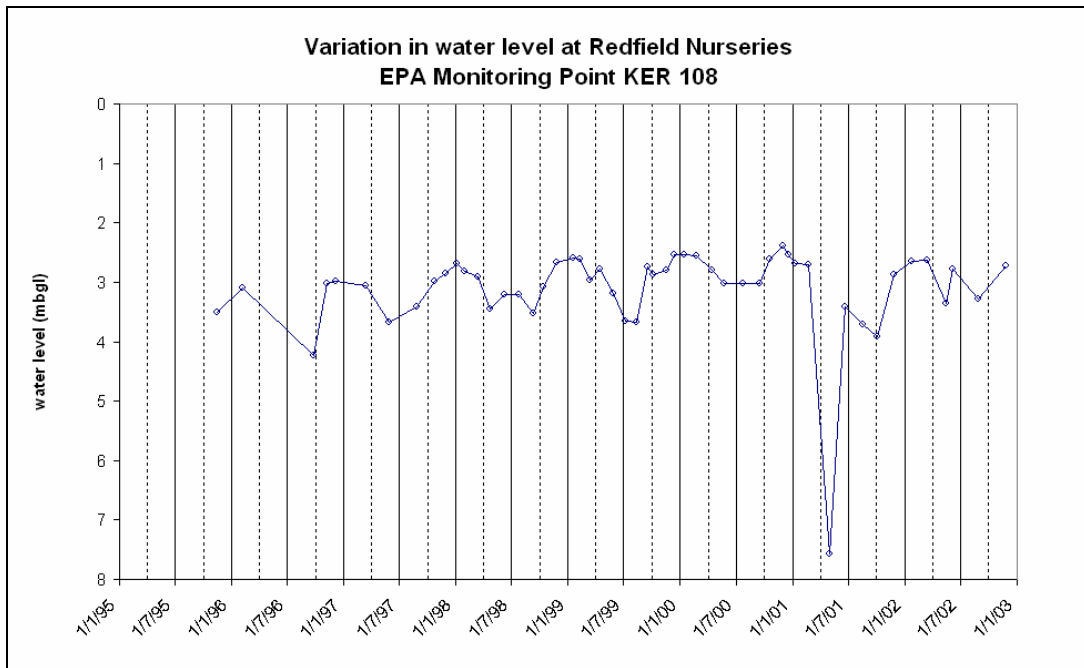


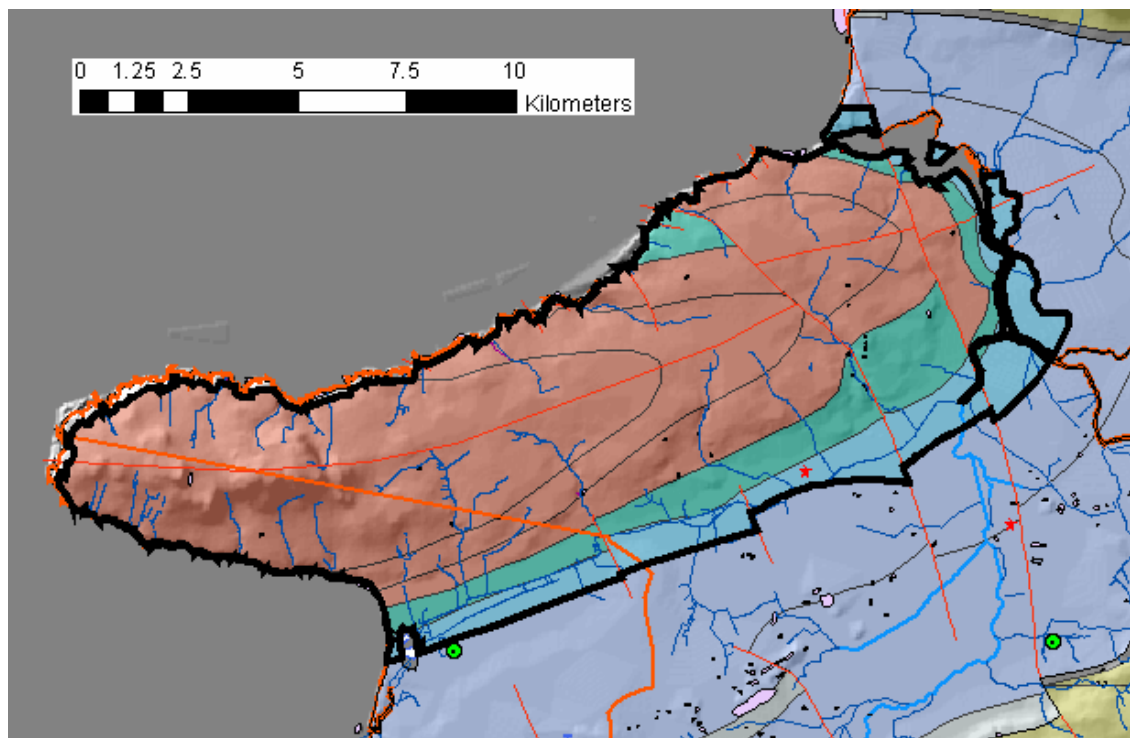
Kerry Head GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km ²)
23- Coastal Area: North Kerry/ Tralee Bay & Feale catchments Kerry Co. Co.	River Brick, Cashen River and Estuary	Cashen Estuary (001340)	130
Topography	This body occupies uplands and slopes at Kerry Head. It is elongated west-east along the ridge. The highest point is 217 mAOD at Maulin Mountain, whilst the lowest points are at sea level. The edges of the groundwater body next to the sea are frequently high cliffs. Slopes decrease more gently inland beyond the topographic break caused by transition from the hard sandstones of the Inshaboy Formation to the softer sandstones and mudstones of the Kilmore Formation. The muddy and impure limestone lithologies occupy the lowest ground on the west and south of the body. Drainage density is relatively high, with lots of small channels; most streams flow at right angles to the boundaries of the groundwater body.		
Geology and Aquifers	Aquifer categories	The majority of the GWB comprises LI : Locally important aquifer which is moderately productive only in local zones. Only the Lower Limestone Shales of the Dinantian (early) Sandstones, Limestones and Shales rock unit group is a PI : Poor aquifer which is generally unproductive except for local zones.	
	Main aquifer lithologies	The majority of the GWB comprises Devonian Old Red Sandstones. There are subordinate amounts of Dinantian Lower Impure Limestones and Dinantian (early) Sandstones, Limestones and Shales.	
	Key structures	The major structure is formed by the core of a large anticline that plunges to the ENE. Bedding dips roughly to the north and south on either side of the fold axis, which runs approximately down the centre of the GWB. Compression during the folding also caused some fracturing and jointing of the rocks. NW-SE trending faults cross-cut the fold axis.	
	Key properties	The ORS and Lower Impure Limestone aquifer transmissivities will be in the range 2-20 m ² /d, with median values occurring towards the lower end of the range. Lower Limestone Shale transmissivities will be lower. Aquifer storativity will be low in all rock units. Groundwater gradients are likely to be in the range 0.01 to 0.04. <i>(data sources: Rock Unit Group Aquifer Chapters, see references)</i>	
	Thickness	The Devonian ORS and Dinantian Lower Impure Limestones reach maximum thicknesses of more than 100's of meters. The Lower Limestone Shale rock unit is often less than 100 m thick. However, most groundwater flow occurs within the top 15 m of the aquifer, in the layer that comprises a weathered zone of a few metres and a connected fractured zone below this. Isolated deeper inflows may occur where faults or significant fractures are intercepted by boreholes.	
