Drumcliff-Strandhill GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km^2)
35 Sligo / Leitrim Co. Co.	Rivers: Drumcliff, Diffreen, Grange, Carney. Streams: Wilsborough. Lakes: Glencar.	Benbulben, Gleniff and Glenade Complex (000623), Cummeen Strand / Drumcliff Bay (000627), Ballysadare Bay (000622) (O'Riain, 2004).	94

Topography	The GWB occupies an area from the Benbulben to Drumcliff, to Sligo and Strandhill. The GWB includes the area around Strandhill due to its proximity and similarity to the main GWB. The topography is varied: the northern part of the GWB occupies the northern, western and southern flanks of Benbulben; the centre is occupied by Glencar valley and the rounded hills of Crockauns; and the southern part is occupied by an undulating land surface sloping toward Sligo Bay. Elevations range from sea level to 400 mAOD. The GWB is bound almost entirely by karst aquifers. The coastline bounds the GWB in the area of Strandhill. Figure 1 shows the boundaries and location of the GWB.	
Geology and Aquifers	**Aquifer categories**	**Ll:** Locally important aquifer, moderately productive only in local zones. **Lm:** Locally important aquifer, generally moderately productive (approximately 12 km^2).
	Main aquifer lithologies	Dinantian Upper Impure Limestones, Dinantian Shales and Limestones, Dinantian Sandstones. Table 1 provides a list of rock units in the GWB.
	Key structures	The northern half of the GWB is located in the Rosses Point-Cuilcagh-Manorhamilton Fault Zone. A NNE-SSW fault bounds the GWB to the west. The beds are dipping at 5^o, mainly to the east and strike is parallel to the boundaries of the GWB. The structural trend is E-W to NE-SW in the southern half of the GWB.
	Key properties	There are no karst features recorded in the limestones, however, there is limited karstification expected within these rocks. There are no hydrogeological data specific to the GWB. Transmissivities are expected to be low, in the range of 2-15 m^2/d., however, in the vicinity of faults, transmissivity may be higher. Storativity is expected to be low (<0.5%). The gradients are expected to be greater than 0.005. In general, Dinantian Sandstones, given their dominant sandstone lithology, which generally results in a higher fissure permeability, has the potential to be a transmissive aquifer. There is a reported artesian borehole, which suggests confining conditions exist locally, however, there is no further information available for this borehole. In the vicinity of faults, transmissivity may be higher. Storativity in the aquifer is expected to be relatively high, in the order of 2%. Water levels are generally 0-5 m below ground level across the GWB.
	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. In the sandstones the zone of interconnected fissuring is expected to be up to 40 m thick.
Overlying Strata	**Lithologies**	Till is the dominant subsoil over most of the GWB, however there are areas of blanket peat and cutover peat occupying the upland areas. Data is limited for the area of the GWB located in County Leitrim.
	Thickness	Depth to bedrock data are sparse. Thicknesses of greater than 10 m are recorded in the lower lying areas, whilst rock outcrops occur in the upland areas.
	% area aquifer near surface	*[Information to be added at a later date]*
	Vulnerability	*[Information to be added at a later date]*
Recharge	**Main recharge mechanisms**	Diffuse recharge occurs via rainfall percolating through permeable subsoil and rock outcrops. Due to the low permeability of the aquifers, a high proportion of the available recharge will discharge to the streams. The stream density is relatively high suggesting high runoff. The steep slopes in the mountainous areas promote surface runoff.
	Est. recharge rates	*[Information to be added at a later date]*
Discharge	**Large springs and high yielding wells (m^3/d)**	None identified
	Main discharge mechanisms	The main discharges are to small springs, streams, rivers, Glencar and to the coast. 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.

