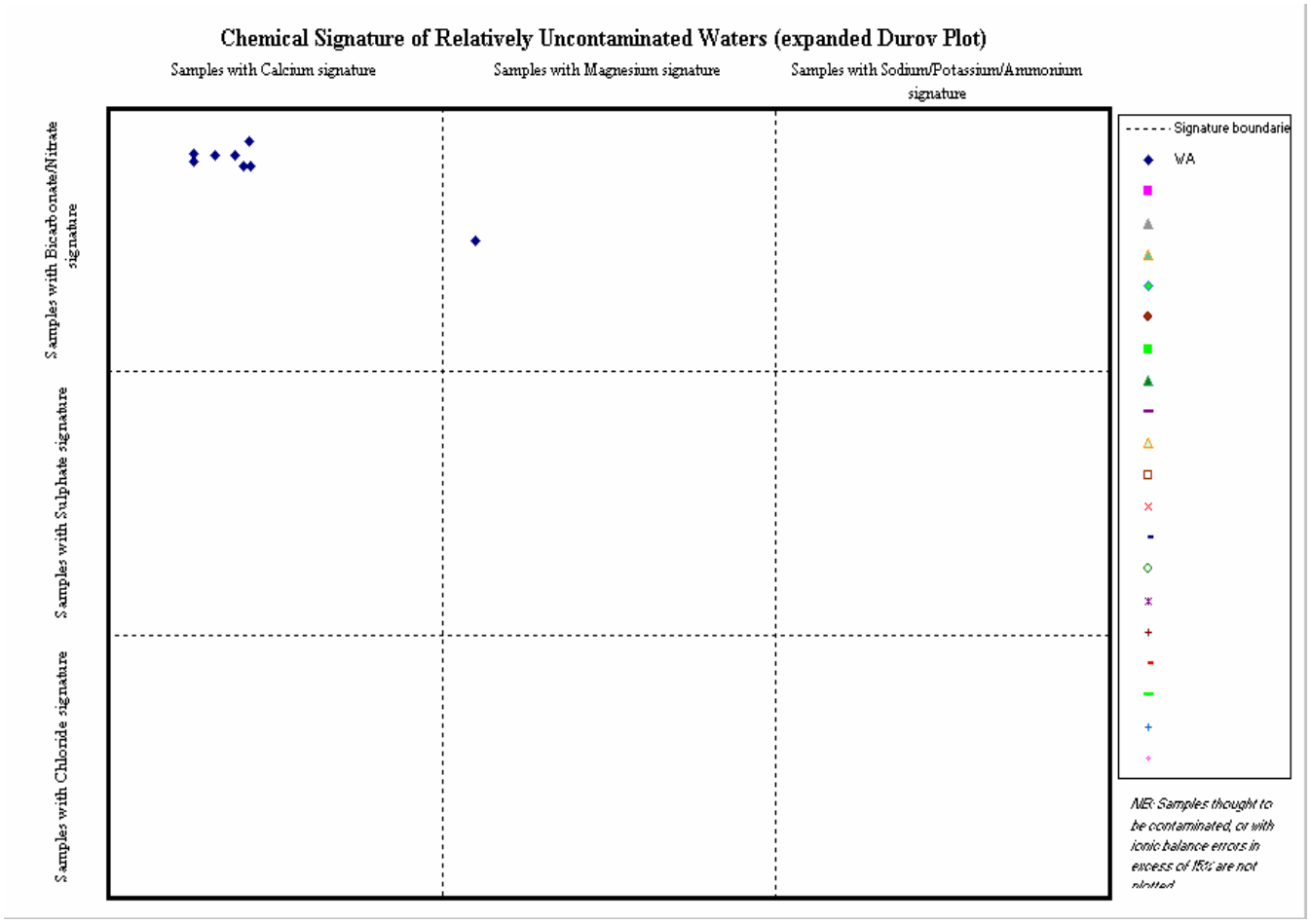
Dungarvan GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water bodies	Associated terrestrial ecosystems	Area (km^2)
17 – Coastal Area Waterford Co. Co.	Brickey, Colligan	Dungarvan Harbour	58.6

