Kilmeedy GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km^2)
24 - Deel Limerick Co. Co.	Streams: Gortnahown and other tributaries to the Deel.	None groundwater-dependent.	19.2

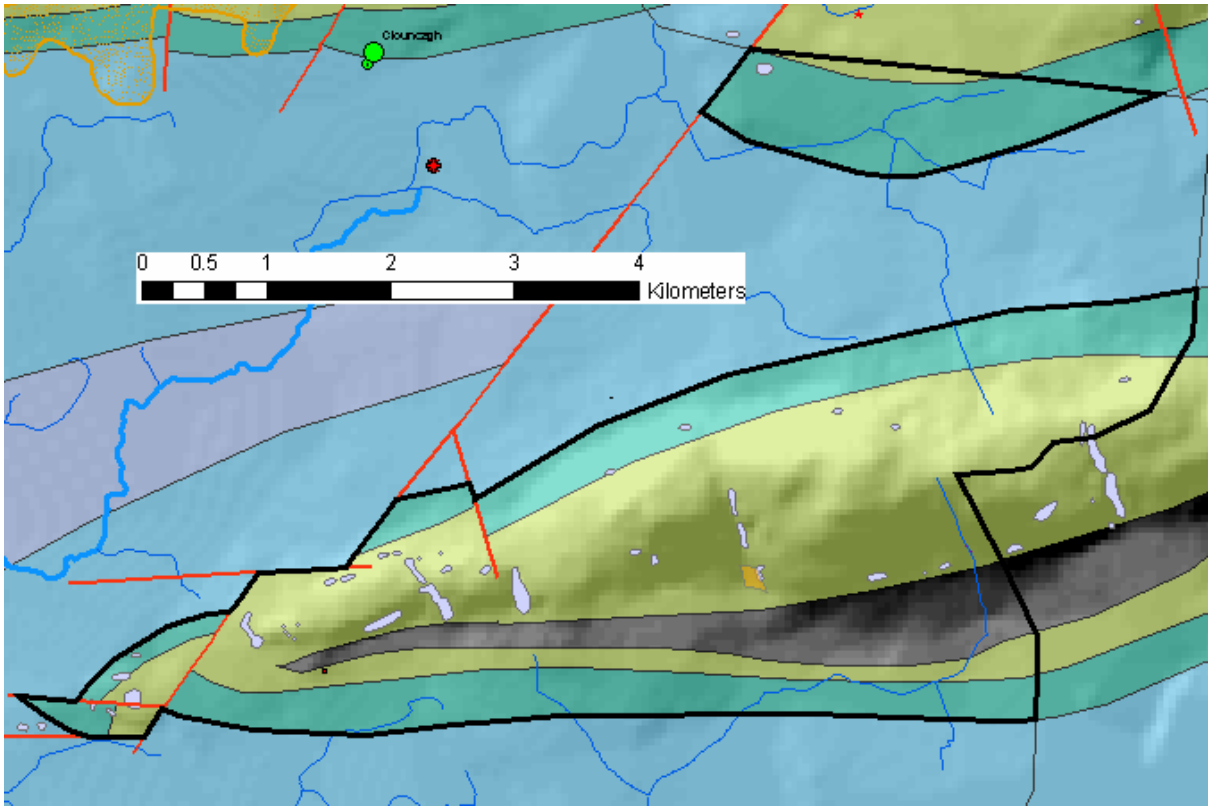
Topography	The GWB has a slightly complex shape: the main part of it is elongated in an ENE-WSW direction along a slightly elevated ridge. There is a smaller part of the GWB that is separated on the ground surface from the main part. However, these parts are connected underground and act as one hydrogeological unit. The highest elevation on the main ridge is at Corronoher, where an elevation of 273 mAOD is reached. The ground elevation decreases towards the margins of the GWB (i.e., north-, west- and southwards), where ground heights are around 70-100 mAOD. Streams generally flow off the lower elevations of the GWB where they ultimately drain into the River Deel. The higher areas are generally well drained; drainage ditches are present in the flatter parts of the area.	
Geology and Aquifers	Aquifer categories	The majority of the GWB comprises **Rf**: Regionally important fissured bedrock aquifer. There are small areas along the ridges underlain by Devonian Old Red Sandstone that are **Ll**: Locally important bedrock aquifer which is moderately productive only in local zones.
	Main aquifer lithologies	Kiltorcan-type Sandstone is the dominant rock unit group in this GWB. Dinantian (early) Sandstones, Limestones and Shales fringe the GWB, whilst there is a small area of Devonian Old Red Sandstone in the centre of the GWB, just to the south of the ridge.
	Key structures	The ridge is formed by the core of an anticlinal fold that is oriented ENE-WSW. The younger rocks of the Dinantian (early) Sandstones, Limestones and Shales rock unit group occupy the lower ground around the ridge. Major faults trending N-S, NE-SW and NW-SE cross-cut and displace the fold axes and disrupt the continuity of the rock units. There are also faults parallel to the fold axes. Deformation during the folding caused fracturing and jointing of the rocks, especially in the sandstone layers. The Devonian Old Red Sandstone in small areas along the ridges is harder and less fractured than in the bulk of the GWB
	Key properties	The transmissivity in this rock unit group generally ranges from 40 to 100 m^2/d. At Kilcolman WS in the Knockaderry GWB just to the north, a pumping test on the borehole provided transmissivities in the range 111–197 m^2/d with 154 m^2/d being the best estimate. At Clouncagh WS, also in Knockaderry GWB, analysis of the pumping test data gave a range of transmissivity values from 42–150 m^2/d, with a best estimate of 68 m^2/d. In these rocks, the specific yield is normally about 2%, but near the surface it can be as high as 5%. Groundwater gradients from the higher areas to the river valley are estimated to be approximately 0.04. *(data sources: Rock Unit Group Aquifer Chapters, Limerick GWPS and Source Reports, see references; estimation from maps)*
	Thickness	The effective thickness of this aquifer is up to 200 m (i.e. the entire thickness of the rock unit groups forming the GWB). The upper 10 m may be more weathered and transmissive than the bulk of the aquifer. It becomes confined where it passes underneath the Ballysteen Formation (Dinantian Lower Impure Limestones) and the upper, muddy, parts of the Dinantian (early) Sandstones, Limestones and Shales (the Ringmoylan Shales).
Overlying Strata	Lithologies	Limestone Till and Till with Gravel.
	Thickness	There are few data to assess subsoil thickness variation over the GWB. Outcropping rock occurs along the central ridge of the main part of the GWB. Subsoils are thin (2-4 m) in the very western part. In the area surrounding the GWB (the Feenagh GWB), subsoils thicknesses are variable but can be considerable, ranging from 6 m to more than 50 m.
	% area aquifer near surface	*[Information to be added at a later date]*
	Vulnerability	Over the main part of the GWB, groundwater vulnerability is predominantly Extreme or High. Extremely vulnerable areas occur mainly along the ridge. Along the lower flanks of the ridge, vulnerability is Moderate or Low, in the main. Over the small separated part of the GWB, vulnerability is High.
Recharge	Main recharge mechanisms	Diffuse recharge will occur over most of the GWB via rainfall soaking through the subsoil and directly into outcropping rock. It will occur most readily where rock is close to surface and will be inhibited in areas where subsoils are thick and of low permeability. A percentage of rainfall will not recharge the aquifer, but will runoff.
	Est. recharge rates	*[Information to be added at a later date]*
Discharge	Important springs and high yielding wells (m^3/d)	No High yielding springs are known in this GWB. A borehole at Glenwilliam Creamery that is thought to be drilled through the low transmissivity confining rocks of the Feenagh GWB is capable of yielding 385 m^3/d (GSI 'Good' yield). A borehole supplying Kilmeedy GWB abstracts 70 m^3/d (EPA database).
	Main discharge mechanisms	There are several streams crossing the GWB that will be gaining. The streams start as springs which mainly emanate mid-way down the ridge slope.
	Hydrochemical Signature	Hydrochemical analyses of groundwater from this aquifer type in the adjacent GWBs indicate a Moderately Hard to Hard water (240–290 mg/l $CaCO_3$), with moderate to moderately high alkalinity (220–270 mg/l $CaCO_3$). The conductivities are variable although generally range from 500–700 µS/cm. The hydrochemical signature is calcium-bicarbonate.

