

**Ballyhean GWB: Summary of Initial Characterisation.**

Hydrometric Area Local Authority	Associated surface water features		Associated terrestrial ecosystem(s)	Area (km <sup>2</sup> )
30 Mayo Co. Co.	<b>Rivers:</b> Keel, Camoge, Aille, Aghinish, Claureen. <b>Streams:</b> Cloondaver North. <b>Lakes:</b> Ballyglas, Buncam, Cloonboorhy, Cooley, Killadeer, Beg, Mannan, Carra, Carrownacon, Derreen, Mask, Nagoyne, Loughaniggaun, Frank.		Lough Beg / Carrowmore (001528), Slisheen Turlough (001559), Lough Carra / Mask Complex (001774), Mount Pleasant School Turlough (001472), Tower Hill Lake (000550), Lough Manan (001533)	140
<b>Topography</b>	The GWB occupies an area between Ballyhean, located in the north of the GWB and Lough Carra in the south. Location and boundaries of the GWB are illustrated in Figure 1. The land surface is low-lying. Elevations range from 20 mAOD to 40 mAOD. Topographic divides form the northern, southeastern and eastern boundaries. The western boundary comprises the poorer aquifers of the Killavally GWB and the shores of Lough Carra and Mask. The drainage is to the south toward Lough Mask.			
<b>Geology and Aquifers</b>	<b>Aquifer categories</b>	<b>Rk<sup>c</sup>:</b> Regionally important karstified aquifer dominated by conduit flow. The 'c' signifies conduit flow.		
	<b>Main aquifer lithologies</b>	Dinantian Pure Bedded Limestones dominate the GWB. Table 1 presents all the rock units in the GWB.		
	<b>Key structures</b>	The structural trend is NE-SW in the south eastern half of the GWB and almost N-S in the northern half. Major faults such as the Errif Valley fault cut across the GWB. The bedding strikes NE-SW in the south eastern portion of the GWB, generally dipping at 2-5° to the southeast. On the western side of the GWB the beds strike almost N-S and dip to the northeast at low angles.		
	<b>Key properties</b>	Karst features are recorded throughout the GWB and only considered to represent only a fraction of existing features. Aille Cave is located close to the northwestern boundary with the Aghagower GWB. It is a spectacular karst feature where the Aille river sinks underground. There are up to 8 turloughs clustered together to the east of L. Carra. There are no hydrogeological data specific to the GWB. Transmissivities are expected to be variable, ranging from 1 to greater than 2000 m <sup>2</sup> /d. Storativity is likely to be low - approximately 0.01-0.02. Groundwater velocities are expected to range from 10-100m/hr. Flow directions are likely to be to the south under hydraulic gradients that are expected to be greater than 0.0005.		
<b>Overlying Strata</b>	<b>Thickness</b>	Most groundwater flows is likely to be in an epikarstic layer a couple of metres thick and in a zone of interconnected solutionally-enlarged fissures and conduits that extends approximately 30 m below this. Deeper inflows can occur in areas associated with faults or dolomitisation.		
	<b>Lithologies</b>	Till is the dominant subsoil type. The presence of blanket peat/cutover peat is unexpected over the karstified limestone. It may be due to the presence of low permeability till.		
	<b>Thickness</b>	There are no depth to bedrock data available. Areas of rock near the surface occur in the vicinity of L. Carra and L. Mask.		
	<b>% area aquifer near surface</b>	[Information to be added at a later date]		
<b>Recharge</b>	<b>Vulnerability</b>	[Information to be added at a later date]		
	<b>Main recharge mechanisms</b>	Both point and diffuse recharge occur in this GWB. Diffuse recharge occurs over the GWB via rainfall percolating through permeable subsoil and rock outcrops. Point recharge occurs by means of swallow holes and collapse features/dolines. Recharge may also occur along 'losing' sections of streams.		
<b>Discharge</b>	<b>Est. recharge rates</b>	[Information to be added at a later date]		
	<b>Large springs and high yielding wells (m<sup>3</sup>/d)</b>	There are no good wells. The River Aille re-emerges at Pollatoomary. Discharge is unknown.		
	<b>Main discharge mechanisms</b>	The main discharges are to the streams, rivers and lakes.		
	<b>Hydrochemical Signature</b>	There are no data, however, the groundwater is expected to have a calcium bicarbonate signature, with high alkalinities and hardness (in the order of 300 and 350 mg/l CaCO <sub>3</sub> ). Electrical conductivity is also expected to be high, approximately 700 µS/cm.		

