ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

TIER 2 RISK ASSESSMENT

THORPES HISTORIC LANDFILL, BALLYRAGGET, CO. KILKENNY

DECEMBER 2020

FEHILY TIMONEY & COMPANY

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Abstract: This report represents the findings of a Tier 2 site investigation carried out at Thorpes Historic Landfill, Ballyragget, Co. Kilkenny, and conducted in accordance with the EPA Code of Practice for unregulated landfill sites.

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NON-TECHNICAL SUMMARY

Fehily Timoney & Company (FT) was appointed by Kilkenny County Council (KCC) to complete a Tier 2 environmental risk assessment (ERA) of Thorpes Historic Landfill in accordance with the Environmental Protection Agency (EPA) Code of Practice (CoP) (2007): *Environmental Risk Assessment for Unregulated Waste Disposal Sites*.

The site is located approximately 1.5km east of the town of Ballyragget, Co. Kilkenny, off the R694 road from Ballyragget to Castlecomer. The site was used by Kilkenny County Council for the disposal of municipal waste.

A Tier 1 study, received as part of the project brief, was conducted by Kilkenny County Council and determined the site to be a moderate risk classification (Class B). The primary risks identified by KCC related to the landfill being cited above a regionally important karstified aquifer and the risk of leachate runoff entering a nearby stream.

The Tier 2 study, presented herein, consisted of a desk study, site walkover, environmental monitoring (surface water sampling) and laboratory analysis. The results of these works informed the development of the CSM (conceptual site model) and risk screening model.

An examination of the national bedrock aquifer map on the GSI online mapping identified that the aquifer underlying the site is classified as a *'Poor Aquifer – Bedrock which is generally unproductive'*. An area of 'Regionally important Aquifer – Karstified (diffuse)' is present within 50m of the western site perimeter.

A site walkover conducted prior to undertaking any site investigation works confirmed the presence of non-putrescible commercial and industrial type waste along a north facing bank adjacent to the R694 road at the site. The site walkover noted dense vegetation overgrowth across the tipping site and assessed the feasibility for intrusive works on that basis.

Intrusive investigative works could not be undertaken due to limited access to the site and health and safety risks associated with the nature of the site i.e., dense tree coverage and locally steep slopes. The scope of the investigation was reduced to assess the surface water quality upstream and downstream of the site.

Analysis of surface water samples SW1 (downstream) and SW2 (upstream) when assessed against the MAC (1989) and EQS (2009) quality standards were found to be below the guideline values in all assessments.

The results of the Tier 2 assessment and risk model indicate that the site is a **Low-Risk Classification (Class C)**. The highest risk identified in the risk prioritisation was the migration of leachate from the site to the Ballyragget Stream surface water receptor. Surface water monitoring undertaken indicates no measurable effect on surface water quality downstream of the site. The reclassification of the overall risk from Moderate Risk Class B (as per Tier 1 assessment) to a Low Risk Class C is based on the age of the waste mass and the non-putrescible constituents identified during the site walkover.

As the results of the risk assessment indicate that this site is "not considered to pose a significant risk to environment or human health", and is classified Low Risk – Class C, the CoP directs that the site will have to apply for a certificate of authorisation to certify compliance with Regulation 7(7) of the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008.

It is recommended that Kilkenny County Council proceeds to apply for a Certificate of Authorisation for this site. FT recommends that surface water monitoring be undertaken at both monitoring locations, SW1 and SW2, monthly for three months prior to the Certificate of Authorisation application, and quarterly surface water monitoring thereafter subject to the conditions of the Certificate of Authorisation.

1 INTRODUCTION

1.1 Background

The site is located approximately 1.5km east of the town of Ballyragget, Co. Kilkenny, off the R694 road from Ballyragget to Castlecomer. The entire site footprint is approximately 1.8 hectares and was used for the disposal commercial and industrial type waste

Kilkenny County Council (KCC) has completed a Tier 1 risk assessment and classified the site as Medium Risk based on the primary risks associated with the size and importance of the underlying aquifer, which is karstified and regionally important, risk of leachate runoff entering a nearby stream, and the risk of leachate runoff entering public water supply.

1.2 Scope of Works

FT's scope of work was to undertake a Tier 2 assessment of the site in accordance with the EPA Code of Practice (CoP) 2007: *Environmental Risk Assessment for Unregulated Waste Disposal Sites*. This approach required the completion of the following:

- Desk Study
- Site Walkover
- Environmental Sampling: surface water
- Environmental Risk Assessment (ERA)
- Development of a conceptual site model (CSM)

As part of the initial desk study, a review of available information was undertaken. This was followed-up with a site walkover by FT personnel. The desk study and site walk-over were used to determine the locations for surface water sampling.

Laboratory analysis of surface water samples was conducted to assess and quantify any potential or ongoing environmental impacts.

The information gathered from the desk study and surface water sampling were used to inform the development of both the CSM and the Environmental Risk Assessment (ERA). This report presents the findings of the assessment.

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
- Environmental Protection Agency Maps: www.epa.ie
- National Parks and Wildlife Service Map Viewer: www.npws.ie
- BS 5930: 1999, Code of Practice for Site Investigations
- BS 10175: 2000, Investigation of Potentially Contaminated Sites – Code of Practice

A desktop review of available documentation for the site was conducted followed by a site walkover. The documentation made available to FT for the desktop review included the Tier 1 Risk Assessment prepared by Kilkenny County Council.