Groundwater Flow Paths	The rocks are devoid of intergranular permeability; groundwater flow occurs in fractures and faults. The fissuring associated with faults results in higher transmissivities, specific capacities and yields for some wells. The sandier units (at the top of the ORS and the base of Dinantian (early) Sandstones, Limestones and Shales) are more prone to fracturing. 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 folding of the rock units renders the aquifer both confined and unconfined; groundwater flow is initially unconfined but, as it travels below thickening subsoils and then underneath the Dinantian Lower Impure Limestones (the Ballysteen Formation), it becomes confined. Water levels vary depending on topography, ranging from near-surface to depths of over 20 m. Artesian supplies may be obtained where boreholes penetrate the aquifer through the confining shaley beds of the overlying formations, or where subsoils are particularly thick and of low permeability. Confined groundwater circulating at depth may discharge to the surface via large faults. Impermeable fault zones may also retard circulation, however, by isolating all or part of an aquifer block from another, or by isolating the recharge area from the deepest parts of the formation. The general groundwater flow direction is naturally downhill radiating outwards north-, south- and westwards from the high ground along the ridges.
Groundwater & Surface water interactions	Drainage on higher ground is good and there are no drainage ditches. Springs occurring on the hills slopes drain into the local streams. The larger streams crossing the GWB are considered to be in at least partial hydraulic continuity with the aquifer and gaining baseflow from the aquifer. Deakin (1995) considers that many of the small springs, rises and isolated ponds in the area are likely to be sourced from perched groundwater meaning that, in these areas, interaction between surface and groundwaters will be rapid.

Conceptual model

- The GWB comprises two areas that are discontinuous at the surface, but are hydraulically connected underground. The main, southern, part is elongated ENE-WSW, along a slightly elevated ridge. It is bounded on the north, west and south by the contact with the surrounding Dinantian Lower Impure Limestone (Ballysteen Limestone), under which the aquifer becomes confined. The upper units of the LLS (the Ringmoylan Shales - unmapped as a separate unit in this area) also confine the aquifer. The smaller area is bounded in a similar way on its southern margin. The eastern boundaries of both areas are surface water catchment divides that are implied groundwater highs. The terrain is slightly hilly; ground elevation decreases outwards from the ridges and also westwards.
- The groundwater body is predominantly comprised of high transmissivity fissured bedrock. The topmost unit of the Lower Limestone Shales (the Ringmoylan Shales) is shaley and low permeability. Specific yields in the sandstone are higher than most Irish bedrock aquifers.
- Flow occurs along fractures, joints and major faults. In certain areas the rock cement has been dissolved and 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. Gravel lenses in the subsoils may contribute flow and storage to the aquifer.
- 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 Impure Limestones rock unit group, or under thick low permeability tills; here, wells are artesian. Groundwater flow follows topography, radiating outwards mainly to the north and south from the central ridge. Flow path lengths in the unconfined areas may be up to 1000's metres but, depending upon the topography, may be much shorter. Confined flow path lengths can be considerably lengths, and groundwater flow will be slow. There is evidence of some perching of groundwater in higher areas.
- Groundwater discharges to the rivers and streams crossing the aquifer, which are gaining, and near the contact with the overlying Lower Impure Limestones. Groundwater also discharges from depth, by flowing upwards along fault zones, as at Kilcolman WS in the adjacent GWB. Perched groundwater may feed small springs and streams emerging mid-way down the slopes.

Attachments	None.
Instrumentation	Stream gauges: 24042.
Information Sources	Deakin, J., Daly, D. and Coxon, C. (1998) *County Limerick Groundwater Protection Scheme*. Geological Survey of Ireland Report to Limerick Co. Co., 72 pp. Deakin, J. (1995) *Clouncagh PS: Groundwater Source Protection Zones*, GSI Report to Limerick Co. Co., 6 pp. Deakin, J. (1995) *Kilcolman PS: Groundwater Source Protection Zones*, GSI Report to Limerick Co. Co., 7 pp. Aquifer chapters: Devonian Kiltorcan-type; Dinantian (early) Sandstones, Limestones and Shales.
Disclaimer	Note that all calculations and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae



Rock units in GWB

Rock unit name and code	Description	Rock unit group
Old Red Sandstone (undifferentiated) (ORS)	Red conglomerate, sandstone and mudstone	Devonian Kiltorcan-type Sandstones AND Devonian Old Red Sandstones
Lower Limestone Shales (LLS)	Sandstone, mudstone and thin limestone	Dinantian (early) Sandstones, Limestones and Shales