Shannon North Estuary Catchment Assessment 2010-2015 (HA 27)

Catchment Science & Management Unit

Environmental Protection Agency

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Preface

This document provides a summary of the characterisation outcomes for the water resources of the Shannon North Estuary Catchment, which have been compiled and assessed by the EPA, with the assistance of local authorities and RPS consultants. The information presented includes status and risk categories of all water bodies, details on protected areas, significant issues, significant pressures, load reduction assessments, recommendations on future investigative assessments, areas for actions and environmental objectives. The characterisation assessments are based on information available to the end of 2015. Additional, more detailed characterisation information is available to public bodies on the EPA WFD Application via the EDEN portal, and more widely on the catchments.ie website. The purpose of this document is to provide an overview of the situation in the catchment and help inform further action and analysis of appropriate measures and management strategies.

This document is supported by, and can be read in conjunction with, a series of other documents which provide explanations of the elements it contains:

1. An explanatory document setting out the full characterisation process, including water body, subcatchment and catchment characterisation.
2. The Final River Basin Management Plan, which can be accessed on: www.catchments.ie.
3. A published paper on Source Load Apportionment Modelling, which can be accessed at: http://www.jstor.org/stable/10.3318/bioe.2016.22
4. A published paper on the role of pathways in transferring nutrients to streams and the relevance to water quality management strategies, which can be accessed at: http://www.jstor.org/stable/pdf/10.3318/bioe.2016.19.pdf
5. An article on Investigative Assessments which can be accessed at: https://www.catchments.ie/download/catchments-newsletter-sharing-science-stories-june-2016/

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1 Introduction

This catchment includes the area drained by the River Fergus and all streams entering tidal water between Thomond Bridge and George's Head, Co. Clare, draining a total area of 1,658 km². The largest urban centre in the catchment is Ennis. The other main urban centres are Shannon, Clarecastle, Kilrush, Kilkee and Sixmilebridge. The total population of the catchment is approximately 78,400 with a population density of 47 people per km².

The catchment runs from the southern tip of the Clare Peninsula, eastwards to the Slieve Bearnagh Hills and northwards nearly to Ballyvaughan, including much of the central and southern parts of The Burren. The central part of the catchment is entirely underlain by highly karstified limestones and the surface water drainage network is either virtually absent (i.e. The Burren) or highly connected to the groundwater system in much of this area. West of Ennis to Loop Head and along the western edge of the catchment is underlain by sandstones and shales, while the uplands along the eastern edge of the catchment from Maghera to the Slieve Bearnagh Hills is underlain by impure limestone, red sandstones and with some metamorphic rocks on the highest parts of the uplands.

The southwestern part of the catchment from Loop Head to Killadysert is drained by a series of small rivers which drain into the Shannon Estuary. The most significant of these rivers (from west to east) are the Doonagh, Moyasta, Wood, Crompaun, and Cloon Rivers.

The River Fergus rises to the southeast of Kilfenora as the Kilmore, Clooneen and Commonage Streams. The Fergus flows east and then turns south into Inchiquin Lough. Numerous underground flow routes have been identified that show much of the water flowing underground in the northern Burren part of the catchment resurfaces at springs that join the Fergus upstream or near Inchiquin Lough.

South of the Lough, the Fergus is joined from the west by the Craggaunboy River, before turning east and flowing through Corrofin and into Lough Atedaun, along with the Kilvoydan River. The Fergus then continues eastwards until it is joined by the Castle or Moyree River. Downstream of this confluence, the Fergus is joined by the Millbrook River and the Doonagh River. Continuing south, the Fergus is joined by the Shallee River and the Inch River. Downstream of Ennis, the Spancelhill River enters the Fergus which continues south to the tidal limit at Clarecastle. The Rine River then flows into the estuary from the east, before the Fergus joins the Shannon Estuary to the west of Shannon Airport.

The Owenogarney River rises near the summit of Moylussa and flows through Sixmilebridge and past Bunratty and into the Shannon Estuary. The south-eastern section of the catchment is drained by a series of southerly flowing stream that flow into the northern side of the Shannon Estuary. Estuarine embankment works have been completed along the banks of the Shannon in Clare from 1958 to 1960, on the River Fergus from 1959 to 1960 and on the Owenogarney during 1955-1959. Flood relief works were completed around Sixmilebridge during 1997 and Ennis during 2013.

The Shannon North Estuary catchment comprises 14 subcatchments (Table 1, Figure 1) with 69 river water bodies, 26 lake water bodies, five transitional and five coastal water bodies, and 15 groundwater bodies. There is one heavily modified water body and no artificial water bodies in the Shannon North Estuary Catchment.

Table 1. List of subcatchments in the Shannon North Estuary catchment

Subcatchment ID	Subcatchment Name
27_1	Fergus_SC_040
27_2	Killadysertstream_Sc_010
27_3	Fergus_SC_030
27_4	Wood_SC_010
27_5	Cloon[Clare]_Sc_010
27_6	Rine_SC_010
27_7	Fergus_SC_010
27_8	Doonah_SC_010
27_9	Owenslieve_SC_010
27_10	Fergus_SC_050
27_11	Ballygirreen_Sc_010
27_12	Owenogarney_SC_020
27_13	Owenogarney_SC_010
27_14	Fergus_SC_020

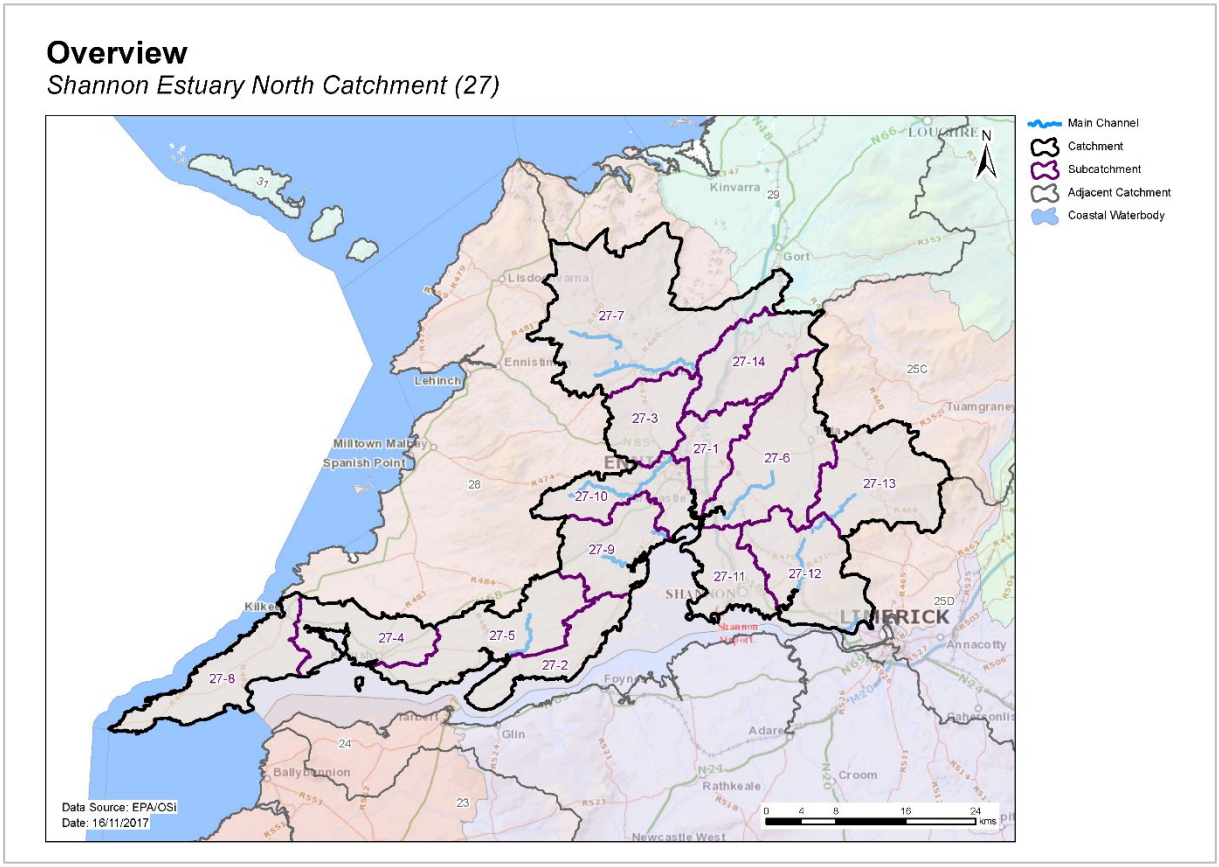


Figure 1. Subcatchments in the Shannon North Estuary catchment

2 Water body status and risk of not meeting environmental objectives

2.1 Surface water ecological status

2.1.1 Rivers and lakes

- There were 36 (38%) river and lake water bodies at Good or High status, and 28 (29%) at less than Good status in 2015 (Table 2, Figure 2). Thirty-one (33%) river and lake water bodies are Unassigned.
- Four river water bodies and sites (Owenogarney_010, Owenogarney_020, Broadford_020 and Owenslieve_010) and one lake (Cullaun) have a high ecological status objective. In 2015, all four river water bodies were at High status, whilst the lake was at Good (Figure 3, Appendix 1).
- Since 2007-09 when WFD monitoring began, ten river water bodies have an improved status whereas eight have deteriorated. Five lake water bodies improved and two deteriorated (Figure 7).
- The variation in nutrient concentrations and loads in the Shannon North Estuary (Fergus) main channel is illustrated in Appendix 2.

2.1.2 Transitional and coastal (TraC)

- There were five (50%) TraC water bodies at less than Good status in 2015. Four TraC water bodies were at Moderate status (Fergus Estuary, Lower Shannon Estuary, Mouth of the Shannon and Shannon Airport Lagoon) and one was Poor status, Upper Shannon Estuary (Figure 2, Table 2). Five (50%) TraC water bodies were Unassigned (Clonderalaw Bay, Cloonconeen Pool, Scattery Island Lagoon, Shannon Plume and Southwestern Atlantic Seaboard).
- The Upper Shannon Estuary declined from Good to Poor status between monitoring cycles. There was no change in the status class for the other TraCs (Figure 7).
- These water bodies do not have a high ecological status objective.
- The numbers of water bodies at each status class in 2007-09 and 2010-15 are shown in Figure 4 (rivers) Figure 5 (lakes) and Figure 6 (TraCs).

Table 2. Summary of surface water body status and risk categories

	Number of water bodies	2010-15 Status						Risk Categories		
		High	Good	Mod	Poor	Bad	Unassigned	*Not at Risk*	*Review*	*At Risk*
Rivers	69	5	25	7	16	0	16	33	13	23
Lakes	26	1	5	5	0	0	15	14	6	6
TraCs	10	0	0	4	1	0	5	2	5	3

