

*1<sup>st</sup> Draft Frosses GWB Description – July 2004*

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

Hydrometric Area Local Authority		Associated surface water features	Associated terrestrial ecosystem(s)	Area (km <sup>2</sup> )
Hydrometric Area 36 Donegal Co. Co.		<b>Rivers:</b> Eany Beg, Eany Water. <b>Lakes:</b> Glencoagh, St. Peter's.	None identified (O'Riain, 2004)	23
<b>Topography</b>		The Frosses GWB is surrounded by lower permeability aquifers, except for along a small proportion of the SW boundary, which comprises coastline. Elevations gently increase from <10 AOD at the coast in the southwest, to 150 mAOD in the northeast. Drumlins are a common feature in the north/northwest of the body and surface water generally flows in a south-westerly direction.		
<b>Geology and Aquifers</b>	<b>Aquifer categories</b>	This GWB is underlain by <b>Lm</b> : Locally important aquifer which is generally moderately productive.		
	<b>Main aquifer lithologies</b>	Dinantian Sandstones are the sole rock group in the GWB. Refer to Table 1 for details.		
	<b>Key structures</b>	The Mountcharles/Burns Faults delineate the south-eastern GWB boundary and the Eglisli Fault splits the body. The rocks are dipping to the southeast by c.5°.		
	<b>Key properties</b>	The dominant sandstone lithology of this GWB will generally results in a higher fissure permeability and therefore, the potential to have relatively high transmissivity values – in the order of 10-50 m <sup>2</sup> /d, although they may be higher in the vicinity of faults (c.100-150 m <sup>2</sup> /d). One specific capacity value is available – 22 m <sup>3</sup> /d/m, which falls within the range expected for this aquifer type. Storativity is also expected to be reasonable.  There are 8 groundwater water levels available, 7 of which are 0-10 m below ground level. Groundwater gradients cannot be calculated but are expected to be less steep than in the surrounding LI GWB.  <i>(Dinantian Sandstones Aquifer Chapter; Donegal GWPS)</i>		
	<b>Thickness</b>	Most groundwater flux is likely to be in the upper part of the aquifer, comprising three broad zones: broken and weathered rock, typically less than 3 m thick; interconnected fissuring up to 30-40 m thick; and a zone of isolated poorly connected fissuring typically less than 150 m. Two boreholes have water strikes of 43 and 55 m below rock head respectively, suggesting that the fissured network extends to at least c.40 m bgl. Fissure permeability is generally expected to be more developed in the top 20-30 m of fractured weathered rock and close to fault zones.		
<b>Overlying Strata</b>	<b>Lithologies</b>	Approximately two-thirds of the GWB is mapped as till subsoil, with a smaller proportion of peat (27%).		
	<b>Thickness</b>	The outcrop and borehole data indicate that subsoil is absent or thin over the central area of the GWB. The deposits generally increase in thickness toward the boundaries (>3 m) and are deepest in the southwest and northwest areas (limited extent of >10 m thick). Drumlins in the north and west constitute the deepest areas of subsoil.		
	<b>% area aquifer near surface</b>	<i>[Information will be added at a later date]</i>		
	<b>Vulnerability</b>	From the Donegal GWPS, the central proportion of the GWB is classed as Extremely vulnerable. The vulnerability rating is predominantly High and Moderate in the surrounding zone, with small areas of Low vulnerability in the north-western and south-western areas.		
<b>FsRecharge</b>	<b>Main recharge mechanisms</b>	Diffuse recharge occurs via rainfall percolating through the subsoil and rock outcrops. A proportion of the effective rainfall will discharge to the streams in the GWB, especially where thicker, low permeability subsoil is present (till or peat). In addition, the steep slopes of drumlins will promote surface runoff. The stream density, which is relatively high, is likely to reflect the coastal-zone nature of this body i.e. a discharge area, and influence of the lower permeability till.		
	<b>Est. recharge rates</b>	<i>[Information will be added at a later date]</i>		
<b>Discharge</b>	<b>Large springs and high yielding wells (m<sup>3</sup>/d)</b>	Springs: None identified. Excellent Wells: None identified. Good Wells: Mountcharles – 327 m <sup>3</sup> /d; Drumconor – 218 m <sup>3</sup> /d.		
	<b>Main discharge mechanisms</b>	The main groundwater discharges are to the streams, rivers and any springs within the GWB. Seepages will also develop on the small area of coastline. Given the higher transmissivities associated with Lm aquifers, the baseflow proportion of the total streamflow is expected to be higher in this GWB than for the adjacent LI GWBs.		

