Rosses Point West GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km^2)
35 Sligo Co. Co.	**Rivers**: None **Streams**: Wilsborough **Lakes**: Doonweelin, Curraghnagark, Curraghmore, Curraghaleebeen.	Cummeen Strand / Drumcliff Bay (000627)	28

Topography	The GWB occupies an area stretching E-W from Rosses's Point to Crockauns, south of Glencar Lough. Elevations range from sea level to 452 mAOD. The peninsula is bounded by the coastline. The inland part of the GWB is bounded by the Drumcliff GWB. Figure 1 shows the location and boundaries.	
Geology and Aquifers	**Aquifer categories**	**Rk^c:** Regionally important karstified aquifer dominated by conduit flow. The 'c' signifies conduit flow. **Lm:** Locally important aquifer, generally moderately productive (3 km^2). **Pl:** Poor aquifer, generally unproductive except for local zones (2 km^2). 2 rock units occupying approximately 4 km^2 are pending classification.
	Main aquifer lithologies	Dinantian Pure Bedded Limestones dominate the GWB. Precambrian Quartzites, Gneisses and Schists, Dinantian Pure Unbedded Limestones, Dinantian Sandstones occupy small areas of the GWB. Table 1 lists the rock units present.
	Key structures	The GWB is located in the Rosses Point-Cuilcagh-Manorhamilton Fault Zone, which comprises several closely spaced steep normal E-W trending faults. The faults cross cut a short anticline trending NW-SE present in the Precambrian rocks toward the end of the Rosses Point.
	Key properties	Hydrogeological data specific to the GWB are sparse. There are no karst features recorded, though the limestones are expected to be karstified. An intermediate sized spring (greater 500 m^3/d) spring and one 'good' well are recorded in the Pure Bedded Limestones. Transmissivities are expected to be variable, ranging from 1 to greater than 2000 m^2/d. Storativity is likely to be low - approximately 0.01-0.02. Groundwater velocities are expected to be rapid. Groundwater gradients are expected to be greater than 0.0005 and greater than 0.005 on the upland area of Crockauns. Transmissivities are expected to be low within the Precambrian rocks. Yields are estimated to range from 40-300 m^3/d, in three wells drilled into the Dinantian Sandstones (Daly, 1975). Transmissivity is in the order of 100-150 m^2/d in the sandstones. In the vicinity of faults, transmissivity may be higher. Storativity in the sandstones is expected to be in the order of 2%. General flow directions are likely to be to the coast.
	Thickness	Within the limestones, most groundwater flow is likely to be in an epikarstic layer a couple of metres thick and in a zone of interconnected solutionally-enlarged fissures and conduits that extends approximately 30 m below this. Within the sandstones, most groundwater flux is likely to be in the upper part of the aquifer, comprising three broad zones: a zone comprising a broken and weathered zone typically less than 3 m thick; a zone of interconnected fissuring up to 40 m thick; and a zone of isolated poorly connected fissuring typically less than 150 m.
Overlying Strata	**Lithologies**	Till is the dominant subsoil over the lower lying areas. Blanket peat is dominant on the uplands, in the eastern part of the GWB. The presence of blanket peat is unusual over karstified limestones, however, an explanation is offered by Mac Dermot *et al* (1996), whom indicate that weathering of the Dartry Limestones leaves behind a "cherty residue" which provides a base for peat development. The peat may also form on top of low permeability till, however the stream density is relatively low, which may indicate relatively permeable till.
	Thickness	Depth to bedrock data are sparse. Thickness varies from 0-10 m. The greatest thicknesses occur on either side of the road joining Drumcliff and Sligo.
	% area aquifer near surface	*[Information to be added at a later date]*
	Vulnerability	*[Information to be added at a later date]*
Recharge	**Main recharge mechanisms**	Diffuse recharge occurs via rainfall percolating through permeable subsoil and rock outcrops. There is no evidence for point recharge occurring, however there may be unrecorded karst features via which point recharge may be occurring in the limestones.
	Est. recharge rates	*[Information to be added at a later date]*

Discharge

Large springs and high yielding wells (m^3/d)

One good well reported at Ballinear House (109 m^3/d)

Main discharge mechanisms

The main discharges are to springs, streams and to the coast.

Hydrochemical Signature

The groundwater has a $CaHCO_3$ signature, with high alkalinity (254, 304 mg/l as $CaCO_3$) and electrical conductivity (650-750 μS/cm).

Chloride (mg/l): 31-32.

The quality of the water from the Mullaghmore Sandstone is liable to be high in iron (Aldwell, 1981). The results of a water sample take from a GSI investigation borehole near Sligo town (Daly 1975) are shown below.

Total Hardness (mg/l CaCO3)	Calcium (mg/l)	Magnesium (mg/l)	Sodium (mg/l)	Potassium (mg/l)	Total Alkalinity (mg/l CaCO3)	Sulphate (mg/l)	Chloride (mg/l)	EC(µS/cm)	Iron (mg/l)	Manganese (mg/l)
44	25	19			328	140	35		28.0	nil

Groundwater Flow Paths

Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones within the sandstones. Flow paths can be expected to be relatively long. Groundwater flow directions are expected to follow topography, generally toward the coast.

