



Unit of Management 25-26: Shannon Estuary Upper & Lower - Flood History and Key Environmental Issues

Strategic Environmental Assessment - Scoping
Report [Consultation Draft] - Annex III










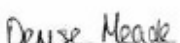

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1**Introduction****1.1 Background**

As part of the Strategic Environmental Assessment (SEA) process, the Office of Public Works (OPW) invites you to give your views on the development and implementation of a series of Flood Risk Management Plans (FRMPs) in the Shannon River Basin District (RBD).

This Annex represents a key element of the SEA scoping process for the proposed FRMP for the **Shannon Estuary Upper & Lower Unit of Management (UoM 25-26)** by describing the existing and potential future characteristics of the Unit of Management, summarising the history of flooding associated with its river catchments, and identifying the key social and environmental issues relating to flooding and flood risk management specific to this Unit of Management. This Annex should be read in conjunction with the overarching Shannon River Basin District Environmental Scoping Report which documents all other elements relevant to this scoping process.

Your comments on the information outlined in this Annex, coupled with those on the overarching Shannon RBD Environmental Scoping Report, will assist the scoping of, and the consultation about, the environmental impacts of the Shannon Estuary Upper & Lower Unit of Management (UoM 25-26) FRMP by initiating the strategic environmental assessment scoping stage.

The preparation of the FRMP for Unit of Management 25-26 will consider the risk of flooding from the rivers, estuaries and coastal waters at various different spatial scales. The locations that are considered to be potentially at risk of flooding, and therefore been identified as Areas for Further Assessment (AFAs) or Individual Risk Receptors (IRRs), will be subject to more detailed consideration in the development of the FRMP for this Unit of Management given their history of flooding, or where such risk might arise through future development or other changes/pressures.

Flood maps indicating where flood risk from river, or estuarine/coastal waters exists within AFAs or at IRRs, and along the watercourses connecting AFAs / IRRs will be produced for this Unit of Management.

1.2 Consultation

You have an important role to play in helping us identify all the key issues relating to flood risk management, and we are keen to hear what you think. Specific to **Unit of Management 25-26 (Shannon Estuary Upper & Lower)**, we welcome your comments on the key environmental issues.

It is important to note that the information in this Annex accounts for pre-scoping consultation already undertaken with key organisations, and the following sections present our current understanding of the Lower Shannon and Upper Shannon Unit of Management. The SEA baseline and framework will develop as the Study progresses, and will be further informed by views and knowledge of stakeholders and the wider public.

You can send us your views by email or by post to the details below.

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2 Unit of Management Characteristics and History of Flooding

2.1 Unit of Management Characteristics

The Shannon Estuary Upper & Lower Unit of Management (UoM 25-26) is shown in Figure 2.1. This Unit of Management encompasses areas of the following counties; Sligo, Leitrim, Roscommon, Longford, Cavan, Meath, North and South Tipperary, Offaly, Galway, Clare, Westmeath, Limerick and small areas of Mayo and Laois. A very small area of County Fermanagh contributes to groundwater flow in the headwaters of the River Shannon.

The Unit of Management is defined by the catchment of the River Shannon to its tidal limit just upstream of Limerick City. The full extent of the AFA defined for Limerick City lies within three Units of Management and includes all of the developed land within the contiguous urban area of Limerick, and all lands zoned for development in or adjacent to Limerick City (including areas that may be outside of the Limerick City Council jurisdictional boundary). For the purpose of this Study, this AFA will be assessed as part of Unit of Management 25-26.

The River Shannon reportedly rises in the Shannon Pot, a round pond on the slopes of Cuilcagh Mountain in Co Cavan, from which a small stream emerges. However, the true source of the river is probably in Co Fermanagh where a small stream disappears into a sink-hole. The whole upper part of Cuilcagh Mountain consists of a porous limestone and is full of sink-holes and risers. From the Shannon Pot, the river is joined by a number of tributaries, some of which are larger than the river itself, and emerges into the head of Lough Allen.

From Lough Allen the Shannon flows south through a series of navigation locks to Lough Ree. It is joined on its way by major tributaries including the Boyle and Inny, but also by the Shannon-erne Waterway.

Lough Ree discharges at Athlone and continues south. Between Athlone and Portumna the Shannon is wide and passes through an area of extensive peat bogs which form part of the natural floodplain. In the areas of mechanised peat extraction, silt from the peat bogs has encroached into the upper portions of Lough Derg. The silt is conveyed through a series of drainage networks used to convey runoff from the peat bogs. Although historically these networks discharged directly into the Shannon, some effort has been made to regulate this discharge with the intention of reducing the volume of silt leaving the bogs and entering the river.

Prior to entering Lough Derg, the Shannon is joined by the River Suck, which flows through the town of Ballinasloe, as well as the River Brosna, River Little Brosna and the Grand Canal. The area between Athlone, Ballinasloe and Lough Derg form the Shannon Callows. On the final reach between Lough Derg and the tidal limit at Limerick, the Shannon is joined by the Mulkear on the left bank.

Annex III - Shannon Estuary Upper & Lower Unit of Management (UoM 25-26)

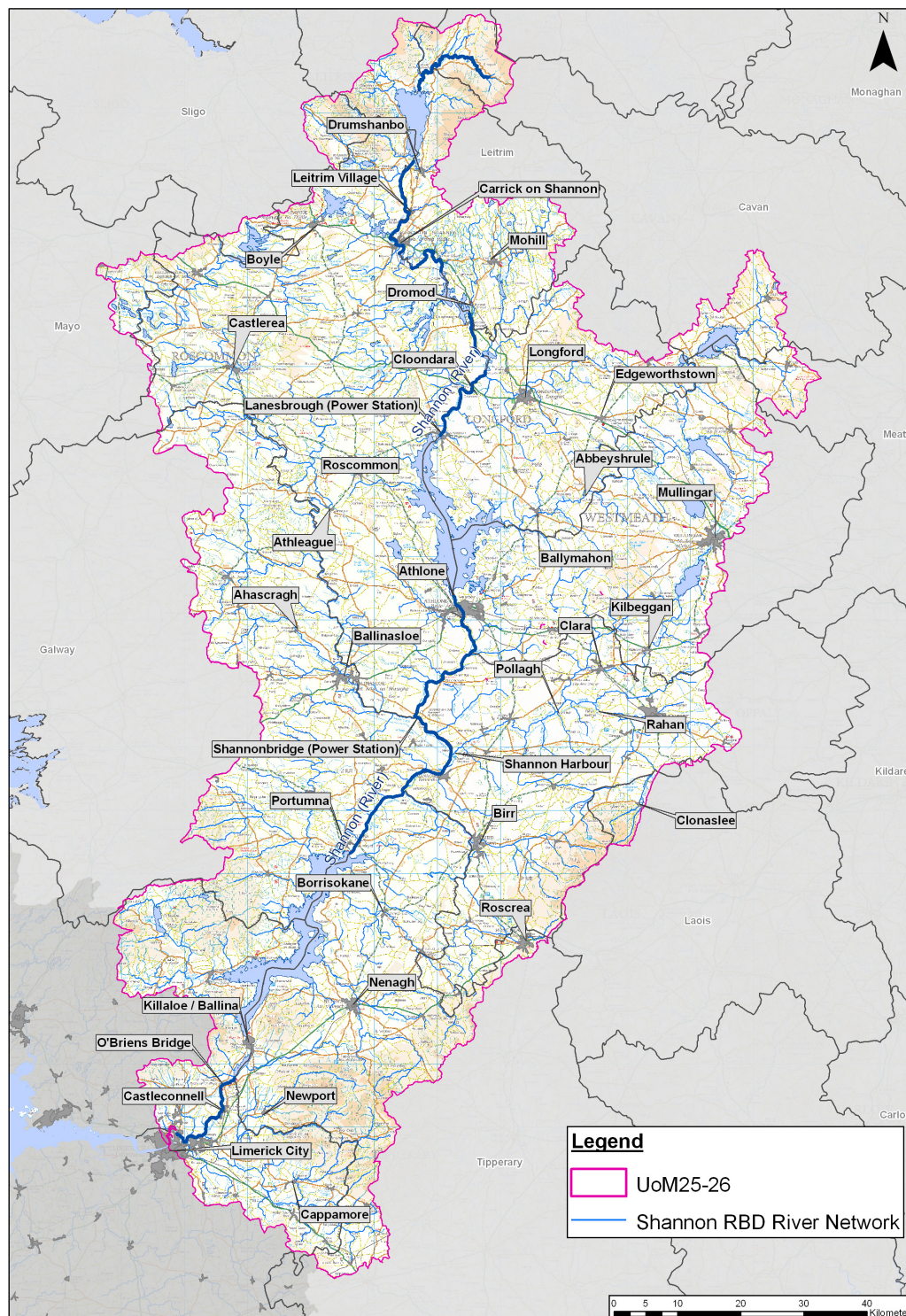


Figure 2.1 - UoM 25-26 Shannon Estuary Upper & Lower Overview

Spatial Scales Assessment

There are 10 Water Management Units (WMUs) within Unit of Management 25-26. These consist of the:

- Upper Shannon;
- Inny;
- Brosna;
- Little Brosna;
- Nenagh;
- Mulkear;
- Lough Derg;
- Hind/Lough Ree;
- Suck; and
- Camlin/Rinn.

Table 2.1 and Figure 2.2 illustrate the AFAs and IRRs identified for Unit of Management 25-26, all of which may be subject to changes as the CFRAM Study develops.

Table 2.1: UoM 25-26 spatial scales of assessment

County	WMU	AFA / IRR Name
Areas For Further Assessment		
Clare	Lough Derg	Springfield
Galway	Suck	Ballinasloe
Galway	Suck	Ahascragh
Galway	Lough Derg	Portumna
Laois	Brosna	Clonaslee
Leitrim	Camlin/Rinn	Mohill
Leitrim	Upper Shannon	Carrick on Shannon
Leitrim	Upper Shannon	Drumshanbo
Leitrim	Upper Shannon	Dromod
Leitrim	Upper Shannon	Leitrim Village
Limerick	Mulkear	Cappamore
Limerick	Lough Derg	Castleconnell
Limerick	Lough Derg	O'Briens Bridge
Limerick City	Maugue	Limerick City
Longford	Camlin/Rinn	Longford
Longford	Hind/Lough Ree	Cloondara
Longford	Inny	Abbeyshrule
Longford	Inny	Edgeworthstown
Longford	Inny	Ballymahon
Offaly	Little Brosna	Birr
Offaly	Brosna	Clara
Offaly	Brosna	Pollagh
Offaly	Brosna	Rahan
Offaly	Brosna	Shannon Harbour
Roscommon	Hind/Lough Ree	Roscommon
Roscommon	Suck	Castlereagh
Roscommon	Suck	Athleague
Roscommon	Upper Shannon	Boyle
Tipperary	Mulkear	Newport
Tipperary	Nenagh	Borrisokane
Tipperary	Nenagh	Nenagh
Tipperary	Little Brosna	Roscrea
Tipperary	Lough Derg	Killaloe / Ballina
Westmeath	Hind/Lough Ree	Athlone
Westmeath	Brosna	Kilbeggan
Westmeath	Brosna	Mullingar
Individual Risk Receptors		
Longford	Hind/Lough Ree	Lanesbrough (Power Station)
Offaly	Lough Derg	Shannonbridge (Power Station)

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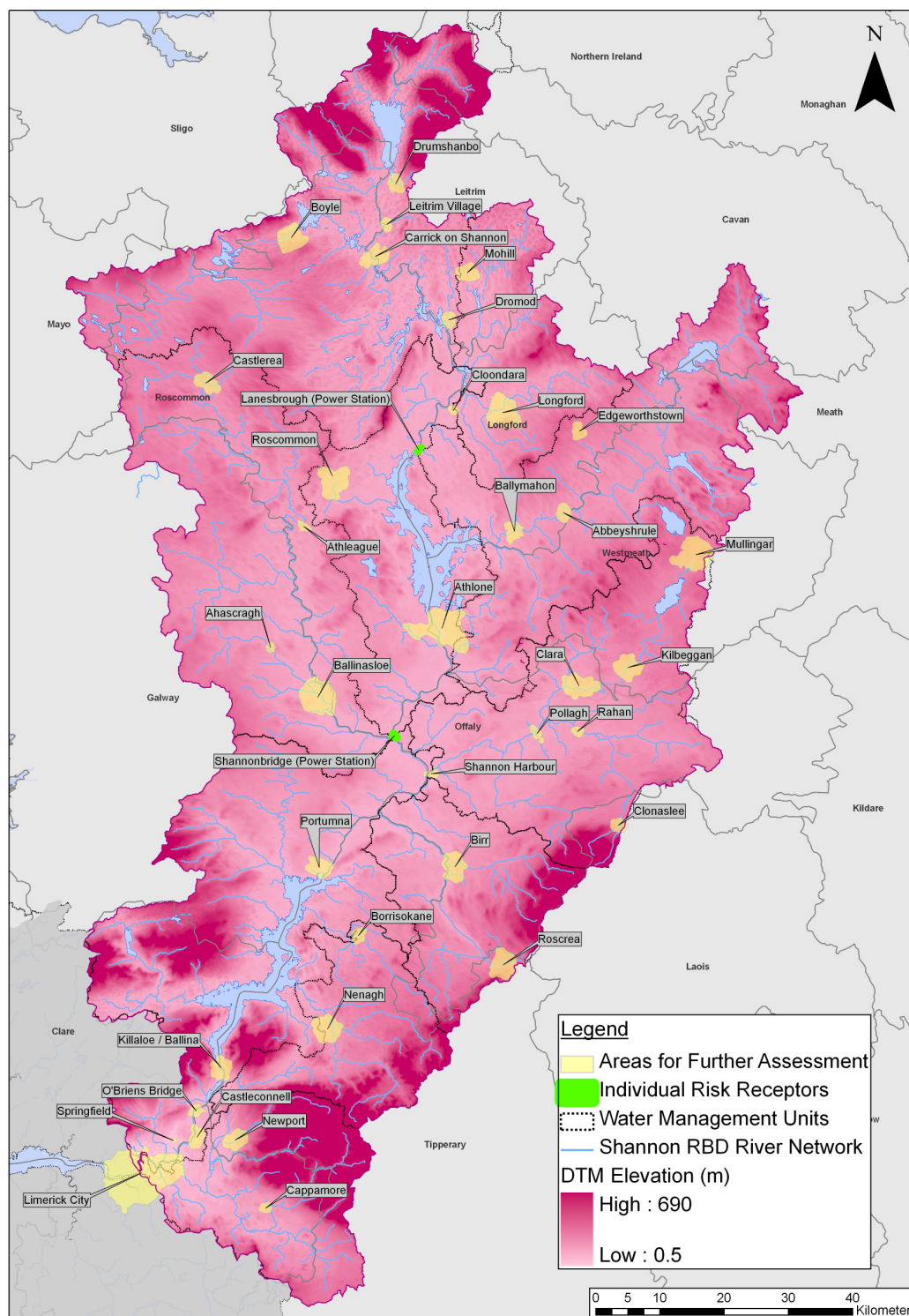


Figure 2.2 - UoM 25-26 Spatial Scales of Assessment

2.2 History of Flooding

Within Unit of Management 25-26, there are records of significant flooding that has occurred throughout the various WMUs from 1839 to 2009, affecting a number of towns and villages. The major cause of flooding, based on the available records, appears to be fluvial and tidal.

Tables 2.2 to 2.11 show the reported flood events for the AFAs and IRRs currently identified within Unit of Management 25-25 WMUs. This historical flooding information has been gathered using the OPW National Flood Hazard Mapping website (www.floodmaps.ie), and the National Preliminary Flood Risk Assessment (PFRA) Report (August 2011) produced by the OPW. The 'known' main flood mechanism is not recorded for all flood events and is assumed for some records in the tables below (these are shown in *italics*).

Table 2.2: Summary of historical flood events within the Upper Shannon WMU

UPPER SHANNON WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
(a) Boyle		
1999/2000	<i>Fluvial</i>	Railway flooded.
Oct 1998	<i>Fluvial</i>	No flooding details available.
Jul 1996	<i>Fluvial</i>	Railway line, railway station, Felton Road & Hanley Avenue flooded.
Dec 1992	<i>Fluvial</i>	No flooding details available.
Recurring 1970/1980s	Fluvial	Entire Boyle town affected by flooding.
Recurring	Fluvial	Road and land flooding occurred a number of times over the past few winters downstream of Boyle town. A number of residential properties at Boyle at risk. Road at Breandrum liable to flooding.
(b) Carrick on Shannon		
Nov 2009	Fluvial	10 properties flooded (PFRA).
Winter 1999/2000	Fluvial	Major flooding to roads leading to & from Carrick on Shannon including N4 & N5. One residential property reported flooded and businesses affected.
Winter 1994/1995	Fluvial	Extensive flooding throughout the Shannon catchment.
Feb 1990	Fluvial	Extensive flooding throughout the Shannon catchment.
Jan 1965	<i>Fluvial</i>	No flooding details available.
Winter 1959	Fluvial	Extensive flooding throughout the Shannon catchment.
Dec 1954	Fluvial	4 families marooned. Carrick on Shannon completely isolated for communication. Roads and lands flooded.
Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.
Recurring	<i>Fluvial</i>	The old N4 and road at Lough Eidin, Cleaheen & Sroankeeragh (R237) liable to flooding. Low lying land at Sroankeeragh also flooded.

UPPER SHANNON WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
(c) Dromod		
Nov 2009	Fluvial	3 properties flooded (PFRA).
Winter 1999/2000	Fluvial	Extensive flooding throughout the Shannon catchment. Residents of Lough Rynn Avenue were cut off from communication and farmers' lands were flooded.
Winter 1994/1995 Feb 1990 Winter 1959 Dec 1954 Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.
Recurring	Fluvial	Land east of the N4 south of Dromod and west of the R202 in the Cloonturk area, significant area in Roosky and road west of the R202 at Corrascoffly flooded.
(d) Drumshanbo		
Winter 1999/2000 Winter 1994/1995 Feb 1990 Winter 1959	Fluvial	Extensive flooding throughout the Shannon catchment.
Dec 1954	Fluvial	Extensive flooding throughout the Shannon catchment. Main roads flooded and train disrupted from Ballinamore to Drumshanbo.
Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.
(e) Leitrim Village		
Nov 2009	Fluvial	17 properties flooded (PFRA).
Winter 1999/2000 Winter 1994/1995 Feb 1990 Winter 1959 Dec 1954 Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.

Table 2.3: Summary of historical flood events within the Camlin/Rinn WMU

CAMLIN/RINN WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
(a) Mohill		
Recurring	Fluvial	Lands and roads flooded in Clooncahir area.
(b) Longford		
Jan 2005	Fluvial	Railway line, lands & road flooded. Areas affected including Mullagh, Great Water Street & Springlawn in Longford.
Feb 2002	Fluvial	No flooding details available.
Winter 1999/2000	Fluvial	Area immediately to the south west of Longford flooded.
Winter 1994/1995	Fluvial	Extensive flooding throughout the Shannon catchment.
Feb 1990	Fluvial	Extensive flooding throughout the Shannon catchment.
1987	Fluvial	No flooding details available.
Sep 1968	Fluvial	No flooding details available.
Jan 1965	Fluvial	No flooding details available.
Winter 1959	Fluvial	Extensive flooding throughout the Shannon catchment.
Dec 1954	Fluvial	Extensive flooding throughout the Shannon catchment.
Mar 1947	Fluvial	Reported one farmer's house flooded.
Nov – Jan 1929/1930	Fluvial	Longford suffered incalculable damage. Wide area from Tarmonbarry to the entrance of Lough Ree was under water.
Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.
Recurring	Fluvial	N52 at Mullagh/Ballyminion, road & properties at Springlawn, Little Water Street, Glack 2 and Whiterock affected. Road at Glack 1 and Driving Range also liable to flood. Low lying area at Driving Range and Whiterock floods every year after heavy rain.

Table 2.4: Summary of historical flood events within the Hind/Lough Ree WMU

HIND/LOUGH REE WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
(a) Athlone		
Nov 2009	Fluvial	Extensive flooding throughout the Shannon catchment. 75 properties flooded on 19 Nov 2009 (PFRA).
Nov/Dec 2006	Fluvial	No flooding details available.
Feb 2003	Fluvial	No flooding details available.
Nov 2002	Fluvial	60 to 80 residential properties flooded at Willow Park Estate to a depth of 1200mm. Golden Island area affected.

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HIND/LOUGH REE WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
Feb 2002	Fluvial	Burgess Park, McQuaids Bridge & Deer Park area affected by flooding.
Winter 1999/2000	Fluvial	Extensive flooding throughout the Shannon catchment. Barrymore, Golden Island, Creggan, Clonown, Cloonbonny & Carrick O'Brien area flooded.
Winter 1994/1995	Fluvial	Extensive flooding in the Shannon catchment south of Athlone. Clonown Road flooded.
Feb 1990	Fluvial	Extensive flooding throughout the Shannon catchment. 3,000 farm families & 700 acres of land south of Athlone affected by flooding.
Jan 1965	Fluvial	Hundreds of acres of land from Banagher to Athlone flooded.
Winter 1959	Fluvial	Extensive flooding throughout the Shannon catchment.
Dec 1954	Fluvial	Reported 124 farm holdings & 70 residential properties between Athlone & Meelick seriously flooded. (Estimated 165 farms & 100 dwellings) Thousands of acres of farmland flooded in the Shannon.
Nov – Jan 1929/1930	Fluvial	Low lying areas of Athlone flooded.
Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment. No flooding details available.
Recurring	Fluvial	Low lying area at Railway Bridge, Ballymahon Road, Retreat Rd, Railway Bridge, Coosan, Central Terrace, Cartron Drive, Auburn Heights & Marine View floods after heavy rain every year. Considerable area North of Athlone is flooded by the River Shannon.
(b) Cloondara		
Winter 1999/2000	Fluvial	Extensive flooding throughout the Shannon catchment. Map showing Knappogue and Cloondara were flooded.
Winter 1994/1995 Feb 1990 Winter 1959 Dec 1954 Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.
Recurring	Fluvial	Road at Cloondara and Knappogue is liable to flood after heavy rain. River Fallan overflows its banks at Fallan Bridge. Low lying areas floods after very heavy rain at Cornollen.
(c) Roscommon		
Nov 2009	Fluvial	Extensive flooding in Roscommon including Lanesborough Road (N63), north of Creevy Road, Golf Links Road, access road at WWTP, Ballingard and Athlone Road (N61). Flooding also occurred at the rear of Centrepont Retail Park at Circular Road, Glenview, Ballymartin, Derrydonnell and north of railway at Bogganfin. Low lying area flooded at Ballinagard. 10 properties flooded in Roscommon (PFRA).

HIND/LOUGH REE WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
Jan 1969	Fluvial	Minor flooding in and around Roscommon town. Low lying land in the direction of Athleague severely flooded.
Jan 1965	Fluvial	No flooding details available.
Recurring	Fluvial	Low lying land at the lough, Cloonyourish and Lisamult floods every year. Low lying marsh land of the golf course near N61, Fearagh and Portrunny Bay frequently flooded. N61, a country road and N63 also flooded.
(d) Lanesborough Power Station (IRR)		
Nov 2009	Fluvial	Extensive flooding throughout the Shannon catchment.
Feb 2007	Fluvial	The Turlough & access road to a house flooded.
Winter 1999/2000	Fluvial	Extensive flooding throughout the Shannon catchment.
Winter 1994/1995	Fluvial	Extensive flooding throughout the Shannon catchment and Lanesborough.
Feb 1990 Winter 1959 Dec 1954 Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.

Table 2.5: Summary of historical flood events within the Suck WMU

SUCK WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
(a) Ahascragh		
Nov 2009	Fluvial	One commercial property and adjoining lands flooded.
Recurring	Pluvial	Low lying area around dip in the road floods after heavy rain every year due to inadequate road drainage.
(b) Athleague		
Nov 2009	Fluvial & pluvial	27 properties affected and roads in Athleague closed.
Jan 2005	Fluvial	Aerial photographs show extensive flooding in Carderryhugh, Aghagower, Gorteenclough, Aghadabeg, Castlestrange to Athleague, Muff to Carderryhugh, Carderryhugh to Rockwood.
Recurring	Fluvial	Extensive area in Athleague and Coollusty flooded. Surrounding land also flooded from Castlestrange to Athleague. In Clooneen, low lying area flooded and road was liable to flooding.
(c) Ballinasloe		
Nov 2009	Fluvial	Residential and commercial properties affected by

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SUCK WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
		flooding in the Marina, Willow Park area, Derrymullan and Ballinasloe town. More than 90 properties flooded (PFRA).
Jan 2005	Fluvial	Flooding affected Bellagill Bridge to concrete work, Suck Bunowen area, Creggaun, Derrymullan & Rail Bridge Ballinasloe area.
Jan 1995	Fluvial	Residential & commercial properties affected by flooding. Killure & Derrymullen Roads to Ahascragh & Ballinasloe/New Inn Road were impassable.
Feb 1990	Fluvial	Housing estate was flooded.
Jan 1965	Fluvial	Flood water from the River Suck crept up on the grounds of a church at Ballinasloe.
Dec 1954	Fluvial	Extensive flooding throughout the Shannon catchment. No flooding details available for Ballinasloe.
(d) Castlerea		
Recurring	Fluvial	Approximately 30 acres of land flooded. No properties or roads flooded.

Table 2.6: Summary of historical flood events within the Lough Derg WMU

LOUGH DERG WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
(a) Castleconnell		
Nov 2009	Fluvial	Castleconnell, Montpelier & Castletroy severely affected. Roads from Charco's to Scanlan Park & from car parks towards the village flooded & damaged. Households affected by flooding (9 families evacuated). Farmlands flooded.
Dec 2006	Fluvial	No flooding details available.
Feb 1990	Fluvial	Many villages & roadways in Limerick county badly flooded.
Winter 1999/2000 Winter 1994/1995 Winter 1959 Dec 1954	Fluvial	Extensive flooding throughout the Shannon catchment.
Aug 1946	Fluvial	No flooding details available.
Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.
(b) Killaloe		
2004	Fluvial	Summerhill Road (R404) flooded.
Winter 1999/2000 Winter 1994/1995	Fluvial	Extensive flooding throughout the Shannon catchment.

