

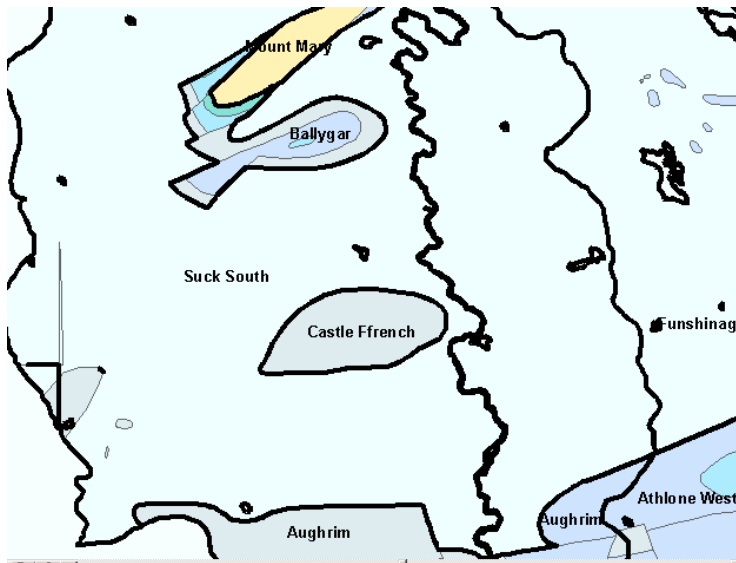
Castle Ffrench Groundwater Body: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km ²)
26 - Suck Galway Co.Co.	None	(000280) Castleffrench West (Bog)	29
Topography	This small GWB occurs in a low-lying area. Ground elevations range from 50-70 mAOD sloping gently downwards from west to east. Large areas of cut peat, particularly in the east of the body and in the stream valleys, rarely rise above about 50 mAOD. In the west of the body an area of higher ground (60-70 mAOD) covered by glacial till runs northwest to southeast across the body. The highest point is a low hill to the west of the body (70 mAOD). There are several small narrow ridges of gravel deposits in this area, each not more than a few hundred metres in length, running north south and northwest southeast.		
Geology and Aquifers	Aquifer categories	LI: Locally important aquifer which is moderately productive only in local zones	
	Main aquifer lithologies	Dinantian Upper Impure Limestones	
	Key structures	Few faults are mapped in the region in which this GWB occurs. This may reflect the poor exposure and lack of major variation in the rock lithology.	
	Key properties	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. Dinantian Upper Impure Limestones are generally not karstified, however some karst features can occur. A swallow hole is reported in the east of this body.	
Thickness	A thickness of 130 m has been reported for the Lucan Formation, also referred to as Black Calp (the uppermost Dinantian Upper Impure Limestone in this region) in the Ballinasloe area (Gately <i>et al</i> 2003). No data is available however on the thickness of the unit within this GWB. It is expected that in this rock type most groundwater will flow in a zone within the uppermost 15 m of bedrock, comprising a weathered of a few metres thick and a zone of interconnected fissures that extends approximately 10 m below this. Isolated deeper inflows can occur where faults or significant fractures are intercepted by boreholes.		
Overlying Strata	Lithologies	The subsoil cover in this GWB consists of cut peat, limestone till and some small areas of gravel and a tiny area of alluvium in the west of the body. The cut peat occurs mainly in the east and south west of the body. The gravel deposits occur as several small narrow north south to northwest-southeast trending ridges of a few hundred metres in length. Two very small areas of outcrop occur in this body. <i>Subsoil Types identified in the body by Teagasc Parent Material Mapping: Cut Peat (Cut); Limestone Till (TLs); Gravel deposits (GLs); Karstified Limestone outcrop & rock close to surface; Alluvium (A)</i> <i>[More information will be added at a later date]</i>	
	Thickness	No borehole data on depth to bedrock are available for this GWB. Only two very small areas of outcrop occur within the body. In the surrounding Suck South GWB depth to bedrock is generally 0-10 m, shallowest in the vicinity of areas of rock outcrop and shallow rock. <i>[Further information required here]</i>	
	% area aquifer near surface	<i>[Information will be added at a later date]</i>	
	Vulnerability	A Groundwater Vulnerability Map is not currently available for County Galway. The large areas of cut peat are 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. Areas of High and Extreme vulnerability may occur in the till and gravel covered areas where the subsoil is shallow. At a minimum an area of 15 m around the swallow hole that occurs in the east of the body will be of Extreme Vulnerability. <i>[Information will be added at a later date]</i>	

