Waterford GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority		Associated surface water bodies	Associated terrestrial ecosystems	Area (km^2)
16 – Suir Waterford Co Co Kilkenny Co Co		Dawn, Smartcastle Stream, Whealans Br. River, Lisduggan Stream, St. Johns	Killbarry Bog, King's Channel.	207
Topography		The highest elevations are to the west, significantly Croughan hill at 391mOD, the peak of which lies just outside the body. There are raised elevations to the south, west and northwest. The lower elevations are to the north, the lowest elevation being along the flood plain of the Suir River. The drainage pattern of the area is mostly northwards to the R. Suir. To the extreme west some drainage is northward to the Clodiagh River which is outside the body.		
Geology and Aquifers	Aquifer type(s)	**Rf**: Regionally Important Fractured aquifer. There are very small areas of poorer aquifers located within the main body.		
	Main aquifer lithologies	CA: Campile Formation: Rhyolitic volcanics, greys & brown slates. This rock contains areas of felsic volcanic rock which are the water bearing components. CArs – Ross Member - Dark grey slate with thin siltstones KI – Kilmacthomas Formation - Green, grey & purple slate, siltstone BI - Ballynaclogh Formation - Basaltic & andesitic volcanics, slates CB - Clashabeema Formation - Rhyolites succeeded by rhyolitic tuffs		
	Key structures.	The rocks were deformed during the Caledonian (Silurian to Devonian) mountain building episode. The Caledonian deformation affected the Lower Palaeozoic rocks of eastern Waterford, resulting in complex folding, faulting and low-grade metamorphism. The crystalline volcanic rocks will have ruptured and broken rather than bent and folded under the mountain building forces that affected the whole area.		
	Key properties	Pumping tests on various public supplies located with in the Campile Formation show transmissivity values ranging from 2 to 290 m^2/d with an average of 108 m^2/d. There is very little information from Co. Waterford regarding storage coefficients for these rocks, however Daly (1982) suggests that in the unconfined state it will be less than 1% and in the confined state less than 0.01%. One of the wells in the Kilmacthomas Formation (at Fews) is used as a public supply. This well has a yield of 200 m^3/d with an approximate specific capacity and transmissivity of 38 $m^3/d/m$ and 47 m^2/d respectively.		
	Thickness	Significant fractures have been logged at 50m below ground in Co. Kilkenny. Effective thickness of this aquifer is probably as deep as 100m.		
Overlying Strata	Lithologies	The Ballyvoyle Till occurs throughout Waterford and is seen to overlie the Irish Sea Till along the coast. The till is generally a massive, structureless, sandy-stony deposit with a well-defined fabric (usually aligned north to south). The composition of the matrix and clasts is variable and is largely controlled by the interaction of glacial processes and the underlying geology. In this groundwater body a volcanic till is seen southeast of the Dawn River. To the west and north of that river is a shale till. The shale and volcanic tills are more likely to weather into finer grained sediment. This is supported by the available particle size data. Up to 20% of these subsoils were finer than 0.0065 mm (up to 50% are finer than 0.065 mm). These tills are therefore considered to have a low permeability.		
	Thickness	The main area of the groundwater body subsoil thickness is between 1 to 3m but in local areas there this is between 3 and 5 and rarely more than 5m.		
	% area aquifer near surface	*[Estimates will be added at a later date]*		
	Vulnerability	Mostly EXTREME with mixed local areas of HIGH to LOW vulnerability. This is a reflection of the upland hilly terrain where subsoil thickness is low.		
Recharge	Main recharge mechanisms	Most recharge is likely to occur in the west and north where there are extensive areas of thin subsoil cover and higher rainfall.		
	Est. recharge rates	*[Recharge estimates will be added at a later date]*		
Discharge	Springs and large known abstractions (m^3/d)	Ballykinsella (90), Kilmeaden (250), Portlaw (400).		
	Main discharge mechanisms	The regional discharge appears to be towards the Suir River But in many areas there is a poor aquifer between this groundwater body and the River Suir. Therefore it is likely that in these areas the groundwater will be forced into the associated surface water bodies e.g. the Dawn River and the Whealan Bridge River. To the west there is probably a groundwater divide which coincides with the topographic peaks. The groundwater body extends west of these peaks by a few kilometres and therefore recharge from these peaks can flow to the west where it will discharge to the mountain streams. It is possible that the sources of such mountain streams lie on the geological contact, which defines the boundary of the groundwater body.		

	Hydrochemical Signature	The limited data suggest that the groundwater is of an intermediate type, where no one cation or anion is dominant and the groundwater has roughly equal proportions of calcium, magnesium and sodium (cations) and bicarbonate and chloride (anions). The data do not indicate more than one water type although in some of the samples elevated chloride levels are associated with high nitrate values (due to contamination). The calcium-magnesium-sodium cation composition is partly the result of the dissolution of minerals in the volcanic/sedimentary sequence and the overlying volcanic till (volcanic rocks can have a relatively high component of magnesium and sodium). Some of the sodium is also likely to be associated with elevated levels of precipitation in coastal areas. Bedrock strata of this aquifer are **Siliceous**. In addition water samples are moderately soft (51 - 100 mg/l $CaCO_3$) to slightly hard (101-150 mg/l $CaCO_3$), with a slightly acidic pH (generally between 6.0-6.8). Alkalinity ranges from 21-170 mg/l $CaCO_3$.
Groundwater Flow Paths		Groundwater flow in the Campile is considered to be entirely through fractures within these rocks (there may be a very minor component of primary porosity as a result of vesicles (gas bubbles) in some lava flows. Groundwater flow is likely to have a relatively high velocity in the west due to the upland topography. Regional flow systems are likely to take water in interconnected networks of fractures from these high elevations right down to the Suir river.
Groundwater and Surface water interactions		
Conceptual model		This groundwater body is defined to the north by the River Suir, to the east and west by the extent of the Campile and to the south by the boundary of Hydrometric area 16. Groundwater is most likely recharged in the west and south where there is higher rainfall and lower subsoil cover. Groundwater then flows towards the north, discharging to surface water bodies. Where contact can be made with the River Suir e.g. near Kilmeaden and east of Waterford city there is likely to be significant discharge as these areas are at the lowest elevations. Where an aquitard blocks this connection groundwater is likely to be forced to up to the surface into rivers.
Attachments		(Figure 1) Map of GW body incl. Aquifers, Monitoring boreholes, public supplies and water quality data (Figure 2) Durov plot- No Data
Instrumentation		Stream gauge: 16045, 16044, 16056, 16107, 16111, 16112, Borehole Hydrograph: none EPA representative monitoring boreholes: Ballykinsella (#12 - S602051) & Ballykinsella WS (S602050)
Information Sources		Daly, E. P. (1982) "*The Groundwater Resources of the South East Industrial Development Region*", Geological Survey of Ireland Report for the South East Regional Development Agency. Hudson M., Daly D., Duffy S., & Johnston P., 1997. County Waterford Groundwater Protection Scheme.
Disclaimer		Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae