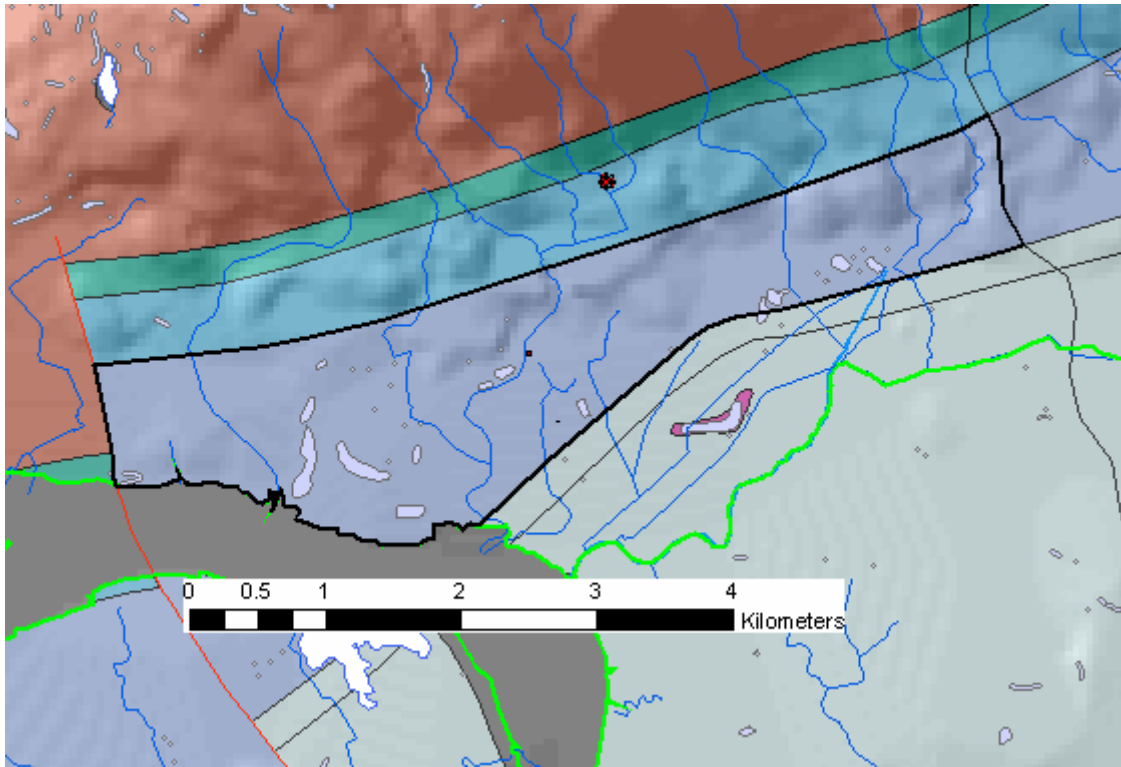


**Cratloe GWB: Summary of Initial Characterisation.**

Hydrometric Area Local Authority		Associated surface water features	Associated terrestrial ecosystem(s)	Area (km <sup>2</sup> )
27 - Fergus catchment/ Shannon North Clare Co. Co.		Rivers: Shannon, Cratloe, Crompaun (East), Cratloe Creek.	Fergus Estuary and Inner Shannon, North Shore (002048)	7.7
<b>Topography</b>	This small and narrow GWB is elongated in an ENE-WSW direction, and is about 6.5 km long by 1.2 km wide. In general, the ground is 10–20 mAOD, and flat-lying to gently undulating. Ground elevation within the GWB ranges from sea level to just over 30 mAOD. The highest ground occurs along the northern margin of the GWB. Drainage density is relatively high, since this area is generally low-lying.			
<b>Geology and Aquifers</b>	Aquifer categories	The GWB comprises an <b>Rk<sup>d</sup></b> : Regionally important karstified aquifer dominated by diffuse flow.		
	Main aquifer lithologies	Dinantian Pure Unbedded Limestones.		
	Key structures	The rocks of this GWB occur on the northern limb of a syncline. Bedding dips southwards at low angles of approximately 20°. The western edge of the GWB is formed by a NNW-SSE trending major fault that juxtaposes the karst limestones of this GWB against the low transmissivity Devonian Old Red Sandstones of the Tulla – Newmarket-on-Fergus GWB.		
	Key properties	Transmissivities in diffusely karstified aquifers are in the range 20–2000 m <sup>2</sup> /d. In this area of the country, the median value will probably be towards the lower-middle end of the range. At Croom and Fedamore WSs in the nearby Fedamore GWB (in Co. Limerick), transmissivities are 120 m <sup>2</sup> /d [estimate range 95–145 m <sup>2</sup> /d] and 34 m <sup>2</sup> /d [estimate range 23–41 m <sup>2</sup> /d], respectively. Groundwater gradients within the karstic aquifer are low, ranging from approximately 0.005 to 0.01. Storativity in this aquifer is low (effective porosity ~1.5-2.5%). <i>(data sources: Rock Unit Group Aquifer Chapters, Clare GWPS, Limerick GWPS and Source Reports, see references; estimates from maps)</i>		
	Thickness	The Dinantian Pure Unbedded Limestones attain maximum thicknesses of more than 1200 m. However, most groundwater flows in an epikarstic layer a few metres thick and in a zone of interconnected solutionally-enlarged fissures and conduits extending about 30 m below this. Deeper groundwater flows can occur along fault zones. On Aughinish island, on the south side of the Shannon Estuary, there are very deep (~ 60 mbsl) conduits that relate to an ancient baselevel. There may be such conduits in this area, but they are not known; field work would be required to confirm their presence or otherwise.		
<b>Overlying Strata</b>	Lithologies	<i>[Information to be added at a later date]</i>		
	Thickness	There are no data available for this area. Rock outcrops in patches in the southern part of the GWB.		
	% area aquifer near surface	<i>[Information to be added at a later date]</i>		
	Vulnerability	Groundwater vulnerability is High and Extreme in the western 2/3 of the GWB, and Low and Moderate in the NE areas.		
<b>Recharge</b>	Main recharge mechanisms	Diffuse recharge will occur over nearly the entire groundwater body via rainfall soaking through the subsoil and directly to the aquifer via outcrop. Surface water running-off the low transmissivity Tulla – Newmarket-on-Fergus GWB upslope to the north is likely to sink into the aquifer of this GWB, thereby recharging at points or along linear river stretches. The lack of surface drainage in elevated parts of this GWB indicates that potential recharge readily percolates into the groundwater system. However, in low-lying areas with a high water table in this highly transmissive aquifer, there will be some rejected recharge, i.e. a proportion of the effective rainfall is rejected due to lack of storage space in the aquifer.		
	Est. recharge rates	<i>[Information to be added at a later date]</i>		
<b>Discharge</b>	Important springs and high yielding wells (m <sup>3</sup> /d)	There are no data available for this GWB.		
	Main discharge mechanisms	The main discharges are to the streams and rivers crossing the body and to the River Shannon at the SW of the GWB.		