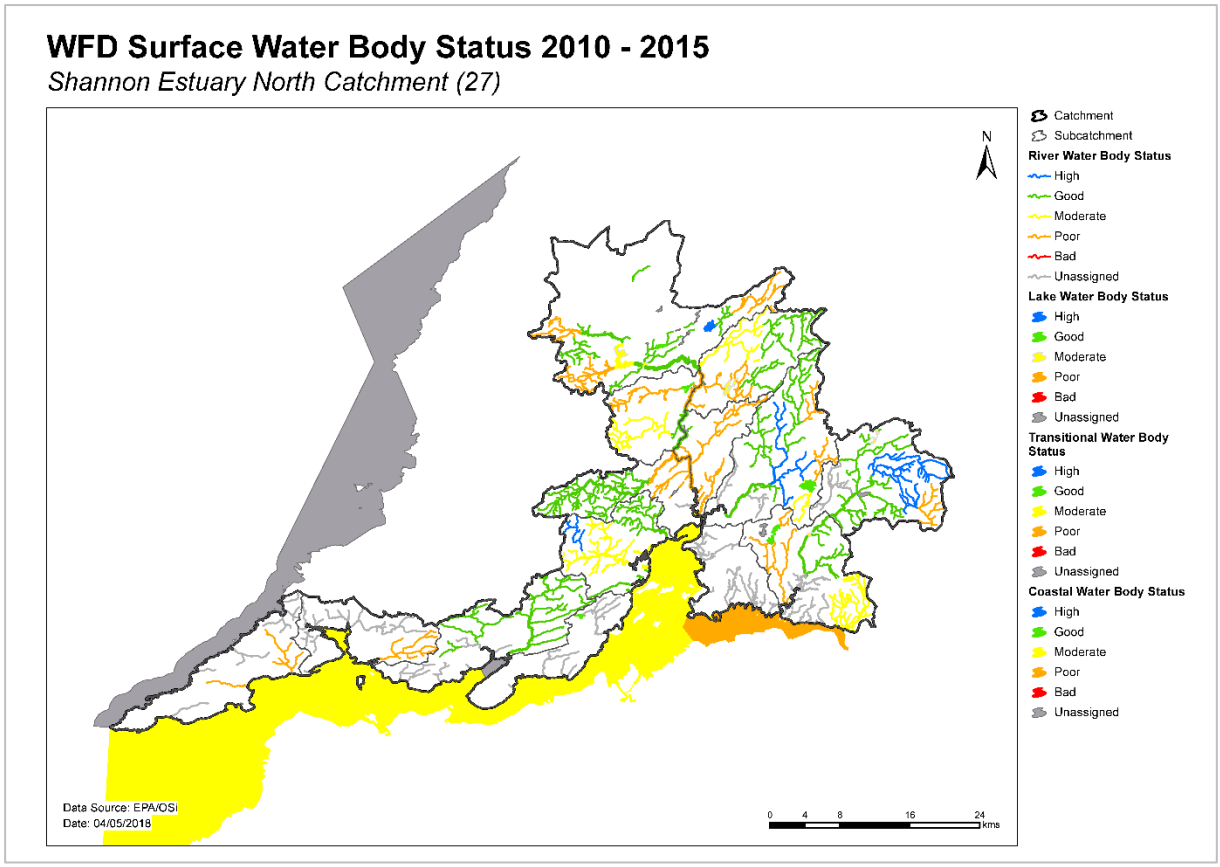


Figure 2. Surface water ecological status

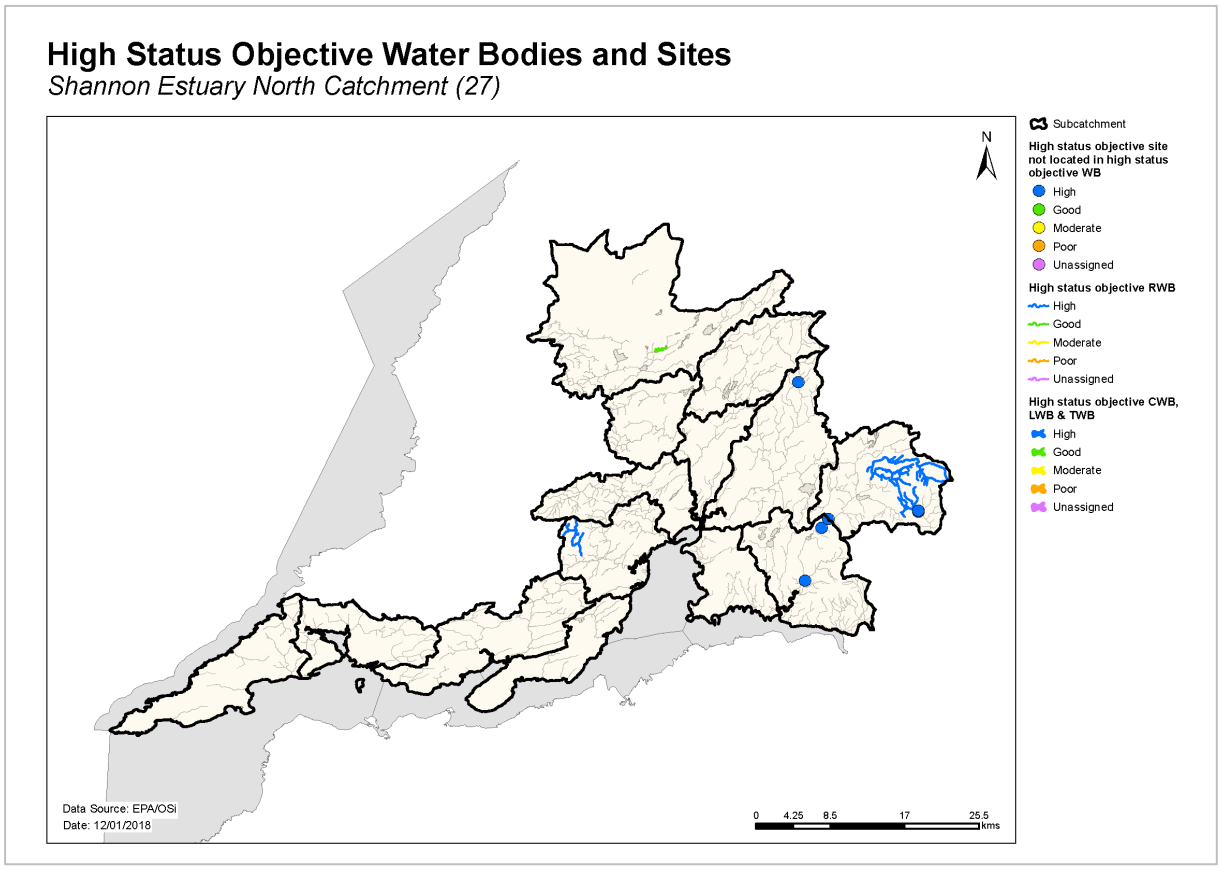


Figure 3. High ecological status objective water bodies and sites

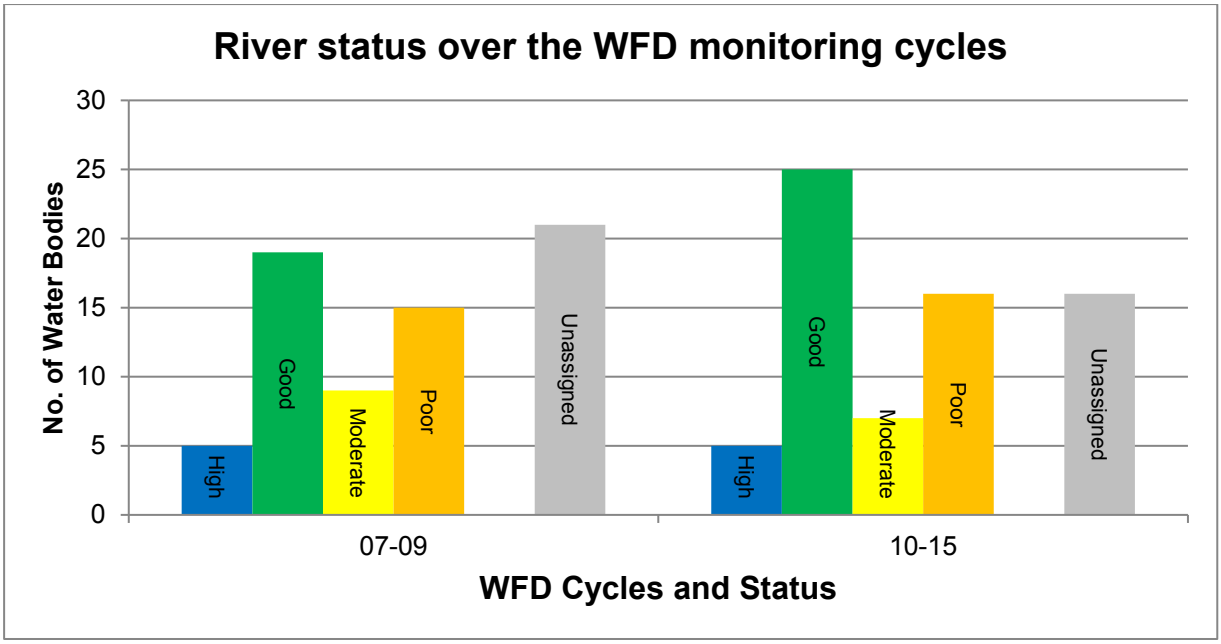


Figure 4. Number of rivers at each status class in 2007-09 and 2010-15

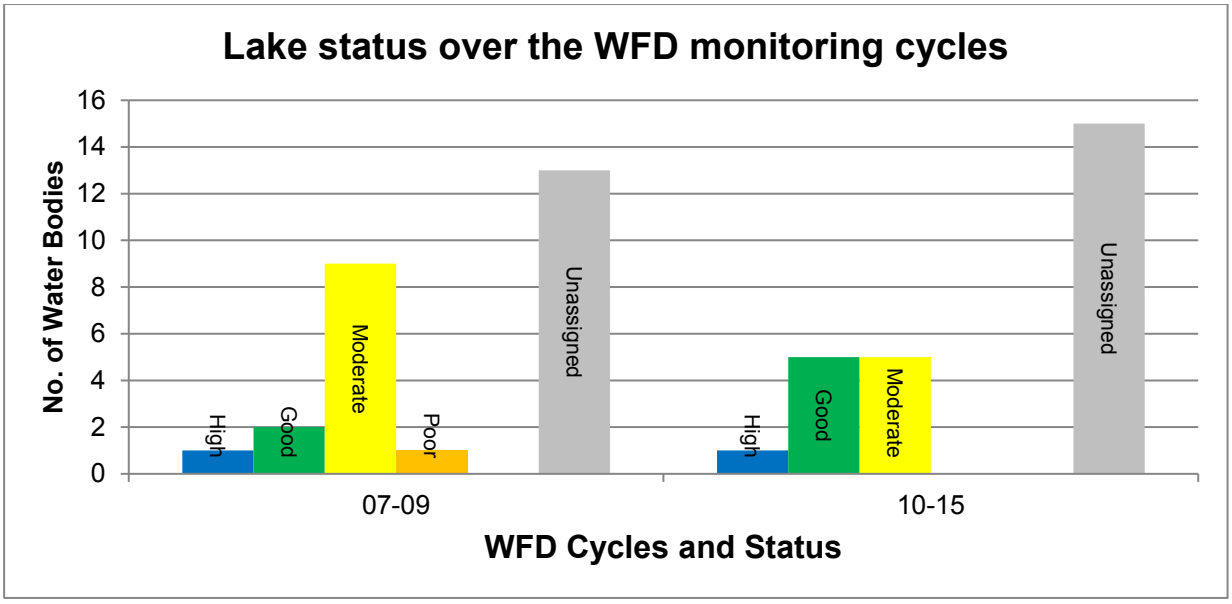


Figure 5. Number of lakes at each status class in 2007-09 and 2010-15

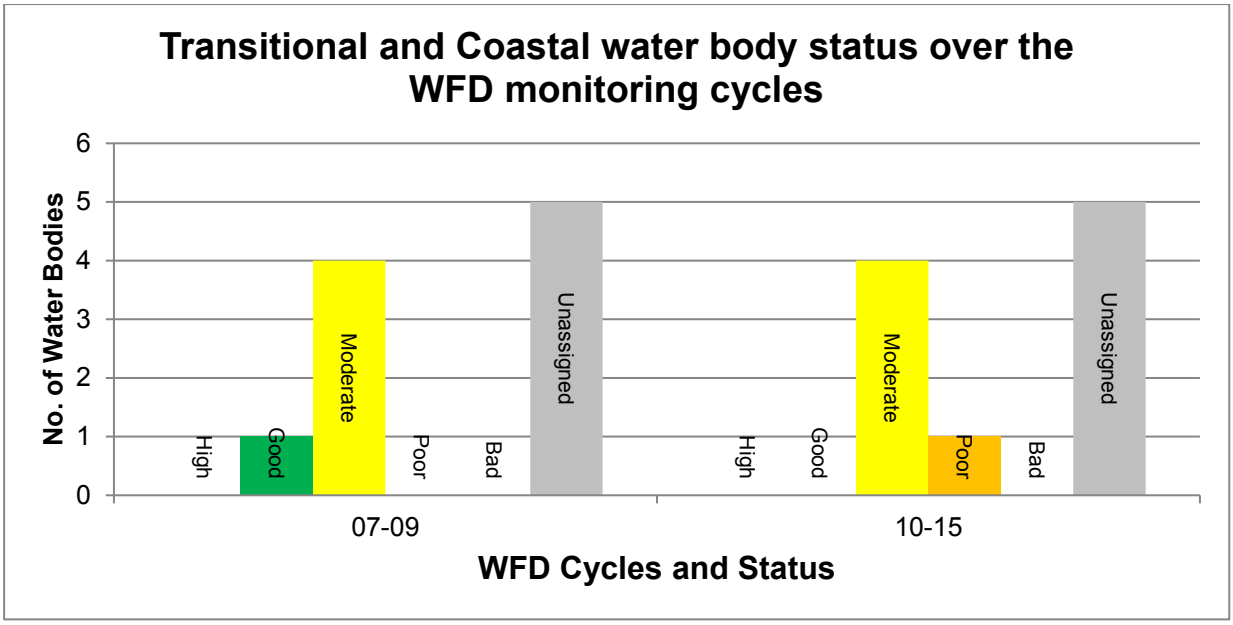


Figure 6. Number of TraCs at each status class in 2007-09 and 2010-15

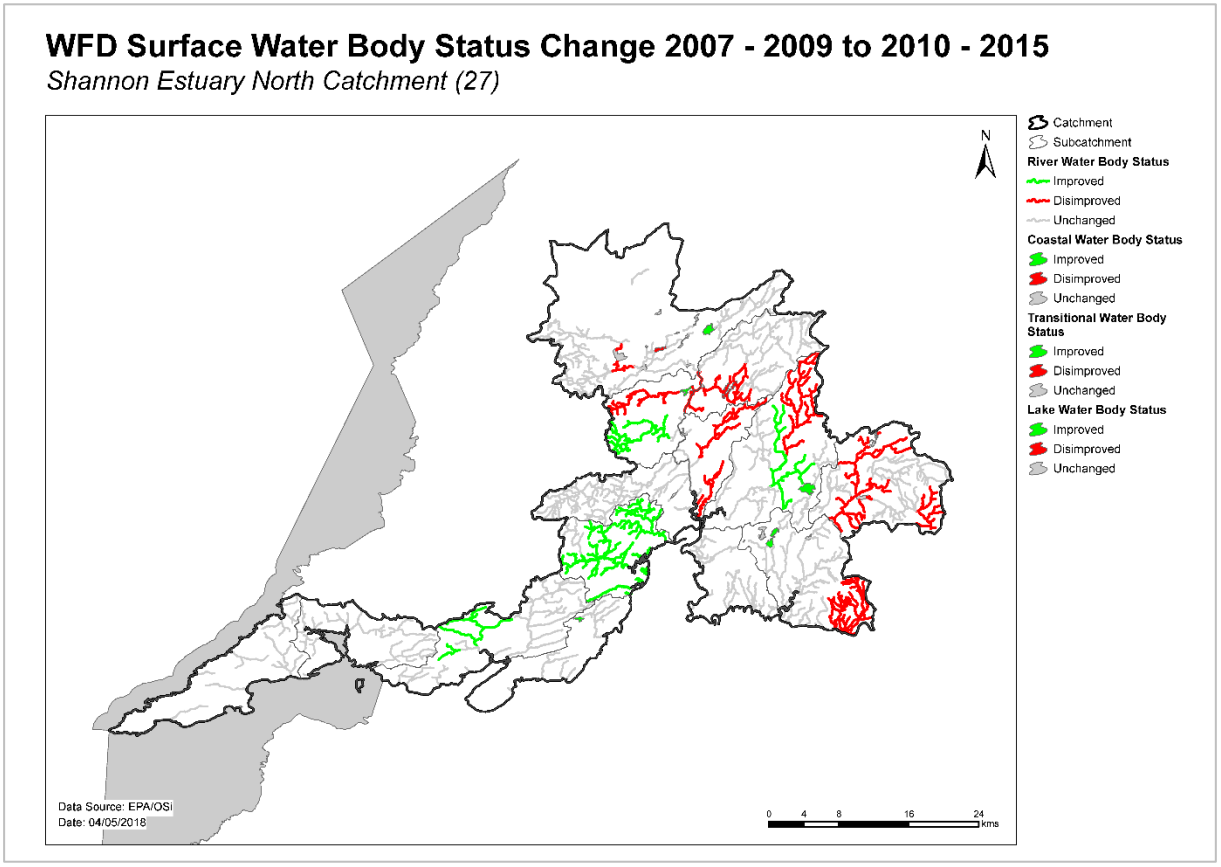


Figure 7. Surface water body status change from 2007-09 to 2010-15

2.2 Groundwater status

- There were 13 groundwater bodies at Good status and two at Poor status in 2015 (Table 3 and Figure 8).
- Limerick City Northwest groundwater body has been at Poor status from 2007-12 to 2010-15. Industrial Facility (P0012-04) was classified at Poor status for 2010-2015 due to improved information being available and the development of technical assessment approaches, rather than there being deterioration in water quality in this water body between 2007-12 and 2010-15. The remaining 13 groundwater bodies were consistently at Good status.

Table 3. Summary of groundwater body status and risk categories

	Number of water bodies	2010-15		Risk Categories		
		Good	Poor	*Not at Risk*	*Review*	*At Risk*
Groundwater	15	13	2	2	10	3

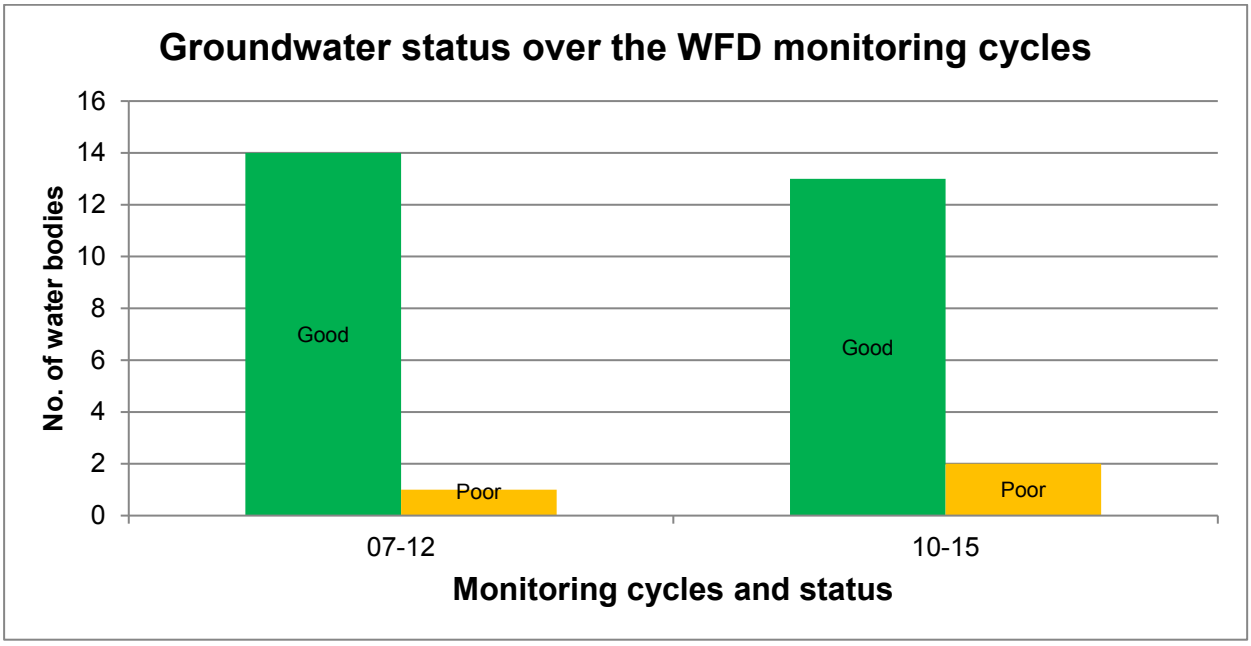


Figure 8. Number of groundwater bodies at each status class in 2007-12 and 2010-15

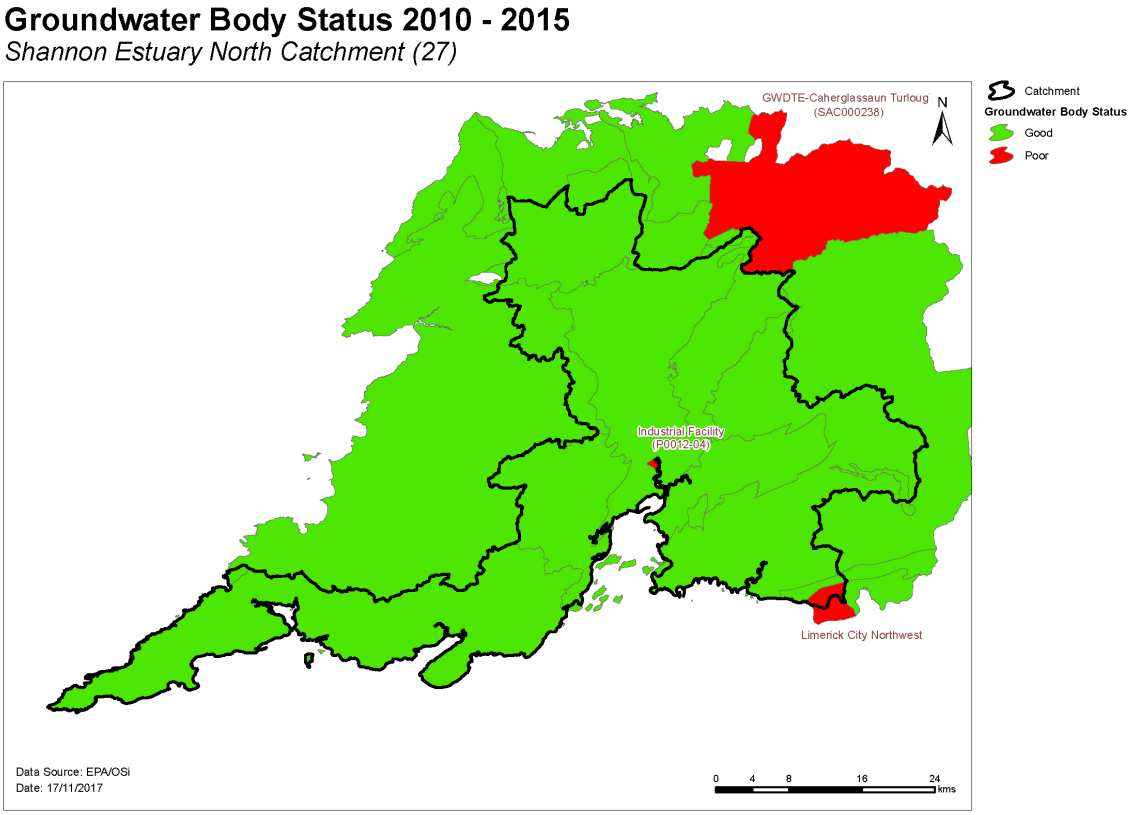


Figure 8a) – Groundwater Body Status

