Foxford GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km^2)
34 Sligo and Mayo Co. Co.	**Rivers**: Brusna, Devlin, Bellawaddy, Behy, Glenree. Bunnafinglas, Carra, Cloonlee, Clydagh, Gweestion, Killeen, lough Talt, Mad, Owenaher, Moy, Spaddagh, Tobergal, Toormore, Yellow, Behy, Bellanamean, Carroward, Castlebar, Crumlin, Eighnagh, Glenree, Lenyvee, Loughnaboll, Oughtagh, Strade. **Lakes**: See table 1.	Ox Mountains Bogs (002006), Lough Conn and Lough Cullin (000519), Lough Hoe Bog (000633), Moy Vally (002078), Dambaduff Lough (001491). Killalla Bay/Moy Estuary (000458) (O'Riain, 2004).	583

Topography	The GWB stretches from north of Castlebar to north of Tobercurry. Foxford town is present in the middle of the GWB. The land surface is characterized by the mountainous terrain of the Ox Mountain range. Elevations range from 10-450 mAOD. It is bounded to the south by the Dinantian Pure Bedded Limestones of the Swinford GWB. The eastern and western boundaries are surface water divides with hydrometric area 35 and 33. L. Conn acts as a boundary where it cuts into the GWB west of Foxford. The northern boundary is against the Ballina GWB and the coastline of Killala Bay. The river Moy is the principal river, draining the majority of the GWB.	
Geology and Aquifers	**Aquifer categories**	**Pl:** Poor aquifer, generally unproductive except for local zones. **Ll:** Locally important aquifer, moderately productive only in local zones. **Lm:** Locally important aquifer, generally moderately productive.
	Main aquifer lithologies	The GWB is predominantly composed of Precambrian Quartzites, Gneisses & Schists and Granites & other Igneous Intrusive rocks. See table 2 for a full list.
	Key structures	The key structural trend is NE-SW. Thrust faults, synclines and anticlines extend the entire length of the GWB along the flanks of the Slieve Gamph Igneous Intrusion which forms the spine of the GWB. The Slieve Gamph Intrusion is linear, with the boundaries paralleling the main structural trend. Cross cutting the main structural trend are a number of NW-SE faults. In the area of Corbally, occupied by the Dinantian Upper Impure Limestones there are NW-SE trending synclines and anticlines. The beds of the limestone generally dip at low angles.
	Key properties	Yields are less than 40 m^3/d for three wells located the western part of the GWB. Specific capacities for the three wells are 0.15, 1.7 and 1.2 $m^3/d/m$. The area around the wells are occupied by Precambrian Quartzites, Gneisses & Schists and Granites & other Igneous Intrusive rocks. These data indicate low transmissivities, in the range of 0.1-10 m^2/d. In the vicinity of faults, transmissivity may be higher. Storativity is expected to be low (<0.5%). The data are inadequate to calculate groundwater gradients, however, these are generally expected to be greater than 0.01. The gradients are expected to lower along the southern flank of the GWB, where there is a narrow band (less than 200 m) of moderately productive sandstones, at the western end of the GWB, where there is a small area of Devonian Old Red Sandstone and in the area of Corbally. There is one "good" well to the west of Corbally.
	Thickness	Most groundwater flux is likely to be in the uppermost part of the aquifer; comprising a broken and weathered zone typically less than 3 m thick; a zone of interconnected fissuring 10-15 m thick; and a zone of isolated poorly connected fissuring typically less than 150 m.
Overlying Strata	**Lithologies**	Till and blanket peat are the predominant subsoils, with pockets of sand/gravel present immediately northeast of Foxford and south of Corbally.
	Thickness	The depth to bedrock in 4 wells located in the western part of the GWB is 5-10 m. The thickness of the blanket peat is 1.5 m at one of the wells.
	% 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 the subsoil and rock outcrops. Due to the low permeability of much of the subsoil (blanket peat) and the aquifers, a high proportion of the available recharge will discharge to the streams. In addition, the steep slopes in the mountainous areas promote surface runoff. The stream density is high, indicating the high proportion of surface runoff.
	Est. recharge rates	*[Information to be added at a later date]*

