Suck North GWB: Summary of Initial Characterisation.

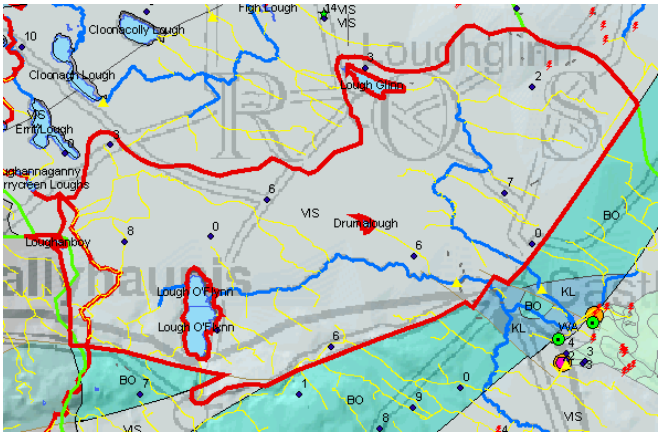
Hydrometric Area Local Authority	Associated surface features	Associated terrestrial ecosystem(s)	Area (km^2)
26 – Suck Roscommon & Mayo Co. Co.'s	Rivers: Suck, Cloonard, Francis Streams: Cloonfower. Loughs: O'Flynn, Drumalough, Glinn, Loughanboy	(000592) Bellanagare Bog; (001644) Lough Glinn; (000597) Carrowbehy/Caher Bog; (001632) Drumalough Bog; (001645) Lough O'Flynn; (000600) Cloonchambers Bog.	100

Topography	This GWB is relatively flat with ground elevations ranging from 80-90 mAOD over most of the body. Elevations are highest (90-150 mAOD) in the north east of the body and along the body boundary in the southwest. A large proportion of the body is covered by peat land, much of which has been cut away and is now reclaimed grassland. Low hills of glacial till separate the peat areas. Esker gravels form a line of long, narrow, winding ridges that run east west, between Castlerea and Lough O'Flynn north of the River Suck. West of the Lough O'Flynn there is a broader area of gravel deposits with a hummocky topography. The River Suck flows northwest to southeast across the body, while its tributary the River Francis flows north to south. The lakes Lough O'Flynn and Lough Glinn occur in the southwest and north of the body respectively.	
Geology and Aquifers	**Aquifer categories**	**Rk^c:** Regionally important karstified aquifer dominated by conduit flow.
	Main aquifer lithologies	Dinantian Pure Bedded Limestones.
	Key structures	Few faults are mapped in this area; this may reflect the poor exposure and the lack of major variation in the rock lithology. Major faults are mapped in the vicinity of the Castlerea inlier. The dips over the GWB area are generally less than 10^o, except near faults, where steeper dips result from fault drag.
	Key properties	This GWB is underlain by pure bedded limestone which is highly susceptible to karstification. Current records of karst features are considered to represent only a fraction of existing features. As with most karstic systems, permeability and transmissivity data are very variable. Transmissivity in karstified aquifers with conduit flow can range up to a few thousand m^2/d. A pumping test carried out just south of this GWB at Ballinlough in the Suck South GWB estimated a bulk transmissivity of 80 m^2/d to 90 m^2/d although the transmissivity of the intensely fractured zone was estimated as 400 m^2/d (K.T. Cullen & Co., 1999). Rapid groundwater flow velocities have been recorded in karstified pure bedded limestones. Tracer tests carried out within the Suck South GWB recorded minimum velocities ranging from 68 to 107 m/hr between several connections east of Castlerea (Longford and Silver Island Springs multiple tracer test, GSI, 2001) and 70 m/hr and 110 m/hr recorded in the Killeglan Springs tracer test (Roscommon County Council, 1991 and 1994). Rapid velocities recorded for groundwater in these areas imply flow through relatively sizeable conduits. Surface geophysical work, which was carried out east of Castlerea, infers the presence of at least seven large conduits in that area (McGrath, 2001). In karstified Pure Bedded Limestone, enlargement of the fracture network by solution, and the generally well connected and widespread fracture systems result in a highly permeable aquifer with rapid groundwater flow. Storativity in this aquifer will be low. *(data sources: Rock Unit Group Aquifer Chapters, Roscommon GWPS and Source Reports, see references)*
	Thickness	The Dinantian Pure Bedded Limestones are generally well over 100 m thick. Most groundwater flows 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. Deeper inflows can occur in areas associated with faults or dolomitisation.
Overlying Strata	**Lithologies**	Areas of peat, including cut peat and lands reclaimed for grassland cover at least 50% of this GWB. Sandstone till occurs between the bog areas. The till is of 'low' permeability, the matrix influenced by the sandstone rock to the north and west of this region. The areas of peat are also classed as 'low' permeability. The 'low' permeability underlying subsoil is likely to control the permeability where the peat deposits are thinner. The till is described as 'CLAY' (BS5930). The overall poor drainage is indicated by the high frequency of rushes and drainage ditches. The soils map records mainly heavy textured gley and peat in this region, which also indiate low permeability. Gravel deposits occur just west of Lough O'Flynn and in the extreme north west of the body, south east of Errit Lough. A line of eskers run east west, between Castlerea and Lough O'Flynn north of the River Suck. These gravel deposits are of 'high' permeability. Rock outcrop or rock close to the surface is confined mainly to the north east of the body, and in the vicinity of Castlerea. *Subsoil Types identified in body by Teagasc Parent Material Mapping - Alluvium (A), Esker (Bas Esker), Cut Peat (Cut), Gravels –Limestone (GLs), Rock outcrop and rock close to surface (Rck), Karstified Limestone outcrop and close to surface (KaRck), Lake sediment (L), Till –Devonian Sandstone Till (TDSs) & Limestone Till (TLs).* *[Information to be added at a later date]*
	Thickness	Areas of outcrop are mainly confined to the northeast of the body, and in the south of the body in the vicinity of Caslterea where subsoil thickness is generally < 3 m. Elsewhere subsoil thickness is generally between 3 –10 m.
	% area aquifer near surface	[Information to be added at a later date]

