

1st Draft Kilkelly-Charlestown Description – July.2004

Kilkelly GWB: Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km ²)
34 Roscommon, Sligo and Mayo Co. Co's.	<p>Rivers: Black, Bracklagh, Talt, Mullaghanoe, Owengarve, Moy, Sonnagh, Eighnagh, Bracklagh, Geestaun, Glone, Little, Mullaghanoe, Owengarve, Pollagh, Trimoge, Yellow, Cloonlavis, Owenlobnaglaun, Owenmore, Sonnagh, Spaddagh.</p> <p>Streams: Lissydaly, Loughnamino.</p> <p>Lakes: Caher, Carrick, Carrigeen, Carrowmore, Cloghvoley, Crocknacloy, Cuiltybo, Cuiltybobgga, Derreen, Drumman, Easker, Boy, Caldragh, Coghlan, Doo, Duff, Nadrimina, Nambrackkeagh, Naminnoo, Naspadda, Rinn, Shammer.</p>	Cloongoonagh Bog (001657), Gowlaun Bog (000502), Tawnaghbeg Bog (000547), Kilgarrif Bog (000510), Derrynabrook Bog (000547), Lough Gownner (000523), Carrowmore Lough (001492), Balla Turlough (000463) (O’Riain, 2004).	386
Topography	The GWB occupies an area from Kiltimagh to Charlestown. The land surface is generally low-lying but there are areas of higher relief at Kiltimagh and north of Kilkelly. Elevations range from 40-240 mAOD. The GWB is bounded by the karstified limestones of the Swinford GWB to the north, west and southwest. The southeastern and part of the eastern boundary comprises the western extent of the Curlew Mountains, which act as a surface water divide with the Shannon area RBD. To the northeast, the boundary comprises the Tobercurry GWB.		
Geology and Aquifers	Aquifer categories	<p>Ll: Locally important aquifer, moderately productive only in local zones.</p> <p>Pl: Poor aquifer, generally unproductive except for local zones.</p> <p>Pu: Poor aquifer, generally unproductive.</p>	
	Main aquifer lithologies	Ordovician Volcanics, Granites & other Igneous Intrusive rocks, Dinantian Upper Impure Limestones, Silurian Metasediments and Volcanics, Namurian Shales, Namurian Sandstones, Devonian Old Red Sandstones, Dinantian Lower Impure Limestones, Dinantian Mixed Sandstones, Shales and Limestones, Basalts & other Volcanic rocks.	
	Key structures	In the vicinity of Kiltimagh, there are faults trending NW-SW and NE-SW, with beds dipping 10-20° to the SW and NW. A major NE-SW trending fault (Belhavel Fault) extends through the entire length of the GWB and forms part of the northern boundary with the Swinford GWB. The Curlews Fault, which is a major fault extending into the Shannon RBD, initiates in this GWB, propagates SE from its junction with the Belhavel Fault north of Carracastle. In the centre of the GWB, the structural trend of the Ordovician volcanics is NE-SW.	
	Key properties	Data are sparse, with 3 “Good” (in Dinantian aquifers) and 2 “Poor” yields (Ordovician) and 1 record of a “Failed” well (Silurian). There are no data specific to the Namurian aquifers. Specific capacities are calculated for three wells: 2.6, 15 and 10 m ³ /d/m. Thus, transmissivities are low, ranging from 2-15 m ² /d. Transmissivity is expected to be low across the entire GWB, however, in the vicinity of faults, transmissivity may be higher. Storativity is expected to be low (<0.5%). The data are inadequate to calculate groundwater gradients. These are expected to be greater than 0.01 in the areas composed of Namurian, Silurian, and Ordovician aquifers (Pu, Pl). In the areas composed of Dinantian aquifers (Ll) the gradients are expected to be greater than 0.005.	
	Thickness	Most groundwater flux is likely to be in the uppermost part of the aquifer; comprising a broken and weathered zone typically less than 3 m thick; a zone of interconnected fissuring 10-15 m thick; and a zone of isolated poorly connected fissuring typically less than 150 m. Water strikes are recorded at 15, 34, 44 and 63 m below ground level but only the one at 15 m provides a significant yield.	
Overlying Strata	Lithologies	The northeastern side of the GWB is predominantly covered by blanket peat. The central part of the GWB is predominantly covered by till. The western part of the GWB is covered by a mixture of till and blanket peat. A small portion of the eastern area of the GWB between Carracastle and Ballaghadreen is described under the Roscommon Groundwater Protection Scheme (Lee and Daly, 2003). The till in this area is described as “CLAY” (BS 5930), and is classed as “low” permeability. There are significant areas of sand/gravel north of Kilkelly and southwest of Kiltimagh.	
	Thickness	Depth to bedrock ranges from 0-13 m. Rock outcrops are more prevalent in the western and central parts of the GWB where there is higher relief.	
	% area aquifer near surface	[Information to be added at a later date]	
	Vulnerability	The vulnerability for a small portion of the eastern area of the GWB between Carracastle and Ballaghadreen is described in the County Roscommon Groundwater Protection Scheme (Lee and Daly, 2003). In this area the vulnerability classification is “extreme” to “high”, dependent on the depth to bedrock.	