2.3 Risk of not meeting surface water environmental objectives

2.3.1 Rivers and lakes

- There are 33 *Not at Risk* river water bodies and 14 *Not at Risk* lake water bodies (Figure 9, Table 2) and these require no additional investigative assessment or measures to be applied, other than those measures that are already in place.
- There are 13 river and six lake water bodies in *Review*. This includes 17 water bodies where more information is required and two water bodies where measures have recently been implemented and improvements have not yet been realised.
- Twenty-three river and six lake water bodies in the catchment are *At Risk* of not meeting their water quality objectives. Measures will be needed in these water bodies to improve the water quality outcomes. Summary information for the *At Risk* water bodies is given in Appendix 3.

2.3.2 Transitional and coastal (TraC)

- There are two TraC water bodies that are *Not at Risk* (Figure 9), Shannon Plumbe and Southwestern Atlantic Seaboard and therefore require no additional investigative assessment or measures to be applied, other than those measures that are already in place.
- Five TraCs water bodies are in *Review* – Clonderalaw Bay, Cloonconeen Pool, Scattery Island Lagoon, Mouth of the Shannon and Shannon Airport Lagoon. Further information is required for these water bodies.

- Three TraCs water bodies are *At Risk* (Upper Shannon, Lower Shannon and Fergus Estuaries) of not meeting their water quality objectives. Measures will be needed in these water bodies to improve the water quality outcomes.

