Bredagh West GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water bodies	Associated terrestrial ecosystem(s)	Area (km^2)
25 - Little Brosna Catchment Offaly Co. Co.	Rivers: Camcor, Breaghmore, Bunow. Streams: Clareen, Golden Grove.	-	20

Topography	This groundwater body is located at the base of the southwestern slopes of Slieve Bloom. Where the rock unit is at or close to the ground surface, it is a narrow strip that occupies the southwestern quarter around the uplands. The northern boundary is defined by a surface water catchment. The western, eastern and southern boundaries are formed by the contact with lower transmissivity bedrock. Elevations generally range from 120 to 210 mAOD and decrease away from Slieve Bloom. There is a break in slope located within the area of the body from mountainous to lowland topography. In the centre part of the GWB, elevations reach 318 mAOD. Some of the rivers flowing off the uplands have incised valleys into the rocks. The GWB is the southwards continuation of the Clonaslee GWB aquifer.	
Geology and Aquifers	Aquifer categories	**Rf:** Regionally important fissured aquifer.
	Main aquifer lithologies	Kiltorcan-type Sandstones.
	Key structures	The strata form the limbs of a large anticlinal fold, whose core forms Slieve Bloom. The rock layers dip from northwest- to southwest-wards at 10–20°. North-south faults are frequent in the area. There are two sets of major vertical joints – NW-SE and NE-SW – and horizontal fractures can be recognised in most exposures. Microfractures are present in many exposures and are frequently closely spaced (≤0.2m). These fractures can give exposures a blocky appearance.
	Key properties	Transmissivity 20 to 90 m^2/d. Storativity = 8.4 x 10^{-4}. Gradients in the upland areas are as high as 0.09. In the lower-lying areas, gradients are approximately 0.02 (Daly, 1988). *(data sources: Rock Unit Group Aquifer Chapters, GWPS Reports, see references)*
	Thickness	The rock unit varies in maximum thickness from 70 to 105m. The effective thickness of this aquifer is likely to include the whole interval.
Overlying Strata	Lithologies	The lithology of the subsoil varies with the elevation. There is peat and Devonian Sandstone Till on the elevated slopes of the mountains, and Limestone Till lower down. *[More information to be added at a later date]*
	Thickness	Subsoils range in thickness from a few metres to more than 20 m; they are thicker lower down the slopes. Rock outcrops are limited to small isolated areas and along stream courses.
	% area aquifer near surface	*[Information to be added at a later date]*
	Vulnerability	Vulnerability is variable over this groundwater body. Vulnerability is predominantly High. On the upland slopes in the northern half of the GWB, groundwater vulnerability is Extreme. Extreme vulnerability in the southern half of the GWB is limited to small patches.
Recharge	Main recharge mechanisms	Most recharge takes place where the overburden is less than 5m thick or where sands and gravels exist.
	Est. recharge rates	*[Information to be added at a later date]*
Discharge	Springs and large known abstractions (m^3/d)	*[Information to be added at a later date]*
	Main discharge mechanisms	Groundwater will discharge to the rivers crossing the aquifer, where the subsoil is not too thick to prevent this. There is some evidence of springs within the lower section of the sandstones (e.g. St. Brigit's Well at Rosenallis), implying that recharge is being rejected by the lower permeability layers (Barber 1979).
	Hydrochemical Signature	No hydrochemical data are available for assessment for this GWB. Samples taken during the pumping tests on the production wells at Clonaslee indicate hard groundwater. There, alkalinity is moderate to moderately high (180–270 mg/l $CaCO_3$), groundwater conductivity generally ranges from 500–600 µS/cm and laboratory pH is neutral (7.2-7.4). The Hydrochemical signature is calcium-bicarbonate. The hydrogeological setting would imply that softer water would be more typical of these strata. However, the subsoil comprises limestone till which would supply the calcium carbonate in the system. The bedrock layers of this groundwater body are mainly **siliceous** (although there may be a $CaCO_3$ cement in parts of the unit).