Hydrochemical Signature	There are no data available to assess this GWB. The hydrochemistry of groundwaters from the nearby Fedamore GWB indicates Very Hard (370–430 mg/l as CaCO <sub>3</sub> ), calcium-bicarbonate type waters with high alkalinities (330–380 mg/l as CaCO <sub>3</sub> ) and electrical conductivities, and neutral pHs. Conductivities range between 720–900+ µS/cm. In general, background chloride concentrations will be higher than in the Midlands, due to proximity to the sea. Elsewhere in the limestones in the Fergus catchment, problems with <i>E. coli.</i> , iron, colour and turbidity are reported (Coxon and Drew, 1998). The sandstones and overlying peat to the north could be the potential origin of suspended matter, although there may also be a contribution from ancient infilled unconsolidated deposits in karst depressions and/or the epikarst.
<b>Groundwater Flow Paths</b>	<p>These rocks are devoid of intergranular permeability; groundwater flows through a diffuse network of solutionally-enlarged fissures and small conduits, and along faults. Dissolutional enlargement of joint, fracture and fault planes is the major mechanism that has created permeability. Groundwater is likely to flow in two main hydrogeological regimes:</p> <p>(1) an upper, shallow, highly karstified weathered zone, known as the epikarst, in which groundwater moves quickly, through solutionally enlarged conduits, in rapid response to recharge;</p> <p>(2) a deeper zone, where a dispersed slow groundwater flow component in smaller fractures and joints outside the main conduit systems.</p> <p>In some areas, the aquifer may be highly karstified, with groundwater flowing through interconnected, solutionally enlarged conduits and cave systems. These localised high permeability zones can give rise to rapid groundwater velocities.</p> <p>The GWB is mostly unconfined. Only in the NE of the GWB, where groundwater vulnerability is Low, is the aquifer potentially confined. It is considered that the rivers and streams are in hydraulic continuity with the aquifer. Therefore, they represent the water table elevation. Near streams and rivers, water levels should be within 2 m of ground level. In relatively elevated areas between rivers, the water table may be considerably deeper, giving significant unsaturated zones. The water table is likely to generally follow the topography.</p> <p>Groundwater flow paths in this GWB are generally long, and can be up to several km's long. Groundwater may also discharge locally to surface water features or springs, however, if the topography is variable. In discharge zones, flow paths will be shorter, around 100–300 m. The regional groundwater flow direction is from north to south and southwest. Local groundwater flow will be from the higher ground between surface water bodies to the rivers and streams.</p> <p>The epikarst is thought to be relatively modern, being formed after the last ice age, while the deeper karst is likely to be a remnant of not only recent solution, but also glacial and pre-glacial solution. The groundwater flow regimes will be hydraulically connected, with the degree of interconnection depending on the faults and joints associated with the structural deformation. Groundwater flux is thought to be concentrated in the top 30 m or so of the aquifer.</p> <p>Heavy rainfall can cause temporary high water levels in the shallow epikarst zones, and pulses of recharge can displace material which is normally relatively undisturbed. Groundwater levels will respond quickly to rainfall events due to the general absence of subsoil cover. Bacteria are a common problem in karst areas as groundwater travel times are so short and vulnerability generally extreme. The fluctuations in colour and bacteria and, occasionally, iron, are all typical of a karst environment with a rapid 'flashy' response to rainfall events and short residence times.</p>
<b>Groundwater &amp; Surface water interactions</b>	<p>There is an effective hydraulic interconnection between groundwater and surface water in the karst limestone. Groundwater is discharged to the surface as baseflow to streams and rivers crossing the groundwater body. Groundwater is most likely recharged near the northern boundary of the GWB by surface water flowing off the low transmissivity Tulla – Newmarket-on-Fergus. The epikarst redistributes diffuse recharge in the subsurface. The nature and quality of the water in the Inner Shannon (NHA 2048) will to some extent be affected by the groundwater quality in this GWB.</p>

