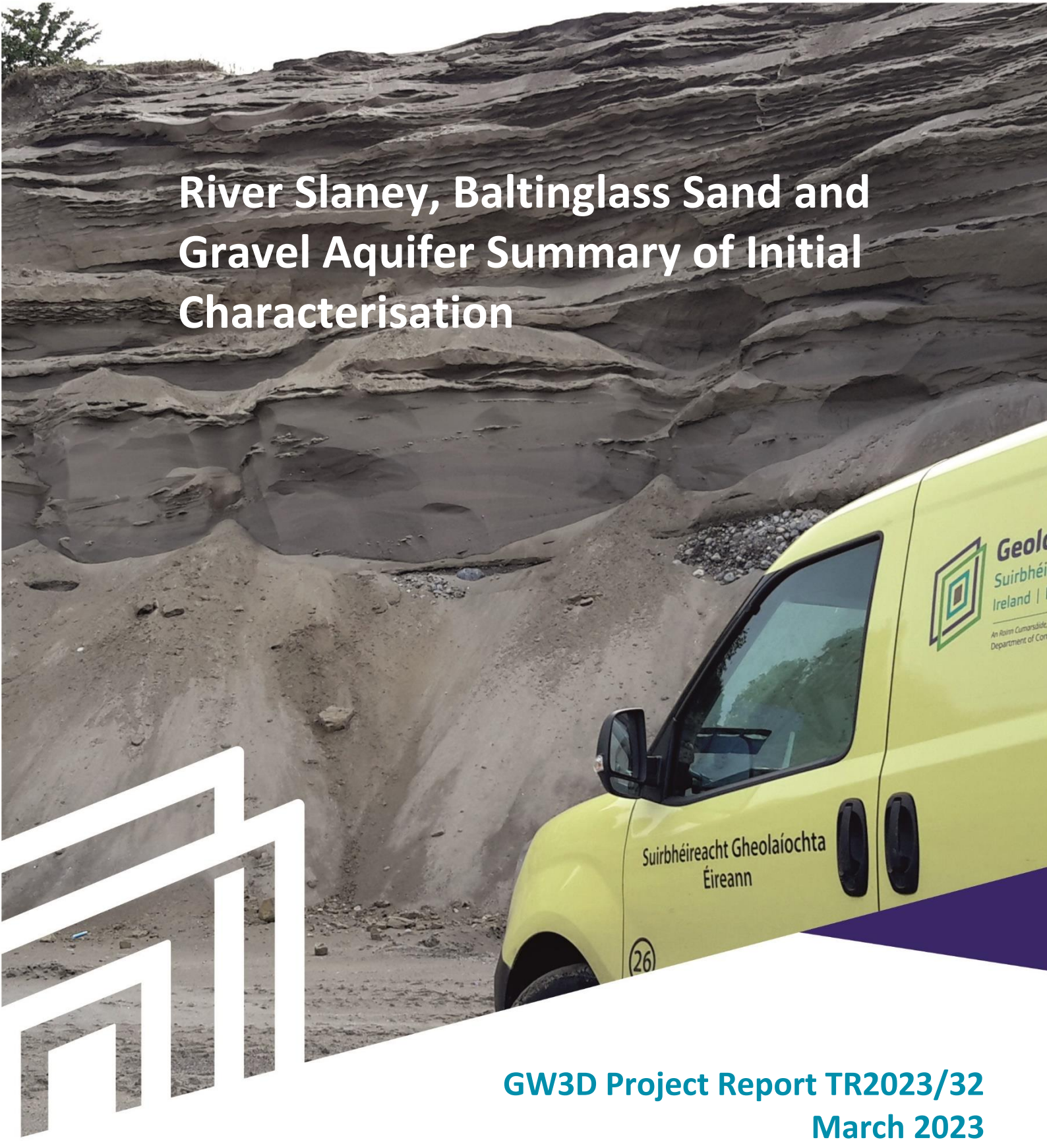
Rialtas na hÉireann
Government of Ireland