2.2 Desk Study

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

2.2.1 Site Description & On-Site Conditions

The site is located approximately 1.5km east of the town of Ballyragget, Co. Kilkenny, off the R694 road from Ballyragget to Castlecomer. The site occupies approximately 1.8 hectares.

The site is currently predominantly overgrown with vegetation and trees. A small concrete hardstanding area has been constructed along the northern boundary of the site which appears to be used for agricultural purposes. The surrounding fields are used for agriculture namely grazing. The land falls locally in an easterly direction, though the wider area slopes in a south / south easterly direction. There is a stream flowing east to west downgradient through the middle of the site towards Ballyragget.

Observations made during the site walkover noted the presence of typically non-putrescible commercial and industrial type waste across an area of the South Eastern river slope. It is assumed waste materials were tipped from the R694 road into a localised land depression or across the stream bank. Accumulations of waste of approximately 1-2m deep were noted above the assumed original slope profile across this area.

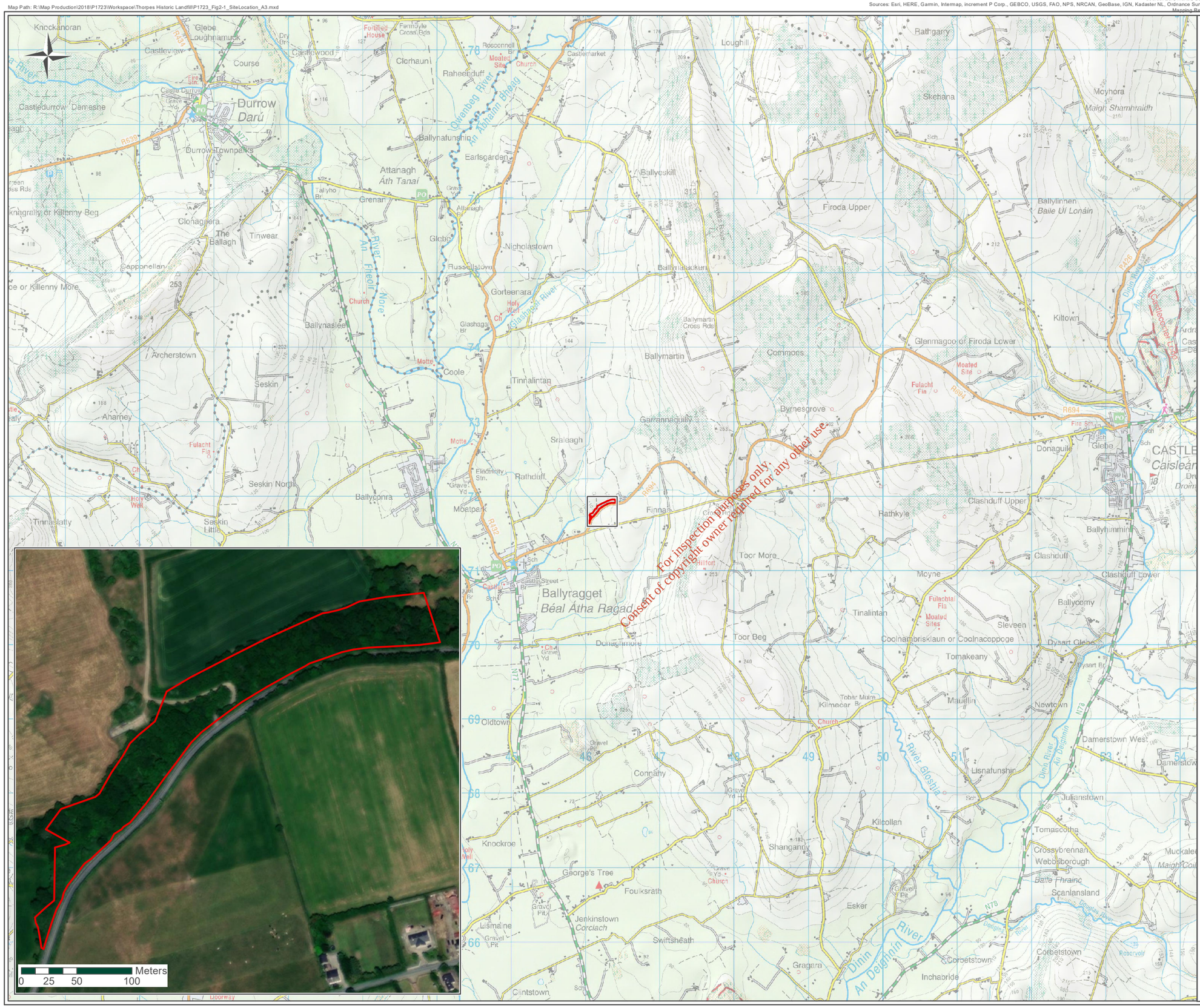
The location of the site is shown in Figure 2.1, overleaf.

