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**TIER 3 RISK ASSESSMENT  
HISTORIC LANDFILL AT CLAREMORRIS, CO. MAYO**

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Prepared for: Mayo County Council



**Date:** September 2020

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## TIER 3 RISK ASSESSMENT HISTORIC LANDFILL AT CLAREMORRIS, CO. MAYO

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**Abstract:** This report represents the findings of a Tier 3 risk assessment carried out at Claremorris Historic Landfill, Co. Mayo, conducted in accordance with the EPA Code of Practice for unregulated landfill sites.

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## EXECUTIVE SUMMARY

Fehily Timoney and Company (FT) was appointed by Mayo County Council (MCC) to complete a Tier 3 environmental risk assessment (ERA) of Claremorris Historic Landfill in accordance with the Environmental Protection Agency (EPA) Code of Practice (CoP) (2007): Environmental Risk Assessment for Unregulated Waste Disposal Sites.

The historic landfill occupies approximately 3.2 ha of a wider 9 ha site of open land located to the east of the Claremorris town centre. The site is currently vacant albeit with evidence of rough grazing by horses. Neighbouring adjacent land uses include grassland and, residential land located approximately 280 m west of the site. An electric substation is located approximately 150 m north of the site. The site is bounded by a railway to the North and by the Knock-Claremorris Bypass (N17) to the West, the other sides are bounded by agricultural land (boggy ground). There are no dwellings located within or immediately adjacent the site boundary, however a housing estate (approximately 280 m west) and Claremorris town centre (approximately 80m north-west) are located in the surroundings.

It is proposed that the site be developed to form part of a larger solar farm which incorporates both the field underlain by the historical landfill and an adjacent privately-owned field.

An initial risk assessment of the site was completed by MCC in 2010 which determined that the site had a moderate risk (Class B) to the environment, with the highest score assigned being 61% to leachate migration to the groundwater body via groundwater pathways.

A site investigation (S.I.) program was completed in 2011. The findings of the site investigation work suggest the waste material is deposited in a single infill area over an estimated plan area of 26,000 m<sup>2</sup>.

MCC initially estimated that approximately 168,000 tonnes were deposited at the site. A review of S.I. data suggests that this quantity may be approximately 191,100 tonnes.

Analysis of waste samples from the trial pits excavated, when assessed against the inert waste acceptance criteria, indicated that much of the waste material within the site is typically inert. The waste classification is considered to reflect the level of degradation over time since landfilling ceased. Trial pits confirmed the waste material is near the surface with a minimal topsoil and clay cover present across the site.

Landfill gas monitoring from perimeter well BH02 at the site indicates gas concentrations detected are below threshold levels set by the EPA CoP. However, gas concentrations measured in 2010 at BH01 located within the waste body yielded a methane concentration of 78%. Groundwater monitoring was conducted on BH01 and BH02. Surface water sampling was also undertaken.

Based on the results of this updated assessment, the site is still classified as a **Moderate Risk Classification (Class B)**. The principal risk identified on the site is the risk posed to the aquifer from migration of leachate from the waste material encountered at the site through groundwater.

The purpose of this Tier 3 assessment was to further examine and quantify those risks/impacts through generation of computer models allowing a prediction of both the current and future impacts on:

- Groundwater quality, and
- the current and future extent landfill gas being generated by the waste present on site.



This information was used to inform appropriate remedial and mitigation measures to be implemented on site to either eliminate or reduce these risks.

Estimation of leachate generation at the site indicates that the site may contribute a very small amount of groundwater recharge volume to the wider Clare/Corrib groundwater body, therefore it is not likely to have an impact regionally.

LandGEM was utilised to estimate the quantity of landfill gas produced by the waste underlying the site. The model suggests that the site is continuing to produce landfill gas and methane in moderate quantities, thereby requiring remedial actions to be implemented.

The Tier 3 assessment concluded an engineered landfill cap layer will be required across the site to mitigate the impacts of leachate generated on site on the underlying aquifer and receptors downgradient. The proposed landfill cap will be constructed in accordance with the EPA recommendations/requirements for landfill site design. An engineered cap will have a barrier layer which will isolate rainfall inputs and so reduce future leachate generation. This cap should also be designed to take into consideration the proposed future use of the site as a solar farm and will be required to support any proposed on-site solar farm infrastructure.

To monitor the efficacy of the proposed remediation measures, additional groundwater monitoring locations are proposed downstream of the site. Additional surface water monitoring locations are also proposed upstream and downstream of the waste body.

The landfill capping shall also include active or passive landfill gas controls. A final decision on landfill gas control measures will be made upon completion of a landfill gas pumping trial. The pumping trial shall be used to determine the quantity and quality of landfill gas actively produced at the site. The most appropriate landfill gas control measures should be determined with reference to EPA Guidance: Management of Low Levels of Landfill Gas and EPA Landfill Manuals, Landfill Site Design.

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## 1. INTRODUCTION

### 1.1 Background

The Claremorris waste footprint (3.2 ha.) is located within a larger body of open land (approximately 9 ha.) located approximately 1 km south-east from the centre of Claremorris town. Claremorris is approximately 24 km south-east of Castlebar. The landfill site is located in the townland of Clare and situated in agricultural land. The site is, bounded by a railway to the north and by the Knock-Claremorris Bypass (N17) to the West. The south and east boundaries comprise (boggy) agricultural lands. Access to the site was difficult due to overgrown brambles, gorse, trees and alien species.

The exact waste footprint area was unconfirmed. The site operated as a regional landfill accepting municipal waste from 1982 to March 1996. The site is currently under private ownership. The site was capped with boulder clay, but no remediation works have been completed. It has been reported that on occasion fires broke out on the site.

MCC is required to complete a tiered risk assessment of unregulated waste disposal sites in accordance with the Environmental Protection Agency (EPA) code of practice for unregulated waste disposal sites.

A Tier 2 Environmental Risk Assessment was conducted in 2010 and the report can be found in Appendix 1. A site investigation was carried out and the report containing the findings can be found in Appendix 2. MCC's 2010 assessment determined that the site had a moderate risk to the environment, which the highest normalised score assigned being 61.25%.

### 1.2 Scope of Works

FT's scope of work was to undertake a Tier 3 risk assessment of the site in accordance with the EPA Code of Practice (CoP) 2007: *Environmental Risk Assessment for Unregulated Waste Disposal Sites*. FT undertook the following:

- Desk study.
- Site walkover.
- Environmental risk assessment (ERA).
- Development of a conceptual site model (CSM).

The Tier 3 risk assessment was undertaken in tandem with a proposed Part 8 planning application to develop the site and surrounding area into a solar farm. The proposed application accelerated the need to regularise the site by MCC.

As part of the initial desk study, a review of available information including the previous site investigation and assessment was undertaken. This was followed-up with a site walkover by FT personnel. The desk study and site walkover were used to provide an updated view of the condition of the site and as a preliminary step in determining appropriate remediation measures.

The site walkover checklist, accompanying photo log and site walkover notes are included in Appendix 3 to this report.



The information gathered from the desk study and previous intrusive site investigation were used to inform the development of the conceptual site model (CSM) and the Environmental Risk Assessment (ERA). This report presents the findings of the assessment.