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Recharge	Main recharge mechanisms	Diffuse recharge occurs via rainfall percolating through the subsoil and rock outcrops. Due to the low permeability of much of the subsoil and the aquifers, a high proportion of the available recharge will discharge to the streams. In addition, the steep slopes in the higher relief areas promote surface runoff. The stream density is high, indicating the high proportion of surface runoff.
	Est. recharge rates	<i>[Information to be added at a later date]</i>
Discharge	Large springs and high yielding wells (m³/d)	Good Wells: Cloonmore-Rooskey – 180 m ³ /d, Killedan – 130 m ³ /d, Cloonlumney – 131 m ³ /d.
	Main discharge mechanisms	Shallow groundwater is likely to discharge to streams and lakes, but the limited bedrock transmissivity means that the baseflow component of the total streamflow will be low. Small springs and seeps are likely to issue at the stream heads and along their course. The generally poor aquifer properties indicate that the baseflow component of total streamflow is likely to be low.
	Hydrochemical Signature	<p>The available data (n=4) are sparse and are restricted to the Ordovician (2), Dinantian Mixed Sandstones (1) and Silurian Metasediments (1).</p> <p>Ordovician Volcanics generally have a CaMgHCO₃ signature. Alkalinity (mg/l as CaCO₃): 196, 256. Alkalinity is greater than hardness in one sample indicating ion exchange. Total Hardness (mg/l): 224, 240. Conductivity (μS/cm): 484, 518. Iron (mg/l): 0.04, 1. Manganese (mg/l): 0.018, 0.4.</p> <p>Dinantian Mixed Sandstones generally have a CaHCO₃ signature. Alkalinity (mg/l as CaCO₃): 194. Alkalinity is greater than hardness indicating ion exchange. Total Hardness (mg/l): 182. Conductivity (μS/cm): 484.</p> <p>Silurian Metasediments generally have a CaMgHCO₃ signature. Alkalinity (mg/l as CaCO₃): 116. Total Hardness (mg/l): 126. Conductivity (μS/cm): 325.</p> <p>There are no data for the Namurian, Dinantian Upper and Lower Impure Limestones but generally are expected to have a CaHCO₃ signature.</p>
Groundwater Flow Paths		Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. Generally, water levels are 0-10 m below ground level. Flow paths are likely to be up to 300 m, with groundwater discharging rapidly to nearby streams and small springs. There are observed deep water strikes, indicating that there is a component of deep groundwater flow, however shallow groundwater flow is dominant. Groundwater flow directions are expected to follow topography, generally to the northwest.
Groundwater & Surface water interactions		Groundwater will discharge locally to streams and rivers crossing the aquifer and also to small springs and seeps. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater - surface water interactions occur. Baseflow to rivers and streams is likely to be relatively low.
Conceptual model	<ul style="list-style-type: none"> • The GWB occupies an area from Kiltimagh to Charlestown. The land surface is generally low-lying but there are areas of higher relief at Kiltimagh and north of Kilkelly. Elevations range from 40-240 mAOD. • The GWB is bounded by the karstified limestones of the Swinford GWB to the north, west and south. The eastern boundary comprises the surface water divide with the Shannon area RBD. To the northeast, the boundary comprises the Tobercurry GWB. • The GWB is composed primarily of low transmissivity rocks. Transmissivities are low, ranging from 2-15 m²/d. Most of the groundwater flux is likely to be in the uppermost part of the aquifer. • Storativity is expected to be low (<0.5%). The data are inadequate to calculate groundwater gradients, however, these are generally expected to be greater than 0.005. • Recharge occurs diffusely through the subsoils and rock outcrops. Recharge is limited by peat, low permeability subsoils and the low permeability bedrock, thus most of the available recharge discharges rapidly to nearby streams and small springs. • Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. Generally, water levels are 0-10 m below ground level. Flow paths are likely to be up to 300 m, with groundwater discharging rapidly to nearby streams and small springs. The overall flow direction is to the northwest. • The rock units in GWB are generally of low permeability and baseflow to rivers and streams is likely to be relatively low. 	