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LOUGH DERG WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
Feb 1990 Winter 1959 Dec 1954		
Aug 1946	Fluvial	Foley's Cross on the Killaloe-Scariff Road, the Birdhill Rly Bridge & road at Ballyvally severely flooded.
Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.
(c) Limerick City		
Nov 2009	Fluvial	Extensive flooding in the Limerick City area.
Dec 2006	<i>Fluvial</i>	No flooding details available.
Jan/Feb 2002	Fluvial	12 properties at Clancy's Strand and roads flooded. Other areas including O'Callaghan Strand, Corbally Road etc also affected.
Feb 2001	Fluvial	Flooding to the rear of properties 13-25 Athlunkard Street.
Winter 1999/2000	Fluvial	Extensive flooding with up to 60 houses, roads & 200 acres of land flooded.
Oct 1995	Fluvial	Corrib Drive, garages & an indoor play area to a Supermacs fast food outlet flooded.
Jan/ Feb 1995	Fluvial	Sir Harry's Mall, Clancy's Strand, Dock Road, Longpavement, Rosbrien etc flooded. Roads, roadway, low lying ground & at least 2 houses in the vicinity of De Courcy's Bridge flooded.
May 1994	Fluvial	Roads shown as flooded from the photographs. No flooding details available.
Feb 1990	Fluvial	Arthur's Quay, Bishops Quay, Clancy's Strand, Sarfield House & car park, Condell Road & road from Corbally to Crusheen flooded.
Aug 1986	Fluvial	Limerick Road flooded.
Dec 1954	Fluvial	Extensive flooding throughout the Shannon catchment. No flooding details available for Limerick City.
Recurring	Fluvial	Rosbrien Road frequently flooded & 100 acres of callow land between Rosbrien Road & Ballinacurra Bridge flooded some months each year. Flooding of roads, industries and open ground in the vicinity of the Tipperary Roundabout & Ballysimon Road in the past. Flooding to back gardens of houses in Ashbrook Gardens. Considerable flooding at South Circular Road area.
Jan/Feb 2002	Tidal	12 properties at Clancy's Strand and roads flooded. Other areas including O'Callaghan Strand, Corbally Road etc also affected.
Oct 2001	<i>Fluvial</i>	No flooding details available.
Dec 2000	Tidal	Severe flooding on R464 Longpavement.
Feb 2000	<i>Fluvial</i>	No flooding details available.
Winter 1999/2000	Tidal	Extensive flooding with up to 60 houses, roads & 200 acres of land flooded.
Feb 1997	Tidal	>75 properties (>30 at Sir Harry's Mall, >25 at Clancy

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LOUGH DERG WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
		Strand, ~20 at O'Callaghan), extensive areas of lands & roads flooded.
Jan/Feb 1995	Tidal	Sir Harry's Mall, Clancy's Strand, Dock Road, Longpavement, Rosbrien flooded. Roads, roadway, low lying ground & at least 2 houses in the vicinity of De Courcy's Bridge flooded.
Jan 1994	Fluvial	Roads shown as flooded from the photographs. No flooding details available. Flood water pumped back into the river.
Oct 1961	Tidal	No flooding details available.
(d) O'Briensbridge		
Nov 2009	Fluvial	Extensive flooding in the O'Briensbridge area including Montpelier. R525 Castleconnell to Mountpelier/ O'Briensbridge closed due to flooding. Households affected by flooding. Farmlands flooded.
Dec 2006	Fluvial	No flooding details available.
Winter 1999/2000	Fluvial	Extensive flooding throughout the Shannon catchment.
Winter 1994/95	Fluvial	Extensive flooding throughout the Shannon catchment.
Feb 1990	Fluvial	Many villages & roadways in Limerick county badly flooded.
Winter 1959	Fluvial	Extensive flooding throughout the Shannon catchment.
Dec 1954	Fluvial	Extensive flooding throughout the Shannon catchment.
Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.
(e) Portumna		
Nov 2009	Fluvial	Extensive flooding throughout the Shannon catchment.
Dec 2006	Fluvial	No flooding details available.
Winter 1999/2000	Fluvial	Extensive flooding throughout the Shannon catchment.
Feb 1995	Fluvial	Up to half a dozen of houses badly damaged. Thousands of acres of farmland flooded and houses evacuated in a number of areas in the county. Numerous roads impassable, particularly secondary roads.
Winter 1994/1995 Feb 1990 Winter 1959 Dec 1954 Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.
(f) Shannonbridge Power Station (IRR)		
Nov 2009	Fluvial	Extensive flooding throughout the Shannon catchment.
Aug 2008	Fluvial	Flooding occurred in several parts of the county.
Dec 2006	Fluvial	No flooding details available.
Jan 2005	Fluvial	Extensive flooding in the vicinity of Shannonbridge.

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LOUGH DERG WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
2003	Fluvial	Low lying area close to the Shannon floodplain flooded due to blocked drains.
Winter 1999/2000	Fluvial	Extensive flooding throughout the Shannon catchment. Farmers at Shannonbridge badly affected.
Winter 1994/1995	Fluvial	Extensive flooding throughout the Shannon catchment.
Feb 1990	Fluvial	Extensive flooding throughout the Shannon catchment.
Oct/Nov 1968	<i>Fluvial</i>	No flooding details available.
Jan 1965	Fluvial	The richest meadow in Shannonbridge flooded. Few houses flooded in the Shannon.
Winter 1959	Fluvial	Extensive flooding throughout the Shannon catchment.
Dec 1954	Fluvial	The Reisk-Shannonbridge area covered with water. Houses & outhouses flooded.
Oct 1954	<i>Fluvial</i>	No flooding details available.
1948	<i>Fluvial</i>	No flooding details available.
Mar 1947	Fluvial	Hundred of acres of land between Athlone & Shannonbridge inundated.
Jan 1930	Fluvial	Shannon flooded between Shannonbridge & Meelick and people evacuated.
Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.
1924 Aug 1905 Oct 1886 1839	<i>Fluvial</i>	No flooding details available.
(g) Springfield		
Nov 2009	Fluvial	Extensive flooding in Cloonlara, County Clare. 10 properties flooded in Springfield (PFRA).
Dec 2006	<i>Fluvial</i>	No flooding details available.
Aug 2004	Fluvial	R463 & L7040 roads badly flooded & impassable. Localised flash flood.
Feb 1990	Fluvial	County Clare experienced serious flooding with approximately 200 houses & many roads affected.
Dec 1954	Fluvial	Extensive flooding throughout the Shannon catchment.

Table 2.7: Summary of historical flood events within the Mulkear WMU

MULKEAR WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
(a) Newport		
Aug 1997	Fluvial	No flooding details available.
Winter 1994/1995	Fluvial	Newport badly flooded. Roads between Nenagh & Newport flooded.
Aug 1986	Fluvial	Severe flooding in Newport.
Dec 1960	Fluvial	Severe flooding in Newport with hundreds of acres of land flooded & residents had to leave their homes.
1950	Fluvial	One bridge reported damaged.
Aug 1946	Fluvial	Lands & public roads flooded. Ballynmaokey & Shower bogs also flooded. Farms affected & some bridges damaged.
Sep 1944	Fluvial	No flooding details available.
(a) Cappamore		
Winter 1994/1995	Fluvial	Cappamore was severely flooded. Bridge Street area flooded.
Dec 1993	Fluvial	No flooding details available.
Aug 1986	Fluvial	Houses, pub, shops, roads and land flooded.
1983	Fluvial	Houses, land & road flooded. Agricultural land downstream of Cappamore flooded due to breached embankments.
1975	Fluvial	No flooding details available.
1973	Fluvial	No flooding details available.
1969	Fluvial	No flooding details available.
Aug 1946	Fluvial	Houses in low lying section of Cappamore, roads & lands flooded. Breached embankment.
Recurring	Fluvial	Numerous houses flooded & a number of roads rendered impassable once every 3 to 4 years. 46 properties flooded (PFRA).

Table 2.8: Summary of historical flood events within the Nenagh WMU

NENAGH WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
(a) Nenagh		
Winter 1994/1995	Fluvial	Roads between Limerick & Nenagh, Nenagh & Newport and Nenagh & Borrisokane flooded.
Jan 1984	Fluvial	An industrial estate near Nenagh flooded.
Nov-Jan 1968/1969	Fluvial	A considerable area of land flooded. Road & a mill flooded at Ballyartella. At Islandbawn, the Nenagh-Dublin Road, a dwelling & a shop flooded.
Recurring	Fluvial	N7 Bypass (Nenagh/Newport Road), Ballynavlogh and Thurles Road flooded regularly. Road at Coolaholliga

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NENAGH WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
		(North of Nenagh) flooded to 0.5m and access to 10 houses impacted. Ballygraique Estate and Creamery flooded historically by Clareen Stream. Road & houses at Springfort Cross and Shannon Development Industrial Estate flooded historically.
(b) Borrisokane		
-	-	No recorded flooding.

Table 2.9: Summary of historical flood events within the Little Brosna WMU

LITTLE BROSNA WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
(a) Birr		
Aug 1997	Fluvial & pluvial	No flooding details available.
Jan 1995	Fluvial & pluvial	One residential property, some farm buildings & 25 acres of agricultural land flooded. Flooding of land & premises at Ballindown & Ballywilliam also. Roads flooded & impassable at N52, N62, Kennedy's Cross & the Mountmellick/Birr Road (R440).
Jan 1990	Fluvial	No flooding details available. Bridge at Borrisokane Road outside Ardcroney to Ballycommon was reported damaged.
Nov 1965	Fluvial & pluvial	No flooding details available.
Jan 1965	Fluvial & pluvial	No flooding details available.
(b) Roscrea		
-	-	No recorded flooding.

Table 2.10: Summary of historical flood events within the Brosna WMU

BROSNA WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
(a) Clara		
Aug 2008	Fluvial	Flooding occurred in several parts of the Offaly county.
Jan 1995	Fluvial	Residential, commercial properties, farmlands & streets flooded notably in Gort, Co Galway, Ennis, Co Clare & Carlow.
1954	Fluvial	No flooding details available.
Recurring	Fluvial & pluvial	Various locations in Clara, low lying land at Ballicknahee, Aghamore, Clara Bog & Woodfield Bog and roads are liable to flood. Properties at Ballicknahee are also affected.
(b) Clonaslee		

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BROSNA WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
-	-	No recorded flooding.
(c) Kilbeggan		
Recurring	Fluvial & pluvial	Council Estates at Brosna View & the road at Coola Bridge are liable to flood every year after heavy rain.
(d) Mullingar		
Aug 2008	Fluvial	6 houses' back gardens flooded and car park of hospital flooded to 0.25m.
1995	Fluvial	No flooding details available. Flooding due to blocking of the bridge opening at Pearse Street due to mattress.
Oct 1987	Fluvial	Flooding in the Bleach Yard & Lynn Road due to a mattress blocking the bridge opening at Pearse Street.
Nov 1967	Fluvial	Overtopping of the Royal Canal.
Nov 1965	Fluvial & pluvial	Significant flooding at Pearse Street, Springfield Aqueduct & Bleach Yard/Lynsburry Terrace.
Recurring	Fluvial	Properties at Austin Friar Street & one property at Balrath and Mullenoran Bridge, Bunbrosna affected. N52 & road at Mullenoran Bridge also affected.
(e) Pollagh		
Nov-Jan 1968/1969	Fluvial	Some flooding of farmland. Minor flooding only.
Dec 1944	Fluvial	No flooding details available. Only flooding photographs.
Recurring	Fluvial	Low lying flat land in Lemanaghan & road at Pollagh & Lemanaghan is liable to flood after very heavy rainfall.
(f) Rahan		
Aug 2008	Fluvial & pluvial	Flooding occurred in several parts of the Offaly county.
Nov-Jan 1968/1969	Fluvial & pluvial	No flooding details available.
Recurring	Fluvial & pluvial	Low lying land at Killina floods every year. Road is liable to flood.
(g) Shannon Harbour		
Aug 2008	Fluvial	Banagher Bridge area flooded.
Winter 1999/2000	Fluvial	Extensive flooding throughout the Shannon catchment. Shannon Harbour severely flooded.
Winter 1994/1995	Fluvial	Extensive flooding throughout the Shannon catchment.
Feb 1990	Fluvial	Extensive flooding throughout the Shannon catchment.
Dec 1968	Fluvial	No flooding details available.
Nov-Dec 1965	Fluvial	No flooding details available.
Jan 1965	Fluvial	Lands flooded from Banagher to Shannon Harbour and Shannonbridge.
Winter 1959	Fluvial	Extensive flooding throughout the Shannon catchment.
Dec 1954	Fluvial	Shannon harbour badly flooded. Roads & yards of farmhouses reported flooded.

BROSNA WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
Oct 1954	<i>Fluvial</i>	No flooding details available.
Nov 1941	<i>Fluvial</i>	No flooding details available.
Jan 1930	Fluvial	Extensive flooding at Shannon Harbour via Moore & Clomacnoise and valley of the Suck & Grand Canal.
Jan 1925	Fluvial	Extensive flooding throughout the Shannon catchment.

Table 2.11: Summary of historical flood events within the Inny WMU

INNY WMU		
Flood Event	Main Flood Mechanism	Description of Flood Event
(a) Abbeyshrule		
-	-	No recorded flooding.
(b) Ballymahon		
1990	<i>Fluvial</i>	Main road to Ballymahon obstructed.
Dec 1954	Fluvial	Extensive flooding throughout the Shannon catchment.
Recurring	<i>Fluvial</i>	Low lying areas floods after heavy rain every year.
(c) Edgeworthstown		
-	-	No recorded flooding.

3**Key Environmental Issues in Unit of Management 25-26****3.1 Introduction**

The following sections provide a preliminary discussion of the environmental baseline for Unit of Management 25-26.

Both the existing and potential future environmental characteristics of the Unit of Management are summarised. These characteristics can influence the risk and repercussions of flooding and can constrain or provide opportunities for the implementation of strategic flood risk management options.

On developing the scope of the SEA for the Shannon CFRAM Study, and following consultation with stakeholders, the key social and environmental issues relating to flooding and flood risk management within Unit of Management 25-26 have been identified, and these are documented in the following sections.

Potential interactions between the different aspects of the environment are outlined within Section 5 of the overarching Shannon RBD Environmental Scoping Report. These interactions will be further considered and documented during the later stages of the SEA process.

3.2 Population and Human Health

3.2.1 Current Conditions

Population

The population of Ireland was over 4.2 million in 2006 and provisional numbers from the 2011 census indicate that population figures have increased by approximately 8.1% to 4.5 million. Ireland has experienced increasing population growth since 1961, however the past two years has seen a decrease in the demand for development, and increased unemployment within this Unit of Management as is the trend seen across the entire country.

The provisional 2011 census population figures currently available from the Central Statistics Office (CSO) do not segregate city populations from rural population, but these are due to be published in April 2012 and will be considered as appropriate in the following stages of the SEA. Settlement patterns within this Unit of Management are illustrated in Figure 3.2.1.

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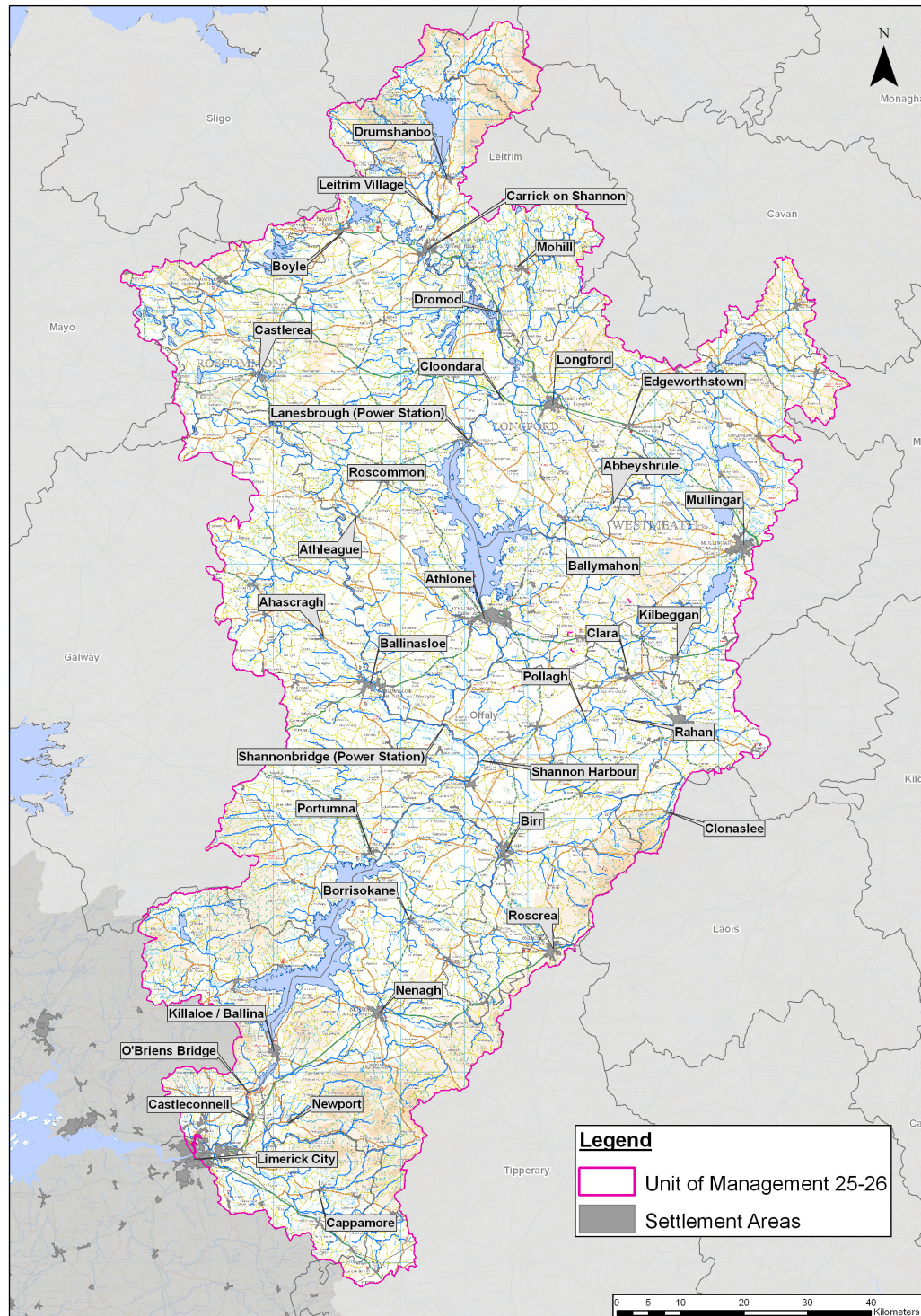


Figure 3.2.1 - Settlement patterns within UoM 25-26

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Population figures reported in the 2006 census for the town boundaries of each AFA within this Unit of Management are outlined in Table 3.2.1. Population figures for Abbeyshrule, Shannon Harbour and Springfield are not defined separately.

Table 3.2.1: Population figures within the Areas for Further Assessment
(source: CSO)

Town (AFAs)	Population 2002	Population 2006	Difference 2002-2006
Abbeyshrule	-	-	-
Ahascragh	271	221	-50
Athleague (rural)	822	900*	78
Athlone Town	7,354	14,347	6,993
Ballinasloe	5,984	6,049	65
Ballymahon	827	963	136
Birr	3,590	4,091	501
Borrisokane	832	832	0
Boyle	1643	1,599	-44
Cappamore	684	669	-15
Carrick-on-Shannon Town	2,237	3,163	926
Castleconnell	1,343	1,330	-13
Castlerea	1,788	1,873	85
Clara	2,704	3,001	297
Clonaslee	538	501	-37
Cloondara (rural)	549	575*	26
Dromod	-	-	-
Drumshanbo	623	665	42
Edgeworthstown	726	1,221	495
Kilbeggan	652	822	170
Killaloe / Ballina	1174	1,035	-139
Leitrim Village	-	258	-
Limerick City	54,023	52,539	-1,484
Longford Town	6,831	7,622	791
Mohill	786	931	145
Mullingar	8,824	8,940	116
Nenagh Town	6,121	7,415	1,294
Newport	887	1,286	399
O'Briensbridge	375	378	3
Pollagh	-	229	-
Portumna	1,235	1,377	142
Rahan	737	696*	-41
Roscommon (urban & rural)	4,489	5,017	528
Roscrea	4,578	4,910	332
Shannon Harbour	-	-	-
Springfield	-	-	-

* Population numbers from Electoral District

Provisional results of the 2011 Census indicate that the midland region, much of which is within this Unit of Management, has experienced a 12.1% population increase since 2006.

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This Unit of Management is of relevance to various Regional Authorities; primarily, the Midland, West and Mid-west Regional Authorities; smaller areas lie within the Midland East and Border Regional Authorities. The various Regional Authorities have identified a number of Gateways¹ cities/ towns relevant to this Unit of Management as follows:

- Mid-west Regional Authority - Limerick-Shannon Gateway;
- Midland Regional Authority - Athlone, Mullingar and Tullamore as a combined Gateway;
- West Regional Authority - Galway; and
- Border Regional Authority – Sligo.

These Gateways are designated as key areas for population growth, and infrastructural development, which follow the strategies from the National Spatial Strategy (NSS).

Transport 21, the Government's development programme for the network of national roads over the period 2006 to 2015 included the following developments of relevance to the population distribution within this Unit of Management:

- Atlantic Road Corridor from Letterkenny to Sligo, Galway, Limerick and Waterford. This will connect the National Spatial Strategy's 2002-2020 Gateway Cities;
- Improve the key national primary routes including the N24 from Limerick to Waterford.

Transport 21 will be superseded by the new National Development Plan from 2012. However, the NDP reflects many of the road infrastructural proposals under Transport 21.

Human Health

Hospitals, health service centres, nursing homes, and schools, and their ancillary services and transport routes, are recognised as vulnerable receptors to flooding. The distribution of these receptors groups throughout this Unit of Management is illustrated by Figure 3.2.2. The hospitals and health services centres in this Unit of Management range from regional hospitals to care centres, some of which are located on low ground and considered as principle receptors in this Unit of Management.

Details regarding the existing and future characteristics of this Unit of Management associated with pollution risks to human health are outlined in Section 3.4 of this Annex.

¹ Relevant regional authorities identified key areas for population, and produced plans to promoting growth both in infrastructure and connectivity of rural/urban areas, under the National Spatial Strategy.

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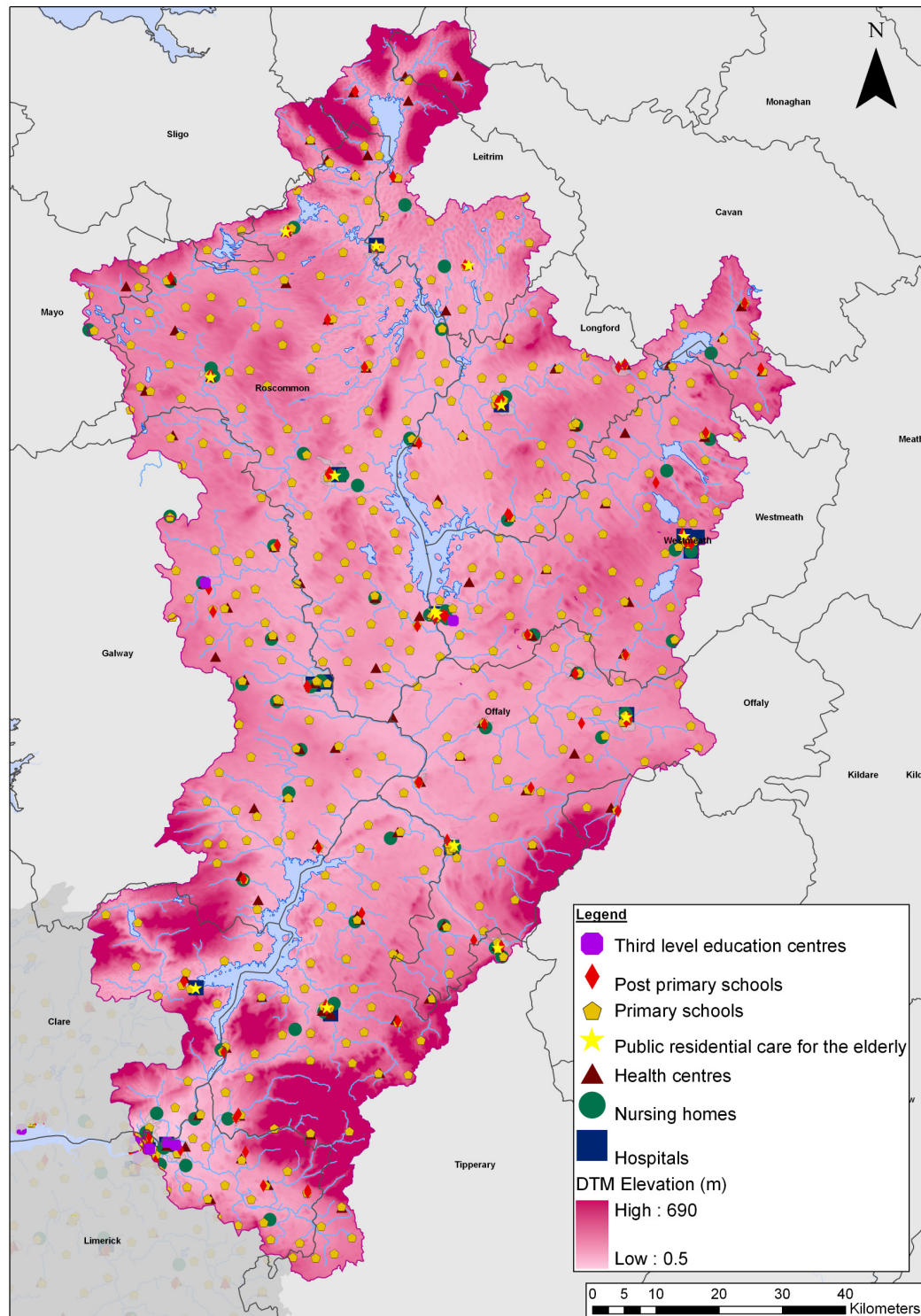


Figure 3.2.2 - Critical human health receptors within UoM 25-26 (source: OPW, HSE)

3.2.2 Future Trends

Housing and Economic Development Planning

The Planning and Development (Amendment) Act 2010 (and subsequently the Regional Planning Guidelines) includes new provisions for Development Plans, requiring the introduction of a 'core strategy that shall show that the development objectives in the Development Plan are consistent, as far as practicable, with national and regional development objectives set out in the National Spatial Strategy and Regional Planning Guidelines'. The Core Strategy of each plan must provide a transparent evidence-based rationale for the amount of land proposed to be zoned for residential and allied mixed-use zonings in the relevant Development Plan and associated compliance with relevant EU Directives. The implementation of core strategies (which is being monitored by the Regional Authorities) within the Development Plans is likely to result in de-zoning, re-zoning and phasing of development of lands.

Local Authorities within this Unit of Management have incorporated Core Strategies into their Development Plans, and are in the process of integrating these into the relevant Local Area Plans. The implementation of these strategies may result in re-zoning, de-zoning and/or phasing of development of lands within this Unit of Management, influencing population distribution and development. Core Strategies outlined in the County Development Plans² emphasise the need for proper planning and sustainable development, in addition some outline the need for a strong link to enforcement of planning regulations for sustainable development into the future. The strategies relevant to the AFAs will be examined further in the next stage of the SEA process. In addition, consultation with relevant Regional Authorities for this Unit of Management will continue.

There is a requirement for planning authorities to have regard to the Planning System and Flood Risk Management Guidelines (Department of Environmental Heritage and Local Government³ and the OPW, 2009) in carrying out their functions under the Planning Acts. This is to ensure that 'where relevant, flood risk is a key consideration in preparing Development Plans and Local Area Plans and in the assessment of planning applications'. These guidelines aim to help revise and strengthen planning policy on development and flood risk across Ireland, and will therefore have a significant influence on future population and development growth and distribution across the Unit of Management.

The preparation of a Strategic Integrated Framework Plan (SIFP) and its associated SEA and AA for the Shannon Estuary has recently commenced. This Plan aims to identify the nature and location of future development, economic growth and employment that can be sustainably accommodated within the estuary whilst ensuring that the habitat status of the Natura 2000 and other environmentally sensitive sites would not be reduced as a result of the impacts of such developments (for further information, refer to Section 3.9.2).