	Vulnerability	Most of this GWB is in an area of Moderate vulnerability. There are small areas of Low vulnerability in the north of the body and in the vicinity of Errit Lough. Areas of Extreme vulnerability occur in the northeast of the body and in the south of the body in the vicinity of Castlerea. Areas of High vulnerability occur in the northeast of the body, in the south of the body in a broad area northwest of Castlerea, west of Errit Lough in an area of gravel deposits, and along the esker ridge between Castlerea and Errit Lough. A Groundwater Vulnerability Map has been prepared for County Roscommon as part of a Groundwater Protection Scheme. [Information to be added at a later date]
Recharge	**Main recharge mechanisms**	Both point and diffuse recharge can occur in this GWB. Diffuse recharge will occur over the entire GWB via rainfall percolating through the subsoil. However, most of this GWB is covered by 'low' permeability subsoil which will restrict percolation of recharge. The presence of large areas of peat and the high frequency of rushes and drainage ditches is indicative of the poor drainage. Despite the presence of peat and low permeability till, point recharge to the underlying aquifer can still occur by means of swallow holes and collapse features/dolines. Dolines have been recorded even in area of thick peat deposits (Hickey et al, 2002).
	Est. recharge rates	*[Information to be added at a later date]*
Discharge	**Springs and large known abstractions (m^3/d)**	*[Information to be added at a later date]*
	Main discharge mechanisms	The main discharges are to the streams and rivers crossing the body.
	Hydrochemical Signature	No relevant hydrochemical data are available in this GWB for assessment. The hydrochemistry of the carbonate rocks, especially pure limestones, is dominated by calcium and bicarbonate ions. Hardness can vary from slightly hard to very hard (typically ranging between 380–450 mg/l). Spring waters tend to be softer, as throughput is often quicker with less time for the dissolution of minerals into the groundwater. Groundwater alkalinity is variable, but can be high. Alkalinity is generally less than hardness indicating that ion exchange (where calcium or magnesium are replaced by sodium) is not a significant process. Lime-scale can be problematic in limestone areas. Like hardness and alkalinity, electrical conductivities (EC) can vary greatly. Typical limestone groundwater conductivities are of the order 500–700 µS/cm. Lower values suggest that groundwater residence times are very short. In some springs and boreholes in karst areas, high turbidity occurs after heavy rainfall.
Groundwater Flow Paths		These rocks 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, as shown by several tracing studies (Drew and Daly, 1993). 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. Groundwater flow in highly permeable karstified limestones is of a regional scale. Flow path lengths can be up to a several kilometres in length. Overall groundwater flow will be towards the rivers crossing the body, but the highly karstified nature of the bedrock means that locally groundwater flow directions can be highly variable. The low permeability rocks of the Castlerea and Rabbitburrow GWBs separate flow in the Suck North GWB from the Such South GWB.
Groundwater & Surface water interactions		There is a high degree of interconnection between groundwater and surface water in karstified limestone areas such as in this GWB. Even though large areas of peat and low permeability tills overlie the body, collapse features providing a direct connection between the surface and the groundwater systems still occur. Because of the close interaction between surface water and groundwater in karstified aquifers, surface water and groundwater quality are also closely linked. Any contamination of surface water is rapidly transported into the groundwater system, and vice versa. There are a number of terrestrial ecosystems within this GWB with varying dependence on groundwater.