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann



River Slaney, Baltinglass Sand and Gravel Aquifer Summary of Initial Characterisation

GW3D Project Report TR2023/32
March 2023

Geological Survey Ireland is a division of the Department of the Environment, Climate and Communications

River Slaney, Baltinglass Sand and Gravel Aquifer Description March 2023

This sand and gravel report forms part of a series representing the output of a body of work undertaken to re-evaluate previously mapped sand and gravel aquifers and to identify new sand and gravel aquifers. This study resulted in the refinement of existing sand and gravel aquifer mapped extents, the modification of some sand and gravel aquifer categories, and the removal of some previously mapped sand and gravel aquifers, as well as identification of new aquifers. In addition to mapping the extent and depths of the sand and gravel aquifers, the investigations consider the hydraulic properties.

The study, undertaken as part of the GW3D project (2015-2019), comprised three parts:

1) Desk study and fieldwork preparation

Sand and gravel bodies above a minimum size criterion were extracted from the GSI Quaternary Sediments 1:50,000 map. Where it was known that the surface expression of the sands and gravels was only a small portion of the subsurface body, such areas were retained. This process left several hundred sand and gravel bodies remaining as a starting point for field work.

2) Fieldwork including mapping and data collection

Field work included a visit to each of the areas which had the potential to be (at least) a Locally Important Sand and Gravel Aquifer owing to its area. In such areas, gravel pits and sand pits were visited and depth and type of sediment recorded, other exposures into the subsurface were visited and logged, wells (whether Public Supply, Group Scheme or private farm or domestic) were dipped and any information on depths recorded, and data was collected where geological and hydrogeological data existed for the area.

3) Data collation, analysis and reporting.

All field data, and information from earlier reports and studies, were compiled and analysed. Where a sand and gravel body had qualifying aquifer properties (either 10 m depth sand and gravel, or 5 m depth saturated sediments), these areas were digitised in a GIS. The aquifer area was then ascertained and drawn up. Such areas formed the basic building blocks for the sand and gravel aquifer map, which included details on the aquifer name, area, aquifer resource value (Rg or Lg), confidence level, county, and any important aspects to note for each body.

The updated mapped sand and gravel aquifers are found on the Geological Survey Ireland site https://www.gsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx#Aquifers

The GW3D Mapping Team involved in the current revision of delineated sand and gravel aquifers were:

Geological Survey Ireland staff:

- Dr. Sophie O'Connor, Groundwater Programme / Land Mapping Unit
- Dr. Sarah Blake, Groundwater Programme

Consultant support:

- Dr. Robbie Meehan, Talamh Ireland
- Coran Kelly, Tobin Consulting Engineers
- Damien Doherty, independent Consultant Geologist/ Tobin Consulting Engineers
- Natalie Duncan, independent Consultant Geologist
- Sara Raymond, independent Consultant Geologist
- James McAteer, Gavin and Doherty Geosolutions

River Slaney, Baltinglass Sand and Gravel Aquifer Description March 2023

River Slaney, Baltinglass Sand and Gravel Aquifer: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km^2)
12 – Slaney and Wexford Harbour Wicklow Co. Co.	**Rivers:** River Slaney **Streams:** Clogh Lower Stream, several unnamed streams **Lakes:** None	Slaney River Valley SAC	1.09

