

## Castlecomer Sandstone GWB: Summary of Initial Characterisation

Hydrometric Area Local Authority		Associated surface water bodies	Associated terrestrial ecosystems	Area (km <sup>2</sup> )	Outcrop Area (km <sup>2</sup> )
15 – Nore Kilkenny Co Co Carlow Co Co Laois Co Co		Castlecomer Stream, Clogh, Dinin (Nore), Monefelim,	None	224	102
<b>Topography</b>		Underlies the Castlecomer Plateau, an elevated saucer-shaped upland. The highest point lies at 337 m OD on the eastern rim. Other locations on plateau rim (East, West, North and South) range 290 – 330m OD. The lowest point lies at c. 100 m OD in the Dinin valley.			
<b>Geology and Aquifers</b>	Aquifer type(s)	<b>Lm:</b> Locally important, generally moderately productive, fractured sandstone aquifer. Most of the groundwater body is confined, the unconfined portion being a relatively narrow strip around the perimeter of the plateau.			
	Main aquifer lithologies	<b>Clay Gall Sandstone (CG):</b> Medium and fine grained quartz sand with some feldspar. <b>Swan Sandstone Member (CQss):</b> Laminated dark grey fine-grained siliceous sandstone.			
	Key structures.	<ul style="list-style-type: none"> <li>The rocks are folded into a syncline by at least one major phase of folding, causing considerable fracturing within the two sandstone formations, which reacted to the stress in a more brittle manner than the surrounding shales.</li> <li>The aquifer outcrops around the rim of the plateau, but dips down to depths of over 246 m below ground in the centre of the plateau.</li> <li>Away from the main recharge-outcrop area, the groundwater is confined by the overlying low permeability Westphalian shales. This is reflected by artesian pressures in wells drilled closer to the centre of the plateau (e.g. the Swan public supply in County Laois).</li> <li>Several important faults cross the body. Some of these juxtapose the two sandstones and allow flow between them. Some faults act as barriers to flow.</li> </ul>			
	Key properties	<ul style="list-style-type: none"> <li>Well testing (Misstear et al. 1980) suggests transmissivities in the order of 10m<sup>2</sup>/day (range 1m<sup>2</sup>/d - 500 m<sup>2</sup>/d) and permeabilities in the order of 0.1 m/day (range 0.01 m/d - 50 m/d).</li> <li>Permeability and Transmissivity is sometimes enhanced near faults.</li> </ul>			
Thickness	<ul style="list-style-type: none"> <li>The Swan Sandstone does not occur everywhere within the Plateau but can be up to 28 m thick.</li> <li>The Clay Gall Sandstone ranges from 2m to 58m in thickness.</li> </ul>				
<b>Overlying Strata</b>	Lithologies	Thin glacial till above shale bedrock (generally less than 5m). Moyadd Coal (MC): Black shale, siltstone and minor sandstone, typically 55 m thick. Lickfinn Coal (LF): Sandstones, shales, fireclay (fossil soil) and up to eight coal seams.			
	Thickness	50 m to 250 m.			
	% area aquifer near surface	There is a very small proportion of the aquifer exposed at the surface.			
	Vulnerability	Generally LOW except at perimeter recharge area, where it is typically EXTREME. In areas where the rock is exposed at the surface, the land is 'rushy', small springs are frequent at breaks-in-slope and drainage densities are high.			
<b>Recharge</b>	Main recharge mechanisms	Rainfall recharge in unconfined portion.			
	Est. recharge rates	Long term average rainfall about 1030 mm (Met Eireann). Potential Evapotranspiration (PE) estimated at 457 mm (EPA); Actual Evapotranspiration (AE) estimated as 95% of potential, i.e. 434 mm. Potential recharge estimated as 596 mm. Surficial cover over bedrock is generally < 5 metres. Annual recharge over the outcrop of the sandstone aquifers is 300 mm, i.e. just over 50% of effective rainfall.			
<b>Discharge</b>	Springs and large known abstractions	Swan WSS (Co. Laois): 500 m <sup>3</sup> /d. Overflow discharge from Swan artesian borehole is 60 m <sup>3</sup> /d (0.7 l/s). BILBOA (11), Coan Creamery (7), Muckalee Co-Op (Ballyfoyle (20)), Clogh/Castlecomer RS (Gallery - 820), Castlecomer Co-Op (45), Carlow WS (Ardataggle - 909), Athy Town GWS (Spring at Wolfhill) (450), Fermoylan.			
	Main discharge mechanisms	The Dinin is gauged at Massford Bridge (Hydrometric Station # 15017), and at Castlecomer, 5 km further south (Station # 15013). Long term average runoff at Castlecomer is 2.78 m <sup>3</sup> /sec (573 mm/year), estimated dry weather flow is 0.110 m <sup>3</sup> /sec., and estimated 95 percentile flow is 0.210 m <sup>3</sup> /sec. At the Swan Bridge beside Swan WSS, the river dried up in the dry summer of 1975, i.e. there was no flow Most discharge is to the Swan WSS and the Dinin River. The specific dry weather flow is relatively low (0.7 l/sec/km <sup>2</sup> )			