The Dinantian Limestones are generally devoid of intergranular permeability. Groundwater flows through fissures, faults, joints and bedding planes. In pure bedded limestones these openings are enlarged by karstification which significantly enhances the permeability of the rock. Karstification can be accentuated along structural features such as fold axes and faults. Groundwater flow through karst areas is extremely complex and difficult to predict. As flow pathways are often determined by discrete conduits, actual flow directions will not necessarily be perpendicular to the assumed water table contours. Flow velocities can be rapid and variable, both spatially and temporally. Rapid groundwater flow velocities indicate that a large proportion of groundwater flow takes place in enlarged conduit systems. Flow path lengths can be up to a several kilometres in length, however, due to the relatively small size of the GWB, it is likely that flow paths will be shorter than other large karst GWB's. Overall groundwater flow will be towards the sea, but the karstified nature of the bedrock means that locally, groundwater flow directions can be highly variable.

Groundwater & Surface water interactions

Generally, there is a high degree of interconnection between groundwater and surface water in karstified limestone areas. Any contamination of surface water is rapidly transported into the groundwater system, and vice versa. Groundwater will contribute baseflow to the streams and rivers.

Conceptual model

- The GWB occupies an area stretching E-W from Rosses's Point to Crockauns, south of Glencar Lough. Elevations range from sea level to 452 mAOD.
- The GWB is bounded by the coast at the western end of the peninsula. The inland part of the GWB is bounded by the Drumcliff GWB.
- The GWB is comprised mainly of Dinantian Pure Bedded Limestones.
- Transmissivities are expected to be variable, ranging from 1 to greater than 2000 m^2/d in the limestones. Storativity is likely to be in the range of 1-2%. Transmissivity is in the order of 100-150 m^2/d in the sandstones. Transmissivities are likely to be higher in the vicinity of fault zones.
- Most groundwater flux is likely to be in the upper part of the aquifer.
- Till is the dominant subsoil over the lower lying areas. Blanket peat is dominant on the uplands.
- Recharge occurs via diffuse mechanisms. Point recharge to the underlying aquifer may be occurring via as yet unrecorded karst features.
- The main discharges are to small springs, streams, rivers and to the sea along the coastline.
- The groundwater has calcium bicarbonate signature.
- There is a high degree of interconnection between groundwater and surface water.

Attachments

Table 1 and Figure 1.

Instrumentation

Stream gauge
EPA Water Level Monitoring boreholes:
EPA Representative Monitoring points:

Information Sources	Aldwell, C. R. (1981) *The Geology and Mineral Resources of Co. Sligo with special emphasis on Groundwater and its protection*. Lecture by C.R. Aldwell of Geological Survey of Ireland to Institute of Engineers of Ireland. Sligo – March 16th, 1981. Daly, E. (1975) *Report on the groundwater potential of the area around Sligo town*. Geological Survey of Ireland. MacDermot, C.V. Long C.B. and Harney S.J (1996) Geology of Sligo-Leitrim: *A geological description of Sligo, Leitrim and adjoining parts of Cavan, Fermanagh, Mayo and Roscommon, to accompany bedrock geology 1:100,000 scale map, Sheet 7, Sligo - Leitrim*. Geological Survey of Ireland, 100pp. Geological Survey of Ireland, Precambrian quartzites, Dinantian Sandstones and Dinantian Pure Bedded Limestone Aquifer Chapters. Unpublished.
Disclaimer	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae.

Table 1 Rock units in GWB

StratCode	UnitName	Description	RockUnit	Aquifer Class
BS	Ballyshannon Limestone Formation	Pale grey calcarenite limestone	Dinantian Pure Bedded Limestones	Pending Class
CZ	Cregg House Formation	Psammitic paragneiss	Precambrian Quartzites, Gneisses & Schists	Pl
LKcu	Curraghnagark Member	Schist, aluminous pelitic schist	Precambrian Quartzites, Gneisses & Schists	Pl
DA	Dartry Limestone Formation	Dark fine-grained cherty limestone	Dinantian Pure Bedded Limestones	Pending Class
LKdo	Doonweelin Member	Banded pelitic schist	Precambrian Quartzites, Gneisses & Schists	Pl
LKgu	Grit Unit (Curraghnagark Member)	Coarse pebbly grit with graded bedding	Precambrian Quartzites, Gneisses & Schists	Pl
LS	Liscarragh Formation	Psammite, quartzite, marble & volcanics	Precambrian Quartzites, Gneisses & Schists	Pl
MU	Mullaghmore Sandstone Formation	Sandstone, siltstone & shale	Dinantian Sandstones	Lm

StratCode	UnitName	Description	RockUnit	Aquifer Class
BS	Ballyshannon Limestone Formation	Pale grey calcarenite limestone	Dinantian Pure Bedded Limestones	Rkc
DA	Dartry Limestone Formation	Dark fine-grained cherty limestone	Dinantian Pure Bedded Limestones	Rkc
mkDA	Dartry Limestone Formation& Mudbank limestone	Dark fine-grained cherty limestone	Dinantian Pure Unbedded Limestones	Rkc
MU	Mullaghmore Sandstone Formation	Sandstone, siltstone & shale	Dinantian Sandstones	Lm

Figure 1 Location and boundaries of GWB.