Tullaghan-Lough Melvin GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water bodies	Associated terrestrial ecosystems	Area (km^2)
Hydrometric Area 36 Donegal Co. Co. Leitrim Co. Co. Sligo Co. Co. NI	***Rivers:*** Drowes, Duff, Bradoge ***Streams*:** 101 unnamed streams. ***Lakes:*** Bunduff, Cloonty, Melvin, Brollagh.	Bunduff Lough and Machair; Trawalua; Mullaghmor (O'Riain, 2004)	76

Topography	This is a narrow, E-W elongated GWB, extending from east of Lough Melvin to Mullaghmore Head. The GWB is bounded by coastline to the northwest, Lough Melvin to the southeast, a topographic divide to the northeast (the Lough Erne/Melvin catchment divide), and less productive aquifers along the remainder of its borders. Elevations gently increase inland from <10 AOD at the coast to 110 mAOD along the north-eastern boundary and drumlins are over the eastern area. Surface water flows both westwards towards Lough Melvin in the eastern portion of the GWB, and northwards towards the coast in the western half of the GWB.	
Geology and Aquifers	**Aquifer type(s)**	This GWB is predominantly underlain by **Lm:** Locally important aquifer which is generally moderately productive, with a small proportion of **Ll:** Locally important aquifer, moderately productive only in local zones, in the nourtheast. (1%).
	Main aquifer lithologies	Dinantian Sandstones is the dominant rock group in the GWB (>99%). A small area (<1%) of Dinantian Shales and Limestones occurs in the northeast of the GWB. Refer to Table 1 for details.
	Key structures	The rock succession dips to the south by 5-10°. The GWB is delineated by a fault along its southwest boundary.
	Key properties	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^2/d, although they may be higher in the vicinity of faults (c.100-150 m^2/d). Discharge data are available for 5 wells – 109-196 m^3/d (averaging 153 m^3/d), which suggest that these rocks are capable of sustaining good yields. Storativity is also likely to be reasonably good. All of the 5 available groundwater water levels are 0-6 m below ground level. Groundwater gradients cannot be determined however, they are likely to be steeper in the Ll aquifers of the adjacent GWBs. *(Dinantian Sandstones Aquifer Chapter)*
	Thickness	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. Fissure permeability is generally expected to be more developed in the top 20-30 m of fractured weathered rock and close to fault zones.
Overlying Strata	**Lithologies**	There are no data available for the majority of the GWB (77% – NI and Leitrim), although the remaining is dominated by till (11%), with a small areas of sand and gravel (4%).
	Thickness	Although available borehole and outcrop data are limited, the subsoil in this GWB appears to be quite thick (>3 m), with the main zone of thinner or absent subsoil limited to the central area and along the coastline.
	% area aquifer near surface	*[Information will be added at a later date]*
	Vulnerability	No vulnerability maps are available for NI, Leitrim or Sligo. The small proportion of the GWB within County Donegal (c.4%) is mapped as Extreme or High vulnerability.
Recharge	**Main recharge mechanisms**	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 low permeability subsoil is present some tills or peat). In addition, the steep slopes of drumlins in the east will promote surface runoff. The stream density is relatively low, especially given that it is likely to be influenced by its function as a discharge area (coastal zone and surrounding the lake).
	Est. recharge rates	*[Information will be added at a later date]*
Discharge	**Important springs and high yielding wells**	***Sources:*** None identified. ***Springs:*** None identified. ***Excellent Wells:*** None identified. ***Good Wells:*** Bunduff (196 m^3/d (2), 109 m^3/d). Kinlough (109 m^3/d, 152 m^3/d).
	Main discharge mechanisms	The main groundwater discharges are to the streams, rivers, Lough Melvin and any springs within the GWB. Discharge will also occur along the 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 Ll GWBs.