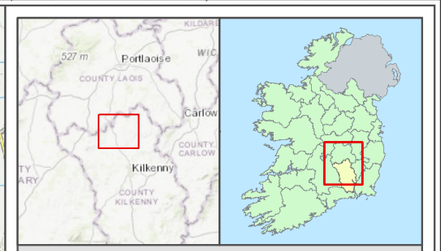
2.2.2 Previous Studies

Kilkenny County Council prepared a Tier 1 Risk Assessment for the site, classifying the site as Medium Risk, due to the potential risks associated with leachate runoff entering the adjacent stream and the risk of leachate migration into the groundwater aquifer.

A copy of this assessment is included in Appendix 1.

Map Path: R:\Map Production\2018\P1723\Workspace\Thorpes Historic Landfill\P1723_Fig2-1_SiteLocation_A3.mxd





Co. Kilkenny

Legend

Site Boundary

Figure Title	Site Location Plan and Aerial View
Figure No.	2.1
Project	Historical Landfills: Thorpes
Client	Kilkenny County Council
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2.2.3 Topography

The site is described as sloping from east to west with much of the site comprising of overgrown vegetated steep slopes. The overgrown slope where the waste was tipped is situated on a north facing, steeply sloped bank with the Ballyragget Stream located at the base of the slope. The broader landscape falls to the west from approximately 120m OD to 100m OD towards the River Nore.

2.2.4 Geology

Drift/Quaternary Geology

The Quaternary Map provided by GSI Online identifies the quaternary sediments at the site as till derived from Limestones, with a small area in the western portion of the site are identified as 'glaciofluvial sands and gravels' derived from Limestones, presented in Figure 2.2.

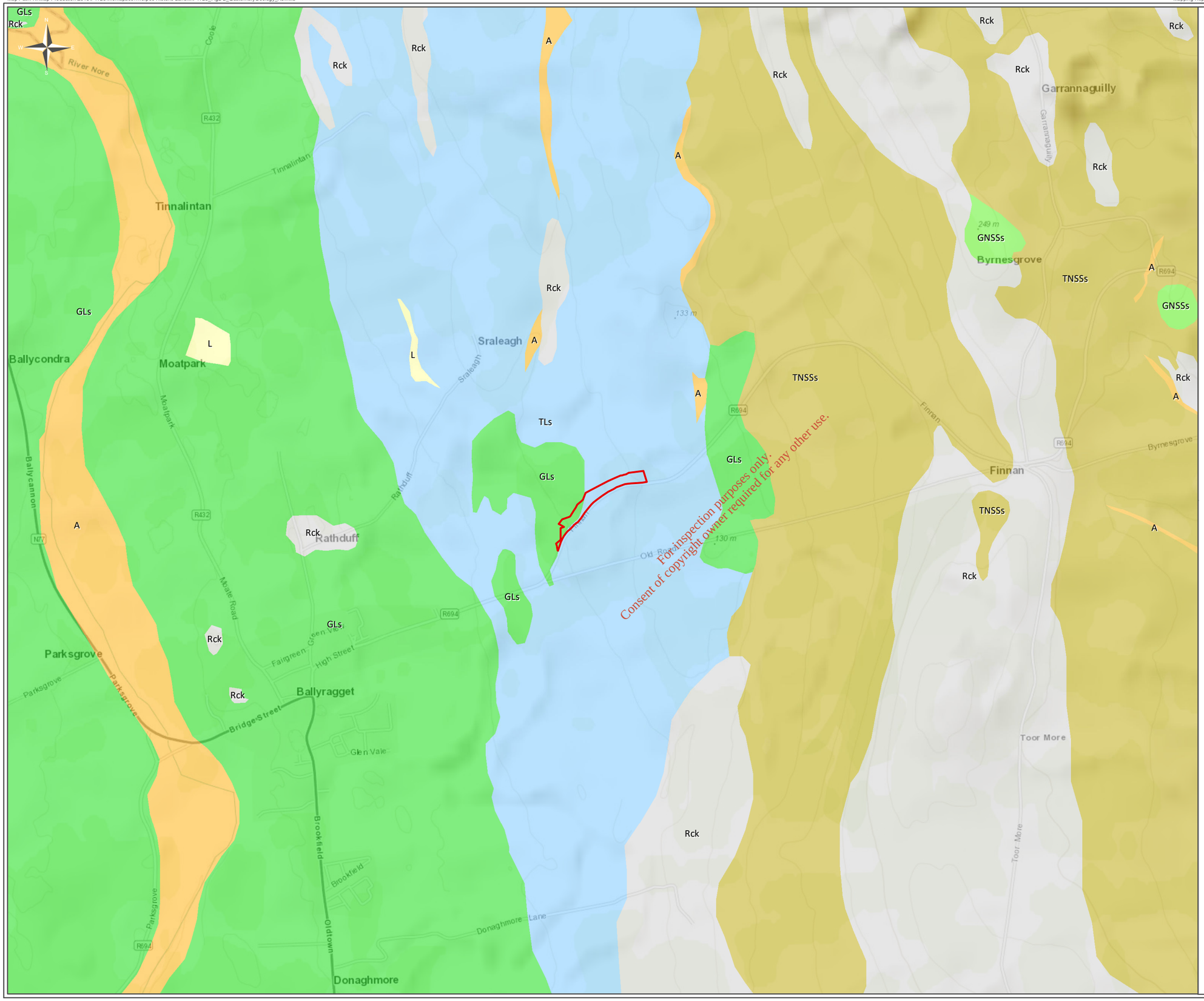
The soil underlying the site is defined, from the GSI Online Teagasc Soils mapping as 'Mineral poorly drained (Mainly basic)' along the northern and eastern sections of the site, with areas of 'Shallow well drained mineral (Mainly basic)' along the southern and western sections of the site. Soils described as 'Deep well drained mineral (Mainly basic)' are also found along the southern perimeter of the site.