Discharge	**Large springs and high yielding wells (m^3/d)**	*None identified*
	Main discharge mechanisms	Shallow groundwater is likely to discharge to streams and lakes, but the limited bedrock transmissivity means that the baseflow component of the total streamflow will be low. Small springs and seeps are likely to issue at the stream heads and along their course. The generally poor aquifer properties indicate that the baseflow component of total streamflow is likely to be low.
	Hydrochemical Signature	There are 3 samples available, one located in the granites, one in the Precambrian Quartzites and one in the Devonian Old Red Sandstone. Alkalinity (mg/l as $CaCO_3$): 95 (Precambrian), 65 (Granite), 328 (Devonian). Total Hardness (mg/l): 96, 66, 328. Conductivity (μS/cm): 267, 221, 757. Iron (mg/l): 0.1, 0.02, 5.9. Manganese (mg/l): 0.01, 0.02, 0.8. There are no data available for the Dinantian Upper Impure Limestones, however, data available from the Bellacorick-Killala GWB for the limestones is presented as follows (n=7). Alkalinity (mg/l as $CaCO_3$): range 150-408, median 372. Total Hardness (mg/l): range 200-420; median 398. Conductivity (μS/cm): range 700-824; median 767.
Groundwater Flow Paths		Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. Generally, water levels are 0-10 m below ground level. Flow paths are likely to be up to 150 m, with groundwater discharging rapidly to nearby streams and small springs. There are observed deep water strikes, indicating that there is a component of deep groundwater flow, however shallow groundwater flow is dominant. Groundwater flow directions are expected to follow topography, generally in a northerly direction.
Groundwater & Surface water interactions		Groundwater will discharge locally to streams and rivers crossing the aquifer and also to small springs and seeps. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater - surface water interactions occur. Baseflow to rivers and streams is likely to be relatively low.
Conceptual model		• The GWB stretches from north of Castlebar to north of Tobercurry. It is characterized by the mountainous terrain of the Ox Mountain range. Elevations range from 10-450 mAOD. • It is bounded to the south by the Swinford GWB. The eastern and western boundaries are surface water divides and L. Conn acts as a boundary where it cuts into the GWB. The northern boundary is composed of the Ballina GWB and the coastline of Killala Bay. The river Moy is the principal river, draining the majority of the GWB. • The GWB is composed primarily of low transmissivity rocks. Most of the groundwater flux is likely to be in the uppermost part of the aquifer: comprising a broken and weathered zone typically less than 3m thick; a zone of interconnected fissuring 10-15m; and a zone of isolated, poorly connected fissuring typically less than 150m. • Storativity is expected to be low (<0.5%). The data are inadequate to calculate groundwater gradients, however, these are generally expected to be greater than 0.01. In the slightly better aquifers of around Corbally and along the southern flank of the GWB the gradients are expected to be flatter. • Recharge occurs diffusely through the subsoils and rock outcrops. Recharge is limited by the peat and the low permeability bedrock, thus most of the available recharge discharges rapidly to nearby streams and small springs. • Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. Generally, water levels are 0-10 m below ground level. Flow paths are likely to be up to 150 m, with groundwater discharging rapidly to nearby streams and small springs. The overall flow direction is to the north. • The rock units in GWB are generally of low permeability and baseflow to rivers and streams is likely to be relatively low.
Attachments		Table 1, 2 and Figure 1.
Instrumentation		**Stream gauges:** 3404934003, 34004, 34006, 34008, 34014*, 34015, 34019, 34038, 34043, 34045, 34071, 34074, 34083. * Adjusted dry water flow data available. **EPA Water Level Monitoring boreholes:** None **EPA Representative Monitoring points:** None
Information Sources		Long, B., Mac Dermot, C.V., Morris, J.H., Sleeman, A.G., Tietzsch-Tyler, D., (1992). *A geological description to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 6, North Mayo.* Geological Survey of Ireland Map Series Report. Geological Survey of Ireland: The Dinantian (early) Sandstones, Shales and Limestones, The Dinantian Upper Impure Limestones, Precambrian Aquifer Chapters. Unpublished. O' Riain, G., (2004). *Water Dependent Ecosystems and Subtypes Draft Report.* WFD Support Projects. Compass Informatics in association with National Wildlife and Parks Service (DEHLG).

Disclaimer	Note that all calculations and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae.

