

L.AllenUplands: Summary of Initial Characterisation.

OUTSTANDING ISSUES – whether to include an area of BKI & GD in northwest; what to say about L Allen and gw surface water interactions, what to mention about Glenade/Dowra GWB and emergence of R.Shannon at Shannon Pot. Whether to include the small area of Meenymore at Glangevlin in LAllen or GlenadeDowra GWBs

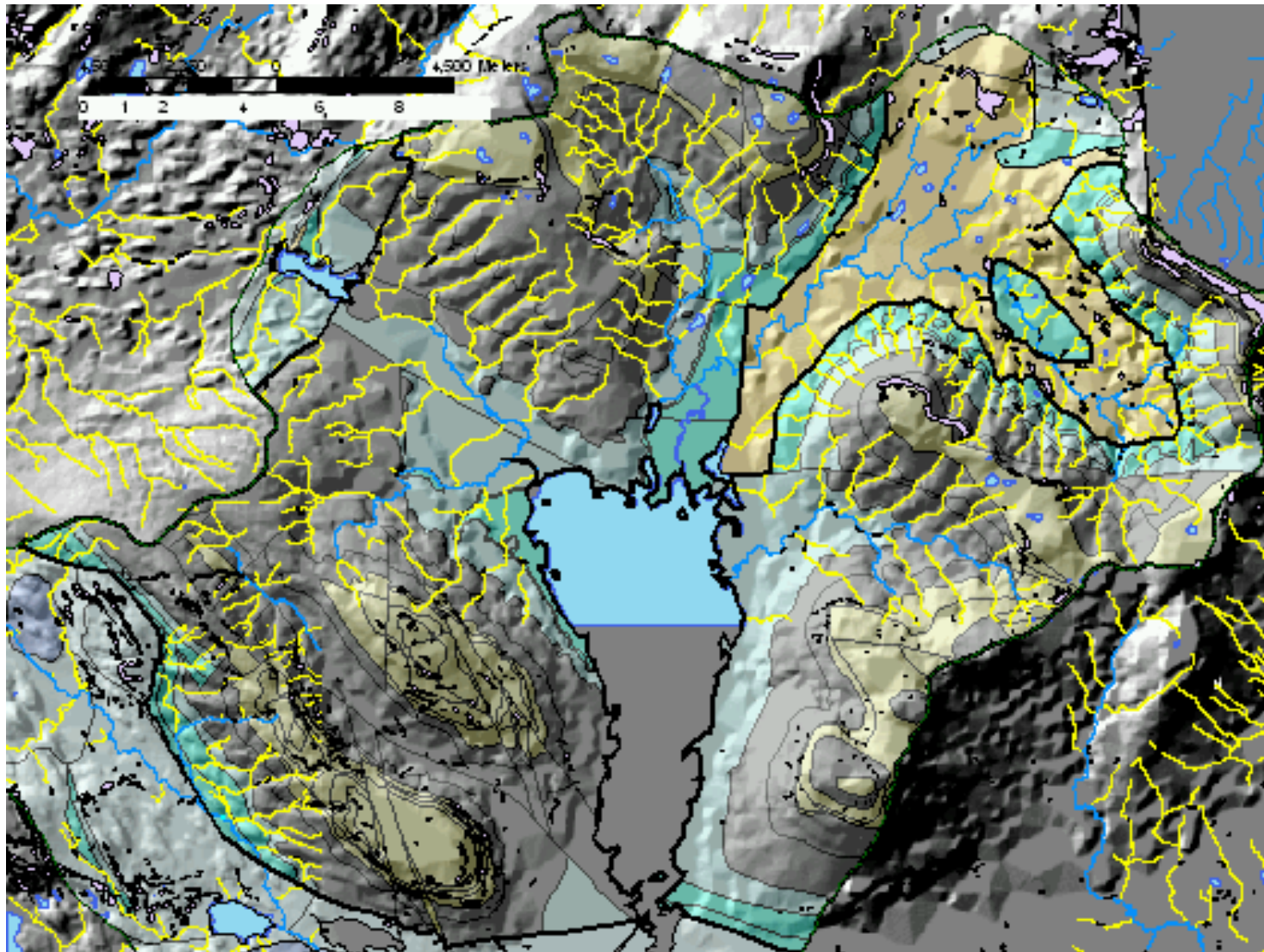
Comments: need data on gradients, gw surfacewater interaction – Shannon pot.

Lough Allen Uplands: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water bodies	Associated terrestrial ecosystem(s)	Area (km ²)
26 – Shannon Upstream Roosky. Roscommon, Sligo, Leitrim, Cavan Co. Co.'s	Rivers: Camoge (tributary to Feorish), Feorish, Arigna, Owengar, Diffagher, Owennale, Graffy (tributary of Owennale), Shannon, Owenmore, Yellow and Altnaguilan Lough: Allen, Balnabahy, Avanny, Doo, Natire, Blind, Nagloghder, Naweleian, Strand, Lackagh, Carran, Altsrahagh, Kilooman, Moneen, Tullynamoyle, Ardrougher, Tents, Corakeeldrum, Legnagrow, Tully, Altshallan, Nambrack, Knockgorm, Munter Eolus, Derrynananta.	Tullytawen Bog (000617); Lough Allen (002109), Cuilcagh-Anierin Uplands, (000584) and Boleybrack Mountain (002032)	367 <i>(may change pending border adjustment at Lough Belhavel)</i>
Topography	This body includes all the upland area around Lough Allen and part of the Cuilcagh Mountains in the north west. The highest point is over 650 mAOD in the Cuilcagh Mountains. Nearly half of the groundwater body occurs in areas of greater than 200 mAOD. In general the ground slopes towards Lough Allen which lies in the centre of the body. Ground elevations are lower in the river valleys of the River Shannon, and the Dirragher, Yellow, Owenmore, Owennale and Arigna Rivers which cut through the upland areas. The lowest point is just under 50 mAOD around the shores of Lough Allen and in the Shannon River valley near its entry at the north side of the lake. The mountain margins are composed of smoothly sloping poorly drained land, often boggy and underlain by shale. The mountains are capped by hard sandstone which forms cliffs and rocky crags. The many streams draining the hills cut narrow valleys in the shale bedrock. The valley bottoms and lower hillslopes are covered with drumlins, which, as they are composed of largely ground-down shale debris, form very waterlogged soils.		
Geology and Aquifers	Aquifer categories	Ll: Locally important aquifer which is moderately productive only in local zones; Pi: Poor aquifer which is generally unproductive except for local zones; Pu: Poor aquifer which is generally unproductive	
Main aquifer lithologies	Namurian Shales, Namurian Sandstones, Namurian Undifferentiated, Dinantian Shales and Limestones, & Dinantian Mixed Sandstones, Shales and Limestones.		
Key structures	The rock units in this body are horizontal to very gently dipping. The uplands are made up of layered units with layers of shale capped by some layers of hard sandstones While some faults are mapped in these rock units, the undisturbed nature of the stratigraphy suggest that they have not been subject to any major structural processes.		
Key properties	No data on hydrogeological properties specific to this groundwater body are available. Within the Namurian rocks, transmissivity is expected to be in the range of 2-20 m ² /d, with median values biased to the lower end of the range. Hydrogeological data is extremely limited for the Dinantian Shales and Limestones and the Dinantian Mixed Sandstones Shales and Limestones. Based on their lithological characteristics transmissivities are expected to be low, generally < 20 m ² /d with values for more shale dominant units < 10 m ² /d. The rock units in this groundwater body are not considered to be major aquifers although there may be some local enhancement of permeability due to structural deformation. The storativity of these rocks will be low. <i>(Data Source: Rock Unit Group Aquifer Chapters)</i>		
Thickness	In general, the effective thickness of this aquifer is likely to be not more than 15 m, comprising a weathered zone of a few metres and a connected fracture zone of up to 10 m below this. The rock unit layers extend to much greater depths Shales extend to over 150 m with the overlying hard sandstones 60-90 m in thickness.		
Overlying Strata	Lithologies	<i>[Information to be added at a later date]</i>	
Thickness	Subsoil likely to be thinnest on upland areas. Drumlins occur on lower slopes. Rock outcrop occurs predominantly on the mountain tops and upper slopes. <i>[Information to be added at a later date]</i>		
% area aquifer near surface	<i>[Information to be added at a later date]</i>		
Vulnerability	Areas of extreme vulnerability occur primarily on the higher ground with some areas of extreme vulnerability close to the shores of Lough Allen.		
Recharge	Main recharge mechanisms	Most recharge is likely to occur in the upland areas where the subsoil thickness is thinnest. A large number of streams runoff the upland areas indicating that the bedrock is of relatively low permeability. Recharge is of a diffuse nature.	
Est. recharge rates	<i>[Information to be added at a later date]</i>		
Discharge	Springs and large known abstractions (m ³ /d)	Arigna WS (Derreenavoggy) 208 m ³ /d (Rosc Co.Co.); Gubbaruda Spring (Gubbaruda) low yield (Rosc. Co.Co.) – GSI Well Database Moher GWS - Slieve Anierin (Spring) LEI33 (51 m ³ /d) - EPA list of groundwater sources (March 2002). <i>[More Information to be added at a later date]</i>	