² Leitrim County Development Plan 2009-2015; Roscommon County Development Plan 2008-2014; Longford County Development Plan 2009-2015; Cavan County Development Plan 2008-2014; Westmeath County Development Plan 2008-2014; Offaly County Development Plan 2009-2015; North Tipperary County Development Plan 2010-2016; Galway County Development Plan 2009-2015; Limerick City Council Development Plan 2010-2016; Clare County Development Plan 2011-2017; Sligo and Environs Development Plan 2010-2016.

³ Now the Department of the Environment, Community and Local Government.

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Regional Planning Guidelines – Population Targets

Population targets are outlined in the respective Regional Planning Guidelines to assist planning authorities to decide on the extent of land to be zoned for development (particularly residential development). Population targets indicate the minimum population numbers for these locations to be used in determining future development land requirements for the region, setting the context for city and county Development Plans and Local Area Plans. While zoning should have regard to these population targets, the Guidelines note that additional development may be permitted where there is a clear need. The targets outlined in Table 3.2.2 below provide an indication of future population distribution in this Unit of Management.

Table 3.2.2: Population targets set out in the Regional Planning Guidelines for regions within UoM 25-26.

Area / Region	2006 (Census)	2016	2022	Predicted Increase 2016-2022
Midland Regional Authority				
Laois	67,059	75,931	79,314	3,383
Offaly	70,868	82,114	86,771	4,657
Westmeath	79,346	99,863	109,623	9,760
Longford	34,391	39,392	41,392	2,000
West Regional Authority				
Galway County	159,256	185,860	198,500	12,640
Mayo*	123,839	143,640	150,800	7,160
Roscommon	58,768	66,700	73,400	6,700
Border Regional Authority				
Leitrim	28,950	33,162	35,700	2,538
Cavan*	64,003	77,378	83,300	5,922
Sligo*	60,894	71,851	77,350	5,499
Mid West Regional Authority				
Tipperary North	66,023	78,145	82,123	3,978
Clare	110,950	131,321	141,600	10,279
Limerick County	124,265	147,081	157,065	9,984
Limerick City	59,790	70,768	81,240	10,472
Mid East Regional Authority				
Meath*	162,831	195,898	210,260	14,362

*The percentage of these counties which fall into UoM 25-26 is relatively small; Mayo (1.6%), Meath (3.8%), Sligo (7.3%) and Cavan (15%).

Box 3.2: Population and Human Health – Key strategic issues relating to flood risk management

- Population and development growth will potentially increase the number of people at risk from flooding;
- Recent and emerging changes to planning and development regulations/guidance and their associated influences on the distribution of both existing and future population and development, can provide opportunities for the avoidance or mitigation of flood risk if appropriately enforced;
- Flooding can have significant social and socio-economic effects, such as increased stress and anxiety for individuals and communities as well as monetary impacts associated with 'clean-up' activities;
- Increased levels of resilience and resistance of infrastructure protecting or managing human health to flooding is important to support emergency planning and response e.g. hospitals, nursing homes, health care facilities, etc;
- Access to healthcare and emergency services should be maintained during flood events;
- Failure to protect or manage potential 'at risk' areas, can influence property insurance policies and may also restrict development potential;
- Publication of nationally / regionally consistent information relating to flood risk will help towards standardising planning, development and insurance policies;
- Good public access to information relating to flood risk can support ongoing community and business resilience, which in turn can provide opportunities for facilitating or enhancing the sustainability of flood risk management; and
- It is acknowledged that Local Authorities are legally required to undertake emergency planning and therefore this will not be proposed as a flood risk management option by the CFRAM Study. However, other aspects of strategic flood risk management can enhance business and community emergency planning and continuity frameworks, e.g. linking emergency planning frameworks with flood forecasting, to provide flood warning.

3.3 Geology, Soils and Land Use

3.3.1 Existing Conditions

Underlying this Unit of Management is a sedimentary **geology** of Carboniferous limestone, with some shale, sandstone, and siltstone, and smaller amounts of volcanic rock such as basalt to the south.

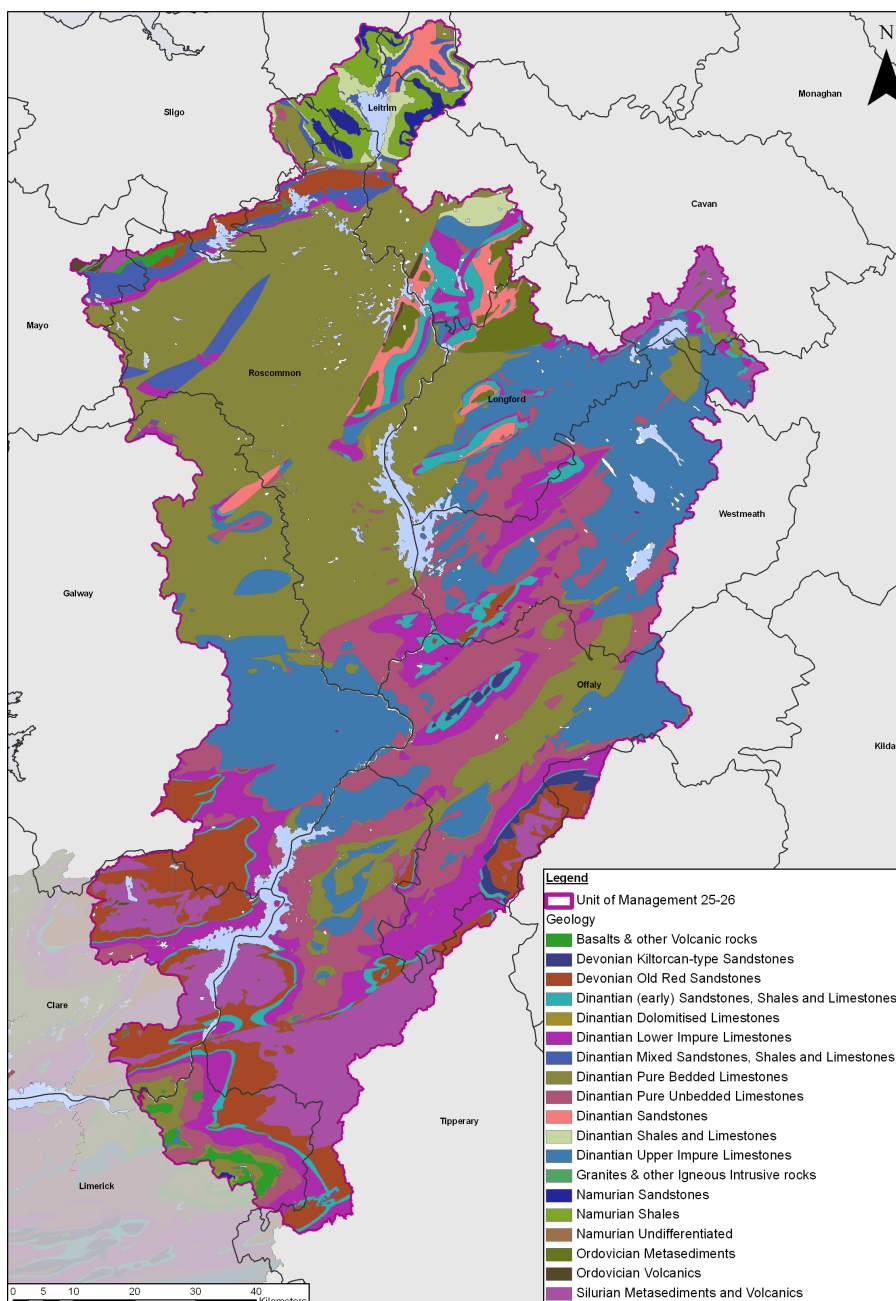


Figure 3.3.1 - Geology within UoM 25-26 (source GSI)

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As part of the Irish Geological Heritage (IGH) Programme, a partnership between Geological Survey of Ireland (GSI) and the National Parks and Wildlife Service (NPWS), the GSI have identified important geological and geomorphological sites which could be conserved as Natural Heritage Areas (NHAs). Until designation is confirmed, these sites are classified as Irish Geological Heritage Sites (IGHs). There are 136 IGHs classified within this Unit of Management. Table 3.3.1 provides a breakdown of IGH by Theme⁴ for Unit of Management 25-26 and Figure 3.3.2 illustrates their location across the Unit of Management.

Table 3.3.1: Breakdown of the IGH within UoM 25-26

Theme No.	Theme Type	No of Sites
IGH 1	Karst	18
IGH2	Precambrian - Devonian Palaeontology	4
IGH4	Cambrian-Silurian	4
IGH6	Mineralogy	4
IGH7	Quaternary	39
IGH8	Lower Carboniferous	22
IGH9	Upper Carboniferous	1
IGH10	Devonian	5
IGH11	Igneous Intrusions	3
IGH12	Mesozoic/ Cenozoic	2
IGH15	Economic Geology	12
IGH16	Hydrogeology	7
Various	Various	13
N/A	Not defined	2

⁴ The geological heritage of Ireland is considered and evaluated within an overall framework of 16 themes. Each theme considers specific aspects, such as stratigraphy, sedimentology, structural geology, volcanic rocks, etc and addresses all aspects of the particular geology involved, but some sites may be considered within two or more themes.

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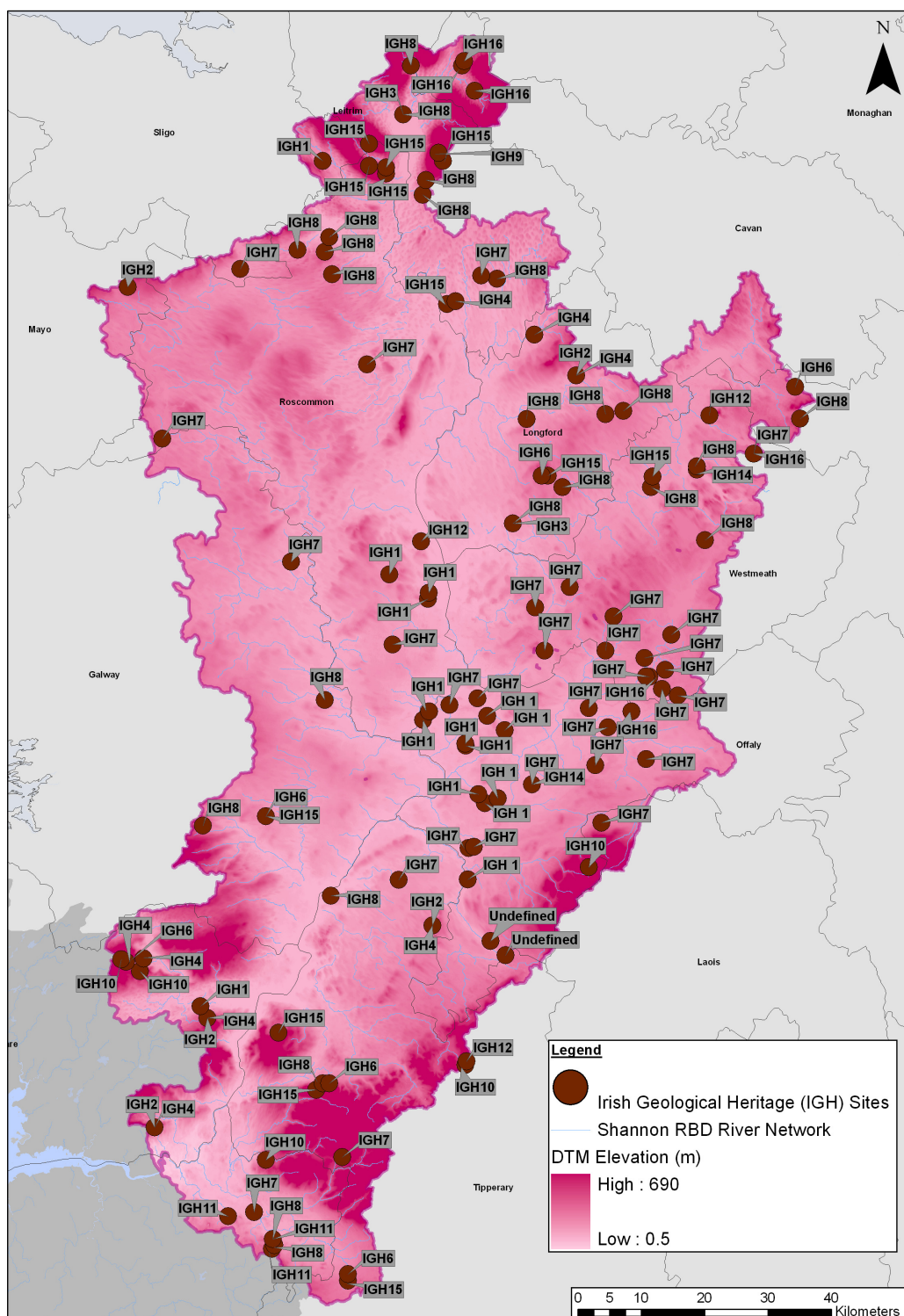


Figure 3.3.2 - Irish Geological Heritage Sites within UoM 25-26 (source: GSI)

The soils are generally a mixture of gley, grey brown podzolics, and lithosols soils to the south-west and south east, with more acid brown podzolics, cut over peat and peaty soils to the central and northern section of this Unit of Management.

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The sub-soil consists of limestone till with shale's / sandstone till, with cut-over peat to the northern and central section, with more bare limestone to the south-west and south. Figure 3.3.1 shows the type of geology within this Unit of Management and Figure 3.3.3 illustrates the sub-soils derived from the underlying geology.

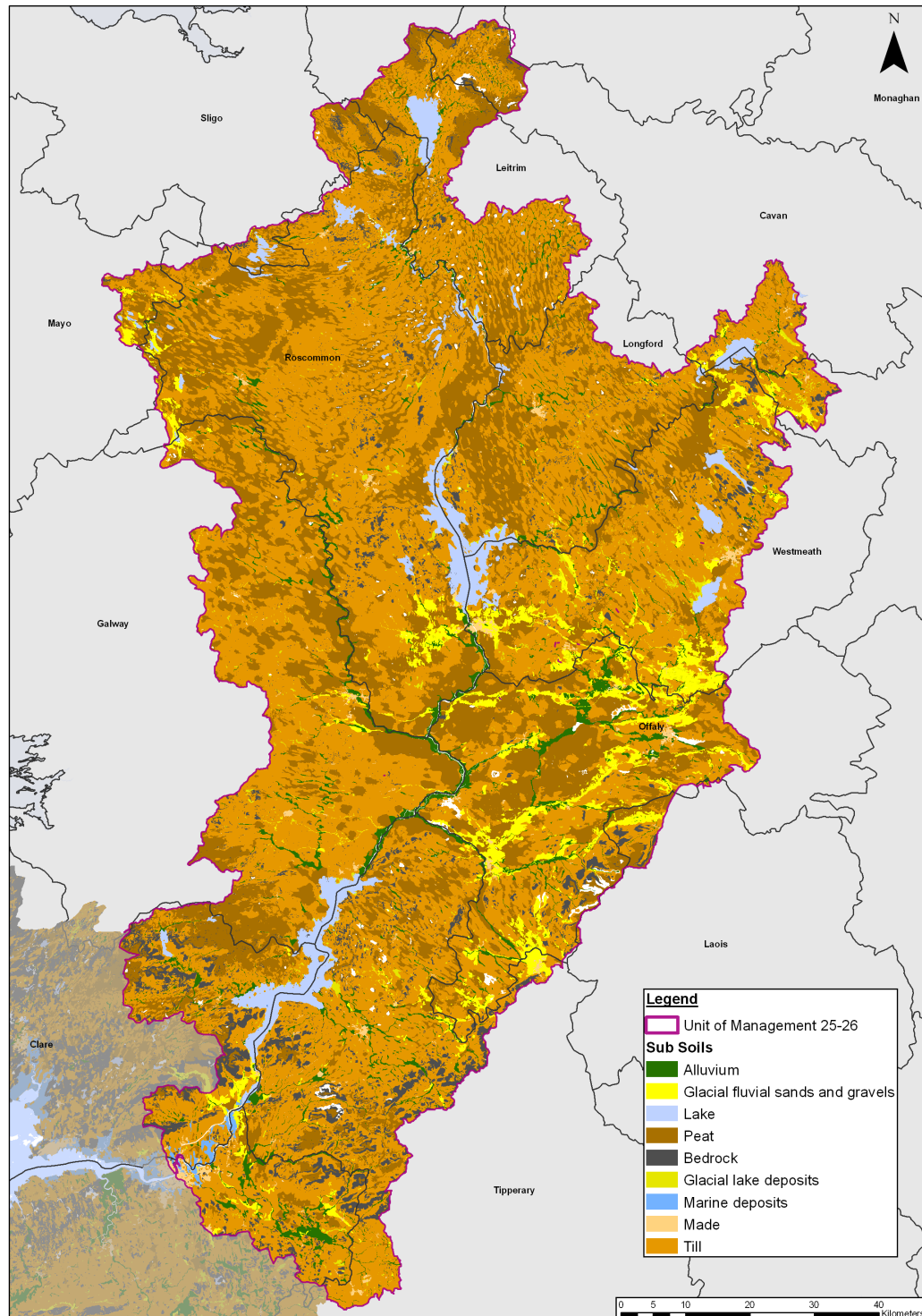


Figure 3.3.3: Sub-soils within UoM 25-26 (source: Teagasc)

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Land use recorded within this Unit of Management is shown in Figure 3.3.4. Based on data from Corine 2006, agriculture is the dominate land use type (71%) within this Unit of Management. Pasture and cattle rearing are the most prominent farming practices; however, towards the central plain of this Unit of Management, farming practices tend to be less intensive along the Shannon Callows. Large areas of peat/wetland are present (9%), with some forestry and semi-natural areas (12%), with water accounting for 2% of the land cover and built land 1%. Forestry has developed in recent years, in particular in parts of north Leitrim and Tipperary.

Large tracts of lowland raised bog are outlined as wetlands in Figure 3.3.4. Peatland has been used since the 1940's as fuel in power stations to generate electricity. Bord na Móna is the main producer of harvested peat within this Unit of Management, and is monitored under IPCC licences from the EPA. Bord Na Móna currently maintain some embankments associated with peatland along the Shannon River. Also, initial consultation has identified that conventionally, peat harvesting of areas <50 hectares were not licensed and therefore records of harvesting activities may not represent the full extent of activity at a particular bog.

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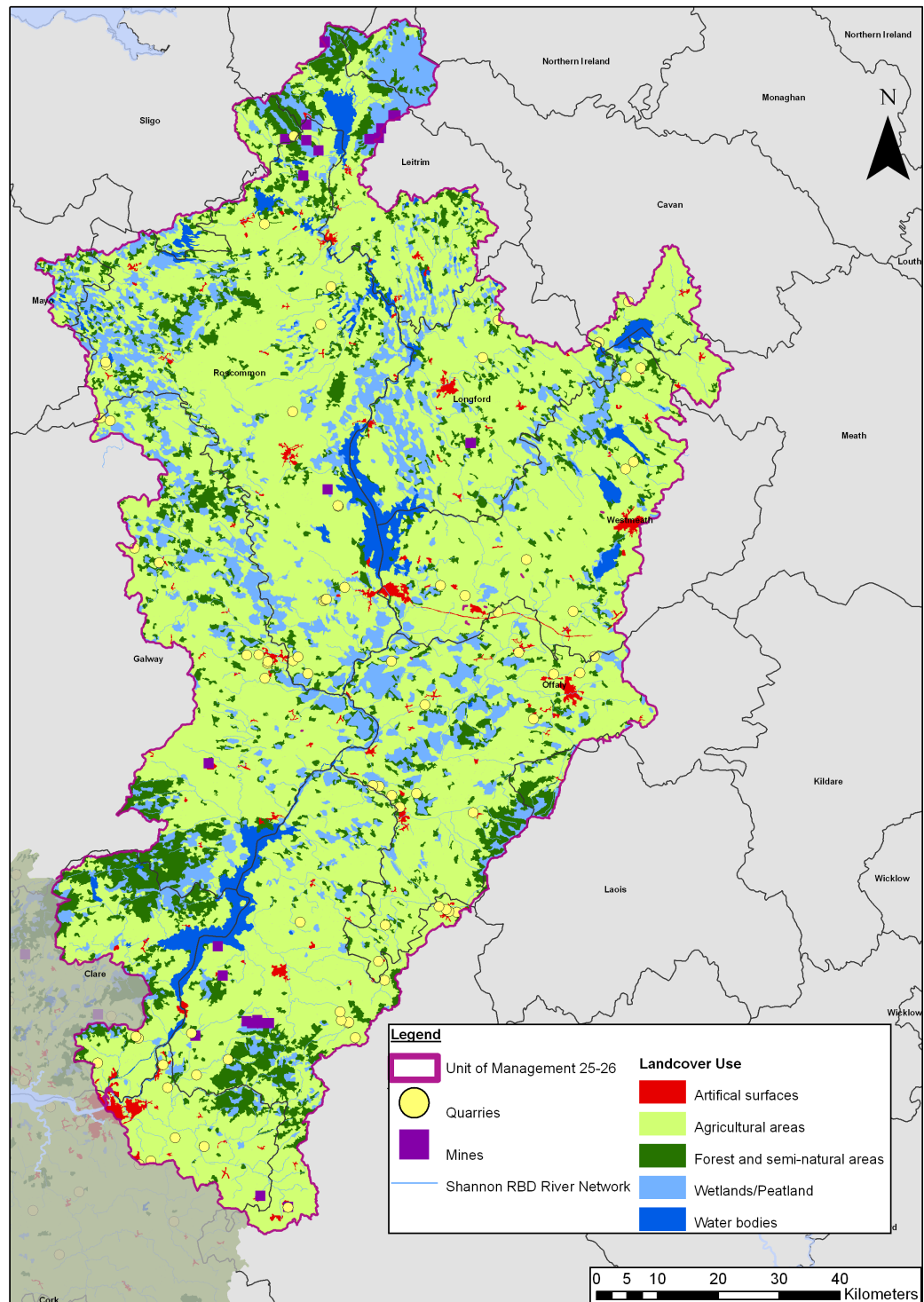


Figure 3.3.4 - Land use within UoM 25-26 (source: EPA Corine land cover database 2006)

The reform of the EU Common Agricultural Policy (CAP) provided the incentive for the formulation of the Rural Environment Protection Scheme (REPS). The overarching principle of the REPS was to reward farmers for undertaking farming practices in an environmentally friendly manner. The uptake of the REPS throughout Ireland is reported on a percentage uptake per county with the highest percentage uptake being 30-35%. The Forest Environmental Scheme (FEPS) which is an 'add on' to REPS, provided incentives to farmers within REPS to plant woodland with emphasis on environmental gain, rather than solely for economic gain. Table 3.3.2 provides the percentage uptake of REPS and FEPS for those counties with the largest land area within this Unit of Management.

Table 3.3.2: Percentage cover of REPS/FEPS per County (source: EPA)

County	REPS Cover (%)	FEPS Cover (%)
Laois	20-25	10-15
Offaly	20-25	5-10
Westmeath	20-25	5-10
Longford	20-25	5-10
Galway County	30-35	5-10
Roscommon	25-30	5-10
Leitrim	30-35	15-20
Tipperary North	20-25	10-15
Clare	25-30	15-20
Limerick County	10-15	5-10

In 2009 the REP Scheme ended, and 2014 will see the last of the REPS payments. In 2010, the Agri-Environmental Options Scheme (AEOS) was rolled out, which targets three environmental challenges; loss of biodiversity, improvement of water quality and combating climate change. This scheme also runs for 5 years, and early REPS⁵ farmers can avail of this scheme. In 2011/12 an AEOS2 is being offered for a period of 5 years, or until CAP reform in 2013. The CAP 2013 reform is still in process, but 'aims to maintain income stability for farmers, while farming with respect to environmental, food safety and animal welfare standards'.

Farms within this Unit of Management are required to comply with Ireland's (second) Nitrates Action Programme which was given effect through a series of Regulations⁶. This includes the implementation of Fertilisation Plans. These Regulations support the protection of waters against pollution from agricultural sources, e.g. by phosphorus and nitrogen.

Figure 3.3.5 overleaf illustrates the recorded forestry cover in this Unit of Management. Forestry is present in small plots throughout the Unit of Management, and consists of mainly commercial plantation of conifers, owned by Collite. These tend to be located on poor soils of the uplands, harvested on a rotational period of 40 years (WRBD, 2008⁷).

⁵ REPS1, REPS2 and REPS3

⁶ The most recent being the European Communities (Good Agricultural Practice for the Protection of Waters) (Amendment) Regulations 2011.

⁷ Western River Basin District (2008), Programme of Measures and Standards for Forest and Water

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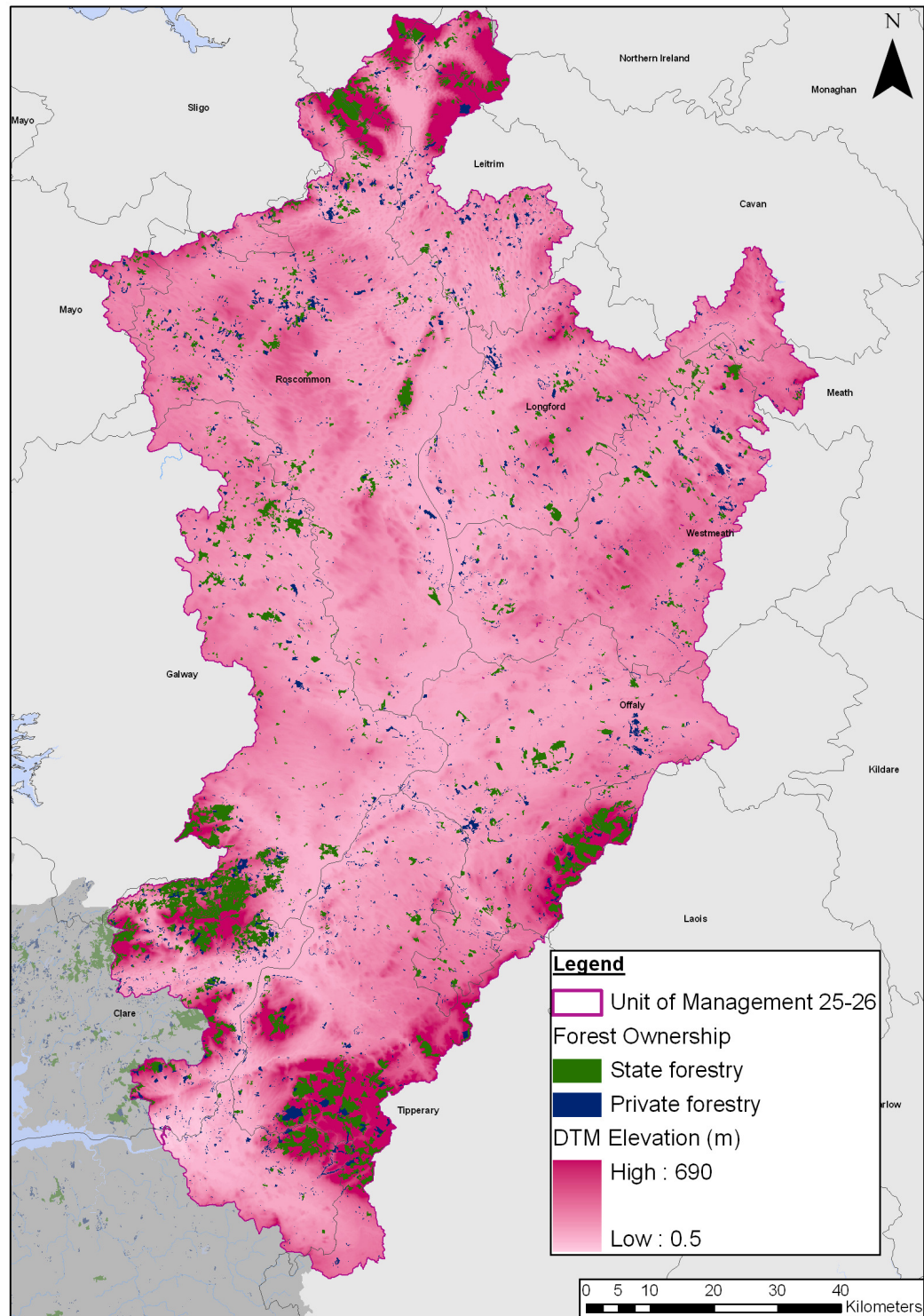


Figure 3.3.5 - Forest ownership within UoM 25-26 (source: Forestry Service)

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Forestry on the lowlands is dominated by small privately owned forest plots. All forestry operations are required to be carried out in compliance with the principles of Sustainable Forest Management (SFM), as outlined in the Code of Forest Practice⁸ to promote sustainable forestry and to meet high environmental, economic and social standard.

