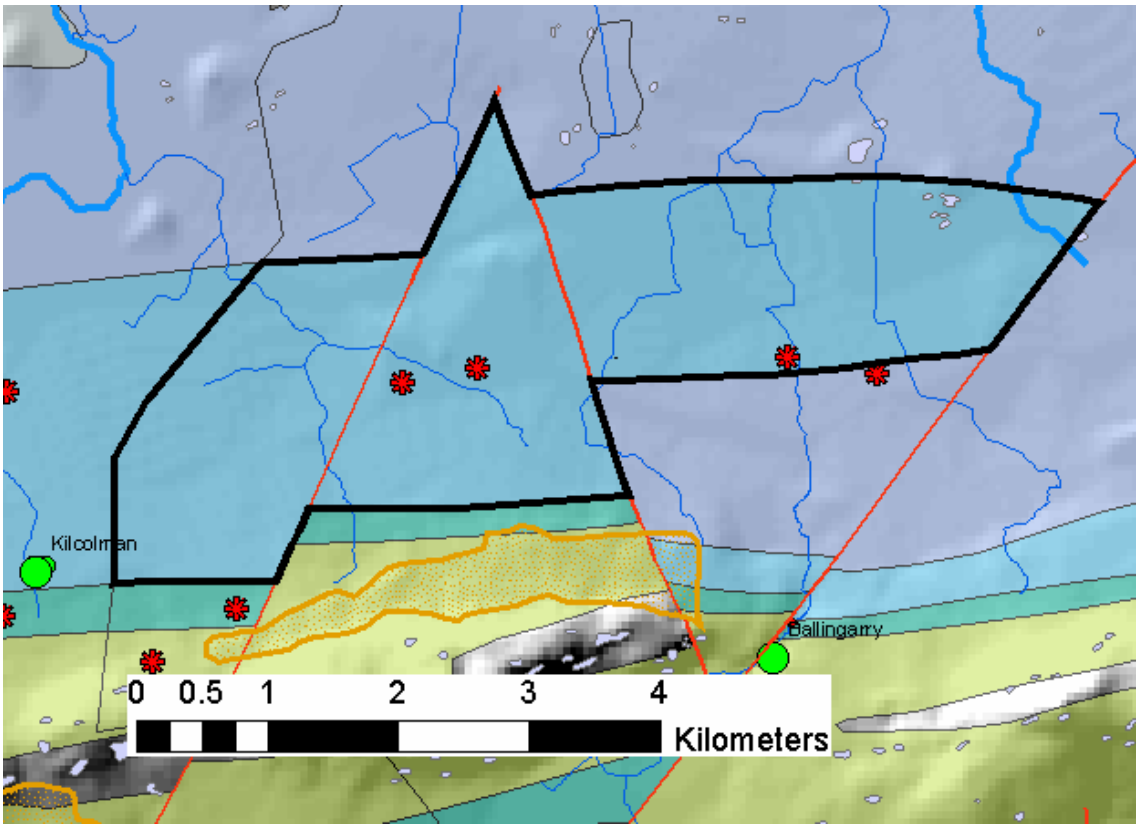
Duckstown GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water bodies	Associated terrestrial ecosystem(s)	Area (km^2)
24 - Maigue Limerick Co. Co.	Rivers: Clonshire.	None.	12.7

Topography	This GWB occupies an area of the lowlands in west Co. Limerick. It is situated on the north of the hillier areas of the Ballingarry GWB. Elevation ranges between 40 mAOD and 60 mAOD. Drainage density is high, with many small tributaries draining to the major rivers crossing the GWB. One stream drains to the Deel, whilst the majority of surface water drains to the River Clonshire, within the Maigue catchment.	
Geology and Aquifers	Aquifer categories	The GWB comprises an **LI:** Locally important aquifer which is moderately productive only in local zones.
	Main aquifer lithologies	The GWB comprises Dinantian Lower Impure Limestones.
	Key structures	The strata are on the northern limb of a major, relatively tightly folded anticline. Bedding dips to the north at and angle of around 30^o. NNE-SSW and NNW-SSE trending faults cross-cut the rocks. Compression during the folding and faulting caused some fracturing and jointing of the rocks.
	Key properties	Transmissivity in the Lower Impure Limestones will typically be in the range 2-20 m^2/d. However, in the adjacent Hospital GWB, a pumping test at Hospital WS provided transmissivity estimates of approximately 75 m^2/d, and at Bruff No 1 WS, aquifer transmissivity is approximately 40 m^2/d, showing that higher transmissivities can be achieved in local zones. Groundwater gradients will be approximately 0.01, and follow topography. *(data sources: Rock Unit Group Aquifer Chapters, Source Reports see references; estimation from maps)*
	Thickness	The rocks in this succession are several hundreds of metres thick. However, most groundwater flow occurs within the top 15-20 m of the aquifer, in the layer that comprises a weathered zone of a few metres and a connected fractured zone below this. Permeabilities can be high in the upper few metres, but generally decrease rapidly with depth. Deeper groundwater flow may occur along faults or significant fractures.
Overlying Strata	Lithologies	Over the western 2/3 of the GWB, the subsoil is Limestone Till. In the NE and east of the GWB, subsoils comprise Till with Gravel.
	Thickness	Depth to bedrock data are few over this GWB, but indicate consistently subsoil thicknesses of around 20 m.
	% area aquifer near surface	*[Information to be added at a later date]*
	Vulnerability	Groundwater vulnerability is Low over nearly all of the GWB. Vulnerability is High and Extreme in the far NE corner of the GWB.