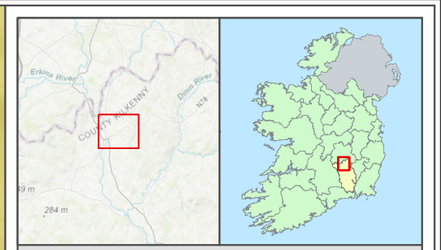
Solid or Bedrock Geology

The GSI online 1:100,000 scale bedrock geology map, shows that the site is found on the Killeshin Siltstone Formation, described as 'Muddy siltstone and silty mudstone'. An unconformity runs northwest to southeast beyond the southwestern boundary of the site.

The bedrock mapping indicates the sites western boundary lies near 'cherty, muddy, calcarenitic limestone' bedrock from the Clongrenan Formation. The bedrock is characterised as typically medium-coarse grained thick limestone beds with a variable presence of shales. Evidence of karstic landforms have been identified within this bedrock formation at Donaghmore Well located approximately 1.5 km south of the project site.

The bedrock geology is presented in Figure 2.3.





Legend

- Site Boundary
- A, Alluvium
- GLs, Gravels derived from Limestones
- GNSSs, Gravels derived from Namurian sandstones and shales
- L, Lacustrine sediments
- Rck, Bedrock outcrop or subcrop
- TLs, Till derived from limestones
- TNSSs, Till derived from Namurian sandstones and shales

Kilometers
0 0.5 1 2

Figure Title
Quaternary Geology

Figure No. 2.2

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Historical Landfills: Thorpes

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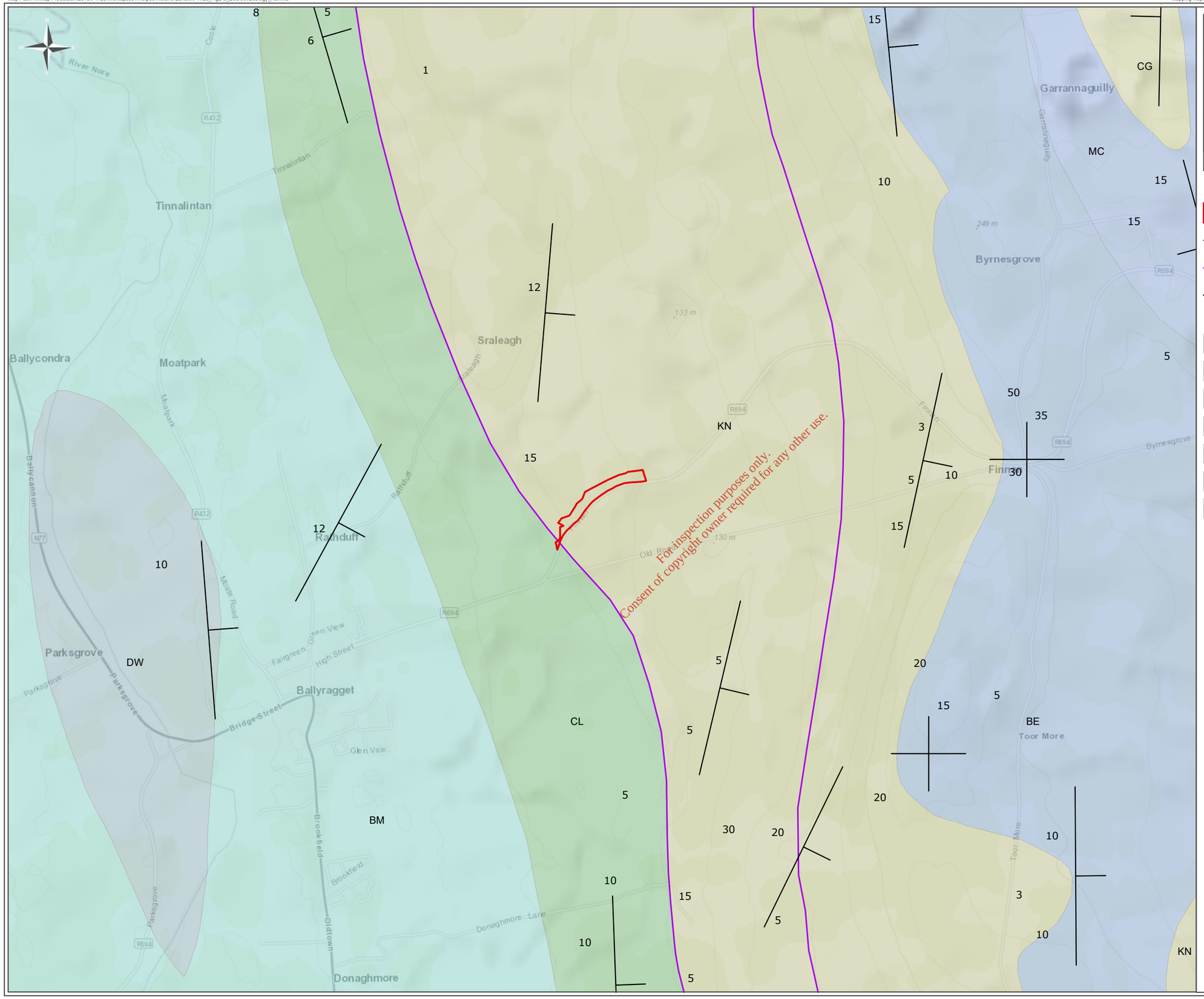