Topography	Dungarvan is located in a broad east-west trending steep sided valley. The valley floor descends at a very low gradient from west to east to the sea at Dungarvan. The highest elevations in this body are about 40m OD. In general drainage density is very low in the limestone valley. The soils and subsoils are relatively free draining. The land is grassland dominated and is largely used for grazing. There is little tillage in the area.	
Geology and Aquifers	Aquifer type(s) Main aquifer lithologies	**Rk**: Regionally Important Karstified Aquifer. There is a small lens of poorer aquifer contained within this body. WA: Waulsortian Limestone - Massive unbedded limestone. BA : Ballysteen Limestone - Dark-grey fossiliferous shaly limestone
	Key structures.	Lismore-Dungarvan syncline: Folding during the Variscan mountain building event has deformed the rocks around Dungarvan, compressing them from north and south to produce an east-west trend to the current rock distribution and ultimately to the topography of the Dungarvan area. Commonly associated with folding is jointing and faulting – there are several faults to the north of Dungarvan which have a north-south trend.
	Key properties	Transmissivity estimated in the area of the supply boreholes at Dungarvan is 900 - 13,000 m^2/d. The central area of the syncline has a higher permeability (15-180 m/d) than the limestones to the north and south (15-70 m/d). This is attributed to a higher degree of fracturing and faulting associated with a minor anticlinal axis. It is estimated that storage in these aquifers can be as high as 5%, but as low as 1% at depth. The effective porosity of the Waulsortian Limestone is estimated to be 2.5% and about 1% for the Ballysteen Limestone.
	Thickness	The majority of groundwater flow occurs in the top 30-40 metres of the limestones.
Overlying Strata	Lithologies	Sandy limestone-derived tills are the most extensive deposits in the Dungarvan area. They are best observed in ditches and field cuttings, and contain small limestone and sandstone clasts. The matrix is predominately sandy but also contains some silt and clay.
	Thickness	Quaternary mapping in the general area suggests that the sandy till is often greater than 10m thick in the valley floor.
	% area aquifer near surface	5%
	Vulnerability	The sandy tills are considered moderately permeable and range from 0->10 m thickness in the valley floor which leads to a variable vulnerability. Areas of HIGH vulnerability bound this to the north and south.
Recharge	Main recharge mechanisms	Recharge to the limestone synclines is likely to be increased as a result of surface water running off the surrounding less permeable and topographically higher Old Red Sandstone rocks onto the more permeable limestones. The sandy till probably allows significant recharge in most areas.
	Est. recharge rates	*[Recharge estimates will be added at a later date]*

Discharge	Springs and large known abstractions	The public supply at Ballynamuck is capable of producing at least 7300 m^3/d; the largest recorded well yield in the Republic of Ireland. Current abstraction is approximately 5450 m^3/d.
	Main Discharge Mechanisms	Groundwater generally discharges in a narrow zone along major rivers; this may be in the form of general baseflow, via springs or through sand and gravels that are in continuity with the rivers. Significant quantities of groundwater from the limestones of the Lismore-Dungarvan syncline are believed to discharge into the Blackwater, Brickley, and lower Finisk and Colligan Rivers in addition to Dungarvan Harbour.
	Hydrochemical Signature	Moderately hard (212 - 244 mg/l $CaCO_3$). Conductivities are in the range of 471 - 512 μS/cm. Chloride levels are slightly elevated, probably due to proximity to the sea. The groundwater has a Calcium Bicarbonate signature, which implies a relatively rapid flow system. The bedrock strata are **Calcareous**.
Groundwater Flow Paths	The upper weathered and fractured zone of bedrock acts as a zone of high permeability; large fissures or karstic conduits are often present within the bedrock, through which a large proportion of groundwater flow takes place; and where sand and gravel is present above the bedrock (e.g. at Ballynamuck), increased groundwater storage will be available to the well. The groundwater gradient is flatter in the more permeable limestone (0.0015) and flow direction in the vicinity of Ballynamuck is eastward toward the sea. A groundwater divide is present to the west of the public supply well in the Whitechurch area. Water to the west of the divide flows toward the River Blackwater and water to the east flows toward Dungarvan Harbour.	
Groundwater and Surface water interactions.	The large abstractions at Dungarvan may have caused some saline intrusion from the Harbour. Drainage density in this area is quite low.	
Conceptual model	This groundwater body is defined to the north and south by the extent of the Waulsortian Limestone near Dungarvan. To the east the boundary is defined by the coast and to the west by the catchment divide between the SERBD and SWRBD. The limestone is unconfined, with the water table generally less than 10 metres below the surface and with an average annual fluctuation of 5 metres. Permeability is entirely secondary, as a result of faulting, dolomitisation and karstification. However at Ballynamuck, the static water level lies within an upper alluvial unit, which semi-confines the groundwater at the well site. Groundwater flow is in large conduits. Substantial recharge comes from north and south sides of the valley, enters the limestone at the geological contact and travels underground until it discharges at Dungarvan Harbour.	
Attachments	(Figure 1) Durov plot.	
Instrumentation	Stream gauge: 17010, 17007 Borehole Hydrograph: none EPA Representative Monitoring boreholes: Dungarvan WS (2 boreholes) (No.41 & 121 - X236948)	
Information Sources	Hudson M., Daly D., Duffy S., & Johnston P., 1997. County Waterford Groundwater Protection Scheme. Cronin C., Daly D., Meehan R. & Johnston P (1997) Dungarvan Public Supply Groundwater Source Protection Zones.	
Disclaimer	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae	


Chemical Signature of Relatively Uncontaminated Waters (expanded Durov Plot)
Samples with Calcium signature
Samples with Magnesium signature
Samples with Sodium/Potassium/Ammonium signature
Samples with Bicarbonate/Nitrate signature
Samples with Sulphate signature
Samples with Chloride signature
Signature boundarie
WA
NB: Samples thought to be contaminated, or with ionic balance errors in excess of 5%, are not