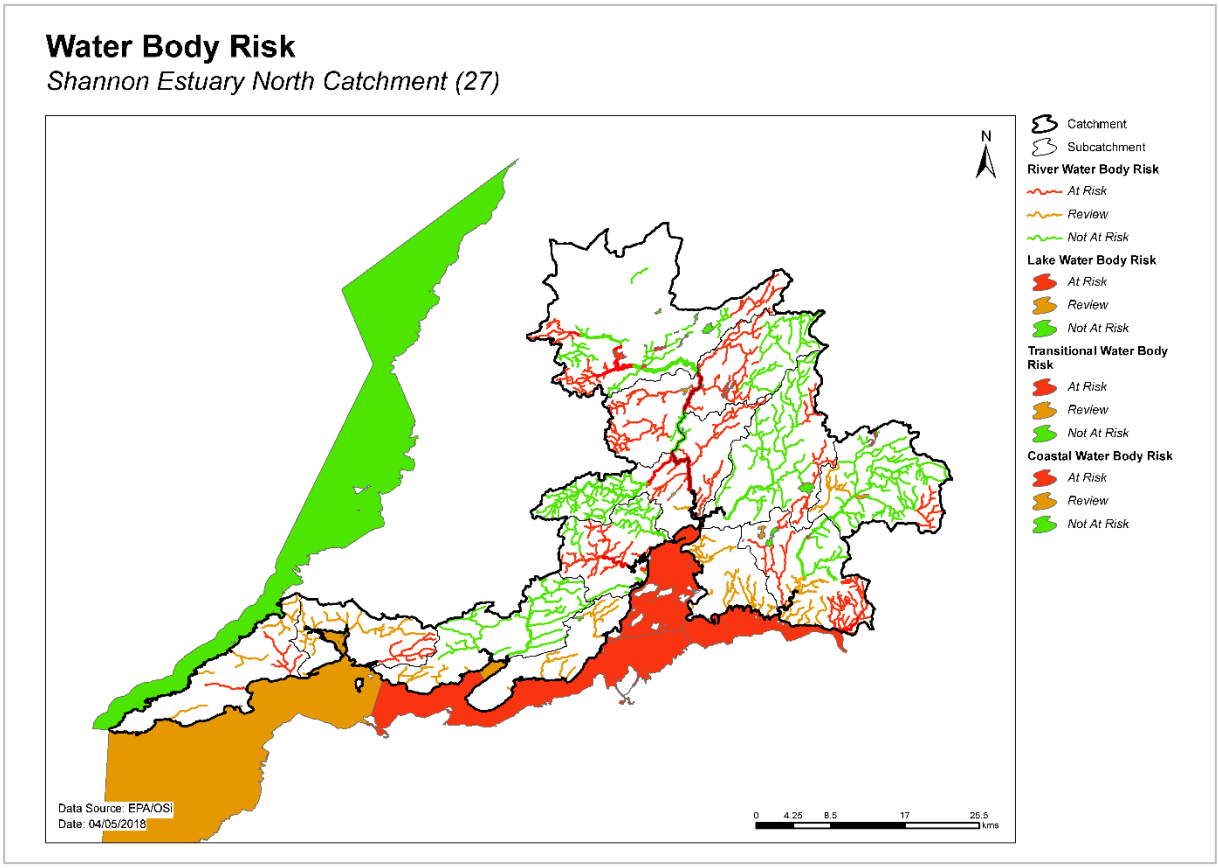


Figure 9. Surface water body risk

2.4 Risk of not meeting groundwater environmental objectives

- Two groundwater bodies (Lissycasey & Kilrush) are *Not at Risk* (Figure 10, Table 3) and require no additional investigative assessment or measures to be applied, other than those measures that are already in place.
- Ten groundwater bodies are in *Review.* For seven of these groundwater bodies, this is due to groundwater contribution of phosphate to associated surface water bodies. For two, Cratloe and Broadford Gravels, this is due to elevated nitrate concentrations. Finally, for GWDTE-Lough Gash Turlough (SAC000051), this is due to ongoing action regarding a WWTP discharge which is not affecting status but is a direct discharge issue.
- There are three groundwater bodies *At Risk; two,* Ennis and Limerick City Northwest, due to elevated phosphate and one, an industrial facility (P0012-04), due to THF and ammonia contamination of groundwater. Measures will be needed in these water bodies to improve water quality outcomes.

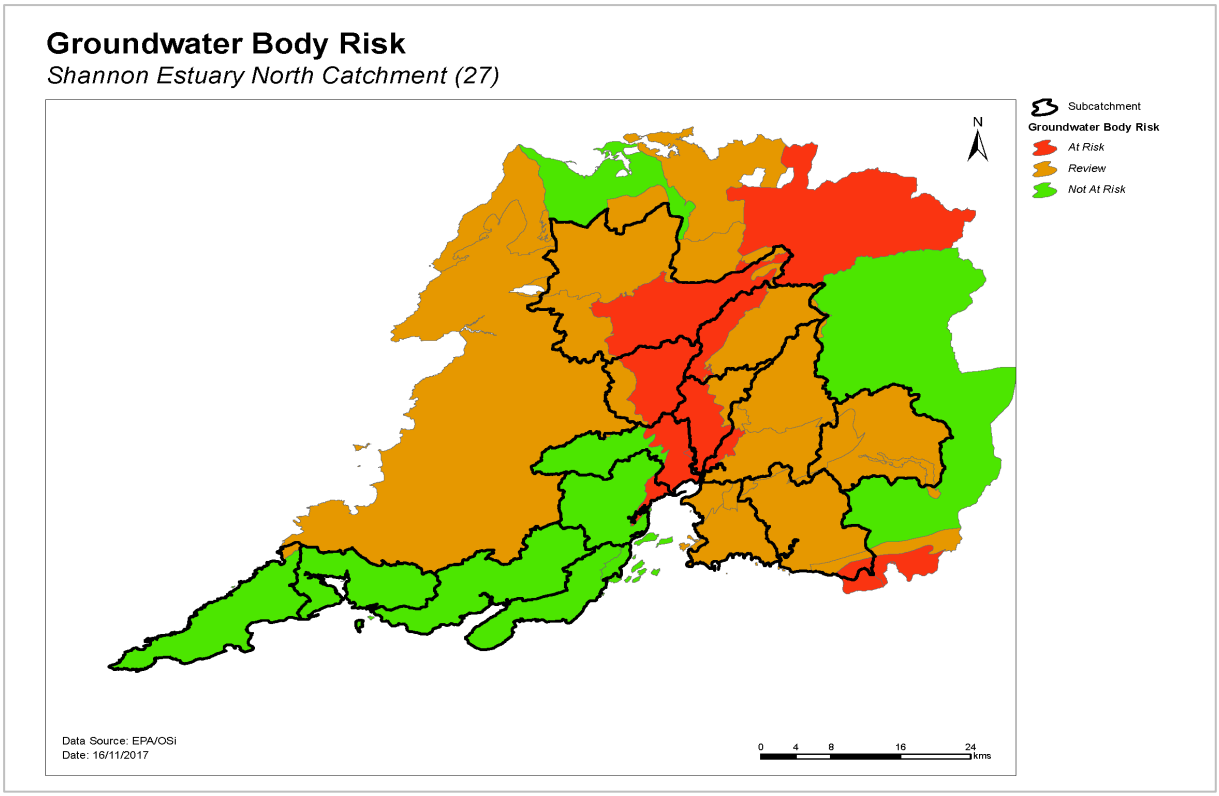


Figure 10. Groundwater body risk

2.5 Protected areas

2.5.1 Drinking water protected areas

- There are 20 abstractions in the Shannon North Estuary Catchment comprising nine private group water schemes, eight public supply schemes and one regional water supply (Shannon/Sixmilebridge RWSS) (Appendix 4).
- Twelve of the abstractions are from three groundwater bodies (Ennis, Burren and Tulla – Newmarket on Fergus); four are from four lakes (Ballyallia, Rosroe, Gortglass and Castle), and four are from four river water bodies (Fergus_020, Fergus_070, Kilkee Lower_010 and Cloverhill Stream_010). The list of the public supplies and the associated water bodies is provided in Appendix 4.
- All drinking water sources were compliant with the standards for nitrate in 2015.
- One drinking water source was non-compliant for pesticides (MCPA and 2, 4-D) in 2015, Shannon/Sixmilebridge RWSS (0300PUB1040) which is an abstraction from Castle Lake.

Table 4. Summary of *At Risk* surface water bodies where phosphate from groundwater may contribute to an impact.

Groundwater body name	Receiving water body code	Receiving water body name
Ennis	IE_SH_27C010900	Castlelodge_010
Ennis	IE_SH_27C070400	Carrownanelly_010
Ennis	IE_SH_27F010300	Fergus_020
Ennis	IE_SH_27F010500	Fergus_040
Limerick City Northwest	IE_SH_25N170970	North Ballycannan_010
Limerick City Northwest	IE_SH_27C090600	Crompaun (East)_010

2.5.2 Bathing waters

- There are three designated bathing waters in the catchment (Table 5). All three were compliant with their water quality objectives.

Table 5. Designated bathing waters in the catchment

Bathing water		Water body intersection		Objective met?	
Name	Code	Name	Code	Yes	No
Ballyallia Lake, Ennis	IESHBWL27_72_0100	Ballyallia	IE_SH_27_72	✓	
Cappagh Pier, Kilrush	IESHBWC060_0000_0100	Mouth of the Shannon (HAs 23;27)	IE_SH_060_0000	✓	
Kilkee	IESHBWC070_0000_0400	Shannon Plume (HAs 27;28)	IE_SH_070_0000	✓	

2.5.3 Shellfish areas

- There are three designated shellfish areas in the catchment (Table 6). All three were compliant with their water quality objectives.

Table 6. Designated shellfish area in the catchment

Shellfish area		Water body intersection		Objective met?	
Name	Code	Name	Code	Yes	No
West Shannon Poulnasherry Bay	IEPA2_0021	Mouth of the Shannon (HAs 23;27)	IE_SH_060_0000	✓	
West Shannon Carrigaholt	IEPA2_0022				
West Shannon Rinevella	IEPA2_0023				

2.5.4 Nutrient sensitive areas

- There is one designated Nutrient Sensitive Area (NSA) (Fergus (River)) associated with one waste water treatment plant (Ennis north).
- Ennis north urban waste water treatment plant was compliant with the environmental objective for NSAs.
- Information on the NSA, associated agglomeration and intersecting water body is provided in Table 7.

Table 7. Nutrient sensitive areas in the catchment

Nutrient Sensitive Area		Agglomeration		Intersecting water bodies		Objective met?		Comment
Name	Code	Name	Code	Name	Code	Yes	No	
Fergus (River)	IERI_SH_2010_0003	Ennis north	D0048	Fergus_070	IE_SH_27F010780	✓		Tertiary treatment is in place

2.5.5 Natura 2000 sites

- There are 27 Special Areas of Conservation (SACs) in the catchment (Appendix 5), not all of which have water quality and/or quantity conservation objectives for their qualifying interests.
- Seven water bodies (4 rivers, 2 lakes, 1 transitional) have been prioritised for action as the water conservation objectives for their habitats and/or species are not being supported by ecological status (Appendix 5).

- There are five Special Protected Areas (SPAs) in the catchment:
    - Ballyallia Lough SPA
    - Corofin Wetlands SPA
    - Loop Head SPA
    - River Shannon and River Fergus Estuaries SPA
    - Slieve Aughty Mountains SPA

  As there are no specific water quality and quantity supporting conditions identified in the site-specific conservation objectives for these SPAs, the intersecting water bodies are not assigned priority action for WFD protected area purposes in the second cycle.

- There is one river water body (Clooneen (Clare)_010) that is designated as a salmonid river (under Salmonid Regulations (S.I. 293 / 1988)) but is not located within a SAC. This water body has been prioritised for action as the water conservation objective for this species is not being supported by ecological status (Appendix 5).

2.6 Heavily modified water bodies

- There is one designated heavily modified water body (HMWB) in the catchment – Fergus_070 due to flood protection. It was classified as having Poor Ecological Potential in 2013-15.
- There are no artificially modified water bodies (AWB) in the catchment.

3 Significant issues in *At Risk* water bodies

- Excess phosphate leading to eutrophication is the dominant issue in rivers and lakes in the Shannon North Estuary catchment. While excess ammonia is also of concern, it is only for a limited number of water bodies.
- The alteration of hydromorphological (or physical) conditions is one of the most significant issues in rivers in the Shannon North Estuary Catchment. This includes inputs of excess fine sediment and alteration of the morphology of the river channel, which in turn alter habitat conditions. This can occur because of, for example, implementing river and field drainage schemes, and embankment schemes and barriers.
- Invasive species is another issue for several the surface water bodies.
- Elevated nutrients are an issue in the Upper Shannon Estuary. Here, moderate status is being driven by DO, fish and benthos in the Fergus estuary.
- Of the 15 groundwater bodies, three are *At Risk*. The issues affecting two of these groundwater bodies include excess phosphorus concentrations that are being delivered to surface water bodies that are *At Risk*, via groundwater. For the third water body, ammonia and THF from an industrial site may also impact associated *At Risk* surface water bodies.

4 Significant pressures

4.1 Water bodies

- Where water bodies have been classed as *At Risk* by water quality or survey data, significant pressures have been identified.
- Figure 11 shows a breakdown of the number of *At Risk* water bodies in each significant pressure category.

4.1.1 Rivers, lakes, transitional and coastal (TraC)

- Significant pressures have been identified through the initial characterisation process in 32 surface water bodies, 23 of which have multiple pressures. The significant pressures will be refined as further characterisation is carried out.
- The significant pressure affecting the greatest number of water bodies is agriculture followed by other, forestry, hydromorphological pressures, domestic waste water, diffuse urban, urban waste water and industry (Figure 11).
- The significant pressures affecting the TraC water bodies in this catchment are agriculture (Fergus and Upper Shannon Estuaries) and an unknown pressure in the Lower Shannon Estuary.

