

*1<sup>st</sup> Draft Belmullet GWB Description July .2004*

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

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km <sup>2</sup> )
33 Mayo Co Council	<p><b>Rivers:</b> Altderg, Ballinglen, Baunduff, Belderg, Belfarsad, Bellanaminaum, Bunanoo, Cartron, Clydagh, Glenagh, Glenamoy, Glencullin, Glenedagh, Glenulra, Gweedaney, Heathfield, Keerglen, Meenbog, Muingnabo, Muingnakinkee, Munkin, Owenbeg, Owenduff, Oweniny, Owenmore, Owenpollaphuca, Owiny, Muing, Srahmeen, Sruffaunnamuingabatia, Tarsaghaunmore.</p> <p><b>Lakes:</b> See Table 1 for full listing.</p>	Bellacorick Bog Complex / Owenduff – Nephin Beg Complex / Mullet – Blacksod Bay Complex) (O’Riain, 2004).	1204
Topography	The GWB comprises northwest Mayo: from Broadhaven to and including Achill Island. The northern, western and southern boundaries of the GWB are bounded by coastline. The eastern boundary of the GWB is an upland area dividing water draining to the west to the Atlantic from water draining east to Killala Bay and L. Conn. The land surface is characterised by steep slopes and mountainous terrain (Nephin Beg range) in the central portion of the GWB, flattening east and west. Elevations range from 10-720 mAOD. On the easterly side of the Nephin Beg range elevations are higher than those on the west side, thus overall surface water flow is predominantly to the west, cutting through the mountains.		
	Geology and Aquifers	<b>Aquifer categories</b>	The main aquifer category in this GWB is: <b>PI:</b> Poor aquifer which is generally unproductive except for local zones. It composes 99% of the GWB.
<b>Main aquifer lithologies</b>		This GWB is composed almost entirely of Precambrian Quartzites, Gneisses & Schists, with thin bands (approximately 100m wide) of Precambrian Marbles trending mainly SW-NE across the centre of the GWB and an 8 km <sup>2</sup> pod of granite at Blacksod Bay. Table 2 lists all rock units in the GWB.	
<b>Key structures</b>		The rocks in the GWB have undergone several episodes of deformation, comprising intense folding and faulting. Bedrock strata tend to be steeply dipping subparallel to the faults. Two structural trends are evident: NW-SE in the northern portion of the GWB which then swings N-S in the middle of the GWB; NE-SW, which cross cuts the first set.	
<b>Key properties</b>		Yield data are available for eight wells in the GWB, ranging from 5-250 m <sup>3</sup> /d, with a median of 28 m <sup>3</sup> /d. There is also a record of a failed well. Specific capacity data are available for 3 wells: 0.9, 1.08, 2.9 m <sup>3</sup> /d/m. The data indicate low transmissivities – in the range of 1-5 m <sup>2</sup> /d. In the vicinity of faults, transmissivity may be higher. Storativity is expected to be low (<0.5%). The available data indicates water levels are approximately 0-8 m below ground level. The data are inadequate to calculate groundwater gradients, however, these are expected to be greater than 0.01.	
<b>Thickness</b>		Most groundwater flux will 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. Deep water strikes are noted at 79 m at Bellacorick and at 36m and 43m below ground in two wells near Downpatrick Head at the northern end of the GWB but quantities are low.	
Overlying Strata	<b>Lithologies</b>	The subsoils are dominated by Blanket Peat, covering 70% of the GWB. Along parts of the coastline are deposits of blown sand. Along the larger river valleys (for example the Owenmore river in the centre of the GWB) there is alluvium present. Table 3 lists subsoils in the GWB.	
	<b>Thickness</b>	Subsoil thickness data are sparse. Available data indicate the thickness is generally less than 3 m at Bellacorick (central eastern part of GWB), but one well has a reported depth to bedrock of 20 m. The thickness of the blanket peat ranges from 0-6 m, depending on topography (Daly, 1985).	
	<b>% area aquifer near surface</b>	<i>[Further Information to be added at a later date]</i>	
	<b>Vulnerability</b>	<i>[Further Information to be added at a later date]</i>	
Recharge	<b>Main recharge mechanisms</b>	Diffuse recharge occurs via rainfall percolating through the subsoil and rock outcrops. Due to the low permeability of much of the subsoil (blanket peat) and the poor productivity of the aquifers, a high proportion of the available recharge will discharge to the streams. In addition, the steep slopes in the mountainous areas promote surface runoff. The stream density is high indicating the high proportion of surface runoff.	
	<b>Est. recharge rates</b>	<i>[Information to be added to and checked]</i>	
Discharge	<b>Large springs and large known abstractions (m<sup>3</sup>/d)</b>	Bellacorick Power Station (218 m <sup>3</sup> /d)	
	<b>Main discharge mechanisms</b>	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.	

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	<b>Hydrochemical Signature</b>	There are limited data within this GWB. It has a Ca-Mg HCO <sub>3</sub> signature. Alkalinity (mg/l as CaCO <sub>3</sub> ): range of 14-400; mean of 174. Total Hardness (mg/l): range of 46-412; mean of 218. Conductivity (μS/cm): range of 160-752; mean of 334. <i>(Calcareous/Non calcareous classification of bedrock in the Republic of Ireland report)</i>
	<b>Groundwater Flow Paths</b>	Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. Generally, water levels are 0-8 m below ground level. Flow paths are likely to be short (30-300 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 – overall in a westerly direction.
	<b>Groundwater &amp; Surface water interactions</b>	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. Lakes comprise approximately 1% of the GWB.
<b>Conceptual model</b>		<ul style="list-style-type: none"> <li>• The northern, western and southern boundaries of the GWB are bounded by coastline. The eastern boundary of the GWB is an upland area dividing water draining to the west to the Atlantic from water draining east to Killala Bay and L. Conn. The land surface is characterised by steep slopes and mountainous terrain (Nephean Beg range) in the central portion of the GWB, flattening to the east and west.</li> <li>• The GWB is composed primarily of low transmissivity rocks. Most of the groundwater flux is in the uppermost part of the aquifer: comprising a broken and weathered zone typically less than 3m thick; and a zone of interconnected fissuring typically less than 15m.</li> <li>• Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones.</li> <li>• Recharge occurs diffusely through the subsoils and via outcrops. Recharge is limited by the peat and the low permeability bedrock, thus most of the available recharge discharges rapidly to nearby streams.</li> <li>• Flow paths are likely to be short (30-300 m) with groundwater discharging rapidly to nearby streams and small springs and flow directions are expected to follow topography.</li> <li>• Groundwater discharges rapidly to nearby small streams, lakes, small springs and seeps. Overall flow direction is west toward the coast.</li> <li>• The rock units in GWB are generally of low permeability and baseflow to rivers and streams is likely to be relatively low.</li> </ul>
<b>Attachments</b>		Table 1, 2, 3 and Figure 1.
<b>Instrumentation</b>		<b>Stream gauges:</b> 33001, 33002, 33003, 33004, 33005, 33006, 33007, 33008, 33009, 33010, 33011, 33012, 33013, 33014, 33015, 33070, 33071. <b>EPA Water Level Monitoring boreholes:</b> (MAY 067) <b>EPA Representative Monitoring points:</b> (MAY 034), (MAY 049), (MAY 093)
<b>Information Sources</b>		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. Geological Survey of Ireland Aquifer Chapters: The Ordovician, Precambrian and Ordovician Aquifers. Geological Survey of Ireland. <i>(Calcareous/Non calcareous classification of bedrock in the Republic of Ireland report)</i> 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).
<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 Lakes in GWB**

Termoncarragh Lake, Tawnytruffaun Lough, Srahlaghy Lough, Scardaun Lough, Polloor, Pollnagee, Polladarky, Loughs Gall, Lougherglass Loughaun-fiddaunbuntach, Loughaun, Lough Srahmeen, Lough Neamhbreachkeagh, Lough Naweeloge West, Lough Naweeloge, Lough Namuck, Lough Nambrock, Lough Nambrackkeagh, Lough Namackan, Lough Namachan, Lough Nahelly, Lough Naguroge, Lough Nagrumpaun, Lough Nabullaun, Lough Nabrock, Lough Morenateoran, Lough More, Lough Laur, Lough Kilnabinnia, Lough Glennamaddoo, Lough Gall, Lough Duff, Lough Drumderg, Lough Doo, Lough Dahybaun, Lough Cullylea, Lough Cullydoo, Lough Creive, Lough Cam, Lough Brack, Lough Boy, Lough Anaffrin, Lough Adanacleveen, Leam Lough Knockmoyle, Loughs Knockacorraun, Lough Killeena, Lough Drumslead, Drumnagawna Lough, Cross Lough, Corryloughaphuil Lough, Corranabinnia Lough, Carrowmore Lake, Altderg Lough.