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<b>Hydrochemical Signature</b>	<p>There are minimal data available for this GWB.</p> <p><b>National classification:</b> Dinantian Sandstones          Calcareous. Generally Ca-HCO<sub>3</sub> signature.          Alkalinity (mg/l as CaCO<sub>3</sub>): range of 5-524; mean of 153 (65 ‘non limestone subsoils’ data points)          Total Hardness (mg/l): range of 5-502; mean of 162 (67 ‘non limestone subsoils’ data points)          Conductivity (μS/cm): range of 39-1184; mean of 408 (69 ‘non limestone subsoils’ data points)  <i>(Calcareous/Non calcareous classification of bedrock in the Republic of Ireland report)</i></p>
<b>Groundwater Flow Paths</b>	<p>In the absence of inter-granular permeability, groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. The water levels are mainly 0-10 mbgl. Groundwater flow is thought to be mainly unconfined and although regional scale i.e. long flow path lengths (up to 2000 m) would be expected, they are likely to be shorter in this zone of discharge (c.100-300 m). Overall, the flow direction will be south/south-westwards towards the coastline, as determined by topography.</p>
<b>Groundwater &amp; Surface water interactions</b>	<p>The main groundwater discharges are to the streams, rivers and any springs within the GWB. The baseflow proportion of the total streamflow is expected to be relatively high in this GWB as a) higher transmissivities are generally associated with Lm aquifers, and b) a large proportion of this GWB is likely to constitute a discharge zone.</p>
<b>Conceptual model</b>	<ul style="list-style-type: none"> <li>• The GWB is mainly bounded by differing types of aquifer. A small portion of the SW boundary is coastline. The topography ranges from gently sloping to hilly, with a small area of drumlins in the north/northwest. Elevations range from sea level to 150 mAOD.</li> <li>• The sole rock group in this body is Dinantian Sandstone, which is considered to have the potential for relatively high fissure permeability. Most of the unconfined groundwater flux is expected to be in the uppermost part of the aquifer comprising a broken and weathered zone typically less than 3m thick, a zone of interconnected fissuring typically less than 40m, and a zone of isolated fissuring typically less than 150m.</li> <li>• Transmissivity values are expected to be 10-50 m<sup>2</sup>/d although may be as high as 100-150 m<sup>2</sup>/d, especially in the vicinity of faults. Storativity is likely to be relatively good.</li> <li>• High fissure permeability aquifers can generally support regional scale flow systems. Long flow paths (e.g. 2000 m) can be expected although are likely to be shorter (100-300 m) as this GWB mainly constitutes a discharge area.</li> <li>• Recharge will occur diffusely through the thinner and/or more permeable subsoil and rock outcrops, although is limited by any thicker low permeability subsoil and bedrock.</li> <li>• The main discharges are to the streams, rivers and springs within the GWB, and seeps along the coastline. Overall, the flow direction is to the southwest, as determined by the topography.</li> </ul>
<b>Attachments</b>	Figure 1. Figure 2. Table 1.
<b>Instrumentation</b>	<p><b>Stream gauges:</b> 37072  <b>EPA Water Level Monitoring boreholes:</b> DON 039  <b>EPA Representative Monitoring points:</b> DON 25</p>
<b>Information Sources</b>	<p>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.</p> <p>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.</p> <p>O’ Riain, 2004. <i>Water Dependent Ecosystems and Subtypes (Draft)</i>. Compass Informatics in association with National Parks and Wildlife (DEHLG). WFD support projects.</p>
<b>Disclaimer</b>	<p>Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae.</p>

Figure 1. Location and boundaries of Frosses GWB

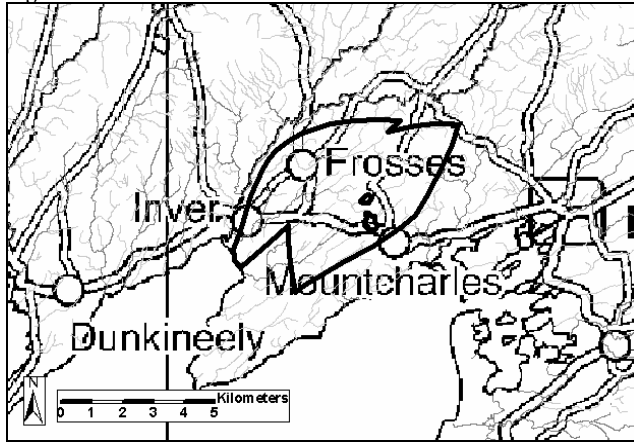


Table 1. List of Rock units in Frosses GWB

Rock unit name and code	Description	Rock unit group	Aquifer Classification
Mullaghmore Sandstone Formation	Sandstone, siltstone and shale	Dinantian Sandstones	Lm

Figure 2. Groundwater hydrographs (EPA Groundwater Level Monitoring)