4.1.2 Groundwater

- Whilst Ennis groundwater body is at Good status, agriculture is a pressure and it is *At Risk* as it is contributing phosphate to hydrologically connected surface water bodies that are *At Risk* (Table 3). Agriculture is also a pressure on Limerick City Northwest groundwater body, and there are several associated *At Risk* river water bodies where phosphate from groundwater may be contributing to an impact. Finally, Industrial Facility (P0012-04) is *At Risk* due to THF and ammonia emissions from the industrial site.

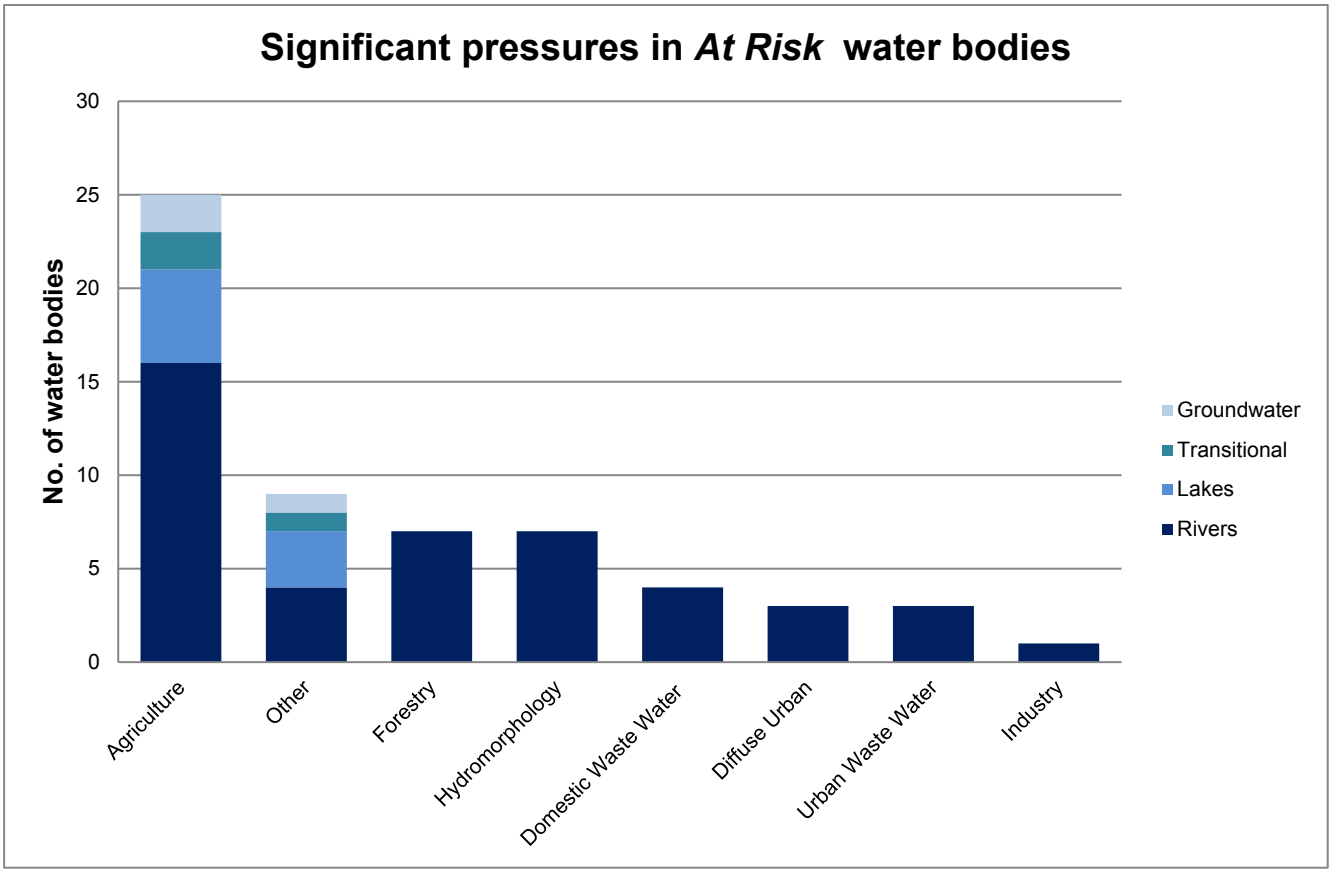


Figure 11. Significant pressures impacting on *At Risk* water bodies

4.2 Pressure type

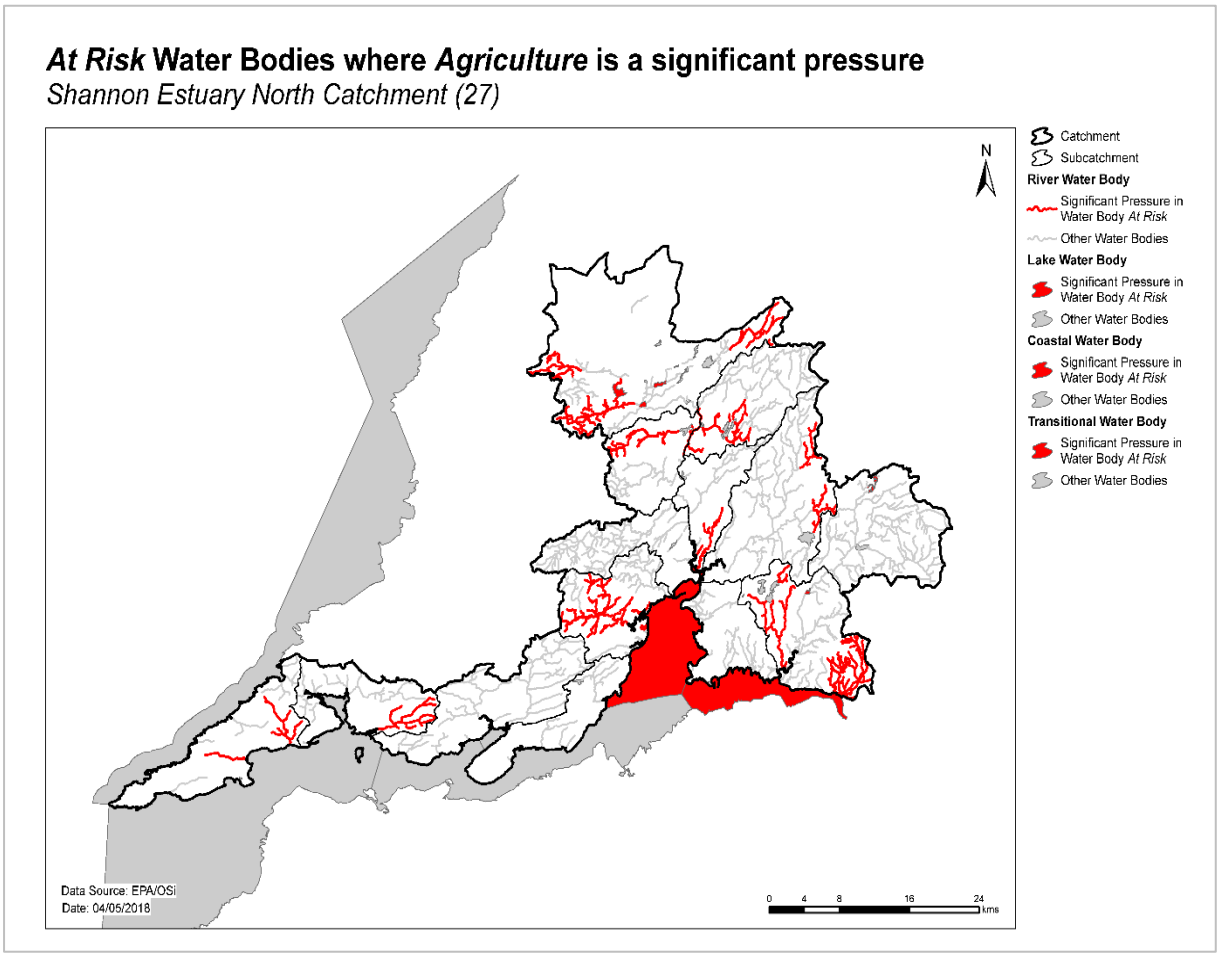
4.2.1 Agriculture

- Agriculture is a significant pressure in 16 river water bodies, five lakes and two TraC water bodies, across several subcatchments.; the water bodies affected by farming are shown in Figure 12. The issues related to farming in this catchment are diffuse phosphate loss to surface waters mainly in areas of poorly draining soils and direct discharges from farmyards, resulting in excess nutrients (elevated phosphate and ammonia) in surface waters. The pollution impact potential map showing areas of relative risk for phosphorus loss from agriculture to surface water is given in Appendix 6.Sedimentation is also an issue in some rivers, due to animal access or extensive poaching. Land drainage for agricultural purposes has been noted by both IFI and Clare County Council as a significant pressure in several rivers.

- Lake water bodies are also affected by agricultural pressures with contributing elements include areas of poorly draining soils combined with large dairy farms which results in elevated nutrients and enrichment. In some areas, the karst landscape facilitates groundwater contribution of nutrients and the transport of nutrients from pressures that are some distance from the lakes.

- The agricultural pressures on the two groundwater bodies are linked to the contribution of phosphate to associated surface water such as CASTLELODGE_010 and CARROWNANELLY_010.

Figure 12. Water bodies that are *At Risk* and are impacted by agricultural activities



4.2.2 Other significant pressures

- *Unknown Anthropogenic*

  There are eight water bodies where the significant pressure is unknown and further characterisation is required. It is thought that the zebra mussels in Inchicronan lake are masking another issue which is an unknown pressure. (Figure 13).

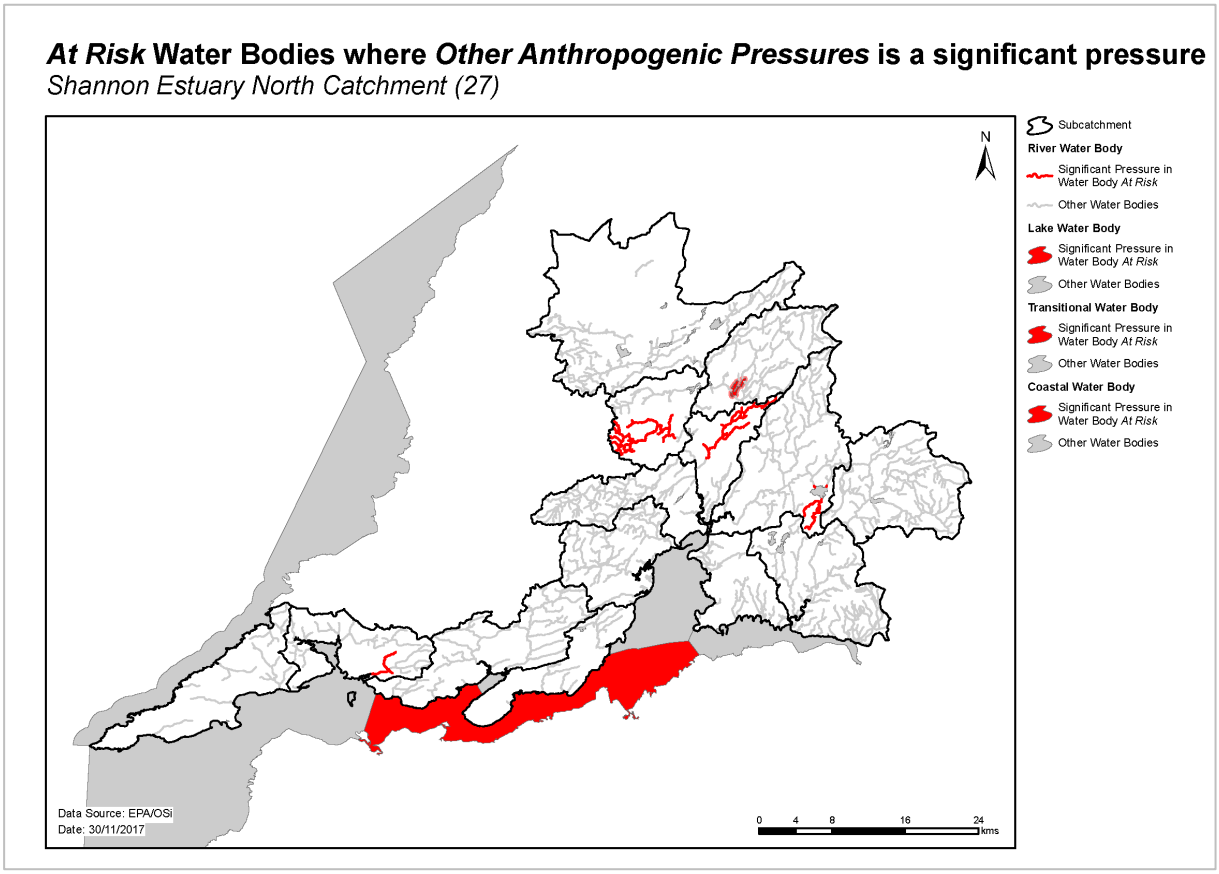


Figure 13. Water bodies that are At *Risk* and are impacted other anthropogenic pressures

- *Invasive Species*

  Three of the lake water bodies (Castle CE, Inchicronin and Bridget) have zebra mussels present, which have been identified as a significant pressure (Figure 14).