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## 2. DESK STUDY

### 2.1 Introduction

The desk study included the review of the following literature sources and websites:

- Geological Survey of Ireland, Groundwater Web Mapping: [www.gsi.ie](http://www.gsi.ie).
- Environmental Protection Agency Maps: <http://gis.epa.ie/Envision>.
- National Parks and Wildlife Service Map Viewer: [www.npws.ie](http://www.npws.ie).
- DoHPLG/EPA/Local Authority maps: [www.catchments.ie](http://www.catchments.ie).
- Mayo County Council Site Plans and Drawings.
- BS 5930: 1999, Code of Practice for Site Investigations.
- BS 10175: 2000, Investigation of Potentially Contaminated Sites – Code of Practice.
- EPA's Historic Mine Sites - Inventory and Risk Classification (2009).
- EPA - Assessing and Developing Natural Background Levels for Chemical Parameters in Irish Groundwater (2017).

A desktop review of available documentation for the site was conducted followed by a site walkover on 16<sup>th</sup> January 2020.

### 2.2 Desk Study

This section of the report presents the findings of the desk study.

#### 2.2.1 Site Description and On-Site Conditions

The Historic landfill is approximately 3.2 ha in size, of open land located to the east of Claremorris town and centre. The site is currently vacant with evidence of rough grazing by horses. Neighbouring land uses include grassland and a housing estate (c. 280 m west). An electric substation is located c. 150m north of the site. The site is bounded by a railway to the North and by the Knock-Claremorris Bypass (N17) to the West, the other sides are bounded by (boggy) agricultural land. There are no dwellings located within or immediately adjacent the site boundary. Claremorris city centre (c. 800m north-west) is located in the surroundings.

The Corine 2018 land use classification for the site is mostly inland wetlands (peat bogs).

The location of the site is shown in Figure 2-1.



### 2.2.2 Previous Studies

A Tier 2 Environmental Risk Assessment was conducted in 2010 and can be found in Appendix 1. A site investigation was carried out and the report containing the findings is found in Appendix 2.

The Tier 2 assessment comprised the following:

- Desk study.
- Development of a conceptual site model (CSM).
- Site investigation works.
- Sample collection.
- Identification of contaminant sources, pathways of contaminant migration and potential receptors which may be vulnerable if exposed to those contaminants; i.e. the identification of Source- Pathway-Receptor (SPR) linkages.
- The prioritisation of sites and SPR linkages based on their perceived risk.

Based on the available information, the Tier 2 Assessment determined that the overall risk score for Claremorris Landfill was 61.25%, resulting in a risk classification of **Moderate (Class B)**.

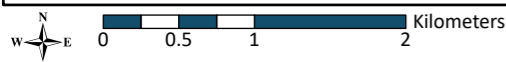
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Site Boundary

<b>TITLE:</b>	
Site Location	
<b>PROJECT:</b>	
Claremorris Tier 3 and Remediation Plan	
<b>FIGURE NO:</b>	
2.1	
<b>CLIENT:</b>	
Mayo County Council	
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### 2.2.3 Topography

The surrounding site is relatively flat. The waste deposition area is raised with respect to the surrounding topography. The site is readily accessed via an artificial steep incline/embankment from N17 road to the west of the site. The site generally falls from south to north towards the railway and west to east towards the bogland and stream.

Regionally, Claremorris town is located within an extensive flat area along the south-east of County Mayo, with land slightly sloping upwards to the north-east of the town.

### 2.2.4 Geology

#### *Drift/Quaternary Geology*

The quaternary Map provided by GSI Online identifies most quaternary sediments at the site as 'Cut over raised peat' and a north-west portion as 'Gravels derived from Limestones'; 'Till derived from limestones' is found in the surroundings. Quaternary sediments are shown in Figure 2-2.

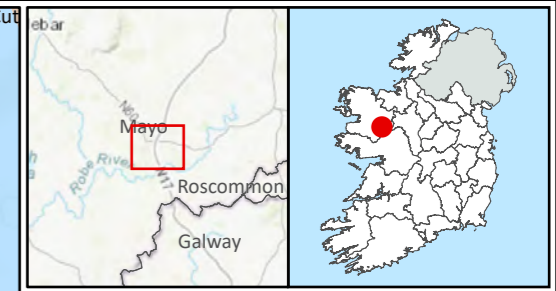
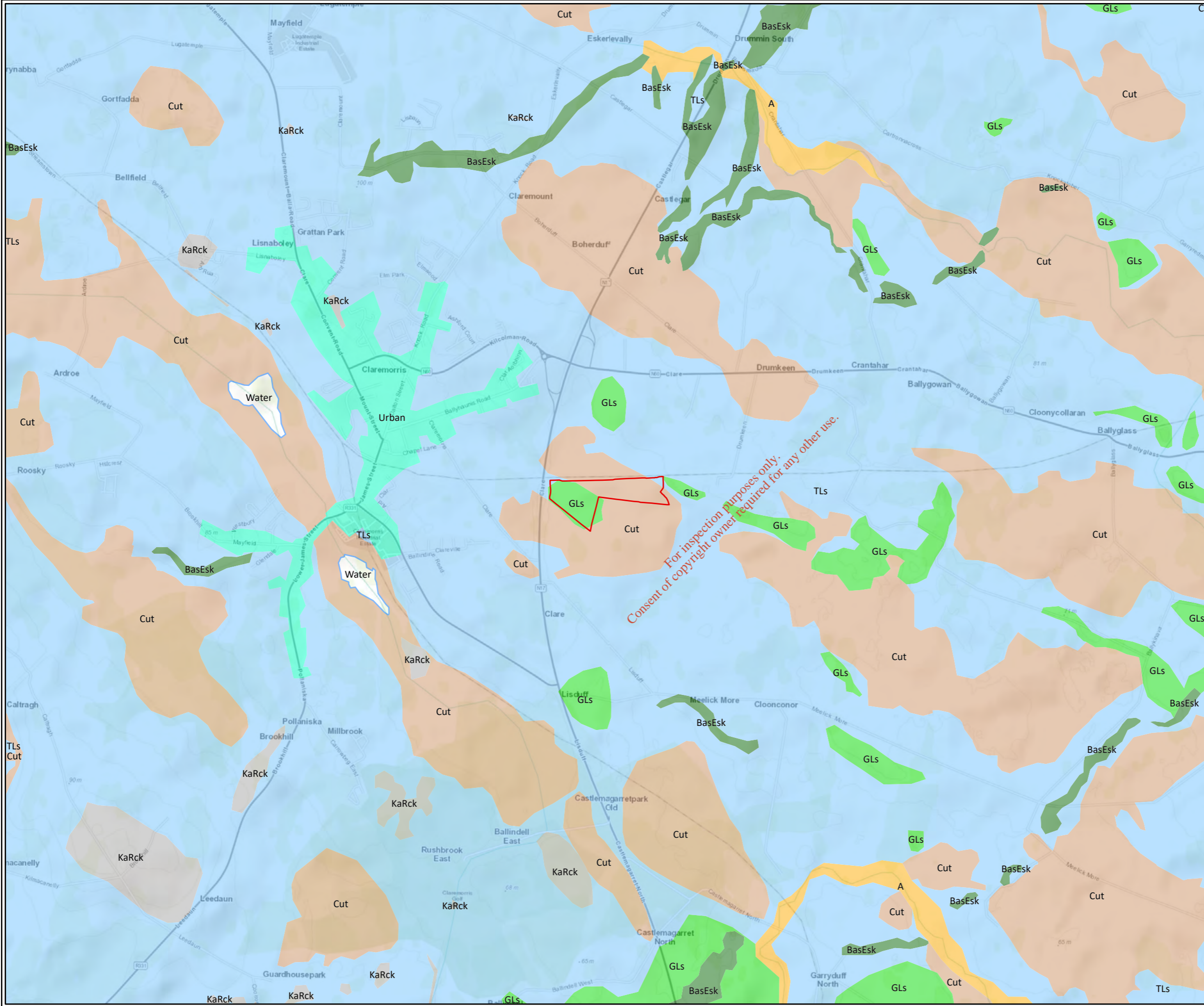
During the installation of boreholes during the site investigation, the presence of natural-black brown peat till is described in the driller's logs to depths of approximately 5.90 m and 4.0 m BGL at boreholes BH01 and BH02, respectively (See Appendix 2).

