Kilglass Dromod Groundwater Body: Summary of Initial Characterisation.

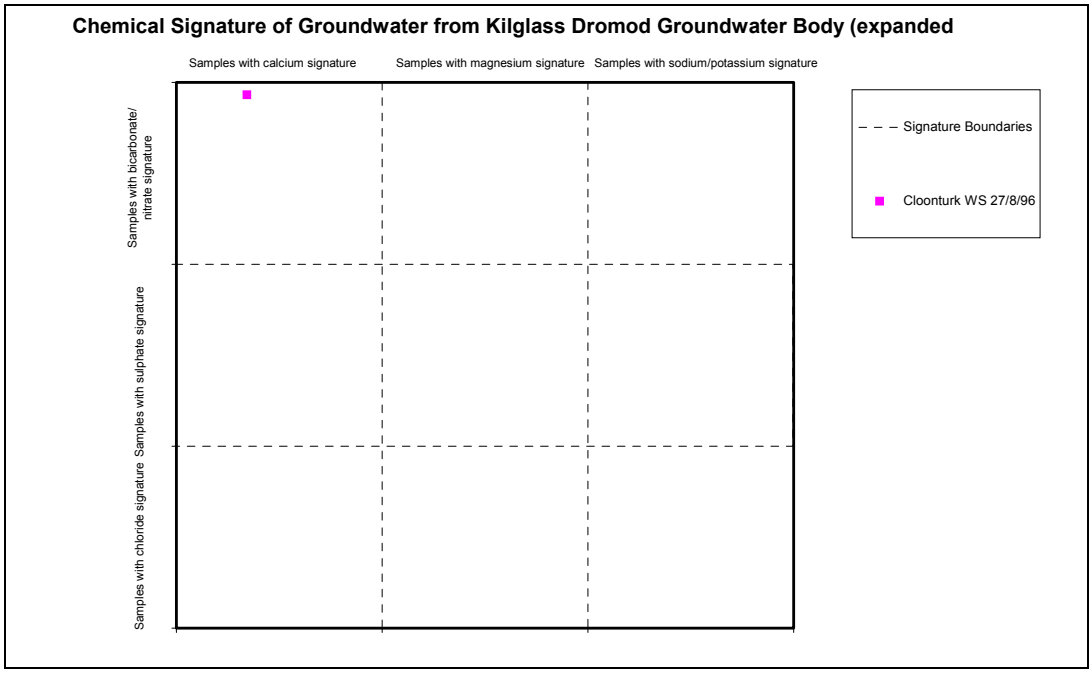
Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km^2)
26 – Shannon Upstream Roosky Leitrim & Roscommon Co. Co.'s	**Rivers:** Eslin, Rowan. **Loughs:** Bofin, Machugh, Erril, Cloonfinnan, Cloonboniagh, Bog, Cloonturk, Gubagraffy.	(001420) Corracramph Bog; (000422) Aghnamona Bog; (001642) Lough Boderg and Lough Bofin.	54