Previous flood relief programmes run by the OPW under the Arterial Drainage Acts 1945 and 1995, have shaped some of the landscape within this Unit of Management. Originally implemented to protect agricultural land from flooding, this programme was updated in 1995 to include urban areas. The OPW maintain all embankment, weirs and bridges that were constructed under this programme.

Landslides have the potential to result in silt deposition in watercourses, and reduced conveyance. Data obtained from the GSI records up to 35 landslides for this Unit of Management since the early 1950's. As noted in Section 2.1 of the Main Environmental Scoping Report, the CFRAM Studies will not include the assessment of areas subject to natural erosion processes unless such processes are predicted to pose significant flood risk by eroding existing flood defence structures (natural or engineered).

Historical contamination of soils resulting from past and present land use may present significant pollutions risks. Data on the location of known contaminated sites is held by Local Authorities and continued consultation with the relevant Local Authorities during the next stages of this SEA will identify those most relevant to this Unit of Management.

There are up to 74 landfills and 25 licensed waste facilities within this Unit of Management (refer to Figure 3.4.6 in Section 3.4 of this report for the location of these facilities).

Sites with concrete plants, desilting ponds, leachate lagoons, disused quarries, holding tanks under cattle houses (slurry tanks) may also be considered as potentially contaminated sites, and will be investigated further during the risk assessment of potential flood risk management options.

Onsite waste water treatment systems (OSWTS)⁹ such as septic tanks can present pollution risks between surface and groundwater both from surface runoff and pathways within the soil. OSWTS have been identified nationally as part of Ireland's Water Framework Directive Programme of Measures Unsewered Wastewater Treatment Systems National Study (Western RBD) 2008. The EPA is in the process of mapping OSWTS, and this data will be made available to this Study in the coming months.

Flooding has the potential to impact on the supply from water treatment plants (WTP). There are 27 water supply treatment plants within this Unit of Management, and these are detailed further in Section 3.4 of this report.

⁸ Forestry Service (2000) Code of Best Forest Practice – Ireland.

⁹ OSWTS are defined as areas not connected to sewerage systems and that discharge treated wastewater into the ground by percolation.

3.3.2 Future trends

The IGH sites referred to above are in the process of being reviewed by the NPWS to determine which sites shall be designated as NHAs and therefore afforded statutory protection.

In 2006, the European Commission adopted a proposal for a Soil Framework Directive, to provide soil statutory protection and to recognise soil as an invaluable natural resource. This is likely to influence land cover and land use practices. As of early 2012, this Directive is still in the decision-making process within the European Council.

Into the future, agriculture land-use within this Unit of Management is likely to remain dominant; although the pattern and trends of this use will change to reflect the reform of the CAP in 2013 ('the CAP towards 2020'), compliance with the Nitrates Regulations (Ireland's Nitrates Action Programme is due to be reviewed for a third time in 2013) and abolishment of the EU Milk Quotas¹⁰ in April 2015. One objective of this CAP 2013 reform is to make agriculture competitive on the world market; similarly the abolishment of the EU Milk Quotas is likely to make the dairy industry more competitive in Ireland. This is in line with the Food Harvest Report 2020 recommendations, which aim to increase Irish agri-food export by 2020.

Coillite forests within this Unit of Management have individual management plans that are derived from the Coillite's Forestry Services District Strategic Plan 2011-2015. This Unit of Management overlaps with the Midland (E3), Lower Shannon District (S2), Clare / south Galway (W1), east Galway / Roscommon (W2), Lakelands (N3) and Sligo / Leitrim (N2) management plan regions, for which both environmental and economic objectives are set for the management of the forests at local level for the next five years. Within the management plans, Coillite recognise forests as being an important resource in the role of moderating flooding at times of high rainfall. Water quality is also addressed as 'drainage and cultivation practices in Coillite forests are designed to minimise their impact on local water'. Water protection areas (buffer zones) are also being established in plantations at present.

The Government has made a commitment to increase the forest area to 17% of the total land area in Ireland by 2030 (CAP, RDP)¹¹ which is likely to include areas within this Unit of Management. As referred to in section 3.3.1, all new forestry is managed in line with the SFM principals, including a guideline of development of a buffer of natural riparian vegetation along rivers and streams (Forestry Service 2000).

The Forestry Service have produced a Geographical Information System (GIS) based Forest Inventory Planning System (FIPS) to act as an aid in the long term spatial planning of national forest, and to provide guidance to forestry grants. This data provides further detail to that provided by the CORINE database, such as tree species.

Bord na Móna have developed a 'Strategic Framework for the Future Use of Peatlands' to guide future decision making in relation to potential future uses and developments on their cutaway bogs. Related to this, Bord na Móna have established an in-house Land Use Review System¹² to continuously assess and evaluate the potential of the company's land bank. Some options for future land use

¹⁰ S.I. No. 94/2000 — European Communities (Milk Quota) Regulations, 2000.

¹¹ Rural Development Programme 2007-2013, CAP Rural Development Division, Dublin.

¹² Bord na Móna – Strategic Framework for the Future Landuse of Peatlands.

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include alternative energy (wind), biodiversity managed land, amenity and recreational areas, forestry and reclaimed agricultural land. It is envisioned that Bord na Móna cutaway peatlands along the Shannon will become wetlands (Bord na Móna). With regards private turf-cutting for domestic use, this is now prohibited on raised bogs designated as Special Areas of Conservation (SACs) in the absence of Ministerial consent.

The EPA has published a series of Codes of Practice and Advice Notes, the implementation of which can influence geology, soils and land use in this Unit of Management. Those of relevance in this context are:

- Code of Practice for Wastewater Treatment and Disposal Systems Serving Single Houses (population equivalent < 10);
- The EPA Code of Practice: Environmental Risk Assessment for Unregulated Waste Disposal Sites; and
- Advice Note No.6, Version 1; Restoring Public Water Supplies Affected by Flooding.

Box 3.3: Geology, Soils and Land Use – Key issues relating to flood risk management

- Flooding and flood risk management measure/options can potentially adversely affect the productivity of agricultural land, and can lead to changes/abandonment of land use;
- Agricultural practices can have both negative and positive effects on flooding and flood risk management, for example:
 - Negative: reduction in soil infiltration rates and available soil water storage capacities, and increasing rapid runoff in the form of overland flow;
 - Positive: agricultural lands may help manage runoff and provide natural storage areas whilst also providing opportunities for biodiversity and potentially supporting agri-environmental schemes;
- Forestry-related land use practices (afforestation and deforestation), and associated land drainage schemes can influence the conveyance of water within the catchment;
- Changes of land use from agriculture to urban/semi-urban behind OPW Arterial Drainage Scheme embankments (originally constructed to protect agricultural land) has increased flood risk in these areas;
- Upland forestry practices can include significant drainage systems resulting in sudden water losses for the area;
- Peat harvesting in the Shannon region, both by Bord Na Móna and private peat harvesters, is an important industry within the region;
- Land use changes of exhausted peatland, including the possibility of closure of pumping systems, altering water conveyance and storage; and
- Peat deposition can result in reduced conveyance in watercourses.

3.4 Water

3.4.1 Existing conditions

The EU Water Framework Directive (2000/60/EC) establishes a framework for the protection of both surface and ground waters. Transposing legislation outlines the water protection and water management measures required in Ireland to maintain high status of waters where it exists, prevent any deterioration in existing water status and achieve at least 'good' status for all waters by 2015. This is currently being achieved through the implementation of River Basin Management Plans (RBMPs). The Shannon RBMP 2009-2015 was adopted in June 2009 and includes Water Management Unit (WMU) Action Plans¹³ and a programme of measures required to facilitate the achievement of the WFD objectives.

Surface Water

The surface water bodies within this Unit of Management are primarily freshwater. There are no coastal water bodies, but two transitional (estuarine) water bodies lie within or in close proximity to this Unit of Management.

Rivers and Lakes

Tables 3.4.1 and 3.4.2 summarise the status of the river and lake water bodies within this Unit of Management as defined in the current WMU Action Plans. The extents of WMUs are illustrated in Figure 2.2 of Section 2.1.

Table 3.4.1: Surface water body status for rivers in UoM 25-26

WMU	No. of water bodies	River Status (% of total no. of water bodies)		
		High	Good	Less than Good ¹⁴
Upper Shannon	98	2	50	48
Brosna	58	-	22	78
Little Brosna	29	3	17	80
Camlin - Rinn	30	-	47	53
Inny	65	-	15	85
Lough Derg	79	13	42	45
Hind - Lough Ree	25	-	28	72
Mulkear	48	4	56	40
Nenagh	29	-	21	79
Suck	67	-	43	57

¹³ WFD Ireland Document Store
http://www.wfdireland.ie/docs/1_River%20Basin%20Management%20Plans%202009%20-%202015/ShIRBD%20RBMP%202010/

¹⁴ Water body status is moderate, poor or bad.

Table 3.4.2: Surface water body status for lakes in UoM 25-26

WMU	No. of water bodies	Lake Status (%of total no. of water bodies)			
		High	Good	Less than Good	Unassigned
Upper Shannon	39	5	33	59	3
Brosna	7	-	50	25	25
Little Brosna	0	-	-	-	-
Camlin - Rinn	3	-	67	33	-
Inny	6	-	33	67	-
Lough Derg	6	-	17	83	-
Hind - Lough Ree	10	10	50	40	-
Mulkear	0	-	-	-	-
Nenagh	0	-	-	-	-
Suck	2	-	-	100	-

The various WMU Action Plans associate the following anthropogenic pressures/activities with the current failure of the surface water bodies to achieve the WFD objectives (refer to Table 3.4.3 for further detail):

- Nutrient sources: Total Phosphorous predominantly from diffuse sources, agricultural discharges, unsewered properties, and waste water treatment plants (WWTPs);
- Point source pressures: such as WWTPs, IPPC discharges, Section 4 discharges (trade or sewage effluent), waste facilities and water treatment plants;
- Quarries and Landfills;
- Agriculture;
- On site waste water treatment systems;
- Physical alterations (morphological pressures); and
- Abstractions.

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Table 3.4.3: Pressures contributing to the water body failing to achieve good or higher WFD Status in UoM 25-26

WMU	WWTP	S4s ¹⁵	IPPC	CST ¹⁶	Quarry	Mines	Landfill	Agri	OSWTS	Forestry	Mor ¹⁷	Abs ¹⁸
Upper Shannon	√	√	√		√	√	√	√	√		√	√
Brosna	√	√			√		√	√	√		√	√
Little Brosna	√	√			√		√	√	√	√	√	
Camlin/Rinn	√	√					√	√	√		√	√
Inny	√	√	√		√		√	√	√		√	√
Lough Derg	√	√	√	√	√	√	√	√	√	√	√	√
Hind/Lough Ree	√		√		√		√	√	√		√	√
Mulkear	√				√	√	√	√	√		√	
Nenagh	√	√				√		√	√		√	
Suck	√	√			√		√	√	√		√	

¹⁵ S4s – Section 4 discharges

¹⁶ CST – Community Septic Tanks

¹⁷ Mor – Morphology (physical alterations)

¹⁸ Abs – Abstractions

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Each Action Plan outlines a programme of measures to be implemented in the catchment areas, and in some instances at a regional or national level. Those of relevance to flood risk assessment and management include:

- Point sources: WWTP upgrades, review of the current terms of discharge authorisations;
- Diffuse sources: inspection / enforcement of the Good Agricultural Practice Regulations and inspection programme of 'at risk' septic tanks; and
- Morphological pressures: Investigation of channelisation to establish if supplementary measures are required to address water quality issues associated with morphology. Channel enhancement measures to assist recovery from this pressure are to be considered.

Implementation of these measures is now progressing so as to achieve the WFD objectives and inform the next RBMPs (2015 – 2021).

Some measures responding to the WFD requirements were implemented prior to the completion of the RBMPs, for example, the EPA are progressing with a revised WWTP licensing regime implemented under the Waste Water Discharge (Authorisation) Regulations 2007.

Transitional (estuarine) and Coastal Waters

The Shannon RBD Transitional and Coastal Waters Action Programme, which accompanies the Shannon RBMP¹⁹, defines the status of two transitional water bodies located within or in close proximity this Unit of Management (there are no coastal water bodies within this Unit of management). Limerick Dock water body is reported as achieving moderate status (and defined as a heavily modified water body) and the Upper Shannon Estuary is achieving good status.

The Shannon RBD Transitional and Coastal Waters Action Programme associates the following anthropogenic pressures/activities with the current failure of the transitional water bodies to achieve the WFD objectives:

- Land based pressures - point source such as WWTPs, IPPC and Section 4 licensed discharges and diffuse sources such as nutrient inputs, overflow of combined sewer and the treatment plant (specific to Limerick Dock); and
- Marine Pressures – Morphology (Limerick Dock only - significant stretches of embankment).

The Shannon RBD Transitional and Coastal Waters Action Programme outlined a programme of measures to be implemented in the catchment areas, and in some instances at a regional or national level. Those of relevance to flood risk assessment and management in this Unit of Management include:

- Morphology (Controls on Physical Modifications): The Action Programme notes that the DECLG are considering the introduction of new regulations to control physical modifications in surface waters. Consultation with the DECLG has confirmed that they are currently in the process of reviewing

¹⁹ WFD Ireland Document Store

http://www.wfdireland.ie/docs/1_River%20Basin%20Management%20Plans%202009%20-%202015/ShIRBD%20RBMP%202010/

water legislation on a number of fronts, including controls on physical modifications however it may be some time before the regulation concerning controls on physical modifications are implemented; and

- Full implementation of existing legislation including the Bathing Water Quality Regulations (including the development of Bathing Water Management Plans), Water Pollution Acts, Water Services Act, IPPC regulations, Urban Wastewater Treatment regulations, the Foreshore Acts and the Birds and Habitats Directives (particularly the Appropriate Assessment process).

The pressures/activities and measures outlined in the Mulkear and Lough Derg WMU Action Plans referred to under the 'River and Lake' section above are also relevant to the transitional and coastal water bodies within this Unit of Management.

Overall Status

Figure 3.4.1 presents the current reported status of all surface water bodies as provided by the EPA in November 2011. Water body classification results are currently being reviewed and updated with more recent monitoring data, and these will be reviewed in consultation with the EPA as the SEA process develops.

Approximately 38% of the river stretches are classified as achieving good status, with just 1% achieving high status, the majority of which are located on higher ground in the south east of the Unit of Management. There are some stretches of river classified as bad status (3%); primarily between Lough Ree and Lough Derg, and a significant stretch of the Arigna River entering Lough Allen is also classed as bad status.

The three large lake systems within this Unit of Management are currently failing to achieve good status: Lough Allen (moderate status), Lough Ree (moderate status) and Lough Derg (moderate status).

The largest transitional water body of relevance to Unit of Management 25-26 the Upper Shannon Estuary is classified at achieving good status.

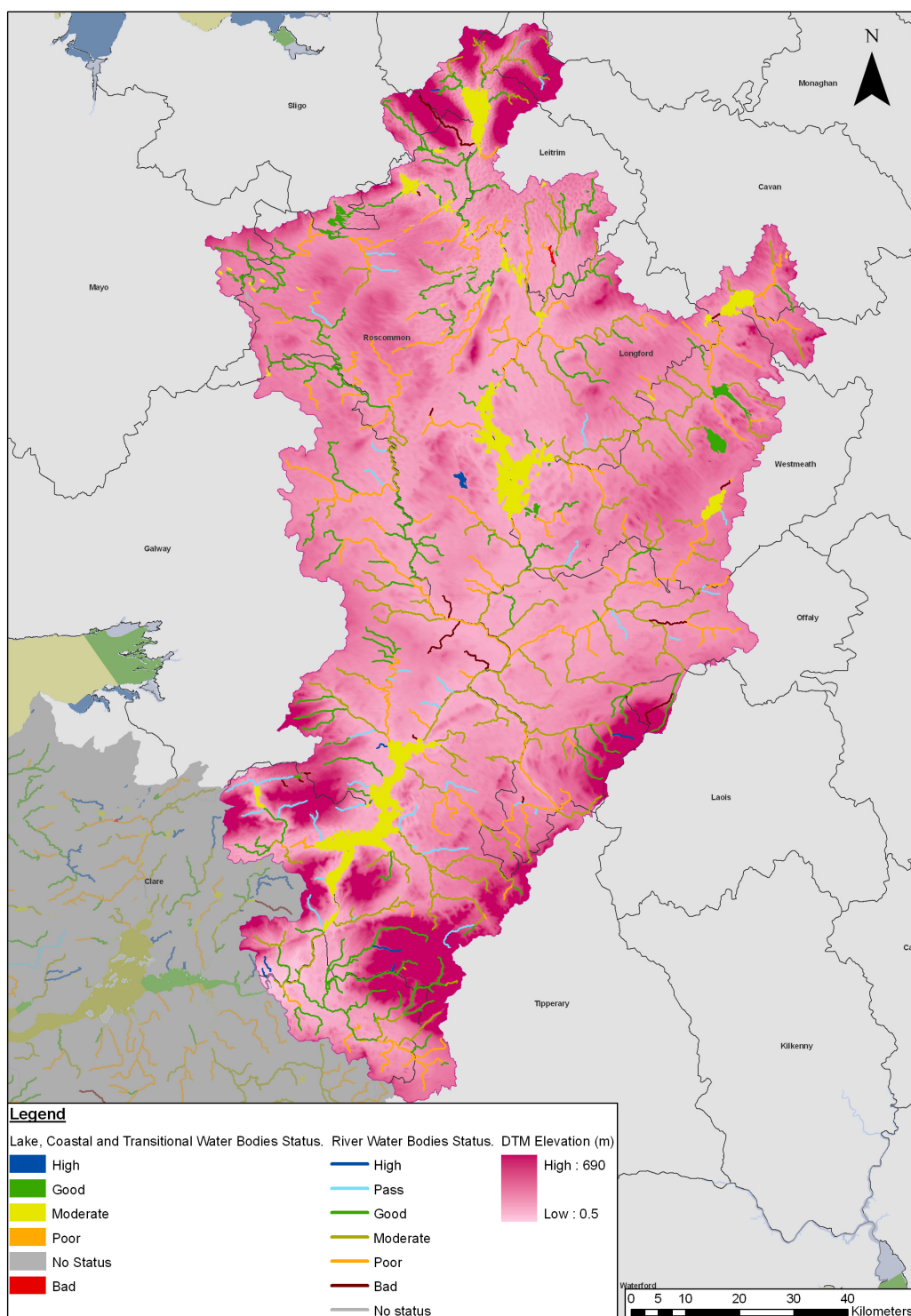


Figure 3.4.1 - Classification of surface water bodies under the WFD within UoM 25-26 (source: EPA)²⁰

²⁰ Water bodies classified as 'pass' are recorded as achieving good status, however prior to further monitoring, the confidence in the data is not at the adequate level to classify these as 'good' status.

As defined by the EPA, the Biotic Indices or Quality (Q) Values is 'a biological water quality index based on the composition and abundance of macroinvertebrate communities e.g. mayflies, stone flies, shrimps, snails, bivalves etc. present in rivers, and their varying sensitivities to increasing levels of pollution'. There are 686 Q Value monitoring stations within this Unit of Management. The Q Values recorded at these stations are summarised in Table 3.4.4 below:

Table 3.4.4: Q Value and equivalent WFD Status recorded at the EPA monitoring stations within UoM 25-26

Q Value*	WFD Status	Pollution Status	Condition**	No. of Stations
Q5, Q4-5	High	Unpolluted	Satisfactory	98
Q4	Good	Unpolluted	Satisfactory	229
Q3-4	Moderate	Slightly polluted	Unsatisfactory	203
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory	115
Q2, Q1-2, Q1	Bad	Seriously polluted	Unsatisfactory	15
Unclassified	-	-	-	26

* These values are based primarily on the relative proportions of pollution sensitive to tolerant macroinvertebrates (the young stages of insects primarily but also snails, worms, shrimps etc.) resident at a river site (EPA²¹).

** 'Condition' refers to the likelihood of interference with beneficial or potential beneficial uses (EPA).

Figure 3.4.2 presents the location of the EPA Q Values monitoring stations and the pollution status recorded at each station.

²¹ EPA River Quality Surveys: Biological (<http://www.epa.ie/qvalue/webusers/>)

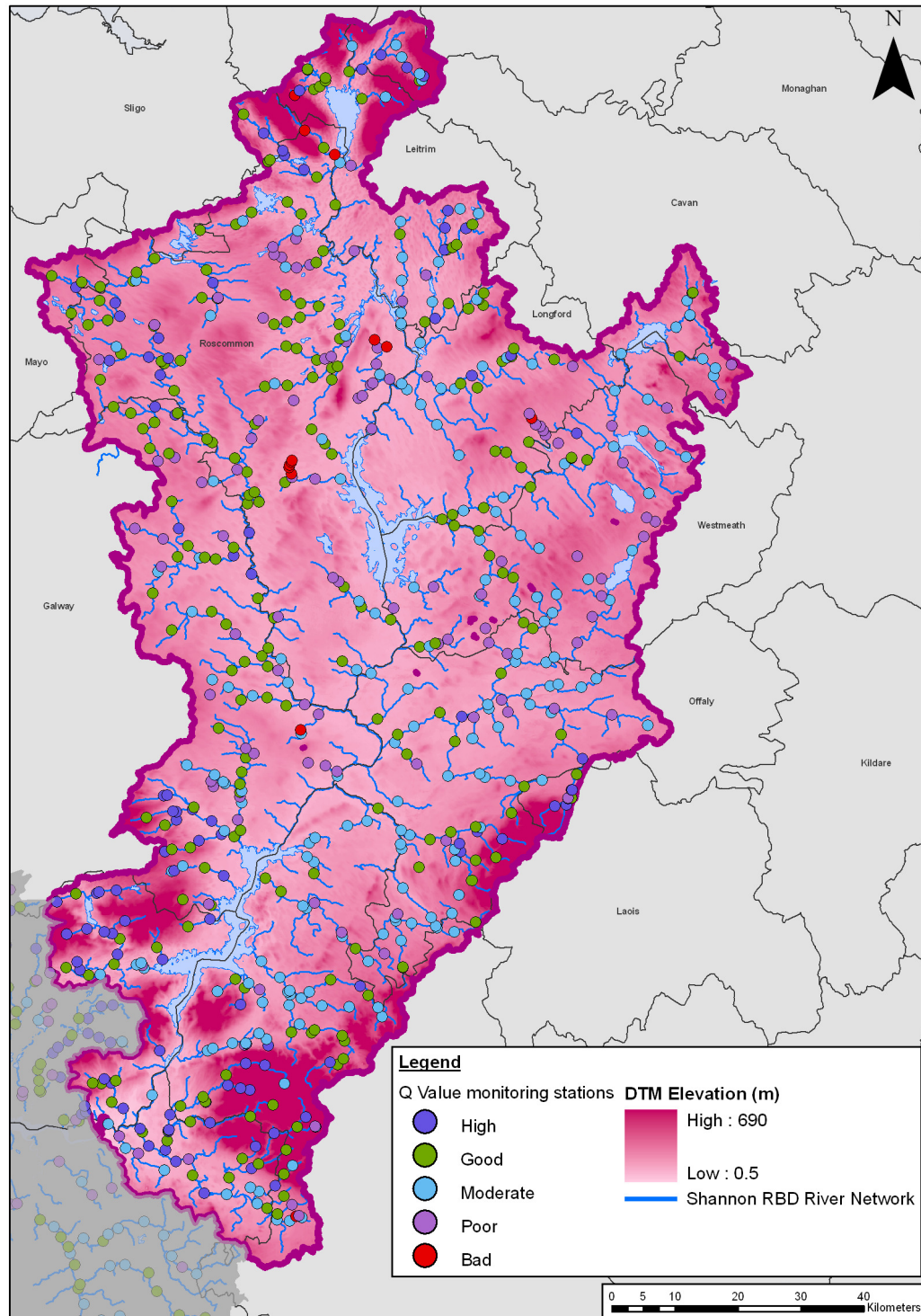


Figure 3.4.2 - EPA Q Value Monitoring Stations within UoM 25-26 (source: EPA)

Groundwater

The Shannon CFRAM Study is not assessing groundwater flood risk; however, the potential for groundwater flood risk to contribute to flood flows is recognised.

Groundwater status within this Unit of Management is classified predominately as good, however there are large areas particularly in the north west and in Limerick City achieving poor status. Figure 3.4.3 presents the current status of groundwater bodies under the WFD and also areas of source protection for drinking water. Groundwater Protection Schemes are county-based projects that are undertaken jointly between the GSI and the respective Local Authorities. The aim of these schemes is to preserve the quality of groundwater, particularly for drinking water abstraction purposes. The Groundwater Protection Schemes within this Unit of Management highlight approximately 59 source protection areas.