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Attachments	Table 1 and Figure 1.
Instrumentation	Stream gauges: 34024, 34041, 34054, 34009, 34013, 34023, 34027, 34031, 34042, 34048. EPA Water Level Monitoring boreholes: none in bedrock GWB EPA Representative Monitoring points: none in bedrock GWB
Information Sources	Lee, M. & Daly D. (2003) <i>County Roscommon Groundwater Protection Scheme</i> . Main Report. Roscommon County Council & Geological Survey of Ireland, 54pp. Long, B., Mac Dermot, C.V., Morris, J.H., Sleeman, A.G., Tietzsch-Tyler, D., (1992). <i>A geological description to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 6, North Mayo</i> . Geological Survey of Ireland Map Series Report. Mac Dermot, C.V., Long, B., Harney, S.J. (1996). <i>A geological description to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 7, Sligo-Leitrim</i> . Geological Survey of Ireland Map Series Report. Geological Survey of Ireland: The Dinantian (early) Sandstones, Shales and Limestones, The Dinantian Upper Impure Limestones, Precambrian Aquifer Chapters. Unpublished. O' Riain, G., (2004). <i>Water Dependent Ecosystems and Subtypes Draft Report</i> . WFD Support Projects. Compass Informatics in association with National Wildlife and Parks Service (DEHLG).
Disclaimer	Note that all calculations and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae.

Table 1. List of Rock units in GWB

Rock unit name and code	Description	Rock unit group	Aquifer Classification
Lisgorman Shale Formation (LG)	Thin-bedded calcareous shale, limestone	Dinantian Shales and Limestones	L1
Leitrim Group (LTG)	Dark micrite, shale, evaporite	Dinantian Shales and Limestones	L1

StratCode	UnitName	Description	RockUnit	AquiferCat
BTbh	Bohoge Member	Thick-bedded cherty limestone	Dinantian Upper Impure Limestones	L1
BO	Boyle Sandstone Formation	Sandstone, siltstone, black mudstone	Dinantian Mixed Sandstones, Shales and Limestones	L1
CX	Carracastle Formation	Intermediate volcanic breccia, tuff	Ordovician Volcanics	PI
CI	Cloonierin Formation	Grey sandstone	Silurian Metasediments and Volcanics	PI
CF	Cloonnamna Formation	Fossiliferous fine-grained sandstone	Silurian Metasediments and Volcanics	PI
CH	Craggagh Shale Formation	Black shale	Namurian Shales	Pu
P	Feldspar or Quartz Porphyry		Granites & other Igneous Intrusive rocks	PI
Pf	Feldspar Porphyry		Granites & other Igneous Intrusive rocks	PI
GS	Glen School Formation	Coarse-grained purple sandstone	Silurian Metasediments and Volcanics	PI
HR	Horan Formation	Basalt, siltstone, chert	Ordovician Volcanics	PI
KL	Kilbryan Limestone Formation	Dark nodular calcarenite & shale	Dinantian Lower Impure Limestones	L1
LG	Lisgorman Shale Formation	Thin-bedded calcareous shale, limestone	Dinantian Shales and Limestones	L1
CHls	Lower Sandstone Member	Thick-bedded pale fine sandstone	Namurian Sandstones	PI
MG	Moygara Formation	Red conglomerate & pebbly sandstone	Devonian Old Red Sandstones	PI
Dp	Pyroxene Diorite		Granites & other Igneous Intrusive rocks	PI
SIL	Silurian (undifferentiated)	Grey-green sandstone, siltstone	Silurian Metasediments and Volcanics	PI
TY	Tawnyinagh Formation	Tuff & minor chert	Ordovician Volcanics	PI
TO	Tooromin Shale Formation	Dark limestone, black shale interbeds	Dinantian Upper Impure Limestones	L1
CHus	Upper Sandstone Member	Thick-bedded pale fine sandstone	Namurian Sandstones	PI

Figure 1. Location and boundaries of GWB