Topography	This GWB consists of two areas underlain by low permeability rocks on the eastern edge of the Shannon Upstream Roosky surface water catchment area. The southern area, which includes the village of Kilglass, occurs on the west side of a ridge of high ground formed by the Strokestown Inlier. Elevations in this area range from 60-140 mAOD. Steep slopes occur, particularly opposite and to south of Kilglass Lough. The remainder of the body, which includes the village of Dromod, is more low-lying. It loops around from the south of Loughs Boderg & Bofin, north along the River Eslin and south again to Loughs Boderg & Bofin, around an inner area of higher permeability rock just north of the lake. Elevations in this part of the body range from 40-100 mAOD, lowest in the vicinity of Lough Boderg and Bofin. South of Lough Bofin the ground is quite flat and areas of peat occur. Moving north along the River Eslin initially there are gentle slopes towards the river. Further north along the river there is a drumlinised topography with small hills rising to 80-90 mAOD. There are several small lakes in this northern area.	
Geology and Aquifers	Aquifer categories	The main aquifer categories are: **Ll:** Locally important aquifer which is moderately productive only in local zones, and **Pl:** Poor aquifer which is generally unproductive except for local zones, with a tiny area (0.07 km^2) of **Lm:** Locally important aquifer which is generally moderately productive
	Main aquifer lithologies	The main aquifer lithologies are Dinantian (early) Sandstones, Shales and Limestones, Dinantian Lower Impure Limestones, Dinantian Upper Impure Limestones, Dinantian Shales and Limestones, and Ordovician Metasediments and Ordovician Volcanics. There is a tiny area (0.07 km^2) of Dinantian Sandstones.
	Key structures	This groundwater body is part of the Strokestown Inlier, a fault bounded inlier with a core of Ordovician metasediments, flanked by Dinantian Sandstones, Dinantian (early) Sandstones, Shales and Limestones, and Dinantian Impure Limestones (Upper & Lower). The Dinantian Sandstones rest unconformably on Ordovician metasediments. The major northeast southwest trending Strokestown Fault lies to the northwest of the inlier.
	Key properties	No data on hydrogeological properties specific to this groundwater body are available. The Ordovician Metasediments of the southwestern segment of the body are considered to be a poor aquifer. From experience in other areas of Ireland transmissivity values for Ordovician Metasediments similar to those found in this groundwater body range from 5-20 m^2/d, with the median value in the lower end of the range. Aquifer properties of the Dinantian Upper Impure Limestones vary across Ireland influenced by lithological variations and variations in the extent of deformation. In this area transmissivity in the Dinantian Upper Impure Limestones is expected to be low. A pumping test at Lorrha WS, in the Nenagh GWB southwest of Lough Derg, indicates an aquifer permeability of 5 m/d in the Upper Impure Limestones. The borehole there intercepts a large fissure, so this value is at the high end of what would be expected for this rock unit group. Transmissivities are typically in the range of 2-20 m^2/d. The Banagher WS, abstracting from the same rock unit group in the Banagher GWB, has similar characteristics: a single large fault zone supplies the source, resulting in a transmissivity estimate of 45-70 m^2/d. An aquifer permeability of 20 m/d was estimated from the thin flowing interval at the source. Within the Dinantian Lower Impure Limestones, transmissivities are likely to be in the range 2-20 m^2/d, with most values at the lower end of the range. Dinantian (early) Sandstones, Shales and Limestones aquifer properties are expected to have similarly low permeabilities however more frequent areas of enhanced permeability could be encountered in the Meath Formation (ME), a limestone which is generally described as having a lower shale content than other Dinantian (early) Sandstones, Shales and Limestones. Overall the rock units in this groundwater body are not considered to be major aquifers, although there can be some local enhancement of permeability due to structural deformation. Storativity in the rocks in this groundwater body will be low.
	Thickness	In the low permeability rocks which make up this groundwater body most groundwater flow will be within the top 15 m of the rock. A weathered zone of a few metres is generally underlain by a zone of interconnected fissures of about 10 m. Deeper flow can occur in areas that have undergone a high degree of structural deformation and faulting, where the resulting fissures have remained open. In poor aquifers such as the Ordovician Metasediments groundwater flow is likely to be restricted to the upper few metres, where weathering and fracturing are likely to be most intense.
Overlying Strata	Lithologies	A Teagasc Parent Material is not currently available for County Leitrim. A Teagasc Parent Material map is available for the County Roscommon part of this GWB. On the higher ground there are frequent areas of rock outcrop and shallow rock, separated by glacial till. Areas of Cut Peat are recorded where ground elevations are lower. There are also some alluvium deposits. *Subsoil Types identified in body in County Roscommon by Teagasc Parent Material Mapping: Cut Peat (Cut); Till (TDSs, TLPDSs, TLs); Rock outcrop and rock close to surface (Rck); and Alluvium (A).* *[More information to be added at a later date]*
	Thickness	There are limited point data on depth to bedrock currently available for this GWB. As areas of outcrop and shallow rock are common, it is expected that there will be large areas of shallow subsoil (<3 m) within this GWB, particularly on the higher ground. *[More information to be added at a later date]*