	Hydrochemical Signature	There are minimal data available for this GWB. ***National classification:*** Dinantian Sandstones Calcareous. Generally Ca-HCO_3 signature. Alkalinity (mg/l as $CaCO_3$): 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) *(Calcareous/Non calcareous classification of bedrock in the Republic of Ireland report)*
Groundwater Flow Paths		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 level data are 0-6 mbgl. Groundwater flow is thought to be unconfined and of a regional scale i.e. long flow path lengths (up to 2000 m) would be expected although are likely to be shorter in discharge areas (c.100-300 m). Overall, the flow direction will be west to north-westwards, to eventually discharge at the coast.
Groundwater & surface water interactions		The main groundwater discharges are to the streams, rivers, Lough Melvin 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.
Conceptual model		• The northwest GWB boundary comprises coastline, the southeast boundary is Lough Melvin and the northeast boundary is a topographic divide. The remainder of the GWB is bounded by differing types of aquifer. The topography ranges from gently sloping to drumlin-dominated landscape, with elevations ranging from sea level to 110 mAOD. • The predominant rock group in this body is Dinantian Sandstone (>99%), 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 3 m thick, a zone of interconnected fissuring typically less than 30-40 m, and a zone of isolated fissuring typically less than 150 m. • Transmissivity values are expected to be 10-50 m^2/d although may be as high as 100-150 m^2/d, especially in the vicinity of faults. Storativity is likely to be relatively good. • 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 is discharge areas (100-300 m). • 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. • The main discharges are to the streams, rivers and lakes within the GWB, and seeps along the coastline. Overall, the flow direction is towards the coast (north and north-westwards).
Attachments		Figure 1. Figure 2. Table 1.
Instrumentation		**Stream gauges:** 35013, 35021, 35027, 35029, 35050, 35071. **EPA Water Level Monitoring boreholes:** (LEI 064) **EPA Representative Monitoring points:** (LEI 44)
Information Sources		MacDermot, C.V. Long C.B. and Harney S.J (1996) *Geology of Sligo-Leitrim: A geological description of Sligo, Leitrim and adjoining parts of Cavan, Fermanagh, Mayo and Roscommon, to accompany bedrock geology 1:100,000 scale map, Sheet 7, Sligo - Leitrim*. With contributions from K. Carlingbold, G. Stanley, D. Daly and R. Meehan. Geological Survey of Ireland, 100pp. O' Riain, 2004. *Water Dependent Ecosystems and Subtypes (Draft)*. Compass Informatics in association with National Parks and Wildlife (DEHLG). WFD support projects.
Disclaimer		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 Tullaghan-Lough Melvin GWB.

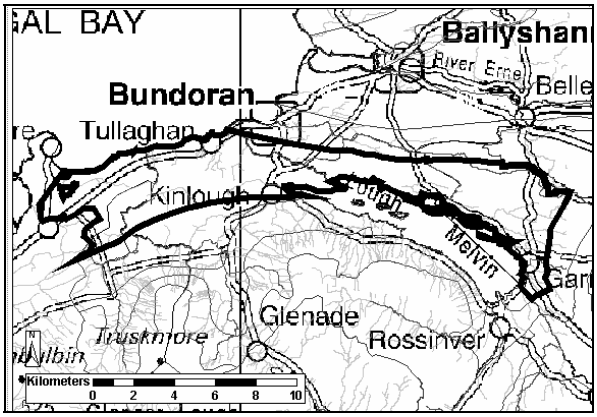

Table 1. List of Rock units in Tullaghan-Lough Melvin GWB (RoI data)

Rock unit name and code	Description	Rock unit group	Aquifer Classification	% Area
Mullaghmore Sandstone Formation (MU)	Sandstone, siltstone and shale	Dinantian Sandstones	Lm	99.38
Bundoran Shale Formation	Dark shale, minor fine-grained limestone	Dinantian Shales and Sandstones	Ll	0.62

Figure 2. Groundwater hydrographs (EPA Groundwater Level Monitoring)