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

<table>
<thead>
<tr>
<th>Hydrometric Area Local Authority</th>
<th>Associated surface water features</th>
<th>Associated terrestrial ecosystem(s)</th>
<th>Area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 - Maigue Catchment Limerick Co. Co.</td>
<td>River: Maigue.</td>
<td>-</td>
<td>28.6</td>
</tr>
</tbody>
</table>

**Topography**

The groundwater body is elongated in an ENE-WSW direction along a slightly elevated ridge. The highest elevations are 125 m AOD west of Bruree and 103 m AOD east of Bruree. The River Maigue flows roughly N-S across the GWB at Bruree, where the elevation is approximately 50 m AOD. The area is well drained; streams generally flow off the lower parts of the GWB where they ultimately drain into the River Maigue.

**Aquifer categories**

Rf: Regionally important fissured aquifer.

**Main aquifer lithologies**

Devonian Kiltorcan-type Sandstones underlie the centre of the GWB; Dinantian (early) Sandstones, Limestones and Shales underlie the outer margins of most of the GWB.

**Key structures**

The major structure is formed by the core of a large anticline that is orientated ENE-WSW. Major N-S, NE-SW and NW-SE trending faults cross-cut the fold axis. There are also faults parallel to the fold axis. Compression during the folding caused fracturing and jointing of the rocks. The beds dip outwards around the entire GWB at angles of 10-20°.

**Key properties**

The transmissivity in this rock unit group generally ranges from 40 to 100 m²/d. Analyses of a pumping test at the Ballyagran WS provided transmissivities ranging from 94 to 196 m²/d with 105 m²/d appearing to be the best estimate. At Bruree WS, analysis of a 10-hour pumping test gave a transmissivity of 132 m²/d [range 54–151 m²/d]. However, water levels and water temperature measurements taken during the test indicated that a significant proportion of the supply is being contributed by the river. At Kilcoleman WS in the nearby Knockaderry GWB, a pumping test on the borehole provided transmissivities in the range 111–197 m²/d with 154 m²/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 m²/d, with a best estimate of 68 m²/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)

**Geology and Aquifers**

**Lithologies**

The dominant subsoils are light orange-brown clayey, stony deposits, with small sub-angular to angular limestone clasts; they are interpreted to be limestone tills. The area lies within the extensive ice marginal deposits in Limerick which stretch from the foot of the Galty Mountains, through south Limerick, and up towards Foynes. The deposits are typically quite thick, reaching 40 m in places, and they comprise a mixture of sands and gravels, silty sands, various tills and stiff clays. There is a channel of alluvium present along the course of the River Maigue.

More information to be added at a later date

**Overlying Strata**

**Thickness**

The subsoil varies in thickness from about 3 m to more than 20 m. The thinner subsoils are found in the higher areas, where there are also small scattered outcrops. Deeper subsoils occur around the edges of the GWB, in the lower-lying areas.

More information to be added at a later date

% 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 will occur over the entire groundwater body via rainfall soaking through the subsoil, particularly in the higher areas where subsoils are thinner. A percentage of rainfall will not recharge the aquifer, but will runoff. Gravel lenses in the subsoils may contribute flow and storage to the bedrock aquifer.

More information to be added at a later date

**Est. recharge rates**

[Information will be added at a later date]

**Discharge**

**Springs and large known abstractions (m³/d)**

Bruree WS [410 m³/d]; Ballyagran (Drewscourt/ Castletown) WS [1070 m³/d]

More information to be added at a later date
There are numerous springs occurring to the east and west of Bruree village; these drain into the River Maigue. The streams and rivers crossing the GWB are gaining. Most of the streams originating as springs within the GWB have their origins in the lower-lying ground (<100 mAOD). Known springs occur in similarly low-lying ground (< 70 mAOD). Deakin (1995) considers that the small springs, rises and isolated ponds within the GWB are perched.