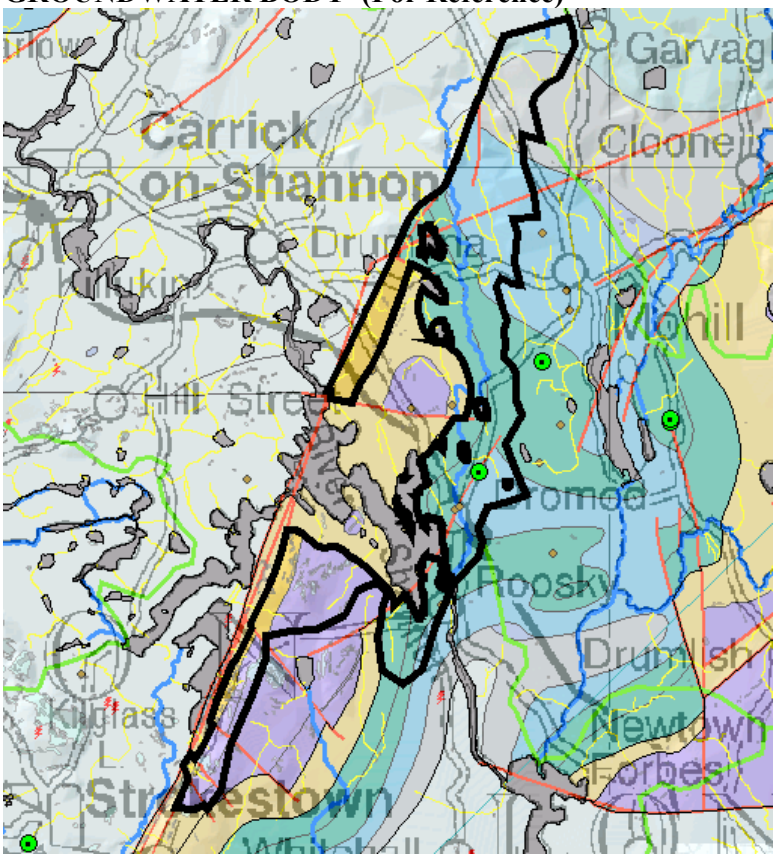
	% area aquifer near surface	*[More information to be added at a later date]*
	Vulnerability	A Groundwater Vulnerability Map has been prepared for County Roscommon. In the south of the body in County Roscommon there is a high proportion of areas of higher ground designated as Extreme vulnerability. Remaining areas of high ground are High Vulnerability. Where the ground elevations are lower there are areas of Moderate and Low Vulnerability, coinciding with areas of deeper subsoil. In County Leitrim where a Groundwater Vulnerability Map is not currently available, there will be areas of Extreme Vulnerability in the vicinity of rock outcrop and shallow rock in this GWB. Areas of cut peat would be expected to have Moderate or Low Vulnerability due to the peat cover and the underlying lacustrine clay and marl that are generally found beneath large areas of peat in this region, however the vulnerability rating will be dependant on the thickness of the subsoil. *[More information to be added at a later date]*
Recharge	Main recharge mechanisms	Diffuse recharge will occur over the entire GWB 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. Subsoil permeability has not currently been mapped in detail in County Leitrim. In the part of the body in County Roscommon percolation of recharge will be restricted by the 'low' permeability subsoils that occur within the body. *[Information to be added at a later date]*
	Est. recharge rates	*[Information to be added at a later date]*
Discharge	Important springs and high yielding wells (m^3/d)	There are no major abstractions or large springs currently recorded in this groundwater body. Three wells with 'Good' yields are recorded in the GSI borehole database. A number of small group schemes are listed in the EPA sources list and in the GSI database. *[More information to be added at a later date]*
	Main discharge mechanisms	The main discharges will be local, to the main rivers and their tributaries crossing the groundwater body, and to Lough Boderg and Bofin in the centre of the body.
	Hydrochemical Signature	There is one EPA Representative Monitoring Point in this groundwater body, however there is only one complete sample record currently available for that point (LEI11). The hydrochemical signature of groundwater from this well (which is in the Dinantian Lower Impure Limestone) is demonstrated in an expanded Durov plot in Figure 1 below. Groundwater from the Dinantian rocks has a calcium-bicarbonate signature. Hardness, alkalinity and electrical conductivities vary between the different rock unit group aquifers, however. In the Dinantian (early) Sandstones, Limestones and Shales and the Lower Impure Limestones, groundwaters are Hard to Very Hard (typically ranging between 380–450 mg/l), and high electrical conductivities (650–800 µS/cm) are often observed. Alkalinity is also high, but less than hardness (250-370 mg/l as $CaCO_3$). Within the Impure Limestones, iron and manganese concentrations frequently fluctuate between zero and more than the EU Drinking Water Directive maximum admissible concentrations (MACs). Hydrogen sulphide can often reach unacceptable levels. These components come from the muddy parts of these rock units and reflect both the characteristics of the rock-forming materials and the relatively slow speed of groundwater Groundwaters from Ordovician Metasediments elsewhere in the country have been found to be quite variable in hydrochemistry. Hardness ranged from 'soft' to 'moderately hard', with a hydrochemical signature of calcium bicarbonate to calcium magnesium bicarbonate. The groundwater chemistry in the Ordovician Metasediments can be influenced by the mineralogy of the subsoil, with some areas showing slightly higher hardness and alkalinity, where the overlying tills include limestone clasts which chemically alter the recharging waters.
Groundwater Flow Paths		These rocks are devoid of intergranular permeability; groundwater flow occurs in fractures and faults. Permeability is highest in the upper few metres of bedrock, but decreases rapidly with depth. In general groundwater flow is concentrated in the upper 15 m of the aquifer. Local zones of high permeability can be encountered near fault zones and in areas of intensive fracturing. Groundwater flow in this body will be of a local nature. There is unlikely to be significant flow between the Kilglass and Dromod parts of the GWB as the two areas are linked by only a very narrow area of low permeability rock. Groundwater flow paths are generally short, with groundwater discharging to small springs, or to the streams and rivers that traverse the aquifer. Flow directions are expected to follow the local surface water catchments. Groundwater is generally unconfined in this groundwater body but can become partially confined beneath low permeability subsoils
Groundwater & Surface water interactions		Groundwater and surface water interactions require special attention where terrestrial ecosystems are dependant on a sustainable balance between the two. A number of raised bogs and lakes are recorded in this groundwater body which may have some localised interaction with groundwater.