Hydrochemical Signature	Hydrochemical data are available from the Swan WSS well in Laois and from GSI sampling. Waters close to recharge-outcrop area have a calcium-bicarbonate signature. Waters in the deeper, confined parts of the aquifer have a sodium bicarbonate signature, a result of ion exchange, reflecting long residence times. Waters are 'moderately soft' to 'moderately hard'; Concentrations of iron and manganese, apparently of natural origin, consistently exceed the EU MAC. The bedrock strata of this aquifer are <b>Siliceous</b> . Carbon isotope dating of water from Swan WSS (1976) determined a corrected age of 1440 (+/-170) years.
<b>Groundwater Flow Paths</b>	Water infiltrates at the exposed areas around the perimeter. Some will discharge outwards to the surrounding basins. The remainder flows towards the center of the syncline, ultimately discharging to the River Dinin, unless it is captured <i>en route</i> by boreholes.
<b>GW/SW Interactions</b>	Some potential recharge probably rejected at margins Main discharge is to River Dinin.
<b>Conceptual model</b>	The Body comprises a Locally Important fractured sandstone aquifer, which is unconfined in a small strip around the perimeter and confined over most of its area in the centre of the Plateau. Rainfall recharge occurs only in the unconfined portion. Downward leakage from confining layers is unlikely because of artesian pressure. Groundwater flows through the Body from the perimeter inwards, with some discharging into the Dinin River. Artificial discharge mainly occurs from Swan WSS.
<b>Attachments</b>	Borehole hydrograph
<b>Instrumentation</b>	Stream gauges: 15017, 15013, 15036, 15016 Borehole hydrograph: (LS 31/1) Water quality: Swan WSS (LS 31/1), Fermoylan (#7 - S602839), Athy Town WS (#5 - S602839), Castlecomer Yarns (#40 - S536733)
<b>Information Sources</b>	Daly, D., Lloyd, J.W., Missteart, B.D.R., & Daly, E.P., 1980. Fault control of groundwater flow and hydrochemistry in the aquifer system of the Castlecomer Plateau, Ireland. Quarterly Journal of Engineering Geology, London, vol. 13, pp 167-175. Daly, D. & Missteart, B.D.R., 1976. A preliminary hydrogeological survey of the Castlecomer Plateau, S.E. Ireland. Unpublished M.Sc. dissertation, University of Birmingham, England. E.P.A. 1997. Nitrates in Groundwater: County Kilkenny, County Laois. Environmental Protection Agency. Missteart, B.D.R., Daly, E.P., Daly, D., & Lloyd, J.W., 1980. The groundwater resources of the Castlecomer Plateau. Geological Survey of Ireland, Report Series RS 80/3.
<b>Disclaimer</b>	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae