

*1<sup>st</sup> Draft Ballyshannon East GWB Description – August 2004*

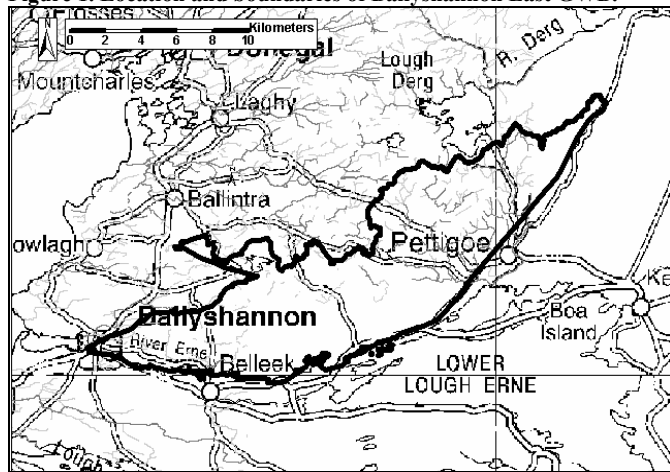
**Ballyshannon East GWB: Summary of Initial Characterisation.**

Hydrometric Area Local Authority	Associated surface water bodies	Associated terrestrial ecosystems	Area (km <sup>2</sup> )
Hydrometric Area 36  Donegal Co. Co.	<b>Rivers:</b> Crassowen, Garvary, Erne, Ominey, Termon, Two-Mile Water, Waterfoot. <b>Streams:</b> 166 unnamed streams. <b>Lakes:</b> Garvanagh, Aghafoy, Aghalough, Assaroe, Ballywara, Bannus, Black, Breen, Columbkille, Doo Upper, Drumgun, Knader, Acapple, Vearty, Wee, Acuppan, Afurnagh, Aghog, Aguse Beg, Aguse More, Anhim, Atarriff, Atierna, Avaddymore, Avehy, Awaddy, Ayellowin, Brandaneder, Cam, Fao, Fisla, Golagh, Kip, Laghtowen, Lareen, Lee, Meenasallagh, Meenaskeagh, Nabrackalan, Nabrackrawer, Nacragan, Nagolagh, Namna, Namnamurive, Nashanagh, Nasoogan, Navarn, Rushen, Sallagh, Ultan, Unan, Unshin, Loughanbane, Meenygorman, Tullyfascabeg, Tullynacross, Tullynasiddagh.	Lough Golagh and Breesy Hill and Tamur Bog (O’Riain, 2004)	147
<b>Topography</b>	This is an essentially curved GWB that is bounded by more productive aquifers to the northwest, south and east, and by topographic divides to the north (Hydrometric Areas 01 and 37). The landscape is flatter and low-lying on the northern shore of Lake Assaroe (40 mAOD) but becomes hilly moving northwards (160 AOD in the centre), with a maximum elevation of 180 mAOD in the northeast. There are a number of small to medium sized lakes in the area and surface water flows either southwards towards lake Assaroe in the southern half of the body, or eastwards in the northern half.		
<b>Geology and Aquifers</b>	<b>Aquifer type(s)</b>	The majority of the GWB (87%) comprises <b>PI</b> : Poor aquifer which is generally unproductive except for local zones. <b>Pu</b> : Poor aquifer, generally unproductive, is mainly located to the northeast of the body (c.8%) and approximately 3% is categorised as <b>LI</b> : Locally important aquifer, moderately productive only in local zones.	
	<b>Main aquifer lithologies</b>	Precambrian Quartzites, Gneisses & Schists underlie most (96.29%) of the GWB. Dinantian Lower Impure Limestones (1.63%) are found along the north boundary and thin bands of Dinantian (early) Sandstones, Shales and Limestones (c.1%) are located along the northern and southern boundaries. Refer to Table 1 for details.	
	<b>Key structures.</b>	There are approximately 30 faults within this GWB, which are all relatively short. The rocks are predominantly dipping to the northeast by 25-50°.	
	<b>Key properties</b>	Only one well yield is available for this GWB: 4.6 m <sup>3</sup> /d. Data are available for the adjacent South Donegal GWB, which comprise the same rocks. The 17 available yields range from 9-218 m <sup>3</sup> /d, with 12 yields <50 m <sup>3</sup> /d. In addition, 3 specific capacity values are available: 4.5, 4.8 and 28.4 m <sup>3</sup> /d/m. In general, transmissivities in these rocks are likely to be low although higher values may be achieved in faulted zones, especially in the coarser-grained rocks (quartzites and gneisses). Typical specific dry weather flows for the Precambrian rock group in Donegal are low (0.41-1.1 l/s/km <sup>2</sup> at 5 stations), indicating that this aquifer does not make a significant baseflow contribution to streamflow. Storativity is also expected to be low.  The single groundwater level available is 0.4 m below ground level. Given the low permeability of these rocks, groundwater gradients are expected to be relatively steep. <i>(Precambrian Aquifer Chapter; Dinantian Aquifer Chapters; Donegal GWPS)</i>	
	<b>Thickness</b>	Most groundwater flux is expected 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 m thick, and a zone of isolated poorly connected fissuring typically less than 150 m.	
<b>Overlying Strata</b>	<b>Lithologies</b>	The predominant subsoil type mapped in this GWB is peat (42%), with till covering just under 20%. No data are available for 20% of the GWB (N.I.)	
	<b>Thickness</b>	Rock outcrop/thin subsoil is mapped over a large proportion of this GWB. Thicker deposits (>3 m) are only located in the lower-lying eastern areas.	
	<b>% area aquifer near surface</b>	<i>[Information will be added at a later date]</i>	
	<b>Vulnerability</b>	From the Donegal GWPS, the vast majority of the GWB is categorised as Extremely vulnerable. The thicker till in the east results in a classification of High vulnerability.	
<b>Recharge</b>	<b>Main recharge mechanisms</b>	Diffuse recharge occurs via rainfall percolating through the thinner/more permeable subsoil and rock outcrops. Due to the low permeability of some subsoil deposits and the aquifers themselves, a high proportion of the effective rainfall will discharge to the streams in the GWB. Any steeper slopes will also promote runoff.	
	<b>Est. recharge rates</b>	<i>[Information will be added at a later date]</i>	

*1<sup>st</sup> Draft Ballyshannon East GWB Description – August 2004*

<b>Discharge</b>	<b>Important springs and high yielding wells</b>	Sources: None identified. Springs: None identified. Excellent Wells: None identified. Good Wells: Aghalough (182m <sup>3</sup> /d)
	<b>Main discharge mechanisms</b>	The main groundwater discharges are to the lakes, and rivers and streams crossing the GWB, reflecting short groundwater flow paths. Small springs and seeps are likely to issue at the stream heads and along their course. Groundwater may also flow into the adjacent, higher permeability (karstic) GWBs (Ballyshannon and Pettigo).
	<b>Hydrochemical Signature</b>	No data are available within this particular GWB. <i>National classification:</i> Precambrian Quartzites, Gneisses and Schists. Non-calcareous with bi-modal alkalinity distribution although the higher range is possibly caused by thin marble bands and overlying limestone subsoil. Alkalinity (mg/l as CaCO <sub>3</sub> ): range of 14-400; mean of 168 (41 ‘non limestone subsoils’ data points) Total Hardness (mg/l): range of 46-412; mean of 200 (39 ‘non limestone subsoils’ data points) Conductivity (µS/cm): range of 160-752; mean of 446 (45 ‘non limestone subsoils’ data points) <i>(Calcareous/Non calcareous classification of bedrock in the Republic of Ireland report)</i>
<b>Groundwater Flow Paths</b>		In the absence of inter-granular permeability, groundwater flow is expected to be concentrated in upper fractured and weathered zones and in the vicinity of fault zones. Unconfined flow paths are likely to be short (30-300 m), with groundwater discharging rapidly to nearby lakes, streams and small springs. Groundwater flow directions are expected to follow topography – predominantly southwards in the southern half of the GWB and in an easterly direction in the northern half.
<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 relatively low.
<b>Conceptual model</b>	<ul style="list-style-type: none"> <li>• More productive aquifers provide the north-western, southern and eastern boundaries of this GWB, whilst topographic divides constitute the northern boundary. The terrain is mainly hilly, although is lower-lying and flatter along the shores of lake Assaroe. Elevations range from 40 to 180 m AOD.</li> <li>• The GWB is composed of low transmissivity rocks. Most of the 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 typically less than 10 m; and a zone of isolated fissuring typically less than 150 m.</li> <li>• Recharge occurs diffusely through the thin/permeable subsoil and rock outcrops, although is limited by any thicker subsoil and the low permeability bedrock itself. Therefore, most of the effective rainfall is not expected to recharge the aquifers.</li> <li>• Flow paths are likely to be short (30-300 m) with groundwater discharging rapidly to the lakes and streams crossing the aquifer, and to small springs and seeps. Overall, the flow directions are expected to be to the south and east, as determined by the topography.</li> </ul>	
<b>Attachments</b>	Figure 1. Table 1.	
<b>Instrumentation</b>	<b>Stream gauges:</b> 36014, 36092, 36170. <b>EPA Water Level Monitoring boreholes:</b> None identified. <b>EPA Representative Monitoring points:</b> Don 44.	
<b>Information Sources</b>	Lee M. and Fitzsimons V. (2004). <i>County Donegal Groundwater Protection Scheme</i> . Main Report. Draft Report to Donegal County Council. Geological Survey of Ireland 58pp. Long, C.B. and McConnell (1999) <i>Geology of South Donegal: A geological description, to accompany bedrock geology 1:100,000 scale map, Sheet 3, South Donegal</i> . With contributions by G.I. Alsop, P. O’Connor, K. Carlingford and C. Cronin. Geological Survey of Ireland, 116pp. O’ Riain, G. 2004. <i>Water Dependent Ecosystems and Subtypes (Draft)</i> . Compass Informatics in association with National Parks and Wildlife (DEHLG). WFD support projects.	
<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	

**Figure 1. Location and boundaries of Ballyshannon East GWB.**



**Table 1. List of Rock units in Ballyshannon East GWB**

Rock Unit Name	Code	Description	Rock Unit Group	Aquifer Class.	% Area
Psammitic paragneiss	SWQ	Granoblastic quartzofeldspathic psammite	Precambrian Quartzites, Gneisses & Schists	Pl	87.79%
Croaghgarrow Formation	CW	Schist and aluminous schist	Precambrian Quartzites, Gneisses & Schists	Pu	6.25%
Semi-pelitic biotite schist	SWB	Biotite-muscovite-quartz-feldspar schist	Precambrian Quartzites, Gneisses & Schists	Pu	2.25%
Argillaceous limestones & calc. shales	BSag	Argillaceous limestones & calc. shales	Dinantian Lower Impure Limestones	Ll	1.63%
Basal sandstones	BSbc	limestones & shales	Dinantian (early) Sandstones, Shales and Limestones	Ll	0.96%
Ballyshannon Limestone Formation	BS	Pale grey calcarenite limestone	Dinantian Pure Bedded Limestones		0.77%
Keenaghan Shale Formation	KE	Micaceous shale, micrite, sandstone	UNKNOWN		0.31%