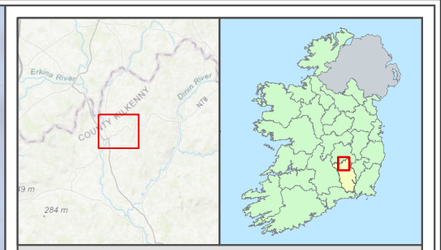

Legend

- Site Boundary
- Dip of Bedding in Degrees
- Stratigraphical Linework
- Structural Linework

Bedrock Geology

- BE: Bregaun Flagstone Formation
- BM: Ballyadams Formation
- CG: Clay Gall Sandstone Formation
- CL: Clogrenan Formation
- DW: Durrow Formation
- KN: Killeshin Siltstone Formation
- MC: Moyadd Coal Formation

Kilometers
0 0.5 1 2

Figure Title
Bedrock Geology

Figure No. 2.3

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Historical Landfills: Thorpes

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2.2.5 Hydrogeology

There are no karst landforms within the site boundaries according to the GSI Groundwater Karst Data. The nearest karst landform is the Donaghmore Well spring in the Townland of Donaghmore, approximately 1.5 km south of the project site.

The Water Framework Directive Groundwater Bodies dataset from GSI shows that the groundwater body is named Ballingarry and has a poorly productive bedrock flow regime. The River Basin District Code is *'South Eastern'*.

There are no Groundwater Drinking Water Protection Areas within the site boundaries according to GSI. The closest groundwater protection area to the site is approximately 2.5 km to the west of the site in the Townland of Ballyconra. The inner protection area of the water body is 4.1 km^2.

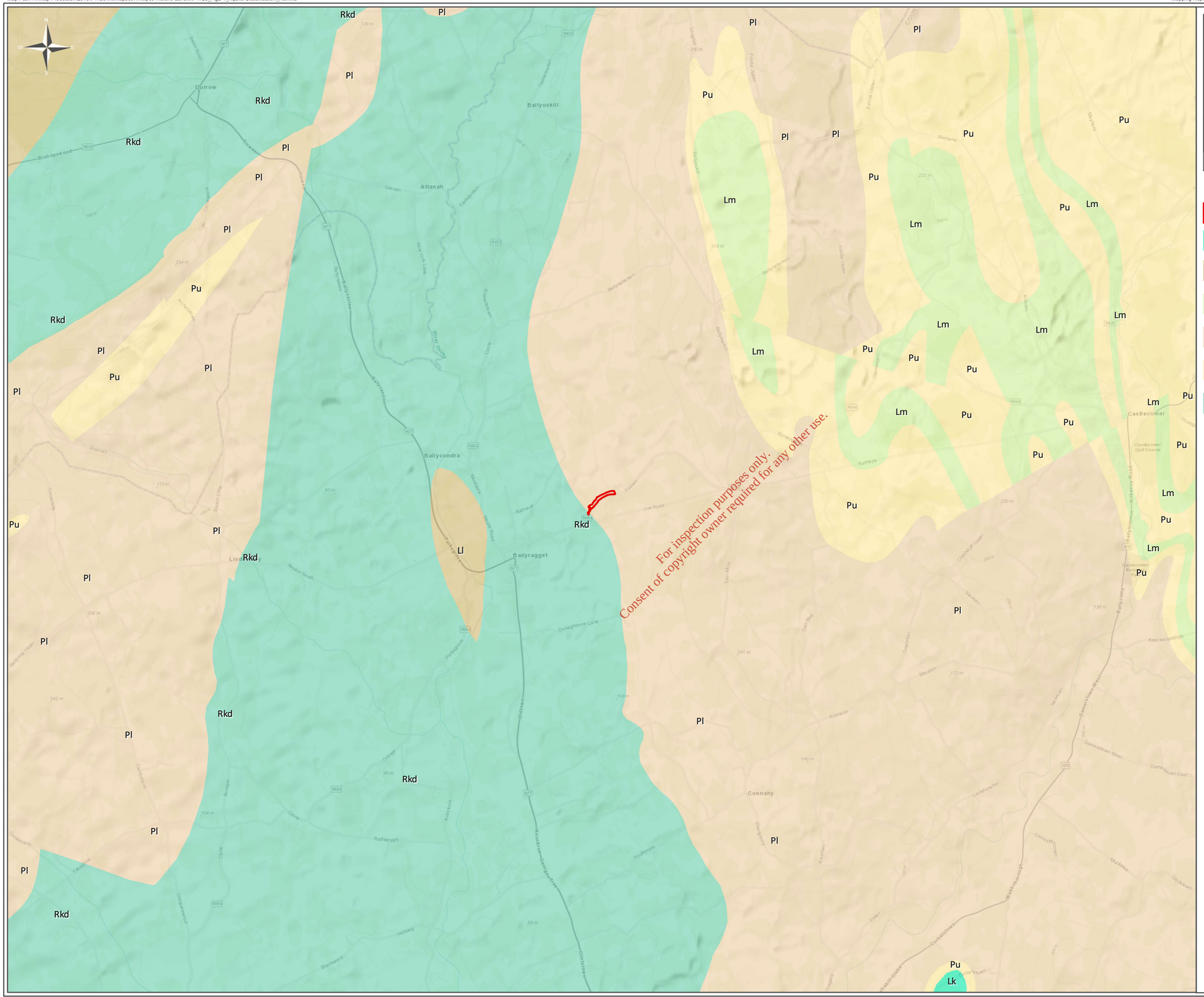
An examination of the national bedrock aquifer map on the GSI online mapping identified that the aquifer underlying the site is classified as a *'Poor Aquifer – Bedrock which is generally unproductive'*. An area of 'Regionally important Aquifer – Karstified (diffuse)' is present within 50m of the western site perimeter. The bedrock aquifer mapping is presented in Figure 2.4.