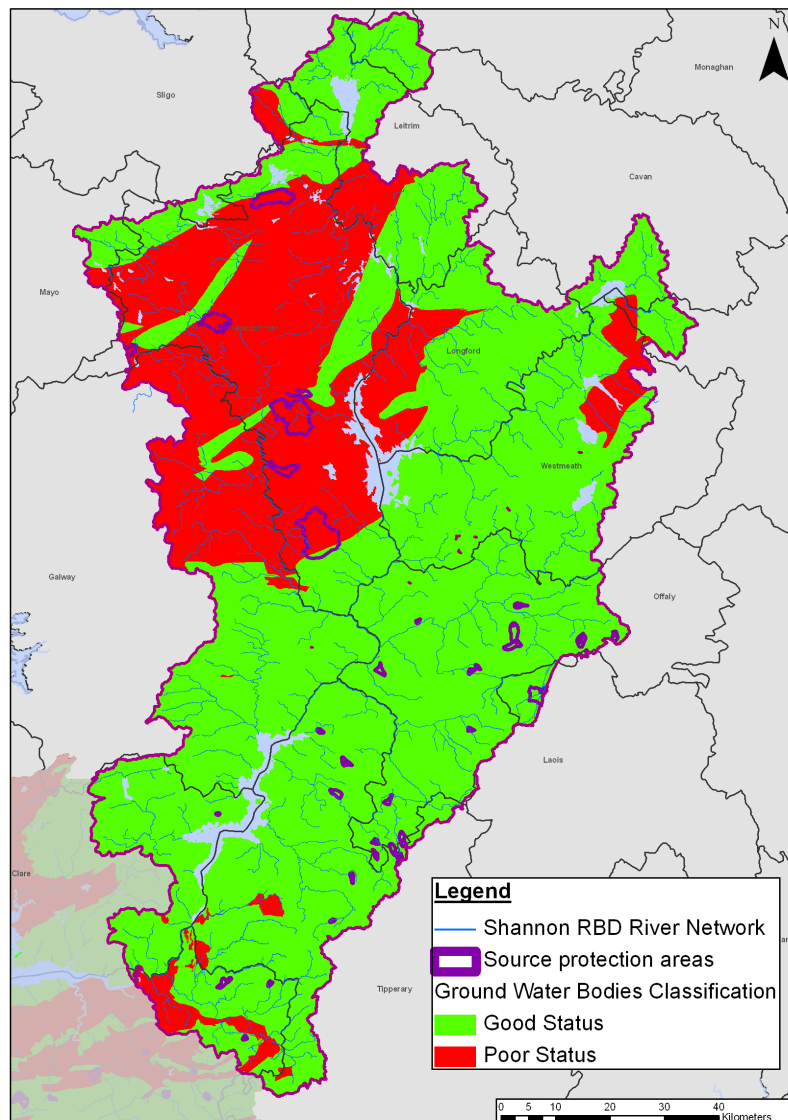


Figure 3.4.3 - Classification of groundwater bodies under the WFD and Source Protection Zones within UoM 25-26 (source: EPA)

The Shannon RBD Groundwater Action Plan associates the following anthropogenic pressures/activities with the current failure of groundwater bodies to achieve the WFD objectives:

- Point source pressures: Existing landfills and old dump sites (illegal landfill sites), mines, contaminated land, and abstractions; and
- Diffuse source pressures: agriculture (nutrient loading), and OSWTS (septic tanks in areas of high or extreme vulnerability or systems located at unsuitable sites).

The Shannon RBD Groundwater Action Plan outlines a programme of measures to be implemented in the catchment areas as follows:

- Nitrate Action Plan – Implementation of the Nitrates Action Plan and Code of Good Agricultural Practices to reduce the level of pressure from diffuse nutrient sources;
- IPPC Licensing – Remediation of contaminated land at IPPC licensed sites; and
- OSWTS – Implement the EPA Code of Practice for Wastewater Treatment and Disposal Systems Serving Single Houses (population equivalent ≤ 10)²².

Though not highlighted within the Shannon RBD Groundwater Action Plan, it is also recognised that the EPA licensing of WWTPs could aid in the achievement of the WFD objectives for groundwater bodies.

The Shannon RBD Groundwater Action Plan also identifies groundwater dependant terrestrial ecosystems located within this Unit of Management for example Lough Ree (SAC 000440).

All the groundwater bodies in this Unit of Management and within the Shannon RBD are classed as drinking water protected areas.

In terms of vulnerability (the likelihood of contamination if a contamination event occurs), there are also areas of extreme vulnerability within this Unit of Management, amounting to approximately 15% of the land area. In addition approximately 4% of the land area is identified as rock near surface or karst. These areas can be very vulnerable to infiltration and transportation of pollutants. Figure 3.4.4 illustrates the groundwater vulnerability within this Unit of Management.

²² EPA 2000 Guidance is now replaced by EPA (2010) Code of Practice for Wastewater Treatment and Disposal Systems Serving Single Houses.

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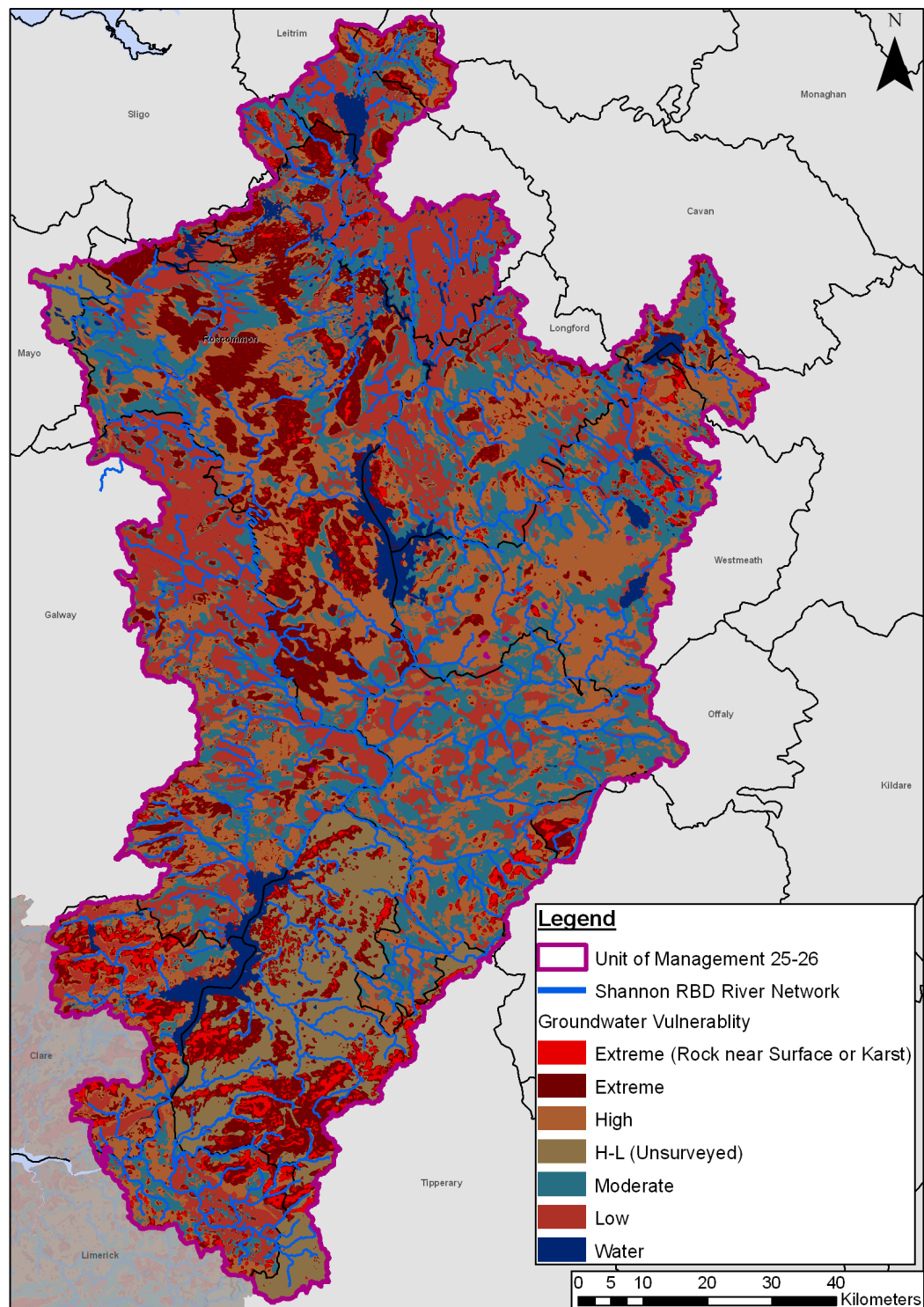


Figure 3.4.4 - Groundwater Vulnerability within UoM 25-26 (source: GSI)

Registered Protected Areas

In accordance with the WFD, a Register of Protected Areas has been compiled for the Shannon RBD. These areas are identified as those requiring special protection under existing national or European legislation:

- Waters used for the abstraction of drinking water (there is a significant number of rivers and lakes used for this purpose in Unit of Management 25-26);
- Areas designated to protect economically significant aquatic species - These are protected areas established under earlier EC directives aimed at protecting shellfish (79/923/EEC) and freshwater fish (78/659/EEC) (there are no such areas designated within this Unit of Management);
- Recreational waters (there is one recreational beach (Lilliput Beach on Lough Ennell) and three recreational lakes (Lough Derg, Lough Ennell and Lough Owel) within this Unit of Management);
- Nutrient Sensitive Areas (some stretches designated as nutrient sensitive rivers within Unit of Management 25-26 including the River Brosna, Camlin and part of the River Shannon. There are also three nutrient sensitive lakes Lough Ree and Lough Derg on the River Shannon and Lough Ennell in County Westmeath); and
- Areas designated for the protection of habitats or species (refer to Section 3.6 for details).

The locations of the Registered Protected Sites currently recorded for this Unit of Management are illustrated in Figure 3.4.5.

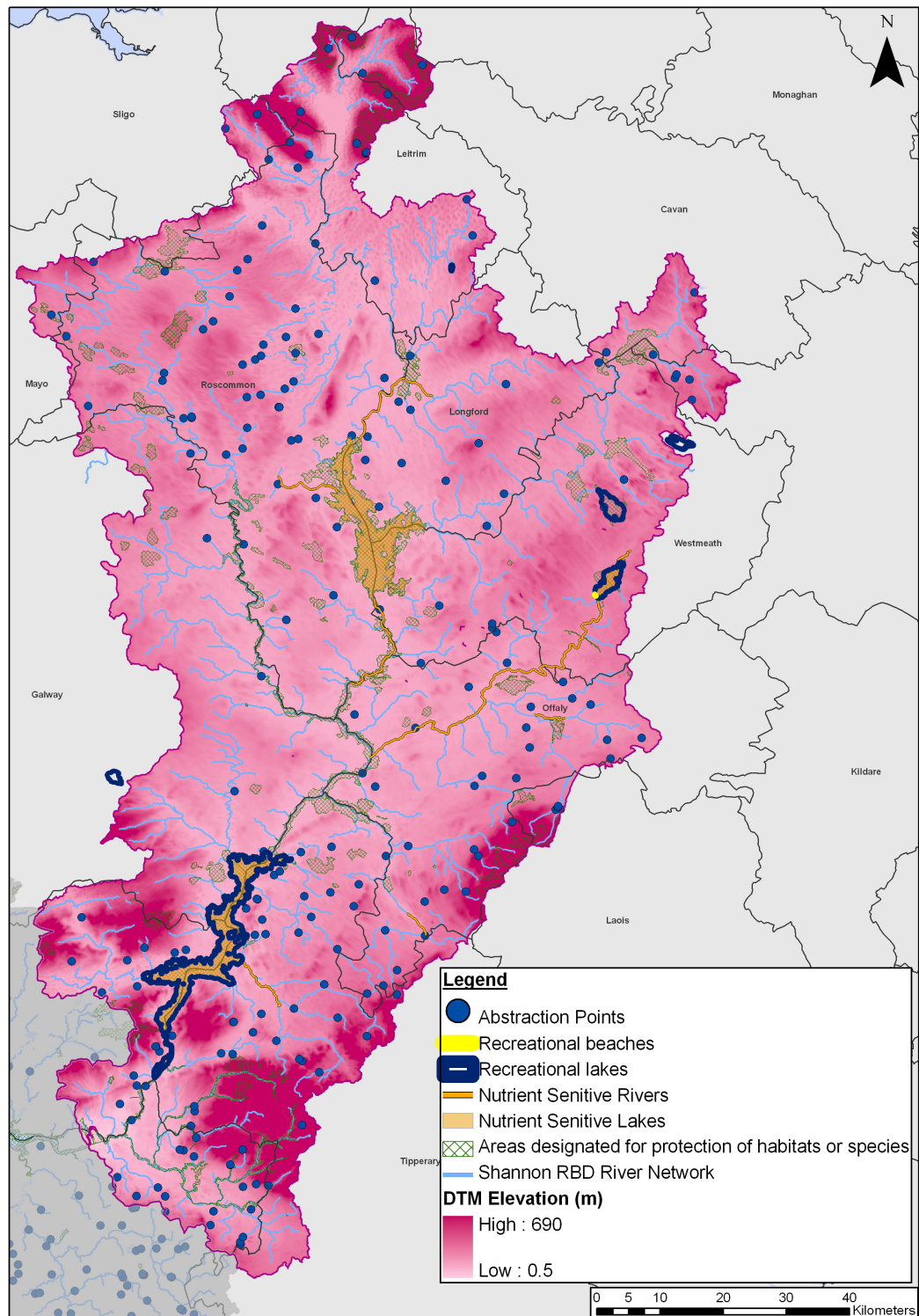


Figure 3.4.5 - Registered Protection Areas within UoM 25-26 (source: EPA)

Activities / Pressures

Figure 3.4.6 illustrates the distribution of various activities within this Unit of Management which can both influence and be influenced by the quality of water. The majority of this data was collated for the purpose of the WFD (and reported within the RBMP 2009-2015) and is currently being updated by the EPA and Local Authorities. Further information relating to these activities will be considered where relevant in the next stages of the SEA.

A total of 100 facilities within this Unit of Management currently hold IPPC licences. IPPC licences aim to prevent or reduce emissions to air, water and land, reduce waste and use energy/resources efficiently.

There are seven waste transfer stations and two hazardous waste facilities within this Unit of Management, which are licensed by the EPA. A total of 74 landfills are located within this Unit of Management.

Data supplied by the EPA indicated that there are 104 WWTP within this Unit of Management.

The EPA report 'Focus on Urban Waste Water Discharges in Ireland (February 2012)', includes a review of the operation of urban waste water treatment plants (UWWTPs) that are the subject of an EPA waste water discharge licence application. Within this Unit of Management, the status of these UWWTPs varies from pass, fail and undetermined.

The majority of this Unit of Management is unsewered, with private sewerage systems/septic tanks installed. However, there are a number of sewerage areas within this Unit of Management as indicated in Figure 3.4.6, including the following areas²³:

- | | |
|-----------------------|---------------------|
| • Ballinasloe; | • Castlereagh; |
| • Portumna; | • Monksland; |
| • Carrick on Shannon; | • Roscommon Town; |
| • Castletroy; | • Ballina/Killaloe; |
| • Edgeworthstown; | • Nenagh; |
| • Longford Town; | • Roscrea; |
| • Birr; | • Athlone; |
| • Clara; | • Kilbeggan; |
| • Tullamore; | • Moate; and |
| • Ballaghaderreen; | • Mullingar. |
| • Boyle; | |

Water Pollution Discharge Licences issued under Section 4 of the Local Government (Water Pollution) Act 1977, as amended in 1990, refer to the discharge of trade or sewage effluent to waters. There are 69 such discharges within these Units of Management.

²³ This does not include any sewerage network connected to a sewage treatment plant with less than 500 p.e. as this was the threshold for inclusion in WFD risk assessments.

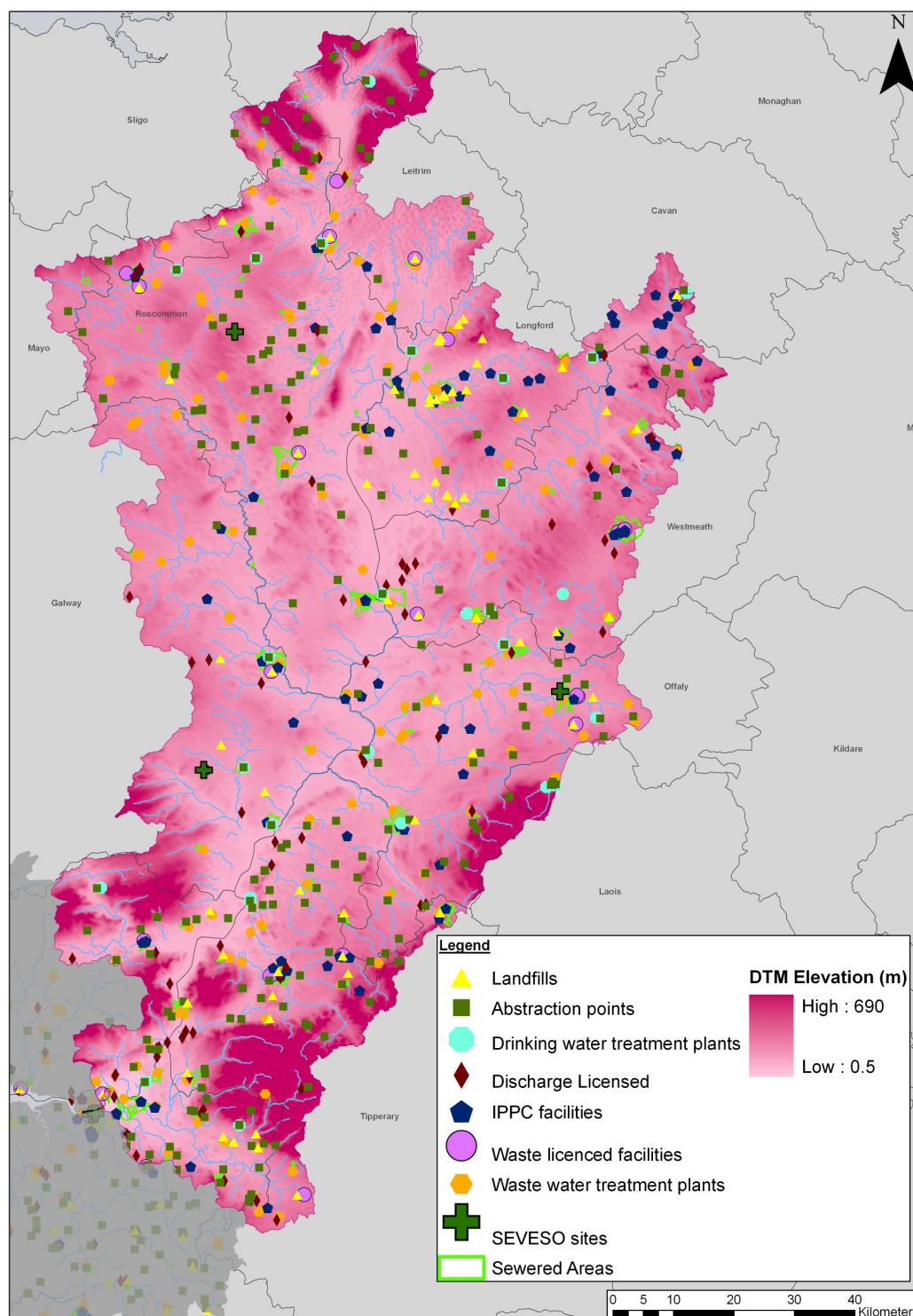


Figure 3.4.6 - Estimated locations of licensed abstractions (as of 2008), IPPC, waste licenced facilities, landfills, licensed discharges, wastewater and water treatment plants, SEVESO sites and sewered areas (source: EPA, GSI, HSE and various County Councils)

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There are 27 water supply treatment plants within this Unit of Management. Water supply treatment plants are most likely to be located on the banks of rivers, and the EPA has published guidance²⁴ on post-flooding checks for Local Authorities to implement at such plants.

The Control of Major Accident Hazards Involving Dangerous Substances Regulations, 2006 (SEVESO Regulations) deal with dangerous substances in industry, covering both industrial activities as well as the storage of dangerous chemicals. There are two tiers to the legislation; Lower Tier for smaller facilities using or storing hazard material (which require a Major Accident Prevention Policy, general duties and notification to relevant authorities), and an Upper Tier for large facilities (requiring additional plans such as internal emergency plans and notifications to the public). Within this Unit of Management there are three facilities listed as SEVESO sites.

Hydromorphology

The WFD requires that hydromorphological elements are considered when defining, maintaining and improving water status. There have been some physical (morphological) alterations to various water bodies within this Unit of Management to facilitate certain uses such as navigation, flood defence/protection schemes, agricultural drainage schemes, etc. In accordance with the WFD, some of these water bodies have been designated as Heavily Modified Water Bodies (HMWBs) or Artificial Water Bodies (AWBs) due to the presence/operation of such alterations.

- A HMWB is defined as 'a body of surface water which as a result of physical alterations by human activity is substantially changed in character'.
- An AWB is defined as 'a body of surface water created by human activity'

There are 15 AWBs located within this Unit of Management:

- Allen Canal;
- Shannon Erne Waterway;
- Boyle Canal;
- Royal Canal Main Line East of Lough Owel;
- Royal Canal Lough Owel Feeder;
- Royal Canal Longford Branch;
- Royal Canal Main Line west of Lough Owel;
- Shannon Navigation:
 - Part of Canal East of Meelick;
 - Clonahenogue Canal;
 - Part of Limerick Park Canal;
 - Jamestown Canal; and
- Grand Canal Main Line;
- Errina Plassey Canal;
- Tailrace and headrace of Ardnacrusa hydroelectric power generation station;
- Athlone Canal;
- Cloondara Canal;
- Ballinasloe Canal.

There are four HMWBs located within this Units of Management:

²⁴ Advice Note No.6, Version 1; Restoring Public Water Supplies Affected by Flooding, EPA (2009).

- Brosna WMU - Tullamore flood alleviation;
- Brosna WMU - Mullingar flood alleviation works;
- Brosna WMU - Lough Borra Parklands (Eco Tourism); and
- Inny - Flood alleviation works completed at Abbeylara.

Water bodies designated as HMWBs or AWBs must meet the objectives of maximum or good ecological *potential*.

It is important to note that although all stretches of the Shannon River are not designated as HMWB or AWBs, this is essentially a *managed* system with water level controls managed by both the ESB and Waterways Ireland for the purpose of electricity generation and navigation respectively.

There are no significant dredging operations within this Unit of Management, however, initial stakeholder consultation indicates an interest in increasing the extent of dredging to alleviate peat accumulation and siltation in the river channels. It was acknowledged that dredging can have both positive and negative impacts, and if it is undertaken it must be environmentally sensitive and sustainable, considerate of downstream impacts and requires a clear maintenance plan.

3.4.2 Future trends

The implementation of the programme of measures identified to meet the requirements of the WFD for this Unit of Management and the wider Shannon RBD aim to drive improvements and maintenance of the water quality in the short term and provide a basis for the continued maintenance of good status in the future. The EPA are continuing to monitor the status of surface and ground water bodies, and work will soon commence on the Shannon RBMP for the 2015 – 2021 cycle.

Water levels in Shannon catchment will continue to be controlled for both electricity generation and navigation. Stakeholder consultation undertaken to date confirms that there are a number of conflicting legislative requirements for water resources in the Shannon catchment, and that RBD/catchment-level integrated management plans for all water-related issues (abstractions, proposed developments, wildlife protection etc) would be of national interest and benefit if scoped and resourced appropriately. Strategies do not currently exist for such integrated plans, but the increased need for sustainable water management may soon identify the need for such plans.

Proposed future development must meet the requirements of the WFD and transposing regulations. Derogations relating to new physical modifications and new sustainable developments are provided for in this legislation²⁵; however, strict conditions for the application of such exemption provisions apply and must be demonstrated if these are to be considered for future development.

Future physical alterations to water bodies within this Unit of Management are likely to include flood relief measures (modifications).

²⁵ Articles 32 – 34 of S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009

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The Water Supply Project (Dublin City Council) proposes to abstract water from Lough Derg, pumping this to Garryhinch cut-away bog for storage and treatment, before piping to the Dublin region.

Box 3.4: Water – Key strategic issues relating to flood risk management

- Proposed future development must meet the requirements of the WFD and transposing regulations;
- There may be opportunities for flood risk management measures/options which can present both flood risk benefits and ensure the environmental objectives of the WFD are met;
- The WFD programmes of measures include the modification or maintenance / removal of obsolete structures, including flood defence structures and also requirements for enhancing river morphological development and flood storage. This can offer opportunities and constraints for flood risk management;
- Physical modifications of water bodies can affect natural sediment processes and biodiversity;
- Flooding can pose a significant risk to water supply infrastructure and processes as well as influencing diffuse pollution of water bodies;
- There may be opportunities for acceptable improvements to the operation of the control structures and dams on the main body of the river Shannon (as operated by ESB and Waterways Ireland) with respect to flood risk management; and
- FRMPs have the potential to help inform appropriate and sustainable planning / operation of water services, e.g. Water Safety Plans in accordance with EPA Guidance (Advice Note No. 8 Developing Drinking Water Safety Plans; EPA, 2011).

3.5 Air and Climate

Air quality in Ireland is of good quality, and remains among the best in Europe²⁶. The EPA have established an air quality monitoring network throughout the country with one active station located within this Unit of Management, in Longford. The current air quality is described as 'good' at this monitoring location. This ongoing monitoring programme is a prerequisite of the transposed CAFE Directive²⁷.

Air quality will not be influenced or affected by the recommendations of the strategic flood risk assessment and management study for this Unit of Management or by the wider Shannon CFRAM Study. Any specific issues relating to air quality will be considered as part of the environmental impact assessment of any detailed projects arising from the Shannon Estuary Upper and Lower Unit of Management 25-26 FRMP. Therefore, air quality will not be considered further in the SEA process as air quality will not be affected by CFRAM process.

Future changes in **climate** and associated impacts on sea level, rainfall patterns/intensity and river flow will influence flooding frequency and extent in the future. The FRMPs will help Ireland adapt to some impacts of climate change. In addition to using best available data, policy and research documents will be referred to on considering these changes and determining the likely future influence of climate change on flood risk in this Unit of Management. The consideration of climatic factors in the development of the FRMPs will assist the Local Authorities in compliance with the Regional Planning Guidelines requirements to adopt sustainable flood risk strategies in areas likely to be at risk of flooding in the future in the context of climate change and changing weather patterns.

Stakeholder consultation undertaken to date has identified flood forecasting as a key aspect of flood risk assessment and management in Ireland. Rainfall prediction is a difficult factor to quantify (and is outside the scope of this Study); however, further development of elements of the OPW's national pluvial flood risk screening study²⁸ is considered essential to develop the quality of flood warnings.

²⁶ Environmental Protection Agency (2010) - Air Quality in Ireland Report.

²⁷ Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive, transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011).

²⁸ Office of Public Works (2010) Flood Risk Assessment and Management Programme National Pluvial Screening Project for Ireland. HR Wallingford Ltd.

Box 3.5: Climate – Key strategic issues relating to flood risk management

- Some flexibility and adaptability within the FRMPs is likely to be required to allow the FRMPs to adapt to unforeseen climate change and associated impacts;
- Flood risk management measures may provide opportunities of renewable energy through small-scale (or micro) hydropower, e.g. on tidal barrages or locks. However, these are considered as 'bolt-on' measures to be assessed/progressed at detailed project level; and
- Green infrastructure (such as networks of peatland, parks or drainage ditches) in the context of flood risk management can reduce, if not avoid, emissions from more engineering-based solutions.

3.6 Biodiversity, Flora and Fauna

3.6.1 Existing conditions

This Unit of Management contains a variety of terrestrial, wetland and freshwater habitats which support a range of habitats and species, many of which are of particular conservation concern. Associated with these habitats and species are a number of European designated nature conservation sites (Natura 2000 sites). Consideration of potential impacts on these sites needs to meet the requirements of the European Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC). Specific assessment of the potential impacts of the FRMPs on these sites will be documented separately as part of the Appropriate Assessment (AA) process (required by Article 6 of the Habitats Directive).

The designated European, National and other nature conservation sites present within this Unit of Management are illustrated in Figures 3.6.1 - 3.6.3 and listed in Tables 3.6.1 and 3.6.2.

This Unit of Management is the largest of the four and the number of designated sites reflects this size. This Unit of Management contains 120 sites designated under the EU Habitats and Birds Directives, 99 of which are candidate Special Areas of Conservation (cSACs) and 21 are designated as Special Protection Areas (SPAs).