Topography		This sand and gravel body is located 1 km southeast of Baltinglass, County Wicklow, and follows the path of the River Slaney for a distance of just over 2 km. The aquifer has been classified as 'hummocky glaciofluvial sediments' topography (GSI, 2023a), as part of a series of high terraces on either side of the Slaney, at elevations between 110 m and 125 m AOD. The deep river valley and associated terraces dominate the topography of the immediate area of the aquifer body. The higher-elevation, surrounding landscape is dominated by Baltinglass Hill, which is bedrock-cored, and which rises to 382 m AOD, 1.5 km northeast of the aquifer locality (Figure 1).
Geology and Aquifers	**Aquifer categories**	There were data available from three borehole records from within the aquifer body. The aquifer meets the groundwater throughput threshold of 1,000 m^3/d due to the inclusion of rejected recharge from the surrounding Locally Important Bedrock Aquifer **(LI)**. Based on its areal extent, inferred thickness, saturated thickness, groundwater throughput and position in the landscape the deposit is classified as **Locally Important Sand and Gravel Aquifer (Lg)** (DELG/EPA/GSI, 1999; GSI, 2017).
	Main aquifer lithologies	Hummocky, glaciofluvial sands and gravels derived chiefly from granites (GGr), with some alluvium (A).
	Key structures	In general, exposure is poor within this sand and gravel body, and no significant sand and gravel sedimentary structures were noted during fieldwork.
	Key properties	There are three water level data points available from within the sand and gravel body (GSI, 2023b), which have allowed for inferences to be made on water levels throughout the locality. Approximately 53% of the area of the aquifer is inferred to have a depth of saturated sands and gravels greater than 5 m. In general, sand and gravel aquifers consist of unconsolidated, coarse-grained material, usually containing less than 8% fines (Ó'Súilleabháin, 2000).
	Thickness	A borehole at the Baltinglass Public Water Supply site, at the northern end of the delineated aquifer body (Figure 1), suggests 25 m depth of subsoil with 17 m of this depth saturated under static water level conditions (Woods and Wright, 2003). Based on the geomorphological setting, it is assumed that sands and gravels makes up a significant proportion of the subsoil depth, and that a similar depth of saturated sands and gravels extends southwards throughout the central core of the delineated aquifer body.
Overlying Strata	**Lithologies**	Approximately 34% of the aquifer is overlain with alluvial deposits, with sand and gravel assumed beneath.
	Thickness	Where present, the thickness of the alluvium is inferred to be less than 3 m thick.
	% area aquifer near surface	Approximately 66% of the sand and gravel aquifer is at the surface, with the remainder beneath the alluvial deposits.
	Vulnerability	The groundwater vulnerability of the sands and gravels is 'Extreme' where the water table is inferred to be < 3 m from the surface, this accounts for 85% of the delineated aquifer area. In all other areas where the water table is at a depth > 3 m, the vulnerability is classed as 'High' (15% of the area, Figure 3).
Recharge	**Main recharge mechanisms**	Diffuse recharge occurs *via* rainfall percolating through the unsaturated sands and gravels. Due to the high permeability of sand and gravel, a high proportion of the available recharge will percolate down to the water table. Rejected recharge from the surrounding, higher-elevation Locally Important Bedrock Aquifer **(LI)** has also been conceptualised as part of the throughput calculations for this aquifer.