Overlying Strata	Lithologies	The majority of the GWB is covered by Devonian sandstone till. There are small areas of cutover peat along the central ridge, and a larger area along the southern margin. Namurian Shale and Sandstone till also covers parts of the south of the GWB. Undifferentiated Alluvium occurs in small patches in the higher areas of the GWB; it covers the low area adjacent to the Cashen River and Estuary. There are very small areas of dune sand.	
	Thickness	Subsoil thickness ranges from 3 m to over 20 m. Generally, it is about 4-10 m above 50 m elevation, and thicker lower down the slopes. Outcropping rock is confined mainly to the coastal cliff sections. Small and isolated outcrops occur along streams, and there is a circular area of outcrop around the cutover peat on Maulin Mountain.	
	% area aquifer near surface	<i>[Information to be added at a later date]</i>	
	Vulnerability	<i>[Information to be added at a later date]</i>	
Recharge	Main recharge mechanisms	Diffuse recharge will occur via rainfall percolating through the subsoil. The proportion of the effective rainfall that recharges the aquifer is largely determined by the thickness and permeability of the soil and subsoil, and by the slope. Due to the generally low permeability of the aquifers within this GWB, a high proportion of the recharge will then discharge rapidly to surface watercourses via the upper layers of the aquifer, effectively reducing further the available groundwater resource in the aquifer.	
	Est. recharge rates	<i>[Information to be added at a later date]</i>	
Discharge	Springs and large known abstractions (m ³ /d)	Glenderry WS (114 m ³ /d – GSI database; 38 m ³ /d – EPA database), Causeway Pig Co-op (400 m ³ /d – GSI database; 45 m ³ /d – EPA database), Tiershanaghan WS (56 m ³ /d – GSI and EPA databases), Kerry Co-Op (Ballinskreena Creamery) (5 m ³ /d – GSI and EPA databases), Redfield Nurseries (27 m ³ /d – GSI and EPA databases), Ballyduff WS (227 m ³ /d – GSI and EPA databases), Kerry Co-Op (Ballyduff Creamery) (100 m ³ /d – GSI and EPA databases); Doonamontane WS (24 m ³ /d – EPA database), Kerry Co-Op (Clooneen) (400 m ³ /d – EPA database), Causeway WS (90 m ³ /d – GSI database). <i>[More information may be added at a later date]</i>	
	Main discharge mechanisms	The main discharges are to the streams crossing the sandstone and impure limestone rock units and to small springs and seeps. Groundwater will discharge to the Cashen Estuary, but in small volumes compared with that from the Ballybunion groundwater body. Localised seepages may develop on the cliff faces.	