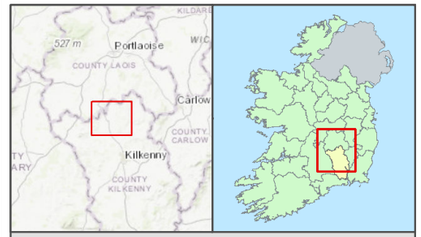
There are no wells or springs within the site boundary. Within a 2km radius of the site boundary there are 5 No. Dug Wells and 3 No. boreholes recorded by GSI Groundwater Wells and Springs map layer and presented in Figure 2.7. Two of the boreholes and dug wells are classified as 'Agri and Domestic use', one of the boreholes is classified as 'Domestic use only', with the remaining five locations of unknown classification. The yield class of all boreholes and dug wells is unknown. The yields of these boreholes and dug wells are also unknown. The borehole depths range from 3.8m to 17.7m. Table 2.2 presents the details of the boreholes and springs within 2km of the site.

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

BH ID/Spring	Yield class	Yield (m^3/d)	Use	Depth (m)	Depth to Rock Confidence	Distance from site (km)	Date
2317SEW152	-	-	Domestic Use Only	16.5	6	0.47	1899
2317SEW151	-	-	Agri & Domestic	4.3	3.8	1.20	1899
2317SEW154	-	-	Unknown	17.7	-	1.61	1973
2317SEW216	-	-	Unknown	-	-	1.62	1899
2317SEW150	-	-	Unknown	7.1	-	1.64	1899
2317SEW254	-	-	Unknown	7.6	-	1.68	1899
2317SEW153	-	-	Agri & Domestic	3.8	-	1.83	1899
2317SEW148	-	-	Unknown	3.8	-	2.03	1973

The GSI mapping showing approximate locations of known wells and springs is included in Figure 2.5.





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Legend

- Site Boundary
- Lk: Locally Important Aquifer - Karstified
- Ll: Locally Important Aquifer - Bedrock Mod Productive Locally
- Lm: Locally Important Aquifer - Bedrock Generally Mod Productive
- Pl: Poor Aquifer Bedrock Generally Unproductive Except Locally
- Pu: Poor Aquifer Bedrock Generally Unproductive
- Rkd: Regionally Important Aquifer - Karstified (diffuse)