Recharge	Main recharge mechanisms	Diffuse recharge will occur via rainfall percolating through the subsoil. The proportion of the effective rainfall that recharges the aquifer is largely determined by the thickness and permeability of the soil and subsoil, and by the slope. In recharge areas, due to the generally low permeability of the aquifers within this GWB, a high proportion of the recharge will discharge rapidly to surface watercourses via the upper layers of the aquifer, effectively reducing further the available groundwater resource in the aquifer. In lowland areas where water tables are high, recharge may be rejected.
	Est. recharge rates	*[Information to be added at a later date]*
Discharge	Important springs and high yielding wells (m^3/d)	There are no known large springs or high-yielding boreholes in this GWB.
	Main discharge mechanisms	In the east of the GWB, groundwater will discharge to the streams and rivers crossing the aquifer and to springs. In the west of the GWB, groundwater will cross-flow from this GWB to the karstic Fedamore GWB to the north.
	Hydrochemical Signature	There are no data available to assess this GWB. Groundwaters sampled in the same rock unit group in the adjacent Hospital GWB are Hard to Very Hard (310-425 mg/l as $CaCO_3$), with corresponding high alkalinities (295-355 mg/l as $CaCO_3$) and electrical conductivities (680-860 µS/cm). The pHs are neutral. Groundwaters have a calcium–bicarbonate signature. In the Lower Impure Limestones, iron and manganese concentrations frequently fluctuate between zero and more than the EU Drinking Water Directive maximum admissible concentrations (MACs). Hydrogen sulphide can often reach unacceptable levels (E.P. Daly, 1982). These components come from the muddy parts of these rock units and reflect both the characteristics of the rock-forming materials and the relatively slow speed of groundwater movement through the fractures in the rock allowing low dissolved oxygen conditions to develop. Background chloride concentrations will be higher than in the Midlands, due to proximity to the sea.

Groundwater Flow Paths	These rocks are devoid of intergranular permeability; groundwater flow occurs in fractures and faults. Generally, flows in the aquifer are concentrated in a thin zone at the top of the rock; the weathered zone may be up to 3 m thick, with a connected fractured zone a further 10 or so metres, below which is a generally poorly fractured zone. Groundwater is confined by thick, low permeability subsoils over most of the GWB. These subsoils restrict recharge and discharge. Small volumes of groundwater probably cross-flow northwards into the karstic Fedamore GWB. In the east of the GWB, alluvium along the river and stream courses will allow groundwater to discharge to the surface. These silty/ sandy/ gravelly deposits will contribute storage to the bedrock aquifer. Groundwater flow paths in the unconfined portions of this aquifer are short (30-300 m), with groundwater discharging locally to the streams, rivers and springs. In the confined parts, flow path lengths may be longer. Recorded groundwater levels are 0–5 m below ground level and may reflect the perched water table rather than the bedrock aquifer water table.
Groundwater & Surface water interactions	Due to the thick, low permeability subsoils, groundwater–surface water interactions over the majority of the GWB will be very low. However, in the east of the GWB, groundwater will discharge to the streams and rivers crossing the aquifer and to the springs. Although the rivers will be gaining, baseflow from the bedrock aquifer will be low due to its low storativity.
Conceptual model	• This GWB is bounded to the north, east and along part of the southern boundary by the contact with the karstic limestones of the Fedamore GWB. The remainder of the southern boundary is formed by the contact with the high transmissivity Ballingarry GWB. The western boundary is coincident with a surface water catchment divide. The terrain is very flat-lying and is generally poorly drained. • The GWB comprises low transmissivity and low storativity rocks, although localised zones of enhanced permeability do occur. Groundwater flows along fractures, joints and major faults. Where saturated alluvium or gravelly tills overlie the bedrock aquifers, these deposits will effectively contribute storage to the bedrock aquifer. • Recharge occurs diffusely through the subsoils. The amount of recharge is a function of subsoil thickness and permeability, and of topographic slope. Recharge will be limited over most of the GWB. In the east of the GWB, where subsoils are higher permeability, recharge may be greater. However, where the water table is close to ground level, potential recharge may be rejected. • Most groundwater flow occurs near the top of the bedrock in a narrow zone comprising a weathered zone of a few metres and a connected fractured zone below this. Deeper inflow levels will occur where isolated fractures or faults are intercepted. The GWB is mainly confined by thick, low permeability subsoils. Measured water levels are from 0-5 mbgl, and probably record a perched water table within the subsoils. In the east of the GWB, subsoils are higher permeability; here, groundwater is considered to be unconfined and in hydraulic connection with the streams and rivers. • Unconfined flow path lengths are relatively short, and in general are between 30 and 300 m. Confined flow path lengths may be longer. • In the east of the GWB, groundwater discharges to the streams and rivers crossing the aquifer and to springs. Local flow directions are controlled by local topography. In the west of the GWB, where conditions are confined, groundwater probably cross-flows into the adjacent karstic Fedamore GWB. • The Lower Impure Limestones of this GWB confine the highly transmissive Devonian Kiltorcan-type rock units of the Ballingarry GWB, which passes underneath, as well as lying next to, this GWB. The high transmissivity aquifers can be reached by drilling through the low transmissivity confining layer formed by this GWB. • The spur of Lower Impure Limestones in the NE of the GWB that sticks into the karstic Fedamore GWB will either deflect northwards-flowing groundwater within the karstic aquifer, or cause it to discharge to surface at springs.
Attachments	None.
Instrumentation	None.
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) *Bruff WS – Groundwater Source Protection Zones*. Geological Survey of Ireland Report to Limerick Co. Co., 6 pp. Deakin, J. (1995) *Hospital WS – Groundwater Source Protection Zones*. Geological Survey of Ireland Report to Limerick Co. Co., 6 pp. Aquifer chapters: Dinantian Lower Impure Limestones.
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
Ballysteen Formation (BA)		Dinantian Lower Impure Limestones