Table 1. List of lakes in GWB

Blind, Fadda, Trout, Carha, Creeve, Doo

Attiappleton Lough	Knockaglana Lough	Lough Hure	Loughnambrackkeagh
Avlog's Lough	Levallinree Lough	Lough Mallard	Lundy's Lough
Ballycong Lough	Lough Akista	Lough Muck	Marl Lough
Ballymore Lough	Lough Alone	Lough Nablaneybawn	Newantrim Lough
Black Lough	Lough Alore	Lough Nabrickeagh	Richards Lough
Blind Lough	Lough Anaffrin	Lough Nalackagh	Roosky Lough
Bob Gay's Lough	Lough Anooran	Lough Naskea	Ross Lough
Callow Lough Upper	Lough Arubble	Lough Naspleenagh	Round Lough
Cappagh Lough	Lough Awaughran	Lough Ogirra	Sessuecommon Lough
Cloonacool Lough South	Lough Callow	Lough Roe	Sessuegarry Lough
Creggabalagh Lough	Lough Cat	Lough Rusheen	Slievenark Lough
Dambaduff Lough	Lough Cloghwelly	Lough Talt	Tuckers Lough
Derreenadooey Lough	Lough Conn	Lough Wallywee	Tullyvellia Lough
Derryhick Lough	Lough Corskea	Lough Watt	Tullyvellia Loughs
Drumminahaha Lough	Lough Doo	Loughalacka	Winny Langan's Lough
Drumneen Lough	Lough Doovoga	Loughalacka Middle	Glendarragh Lough
Fir Lough	Lough Fadda	Loughanaboll	Lough Hoe
Fossea Lough	Lough Gal	Loughanduff Big	Loughannagally
Glendaduff Lough	Lough Hemush	Loughanduff Little	

Table 2. List of rock units in GWB

Rock unit name and code	Description	Rock unit group	Aquifer Classification
Ballina Limestone Formation (Lower) (BL)	Dark fine-grained limestone & shale	Dinantian Upper Impure Limestones	Ll

