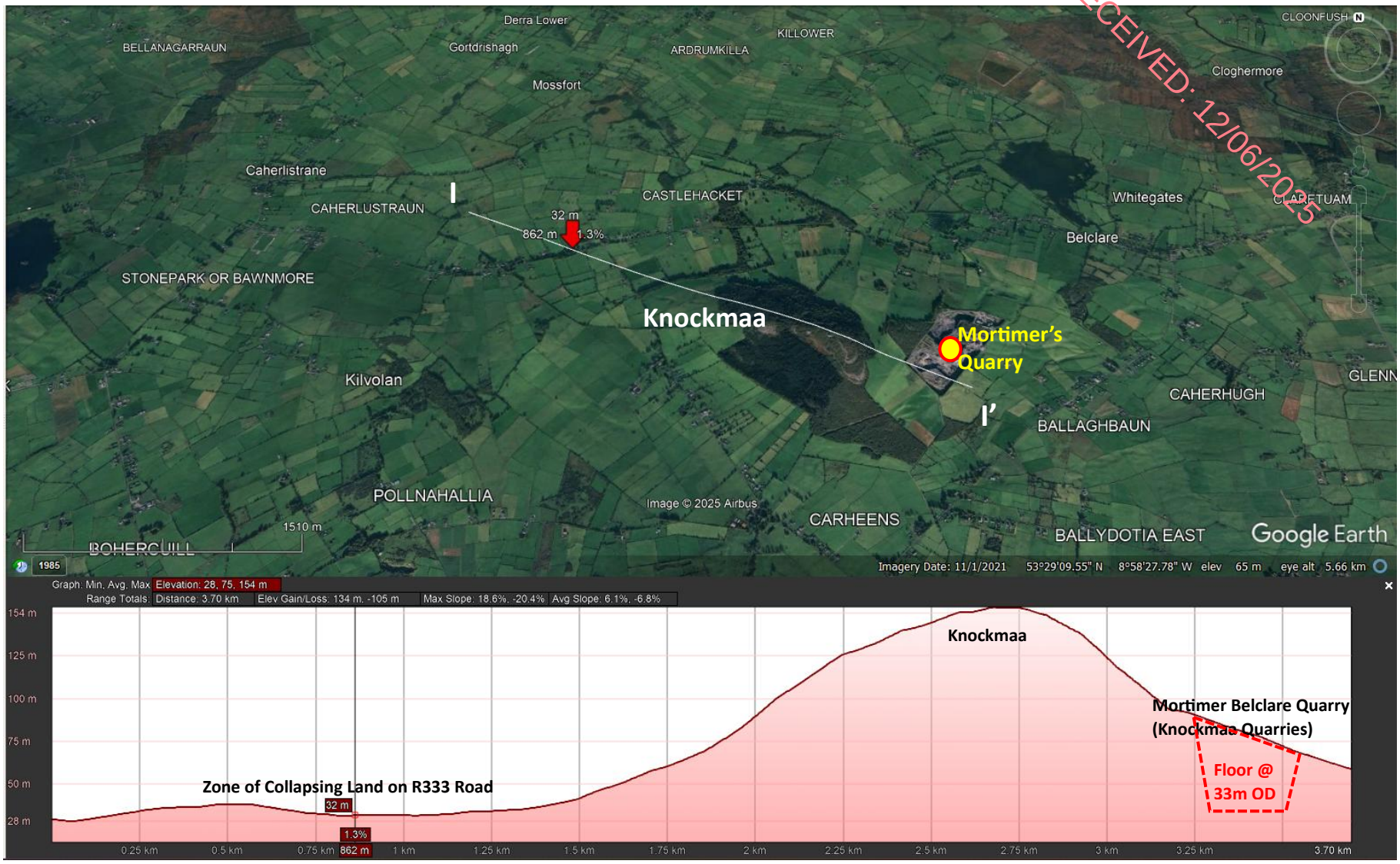

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