	<p>Main discharge mechanisms</p> <p>As the rock units in this body are of relatively low permeability discharges will generally be local to streams and rivers crossing the body reflecting the short groundwater flow paths. There is likely to be local discharge to Lough Allen from the rocks surrounding the lake. Baseflow to rivers and streams will generally be low. There may also be some very limited discharge to adjacent regionally important aquifers.</p>
	<p>Hydrochemical Signature</p> <p>No relevant hydrochemical data are available in this GWB for assessment. The body is composed primarily of Namurian Shales and Sandstones and various Dinantian Sandstones, Shales and Limestones. Groundwaters in Namurian rocks are slightly hard and have moderate alkalinities. Both iron and manganese can exceed allowable concentrations, these components coming from the shales. Reducing conditions may occur. The Namurian rocks are siliceous. Groundwater in the Dinantian Shales and Limestones will have a calcium-bicarbonate signature and will be generally hard and alkaline. Both iron and manganese can exceed allowable concentrations, these components coming from the shales. The Dinantian Shales and Limestones and Dinantian Mixed Sandstones, Shales and Limestones are calcareous.</p>
	<p>Groundwater Flow Paths</p> <p>These rocks are devoid of intergranular permeability; groundwater flow occurs in faults fractures and joints. Due to the low permeability of the rocks in this groundwater body, groundwater flow will be of a local nature. Groundwater flow paths will be short, in general between 30 and 300 m, with groundwater discharging to streams and locally to Lough Allen in the centre of the body. Groundwater flow will be concentrated in a thin zone at the top of the rock. The low permeability rocks of this groundwater body will act as a barrier to groundwater flow from adjoining karstic groundwater bodies. Overall, flow will be generally towards the River Shannon and Lough Allen in the centre of the body. In the extreme southwest of the body in the Feorish subcatchment, the general groundwater flow direction will be southwestwards towards the Geevagh/Ballyfarnan valley and the adjoining Skean Meeglan GWB.</p>
	<p>Groundwater & Surface water interactions</p> <p>The rock units in this body are of low permeability and baseflow to rivers and streams will be low. Small springs emerge on the upland, some at the contact between the sandstones and underlying shales.</p>
Conceptual model	<ul style="list-style-type: none"> • This groundwater body is bounded to the east, north and northwest by topographic highs which coincide with the surface water catchment boundary. To the south and southwest the groundwater body boundary is formed by the contact with the Dinantian Pure Bedded Limestones of the Skean Meeglan GWB and, to the northeast, by contact with the Dinantian Sandstones of the Glenade Dowra GWB. The topography is mountainous, consisting primarily of steep-sloped upland cut by narrow river valleys. • The groundwater body is composed of low permeability rocks although localised zones of enhanced permeability can occur in the vicinity of fault zones. • Groundwater flow will be concentrated in fractured and weathered zones and in the vicinity of fault zones. • Recharge will occur diffusely through the subsoils and via outcrops, primarily in the upland areas where the subsoil is thinnest. The high drainage density in the uplands suggests that a high percentage of potential recharge is rejected. • Groundwater within the body is generally unconfined. Most flow will occur near the surface of the rock. The effective thickness of the aquifer is likely to be not more than 15 m, comprising a weathered zone of a few metres and a connected fracture zone below this, although deeper inflows could occur where there has been a higher degree of structural deformation. Due to the low permeability nature of the rocks in this groundwater body, groundwater flow will be of a local nature. Flow path lengths will be relatively short, and in general are between 30 and 300 m. Local flow directions are controlled by local topography. Overall, groundwater flow within the body will be generally towards the River Shannon and Lough Allen in the centre of the body. In the extreme southwest of the body the general groundwater flow direction will be southwestwards towards the Geevagh/Ballyfarnan valley. • Groundwater discharges to the streams crossing the aquifer, and locally to Lough Allen.
Attachments	None
Instrumentation	<p>Stream gauges: 26120 (Arigna River); 26107 (Arigna River, Altagowlan); 26129 (Owengar River, Barragh Beg); 26240 (Owengar River, Annagherry); 26241 (Diffagher River, Cloonmeone Bridge); 26259 (Owennayle, Derrintawy Glebe); 26258 (Yellow River, Metal Bridge); 26257 (Yellow River, Owenboy Bridge), 26256 (Stoney River, Stonyriver Bridge).</p> <p>EPA Water Level Monitoring boreholes: n/a</p> <p>EPA Representative Monitoring boreholes: n/a</p>
Information Sources	<p>Lee, M. & Daly D. (2003) <i>County Roscommon Groundwater Protection Scheme</i>. Main Report. Roscommon County Council & Geological Survey of Ireland, 54pp.</p> <p>MacDermot, C.V. Long C.B. and Harney S.J (1996) <i>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</i>. With contributions from K. Carlingbold, G. Stanley, D. Daly and R. Meehan. Geological Survey of Ireland, 100pp.</p> <p>Aquifer Chapters: Namurian Shales, Sandstones and Undifferentiated, Dinantian Mixed Sandstones, Shales and Limestones and Dinantian Shales and Limestones.</p>
Disclaimer	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae

Lough Allen Uplands GWB (For Reference) – outlined in bold black line (dashed line is Shannon RBD boundary)



List of Rock units in Lough Allen Uplands Groundwater Body

Rock unit name and code	Description	Rock unit group
Bencroy Shale Formation (BH)	Black shale, silty shale, ironstone beds	Namurian Shales
Bencroy Sandstone Member (BHss)	Sandstone, sandy shale & shale	Namurian Sandstones
Lackagh Sandstone Formation (LH)	Cyclothemetic sandstone, siltstone, coal	Namurian Sandstones
Gowlaun Shale Formation (GO)	Shale & minor turbiditic sandstone	Namurian Shales
Briscloonagh Sandstone Formation (BR)	Fine-grained sandstone, minor shale	Namurian Sandstones
Dergvone Shale Formation (DE)	Shale & minor turbiditic sandstone	Namurian Shale
Namurian (undifferentiated) (NAM)	Shale & sandstone	Namurian Undifferentiated
Carraun Shale Formation (CN)	Grey/black shale with minor limestone	Dinantian Shales and Limestones
Bellavally Shale Formation (BE)	Grey micrite, shale, laminite evaporite	Dinantian Mixed Sandstones, Shales and Limestones
Doobally Sandstone (BEdo)	Medium-grained sandstone	Dinantian Shales and Limestones
Meenymore Formation (ME)	Shale, laminated carbonate, evaporite	Dinantian Mixed Sandstones, Shales and Limestones
Lisgorman Shale Formation (LG)	Thin-bedded calcareous shale, limestone	Dinantian Shales and Limestones