The hydrochemical analyses of groundwater at Ballyagran shows a mean conductivity of 650 μS/cm, with hardness in the region of 335 mg/l (as CaCO₃), and alkalinity approximately 310 mg/l (as CaCO₃). Electrical conductivities are also high at 640–760 μS/cm. Where there is mixing with surface water, such as at Ballingarry (in the adjacent Ballingarry GWB) and at Bruree WS in this GWB, these parameters have lower values. At the source in Bruree groundwater is hard (285–340 mg/l as CaCO₃), with moderately high alkalinity (280–295 mg/l as CaCO₃), pHs are neutral. All analyses are indicative of a calcium-bicarbonate type water which may either be a carbonate rich sandstone or which may lie at the softer end of the limestone carbonate water scale. (Where the aquifer is significantly confined, ion exchange may have taken place, altering the hydrochemical signature towards sodium-bicarbonate.) Iron can be a problem in the sandstone aquifers. Background chloride concentrations will be higher in the Midlands, due to proximity to the sea. The bedrock strata of the Old Red Sandstone aquifer are calcareous, although they may have some carbonate cementing the sand grains. The Lower Limestone Shale rock unit (part of the Dinantian (early) Sandstones, Limestones and Shales rock unit group) is calcareous.

The pumping test at Bruree WS indicates that pumping at the public water supply induces surface water to flow into the aquifer. The general groundwater flow direction is naturally downhill radiating outwards in all directions (but mainly north- and southwards) from the high ground along the ridge.

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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 the Lower Limestone 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 underlies 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. The hydrograph shown in Figure 1 was measured in a well near the highest parts of the GWB, hence the water table ranges between 15-20 mbgl. Despite being near the presumed centre of the recharge mound, the seasonal water table fluctuation is only 5 m, indicating that the specific yield of the aquifer is not as low as most Irish aquifers. 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 discharges 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 in all directions (but mainly north- and southwards) from the high ground along the ridge.

The groundwater body is elongated ENE-WSW. It is bounded all around by the contact with the surrounding Dinantian Lower Impure Limestone (Ballysteen Limestone), under which the aquifer becomes confined. The upper units of the Lower Limestone Shales (the Ringmoylan Shales - unmapped as a separate unit in this area) also confine the aquifer. The area comprises small hills, ground elevation decreases outwards from the central ridge.

The groundwater body is comprised of high transmissivity fissured bedrock. The topmost unit of the Lower Limestone Shales (the Ringmoylan Shales) is shale 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. Groundwater discharges to the small streams emerging mid-way down the slopes. Groundwater can also discharge from depth, by flowing upwards along fault zones. Perched groundwater may feed small springs and streams emerging mid-way down the slopes.

The pumping test at Bruree WS indicates that pumping at the public water supply induces surface water to flow into the aquifer. Deakin (1995) considers that most 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.

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Groundwater hydrograph (Figure 1), Hydrochemical signature (Figure 2).

Instrumentation
Stream gauges: 24004. (Adjusted Specific Dry Weather Flow calculated for this station).
EPA Water Level Monitoring boreholes: Dromin, near Bruff (LIM238)
EPA Representative Monitoring boreholes: Castletown-Ballyagran (LIM7) (EPA grid refs incorrect).

Information Sources
Aquifer chapter: Devonian Kiltocan-type Sandstone.
Aquifer chapters: Devonian Kiltorcan-type Sandstones; Dinantian (early) Sandstones, Limestones and Shales.

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: Groundwater hydrograph

![Groundwater hydrograph](image-url)
Figure 2: Hydrochemical signature

Chemical Signature of Relatively Uncontaminated Waters (expanded Durov Plot)

NB: data used to generate this plot are from Bruree, Ballingarry and Knockaderry GWBs.
Rock units in GWB

<table>
<thead>
<tr>
<th>Rock unit name and code</th>
<th>Description</th>
<th>Rock unit group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Red Sandstone (undifferentiated) (ORS)</td>
<td>Red conglomerate, sandstone and mudstone</td>
<td>Devonian Kiltorcan-type Sandstones</td>
</tr>
<tr>
<td>Lower Limestone Shales (LLS)</td>
<td>Sandstone, mudstone and thin limestone</td>
<td>Dinantian (early) Sandstones, Limestones and Shales</td>
</tr>
</tbody>
</table>