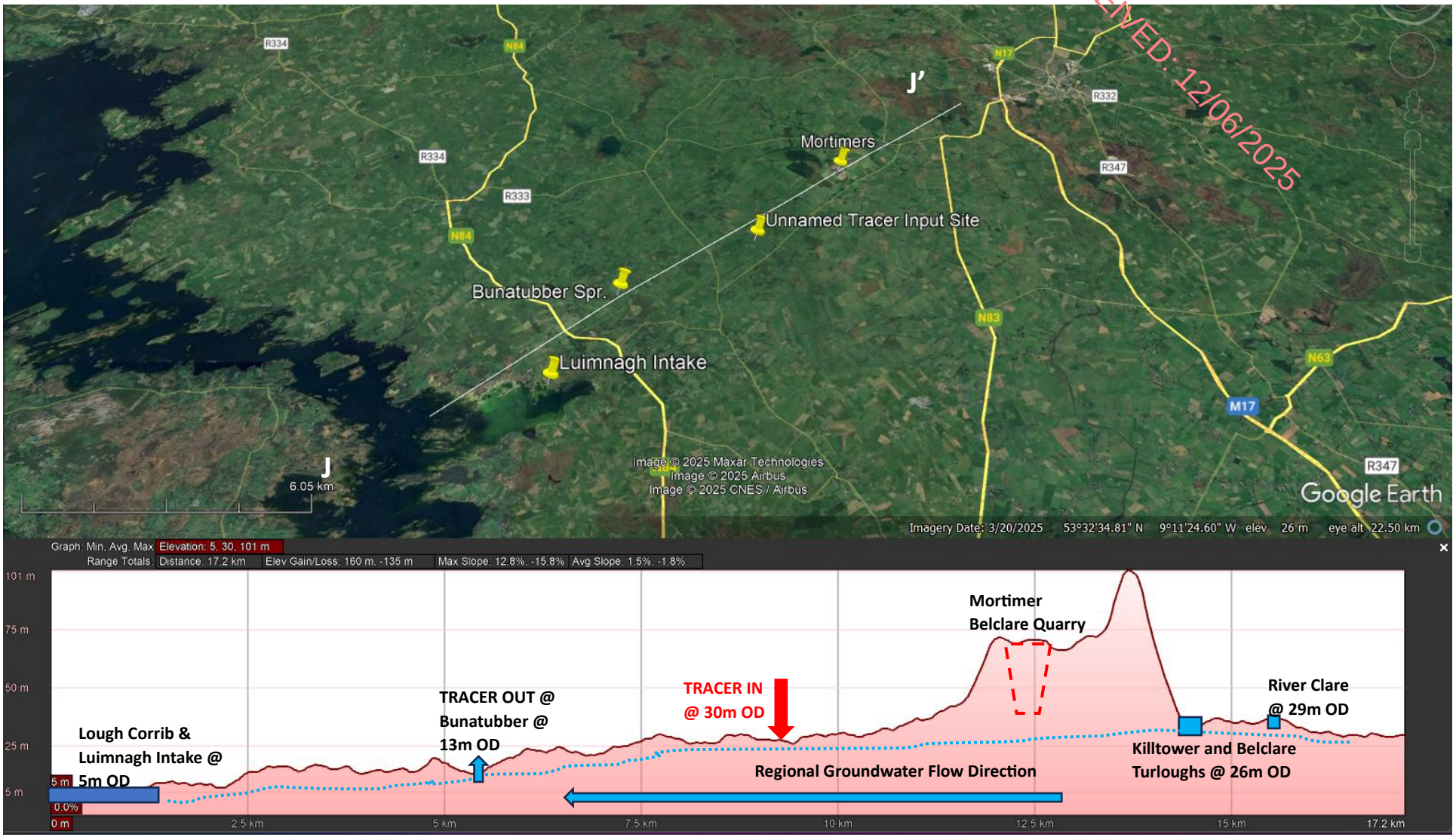

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