Shannon (Lwr) Northern Gravel GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km^2)
25 Westmeath, Offaly Co. Co's	**Rivers**: Brosna **Lakes**: Daly's, Ballykilmore and Swallow lough		66

Topography		Five sand/gravel deposits, each greater than 4 km^2 are grouped together and described as the Shannon (Lwr) Northern Gravel GWB Group. The deposits are located at Kilbeggan, Horseleap, south of Moate, Ballycumber (Boher) and Agall. They are considered together because they have a similar configuration, i.e., similar morphology, located within the same subcatchment (Brosna), located in low-lying areas with similar land use patterns. The deposits are generally situated between 40 to 100 m OAD, typified by a hummocky landscape, with occasional narrow sinuous esker ridges associated with the main sand/gravel deposits. Figure 1 shows the location and extent of the GWB.
Geology and Aquifers	**Aquifer categories**	The sand/gravel deposits in the subcatchment are classified as **Locally Important Sand and Gravel Aquifers (Lg)** (DELG/EPA/GSI (1999). For the purposes of the WFD only sand/gravel aquifers greater than 4 km^2 are considered as GWB's.
	Main aquifer lithologies	Glaciofluvial limestone sand/gravel deposits (Meehan, 2004).
	Key structures	N/A
	Key properties	Yields greater than 1000 m^3/d and 370 m^3/d are recorded in two springs at Agall and Boher. Sand/gravel aquifers generally consist of unconsolidated coarse grained material, usually containing less than 8% fines (O'Suilleabháin, 2000) resulting in an intergranular porosity and relatively high permeabilities and storativity. Transmissivity is estimated to be approximately 600 m^2/d and the permeability is in the order of 75-85 m/d for a small sand/gravel aquifer near Ferbane located within the Brosna catchment, (Kelly, 2004; Daly, 1985). Typically transmissivity ranges from 200 – 1500 m^2/d. Storativity is expected to be high (10%). As the unconsolidated deposits are at the surface, groundwater is likely to be unconfined. The data are inadequate to calculate groundwater gradients, but these are expected to be greater than 0.001.
	Thickness	All the sand/gravel deposits are generally greater than 10 m thick.
Overlying Strata	**Lithologies**	Generally, alluvium is present in narrow strips along streams and rivers. Cutover peat and lacustrine deposits occur in the lowest lying regions often at the edges of the sand/gravel deposits.
	Thickness	The thickness of alluvium, cutover peat and lacustrine deposits are generally less than 3 m.
	% area aquifer near surface	*[Further Information to be added at a later date]*
	Vulnerability	*[Further Information to be added at a later date]*
Recharge	**Main recharge mechanisms**	Diffuse recharge occurs via rainfall percolating through the unsaturated sand/gravel. Due to the high permeability of sand/gravel, a high proportion of the available recharge will percolate down to the water table.
	Est. recharge rates	*[Information to be added to and checked]*
Discharge	**Large springs and large known abstractions (m^3/d)**	Springs: Agall 1000 m^3/d, Boher (370 m^3/d).
	Main discharge mechanisms	Groundwater discharges to small and large springs located at the periphery of the sand/gravel deposits and to rivers/streams that flow through the deposits, though the drainage density is relatively low.
	Hydrochemical Signature	The water is generally very hard, as evidenced by data from Ferbane, with an average total hardness of 360 mg/l (equivalent $CaCO_3$) and electrical conductivity values of 535-705 µS/cm (18 samples). Alkalinity is available from one sample: 344 mg/l.
Groundwater Flow Paths		The length of flow paths depends on the size of the sand/gravel deposit and on local groundwater divides. Generally, the more extensive sand/gravel aquifers are expected to have longer flow paths. In general locally important sand/gravel aquifers, which comprise the GWB are expected to have relatively short flow paths, i.e., up to several hundreds of metres. Sand/gravel has an intergranular porosity, thus groundwater flow is diffuse. Groundwater flow directions are driven by topography, generally to the southwest.
Groundwater & Surface water interactions		In general groundwater from sand/gravel deposits discharges to springs at the periphery or streams/rivers flowing through the deposits. The hydraulic connection between the groundwater in the aquifer and the streams/rivers is expected to be high.

Conceptual model	• The GWB consists of six locally important sand/gravel aquifers. • The deposits are generally situated between 40 to 100 m OAD, typified by a hummocky landscape, with occasional narrow sinuous esker ridges associated with the main sand/gravel deposits. • Typically transmissivity ranges from 200 – 1500 m^2/d. Storativity is expected to be high (10%). Groundwater is likely to be unconfined. Gradients are expected to be greater than 0.001. • Diffuse recharge occurs via rainfall percolating through the unsaturated sand/gravel. Due to the high permeability of sand/gravel, a high proportion of the available recharge will percolate down to the water table. • Groundwater discharges to small and large springs located at the periphery of the sand/gravel deposits and to rivers/streams that flow through the deposits. • Flow paths are likely to be short with groundwater discharging to nearby small springs and streams. Flow directions are expected to follow topography, generally to the southwest.
Attachments	Figure 1.
Instrumentation	**Stream gauges:** none **EPA Water Level Monitoring boreholes:** none **EPA Representative Monitoring points:** OFF019 (Rahan WSS), OFF021 (Rahan WSS)
Information Sources	DELG/EPA/GSI (1999) *Groundwater Protection Schemes*. Department of the Environment and Local Government, Environmental Protection Agency and Geological Survey of Ireland. Daly, D, 1985. Ass*essment of the Proposed Location of a Septic Tank near the public supply boreholes at Skehanagh, Ferbane.* GSI report for Offaly County Council. Daly, D, 1985. *Proposed Tip Site in Ferbane, Co. Offaly, A preliminary appraisal of five areas*. GSI report for Offaly County Council. Daly, D., Cronin, C., Coxon, C., Burns, S.J. (1998). *Offaly Groundwater Protection Scheme*. Geological Survey of Ireland. 78pp. Kelly, C., (2003). *Ferbane WSS. Skehanagh Boreholes. Groundwater Source Protection Zones*. Geological Survey of Ireland, 17pp. Meehan, R.T., (2004) *Subsoils Map for counties Westmeath and Offaly*. Map produced as part of EPA Soil and Subsoil Mapping Project (formerly FIPS-IFS). Teagasc, Kinsealy. O'Suilleabháin, C., (2000). *Assessing the boundary between high and moderately permeable subsoils*. Unpublished MSc., University of Dublin. Department of Civil, Structural and Environmental Engineering, Trinity College Dublin.
Disclaimer	Note that all calculation 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 Northern Gravel GWB Group