Recharge	Main recharge mechanisms	Diffuse recharge will occur 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. Percolation of recharge will be somewhat restricted in some parts of the body due to the covering of peat and the typically associated underlying lacustrine clay or clayey till. Subsoil permeability has not currently been mapped in detail in County Galway but the sub peat subsoil would be expected to be of 'low' permeability. Subsoils of 'high' permeability such as the gravel deposits will allow easy percolation of recharge. However, due to the generally low permeability of the aquifers within this GWB, a high proportion of the recharge will then discharge rapidly to surface watercourses via the upper layers of the aquifer. There can be some point recharge to the GWB through swallow holes or collapse features which occasionally occur in the Dinantian Upper Impure Limestones. There is a swallow hole recorded in the east of the body.
	Est. recharge rates	[Information will be added at a later date]
Discharge	Large springs and high yielding wells (m ³ /d)	None
	Main discharge mechanisms	The main discharges will be local, to streams crossing the body and to the surrounding karstified limestones of the Suck South GWB. There may be some groundwater discharge in 'lagg zones' at the margins of the raised bogs or at flushes within the bogs where the underlying 'low' permeability subsoils are thin or absent.
	Hydrochemical Signature	Typically groundwater from the Dinantian Upper Impure Limestones such as those in this GWB has a calcium-bicarbonate signature. Groundwater will be Hard to Very Hard (typically ranging between 350-450 mg/l), and high electrical conductivities are also observed. Alkalinity will also be high, but less than hardness. In 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 also be problematic in shaly limestones. 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 movement through the fractures in the rock allowing low dissolved oxygen conditions to develop.
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. 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 approximately follow the local surface water catchments. Overall, groundwater flow will be west to east towards the River Suck. In general groundwater is unconfined in this GWB, however groundwater can become confined beneath the clayey till and lacustrine clay deposits that underlie the cut peat areas. There is no hydrogeological data currently available relating to the gravel deposits in this body. The gravel deposits will provide a permeable pathway for recharge to the aquifer and where saturated may provide an element of storage for the underlying bedrock.
Groundwater & Surface water interactions		Castleffrench West Bog (000280), a small raised bog with a high dome, is located in this GWB. The Dúchas/Department of Environment and Local Government Site Synopsis for Castleffrench West Bog (000280) says the following: "Castleffrench West Bog is unusual in having such a relatively large area of a small bog with very wet quaking habitat. Furthermore, the fact that the good quality Scot's Pine flush is immediately adjacent to the edge of the mature coniferous plantation is unusual, and indicates an independent source of ground water."
Conceptual model	<ul style="list-style-type: none"> • This GWB is bounded on all sides by the contact with the karstified Dinantian Pure Bedded Limestones of the Suck South GWB. • The terrain is flat and low-lying, gently rising to the west, with large areas of cut peat in the east. • This GWB is composed primarily of low permeability rocks which have localised zones of enhanced permeability. Groundwater flows along fractures joints and major faults. • Recharge occurs diffusely through the subsoils, but may be restricted in areas covered by peat and underlying 'low' permeability lacustrine clay and till. There are also some small areas of high permeability gravel deposits in this GWB which will allow easy percolation of recharge. Point recharge will also occur through swallow holes which occasionally occur in these impure limestones. • In general groundwater is unconfined in this GWB, however groundwater can become partially confined beneath the clayey till and lacustrine clay deposits that underlie the peat areas. Most groundwater flow occurs in the upper 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. Groundwater flow in this body will be of a local nature. Groundwater flow paths will generally be short. • Groundwater will discharge to the streams crossing the body and the karstified Dinantian Pure Bedded Limestones of the surrounding Suck South GWB. • A flush zone on the margin of Castleffrench West Bog (000280) is supported by groundwater. 	
Attachments		None
Instrumentation		Stream Gauges: None EPA Water Level Monitoring boreholes: None EPA Representative Monitoring boreholes: None

Information Sources	Dúchas/Department of Environment and Local Government. NHA/SAC Site Synopses Gately, S., Sommerville, I., Morris, J.H., Sleeman, A.G. and Emo, G., 2003. <i>Geology of Galway-Offaly. A Geological description of Galway-Offaly, and adjacent parts of Westmeath, Tipperary, Laois, Clare and Roscommon to accompany the bedrock geology 1:100,000 scale map series, Sheet 15.</i> With contributions from W. Cox (Minerals), T.Hunter-Williams (Groundwater) and R. van den Berg and E. Sweeney (Carboniferous Volcanics), edited by A.G. Sleeman. Morris J.H., Somerville I.D. and MacDermot C.V. (2002). <i>Geology of Longford-Roscommon. A Geological Description to Accompany the Bedrock Geology 1:100,000 Bedrock Series Sheet 12.</i> With contributions by D.G. Smith, M. Geraghty, B. McConnell, K. Carlingbold, W. Cox, D. Daly. Geological Survey of Ireland, 121pp. (Publication pending).
Disclaimer	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae

Castle Ffrench GWB (For Reference)



List of Rock units in Castleffrench Groundwater Body

Rock unit name and code	Description	Rock unit group
Lucan Formation (LU)	Dark Limestone & shale (calp)	Dinantian Upper Impure Limestone