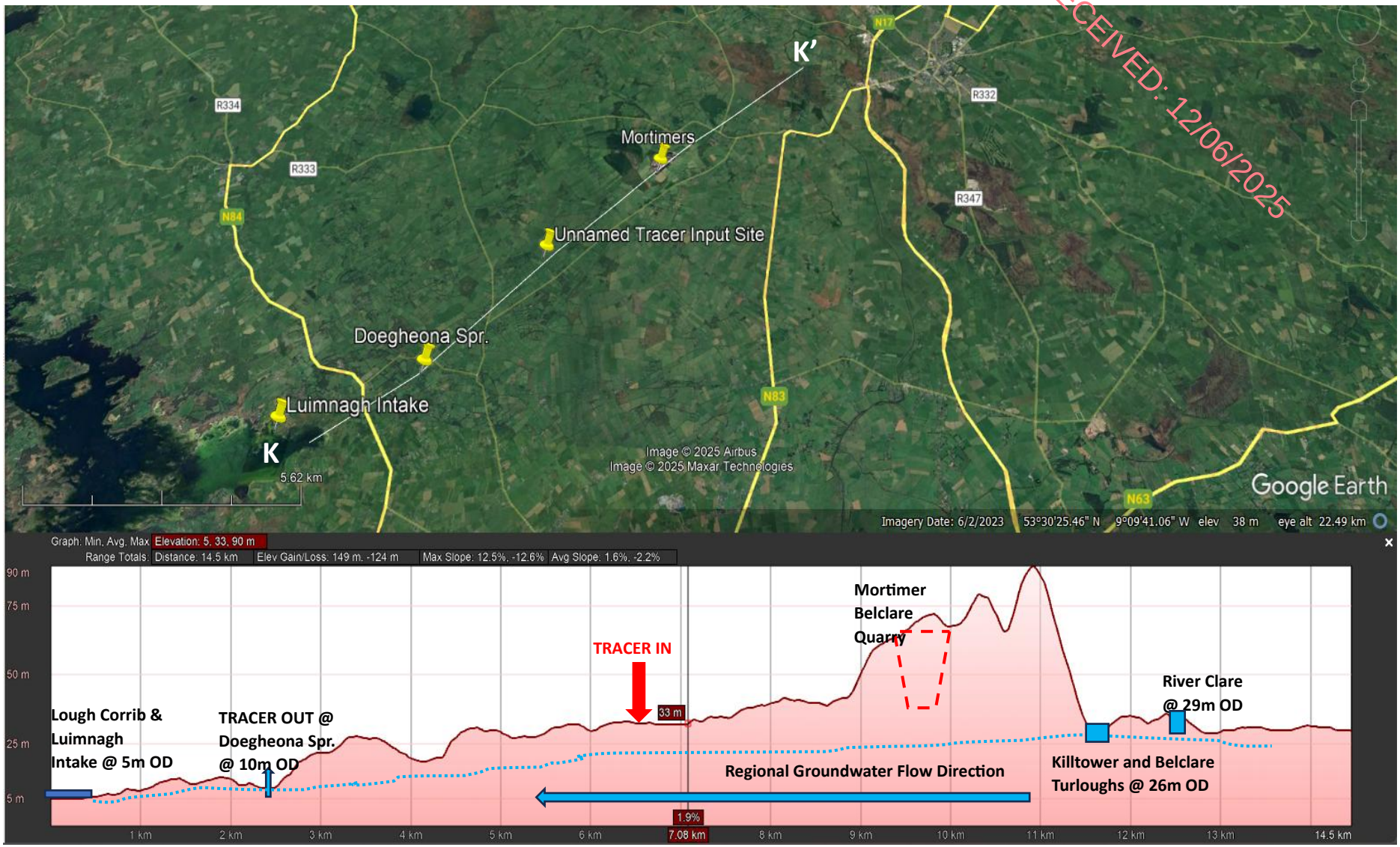

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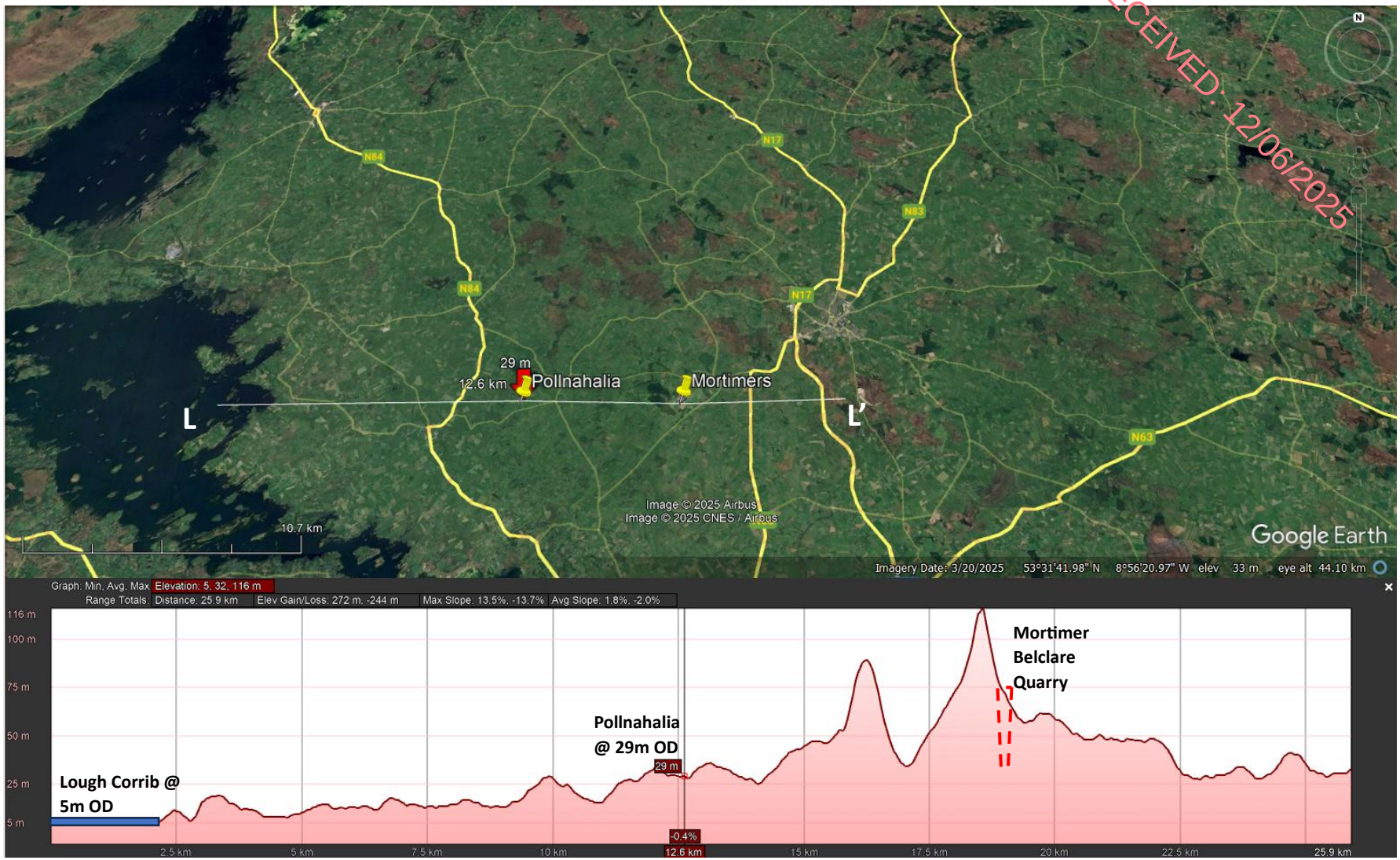

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List of Appendices