Kilometers
0 1 2 4

Figure Title
Aquifer Classification

Figure No. 2.4

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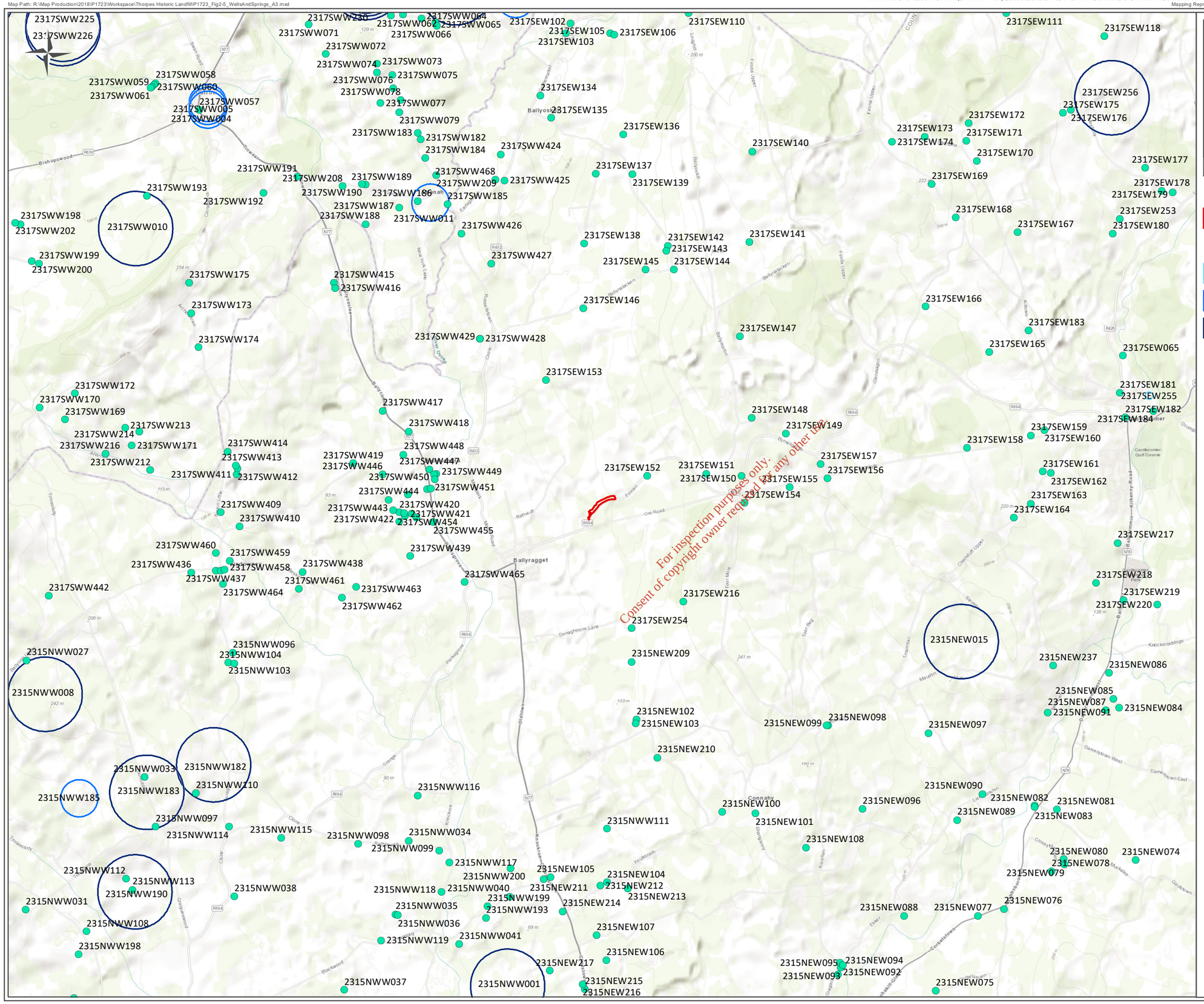

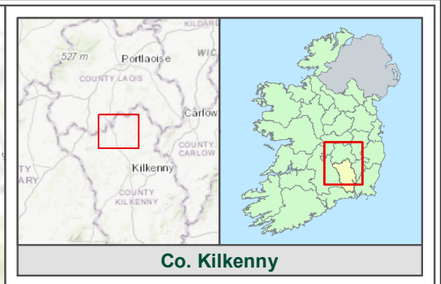

Legend

- Site Boundary
- Wells and Springs (10-50m Accuracy)
- Wells and Springs (50-100m Accuracy)
- Wells and Springs (200-500m Accuracy)
- Wells and Springs (500m-1km Accuracy)

Kilometers
0 1 2 4

Figure Title
Wells and Springs

Figure No. 2.5

Project
Historical Landfills: Thorpes

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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 2.1. The GSI procedure whereby groundwater protection is assessed is outlined in the EPA-GSI publication *Groundwater Protection Schemes* (DELG/EPA/GSI, 1999).

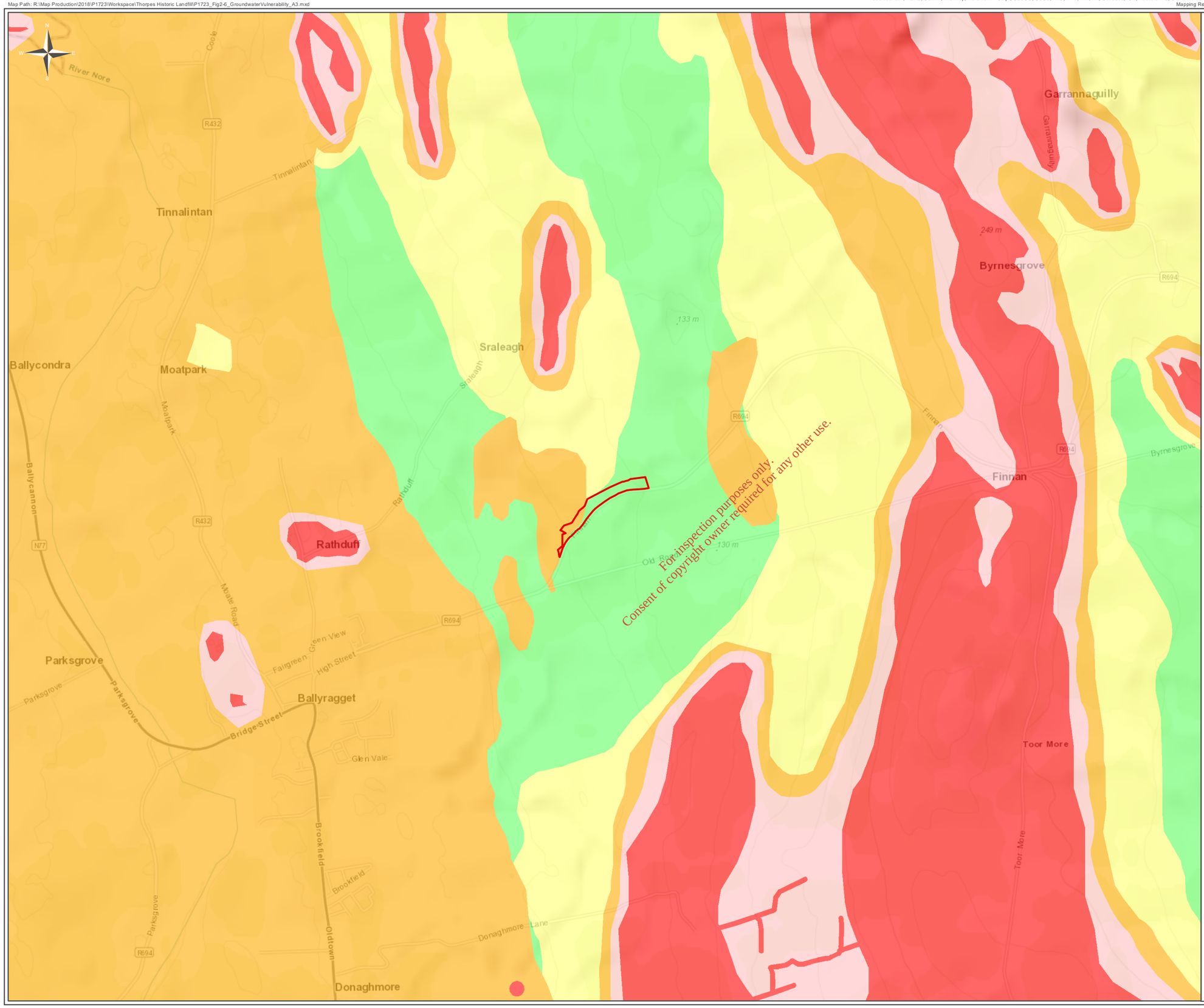
The GSI Online mapping data set identifies that the groundwater vulnerability for the site is classified as having a Low Vulnerability for the eastern section of the site, with the western section of the site classified as having a High Vulnerability. The Groundwater Vulnerability mapping is presented in Figure 2.6.