Groundwater Flow Paths	The fissuring associated with faults results in higher transmissivities, specific capacities and yields for some wells. However the degree of fracturing and consequently development of permeability can vary over relatively short distances. In certain areas the rock cement has been dissolved and so the rock is crumbly and easily weathered. Here it may have intergranular permeability - a feature that is very unusual in Irish bedrock. The general groundwater flow direction is naturally downhill (north and northwest) radiating from the peak of the Slieve Bloom Mountains. The groundwater flow is initially unconfined but, as it travels below thickening subsoils and then underneath the Lower Limestone Shales, it becomes confined. The hydrogeology of the Clonaslee Sandstone has been studied and described by E.P. Daly (Daly 1985; Daly, 1988). He suggests a subdivision into four zones, with different hydraulic and flow characteristics. This is summarised on Figure 1.
Groundwater & Surface water interactions	Springs in the lower parts of the rock unit discharge groundwater to surface. The rivers crossing the aquifer in areas where the subsoil is not too thick are gaining. This aquifer, although narrow, is capable of supplying significant baseflows to surface water channels.
Conceptual model	• The groundwater body is bounded on the uphill and downhill sides by lower transmissivity rocks and to the north and east by the Little Brosna catchment boundary. The topography is hilly, with a generally consistent slope from the uplands to lower ground. • The groundwater body is comprised of high transmissivity fissured bedrock. • Flow occurs along fractures, joints and major faults. In certain areas the rock cement has been dissolved, so the rock is crumbly and easily weathered. Here it may have intergranular permeability. The major faults may compartmentalise the aquifer in certain situations. • Recharge occurs particularly in the upland areas where rock outcrops, or subsoils are thin. • Depending upon topography, the water table can vary between a few metres up to 20 m below ground surface. The aquifer becomes confined where it passes under the Lower Limestone Shales rock unit, or under thick low permeability tills, and wells are artesian. Groundwater flow follows topography, radiating west and southwards outwards from Slieve Bloom. Flow path lengths in the upland areas are short (≤ 300 m). Confined flow path lengths are considerably longer, and flow will be slow. • Groundwater discharges to the small springs, streams emerging mid-way down the slopes, and near the contact with the overlying impure limestones. Groundwater may also discharge from depth, by flowing upwards along fault zones.
Attachments	Schematic representation of groundwater movement (Figure 1), Hydrochemical signature (Figure 2).
Instrumentation	None
Information Sources	Barber, W. (1979) *Evaluation of Groundwater Resources of the Clonaslee Area Co. Offaly.* Geoex Limited. Daly, D., Cronin, C., Coxon, C. and Burns, S-J (1998) *County Offaly Groundwater Protection Scheme.* Geological Survey of Ireland Report to Offaly Co. Co., 54 pp. Daly, E.P. (1988) The Kiltorcan Sandstone Aquifer. Proceedings of *Eighth Annual International Association of Hydrogeologists (Irish Branch) Seminar, Portlaoise.* Daly, E.P. (1985*). Hydrogeology of the Kiltorcan Aquifer System.* Groundwater Section, GSI Internal Report. Aquifer chapter: Devonian Kiltocan-type Sandstone.
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: Schematic representation of groundwater movement in the Clonaslee Sandstone aquifer system (after E.P. Daly, 1988)