There are 64 nationally designated National Heritage Areas (NHAs) which are protected under the Wildlife Act 1976 (as amended 2000), as well as 109 proposed Natural Heritage Sites (pNHAs) which were published on a non-statutory basis in 1995, but have yet to be statutorily proposed or designated. To date, the only sites to have received full NHA status are water dependant bog habitats, as reflected with the 64 designated NHA within this Unit of Management. Some pNHAs have been designated within Natura 2000 sites, and this affords them some statutory protection under the EU Habitat and Birds Directive. However, it is acknowledged that this may not be specific to the listed pNHA interests.

The special features for each Natura 2000 site have been compiled from NPWS records for use in the Appropriate Assessment Screening process, however, due to the extensive number of designated sites, these details are not provided within this report. This and other information, such as conservation objectives, on the designated sites will be detailed for the AA Screening and next stage of the SEA as required. Some of the key habitats and species associated with the sites relevant to this Unit of Management are:

- Active raised bog and turloughs, both priority habitats in Annex I of the E.U. Habitats Directive;
- Orchid-rich grassland such as that in the Pilgrim's Road Eskera SAC. This is rare habitat in Ireland which is also listed as a priority habitat under Annex I of the EU Habitats Directive;
- Numerous bird species listed on Annex I of the E.U. Birds Directive e.g. Greenland White-fronted Goose, Whooper Swan and Golden Plover;
- Rare snail species (*Vertigo sp.*). Including the *Vertigo geryeris* in Annaghmore Lough (Roscommon) which is listed on Annex II of the E.U. Habitats Directive;

Annex III - Shannon Estuary Upper & Lower Unit of Management (UoM 25-26)

- Otter listed on Annex II of the E.U. Habitats Directive; and
- Numerous Red Data Book species such as Alder Buckthorn, Pine Marten and Badger.

Many of the designated sites within this Unit of Management have water dependant and wetland habitats associated with them. The DECLG have published draft Guidance for Planning Authorities on Drainage and Reclamation of Wetlands for consultation which contains a listing of habitat types associated with wetlands. This Guidance will be consulted and specific habitat types associated with water dependant and wetland habitat will be detailed where relevant during the AA process.

There are a number of other international and national designations within this Unit of Management such as RAMSAR²⁹, Wildfowl Sanctuaries³⁰ and Statutory Nature Reserves³¹ which will be detailed as required in the next stage of the AA and SEA.

²⁹ RAMSAR is the Convention on Wetlands, which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

³⁰ Wildfowl Sanctuaries are areas that have been excluded from the 'Open Season Order' so that games birds can rest and feed.

³¹ Statutory Nature Reserve is an area of importance to wildlife, which is protected under Ministerial order.

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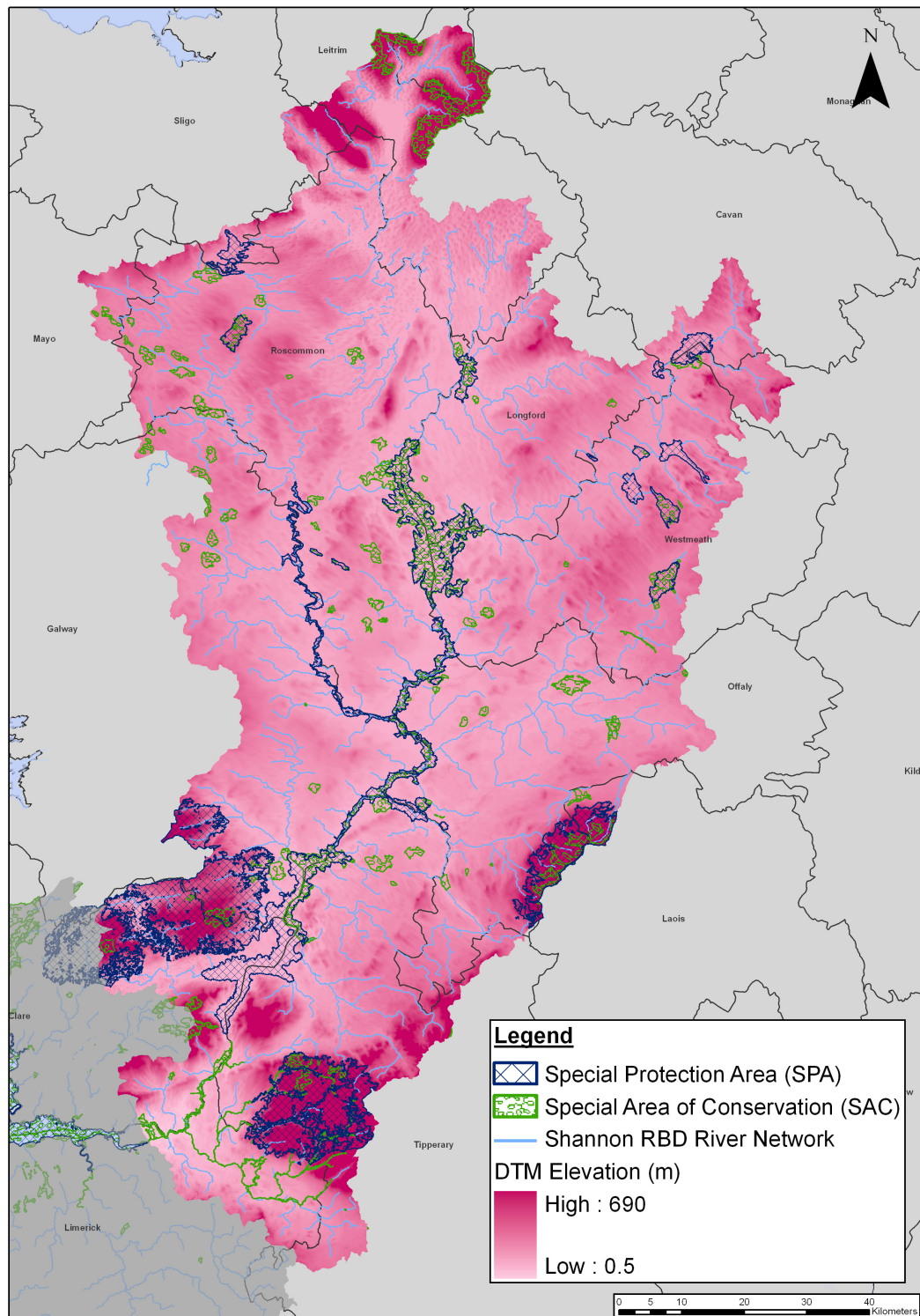


Figure 3.6.1 – European designated nature conservation sites within UoM 25-26 (source: NPWS)

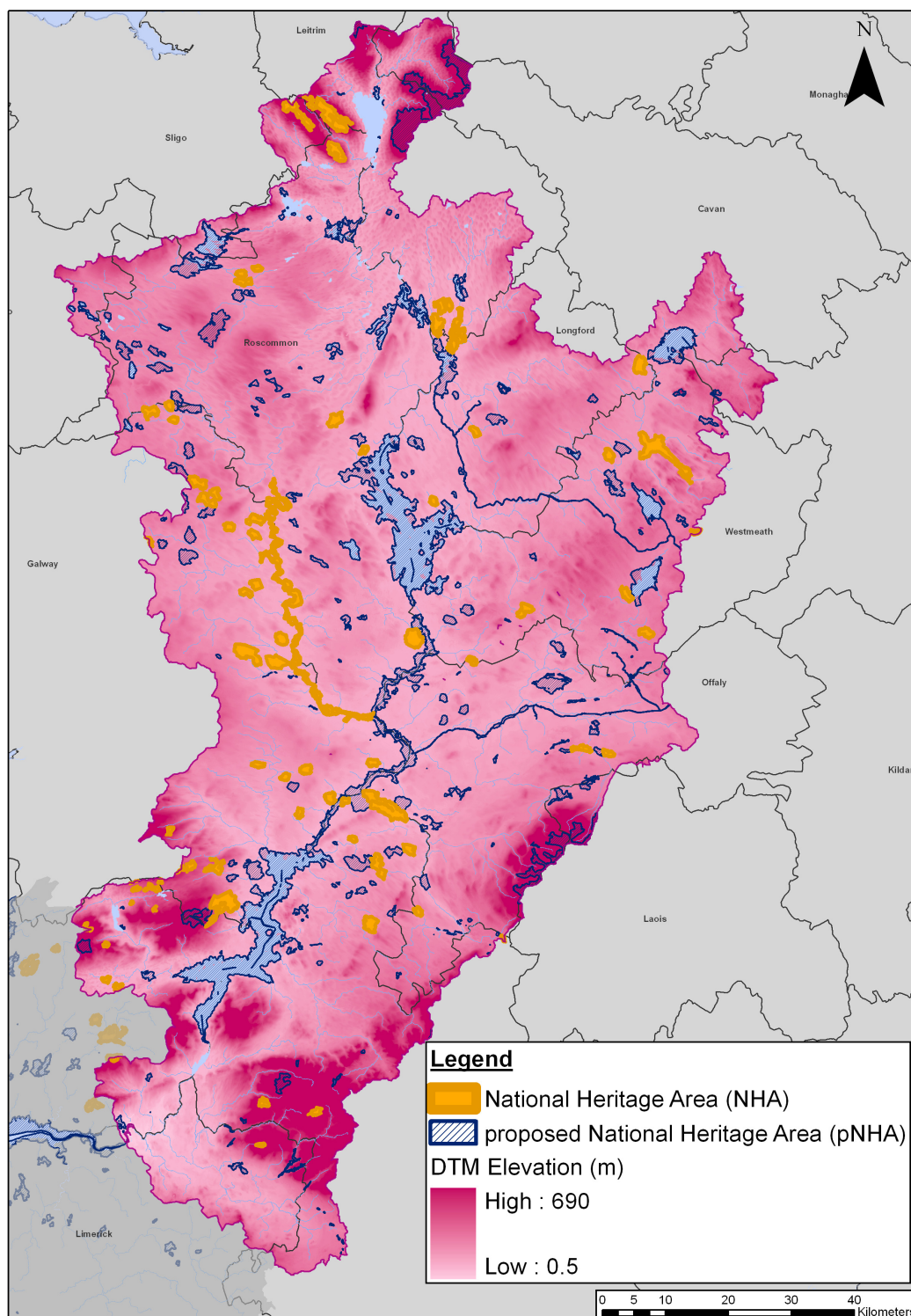


Figure 3.6.2 - Nationally designated nature conservation sites within UoM 25-26 (source: NPWS)

Table 3.6.1: European designated nature conservation sites within this UoM 25-26 (Natura 2000 Sites)

Name	Site Code	Name	Site Code
SACs			
River Shannon Callows	000216	Scragh Bog	000692
Coolcam Turlough	000218	Clonaslee Eskers and Derry Bog	000859
Barroughter Bog	000231	Ridge Road, SW of Rapemills	000919
Cloonmoylan Bog	000248	Clare Glen	000930
Croaghill Turlough	000255	Silvermine Mountains	000939
Derrycrag Wood Nature Reserve	000261	Glenomra Wood	001013
Kilsallagh Bog	000285	Keeper Hill	001197
Lisnageeragh Bog and Ballinastack Turlough	000296	Carrownagappul Bog	001242
Loughatorick South Bog	000308	Rosturra Wood	001313
Pollnaknockaun Wood Nature Reserve	000319	Glenstal Wood	001432
Shankill West Bog	000326	Urlaur Lakes	001571
Slieve Bloom Mountains	000412	Castlesampson Esker	001625
Lough Ree	000440	Annaghmore Lough (Roscommon)	001626
Fortwilliam Turlough	000448	Four Roads Turlough	001637
All Saints Bog and Esker	000566	Liskeenan Fen	001683
Charleville Wood	000571	Pilgrim's Road Esker	001776
Clara Bog	000572	Lough Forbes Complex	001818
Ferbane Bog	000575	Split Hills and Long Hill Esker	001831
Fin Lough (Offaly)	000576	Philipston Marsh	001847
Mongan Bog	000580	Glendree Bog	001912
Moyclare Bog	000581	Boleybrack Mountain	002032
Cuilcagh - Anierin Uplands	000584	Corliskea/Trien/Cloonfellov Bog	002110
Sharavogue Bog	000585	Bolingbrook Hill	002124
Ballinturly Turlough	000588	Pollagoona Bog	002126
Bellanagare Bog	000592	Lower River Suir	002137
Callow Bog	000595	Lisduff Fen	002147
Carrowbehy/Caher Bog	000597	Lower River Shannon	002165
Cloonchambers Bog	000600	Glenloughaun Esker	002213
Derrinea Bog	000604	Killeglan Grassland	002214
Errit Lough	000607	Island Fen	002236
Lisduff Turlough	000609	Lough Derg, North-East Shore	002241
Lough Croan Turlough	000610	Silvermines Mountains West	002258
Lough Funshinagh	000611	Williamstown Turloughs	002296
Mullygollan Turlough	000612	Ballymore Fen	002313
Cloonshanville Bog	000614	Carn Park Bog	002336
Ballyduff/Clonfinane	000641	Crosswood Bog	002337

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Name	Site Code	Name	Site Code
Bog			
Kilcarren-Firville Bog	000647	Drumalough Bog	002338
Garriskil Bog	000679	Ballynamona Bog and Corkip Lough	002339
Lough Ennell	000685	Moneybeg and Clareisland Bogs	002340
Lough Owel	000688	Ardagullion Bog	002341
Camderry Bog	002347	Brown Bog	002346
Clooneen Bog	002348	Curraghlehagh Bog	002350
Tullaghanrock Bog	002354	Redwood Bog	002353
Ardgraique Bog	002356		
SPAs			
Mongan Bog	004017	Lough Ree	004064
Lough Derravarragh	004043	River Little Brosna Callows	004086
Lough Ennell	004044	Middle Shannon Callows	004096
Glen Lough	004045	River Suck Callows	004097
Lough Iron	004046	Ballykenny-Fisherstown Bog	004101
Lough Owel	004047	Garriskil Bog	004102
Lough Gara	004048	All Saints Bog	004103
Lough Derg (Shannon)	004058	Bellanagare Bog	004105
Lough Kinale and Derragh Lough	004061	Dovegrove Callows	004137
Slieve Aughty Mountains	004168	Slieve Bloom Mountains	004160
Slievefelim to Slivermines Mountains	004165		

Table 3.6.2: Nationally designated nature conservation sites within UoM 25-26

Name	Site Code	Name	Site Code
NHAs			
Lough Namucka Bog	000220	Grageen Fen and Bog	002186
Moorfield Bog/Farm Cottage	000221	Corry Mountain Bog	002321
Suck River Callows	000222	Annaghbeg Bog	002344
Ballygar Bog	000229	Hawkswood Bog	002355
Bracklagh Bog	000235	Lough Atorick District Bogs	002377
Clooncullaun Bog	000245	Derryoover Bog	002379
Cloonoolish Bog	000249	Mauherslieve Bog	002385
Crit Island West	000254	Carrane Hill Bog	002415
Funshin Bog	000267	Maghera Mountain Bogs	002442
Castle French West Bog	000280	Bleanbeg Bog	002450
Keeloges Bog	000281	Lisnarragh Bog	002072
Kilmore Bog	000283	Lough Garr	001812
Kilnaborris Bog	000284	Cangort Bog	000890
Leaha Bog	000292	Scohaboy Bog	000937

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Name	Site Code	Name	Site Code
Meeneen Bog	000310	Lough Kinale and Derragh Lough	000985
Aghnamona Bog	000422	Ayle Lower Bog	000993
River Little Brosna Callows	000564	Loughanilloon Bog	001020
Clonydonnin Bog	000565	Aughrim Bog	001227
Bella Bridge Bog	000591	Slieve Aughty Bog	001229
Cornaveagh Bog	000603	Capira/Derrew Bog	001240
Derrycanan Bog	000605	Castle French East Bog	001244
Kilronan Mountain Bog	000617	Derrinlough Bog	001254
Arragh More Bog	000640	Eskerboy Bog	001264
Ballymacegan Bog	000642	Killure Bog	001283
Killeen Bog	000648	Moorfield Bog	001303
Ballynagrenia and Ballinderry Bog	000674	Cashel Bog (Leitrim)	001405
Cloncrow Bog (New Forest)	000677	Corracramph Bog	001420
Lough Derravaragh	000684	Cloonageeher Bog	001423
Rinn River	000691	Forthill Bog	001448
Wooddown Bog	000694	Mount Jessop Bog	001450
Lorrha Bog	001684	Carrickynaghtan Bog	001623
Nure Bog	001725	Tullaghan Bog (Roscommon)	001652
pNHAs			
Dovegrove Callows	000010	Split Hills and Long Hill Esker	001831
Lough Derg	000011	Ballydonagh Marsh	001844
Cahermurphy Wood	000022	Doonoor Marsh	001845
Cloonlara House	000028	Ballyneill Marsh	001846
River Shannon Callows	000216	Philipston Marsh	001847
Coolcam Turlough	000218	Kilbeg Marsh	001848
Barrougher Bog	000231	Ballyvorheen Bog	001849
Camderry Bog	000240	Dromsallagh Bog	001850
Clonfert Cathedral	000244	Bilboa and Gortnageragh River Valleys	001851
Cloonmoylan Bog	000248	Glendree Bog	001912
Croaghill Turlough	000255	Greenane Marsh	001984
Curraghlehanagh Bog	000256	Lough Avan	001995
Derrycrag Wood Nature Reserve	000261	Knockalisheen Marsh	002001
Kilsallagh Bog	000285	Tullaghanrock Bog	002013
Lisnageeragh Bog And Ballinastack Turlough	000296	Bracken'S Dwelling, Near Whiteford	002058
Loughatorick South Bog	000308	Cloghanbeg	002059
Pollnaknockaun Wood Nature Reserve	000319	St. Joseph's Mountheaton	002063
Shankill West Bog	000326	Drumakeenan National School	002064
Anaghmore Lough	000413	Miltown, Shinrone	002065

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Name	Site Code	Name	Site Code
Fen (Offaly)			
Clooncoe Wood and Lough	000424	Ardagullion Bog	002069
Kilgarraiff Marsh	000426	Royal Canal	002103
Lough Allen (south end and parts)	000427	Grand Canal	002104
Castleconnell (domestic dwelling, occupied)	000433	Corliskea/Trien/Cloonfellow Bog	002110
Lough Ree	000440	Ardakillin Lough	001617
Brown Bog	000442	Carrowreagh Turlough	001624
Clooneen Bog	000445	Castlesampson Esker	001625
Derrymore Bog	000447	Annaghmore Lough (Roscommon)	001626
Fortwilliam Turlough	000448	Corbally Turlough	001627
Lough Bannow	000449	Cranberry Lough	001630
Lough Gower	000523	Drum Bridge (Lough Key)	001631
All Saints Bog and Esker	000566	Drumalough Bog	001632
Banagher (domestic dwelling occupied)	000567	Drumman'S Island (Lough Key)	001633
Birr (domestic dwelling occupied)	000569	Feacle Turlough	001634
Charleville Wood	000571	Fin Lough (Roscommon)	001636
Clara Bog	000572	Four Roads Turlough	001637
Clonad Wood	000574	Hog'S Island (Lough Key)	001638
Ferbane Bog	000575	Lough Boderg and Lough Bofin	001642
Fin Lough (Offaly)	000576	Lough Drumharlow	001643
Kinnitty (domestic dwelling occupied)	000579	Lough Glinn	001644
Moyclare Bog	000581	Lough O'Flynn	001645
Roscrea Bog	000583	Newtown Turlough	001646
Cuicagh - Anierin Uplands	000584	Shad Lough	001648
Sharavogue Bog	000585	Tawnytaskin Wood (Lough Key)	001651
Woodfield Bog	000586	Liskeenan Fen	001683
Lough Gara	000587	Cloonamirran Wood	001686
Ballinturly Turlough	000588	Glen Lough	001687
Bellanagare Bog	000592	Ardan Wood	001711
Brierfield Turlough	000594	Ballynagarbry	001713
Corrigeenroe Marsh	000596	Lough Graney Woods	001714
Carrowbehy/Caher Bog	000597	Lough Bane	001721
Castleplunket Turlough	000598	Walshestown Fen	001731
Cloonchambers Bog	000600	Waterstown Lake	001732
Corbo Bog	000602	Murphy'S Bridge Esker	001775
Derrinea Bog	000604	Pilgrim'S Road Esker	001776
Errit Lough	000607	Ballyduff Wood	001777
Kilglass and Grange Loughs	000608	Ballinasloe Esker	001779

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Name	Site Code	Name	Site Code
Lisduff Turlough	000609	Lough Errew	001807
Lough Croan Turlough	000610	Lough Sallagh	001808
Lough Funshinagh	000611	Lough Naneagh	001814
Mullygollan Turlough	000612	Lough Forbes Complex	001818
Rathnalulleagh Turlough	000613	Lough Bawn	001819
Cloonshanville Bog	000614	Cordara Turlough	001821
Ballyduff/Clonfinane Bog	000641	Carrickglass Demesne	001822
Kilcarren-Firville Bog	000647	Doon Esker Wood	001830
Lough Ourna	000650	Lough Nahinch (Tipperary)	000936
Newchapel Turlough	000653	Sheehills Esker	000938
Redwood Bog	000654	Silvermine Mountains	000939
St. Anne'S, (Sean Ross Abbey), Roscrea	000656	Spring Park Wetlands	000941
Aghalasty Fen	000672	Willsborough Esker	000943
Ballynafid Lake and Fen	000673	Knockanavar Wood	000961
Carn Park Bog	000676	Lough Sheelin	000987
Crosswood Bog	000678	Glenomra Wood	001013
Garriskil Bog	000679	Lough O'Grady	001019
Hill of Mael and the Rock of Curry	000681	Nenagh River Gorge	001133
Lough Ennell	000685	Killavalla Wood	001178
Lough Glore	000686	Keeper Hill	001197
Lough Iron	000687	Ardagh Bog	001222
Lough Owel	000688	Ardgraique Bog	001224
Lough Sewdy	000689	Callow Lough	001239
Lough Sheever Fen/Slevin'S Lough Complex	000690	Carrownagappul Bog	001242
Scragh Bog	000692	Cloonascragh Fen and Black Wood	001247
Clonaslee Eskers and Derry Bog	000859	Kilkerrin Turlough	001279
Ballintemple Bog	000882	Rosturra Wood	001313
Ballyduff Esker	000885	Lough Boora	001365
Camcor Wood	000889	Annaghealy Lough	001402
Clonfinlough Esker	000892	Drumhierny Wood	001412
Clonllyn Glebe Bog	000893	Lough Rinn	001417
Clorhane Wood	000894	Owengar Wood	001419
Derrygolan Esker	000896	Sheemore Wood	001421
Derrykeel Meadows	000897	Glenstal Wood	001432
Drumakeenan, Eagle Hill and Perry's Mill	000900	Lough Slawn	001443
Golden Grove Woods	000903	Derry Lough	001444
Kilcormac Esker	000906	Urlaur Lakes	001571
Lough Coura	000909	Ridge Road, SW of Rapemills	000919
Lough Nanag Esker	000910	Ross and Glenns Eskers	000920

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Name	Site Code	Name	Site Code
Mount St. Joseph Woods	000913	Woodville Woods	000927
Pallas Lough	000916	Clareen Lough	000929
Rahugh Ridge (Kiltober Esker)	000918	Clare Glen	000930
Fiagh Bog	000932	Derrygareen Heath	000931
Friar'S Lough	000933		

As with much of the Shannon RBD there are numerous water dependant habitats and species within this Unit of Management. The importance of the River Shannon Callows (000216) and other Callow SACs is specifically recognised as these seasonally flooded grassland ecosystems are dependent on the flood patterns. The River Shannon Callows supports 40% of the breeding population of Corn Crake in Ireland³², which are of conservation concern globally, due to a recent population decline.

The River Shannon SPA, supports three Annex I species in addition to supporting internationally important numbers of wintering wildfowl. Feedback received during stakeholder consultation suggests that undesignated areas within this Unit of Management can also provide roosting habitat for these protected species such as lake shores and some undesignated bogs within the Unit of Management.

Freshwater Pearl Mussels, listed on Annex II of the Habitat Directive, are found at one location within this Unit of Management; along the River Woodford on the Galway - Clare Border, to the north-east of Scarriff. The River Woodford, drains into Lough Derg. Information relating to fish population and diversity is outlined in Section 3.7.

Actions for Biodiversity, Irelands National Biodiversity Plan 2011 -2016, recognises the role natural floodplains play in flood water retention, in addition to seeing possible biodiversity gain from wetland and/or flood plain retention or restoration in Flood Risk Management Plans. A target of this plan is "optimised benefits for biodiversity in Flood Risk Management Planning"³³

The first National Biodiversity Plan (2002), identified the importance of inland waterways, and the threats associated with these ecosystems. Adhering to this Plan, Limerick, Cork and Kerry Development Plans highlight hedgerows, rivers, streams, lakes as well as associated riparian zones, canals, coastal and freshwater wetlands as being of particular biodiversity value, inside or outside of protected areas. These features can also act as important ecological corridors as outlined in Article 10 of the Habitats Directive which refers to 'stepping stones and corridors' of wildlife areas which make the Natura 2000 network a coherent ecological network.

The introduction or spread of invasive species can have a significant negative effect on wildlife and habitats (as well as the economy), and the significance of this is reflected in Ireland's second National Biodiversity Plan (2010 – 2016) and recent EC (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011). Giant Hogweed (*Heracleum mantegazzianum*) has become naturalised particularly along river banks within this Unit of Management, posing a risk to human health and the environment. Other terrestrial alien species found within this Unit of Management,

³² NPWS Site Synopsis Middle Shannon Callows SPA (site code: 004096)

³³ DAHG (2001), Action for Biodiversity 2011-2016, Ireland's National Biodiversity Plan.

include Giant Rhubarb (*Gunnera tinctoria*), Himalayan Balsam (*Impatiens glandulifera*), Japanese Knotweed (*Fallopia japonica*) and Rhododendron (*Rhododendron ponticum*), all which have a negative effect on native species.

3.6.2 Future trends

Increasing land-use change such as urbanisation, afforestation and its associated management and changing agricultural practices (as well as flood events) are likely to continue to pose risks to the quality and distribution of aquatic and terrestrial habitats and species, both within and outside protected sites. However, the continued implementation of measures required to achieve the WFD objectives is likely to benefit protected sites and the wider aquatic environment. In addition, the Conservation Management Plans and conservation objectives which are currently being developed by the NPWS for all Natura 2000 sites, as well as other management plans for declining species (e.g. Species Management Plans) will help protect and enhance biodiversity. It should be noted that the development of these Conservation Management Plans and site specific conservation objectives are unlikely to be developed for all of Natura 2000 site in this Unit of Management, but the NPWS will continue to be consulted in this context as a stakeholder of this CFRAM Study.

Agri-environmental schemes, such as REPS and AEOS, with individual environmental farm plans, will continue to influence farming practices to become more environmentally friendly and sustainable (refer to Section 3.3.1).

In addition to existing guidelines and legislation on Environmental Impact Assessment (EIA), in September 2011, the revision of the Planning and Development Regulations prompted Draft Guidance for Planning Authorities on Drainage and Reclamation of Wetlands, which sets new provisions for the control of drainage and/or reclamation of wetlands providing thresholds to trigger requirements for mandatory EIA. Of relevance to the FRMPs, is the threshold of 2ha for reclamation and/or drainage of wetland on agricultural land.

The EPA's report on alien invasive species in Irish water bodies³⁴ and the continuing development of the Biological Data Centre National Invasive Species Database will aid in the documentation of the distribution of invasive species in Ireland. These reports and datasets will go towards preparing Ireland for the forthcoming European legislation on halting the spread of invasive species.