#### *Solid or Bedrock Geology*

The GSI online 1:100,000 scale bedrock geology map, shows the bedrock beneath to be found on a single formation. The entirety of the site and surrounding area are underlain by the Ballymore Limestone Formation (CDBLYM) which is generally made up of dark fine-grained limestone and shale. No areas of bedrock outcrop are shown within or in the immediate vicinity of the site.

The bedrock geology is presented in Figure 2-3.

No bedrock encountered during the installation of boreholes BH01 and BH02, as referenced in the JS Drilling borehole logs (Appendix 2).



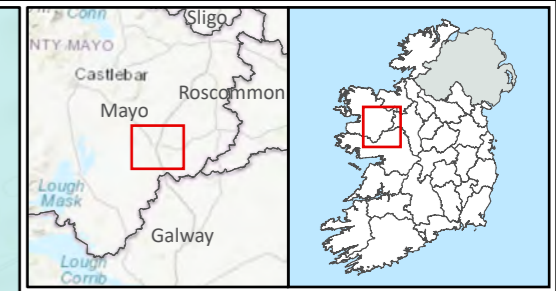
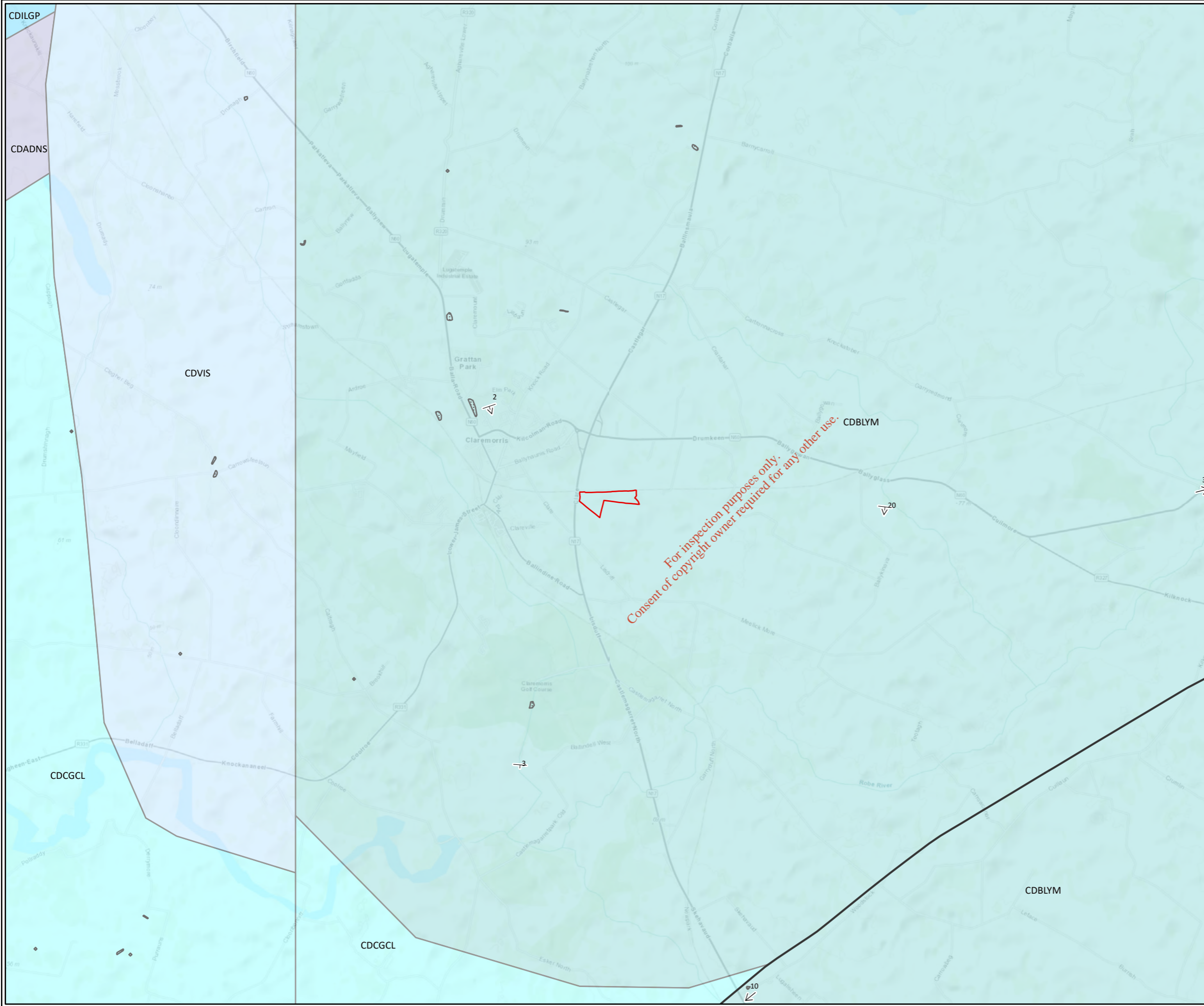
- Site Boundary
- Quaternary Sediments**
- A, Alluvium
- BasEsk, Eskers comprised of gravels of basic reaction
- Cut, Cut over raised peat
- GLs, Gravels derived from Limestones
- KaRck, Karstified bedrock outcrop or subcrop
- TLs, Till derived from limestones
- Urban
- Water

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<b>TITLE:</b>	Quaternary Geology	
<b>PROJECT:</b>	Claremorris Tier 3 and Remediation Plan	
<b>FIGURE NO:</b>	2.2	
<b>CLIENT:</b>	Mayo County Council	
<b>SCALE:</b>	1:20,000	<b>REVISION:</b> 0
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- Site Boundary
- Dip of bedding or main folia on, old GSI data
- Strike and dip of bedding, right way up
- Strike and dip of bedding, way up unknown
- Fault
- Bedrock Outcrop
- Bedrock Geology**
- Ardnasillagh Formation
- Ballymore Limestone Formation
- Cong Canal Formation
- Illaunagappul Formation
- Visean Limestones (undifferentiated)

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<b>TITLE:</b>	
Bedrock Geology	
<b>PROJECT:</b>	
Claremorris Tier 3 and Remediation Plan	
<b>FIGURE NO:</b> 2.3	
<b>CLIENT:</b> Mayo County Council	
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### 2.2.5 Hydrogeology

An examination of the national bedrock aquifer map on the GSI online mapping classifies the underlying bedrock aquifer as 'Regionally Important Aquifer - Karstified (conduit)'. The bedrock aquifer mapping is presented in Figure 2-4.

GSI mapping indicates the presence of karst aquifer located within the site.

Historical mapping for the area shows few springs in the surrounding area. There are several standalone dwellings and clusters of residential units in relative proximity to the site and wider environment where unregistered private wells may be present.

Table 2-1 presents the details of the GSI registered boreholes and springs within 1km of the site. It is noted that all wells listed below have location accuracies of 1 – 2km and may be located outside of the 1km radius.

**Table 2-1: Borehole and Spring Descriptions near the Project Site**

BH/Spring	Yield class	Yield (m <sup>3</sup> /day)	Use	Depth (m)	Depth to Rock confidence (m)	Distance from site (km)	Date
1127SEW004	-	-	Group Scheme	-	-	0.53	1899

The GSI mapping showing approximately locations of known wells and springs is included in Figure 2-5.