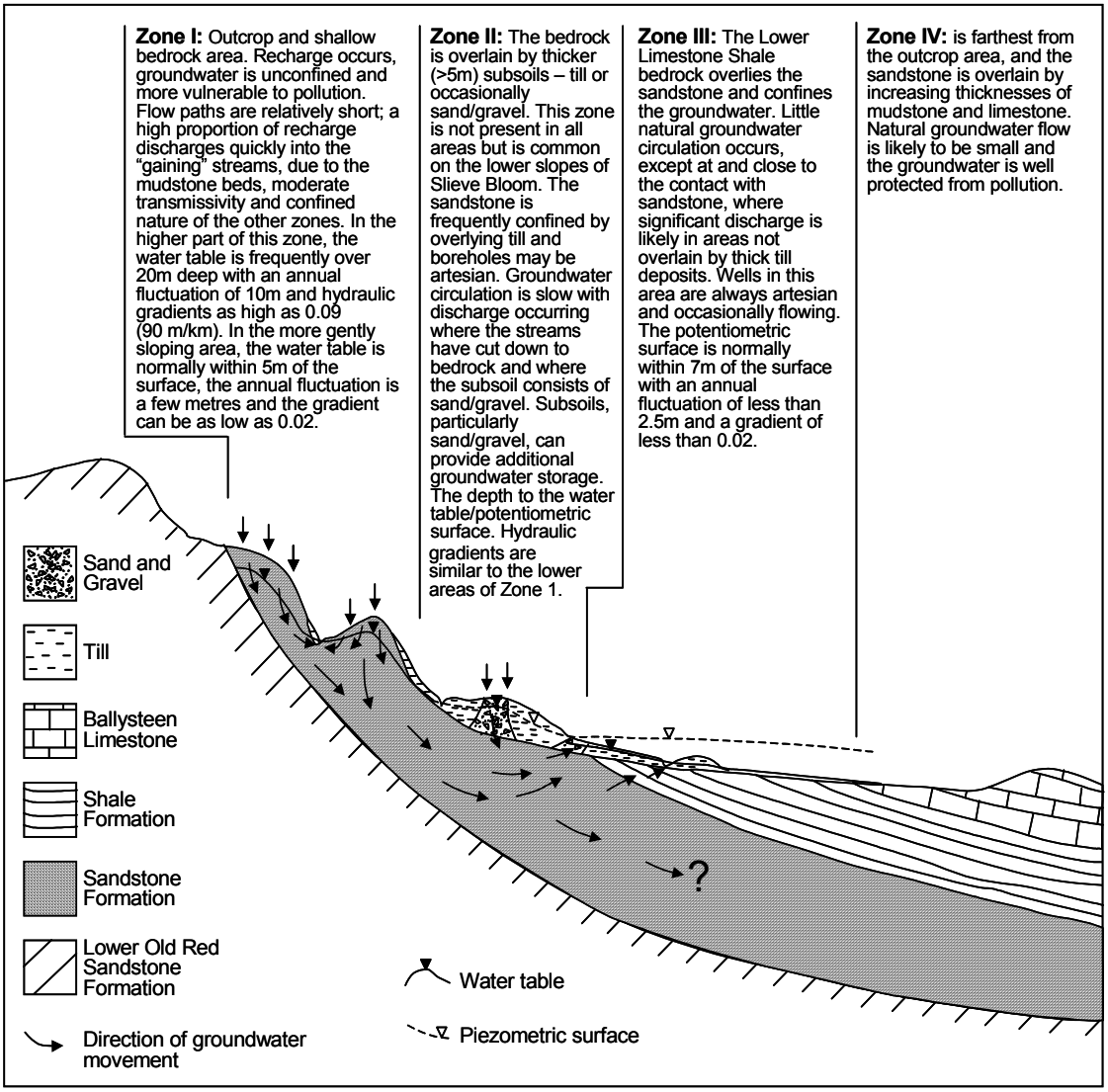
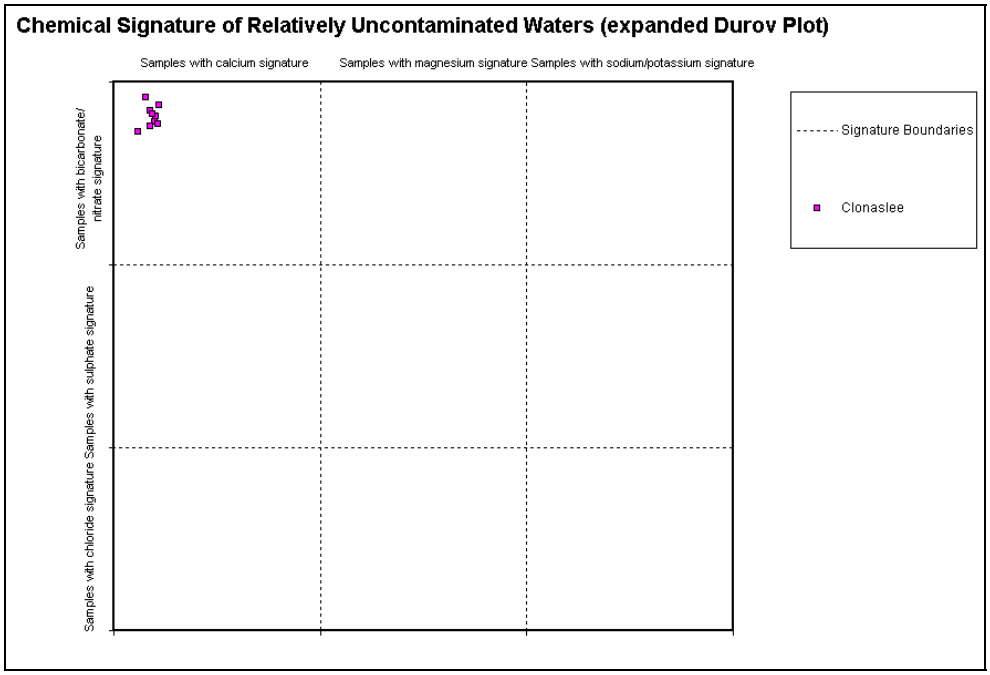
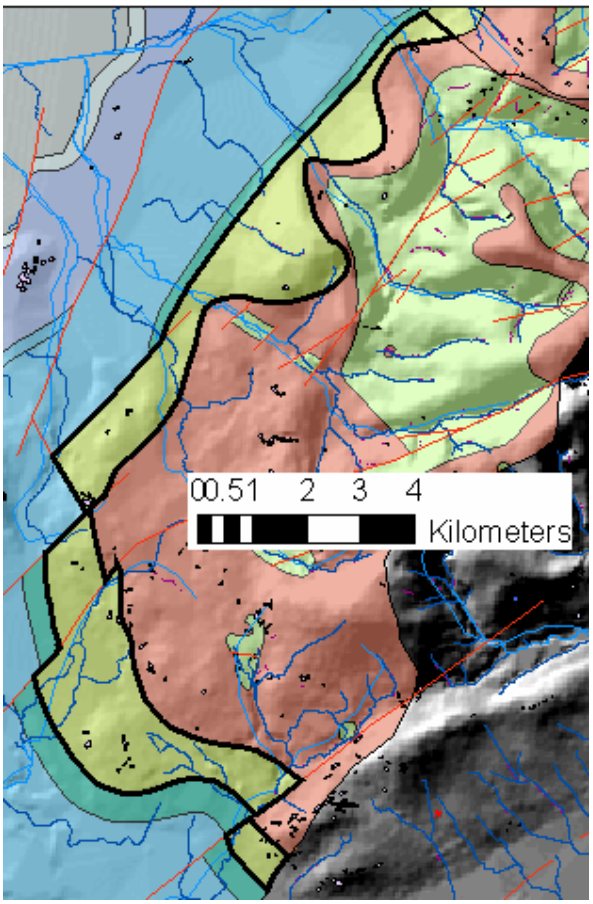


Figure 2: Hydrochemical signature



NB: These data are from the adjacent Clonaslee GWB.



Rock units in GWB

Rock unit name and code	Description	Rock unit group
Clonaslee Sandstone Member (CWcl)		Kiltorcan-type Sandstones