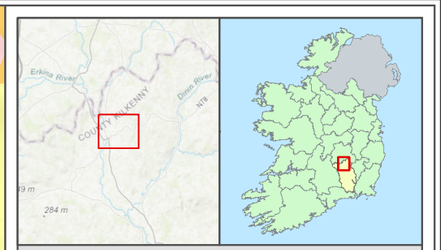
Much of the central and eastern ground conditions consist of mineral soils with low subsoil permeability, and high subsoil permeability occurs in the western section of the site where the glaciofluvial sands and gravels are likely. The recharge coefficient associated with the western section of the site is 85% and the recharge rate is 100 mm/year. The recharge coefficient associated with the eastern section of the site is 7.5% and the recharge rate is 44 mm/year.

Table 2-2: GSI Guidelines – Aquifer Vulnerability Mapping

Vulnerability Rating	Hydrogeological Conditions		
	Subsoil Permeability (Type) and Thickness		
	High Permeability (Sand/gravel)	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





Legend

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

0 0.5 1 2 Kilometers

Figure Title	Groundwater Vulnerability
Figure No.	2.6
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2.2.7 Hydrology

The nearest open waterbody is the Ballyragget stream which flows through the centre of the site in a southwest direction towards the River Nore. The stream is considered to flow along the base of the landfilled material at the site.

The OPW's National Flood Hazard database indicates there has been no historic flooding within or near the project 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). However, the following SACs, SPAs and pNHAs are located within 5km of the site. The ecology protected areas mapping is presented in Figure 2.7.

- NHA
  - River Nore/Abbeyleix Woods Complex NHA (approximately 1.6 km west of the site)
- pNHA
  - Inchbeg pNHA (approximately 4.7 km southwest of the site)
- SAC
  - River Barrow and River Nore (approximately 1.5 km west of the site and approximately 4.0 km to the southeast of the site)
- SPA
  - River Nore (approximately 1.6 km to the west of the site)

2.2.9 Site History

The OSI public viewer historical maps indicate no activity on the site in the 1995 and 2000 ortho maps. The historic 6" map (1837 - 1842) and the 25" map (1883 – 1913) show the site as woodland with a small section to the northwest of site described as a gravel pit. The OSI Historical Mapping is presented in Figure 2.8.

2.2.10 Existing Geological Heritage

There are no Geological Heritage sites with the site boundary according to the GSI Geological Heritage map layer. The closest recorded area of Geological Heritage held by the GSI is Ballyragget Quarry approximately 2.7 km south of the project site. It has geological features *'Exposed faces of limestone overlain by thick glacial deposits*. The geological heritage mapping is presented in Figure 2.9.

2.2.11 Existing Geotechnical Stability

GSI landslides database has no record of geotechnical instability within the site boundaries. The nearest recorded geo-hazard was at Culahill Mountain approximately 10.7 km west of the site in Co. Laois. The landslide mechanism is undefined.

GSI online mapping indicates there is no peat within the site boundary.

Based on the existing database and topography it is considered that the development will have a negligible risk of geotechnical instability and there will be no perceived impact on any existing known geohazards.

2.2.12 Archaeological Heritage

There are no Archaeological Heritage sites with the site boundary according to the Heritage Ireland GSI Geological Heritage map layer.