Conceptual model	• This GWB occupies a broadly rectangular east west trending area north of Castlerea. It is bounded to the north, east and west by groundwater divides and topographic highs which coincide with surface water catchment boundaries. It is bounded to the south by the contact with the Dinantian Mixed Sandstones, Shales and Limestones of the Castlerea and Rabbitburrow GWBs and the topographic high between those two bodies. • This GWB is relatively flat with ground elevations ranging from 80-90 mAOD over most of the body. A large proportion of the body is overlain by peat, and reclaimed grassland on areas of cut peat, separated by low hills of glacial till. • The GWB is composed primarily of high transmissivity karstified limestone. Groundwater flows through a network of solutionally enlarged fissures and conduits. Karst features such as dolines and swallow holes occur within the body. • Groundwater flows along interconnected fractures, joints, faults and bedding planes, many of which have been enlarged by solution. Much of the groundwater flow is concentrated in conduits. Rapid groundwater flow velocities have been recorded through groundwater tracing in adjoining GWBs. • Recharge to this GWB is both point, though swallow holes and collapse features, and diffuse via rainfall percolating through the subsoil. Much of this GWB is covered by 'low' permeability subsoil which will restrict percolation of recharge. Despite the presence of peat and low permeability till, point recharge to the underlying aquifer can still occur by means of swallow holes and collapse features/dolines. • The groundwater in this body is generally unconfined but may become locally confined beneath thick low permeability subsoil. Most of the groundwater flow occurs in the upper epikarstic layer and in a zone of interconnected fissures, enlarged by karstification, generally extending to a depth of 30 m. Deep water strikes in more isolated faults/fractures can be encountered. • In general in karstic aquifers, the degree of interconnection between fractures zones is high and they support regional scale flow systems. Flow paths can potentially be several kilometres in length. • Some areas in this GWB are of extreme vulnerability due to the thin nature of the subsoil, as well as the frequency of karst features. Groundwater storage in karstified bedrock is low and the potential for contaminant attenuation in such aquifers is limited. • Groundwater discharges to the streams and rivers crossing the body. • There is a high degree of interaction between surface water and groundwater in this GWB. There are a number of terrestrial ecosystems within this GWB with varying dependence on groundwater.
Attachments	None
Instrumentation	Stream gauges: 26115 EPA Water Level Monitoring boreholes: none EPA Representative Monitoring boreholes: none
Information Sources	Drew D.P. and Daly D. (1993) *Groundwater and Karstification in Mid-Galway, South Mayo and North Clare.* A Joint Report: Department of Geography, Trinity College Dublin and Groundwater Section, Geological Survey of Ireland. Geological Survey of Ireland Report Series 93/3 (Groundwater), 86 pp Doak, M. (1995) *The Vulnerability to Pollution and Hydrochemical Variation of Eleven Springs (Catchments) in the Karst Lowlands of the West of Ireland*. Unpublished M.Sc. thesis, Sligo Regional Hickey, C., Lee, M., Drew, D., Meehan, R. and Daly D. (2002) Lowland Karst of North Roscommon and Westmeath. International Association of Hydrogeologists Irish Group. Karst Field Trip October 2002. Unpublished IAH Report. Lee, M. and Kelly, C. (2003) Ballinlough Water Supply Scheme (Ballybane Springs), Groundwater Source Protection Zones. Geological Survey of Ireland Report to Roscommon Co. Co., 14 pp. Lee, M. and Kelly, C. (2003) Killeglan Water Supply Scheme (Tobermore Springs), Groundwater Source Protection Zones. Geological Survey of Ireland Report to Roscommon Co. Co., 12 pp. Lee, M. and Kelly, C. (2003) Castlerea Water Supply Scheme (Longford Spring and Silver Island Spring), Groundwater Source Protection Zones. Geological Survey of Ireland Report to Roscommon Co. Co., Lee, M. and Kelly, C. (2003) Mount Talbot Water Supply Scheme (Cloonlaughnan Springs), Groundwater Source Protection Zones. Geological Survey of Ireland Report to Roscommon Co. Co., 12 pp. Lee, M. & Daly D. (2003) *County Roscommon Groundwater Protection Scheme*. Main Report. Roscommon County Council & Geological Survey of Ireland, 54pp. McConnell, B., Philcox, M. and Geraghty, M., 2001. *Geology of Meath: A geological description to accompany the bedrock geology 1:100,000 scale map series, Sheet 13, Meath*. With contributions from J. Morris, W. Cox, G. Wright, and R. Meehan. Geological Survey of Ireland. 77 p. (Publication Pending) McGrath R. (2001). *Microgravity on Roscommon Karst*. Unpublished GSI Report. 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) K.T. Cullen & Co., 1999. *Report on the Drilling and Testing of Two Trial Wells at Ballinlough, Co. Roscommon.* Report for Roscommon County Council.
Disclaimer	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae

SUCK GWB (For Reference)



List of Rock units in Suck North GWB

Rock unit name and code	Description	Rock unit group
Visean Limestones (undifferentiated) (VIS)	Undifferentiated limestone	Dinantian Pure Bedded Limestones