There are no Groundwater Drinking Water Protection Areas within the site boundaries according to GSI. The closest, Loughanemon Barnacarroll GWS, is located approximately 3.2km North from the site. Approximately 4.7 km from the site, also North, Kilcolman Facefield GWS is located. Irishtown GWS can be found c. 5.8km South-East.

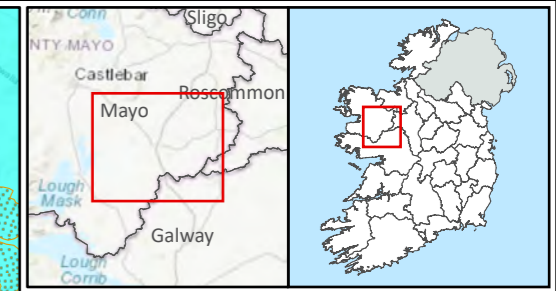
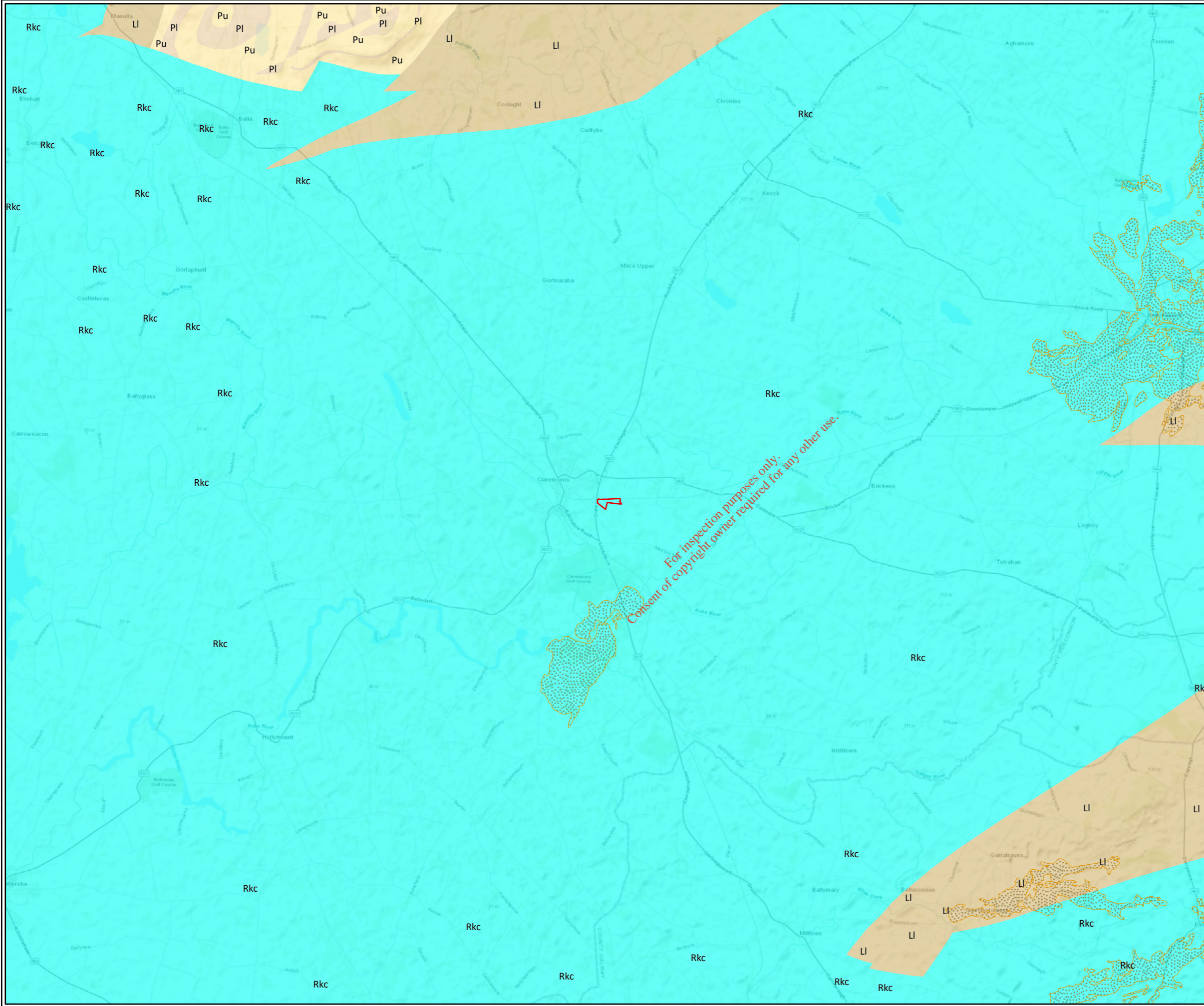
The GSI shows that the groundwater body (GWB) underlying the site is the Cong-Robe GWB and it is a Karstic aquifer. The most recent (2013-2018) Water Framework Directive quality status for the GWB is 'Good'. The WFD risk to groundwater quality was most recently classified as 'Review'.

The closest groundwater dependant ecosystem in the area, according to Catchments Maps, is the Clare-Corrib Groundwater in SAC Habitats (Code: IE\_WE\_G\_0020), located c.4.9km South-East of the site at its closest point.

The GSI mapping shows three different groundwater recharge area rates for the site, the primary two areas are:

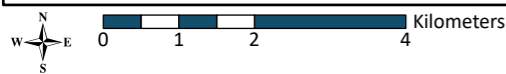
- a. *Low: A pre-cap recharge rate of 33mm/yr for the site was calculated applying a recharge co-efficient of 4.0% to an effective rainfall rate of 832 mm/yr. GSI define the hydrogeological setting as Basin Peat. Found in most of the site.*
- b. *High: A pre-cap recharge rate of 707mm/yr for the site was calculated applying a recharge co-efficient of 85.0% to an effective rainfall rate of 832 mm/yr. GSI define the hydrogeological setting as High Permeable Subsoil, Sand and Gravels overlain by Well-drained Soil. Found in the North-West portion of the site.*