4.2.3 Forestry

- Forestry has been identified as a significant pressure in seven water bodies (Figure 15). The significant issues are a combination of general forestry practices, clearfelling, road construction (Wood_020, Cullaun_010) and afforestation (Clooneen (Clare)_010), which have resulted in heavy siltation and excess nutrients in surface water bodies.

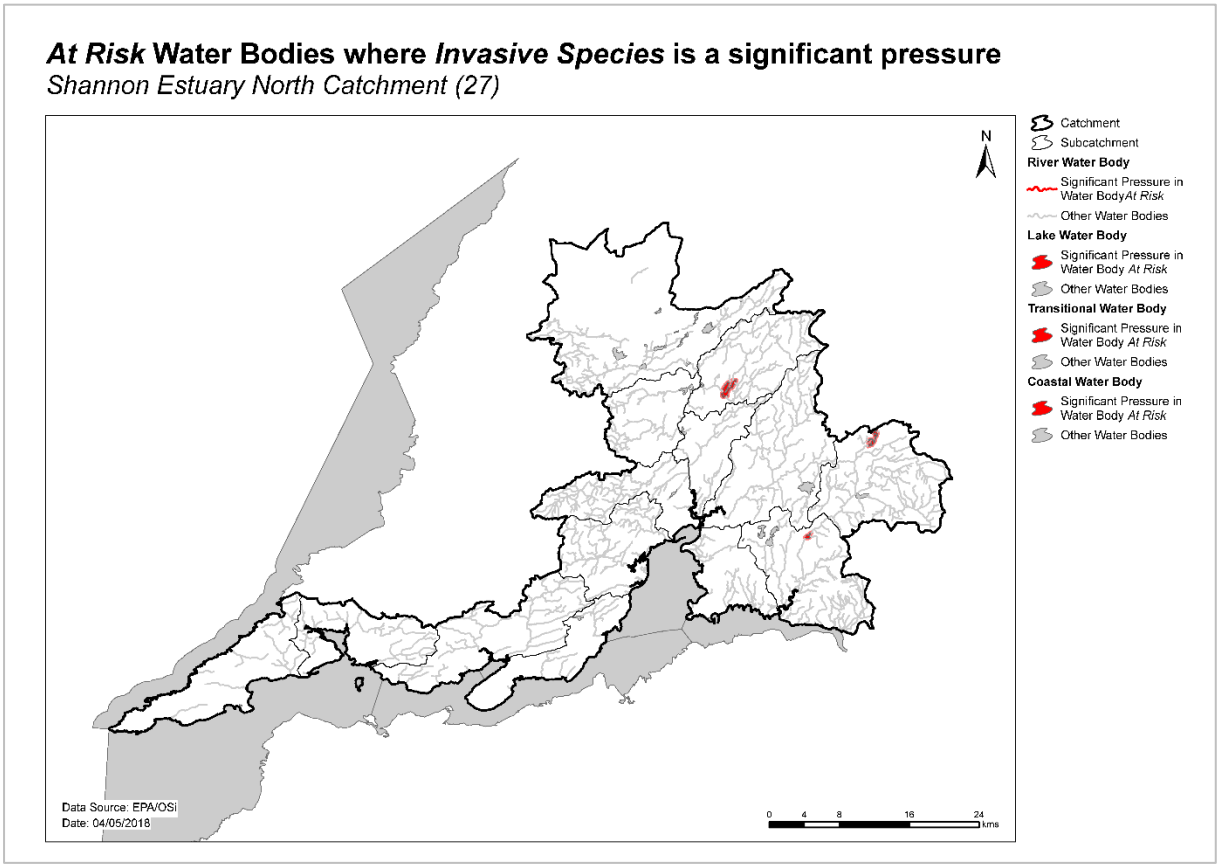


Figure 14. Water bodies that are *At Risk* and are impacted by invasive species

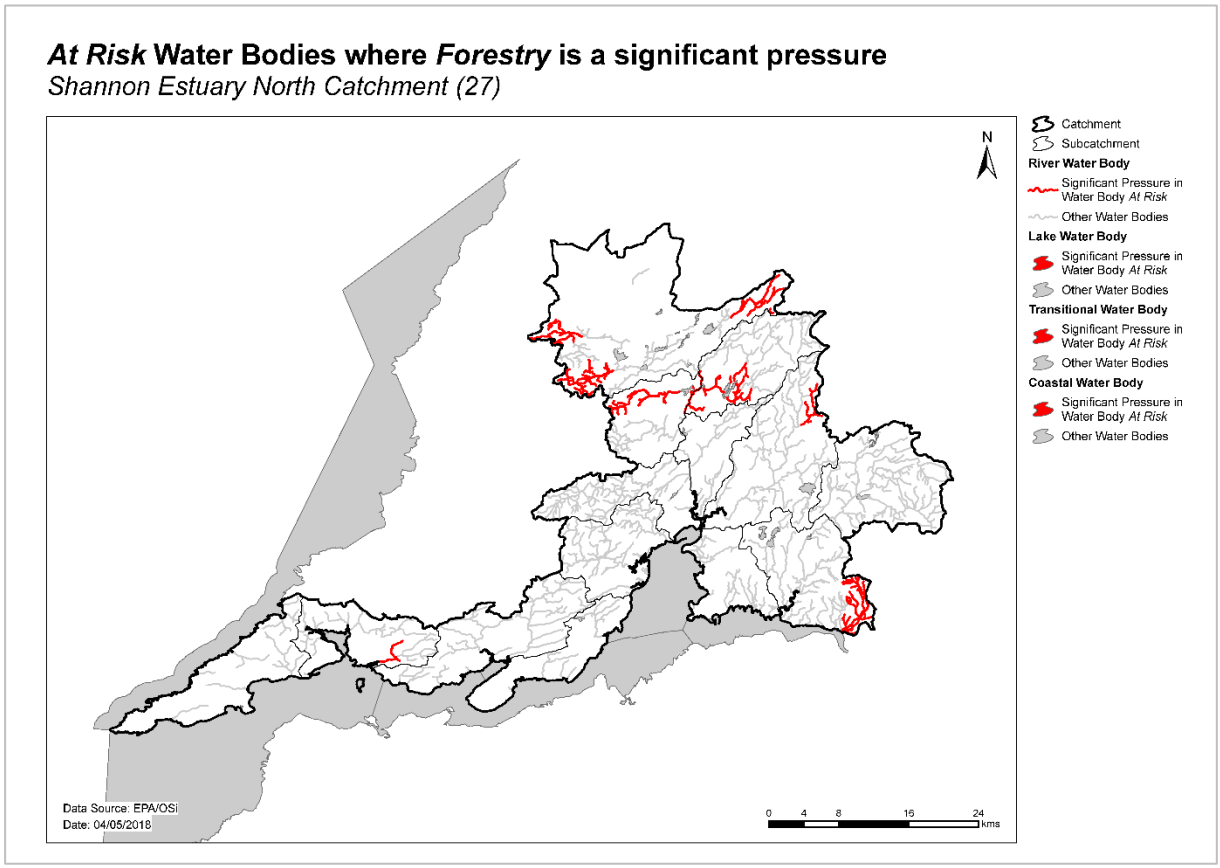


Figure 15. Water bodies that are *At Risk* and are impacted by forestry activities

4.2.4 Hydromorphology

- Six river water bodies within the Fergus and Owenogarney subcatchments are subject to extensive hydromorphological modification due to the presence of drainage schemes, which has led to high levels of siltation. Furthermore, four river water bodies within these sub-catchments are also subject to bank modification due to the presence of embankment schemes. A barrier is present within a river water body of the Fergus subcatchment which may be impacting fish migration. The seven river water bodies impacted by hydromorphological pressures area illustrated in Figure 16 and Table 7a.

Table 7a – Hydromorphological Pressures in the Shannon North Estuary Catchment

Pressure	Sub-Catchment	Water body Code
Channelisation	Fergus (SC27_1), (SC27_10)	Fergus_060, Fergus_070
	Owenogarney (SC27_12)	Cratloe_010, Crompaun(East)_010 Cloverhill Stream_010
	Owenogarney (SC27_13)	Broadford_010
Bank Modification (Embankment)	Fergus (SC27_1)	Fergus_070
	Owenogarney (SC27_12)	Cratloe_010, Crompaun(East)_010 Cloverhill Stream_010
	Fergus (SC27_10)	Fergus_070
In River Structures	Fergus (SC27_14)	Moyree_030

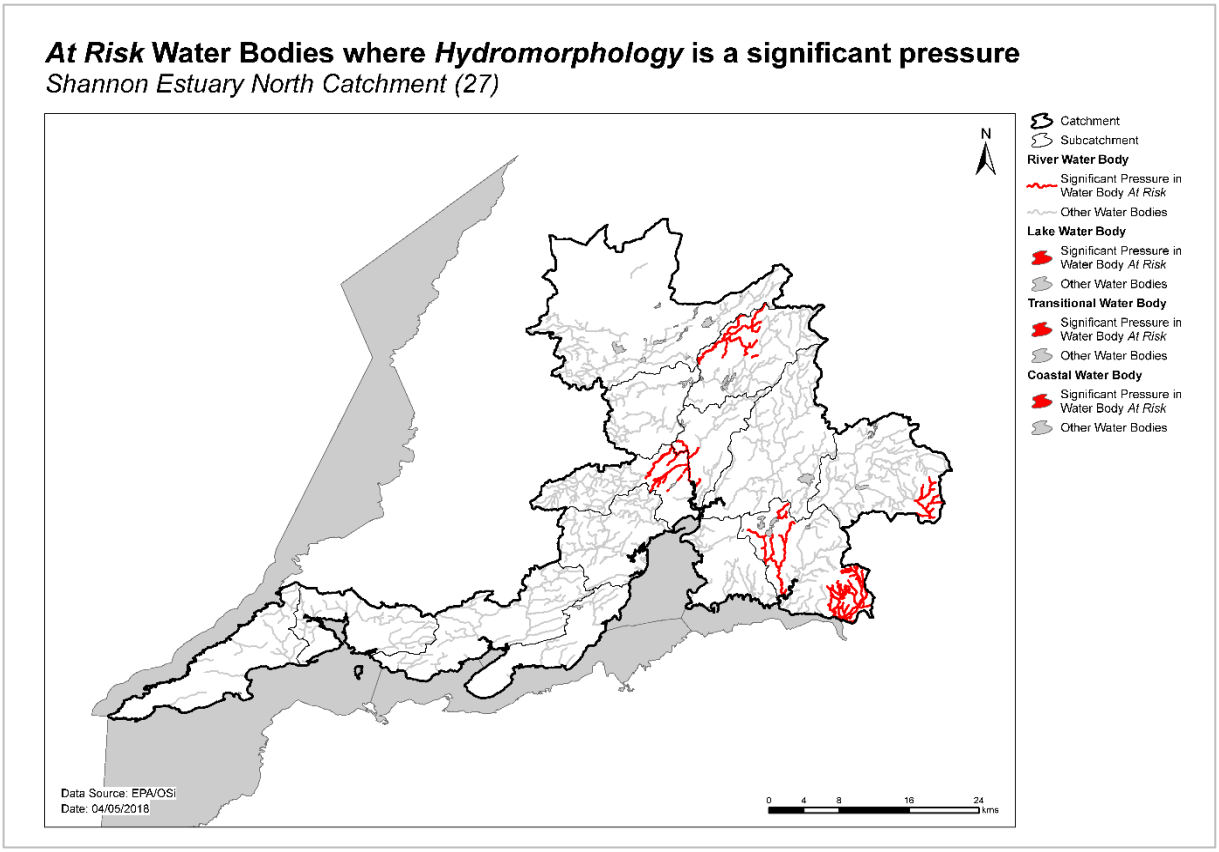


Figure 16. Water bodies that are *At Risk* and are impacted by hydromorphological pressures

4.2.5 Domestic waste water

- Domestic waste water has been identified as a significant pressure in four water bodies – Cratloe_010, Crompaun (East)_010, Cloverhill Stream_010 and Moyana_010 (Figure 17). This are due to several septic tank systems in close proximity to the water bodies, which are on poorly draining soils. The significant impacts are due to excess nutrients entering surface waters. In some areas, there are a large numbers of septic tank systems mapped on areas of high susceptibility to phosphate transport via near surface pathways.