NOTES ON GWB DESCRIPTION

Roscommon: Tullytawen Bog (000617);

Leitrim: Lough Allen (002109), Cuilcagh-Anierin Uplands, (000584) and Boleybrack Mountain (002032)

Think that perhaps the Glenade sandstone should be included in this groundwater body– 75m thick in Cuilcagh decreasing as move southwards. The description in sheet 7 says that there can be shales which range from partings to over 1m in thickness, they may form a greater proportion of the formation than appears from outcrops (180m thick in fermanagh) BUT got 3-10m sandstone unit – formation consists predominantly of thick units 3-10m thick.

Also this body would then include all of the upper reaches of the Shannon and not divide it into to on weak grounds.

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Glenade Sandstone Formation (GD) Pale orthoquartzitic sandstone Dinantian Sandstones

Bricklieve Limestone Formation Lower (BKL) Bioclastic Cherty Limestone Dinantian Pure Bedded Limestones

Bricklieve Limestone Formation Lower & Mudbank Limestone (mkBKL) Bioclastic cherty limestone Dinantian Pure Unbedded Limestones

Springs and large known abstractions (m ³ /d)	<p>Moher GWS - Slieve Anierin (Spring) LEI33 (51 m³/d); Arigna WS - Rover (Spring) ROS3 (118 m³/d) – It is possible these springs could be abstracting from small gravel deposits –no details available; Drumshambo WS - Glangelvin (Spring) CAV99 (No Data); Corloughlin (Spring) LEI19 (164 m³/d) – can't find; Blue Mountain Sp. Water, LEI38 (No data) these are close to boundary with Limestone</p> <p>Shannon Pot (Spring – Re Emergence of Shannon) CAV114. – cross border karstic body</p> <p><i>[More Information to be added at a later date]</i></p>
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Associated surface water bodies
Camoge (trib to Feorish), little bit of Feorish River in NE of body and other but further downstream, Arigna River, Owengar River, Diffagher River, Owennale River, Graffy (trib of Owennale), River Shannon, Owenmore (part of), Yellow River, Altnaguilan River

Main aquifer lithologies	<p>Pu – Namurian Shales Deryvone Shale Formation (DE) – Shale & minor turbiditic sandstone (Nam Sh) Pu Gowlaun Shale Formation (GO) – Shale & minor turbiditic sandstone (Nam Sh) Pu Bencroy Shale Formation (BH) – Black shale, silty shale, ironstone beds (Nam Sh) Pu</p> <p>Pl – Namurian Sandstone Briscloonagh Sandstone Formation (BR) – Fine-grained sandstone, minor shale (Nam Sst) Pl Lackagh Sandstone Formation (LH) – Cyclothem sandstone, siltstone, coal (Nam Sst) Pl Bencroy Sandstone Member (BHss) – Sandstone, sandy shale & shale (Nam Sst) Pl Pl – some Din Sh & Lmst Carraun Shale Formation (CN) – Grey/black shale with minor limestone (Din Sh & Lmst) Pl</p> <p>Ll – Namurian Undiff Namurian (undifferentiated) (NAM) – Shale & sandstone (Nam undiff) Ll Ll – Din Mixed & some Din Sh & Lmst Meenymore Formation (ME) – Shale, laminated carbonate, evaporite (Din Mixed Sst, Shales & Lmst) Ll Bellavally Shale Formation (BE) – Grey micrite, shale, laminite evaporite (Din Mixed Sst, Shales & Lmst) Ll Doobally Sandstone (BEdo) – Medium-grained sandstone (Din Sh&Lmst) Ll Lisgorman Shale Formation (LG) – Thin-bedded calcareous shale, limestone (Din Sh&Lmst)Ll</p>
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GROUNDWATER BODY (For Reference) GROUNDWATER BODY (For Reference)