	Est. recharge rates	The annual average rainfall for the aquifer is 1,066 mm (Walsh, 2012), thus providing an estimated diffuse groundwater recharge of 370 mm/yr. The minimum direct groundwater throughput in the aquifer is consequently estimated to be 591 m^3/d. This groundwater throughput increases to 2,968 m^3/d when rejected recharge is included.
Discharge	**Large springs and large known abstractions (m^3/d)**	There are no known large springs within this delineated aquifer body. Baltinglass Public Water Supply abstracts groundwater from two boreholes in Lathaleere Townland, with an abstraction rate of 325 m^3/d. Borehole casing exists to approx. 29 m in one of these boreholes, and into bedrock (Woods and Wright, 2003); therefore the majority of the groundwater is expected to come from the bedrock resource rather than the sands and gravels.
	Main discharge mechanisms	Groundwater is inferred to discharge into the River Slaney and its tributary streams, which flow through the centre of the delineated aquifer area.
	Hydrochemical Signature	There are no data readily available to assess the hydrochemistry of this aquifer, but the groundwater is likely to have a calcium bicarbonate ($CaHCO_3$) signature.
Groundwater Flow Paths		The length of flow paths depends on the extent of the sand and gravel deposit. In general, locally important sand and gravel aquifers are expected to have relatively short flow paths *i.e*. up to several hundred metres. Based on the geomorphology of this sand and gravel aquifer and the patterns of streams and rivers within it, the flow paths are unlikely to exceed 250 m within this aquifer body.
Groundwater & Surface water interactions		Groundwater is inferred to discharge into the rivers which flow through the aquifer; therefore connectivity between groundwater and surface water is expected.
Conceptual model		• The aquifer has a gently undulating to 'hummocky glaciofluvial sediments' topography (GSI, 2023a), and comprises a set of high terraces on either side of the River Slaney, at elevations between 110 m and 125 m AOD. • A borehole at the Baltinglass Public Water Supply site, at the northern end of the delineated aquifer body (Figure 1), suggests 25 m depth of subsoil, with 17 m of this depth saturated (Woods and Wright, 2003). • Approximately 53% of the area of the delineated aquifer is inferred to have a depth of saturated sands and gravels greater than 5 m, with the remainder inferred to have a saturated thickness less than this. • Approximately 34% of the area of the aquifer is overlain with alluvial deposits, with sands and gravels assumed beneath. • Diffuse groundwater recharge is estimated to be approx. 370 mm/yr. • An area of 2.22 km^2 of rejected recharge from the surrounding, higher-elevation Locally Important Bedrock Aquifer **(Ll)** has been conceptualised as part of throughput calculations for the sand and gravel aquifer body. • The minimum direct groundwater throughput in the aquifer is estimated to be 591 m^3/d, which increases to a potential throughput of 2,968 m^3/d when rejected recharge is included.
Attachments		Figure 1: Location and extent Figure 2: Cross section Figure 3: Groundwater vulnerability
Instrumentation	**Hydrometric gauges:** **National Water Monitoring Stations;** **River:** **Groundwater:**	None present RS12S020740 (u/s Baltinglass WWTP) RS12S020750 (d/s Baltinglass WWTP) RS12S020760 (d/s ambient) RS12S020770 (Slaney –Maidens Ford) None Present

Information Sources	• DELG/EPA/GSI (1999). Groundwater Protection Schemes. Department of the Environment and Local Government, Environmental Protection Agency and Geological Survey Ireland. • EPA map viewer. https://gis.epa.ie/EPAMaps/ • GSI (2017). A description of Irish aquifer categories. 3 pp. Available from: https://www.gsi.ie/documents/GSI%20Aquifer%20Category%20Descriptions.pdf • GSI (2023a). Geological Survey Ireland, Spatial Resources Viewer: Quaternary Geomorphology Map. https://www.gsi.ie/en-ie/data-and-maps/Pages • GSI (2023b). Geological Survey Ireland, Internal groundwater databases. • NPWS viewer. http://webgis.npws.ie/npwsviewer/ • Ó'Súilleabháin, C. (2000). Assessing the boundary between high and moderately permeable subsoils. Unpublished MSc., University of Dublin. Department of Civil, Structural and Environmental Engineering, Trinity College Dublin. • Walsh, S. (2012). A Summary of Climate Averages 1981-2010 for Ireland, Climatological Note No.14, Met Éireann, Dublin. • Woods, L., and Wright, G. (2003). Baltinglass Water Supply, Groundwater Source Protection Report, Geological Survey Ireland.
Disclaimer	Note that all calculation and interpretations presented in this report represent estimations and assumptions based on the information sources described above and established hydrogeological formulae. Figures 1, 2, and 3 are used for illustrative purposes only.