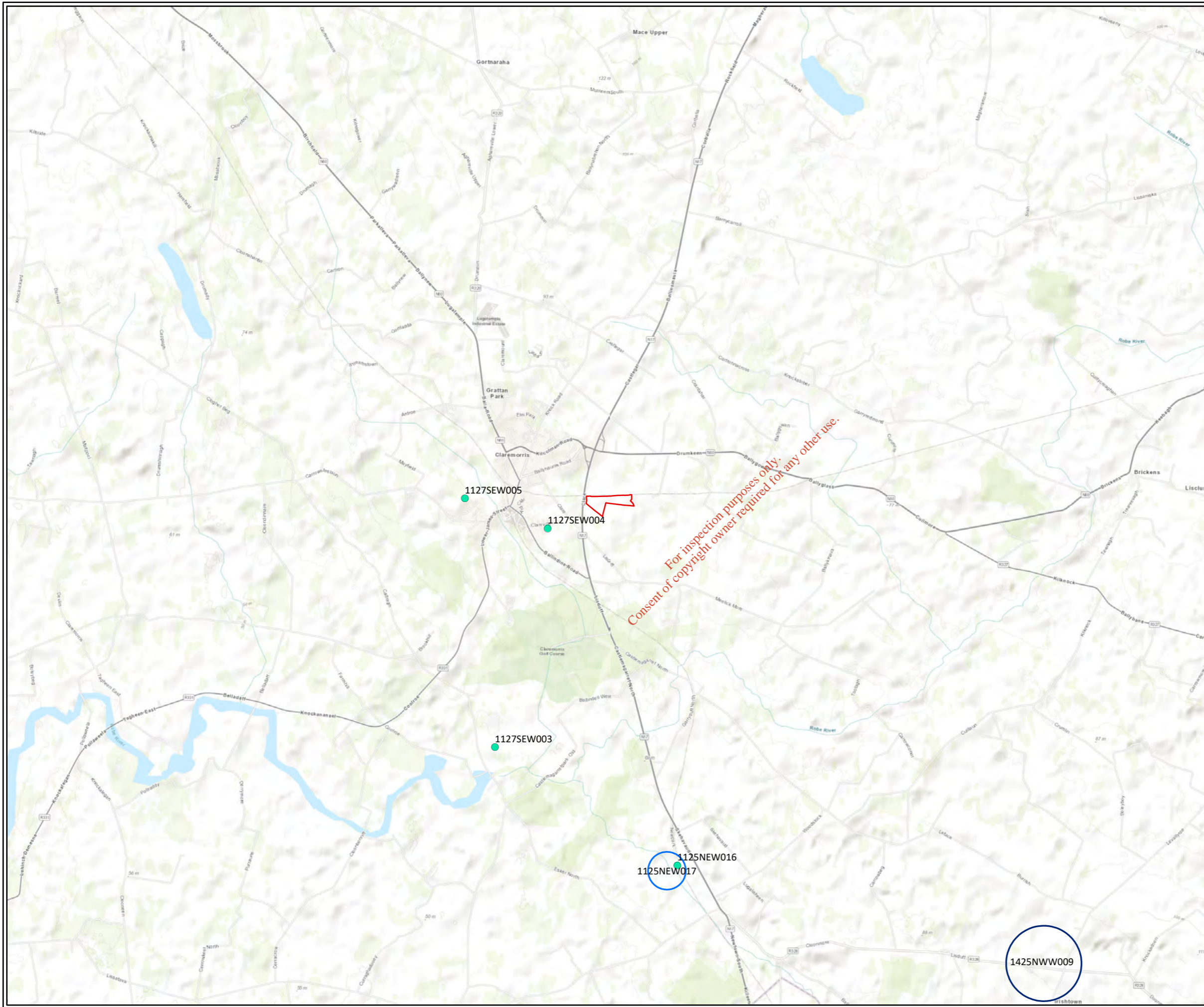


- Site Boundary
- Sand and Gravel Aquifers**
- Locally important gravel aquifer
- Bedrock Aquifers**
- LI: Locally Important Aquifer - Bedrock Mod  
Productive Locally
- PI: Poor Aquifer Bedrock Generally  
Unproductive except Locally
- Pu: Poor Aquifer Bedrock Generally  
Unproductive
- Rkc: Regionally Important Aquifer -  
Karsted (conduit)

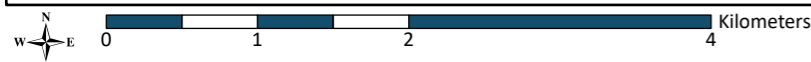
<b>TITLE:</b>	Aquifer Classification	
<b>PROJECT:</b>	Claremorris Tier 3 and Remediation Plan	
<b>FIGURE NO.:</b>	2.4	
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- Site Boundary
- Wells and Springs (10-50m Accuracy)
- Wells and Springs (200-500m Accuracy)
- Wells and Springs (500m-1km Accuracy)



<b>TITLE:</b>	Wells and Springs
<b>PROJECT:</b>	Claremorris Tier 3 and Remediation Plan
<b>FIGURE NO:</b>	2.5
<b>CLIENT:</b>	Mayo County Council
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<span style="font-weight: bold; font-size: 1.2em; vertical-align: middle;">FEHILY TIMONEY</span> <span style="font-size: 0.8em; vertical-align: middle; margin-left: 10px;">Cork   Dublin   Carlow www.fehilytimoney.ie</span>	



## 2.2.6 Groundwater Vulnerability

Groundwater vulnerability, as defined by the GSI, is the term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities.

The factors used in assessing groundwater vulnerability include subsoil type and thickness and recharge type as indicated in Table 2-2. The GSI procedure whereby groundwater protection is assessed is outlined in the EPA-GSI publication Groundwater Protection Schemes (DELG/EPA/GSI, 1999).

The GSI Online mapping data set identifies the vulnerability of groundwater to contamination is classified as H (High) to the Western portion of the site, M (Moderate) in the most North-East portion and in the centre portion it is classified as L (Low) Vulnerability. The Groundwater Vulnerability mapping is presented in Figure 2-6.

**Table 2-2: GSI Guidelines – Aquifer Vulnerability Mapping**

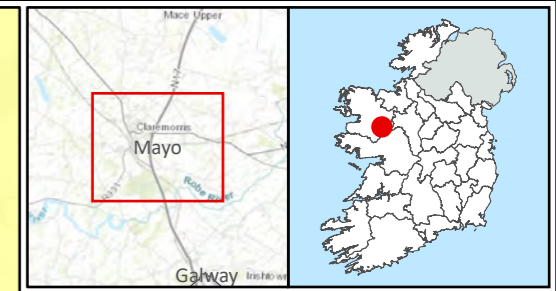
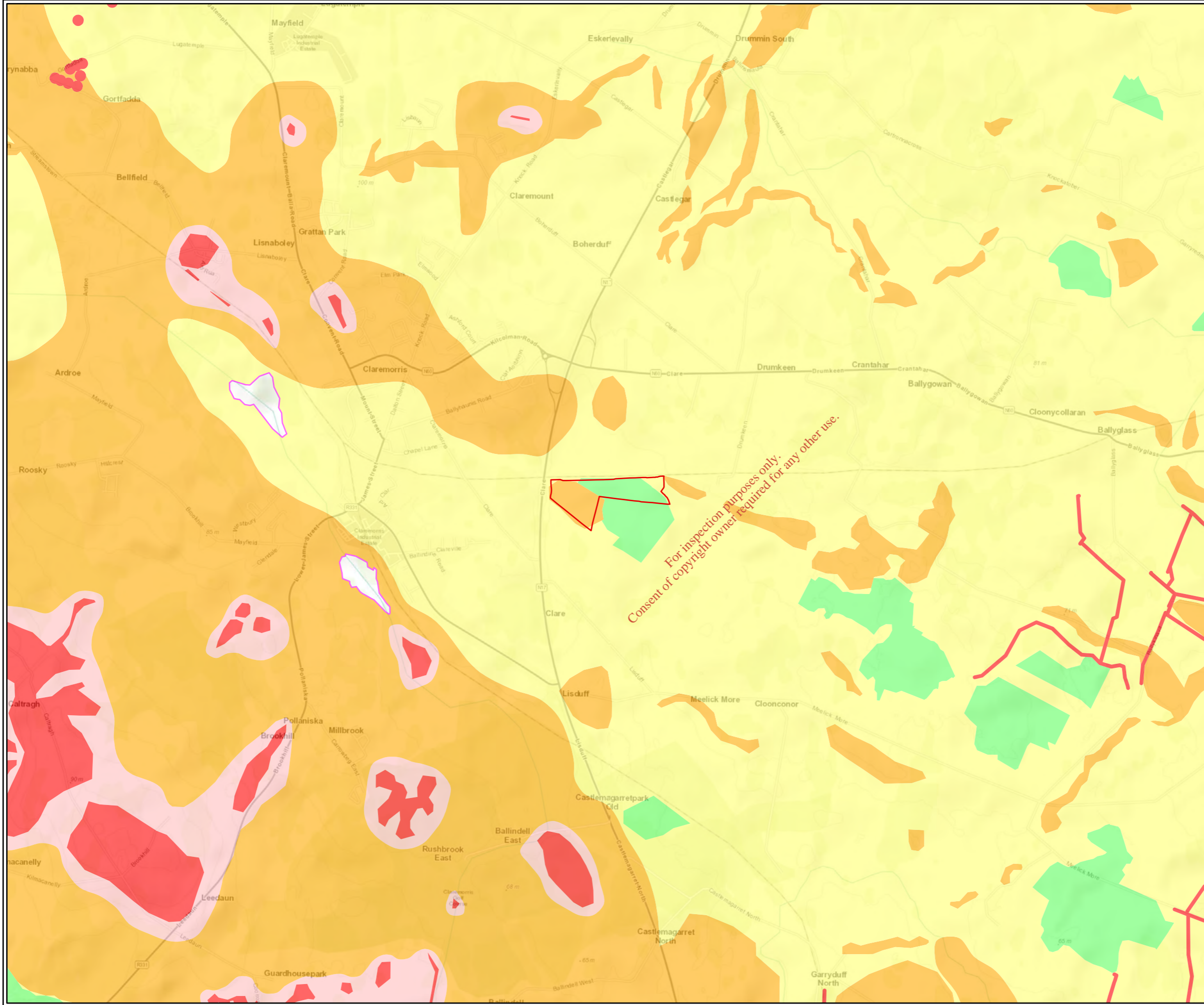
Vulnerability Rating	Hydrogeological Conditions		
	<i>Subsoil Permeability (Type) and Thickness</i>		
	High Permeability (Shallow Bedrock)	Moderate Permeability (e.g. Sandy soil)	Low Permeability (e.g. Clayey subsoil, clay, peat)
Extreme (E)	0 - 3.0 m	0 - 3.0 m	0 - 3.0 m
High (H)	>3.0 m	3.0 -10.0 m	3.0 - 5.0 m
Moderate (M)	N/A	>10.0 m	5.0 - 10.0 m
Low (L)	N/A	N/A	>10 m