Code	Unit Name	Description	Rock unit	Aquifer class
OxA	Acidic Lithologies	Granodiorite, tonalite, pegmatite	Granites & other Igneous Intrusive rocks	Pl
OxAd	Adamellite	Monzogranite	Granites & other Igneous Intrusive rocks	Pl
AR	Ardvarney Formation	Pebbly grits, metagreywackes, phyllites	Cambrian Metasediments	Pl
UY	Attymass Formation (undifferentiated)	Upper and Lower Attymass Formations	Precambrian Quartzites, Gneisses & Schists	Pl
UX	Attymass Group (undifferentiated)	Undifferentiated schist & amphibolite	Precambrian Quartzites, Gneisses & Schists	Pl
AV	Attymass Volcanic Formation	Amphibolitic basic metavolcanics	Precambrian Quartzites, Gneisses & Schists	Pl
BA	Ballycong Limestone Formation	Calcitic marble.	Precambrian Marbles	Pl
OxB	Basic Lithologies	Quartz diorite, diorite, hornblendite	Granites & other Igneous Intrusive rocks	Pl
BI	Birreen Formation	Igneous-clast conglomerate, sandstone	Devonian Old Red Sandstones	Pl
CA	Callow Formation	Basic metavolcanics	Precambrian Quartzites, Gneisses & Schists	Pl
CO	Carrick O'Hara Formation	Semi-pelitic, minor psammitic, schist	Precambrian Quartzites, Gneisses & Schists	Pl
Glca	Cashel Member	Schists, aluminous schists, pebbly grits	Precambrian Quartzites, Gneisses & Schists	Pl
CG	Cloonygowan Formation	Pebbly grit, metagreywacke & phyllite	Precambrian Quartzites, Gneisses & Schists	Pl
CD	Corradrishy Formation	Schist, thin marble & metavolcanics	Precambrian Quartzites, Gneisses & Schists	Pl
COqc	Corradrishy Quartzite Member	Pelitic, feldspathic and psammitic shists	Precambrian Quartzites, Gneisses & Schists	Pl
CM	Croaghmoyle Formation	Quartzite-clast conglomerate	Devonian Old Red Sandstones	Pl
DH	Derryharriff Formation	Sandstones	Devonian Old Red Sandstones	Ll
d	Dolerite and Gabbro	Dolerite & gabbro, commonly silica poor	Granites & other Igneous Intrusive rocks	Pl
EaAd	Easky Adamellite	Monzogranite, pink	Granites & other Igneous Intrusive rocks	Pl
OxG1	equigranular	Equigranular granodiorite, foliated	Granites & other Igneous Intrusive rocks	Pl
P	Feldspar or Quartz Porphyry		Granites & other Igneous Intrusive rocks	Pl
Gl	Glenisland Formation	Semi-pelitic schists	Precambrian Quartzites, Gneisses & Schists	Pl
GM	Graffa More Formation	Red & green conglomerate, sandstone	Devonian Old Red Sandstones	Ll
LQki	Kilmore Limestone Member	Dolomitic marble & calc-silicate schists	Precambrian Marbles	Pl
KH	King's Hill Formation	Conglomerates	Devonian Old Red Sandstones	Pl
LQ	Leckee Quartzitic Formation	Pale psammite & quartzite	Precambrian Quartzites, Gneisses & Schists	Pl
BQ	Lough Brohly Quartzite Formation	Pale quartzites.	Precambrian Quartzites, Gneisses & Schists	Pl
BS	Lough Brohly Schist Formation	Semi-pelitic schists occ. with graphite.	Precambrian Quartzites, Gneisses & Schists	Pl
LtAd	Lough Talt Adamellite	Monzogranite, pink	Granites & other Igneous Intrusive rocks	Pl
LA	Lower Attymass Formation	Semi-pelitic & minor psammitic schist	Precambrian Quartzites, Gneisses & Schists	Pl
LL	Lower Lismoran Formation	Semi-pelitic & psammitic schist	Precambrian Quartzites, Gneisses & Schists	Pl
UMme	Meelick Member	Schist, aluminous schist, pebble beds	Precambrian Quartzites, Gneisses & Schists	Pl
OxG2	megacrystic	Megacrystic granodiorite, foliated	Granites & other Igneous Intrusive rocks	Pl
MO	Moy Sandstone Formation	Sandstone, pebbly conglomerate	Dinantian Sandstones	Lm
OxMs	Muscovite Granite	Muscovite syenogranite, foliated	Granites & other Igneous Intrusive rocks	Pl
UMna	Newantrim Member	Amphibolitic basic metavolcanics	Precambrian Quartzites, Gneisses & Schists	Pl
OxGd	Ox Mountains Granodiorite	Equigranular granodiorite (Group 1)	Granites & other Igneous Intrusive rocks	Pl
RS	Raheen Barr Albite Schist Formation	Feldspathic schist, chloritic green beds	Precambrian Quartzites, Gneisses & Schists	Pl
RQ	Raheen Barr Quartzite Formation	White & grey quartzites, pebble beds	Precambrian Quartzites, Gneisses & Schists	Pl
Glvo	Raheen Barr Volcanic Member	Basic metavolcanics, pebbly grits	Precambrian Quartzites, Gneisses & Schists	Pl
S	Serpentinite	Pebbly grits, metagreywackes, phyllites	Granites & other Igneous Intrusive rocks	Pl
UMsg	Slievenagark Member	Semi-pelitic schist	Precambrian Quartzites, Gneisses & Schists	Pl
TAmb	Tawnyshane Marble Member	Dolomitic carbonates and calcsilicate shists	Precambrian Quartzites, Gneisses & Schists	Pl
TApl	Tawnyshane Pelitic Member	Pelitic, semi-pelitic and psammitic shists	Precambrian Marbles	Pl
TA	Tawnyshane Tillite Formation	Schist of glaciomarine tillite sequence	Precambrian Quartzites, Gneisses & Schists	Pl
OxTo	Tonalite	Tonalite, foliated	Granites & other Igneous Intrusive rocks	Pl
MR	Unassigned metasediment rafts	Semi-pelites and psammitic schists.	Precambrian Quartzites, Gneisses & Schists	Pl
UA	Upper Attymass Formation	Schist & aluminous schist	Precambrian Quartzites, Gneisses & Schists	Pl
UL	Upper Lismoran Formation	Mylonitic semi-pelitic/psammitic schist	Precambrian Quartzites, Gneisses & Schists	Pl
WG	Westport Grit Formation	Pebbly grits, metagreywackes, phyllites	Cambrian Metasediments	Pl

Figure 1 Boundaries and location of Foxford GWB