	Hydrochemical Signature	No data are currently available for this GWB. By analogy with other GWBs, it is likely that the groundwater will have a calcium-bicarbonate signature. In the impure limestones, groundwater will be Hard to Very Hard, with corresponding high alkalinities. In the sandstones, groundwaters will be less hard and alkaline. The pH will be neutral. High iron (Fe) and manganese (Mn) concentrations can occur in groundwater derived from ORS, due to the dissolution of Fe and Mn from the sandstone/shale where reducing conditions occur. It has been demonstrated that at low pumping rates water does not reside long enough in the well for oxidation to occur, thereby resulting in elevated Fe and Mn in small domestic supplies (Applin <i>et al</i> , 1989). Background chloride concentrations will be higher than in the Midlands, due to the proximity to the sea.
	Groundwater Flow Paths	These rocks are devoid of intergranular permeability; groundwater flow occurs in fractures and faults. The rocks are dependent on fracturing and fissuring to enhance their permeability. Permeabilities in the upper few metres are often high although they decrease rapidly with depth. In general, groundwater flow is concentrated in the upper 15 m of the aquifer, although deeper inflows from along faults or connected fractures can be encountered. Groundwater levels are 4-10 m below ground level, and follow the topography. Next to the Cashen River, water levels will be closer to ground level. The water level variation of about 1.5 m observed at Redfield Nursery is likely to be lower than the water level variation in the upland areas. Groundwater flow paths are short, typically from 30-300 m, with groundwater discharging to the streams. Groundwater flows outwards from the topographic ridge along the centre of the body.
	Groundwater & Surface water interactions	The water table is above or close to the base of the subsoils. The streams crossing the aquifer will be gaining. Groundwater will also discharge to small springs and seeps.
	Conceptual model	<ul style="list-style-type: none"> • The groundwater body is bounded to the west, southwest and north by the coast, and to the east and southeast by the contact with the Waulsortian Limestones of the Ballybunnon and Ardfert groundwater bodies, under which the Lower Limestone Shales pass. The topography is hilly, with ground level continually rising to the highest elevations in the centre of the body. • There is a surface water divide (between North Kerry/ Tralee Bay & Feale) and hence a groundwater divide within this GWB. However, the GWB is not subdivided into two GWBs, since much of the flow in the south side of the GWB (North Kerry/ Tralee Bay catchment) will be to the sea, and also because the areas involved are small. • The groundwater body is comprised of low transmissivity and storativity rocks, although localised zones of enhanced permeability can occur along fault zones. • Flow occurs along fractures, joints and major faults. Flows in the aquifer are concentrated in a thin zone at the top of the rock. • Recharge occurs diffusely through the subsoils and outcrops. Where the water table is close to the surface, potential recharge may be rejected. • The water table can vary between a few metres up to 10 m below ground surface, depending upon topography. Groundwater is generally unconfined; it may become confined under some of the more extensive peat deposits. Overall, groundwater flow follows topography, flowing radially outwards from the ridge along the centre of the body. Most flow will be to the east, northeast and southeast. Locally, groundwater flows to the streams. Flow path lengths are short, ranging from 30-300 m. • Groundwater discharges to the numerous small streams crossing the aquifer and to the Cashen River and Estuary. The streams will be gaining. Seepage zones may exist on the cliff faces. A small volume of groundwater may cross-flow into the adjacent karstic Ballybunnon and Ardfert GWBs.
	Attachments	(Figure 1) Groundwater hydrograph.
	Instrumentation	Stream gauges: 23061; 23068. EPA Water Level Monitoring boreholes: Redfield Nurseries (KER108)
	Information Sources	Applin, K. R. and N. Zhao (1989) The Kinetics of Fe(II) Oxidation and Well Screen Encrustation. <i>Ground Water</i> , Vol 27, No 2. Conlon, V. and Wright, G. (1998) <i>County Kerry Aquifer Classification (draft)</i> . Geological Survey of Ireland Report to Kerry Co. Co., 18 pp. Aquifer chapters: Devonian Old Red Sandstone; Dinantian Lower Impure Limestones; Dinantian (early) Sandstones, Limestones and Shales.
	Disclaimer	Note that all calculations and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae

Figure 1: Groundwater hydrograph





Rock units in GWB

Rock unit name and code	Description	Rock unit group
Ballysteen Formation (BA)	Fossiliferous dark-grey muddy limestone	Dinantian Lower Impure Limestones
Lower Limestone Shale (LLS)	Sandstone, mudstone and thin limestone	Dinantian (early) Sandstones, Limestones and Shales
Kilmore Formation (KM)	Yellow-olive mudstone to sandstone	Devonian Old Red Sandstones
Glandahalin Formation (GH)	Red cross-bedded siltstone and sandstone	Devonian Old Red Sandstones
Inshaboy Formation (IY)	Sandstone, siltstone & mudstone	Devonian Old Red Sandstones