Notes:

N/A = Not Applicable

Precise permeability values cannot be given at present





**Site Boundary**

**Groundwater Vulnerability**

- E - Extreme
- H - High
- M - Moderate
- L - Low
- Water
- X - Rock Near Surface or Karst



<b>TITLE:</b>	Groundwater Vulnerability	
<b>PROJECT:</b>	Claremorris Tier 3 and Remediation Plan	
<b>FIGURE NO:</b>	2.6	
<b>CLIENT:</b>	Mayo County Council	
<b>SCALE:</b>	1:20,000	<b>REVISION:</b> 0
<b>DATE:</b>	13/01/2020	<b>PAGE SIZE:</b> A3

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### 2.2.7 Hydrology

According to catchment maps, the site is located within the Corrib catchment (Hydrometric Area 30), at Sub catchment Robe\_SC\_010 (Code: 30\_9) and Robe\_020 Sub-basin. The nearest surface water feature to the site is the Robe\_020 (also known as Kilbeg-Malone) river (Status: Good) which crosses the site to the North-East corner and flows in a south-westerly direction eventually meeting the Robe\_030 river (Status: Moderate) c. 3.6km downstream of the site.

The Robe\_030 river flows in a south-westerly direction eventually meeting the Robe\_060 river (Status: Good). Robe\_060 discharges to Cong Canal\_010 (Status: Good), which flows to three different lakes and to Corrib\_010 River (Status: Unassigned). Corrib\_010 River discharges to Corrib Estuary (Status: Good) and, lastly, to Inner Galway Bay North (Status: Good) in the South, c. 52km from the site.

### 2.2.8 Ecology

The site is not within or directly adjacent to any Natural Heritage Area (NHA), proposed NHA (pNHA), Special Area of Conservation (SAC) or Special Protection Area (SPA). The nearest protected site is the Carrowkeel Turlough SAC and pNHA (Site Code: 000475) and it is located c.6.8km south-west of the site at its closest point.

There does not appear to be any direct pathway or linkage between the site and this protected area.

There is a Special Area of Conservation, River Moy SAC (Site Code: 002298), located 7.57km north at its closest point from the site.

Another protected site in relative proximity to the site is Lough Corrib SAC (Site Code: 000297), located around c.9.6km on the south-east of the site.

There are no other protected sites in the vicinity of the site or any sites that could be considered at risk.

The ecology protected areas mapping is presented in Figure 2-7.

### 2.2.9 Site History

The earliest historical map available on the OSI website dates from 1837-1842 and 1888-1913. The OSI identifies the land within the site boundary was historically used for agricultural purposes (rough pastures).

The OSI Historical Mapping is presented in Figure 2-8.

Historical aerial imagery from 1995 show evidence of filling activity. The next imagery available in 2000 indicates the activity has ceased.

### 2.2.10 Existing Geological History

The GSI holds no records of areas of Geological Heritage within the site boundary.

The nearest recorded of geological heritage held by the GSI is approximately 12.3km north-east of the site boundary at Knock-Ballyhaunis area.



Knock-Ballyhaunis area is described as a “Field of megalineations, largest in Ireland, largest individual lineations in Ireland. Many megalineations in till, interspersed with crag-and-tail features.” and the geological feature of note is “Mega-Flutings”.

Another Geological Heritage is Garranlahan Esker, located 18.0km East from the site. Garranlahan Esker is described as “a long, beaded, often high, sinuous esker ridge system” and the geological feature of note is “long, wide tunnel-deposited esker”.

The geological heritage mapping is presented in Figure 2-9.

#### 2.2.11 Existing Geotechnical Stability

The GSI landslides database indicates that there are no recorded geo-hazards within the site boundary.

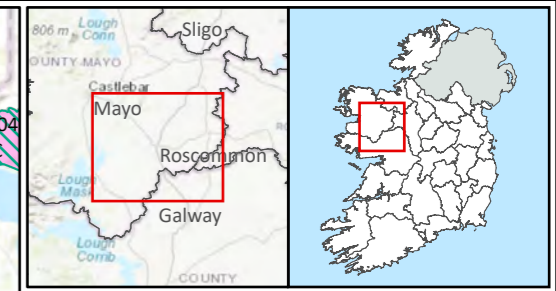
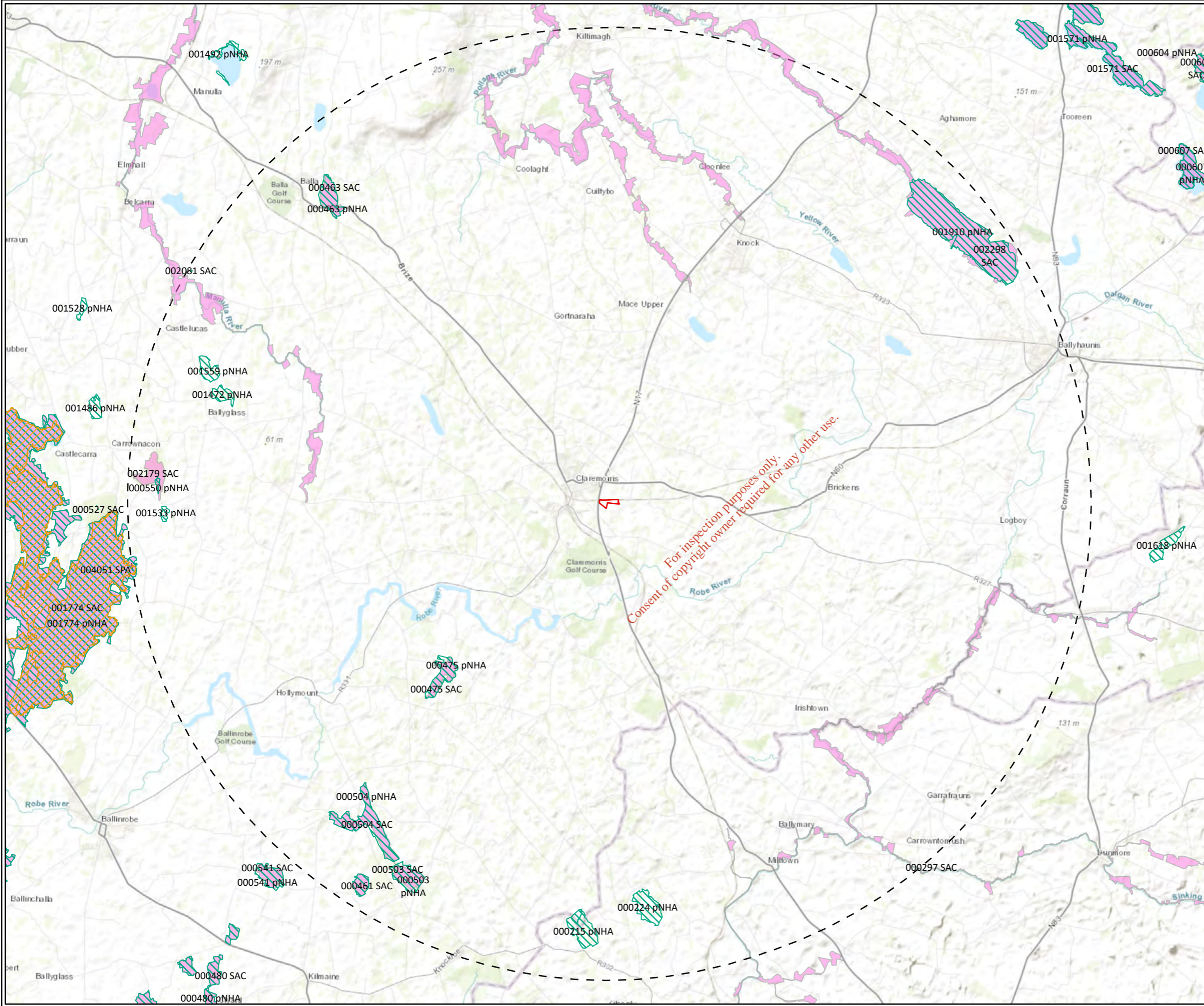
The closest one is located 17km to the north-west of the site, at Bohola, in the village of Carranteaun below Kiltimagh Mountain in December 2001.

#### 2.2.12 Archaeological Heritage

There are six National Monuments to the North, West and East of the site boundaries, between c.0.3km and c.0.9km. They belong to Clare and Kilbeg-Malone Townlands. The Archaeological Survey of Ireland (ASI) is in the process of providing information on monuments, and these records have not been uploaded.

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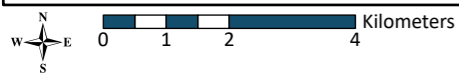


- Site Boundary
- 15km Buffer of Site Boundary
- Proposed Natural Heritage Area (pNHA)      Nearest site: 6.8km
- Special Area of Conservation (SAC)      Nearest site: 6.8km
- Special Protection Area (SPA)      Nearest site: 14.9km

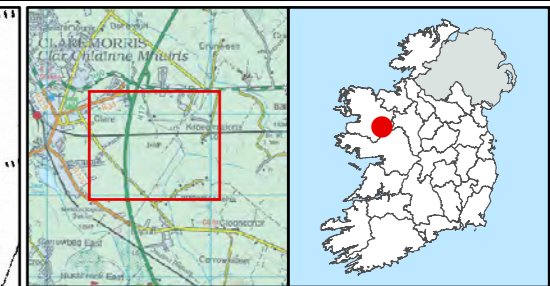
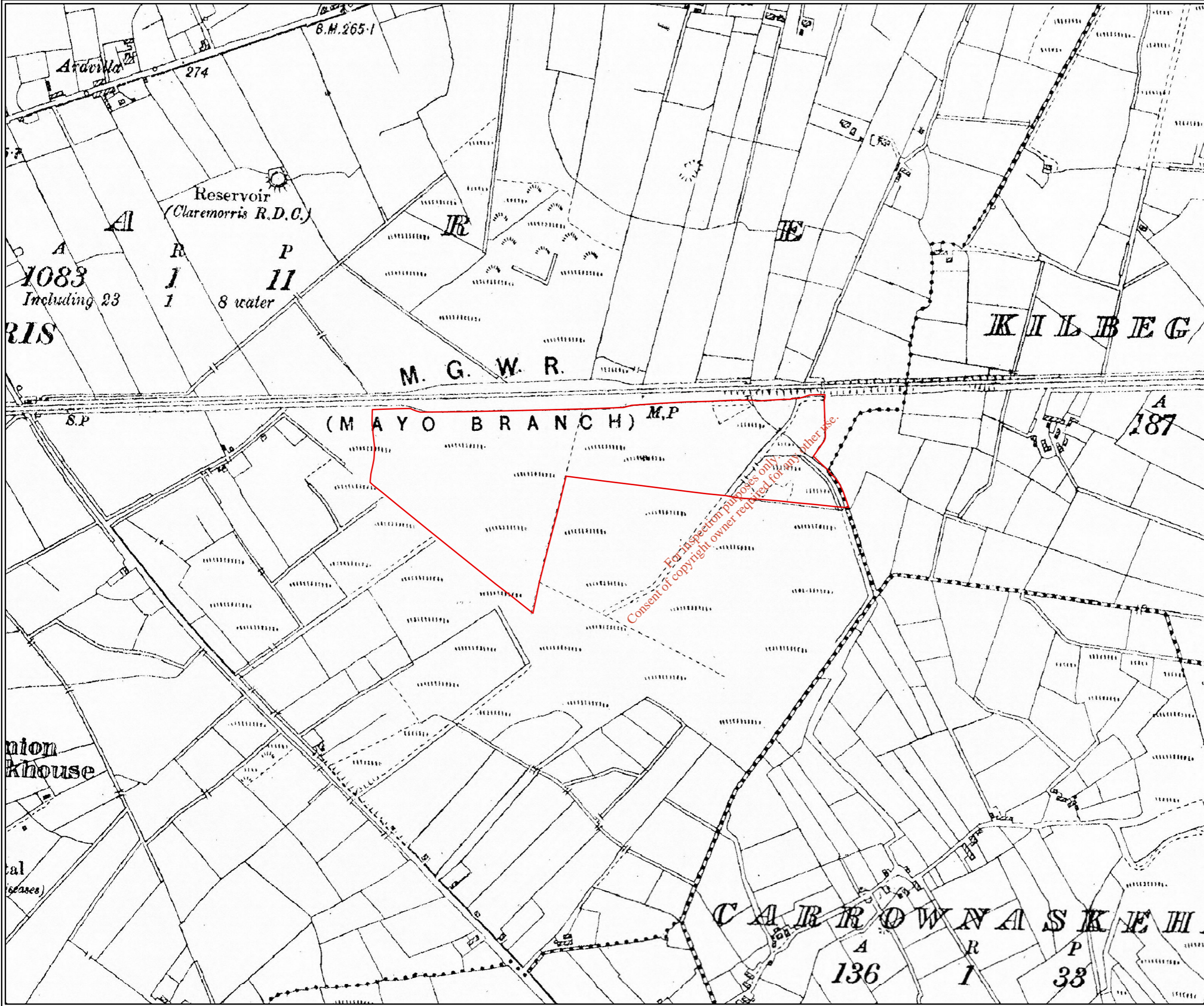
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<b>TITLE:</b> Ecologically Protected Sites	
<b>PROJECT:</b> Claremorris Tier 3 and Remediation Plan	
<b>FIGURE NO:</b> 2.7	
<b>CLIENT:</b> Mayo County Council	
<b>SCALE:</b> 1:120,000	<b>REVISION:</b> 0
<b>DATE:</b> 13/01/2020	<b>PAGE SIZE:</b> A3