³⁴ EPA (2011) Alien Invasive Species in Irish Water Bodies. Synthesis Report for the STRIVE-funded project: 2007-W-MS-2-S1

Box 3.6: Biodiversity – Key strategic issues relating to flood risk management

- Coastal squeeze associated with construction and maintenances of coastal flood defences may result in habitat loss;
- Requirement for ecological protection can pose restrictions on existing/future maintenance of flood defences;
- Floodplains have an important role for biodiversity, as they help remove nutrients, provide wetted habitats as well as acting as key aspects in many species' food chain. Currently, the spatial definition of floodplains is unclear, exacerbated by development, farming practices and drainage schemes;
- Wetlands may provide some level of natural flood protection (green infrastructure);
- Flooding can be a key function of some habitats and present opportunities for habitat creation/enhancement, whilst this can also present adverse effect, if flooding is experienced at the wrong time of year e.g. recorded impacts on populations of Corncrakes on Shannon Callows, associated with summer flooding;
- Flood risk management options may affect winter flooding, which is essential for some protected bird species;
- Consideration of potential impacts on Natura 2000 sites and protected species outside these designated sites will be required;
- Consideration of non-designated biodiversity features e.g. habitats along watercourses and coastal areas, and locally important habitats and species;
- Flood measures can contribute to habitat fragmentation and impact on ecological corridors / networks e.g. riparian habitat and wetted areas;
- Flood storage options can enhance both biodiversity and recreational/tourism value of an area;
- Activities associated with the implementation of flood risk management plans should not result in the spreading or introduction of invasive species;
- Changes to flood regimes may adversely affect water quality resulting in changes in the balance of aquatic ecosystems and eutrophication of water bodies; and
- Flood risk management measures can pose barriers to fish migration. The maintenance and retention of bridges, bridge sills and fish passes is important to fish passage.

3.7 Fisheries, Aquaculture and Angling

3.7.1 Existing conditions

Fisheries

Fish are an important indicator species of water quality. Many rivers and lakes within this Unit of Management support, and are capable of supporting salmonid species such as the salmon and brown trout. Nine lakes and twenty-two rivers have been monitored / surveyed by the Inland Fisheries Ireland (IFI) to help determine the draft fish ecological status for the purpose of the WFD, the results of which are outlined in Table 3.7.1.

Table 3.7.1: WFD fish monitoring / survey results recorded for UoM 25-26³⁵

Water Body	Draft Fish Ecological Status	Species Present
Rivers		
River Shannon Battle Bridge (26S020500)	Moderate	Brown trout; European eel; Gudgeon; Perch; Pike; Roach
Feorish River (Ballyfarnon) Bridge 1.5 km S.W. of Keadue (26F020400)	Poor	Pike
Mountnugent River Mountnugent Br (26M020500)	Good	Brown trout; Gudgeon; Perch; Stone loach
Inny River Br 1 km S of Oldcastle (26I010100)	Good	Brown trout; three spined stickleback
Tullamore River Bridge SW of Ballycowen bridge (25T030400)	Moderate	Brown trout; Gudgeon; Minnow; Pike; Roach; three spined stickleback
Clodiagh River (Tullamore) Br at Rahan (25C060500)	Good	Brown trout; European eel; Lamprey; Minnow; Salmon; three spined stickleback; Stone loach
River Brosna 0.5km NW of Pollagh (25B090760)	Moderate	European eel; Gudgeon; Minnow; Perch; Pike; Roach
Silver River (Kilcormac) Lumcloon Br (25S020700)	Good	Brown trout; Gudgeon; Salmon; Stone loach
Little River (Cloghan) Br 2km SW of Cloghan (25L010200)	Moderate	Brown trout; Gudgeon; Lamprey; Minnow; Roach; three spined stickleback
River Brosna Clonony Br (NW of canal) (25B091100)	Moderate	Bream; Brown trout; European eel; Gudgeon; Minnow; Perch; Pike; Roach; Salmon; Stone loach

³⁵ Inland Fisheries Ireland <http://www.ificis.ie/WFDFishMap/>

Annex III - Shannon Estuary Upper & Lower Unit of Management (UoM 25-26)

Water Body	Draft Fish Ecological Status	Species Present
Little Brosna River Riverstown Br (25L020700)	Good	Brown trout; Salmon; Stone loach
Glenafelly River Br 3km E of Longford (25G210010)	Good	Brown trout
Boor River Br NW of Kilbillaghan (26B071100)	Moderate	Brown trout; European eel; Gudgeon; Lamprey; Minnow; Roach; three spined stickleback; Stone loach
Cross River Bridge u/s Shannon River (26C100400)	Moderate	Brown trout; Gudgeon; Perch; Pike; Roach
Inny River Shrule Br (26I011350)	Moderate	Brown trout; Chub; European eel; Gudgeon; Minnow; Perch; Pike; Roach; Roach x Bream hybrid; Stone loach
River Shannon Ballyleague Br Lanesboro (26S021600)	Moderate	European eel; Perch; Pike; Roach
Camlin River Bridge W. of Lisnabo (26C011000)	Moderate	Brown trout; Gudgeon; Perch; Pike; Roach
Scramoge River Bridge N.E. of Riverdale (26S010300)	Moderate	European eel; Perch; Pike; Roach
River Suck Cloondacarra Bridge (26S070300)	Moderate	Brown trout; European eel; Minnow; Perch; Pike; Roach; three spined stickleback; Stone loach
River Suck Ballyforan Bridge (26S071100)	Moderate	Bream; Brown trout; European eel; Gudgeon; Minnow; Perch; Pike; Roach; Stone loach
Ballyfinboy River Br just u/s L Derg (25B020800)	Moderate	Brown trout; European eel; Salmon; Stone loach
Kilcrow River Ballyshrule Bridge (25K010700)	Moderate	Brown trout; European eel; Gudgeon; Minnow; Perch; Pike; Roach; Salmon; Stone loach
Graney River Caher Br, S of L.Graney (25G040025)	Good	Brown trout; European eel; Lamprey; Roach; Salmon
Bow River Bow River Bridge (25B100100)	Good	Brown trout; European eel; Minnow; Salmon; Stone loach
Nenagh River Ballysoilshaun bridge (25N010300)	Good	Brown trout; European eel; Minnow; Salmon; Stone loach
Newport River Rockvale Br nr Mackney (25N020200)	Good	Brown trout; European eel; Lamprey; Salmon
Bilboa River Br u/s Blackboy Br - Bilboa (25B030080)	High	Brown trout; European eel; Salmon; three spined stickleback; Stone loach
Dead River Pope's bridge (25D010100)	Moderate	Brown trout; European eel; Lamprey; Salmon; Stone loach

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Water Body	Draft Fish Ecological Status	Species Present
Lakes		
Lough Allen (SH_26_716)	Good	Bream; Brown trout; European eel; Perch; Pike; Pollan; Roach; Roach x Bream hybrid
Cavetown Lough (SH_26_705)	High	Bream; European eel; Pike; Roach; Roach x Bream hybrid; Roach x Rudd hybrid
Lough O'Flynn (SH_26_693)	Good	Brown trout; European eel; Perch; Pike; Roach
Lough Derg (Shannon) (SH_25_191a)	Poor/Bad	Bream; Brown trout; European eel; Perch; Pike; Roach; Roach x Bream hybrid; Tench
Lough Owel (SH_26_703)	Moderate	Brown trout; Brown trout (stocked); European eel; Perch; Pike; Roach; Roach x Rudd hybrid; Rudd; three spined stickleback; Tench
Lough Annaghmore (SH_26_669)	Good	European eel; Perch; Pike; Roach; Rudd; Tench
Lough Nanoge (SH_26_580)	Moderate	European eel; Perch; Pike; Roach
Lough Sheelin (SH_26_709)	Moderate	Bream; Brown trout; European eel; Perch; Pike; Roach; Roach x Bream hybrid
Lough Meelagh (SH_26_7110)	Poor/Bad	Bream; Brown trout; European eel; Perch; Pike; Roach; Roach x Bream hybrid; Roach x Rudd hybrid; Tench

Although many of the above rivers support salmonid species including Atlantic Salmon, they are not designated as Salmonid Rivers under the European Communities (Quality of Salmonid Waters) Regulations, 1988.

Initial consultation with the IFI has confirmed that Pollan, which are not found outside Ireland, are known to occur in Lough Derg, Lough Ree and Lough Allen.

In 2012 the Standing Scientific Committee (SSC) of the IFI published their assessment of salmonid rivers throughout Ireland and advised that a number of the rivers should be 'closed' to salmon fishing as there was 'no surplus of fish available for harvesting'. Rivers closed to salmon and sea trout fishing include the Shannon River and all its tributaries with the exception of the Mulkear River. These are now legally closed under the Conservation of Salmon and Sea Trout (Closed Rivers) Bye-Law No. C.S. 309, 2011.

The IFI operate a fish stock management programme with the aim of restoring fish populations in those fisheries which have been affected by pollution, fish kills and other problems.

IFI fish farms operate commercially and sell fish to clubs and private fisheries. There are two IFI fish farms within this Unit of Management at Fanure near Roscrea in Co. Offaly and Cullion near Mullingar in Co. Westmeath.

There is currently no commercial eel fishing in this Unit of Management. In 2008, the Department of Communications, Energy and Natural Resources (DCENR) published their National Eel Stock Recovery Plan which contained the following objectives:

- An immediate cessation of the commercial eel fishery and closure of the market;
- Mitigation of the impact of hydropower, including a comprehensive silver eel trap and transport plan;
- Ensuring upstream migration of juvenile eel at barriers; and
- The improvement of water quality in eel habitats.

There are a number of angling centres and location along the Shannon for coarse and pike fishing. These have been identified by the IFI and will be further detailed as necessary during the next stage of the SEA process.

The IFI also provides mapped locations of easy access angling points for boats and family access to support recreation and tourism in the area. There are approximately 20 of these angling access sites within this Unit of Management³⁶.

3.7.2 Future trends

The implementation of the WFD programme of measures will positively influence the quality of the aquatic environment, and this will in turn improve the quality of aquatic resources as well as the Government's understanding of these resources. These measures are also likely to have indirect beneficial impacts on recreation and tourism.

The IFI are currently in the process of undertaking their Atlantic Aquatic Resource Conservation (AARC) project. The aim of AARC is to increase the understanding of the factors causing salmon population to decline in the River Shannon and how they might be addressed by using new developments from the study of restoration ecology. This project outlines a number of objectives including:

- Identify and relieve access issues; and
- Assess locations for re-establishment of populations.

The final AARC project report is due to be published in the last quarter of 2012 and any potential interaction with the FRMP will be further investigated at the next stage of the SEA process.

The closure of the Shannon River and its tributaries to salmon fishing may in the future result in fisheries / conservation management plans for these watercourses as this closure reflects their failure to achieve a surplus stock above their calculated conservation limit, and they now require efforts to rebuild the salmon stocks.

³⁶ Inland Fisheries Ireland <http://www.ifigis.ie/AccessibleAnglingMap/>

Box 3.7: Fisheries, Aquaculture and Angling – Key strategic issues relating to flood risk management

- Flooding and flood risk management measures can result in changes to morphological features and associated habitat supporting fisheries;
- Flooding may result in the introduction of pollutants and/or nutrient loads to waters supporting fisheries;
- Waterside access and variety of water depths are important features for anglers; and
- Flood risk management options may present the potential for enhancement opportunities for commercial fisheries, aquaculture and/or angling, but can also pose restrictions to the current operation and/or expansion of these activities.

3.8 Landscape and Visual Amenity

3.8.1 Existing conditions

The landscape within this Unit of Management is dominated by agricultural lowlands, with interspaced forestry and extensive areas of raised peat bogs, both cutover and active bog. The extensive river and lake networks within this Unit of Management are very important in defining landscape character and play an important role for recreation and amenity.

In accordance with the Planning and Development Act 2010, all Local Authorities within this Unit of Management have defined Landscape Character Areas (LCA) within their Development Plans to ensure that defining features are protected and managed. There is no national classification system for LCAs as these are geographically specific and have their own distinctive character based on its location and surrounding environment. Local Authorities have also incorporated landscape designation into their Development Plans in the form of views, prospects, landscape conservation areas and scenic routes. Similarly to LCAs, there is no national standardised approach for designating these landscape features/sites. Data relating to the various landscape designations is being collated in consultation with Local Authorities, and these sites/features will be considered further during the next stages of the SEA process.

At this stage of the SEA Scoping, particular reference is made to the Landscape Character Assessments completed for the counties of Roscommon, Tipperary (North), Westmeath, Leitrim, Galway and Longford as these counties make up a substantial area of this Unit of Management:

- The Roscommon assessment has identified three LCAs associated with Lough Ree based on the lake's upper bogland, middle pastureland and lower more urbanised land adjacent to Athlone. Other LCAs include the Kilglass Drumlin Lakeland's and the Slieve Bann and Feorish Bogland Basin, both located north of Lough Ree. The Kilglass Drumlin Lakeland area is considered to be of very high value due to its tourist amenities including fishing, boating and extensive scenic views. The Slieve Bann and Feorish Bogland Basin is considered to be of very high value due to the variety of features in the LCA; a major waterway, extensive bogland and forest upland.
- The North Tipperary assessment identified the Shannon Callows as a LCA, a strongly rural area heavily influenced by the Rivers Shannon and Brosna.
- The Longford assessment has designated the Shannon basin/Lough Ree as a LCA³⁷ which is located along the western boundary of the County forming the border with Counties Leitrim, Roscommon and Westmeath and taking in the Rivers Shannon, Inny and Rinn and Lough Forbes and Lough Ree.
- The Galway assessment has designated the Shannon and Suck River Valley between Portumna and Ballinasloe on the border of Roscommon and Northwest Lough Derg as LCAs.
- The Westmeath assessment has designated the Northern Hills and Lakes, the Inny River Lowlands, Lough Ree/Shannon Corridor and the Western Lowlands all as LCAs.

³⁷ Referred to as Landscape Units within Longford

- The Leitrim assessment has designated the South Leitrim Drumlins & Shannon Basin as a LCA.

Furthermore, the Landscape Character Assessments from Sligo, Cavan, Meath, South Tipperary, Offaly, Clare, Limerick, Mayo and Laois County Councils, with partial areas within this Unit of Management will be considered in the next stage of the SEA process.

There are a number of navigational channels within this Unit of Management including the Shannon Navigation and parts of the Shannon-Erne Navigation, the Royal Canal and the Grand Canal. The Shannon Waterway Corridor Studies³⁸ emphasise waterways as heritage areas both in terms of amenity and tourism resource in the Shannon Region, stressing the intrinsic value of waterways in Ireland.

The National Scenic Landscapes Map Drafted by Bord Fáilte in 1994 identifies four draft national scenic landscapes within this Unit of Management: Lough Derg, Lough Ree, Silvermines and Lough Key/ Arrow.

3.8.2 Future trends

In September 2011 the DAHG published a strategic issues paper for consultation on 'A National Landscape Strategy for Ireland'. This is in line with Ireland's ratification of the European Landscape Convention (2000). One main aim of this strategy is the sustainable management of change affecting landscape, and is relevant to both terrestrial and aquatic environments.

As part of the Heritage Council 2010 report 'Proposals for Ireland's Landscapes', they recommended the introduction of a Landscape Ireland Act. This has been included as an objective in the recent Heritage Council Strategic Plan 2012-2016.

The existing landscape is not expected to change significantly in the immediate future. Landscape protection has been recognised in the county Development Plans, but as noted above, the classification for areas of scenic landscapes, scenic routes, views and prospects etc differ between counties. Relating to this, Fáilte Ireland has produced a feasibility study³⁹ which provides a framework for the development of a national landscape map for the whole country.

³⁸ The Heritage Council and Inland Waterways Ireland. The Shannon Waterway Corridor Studies – (2005) Upper Shannon navigation to Roosky; (2006) Lower Shannon from Meelick to Limerick City; (2004) Landesborough to Shannonbridge, including Lough Ree; (2004) Roosky to Landesborough and the Royal Canal; (2002) Shannonbridge to Meelick including Grand Canal.

³⁹ Fáilte Ireland Scenic Landscape Feasibility Study 2007

Box 3.9: Landscape and Visual Amenity - Key strategic issues relating to flood risk management

- Flood risk management options can have positive and negative effects on visual amenity;
- Development pressures around lakeshore and floodplains can deteriorate landscape;
- Future planning restrictions on development within areas at risk from flooding such as river valleys and estuaries could help to protect the landscape character as well as the view within and from such important landscapes:
- Failure to protect or manage flood risk areas may lead to short-term or medium-term harm to landscape and visual amenity of areas surround flood risk centre (e.g. abandonment of buildings); and
- Flood risk management can provide opportunities to enhance landscape and visual amenity by restoring more natural river forms and links between watercourses and their flood plains. Opportunities for reed-bed / wetland retention and/or enhancement can be considered.

3.9 Material Assets (economic), Development and Infrastructure

3.9.1 Existing Conditions

Industry in the area is associated with Bord na Móna activities, chemical manufacturing processing, the pharmaceutical industry, intensive agriculture (e.g. piggeries) and food processing such as dairy and beef. In addition there are significant urban areas such as Limerick City, Athlone Town and Longford Town.

There are two motorways (M6 & M7) and a number of national road networks (primary and secondary) within this Unit of Management. The motorway and national primary routes originate in Dublin and connect to Cork, Limerick and Galway. Many of the existing roads, including the national roads are located close to and along river valleys, and have a history of flooding (refer to Section 2.2).

A number of railway lines pass through this Unit of Management, such as the Dublin services to Sligo, Westport, Galway, Limerick and Cork.

As noted previously, there are a number of navigational channels (canals) within this Unit of Management including the Shannon Navigation and parts of the Shannon–Erne Navigation, the Royal Canal and the Grand Canal. The Shannon Navigation incorporates 257 km of cruising water from Killaloe to Lough Allen in Co. Leitrim. The Navigation then runs a further 113 km from Killaloe to the sea at Loop Head through Limerick, with one double lock at Ardnacrusha Power Station⁴⁰.

The Shannon–Erne Navigation traverses the boundary between this Unit of Management and the North West and Neagh Bann CFRAM Study area. This section of the Shannon–Erne navigation is named the Ballinamore–Ballyconnell Canal, which forms the connecting canal between Lough Scurl and the River Shannon, just south of Leitrim town.

The Royal Canal and the Grand Canal cut across the centre of Ireland from Dublin to meet up with the Shannon Navigation north of Lough Ree in County Longford and the Shannon Harbour in County Offaly (north of Lough Derg), respectively. As well as the large navigations described, there are also 19 other canals within the District, including the Allen Canal and the Plassey–Erina Canal, totalling almost 64km⁴¹.

The Shannon River catchment is a *managed* system. ESB and Waterways Ireland manage the controls of the River Shannon water levels for the purpose of electricity generation (at Ardnacrusha) and navigation respectively using a series of sluices and weirs from Lough Allen, downstream to the outlet of Lough Derg.

Section 3.4 of this Annex details the number of important infrastructure types such as wastewater and water treatment plants.

Within this Unit of Management, agriculture is also acknowledged as a material asset as it has an important role to play in the region's economy. This Unit of

⁴⁰ SEA for the WFD River Basin Management Plans and Programmes of Measures – Shannon iRBD Environmental Report

⁴¹ SEA for the WFD River Basin Management Plans and Programmes of Measures – Shannon iRBD Environmental Report

Management also has many quality scenic landscapes and offers great opportunities for recreation and tourism (including ecotourism).

The generation of renewable energy has been increasing over the past ten years, with a growth in the number of wind farms arising around the country. There are 20 wind farms currently operational within, or in close proximity to this Unit of Management⁴²; eight are situated within Tipperary North, both and Roscommon and Leitrim have six wind farms relevant to this Unit of Management.

3.9.2 Future trends

County Development Plans present economic development policies which respond to the economic downturn and recognise the importance of taking advantage of emerging and likely future trends and economic opportunities.

Much of the land area within this Unit of Management is associated with prospective mining licences which are granted by the DCENR.

The preparation of a Strategic Integrated Framework Plan (SIFP) for the Shannon Estuary has recently commenced (incorporating jurisdictions of Clare, Kerry and Limerick County Councils, Shannon Foynes Port Company and Shannon Development). The reported aim is to identify the nature and location of future sustainable development, economic growth and employment within the Shannon Estuary whilst ensuring the habitat status of Natura 2000 and other environmentally sensitive sites would not be reduced as a result of the short-term or long-term impact of developments. This Plan is more relevant to Units of Management 24 and 27-28, but following are examples of the development types that may be considered by this Plan and initiated within or adjacent to this Unit of Management:

- Leisure;
- Industry;
- Energy generation; and
- Agriculture.

The National Roads Authority (NRA) report that planned road upgrades and infrastructure for this region are in the 'planning' stage. However in November 2011, the Irish Government suspended large scale infrastructure spending. It is unknown at this stage if this suspension will significantly affect this Unit of Management.

There are a number of national strategies and plan in place for Irelands energy needs, with specific plans developed regarding renewable energy. One of the most recent is the government publication of DCENR Offshore Renewable Energy Development Plan (public consultation, 2010) which includes area of the Shannon Estuary. EirGrid have undertaken a number of studies on the development of electricity grid in Ireland including GRID 25, EirGrid's strategy for the development of Ireland's transmission grid. This strategy proposes to support economic growth and provide the infrastructure to enable Ireland to realise its renewable potential and achieve the challenging 2020 target of having 40% of our electricity generated from renewable sources. This strategy includes proposals for projects to be developed within this Unit of Management.

⁴² Irish Wind Energy Association: <http://www.iwea.com/index.cfm/page/windfarmsinireland>

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The Sustainable Energy Authority Ireland (SEAI) Strategic Plan 2010-2015 promotes renewable energy both on a large commercial scale and as micro-generation. In addition County Development Plans have outlined potential wind energy development areas which will be further detailed as required in the next stage of the SEA process.

The Government has recently proposed reforms of the water sector which include the establishment of a State-led utility and a water metering programme (private wells will remain un-levied). This will inevitably influence the prospects for and management of water-related infrastructure.

The EPA recently published their report 'Hydraulic Fracturing or 'Fracking': A Short Summary of Current Knowledge and Potential Environmental Impacts'. Preliminary authorisations to investigate shale gas extraction in the Lough Allen and Clare Basins has been granted. Significant areas of natural gas are believed to be within this Unit of Management in Co. Leitrim. The EPA proposes to commission further, more extensive research on hydraulic fracturing later in 2012.

Box 3.9: Development, Infrastructure and Material Assets – Key strategic issues relating to flood risk management

- Vulnerability of material assets to existing and future flood risk can result in adverse effects to human health, economy safety, water status etc;
- Future development including ancillary infrastructure such as access bridges can offer opportunities and constraints for flood risk management; and
- Construction of renewable energy options including those outside flood plains e.g. wind farms can influence changes to morphology and run-off characteristics of a catchment.

3.10 Tourism and Recreation

3.10.1 Existing conditions

The natural heritage in this Unit of Management is characterised by a range of scenic landscapes which offer extensive tourism and recreational opportunities such as walking, cycling, and driving routes, as well as water-based activities such as fishing and boating. Although domestic tourism is positive, like much of Ireland, the Shannon region has experienced a decline in international visitor numbers over the past 2-3 years.

Cruising and boating are acknowledged as important recreational and tourism activities within this Unit of Management, playing a major role in the region's tourism industry. There are a number of companies that operate cruises along the River Shannon, and the Inland Waterways Association of Ireland (IWAI), a voluntary body of inland waterway enthusiasts are active in this Unit of Management to help 'advocate the use, maintenance protection, restoration and improvement of these waterways'⁴³. Boats and barges are also available for hire for tourists who wish to cruise the river themselves. The Royal and Grand Canals also provide access to/from the Shannon River (refer to Section 3.9.1 for further details of the navigational channels).

The surface water network throughout the Unit of Management offers an important angling resource for coarse, game and sea fishing which is recognised world-wide.

The Lough Boora Parklands in County Offaly represent an example of how harvested peatland can positively influence recreation whilst providing other sustainable functions, such as storage for surface water. This parkland comprises about 2,000ha of cut-away bog on Bord na Móna lands, situated half-way between Tullamore, Co. Offaly and the River Shannon. Activities at Lough Boora Parklands include walking, hiking, cycling, coarse angling, game fishing and birdwatching.

The National Trails Office promotes the use of recreational trails in Ireland. Those defined for this Unit of Management are illustrated in Figure 3.10.1.

Cultural Heritage sites and resources in this Unit of Management also support heritage-related tourism and recreation. This is discussed further in Section 3.11 of this Annex, but some specific features include Clonmacnoise candidate World Heritage Site in Co. Offaly, St. John's Castle in Limerick City as well as visitor centres such as, Roscrea Heritage Centre and Corlea Trackway Visitor Centre.

⁴³ <http://www.iwai.ie/org/aboutIWAI.html>

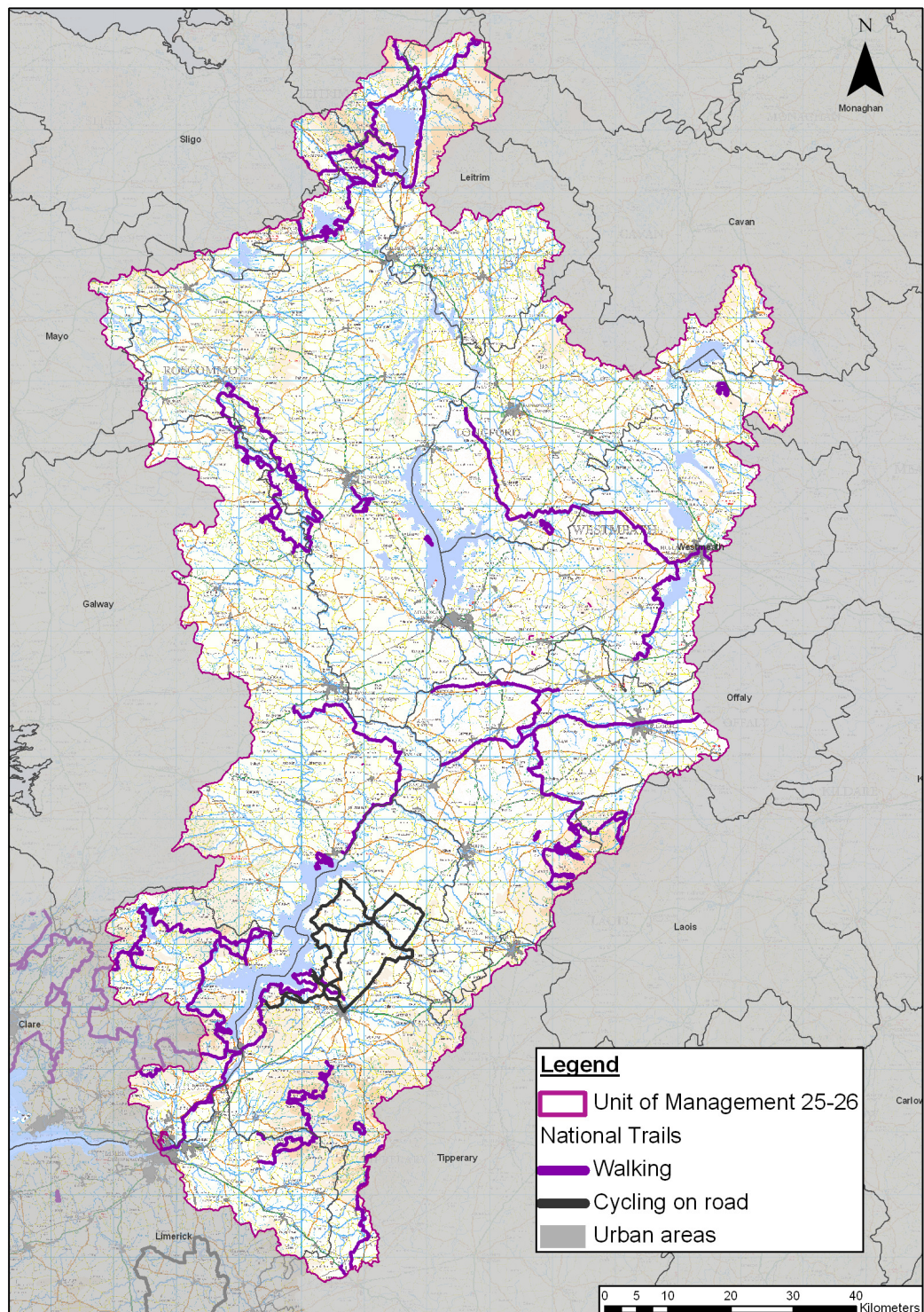


Figure 3.10.1 - National Trails within UoM 25-26 (source: National Trails Office)

3.10.2 Future trends

The National Development Plan 2007 – 2013 (NDP) outlines the Government's Policy to significantly increase revenue from overseas and domestic tourism and achieve a wider distribution of tourists within this period. This NDP policy is supported by policies and objectives in the various County Development Plans.