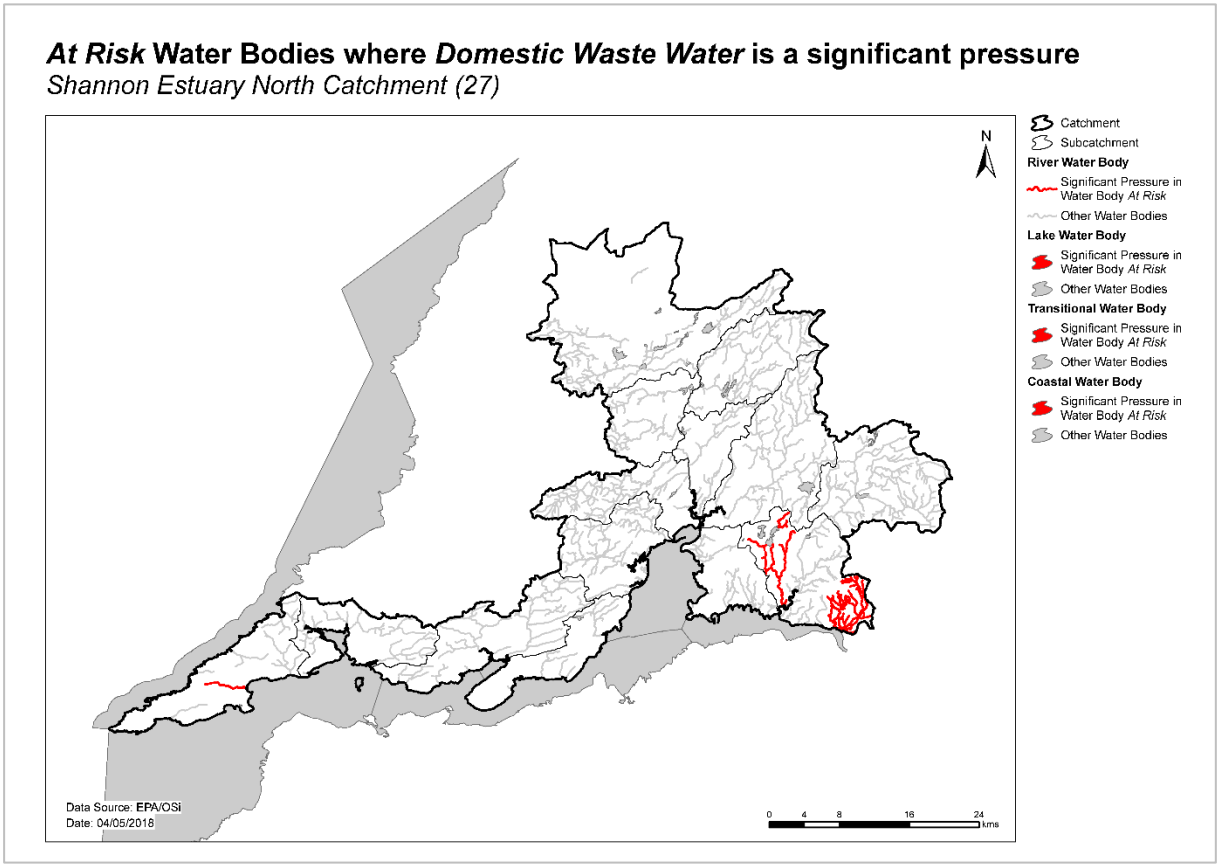


Figure 17. Water bodies that are At Risk and are impacted by domestic waste water

4.2.6 Diffuse urban

- Diffuse urban pressures, caused by misconnections, leaking sewers and runoff from paved and unpaved areas, have been identified as a significant pressure in three river water bodies – Carrownanelly_010 (Ennis), Fergus_020 (Corofin) and Wood_020 (Kilrush) (Figure 18). Elevated concentrations of phosphates and ammonia are the significant impacts.

4.2.7 Urban waste water treatment plants

- Urban Waste Water Treatment Plants (WWTPs) and agglomeration networks have been identified as a significant pressure in three *At Risk* water bodies, Fergus_060, Fergus_070 and Liskenny_010; details are given in Table 8 and Figure 19. One *At Risk* water body, Fergus_070, is impacted by the Ennis North WWTP, which is due for upgrade in 2017. However, the Ennis North agglomeration network, which is currently not specified in improvement plans, is impacting Fergus_060.

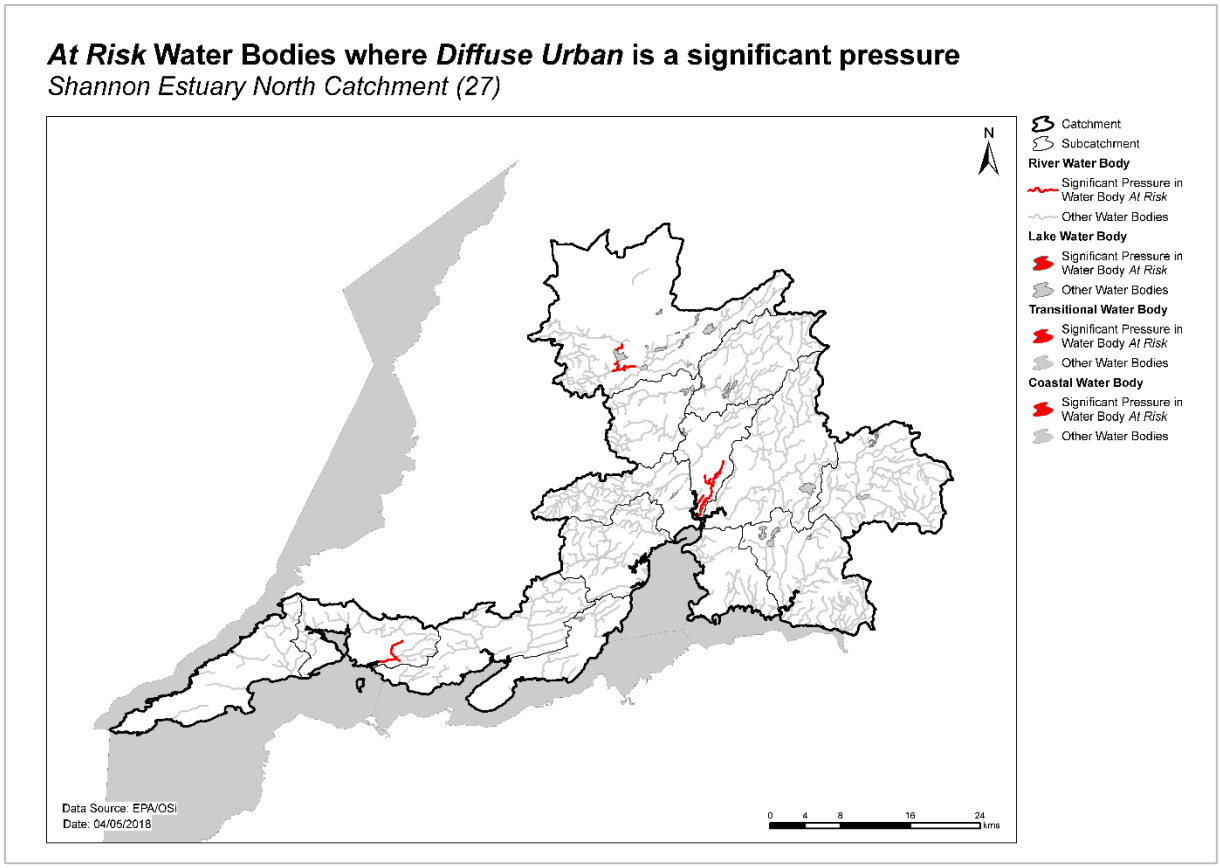


Figure 18. Water bodies that are in At Risk and are impacted by diffuse urban impacts

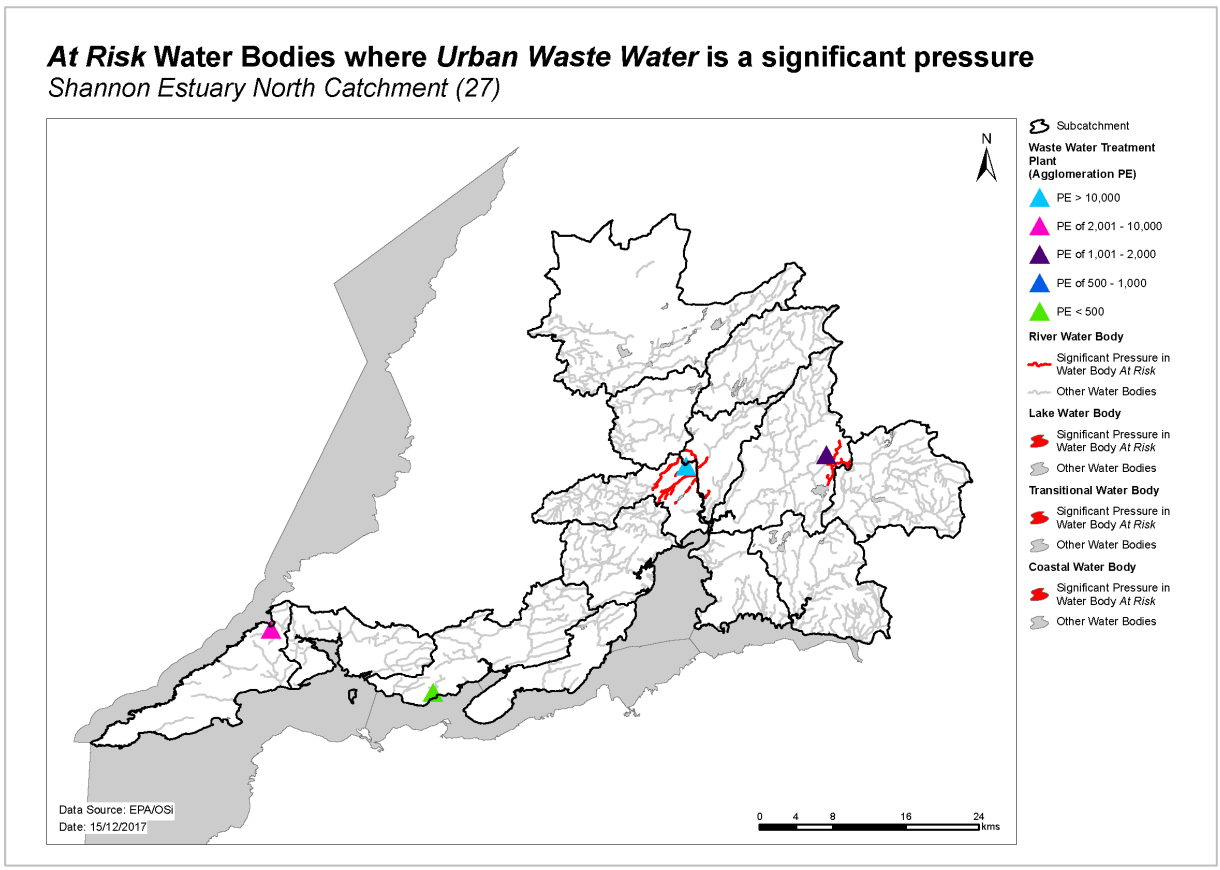


Figure 19. Water bodies that are *At Risk* and are impacted by urban waste water

Table 8. Waste Water Treatment Plants and agglomerations identified as Significant Pressures in *At Risk* water bodies and expected completion dates for associated upgrade works, where applicable.

Facility name	Facility Type	Water Body	2010-15 Ecological Status	Expected Completion Date
Ennis North D0048	> 10,000 p.e.	*Fergus_060*	Poor	*NA* [1]
Ennis North D0048	> 10,000 p.e.	Fergus_070	Poor	Complete
Tulla D0320	1,001 to 2,000 p.e.	Liskenny_010	Poor	*NA* [2]

4.2.8 Industry

- Discharges from an industrial site have been identified as a significant pressure in Moyana_010 (Figure 20), with nutrients being the significant issue.