<b>Conceptual model</b>	<ul style="list-style-type: none"> <li>• The terrain in this GWB is low-lying and gently undulating. Ground elevation increases northwards. It is bounded to the SW by the coast and estuary. The northern and western boundaries are formed by the contact with the lower transmissivity rocks of the Tulla – Newmarket-on-Fergus GWB. The southern/ SE boundary is formed by the contact with the Pure Bedded Limestones of the Limerick City Northwest GWB. The E/ NE boundary is coincident with a surface water and implied groundwater divide.</li> <li>• The GWB comprises diffusely karstified limestones in which groundwater is transmitted through a network of small conduits and fissures, and an epikarstic zone. The fault and fracture network and bedding-parallel pressure solution planes have been enlarged by dissolution, resulting in a highly transmissive aquifer with rapid groundwater flow in which the more permeable zones have specific orientations. The aquifer has low storativity.</li> <li>• Recharge occurs diffusely through the subsoils or at rock outcrop. Linear or point recharge may occur along losing river stretches where streams cross onto this GWB from the low transmissivity GWB to the north. Potential recharge may be rejected in areas where the water table is very close to the surface.</li> <li>• Groundwater in this body is expected to show a rapid response to recharge, with rapid groundwater velocities.</li> <li>• Groundwater flow in this aquifer will be concentrated in an approximately 30 m zone at the top of the bedrock. This zone comprises an epikarstic layer of a few metres, below which is a network of diffuse solutionally-enlarged joints and small conduits, fractures and faults. Deeper groundwater flow can occur along permeable fault zones or deeper fractures.</li> <li>• Nearly the entire GWB is unconfined. Only in the SE of the GWB do the subsoils attain sufficient thicknesses to potentially confine the aquifer. Near rivers and streams, the water table is close to the surface. Beneath higher ground, significant unsaturated zones may exist. Water table fluctuations in discharge areas will be relatively low (on the order of 2-3 m) whereas, in recharge zones, the water table elevation may vary considerably (up to 10 m).</li> <li>• Groundwater discharges to the rivers and streams crossing the GWB, and to the Shannon Estuary. The regional groundwater flow direction is from north to south and southwest. Local groundwater flow directions are determined by topography and local drainage patterns. Flow path lengths are generally long (up to several km's). In discharge zones, flow paths will be much shorter, at around 100–300 m.</li> <li>• Rivers may be both losing and gaining, depending upon the location within the system, and also upon the time of year. In late summer, rivers may be losing, but gaining in the rest of the year.</li> </ul>
<b>Attachments</b>	None.
<b>Instrumentation</b>	Stream gauges: 27005.
<b>Information Sources</b>	<p>Deakin, J. and Daly, D. (2000) <i>County Clare Groundwater Protection Scheme</i>. Geological Survey of Ireland Report to Clare Co. Co., 67 pp.</p> <p>Deakin, J., Daly, D. and Coxon, C. (1998) <i>County Limerick Groundwater Protection Scheme</i>. Geological Survey of Ireland Report to Limerick Co. Co., 72 pp.</p> <p>Deakin, J. (1995) <i>Croom WS – Groundwater Source Protection Zones</i>. Geological Survey of Ireland Report to Limerick Co. Co., 6 pp.</p> <p>Deakin, J. (1995) <i>Fedamore WS – Groundwater Source Protection Zones</i>. Geological Survey of Ireland Report to Limerick Co. Co., 6 pp.</p> <p>Aquifer chapters: Dinantian Pure Unbedded Limestones.</p>
<b>Disclaimer</b>	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**

<b>Rock unit name and code</b>	<b>Description</b>	<b>Rock unit group</b>
Waulsortian Limestones (WA)	Massive unbedded lime-mudstone	Dinantian Pure Unbedded Limestones