Bord na Móna currently have 80,000 hectare of cutaway bog primarily located within this Unit of Management. As noted in Section 3.3.2, Bord na Móna have established an in-house Land Use Review System⁴⁴ to continuously assess and evaluate the potential of the company's land bank. This includes options for amenity and recreational areas. Options will continue to be assessed and developed with regards the use and potential rehabilitation of these areas. This may include the creation of amenities such as that located in the Lough Boora Parklands. The Bord na Móna Strategic Framework for the Future use of Peatlands identified potential future areas of high biodiversity value (24%) and tourism potential (3%).

A Limerick & Clare Joint Sports and Physical Recreation Strategy is currently being developed and will result in a set of goals and objectives for the provision and utilisation of sporting and physical recreation facilities in the area which relate to sustainable development including linkages to smarter travel options.

Complimenting the roles of Fáilte Ireland and Tourism Ireland to market and promote Irish tourism, Shannon Development commit to initiating and supporting tourism development as a 'key element in the achievement of overall economic growth throughout the Shannon region'⁴⁵. 'Ireland's Shannon Region Tourism Plan Summary 2011' outlines a set of key targets which are likely influence tourism in the coming years throughout this Unit of Management.

Box 3.10: Tourism and Recreation – Key strategic issues relating to flood risk management

- Flood risk management options could contribute to the protection of existing tourist attractions and facilities currently at risk from flooding as well as providing opportunities to enhance/create related activities;
- Flooding may restrict, or reduce the quality of resources important for recreation and/or tourism;
- Flood risk management options may affect angling facilities, boating activities and/or associated resources;
- Flood storage options can potentially provide opportunities for enhancing/creating recreational areas; and
- Access to waterways is an important issue to consider e.g. access to rivers for anglers.

⁴⁴ Bord na Móna – Strategic Framework for the Future Landuse of Peatlands.

⁴⁵ <http://www.shannondevelopment.ie/Tourism/>

3.11 Archaeology and Cultural Heritage

3.11.1 Existing Conditions

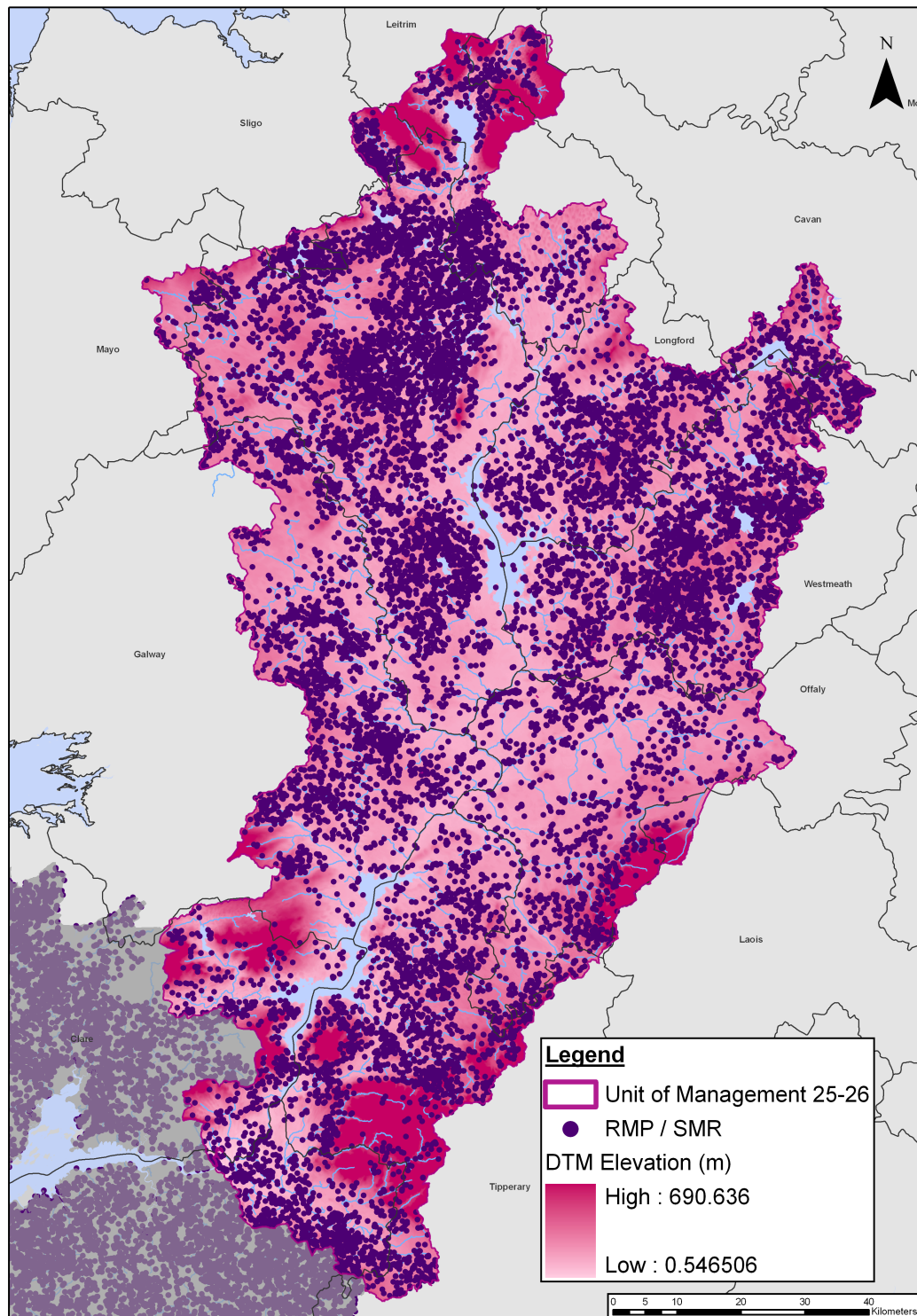
Archaeological sites are legally protected by the provisions of the National Monuments Acts, the National Cultural Institutions Act 1997 and the Planning and Development Acts. The National Record of Monument & Places (RMP) (formerly the Sites and Monuments Record (SMR)) is a statutory list of all known archaeological monuments provided for in the National Monuments Acts. There are almost 20,000 archaeological, architectural and cultural heritage sites within this Unit of Management, recorded in the RMP. The records contain details of the site, including location, description and unique identification number. Many of the sites are located adjacent to watercourses, with some present within the watercourses. This Unit of Management contains a wide range of monuments types including:

- Anomalous stone groups
- Cairns;
- Castles;
- Cathedrals & Churches;
- Crannogs;
- Fulacht Fias;
- Hilltop Enclosures;
- Gatehouses;
- Ogham Stones;
- Ringforts;
- Standing stones
- Round Towers; and
- Town Defences.

The locations of the known archaeological, architectural and cultural heritage sites within this Unit of Management are presented in Figure 3.11.1.

Historic battles are known to have taken place in this Unit of Management, e.g. on Lough Ree (Vikings and natives). It is possible that such sites can host undiscovered archaeological finds.

As some monuments and structures are located within and close to watercourses, the Underwater Archaeology Unit records and the Register of Battle sites held by the DAHG will be consulted to establish any zones of potential archaeological importance in the next stages of the SEA. Of specific relevance, initial consultation with the DAHG highlighted the potential for remains of a piled bridge near Clonmacnoise where the esker and river crossing are thought to have provided a travel route across the bogs and river.



**Figure 3.11.1 - Record of Monuments and Places / Sites and Monuments
Record in UoM 25-26 (source: National Monument Service)**

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The National Inventory of Architectural Heritage (NIAH) was established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. The purpose of the NIAH is to identify, record, and evaluate the post-1700 heritage of Ireland. There are over 8200 listings on the NIAH within this Unit of Management.

Architectural Conservation Areas (ACAs) are designated under Section 81 of the Planning & Development Act 2000-2010 (as amended) for the protection of areas for their special characteristics and distinctive features. There are a number of ACAs within this Unit of Management and these are detailed in the County and Local Area Development Plans (some of which are pending designation). Consultation with the relevant Local Authorities will continue during the next stage of SEA process to obtain further details of these ACAs.

The Planning & Development Act 2000 introduced legislation and methods for protecting the Architectural Heritage and introduced the Record of Protected Structures (RPS). There are over 3000 Protected Structures recorded in this Unit of Management. These are listed in the County Development Plans, but are not available as yet in digital map format. Following consultation with the DAHG, it is acknowledged that the register of protected structures documented in these Plans may not represent all Ministerial recommended sites/structures (which are included in the NIAH).

The locations of NIAH sites recorded within this Unit of Management are presented in Figure 3.11.2.

There are no designated UNESCO World Heritage Sites located in this Unit of Management. However, a Tentative List of sites for Ireland submitted to UNESCO includes five sites within this Unit of Management, as detailed in Table 3.11.1 and Figure 3.11.3.

Table 3.11.1: UNESCO Tentative List of sites within this UoM 25-26

Site Name	County	Site Type
Clonmacnoise	Offaly	Early Medieval Monastic Sites
Durrow	Offaly	Early Medieval Monastic Sites
Inis Cealtra	Clare	Early Medieval Monastic Sites
Hill of Uisneach	Westmeath	The Royal Sites of Ireland
Rathcroghan Complex	Roscommon	The Royal Sites of Ireland

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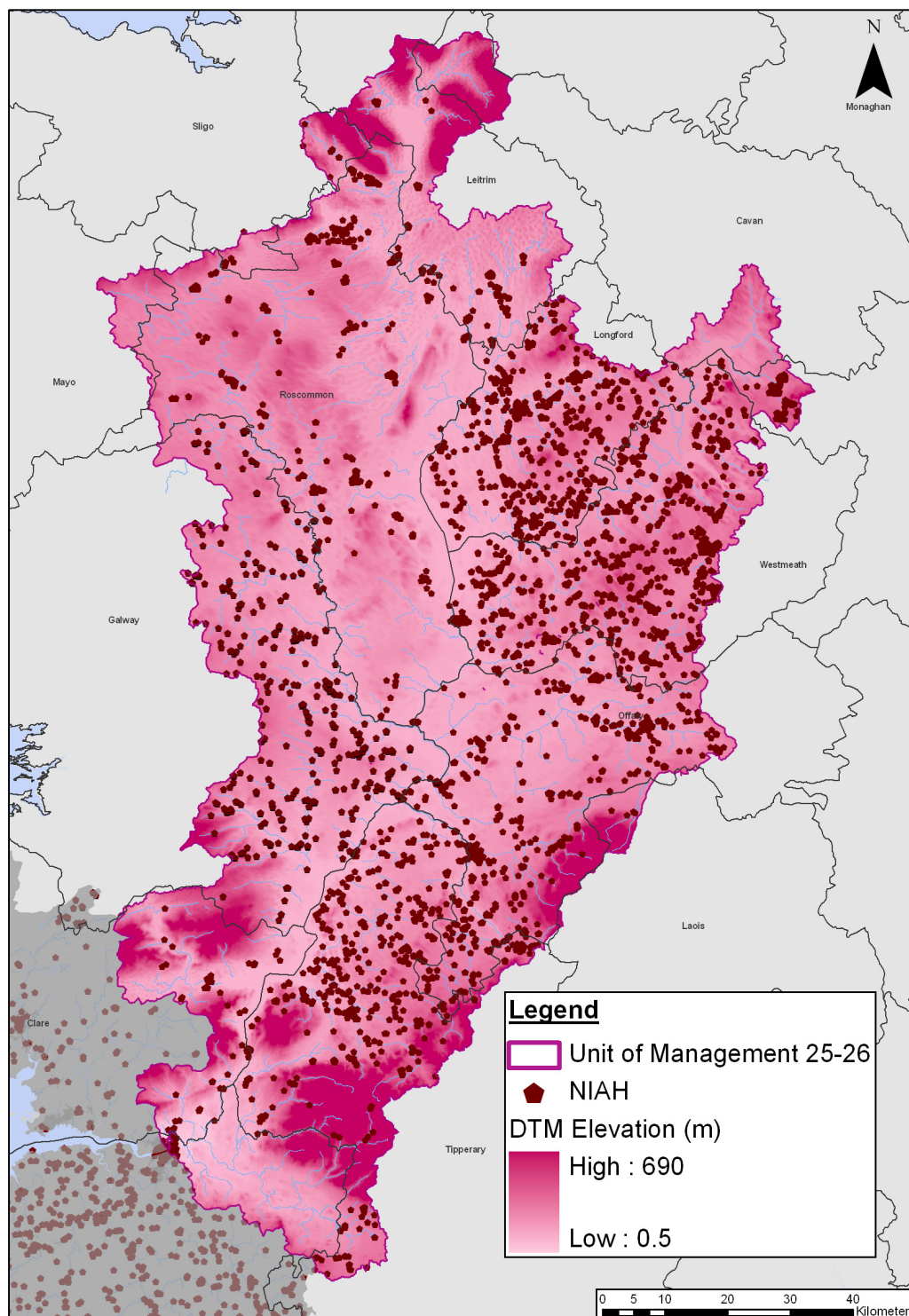


Figure 3.11.2 - National Inventory of Architectural Heritage within UoM 25-26
(source: National Monument Service)

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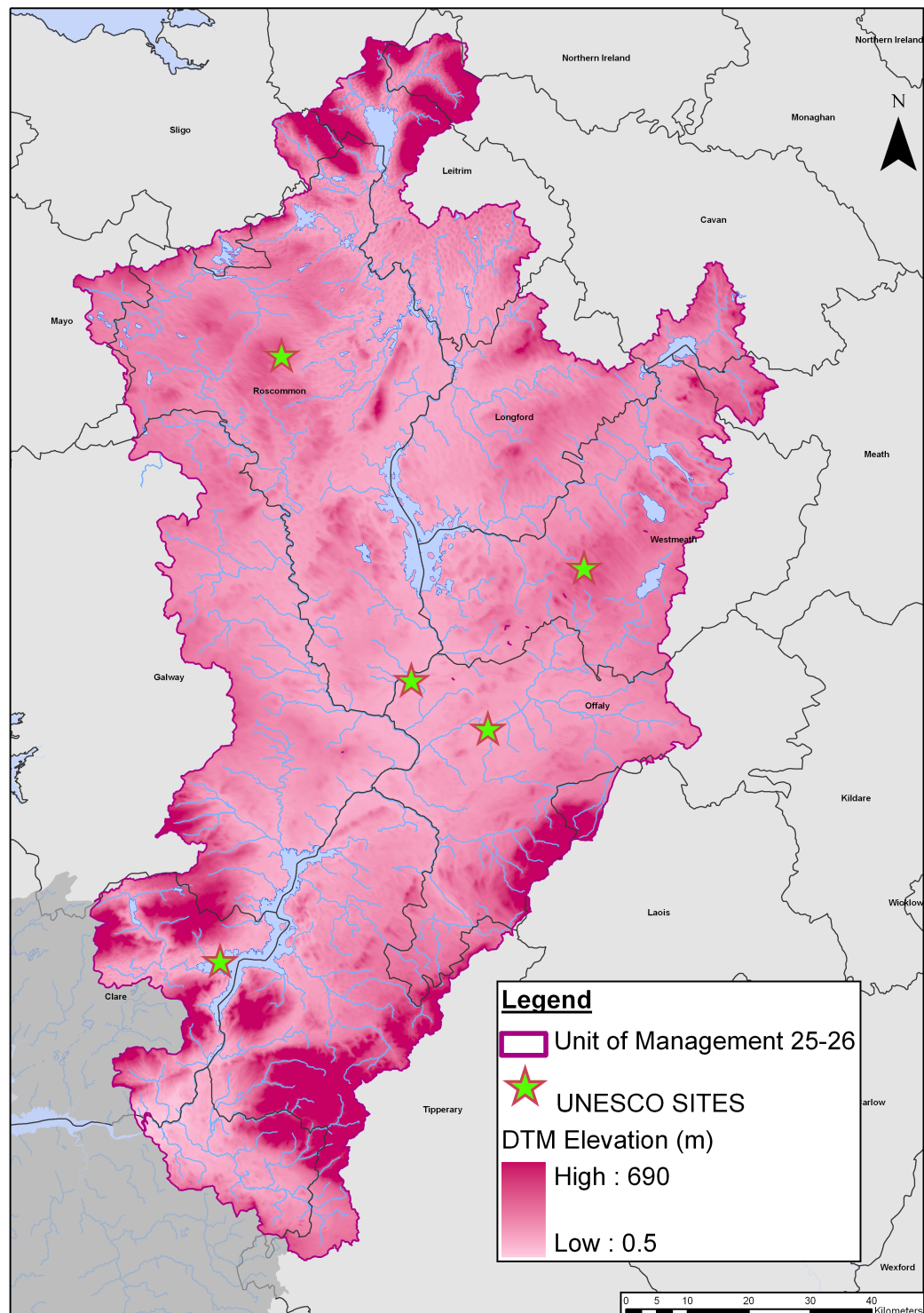


Figure 3.11.3 - Tentative UNESCO World Heritage within UoM 25-26 (source: UNESCO)

The draft Preliminary Flood Risk Assessment report (OPW, 2011) presented a methodology for classifying the vulnerability of National Monuments from flooding in Ireland. The report classifies each monument type with a 'vulnerability' rating (low to extreme) based on the monuments importance and the potential damage that could occur due to flooding. This rating will inform the SEA process for the FRMPs with regards to archaeological monuments and sites.

3.11.2 Future trends

The archaeological, architectural and cultural heritage of this Unit of Management is a finite resource, and protection of this resource from flooding and flood risk management related development will continue to be required. There also remains the possibility for the presence of unknown, undesignated archaeological and architectural remains to be discovered within this Unit of Management during any future developments.

Linking with the climatic factors discussed in Section 3.5 of this Annex, the Heritage Council and Fáilte Ireland commissioned a review of research carried out in relation to the potential impacts of climate change on Ireland's maritime and inland waterways heritage⁴⁶. River and coastal flooding exacerbated by climate changes are reported to present serious consequences for heritage (and socio-economic activity).

Box 3.11: Archaeology and Cultural Heritage – Key strategic issues relating to flood risk management

- Some structures are located within and adjacent to water courses. These can act as a hydraulic restriction within a watercourse and/or constrain flood risk management at a location;
- Existing management plans may require bridges to be repaired/maintained using traditional methods/materials and therefore restrict options for flood risk management;
- Flood risk management options can be constrained by the need to protect the character of areas of existing archaeological and architectural value e.g. ACAs, Protected Structures, National Monuments and RMPs;
- Flood risk management options can potentially reduce the risk from flooding to existing archaeological and architectural features;
- The development of flood risk management options will need to consider the potential for unknown archaeological discoveries, above and below water level (and across flood plains).

⁴⁶ Heritage Council and Fáilte Ireland (2009). Climate Change, Heritage and Tourism: Implications for Ireland's Coast and Inland Waterways.

3.12 Conclusion

This scoping exercise has identified that impacts on air quality can be scoped out of the SEA for the Shannon CFRAM Study, as it will not influence or be affected by the recommendations of this study. All of the remaining topics including climate are relevant to the next stage of the SEA and Unit of Management 25-26.

References

- Bord na Móna (2010), Biodiversity Action Plan 2010-2015
- Bord na Móna (2012), Strategic Framework for the Future Landuse of Peatlands
- Cavan County Council (2008), Cavan County Development Plan 2008-2014
- Clare County Council (2011), Clare County Development Plan 2011-2017
- Cork County Council (2009), Cork County Development Plan 2009- 2015
- Department of Agriculture, Fisheries and Food (2007), Ireland Rural Development Programme 2007-2013
- Department of Arts, Heritage and the Gealtacht (2011), A National Landscape Strategy for Ireland
- Department of Arts, Heritage and the Gealtacht (2011), Actions For Biodiversity 2011-2016, Ireland's National Biodiversity Plan
- Department of Arts, Heritage, Gaeltacht and the Islands (1999), Framework and Principles for the Protection of the Archaeological Heritage
- Department of Communications, Energy and Natural Resources - Inland Fisheries Division (2008), National Report for Ireland on Eel Stock Recovery Plan - Including River Basin District Eel Management Plans
- Department of Communications, Marine and Natural Resources, Government White Paper (2007), Delivering a Sustainable Energy Future for Ireland - The Energy Policy Framework 2007-2020
- Department of Environment, Heritage and Local Government (2004), Architectural Heritage Protection – Guidelines for Planning Authorities
- Department of Environment, Heritage and Local Government (2008), Programme of Measures Unsewered Wastewater Treatment Systems National Study
- Department of Finance (2007), National Development Plan (NDP) 2007-2013
- Department of the Environment (1997), Sustainable Development - A Strategy for Ireland
- Department of The Environment and Local Government (2002), Making Ireland's Development Sustainable - Review, Assessment and Future
- Department of Transport (2008), Shannon Airport Catchment Area Economic & Tourism Development Plan
- Eirgrid (2008), (Draft) Transmission Development Plan 2008-2012
- Environmental Protection Agency (EPA) (2009), Code of Practice - Wastewater Treatment and Disposal System Serving Single Houses
- Environmental Protection Agency (EPA) (2010), Air Quality in Ireland Report
- Environmental Protection Agency (EPA) (2011), Alien Invasive Species in Irish Water Bodies. Synthesis Report for the STRIVE-funded project, 2007-W-MS-2-S1

Annex III - Shannon Estuary Upper & Lower Unit of Management (UoM 25-26)

- Environmental Protection Agency (EPA) (2012), Focus on Urban Waste Water Discharge in Ireland
- Fáilte Ireland (2007), Scenic Landscape Feasibility Study
- Fire Services and Emergency Planning (2006), Working Draft Guidance Document 11 A Guide To Flood Emergencies A Framework For Major Emergency Management, Department of Environment, Heritage and Local Government
- Forest Service (2000), Department of the Marine and Natural Resources - Code of Best Forest Practice - Ireland
- Galway County Council (2009), Galway County Development Plan 2009-2015
- Geological Survey Ireland (2006) Irish Landslides Working Group Landslides in Ireland
- Heritage Council and Fáilte Ireland (2009), Climate Change, Heritage and Tourism: Implications for Ireland's Coast and Inland Waterways
- Irish Peatland Conservation Council (2009), Ireland's Peatland Conservation Action Plan 2020 - Halting the Loss of Peatland Biodiversity
- Kerry County Council (2009), Kerry County Development Plan 2009-2015
- Leitrim County Council (2009), Leitrim County Development Plan 2009-2015
- Limerick City Council (2010), Limerick City Council Development Plan 2010-2016
- Limerick County Council (2010), Limerick County Development Plan 2010-2016
- Longford County Council (2009), Longford County Development Plan 2009-2015
- Mid-West Regional Authority (2009), Mid-West Regional Planning Guidelines 2010-2022
- North Tipperary County Council (2010), North Tipperary County Development Plan 2010-2016
- Offaly County Council (2009), Offaly County Development Plan 2009-2015
- Office of Public Works (OPW) (2010), Flood Risk Assessment and Management Programme National Pluvial Screening Project for Ireland. HR Wallingford Ltd.
- Roscommon County Council (2008), Roscommon County Development Plan 2008-2014
- Sligo County Council (2010), Sligo and Environs Development Plan 2010-2016
- South West Regional Authority (2009), South West Bioenergy Plan 2009-2020
- South-West Regional Authority (2009), South-West Regional Planning Guidelines 2010-2022
- The Heritage Council (2002), Waterways Corridor Study 2002

Annex III - Shannon Estuary Upper & Lower Unit of Management (UoM 25-26)

- The Heritage Council (2004), Waterways Corridor Study 2004
- The Heritage Council (2005), Waterways Corridor Study 2005
- The Heritage Council (2006), Waterways Corridor Study 2006
- The Sustainable Energy Authority of Ireland (SEAI) (2010), 5 Year Strategic Plan 2010-2015
- Western River Basin District (2008), Programme of Measures and Standards for Forest and Water
- Westmeath County Council (2008), Westmeath County Development Plan 2008-2014

Websites

- Bord na Móna future landuse - <http://www.bordnamona.ie/our-company/our-businesses/land-property/>
- Central Statistics Office - <http://www.cso.ie>
- Environmental Protection Agency - <http://www.epa.ie>
- EPA (2007) River Quality Surveys, Biological - <http://www.epa.ie/qvalue/webusers/>
- EPA GeoPortal - <http://gis.epa.ie>
- Floodmaps - <http://floodmaps.ie/>
- Geological Survey of Ireland - <http://www.gsi.ie>
- Health Service Executive - <http://www.hse.ie>
- Inland Fisheries Ireland (Shannon Regional Fisheries Board) Game Angling Guide - River Deel & Lakes, Co Limerick - <http://www.shannon-fishery-board.ie/guides/game/river-deel.htm>
- Inland Fisheries Ireland - <http://www.ifigis.ie/AccessibleAnglingMap/>
- Inland Fisheries Ireland - <http://www.ifigis.ie/WDFishMap/>
- Irish Wind Energy Association - <http://www.iwea.com/index.cfm/page/windfarmsinireland>
- National Monument Service - <http://www.archaeology.ie/>
- National Parks and Wildlife Service - <http://www.npws.ie>
- National Trails Office - <http://www.irishtrails.ie>
- Pollution Reduction Programmes, Characterisation Reports and Maps - <http://www.environ.ie/en/Environment/Water/WaterQuality/ShellfishWaterDirective/ShellfishWatersFinalCharacterisationReportsandPRPs/Clare-Kerry/>
- Shannon Development - <http://www.shannondevelopment.ie>
- Shannon Region Trails - <http://www.shannonregiontrails.ie/>
- The Inland Waterways Association of Ireland - <http://www.iwai.ie/org/aboutIWAI.html>
- Transport 21 - <http://www.transport21.ie>
- WFD Ireland Document Store - http://www.wfdireland.ie/docs/1_River%20Basin%20Management%20Plans%202009%20-%202015/ShIRBD%20RBMP%202010/