Conceptual model	• This GWB consists of two areas underlain by low permeability rocks on the eastern edge of the Shannon Upstream Roosky surface water catchment area. The boundaries of the body are formed, by topographic highs and by contact with bedrock units of a higher permeability. The southern area, which includes the village of Kilglass occurs on the west side of a ridge of high ground. It is bounded to the east by a groundwater divide at the topographic high, which coincides with the surface water catchment boundary, and to the west by contact with the Dinantian Sandstones of the Scramoge North GWB. The remaining area, which includes the village of Dromod, is bounded to the east by a groundwater divide at the topographic high, which coincides with the surface water catchment boundary, to the west by the contact with the Dinantian Pure Bedded Limestones of the Carrick on Shannon GWB. The inner boundary north of Loughs Boderg & Bofin is formed by the contact with the Dinantian Sandstones of the Scramoge North GWB. • The body has a varied topography, with the southern area around Kilglass consisting of a ridge of high ground with some steep slopes (60-140 mAOD) and the remaining area, which includes the village of Dromod consisting of more low-lying ground, relatively flat south of Lough Bofin, and gently rising towards the north where there are drumlins with top heights of 80-90 mAOD. • This groundwater body is composed of low permeability rocks, although localised zones of enhanced permeability can occur along faults and in the vicinity of fault zones. Groundwater flows along fractures, major faults. • Recharge occurs diffusely over the entire GWB via rainfall percolating through the subsoil. The steep slopes in the southern part of the body around Kilglass will increase runoff and reduce the amount of effective rainfall recharging the aquifer. • Groundwater is generally unconfined in this groundwater body but can become partially confined beneath low permeability subsoils, which where present in sufficient thickness, may also act to reduce the amount of effective rainfall recharging the aquifer. • Most groundwater flow will occur within the top 15 m of the bedrock, comprising a weathered zone of a few metres and a connected fractured zone below this. Deep-water strikes in more isolated faults/fractures can be encountered in areas that have undergone a high degree of structural deformation and faulting. Groundwater flow in this body will be of a local nature. Groundwater flow paths will generally be short. There is unlikely to be significant flow between the Kilglass and Dromod parts of the body. • Groundwater will discharge to the streams and rivers crossing the body • A number of bogs and lakes are recorded in this groundwater body which may be locally dependent on groundwater.
Attachments	Hydrochemical signature (Figure 1).
Instrumentation	Stream gauges: (26132) Dromod, Eslin. EPA Water Level Monitoring boreholes: None EPA Representative Monitoring points: Clonturk WS (LEI11)
Information Sources	Morris J.H., Somerville I.D. and MacDermot C.V. (2002). *Geology of Longford-Roscommon.* A Geological Description to Accompany the Bedrock Geology 1:100,000 Bedrock Series Sheet 12. With contributions by D.G. Smith, M. Geraghty, B. McConnell, K. Carlingbold, W. Cox, D. Daly. Geological Survey of Ireland, 121pp. (Publication pending). Aquifer Chapters: Dinantian (early) Sandstones, Shales and Limestones; Dinantian Upper Impure Limestones; Dinantian Lower Impure Limestones; Dinantian Shales and Limestones; Ordovician Metasediments.
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: Hydrochemical signature



GROUNDWATER BODY (For Reference)



List of Rock units in Kilglass Dromod Groundwater Body

Rock unit name and code	Description	Rock unit group
Finnalaghta Formation (FA)	Blue-grey greywacke & black argillite	Ordovician Metasediments
Lackan Formation (LN)	Feldspathic sandstone with jas[er	Ordovician Metasediments
Aghamore Formation (AE)	Lava and volcanicalstic breccia	Ordovician Volcanics
Fearnaght Formation (FT)	Pale conglomerate & red sandstone	Dinantian Sandstones
Moathill Formation (MH)	Limestone, calcareous sandstone, shale	Dinantian (early) Sandstones, Shales and Limestones
Meath Formation (ME)	Limestone, calcareous sandstone	Dinantian (early) Sandstones, Shales and Limestones
Ballysteen Formation (BA)	Dark muddy limestone, shale	Dinantian Lower Impure Limestone
Drumgesh Shale Formation (DH)	Dark shale, fine-grained limestone	Dinantian Shales and Limestones
Lucan Formation (LU)		Dinantian Upper Impure Limestones