River Slaney, Baltinglass Sand and Gravel Aquifer

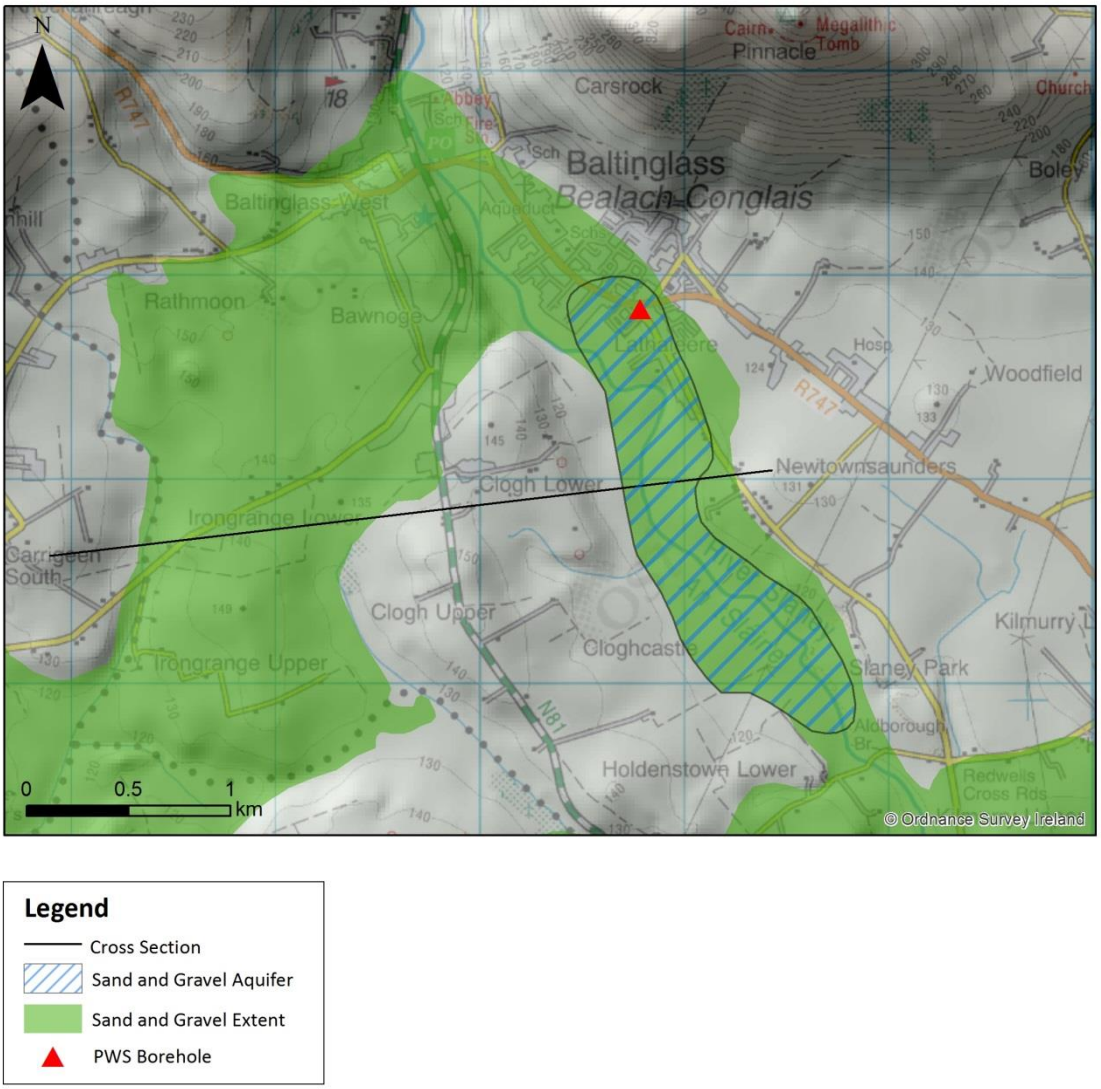


Figure 1: River Slaney, Baltinglass Sand and Gravel Aquifer extent with cross section location.