Table 2. Rock units GWB

Rock unit name and code	Description	Rock unit group	Aquifer Classification
Achill Head Formation (AH)	Pelitic shists & psammitic wackes	Precambrian Quartzites, Gneisses & Schists	PI
Anaffrin Formation (AN)	Psammitic schists, quartzites	Precambrian Quartzites, Gneisses & Schists	PI
Annagh Division (undifferentiated) (HU)	Foliated orthogneisses.	Precambrian Quartzites, Gneisses & Schists	PI
Ashleam Bay Formation (AS)	Schists, marbles, quartzites	Precambrian Quartzites, Gneisses & Schists	PI
Ashleam Bridge Dolomitic Formation (AD)	Dolomitic marble, schists	Precambrian Marbles	PI
Ashleam Bridge Graphitic Member (AQgr)	Black graphitic pelitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
Ashleam Bridge Quartzite Formation (AQ)	Pebbly quartzites, black pelitic schists	Precambrian Quartzites, Gneisses & Schists	PI
Ashleam Head Formation (AP)	Quartzites, schists, chloritic metaulfs	Precambrian Quartzites, Gneisses & Schists	PI
Atlantic Drive Schist Formation (AT)	Schistose quartzites, schists	Precambrian Quartzites, Gneisses & Schists	PI
Aughernagallagh Quartzite Member (DNqa)	Quartzitic psammites with heavy minerals	Precambrian Quartzites, Gneisses & Schists	PI
Ballybeg Park Limestone Formation (BP)	Calcareous schists and marble.	Precambrian Marbles	PI
Bangor Church Banded Member (BKbc)	Banded schists.	Precambrian Quartzites, Gneisses & Schists	PI
Bangor Reservoir Dolomitic Schist Member (BKds)	Calcareous schists.	Precambrian Quartzites, Gneisses & Schists	PI
Bangor/Corslieve Formation (BC)	Banded, graded and X-bedded quartzites.	Precambrian Quartzites, Gneisses & Schists	PI
Belderg Formation (BG)	Banded and X-bedded psammitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
Bellagarvaun Formation (BE)	White X-laminated quartzites and pelites	Precambrian Quartzites, Gneisses & Schists	PI
Benmore Formation (BM)	Psammites with rare heavy mineral bands.	Precambrian Quartzites, Gneisses & Schists	PI
Benmore Formation/Broad Haven Formation (BM/BN)		Precambrian Quartzites, Gneisses & Schists	PI
Birreencorrah Quartzite Member (BHqz)	Quartzites, gritty quartzites, schists	Precambrian Quartzites, Gneisses & Schists	PI
Birreencorrah Schist Formation (BH)	Grey graphitic schists, grey quartzites	Precambrian Quartzites, Gneisses & Schists	PI
Briska Boulder Bed Formation (BK)	Tillites, quartzites and schists.	Precambrian Quartzites, Gneisses & Schists	PI
Broad Haven Formation (BN)	Monotonous massive to banded psammites.	Precambrian Quartzites, Gneisses & Schists	PI
Bunaveela Lough Formation (BV)	Mixed schists, minor basic metavolcanics	Precambrian Quartzites, Gneisses & Schists	PI
Carratull Member (BCcl)	Banded X-bedded psammitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
Corraun Quartzite Member (CNlq)	Pale quartzites, psammitic schists	Precambrian Quartzites, Gneisses & Schists	PI
Corraun Schist (Lower) Member (CNas)	Schists, chloritic basic metavolcanics	Precambrian Quartzites, Gneisses & Schists	PI
Corraun Schist (Upper) Member (CNbs)	Schist, calc-schist, metavolcanic tuffs	Precambrian Quartzites, Gneisses & Schists	PI
Cullydoo Formation (CS)	White quartzites, psammitic schists	Precambrian Quartzites, Gneisses & Schists	PI
Dolerite and Gabbro (D)	Dolerite & gabbro, commonly silica poor	Granites & other Igneous Intrusive rocks	PI
Doolough (per-alkaline) Granite Gneiss (HS)	Weakly foliated granite.	Precambrian Quartzites, Gneisses & Schists	PI
Doonamo Formation (DN)	Semi-pelitic and psammitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
Doon-na-Dell Schist Formation (DD)	Semi-pelitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