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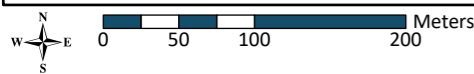




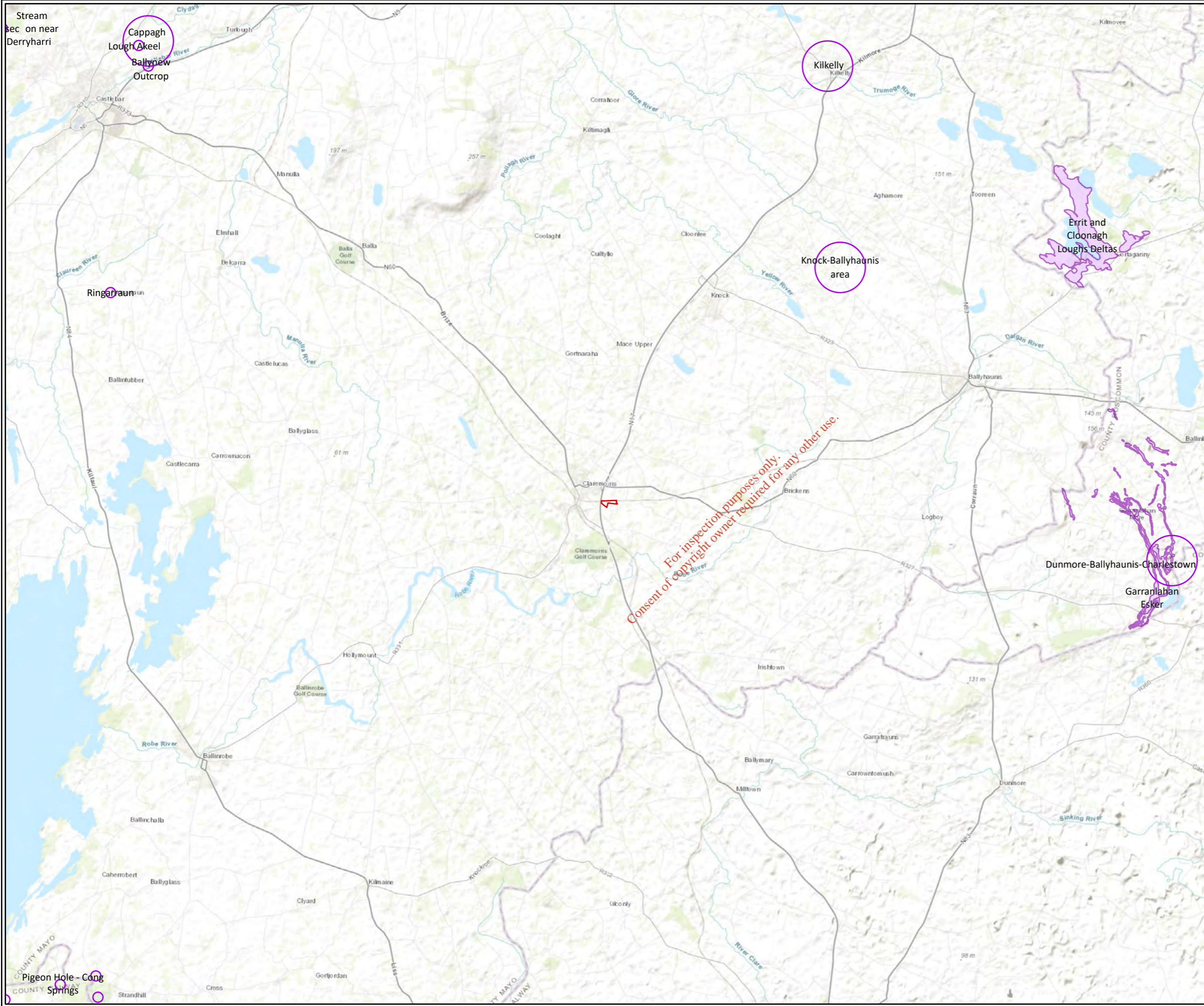
 Site Boundary

TITLE:	OSi Historical Mapping		
PROJECT:	Claremorris Tier 3 and Remediation Plan		
FIGURE NO:	2.8		
CLIENT:	Mayo County Council		
SCALE:	1:5,000	REVISION:	0
DATE:	13/01/2020	PAGE SIZE:	A3

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- Site Boundary
- Geological Heritage Sites (Audited Boundaries)
- Geological Heritage Sites (Unaudited Boundaries)



<b>TITLE:</b>	Geological Heritage	
<b>PROJECT:</b>	Claremorris Tier 3 and Remediation Plan	
<b>FIGURE NO:</b>	2.9	
<b>CLIENT:</b>	Mayo County Council	
<b>SCALE:</b>	1:150,000	<b>REVISION:</b> 0
<b>DATE:</b>	13/01/2020	<b>PAGE SIZE:</b> A3







## 2.3 Previous Site Investigation - N17

FT reviewed the GSI Online borehole Mapping and Site investigation reporting log as part of this desk study. FT reviewed a relevant Site Investigations report which was prepared by IGCL Ltd for the N17 road works.

The IGCL report is included in Appendix 4 to this report.

The review highlighted two boreholes located close to the site for the then proposed (now existing) railway overbridge. The boreholes are referred to as 1250R and 1250L indicating their chainage location. The approximate location of these boreholes according to the GSI is shown in Figure 2-10 below.



**Figure 2-10: GSI Geotechnical Boreholes (Blue Triangle)**

A descriptive extract from the report regarding the boreholes is quoted below:

*(b) Chainage 1250 - Bridge over Railway*

*Two holes were bored at this location. In borehole 1250R, 1.00 metres of filling overlies a 2.00 metres peat stratum. Coarse compact gravel was noted from 3.00 to 3.80 metres with Limestone rock found at 3.80 metres.*



*In Borehole 1250L, fill and peat again occurred to a depth of 1.40 metre, overlying a firm stiff gravelly clay. Gravel was noted from 2.70 to 3.70 metres with refusal (probably rock) at 3.70 metres.*

*Diamond drilling methods were used to recover NQ (50mm) core at both locations. At 1250R good quality core was recovered from 3.70 metres below ground level to 7.00 metres, while at Borehole 1250L solid rock core was recovered from 4.90 to 6.70 metres. Some weathered rock was noted in Borehole 12501. above the solid horizon.*

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## 3. TIER 2 SITE INVESTIGATION

### 3.1 Previous Site Investigation Works

A site investigation on the site was carried out by JS Drilling on behalf of MCC in 2010 and 2011. The full report is presented in Appendix 2.

The scope of site investigation works at the time included:

- Drilling of 2 No. boreholes.
- Excavation of 7 No. trial pits to the full depth of the waste body where possible.
- *In-situ* monitoring of landfill gas.
- Collection of soil/waste samples during drilling/trial pitting.
- Conversion of the 2 No. boreholes to groundwater/leachate monitoring wells.
- Collection of groundwater/leachate from each of the monitoring wells.

The locations of the intrusive works are presented in Figure 3-1.

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