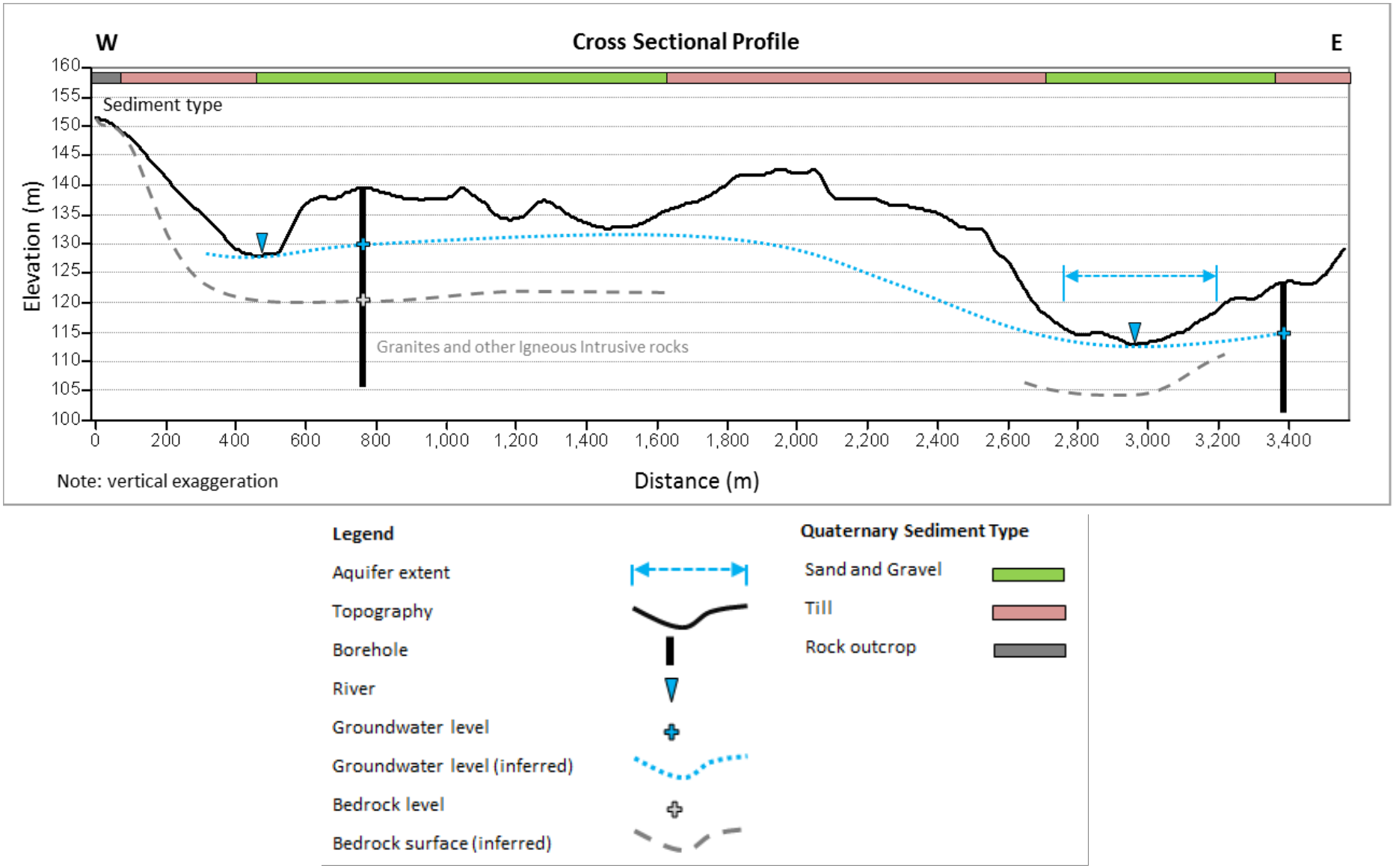


Figure 2: Cross section through the River Slaney, Baltinglass Sand and Gravel Aquifer body.