Downpatrick Formation (DK)	X-bedded sandstone and siltstone.	Dinantian (early) Sandstones, Shales and Limestones	PI
Felsite (F)	Felsite, lamprophyric?	Granites & other Igneous Intrusive rocks	PI
Glenagh River Limestone Member (PClr)	Grey micaceous marble and calc. schists.	Precambrian Marbles	PI
Glencairy Schist Member (PCsg)	Grey semi-pelitic mica-schists.	Precambrian Quartzites, Gneisses & Schists	PI
Glenullin River Formation (GL)	Red, pebbly sandstone with siltstone and mudstone.	Dinantian Sandstones	LI
Glenlara Volcanic Formation (GV)	Basic metavolcanics	Precambrian Quartzites, Gneisses & Schists	PI
Glennamong Member (ANgm)	Pelitic & semi-pelitic schists	Precambrian Quartzites, Gneisses & Schists	PI
Gubastuckaun Formation (IG)	Semi-pelitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
Inishderry Formation (IN)	Quartzites and calc. & graphitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
Inishkea Division (undifferentiated) (IK)	Semi-pelitic and psammitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
Inver Schist Formation (IS)	Graphitic, semi-pelitic schists & marble	Precambrian Quartzites, Gneisses & Schists	PI
Kanfina Formation (KA)	Quartzites, schists and marbles.	Precambrian Quartzites, Gneisses & Schists	PI
Killdownet Quartzite Member (CNuk)	Quartzites, basic metavolcanic tuffs	Precambrian Quartzites, Gneisses & Schists	PI
Kinrovar Schist (IR)	Pelitic & semi-pelitic schists	Precambrian Quartzites, Gneisses & Schists	PI
Knockcorraun Formation (KN)	Graphitic & calcareous schists	Precambrian Quartzites, Gneisses & Schists	PI
Knockcorraun Lough Marble Member (KNma)	Dolomitic marble, minor schists	Precambrian Marbles	PI
Lugnalettin Black Schist Member (PCbs)	Black graphitic pelitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
Maam Formation (MM)	Red sandstone, conglomerate & mudrock	Dinantian Sandstones	LI
Metadolerite (Md)	Intrusive metadolerite, often schistose	Precambrian Quartzites, Gneisses & Schists	PI
Metadolerite or amphibolite (H)	Intrusive metadolerite, often schistose	Precambrian Quartzites, Gneisses & Schists	PI
Mount Eagle Formation (ME)	Pale quartzites, pebbly grits	Precambrian Quartzites, Gneisses & Schists	PI
Nakil Formation (IL)	Semi-pelitic and psammitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
North Carrowgarve Formation (NC)	Aluminous pelitic schists	Precambrian Quartzites, Gneisses & Schists	PI
Old Road Member (ANrd)	Feldspatic pelitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
Oghnadarve Formation (OD)	Schists, melange with serpentinite	Cambrian Metasediments	PI
Owenmore Member (BCow)	Quartzites, psammitic & pelitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
Pollacappul Formation (PC)	Calc., graphitic semi-pelitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
Portnahally Formation (PO)	Quartzites, semi-pelitic schists	Precambrian Quartzites, Gneisses & Schists	PI
Scotch Port Schist (IP)	Semi-pelitic schists.	Precambrian Quartzites, Gneisses & Schists	PI
South Carrowgarve Formation (SC)	Schists, serpentinite melange	Cambrian Metasediments	PI
Sraheens Lough Formation (SR)	Psammitic & semi-pelitic schists	Precambrian Quartzites, Gneisses & Schists	PI
Srahlaghy Limestone Formation (SL)	Marble with calcareous schists.	Precambrian Marbles	PI
Srahlaghy Quartzite Formation (SY)	Massive pale-coloured quartzites.	Precambrian Quartzites, Gneisses & Schists	PI
Srahmore Lodge Dolomite Formation (SD)	Dolomitic marble, quartzites, schists	Precambrian Marbles	PI
Termon Granite (TeGr)		Granites & other Igneous Intrusive rocks	PI