<b>Groundwater Flow Paths</b>	These rocks are generally devoid of intergranular permeability. Groundwater flows through fissures, faults, joints and bedding planes. In pure bedded limestones these openings are enlarged by karstification which significantly enhances the permeability of the rock. Karstification can be accentuated along structural features such as fold axes and faults. Groundwater flow through karst areas is extremely complex and difficult to predict. As flow pathways are often determined by discrete conduits, actual flow directions will not necessarily be perpendicular to the assumed water table contours. Groundwater can flow across surface water catchment divides and beneath surface water channels. Flow velocities can be rapid and variable, both spatially and temporally. Rapid groundwater flow velocities indicate that a large proportion of groundwater flow takes place in enlarged conduit systems. Flow path lengths can be up to a several kilometres in length. Overall groundwater flow will be towards the rivers and lakes, generally to the north, but the karstified nature of the bedrock means that locally, groundwater flow directions can be highly variable.
<b>Groundwater &amp; Surface water interactions</b>	Generally, there is a high degree of interconnection between groundwater and surface water in karstified limestone areas. Aille River is converted to groundwater at Aille Cave which re-emerges at Pollatoomary. The turloughs represent the close interaction between surface water and groundwater in this GWB. Any contamination of surface water is rapidly transported into the groundwater system, and vice versa.
<b>Conceptual model</b>	<ul style="list-style-type: none"> <li>• The GWB occupies an area between Ballyhean, located in the north of the GWB and Lough Carra in the south. The land surface is low-lying. Elevations range from 20 mAOD to 40 mAOD.</li> <li>• Topographic divides form the northern, southeastern and eastern boundaries. The western boundary comprises the poorer aquifers of the Killavally GWB and the shores of Lough Carra and Mask. The drainage is to the south toward Lough Mask.</li> <li>• The aquifer is a Regionally important karstified aquifer (<b>Rk<sup>c</sup></b>).</li> <li>• Karst features occur across the GWB, though there is a group of turloughs located to the east of L. Carra.</li> <li>• Transmissivities are expected to be variable, ranging from 1 to greater than 2000 m<sup>2</sup>/d. Storativity is likely to be in the range of 1-2%.</li> <li>• Most groundwater flux is likely to be in the upper part of the aquifer.</li> <li>• Till is the dominant subsoil type.</li> <li>• Recharge occurs via losing streams, point and diffuse mechanisms. Point recharge to the underlying aquifer occurs by means of swallow holes, caves and enclosed depressions.</li> <li>• The main discharges are to the small springs, streams, rivers and lakes.</li> <li>• The groundwater is expected to have a calcium bicarbonate signature.</li> <li>• There is a high degree of interconnection between groundwater and surface water.</li> </ul>
<b>Attachments</b>	Table 1, 2 and 3. Figures 1 and 2.
<b>Instrumentation</b>	<b>Stream gauges:</b> 30047, 30082. <b>EPA Water Level Monitoring boreholes:</b> None <b>EPA Representative Monitoring points:</b> None
<b>Information Sources</b>	Mc Connell, B., Mac Dermot, C.V., Long, B. (2002). ). <i>A geological description to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 11, South Mayo</i> . Geological Survey of Ireland Map Series Report. Geological Survey of Ireland: The Pure Bedded Limestones Aquifer Chapters. Unpublished.
<b>Disclaimer</b>	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae.

Table 1 Rock units

Code	Rock Unit Name	Description	Rock Unit Group	Aquifer Class
AI	Aille Limestone Formation	Dark fine-grained limestone, shale	Dinantian Pure Bedded Limestones	Rkc
AS	Ardnasillagh Formation	Dark cherty limestone, thin shale	Dinantian Pure Bedded Limestones	Rkc
BT	Barney Limestone Formation	Thick-bedded pale lst, minor shale	Dinantian Pure Bedded Limestones	Rkc
OKbh	Burrischoole Member	Cross-bedded peloidal limestone	Dinantian Pure Bedded Limestones	Rkc
NL	Cong Canal Formation	Medium to thick-bedded pure limestone	Dinantian Pure Bedded Limestones	Rkc
OKcr	Creagh Member	Fine-grained dark limestone & thin shale	Dinantian Pure Bedded Limestones	Rkc
IL	Illaunagappul Formation	Limestone, thin shale partings	Dinantian Pure Bedded Limestones	Rkc
BTkt	Kinturk Member	Cross-bedded oolite	Dinantian Pure Bedded Limestones	Rkc
OKlc	Lough Carra Member	Thick-bedded pale pure limestone	Dinantian Pure Bedded Limestones	Rkc
OK	Oakport Limestone Formation	Pale grey massive limestone	Dinantian Pure Bedded Limestones	Rkc

**Figure 1. Location and Boundaries of GWB**