River Slaney, Baltinglass Sand and Gravel Aquifer Vulnerability

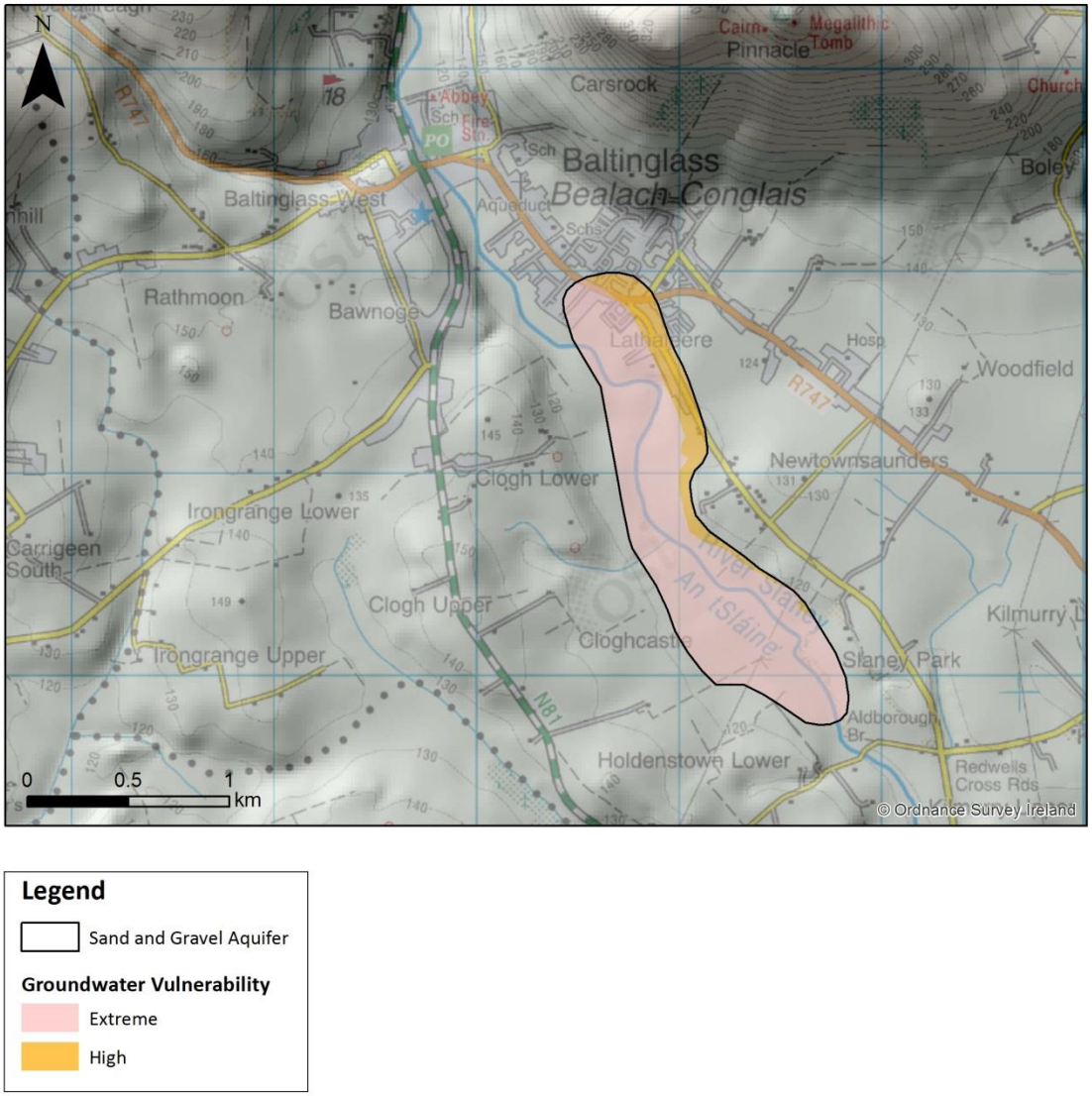


Figure 3: Groundwater vulnerability across the River Slaney, Baltinglass Sand and Gravel Aquifer.