

*1<sup>st</sup> Draft Foyle Gravel GWB Description May 2005*

**Foyle Gravel GWB: Summary of Initial Characterisation.**

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km <sup>2</sup> )
01 Donegal Co. Co.	<b>Rivers:</b> Foyle; Deele; Swilly Burn; numerous unnamed streams.	River Finn (IE0002301)	19.2
<b>Topography</b>	The GWB occupies flat-lying ground along three river valleys – the Deele, Swilly Burn and the Foyle. The gravel body is about 15 km long in a N-S direction and, in the southern part, branches 6 km westwards along the Deele and Swilly valleys. The gravels are predominantly at elevations less than 10 mAOD, excepting areas along the Deele river, where elevations are slightly over 10 mAOD. On the western side of the deposits, the valley sides rise relatively steeply from the river plains to up to 180 mAOD. The Foyle River is tidal at least as far south as the confluence with the Swilly Burn (~7.5 km south of the northern edge of the GWB). The drainage is generally poor, with flooding indicated and a high density of natural and artificial drains.		
<b>Geology and Aquifers</b>	<b>Aquifer categories</b>	The sand/gravel deposit is greater than 10 km <sup>2</sup> . However, drilling and yield data indicate that the proportions of coarse and fine materials are spatially variable, with good yields dependent on the proportion of coarse material at a given location (Donegal GWPS). Accordingly, the deposits are classified as <b>Locally Important Sand and Gravel Aquifers (Lg)</b> (DELG/EPA/GSI (1999). The sand/gravel aquifer overlies bedrock aquifers which are Moderately Productive only in Local Zones (LI) and Generally Unproductive except for Local Zones (PI).	
	<b>Main aquifer lithologies</b>	Alluvial deposits (Meehan, 2004) along river floodplains are thought to comprise sands and gravel at depth, overlain by finer material (silts and clays) (Donegal GWPS). Nearby geophysical investigations indicate 10-20 m sand/gravel, with some clay at 10-20 mbgl (Minerex Environmental Ltd, 1998). Nearby drilling found 11 m of clay over 4-7 m silty sand/gravel (KT Cullen, 1996).	
	<b>Key structures</b>	N/A	
	<b>Key properties</b>	Sand/gravel aquifers generally consist of unconsolidated coarse-grained material, usually containing less than 8% fines (O'Suilleabhain, 2000). However, this aquifer contains greater proportions of fines in places. Productivity and yield data from two wells located 80 m apart recorded a 'good' yield with productivity I, and a 'moderate' yield with productivity class III (Donegal GWPS). In zones where the grains are coarse, transmissivity will probably range from 200 m <sup>2</sup> /d to more than 400 m <sup>2</sup> /d. In areas where the aquifer is more fine-grained, transmissivity will be lower. Storativity is expected to be high (10-20%). In this floodplain area, water levels will generally be very close to ground surface. The groundwater is likely to be unconfined, but may be confined by low permeability clay layers in places. Groundwater gradients will be very low (estimated as 0.0005).	
	<b>Thickness</b>	Thicknesses of more than 10 m are likely along the axes of the rivers, thinning towards the margins of the deposits.	
<b>Overlying Strata</b>	<b>Lithologies</b>	The sand/gravel aquifer is defined mainly on the basis of mapped alluvium. There are small areas of Metamorphic Till (TMp) mapped by Teagasc (Meehan, 2004).	
	<b>Thickness</b>	Drilling nearby indicates that clays up to about 10 m thick may overlie the sand/gravel deposits.	
	<b>% area aquifer near surface</b>	<i>[Further Information to be added at a later date]</i>	
	<b>Vulnerability</b>	The vulnerability is mapped as HIGH.	
<b>Recharge</b>	<b>Main recharge mechanisms</b>	Diffuse recharge occurs via rainfall percolating through the unsaturated sand/gravel. In general, due to the high permeability of sand/gravel, a high proportion of available recharge to gravel aquifers will percolate down to the water table. However, the low permeability layers that occur in this aquifer, together with a likely high water table, will tend to inhibit recharge in places. Depending on the river stage relative to groundwater levels, and on the permeability of the river bottom, river waters may recharge the aquifer. Groundwater from the underlying bedrock aquifer will contribute to the flux.	
	<b>Est. recharge rates</b>	<i>[Information to be added to and checked]</i>	
<b>Discharge</b>	<b>Large springs and large known abstractions (m<sup>3</sup>/d)</b>	<i>[Information to be added to and checked]</i>	
	<b>Main discharge mechanisms</b>	Groundwater discharges to the streams and major rivers that flow through the deposits.	
	<b>Hydrochemical Signature</b>	There are no data currently available to assess the hydrochemistry of this sand/gravel GWB.	