	Hydrochemical Signature	There are limited data within this particular GWB [n=11 Dinantian Upper Impure Limestones and n=15 for Dinantian Sandstones]. It has a $CaHCO_3$ signature as can been seen from the expanded Durov Plot given in Figure 2. Dinantian Upper Impure Bedded Limestones Alkalinity (mg/l as $CaCO_3$): range 116-136, median 122. Total Hardness (mg/l): range 118-168, median 138 (slightly hard). Conductivity (μS/cm): range 289-320, median 308. Dinantian Sandstones Alkalinity (mg/l as $CaCO_3$): range 186-222, median 203. Total Hardness (mg/l): range 194-232, median 220 (moderately hard). Conductivity (μS/cm): range 446-511, median 481.
Groundwater Flow Paths		Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. Flow paths are generally up to 2000 m in the Dinantian Sandstones, however, the sandstones occupy a relatively thin band (approximately 1 km wide) sandwiched between the less transmissive limestones, thus flow paths are expected to be relatively short. Generally, water levels are 0-5 m below ground level. Flow paths are likely to be up to 300 m within the Dinantian Upper Impure Limestones, with groundwater discharging rapidly to nearby streams and small springs. Groundwater flow directions are expected to follow topography, generally toward the coast.
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		• The GWB occupies an area from the Benbulben to Drumcliff, to Sligo and Strandhill. The GWB includes the area around Strandhill due to its proximity and similarity to the main GWB. The topography is varied: the northern part of the GWB occupies the northern, western and southern flanks of Benbulben; the centre is occupied by Glencar valley and the rounded hills of Crockauns; and the southern part is occupied by an undulating land surface sloping toward Sligo Bay. Elevations range from sea level to 400 mAOD. • The GWB is bound almost entirely by karst aquifers. The coastline bounds the GWB in the area of Strandhill. • The GWB is composed primarily of low transmissivity rocks. Most of the groundwater flux is likely to be in the uppermost part of the aquifer. • Storativity is expected to be low (<0.5%) in the limestones and up to 2% in the sandstones. 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 and the low permeability bedrock, thus most of the available recharge discharges rapidly to nearby streams and small springs. Steep slopes of the mountainous areas promote surface runoff. • Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. Generally, water levels are 0-5 m below ground level. Flow paths are likely to be up to 300 m in the limestones, with groundwater discharging rapidly to nearby streams and small springs. The overall flow direction is to the west. • The rock units in GWB are generally of low permeability and baseflow to rivers and streams is likely to be relatively low.

Attachments	Table 1, Figure 1 and 2.
Instrumentation	**Stream gauges:** 35018, 35025. **EPA Water Level Monitoring boreholes:** (SLI 032). **EPA Representative Monitoring points:** (SLI 003), (SLI 010).
Information Sources	Daly, E. (1975) *Report on the groundwater potential of the area around Sligo town*. Geological Survey of Ireland. 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.* Geological Survey of Ireland, Dinantian Sandstones and Dinantian Pure Bedded Limestone Aquifer Chapters. Unpublished. O' Riain, G., (2004). *Water Dependent Ecosystems and Subtypes Draft Report.* WFD Support Projects. Compass Informatics in association with National Wildlife and Parks Service (DEHLG).
Disclaimer	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. List of Rock units in GWB

StratCode	UnitName	Description	RockUnit	Aquifer Class
BB	Benbulben Shale Formation	Calcareous shale with minor calcarenite	Dinantian Shales and Limestones	Ll
BN	Bundoran Shale Formation	Dark shale, minor fine-grained limestone	Dinantian Shales and Limestones	Ll
GC	Glencar Limestone Formation	Dark fine limestone & calcareous shale	Dinantian Upper Impure Limestones	Ll
MU	Mullaghmore Sandstone Formation	Sandstone, siltstone & shale	Dinantian Sandstones	Lm

Figure 1 Location and boundaries of GWB

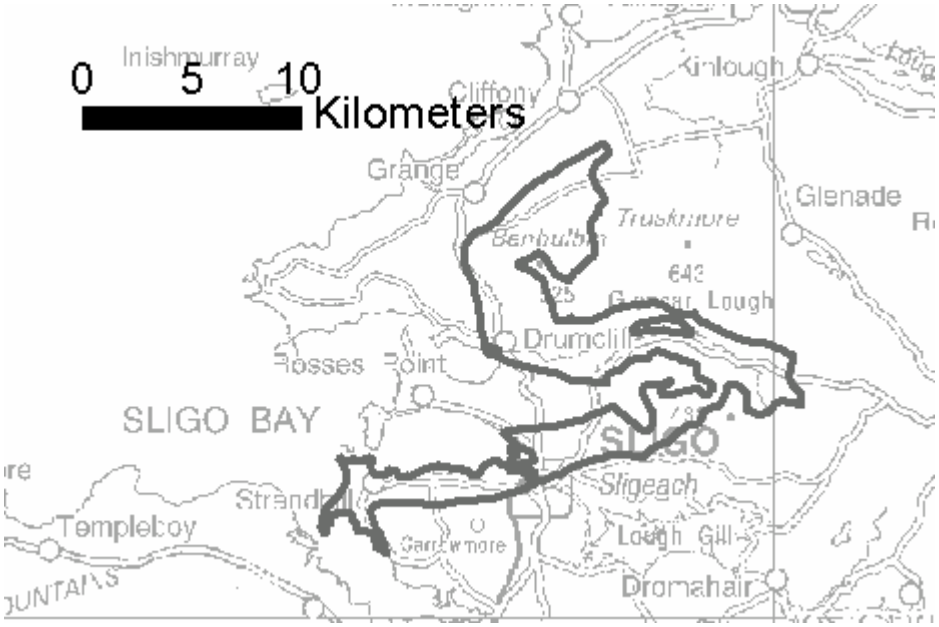

Figure 2