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<b>Groundwater Flow Paths</b>	The length of flow paths depend on the size and dimensions of the sand/gravel deposit, and also upon the spacing of internal groundwater divides and the distance between streams, if groundwater is discharging to them. In general, groundwater will flow at high angles to the Rivers Deele, Swilly Burn and Foyle and smaller streams, thus the flowpaths typically will be considerably less than about 500 m. However, where low permeability subsoils above the gravels confine groundwater locally, groundwater flowpaths may be longer. Flow direction in this case will be parallel to the river.
<b>Groundwater &amp; Surface water interactions</b>	In general groundwater from sand/gravel deposits located in river valleys discharges to the streams/ivers flowing through the valley. The hydraulic connection between the groundwater in the aquifer and the stream is expected to be variable due to spatially varying subsoil permeabilities. Water may be able move into and out of the aquifer from the river in certain locations depending on the river stages and permeability of the subsoils.
<b>Conceptual model</b>	<ul style="list-style-type: none"> <li>• The GWB consists of sand/gravel deposits lying along the River Foyle north of Strabane, and along E-W trending, steep-sided river valleys that feed into the River Foyle.</li> <li>• The deposits are located beneath river floodplains, and are situated at elevations less than 10 mAOD. The surface drainage is westwards and northwards. Surface drainage is poor, and the areas are prone to flooding. The Foyle River is tidal at least as far south as the confluence with the Swilly Burn (~7.5 km south of the northern edge of the GWB).</li> <li>• The aquifers are comprised of alluvial deposits, which drilling data indicate are comprised of sands/gravels with clay layers.</li> <li>• Transmissivity is expected to be 400 m<sup>2</sup>/d or less, depending on the grain size and sorting of the deposits. The grain size of the deposits varies laterally as well as vertically.</li> <li>• The sand/gravel aquifers are likely to be greater than 10 m thick, excepting at their margins.</li> <li>• Ground level data and surface drainage indications suggest that groundwater gradients are very low (estimated as 0.0005).</li> <li>• Diffuse recharge occurs via rainfall percolating through the unsaturated sand/gravel. Recharge is likely to be inhibited by the high groundwater levels and, in places, by low permeability deposits overlying the sands/gravels. Groundwater will also flow laterally into the deposits from the underlying bedrock aquifers.</li> <li>• Groundwater discharges to the rivers and streams that flow through the deposits.</li> <li>• Due to the geometry of the deposits, groundwater flow paths are likely to be less than 500 m in areas where groundwater is unconfined. In areas where the hydraulic connection between ground and surface waters is low due to low permeability deposits, groundwater flow paths are likely to be longer; they will also be parallel rather than at an angle to the rivers.</li> </ul>
<b>Attachments</b>	Figure 1.
<b>Instrumentation</b>	Stream gauges: none. EPA Water Level Monitoring boreholes: none. EPA Representative Monitoring points: none.
<b>Information Sources</b>	DELG/EPA/GSI (1999) <i>Groundwater Protection Schemes</i> . Department of the Environment and Local Government, Environmental Protection Agency and Geological Survey of Ireland. K.T. Cullen & Co. Ltd. (1996). Report on a Trial Well Drilling and Testing Programme at Lagan, East Donegal. Prepared at the Request of: Donegal County Council. No. 813. Lee, M. and Fitzsimons, V. (2004) <i>County Donegal Groundwater Protection Scheme</i> . Volume 1 Main Report, Draft, July 2004. 58 pp. Geological Survey of Ireland. Meehan, R.T., (2004) <i>Subsoils Map for County Donegal</i> . Map produced as part of EPA Soil and Subsoil Mapping Project (formerly FIPS-IFS). Teagasc, Kinsealy. Minerex Environmental Ltd (1998). Report on Lund Imaging Geophysics. Letter to P. Barr, Eurocement, Lifford. O' Riain, G., (2004). <i>Water Dependent Ecosystems and Subtypes Draft Report</i> . WFD Support Projects. Compass Informatics in association with National Wildlife and Parks Service (DEHLG). O'Suilleabhain, C., (2000). <i>Assessing the boundary between high and moderately permeable subsoils</i> . Unpublished MSc., University of Dublin. Department of Civil, Structural and Environmental Engineering, Trinity College Dublin.
<b>Disclaimer</b>	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 Location and extent of Foyle Gravel**