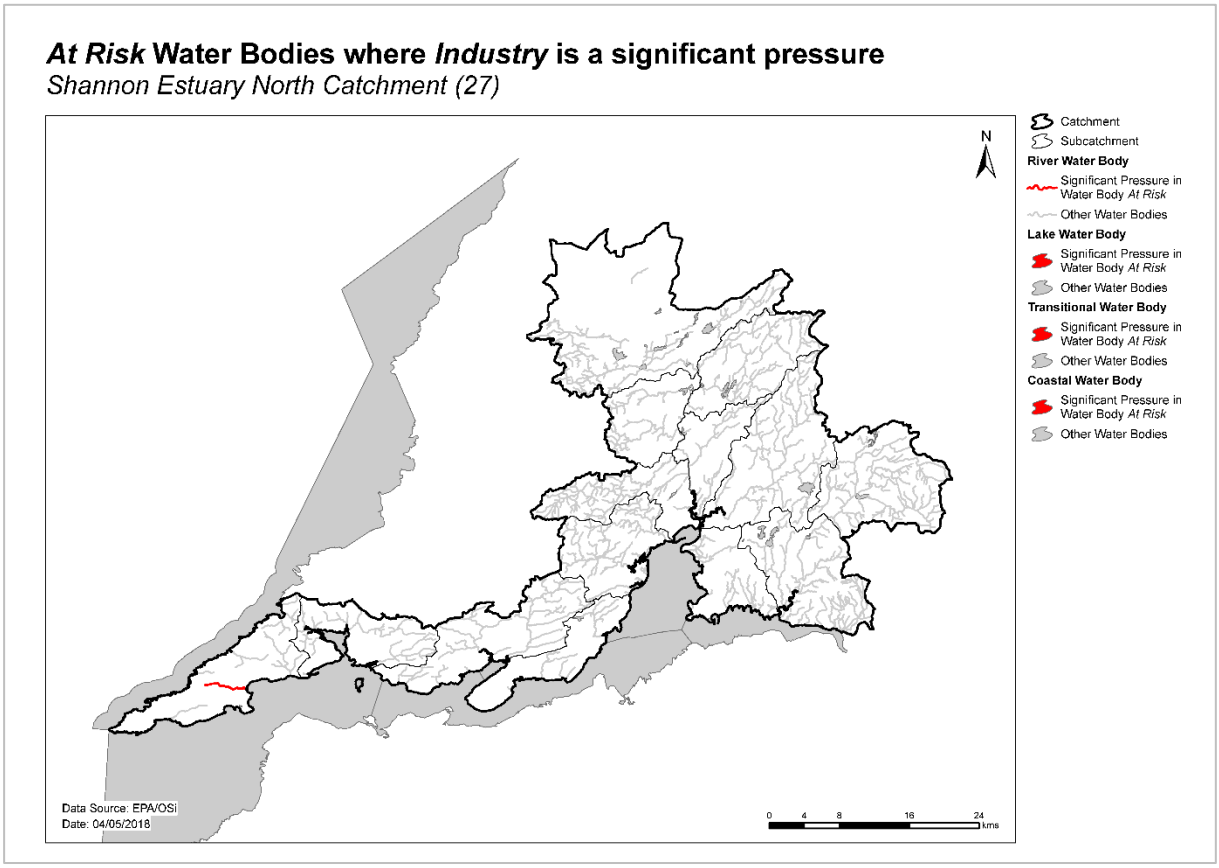


Figure 20. Water bodies that are *At Risk* and are impacted by industrial pressures

[1] *The Ennis North WWTP is due for upgrade in 2017, however, the Ennis North agglomeration network, which is currently not specified in improvement plans, has been identified as a significant pressure impacting Fergus_060.*

[2] *Currently not specified in improvement plans.*

5 Load reduction assessment

5.1 River water body load reductions

- The results of the main channel assessment for the Fergus River indicate that orthophosphate is the parameter of concern (Appendix 2).
- For water bodies where phosphorus monitoring data are available, the reduction in P load that would be required to bring the mean concentration back to the EQS of 0.035 mg/l as P, can be estimated using a simple method based on the average 2013 to 2015 concentration and the average flow, or the estimated 30th percentile flow (Q30) where flow data are not available. The relative load reductions are ranked on a national scale from Very High (>1 kg/Ha/y), to High (0.5-1 kg/Ha/y), to Medium (0.25-0.5 kg/Ha/y) to Low (<0.25 kg/Ha/y). Note that P load reductions may also be required in other water bodies, but without chemistry monitoring data a quantitative estimate cannot be calculated.
- In the Shannon, North Estuary catchment, the available water chemistry data indicate that load reduction is required in two river water bodies (Table 10).

Table 10. Relative load reductions required in monitored water bodies that are *At Risk.*

Water body	P Load Reduction Required
Doonaha_010	High
Moyana_010	Low

5.2 TraC load reductions

Some 18 estuaries in Ireland have been monitored on a continual basis since 1990 as part of Ireland's commitment under the Convention for the Protection of the Marine Environment of the North-East Atlantic (the Ospar Convention). This has shown that generally over the long term, nutrients have decreased but further reduction will be required in many cases to support Good Ecological Status. However, many estuaries have not been monitored to the same degree, and where monitoring data in insufficient, an ongoing programme of modelling has been undertaken to estimate potential nutrient load removal from contributing sub-catchments.

Different estuaries may require reductions in different nutrients. Further modelling work is required to determine precisely what load reductions are required, but in the interim, further monitoring will be carried out to assess the improvements resulting from various planned measures, and to confirm the nature of the issues.

- Nutrient concentrations in the Upper Shannon Estuary are satisfactory and it appears that no further reductions are required. N&P are Good/High but the biological quality, particularly invertebrate status, is poor.

- The Fergus Estuary is at Moderate Status due to fish, dissolved oxygen status, and benthos, although the nutrient status is satisfactory. The Ennis North WWTP is due for upgrade, and when completed will be expected to lead to an improvement in the quality of the discharge. Further characterisation by a local catchment assessment (IA1) is required on the sub-catchment to identify reasons for Moderate Status for fish and benthos and the measures required.

As part of the Irelands commitment to the Ospar Convention, nutrient flux or load monitoring has been carried out on the Fergus Estuary since 1990 (Figure 20a and 20b). Further analysis of these nutrient load trends is available at http://dx.doi.org/10.3318/BIOE.2016.23.

Figure 20a – Total Nitrogen Load (Tonnes/year) 1990-2015

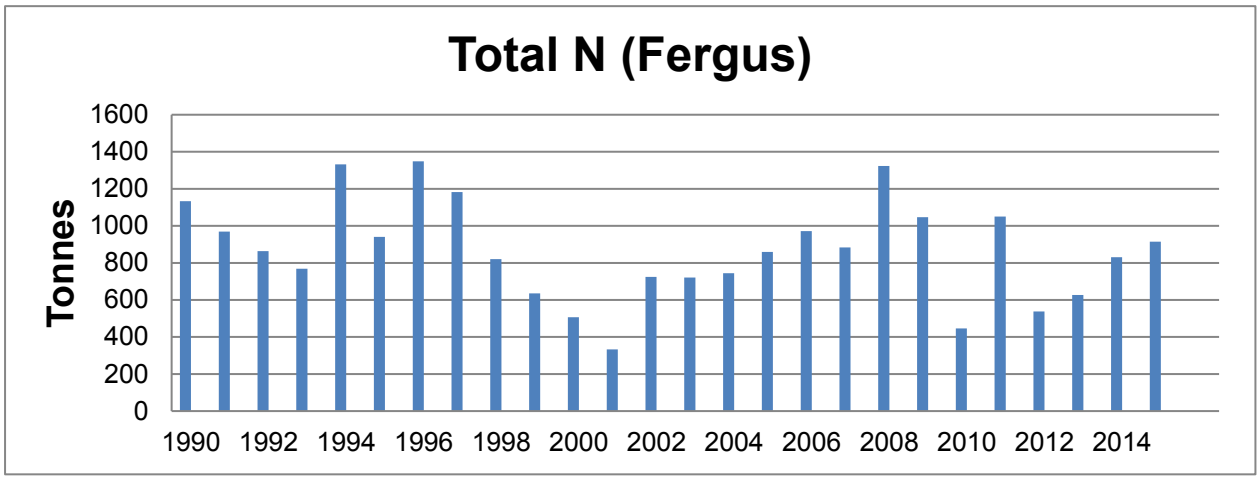
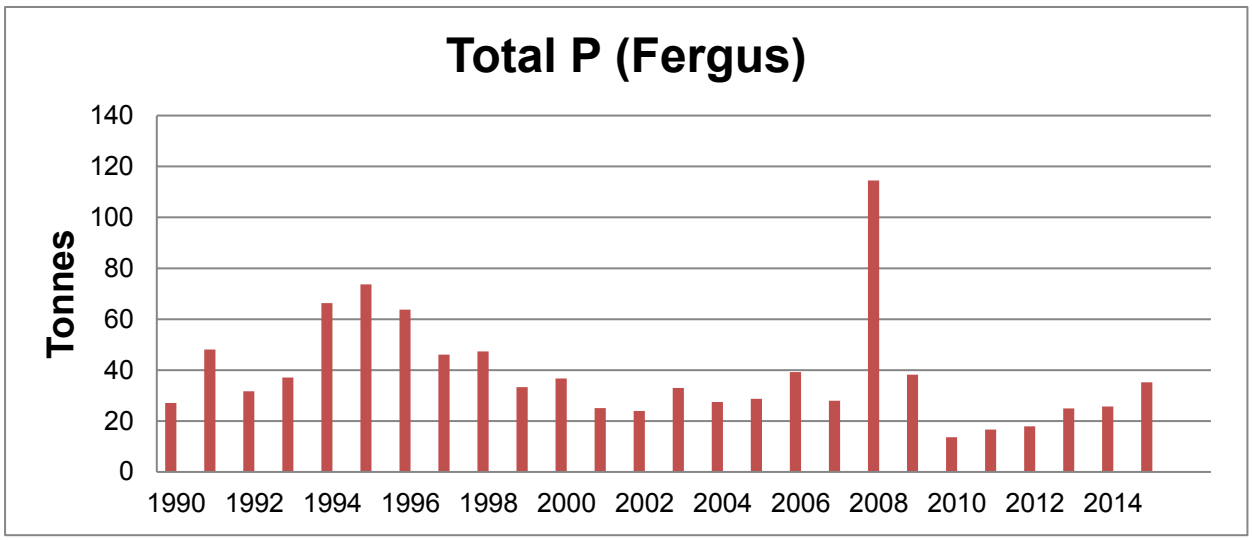


Figure 20b – Total Phosphorus Load (Tonnes/year) 1990-2015



Load calculations are also available for the Shannon Old Channel and the Tail Race. These are shown in the Lower Shannon (HA25D) Report, pages 20-21.

6 Further characterisation and local catchment assessments

- Further characterisation through local catchment assessments is required in 29 of the *At Risk* river and lake water bodies to refine the understanding of the significant pressures at the site/field scale so that specific and targeted measures can be identified.
- Further characterisation through local catchment assessments is needed in 19 of the *Review* water bodies to refine the understanding of the significant pressures at the site/field scale so that specific and targeted measures can be identified.
- Brief definitions on the 10 IA scenarios are given in Appendix 7.

Table 11. Local Catchment Assessment Allocation for *At Risk* and *Review* River and Lake Water Bodies in the Catchment

Risk	IA 1	IA 2	IA 3	IA4	IA 5	IA6	IA 7	IA 8	IA 9	IA10	Total
At Risk	19	0	5	0	7	3	11	1	4	1	51
Review	2	0	13	0	0	1	0	0	1	0	17
Note water bodies may have multiple categories of Local Catchment Assessments											

7 Catchment summary

- Of the 69 river water bodies, 23 are *At Risk* of not meeting their WFD objectives.
- Six of the 26 lake water bodies are *At Risk* of not meeting their WFD objectives.
- Excess phosphorus leading to eutrophication is a major issue in several water bodies. While excess ammonium is also of concern, it is only for a limited number of water bodies.
- Hydromorphological (or physical) conditions (including the input of excessive fine sediment) and poor habitat quality are also issues of concern for a significant number of surface water bodies.
- There are three *At Risk* TraC water bodies. Nutrients status is satisfactory in the Upper Shannon Estuary, although biological status is poor. There is an unknown pressure on the Lower Shannon Estuary and Moderate status is being driven by DO, fish and benthos in the Fergus estuary, despite nutrient status being satisfactory.
- Three groundwater bodies are *At Risk*, with two of these bodies potentially contributing phosphate to hydrologically connected rivers that are *At Risk*. The third water body is impacted by ammonia and THF from an industrial site.

8 Areas for Action

The characterisation outcomes described above have highlighted that there is significant work to do in the catchment to protect and restore water quality, and meet the objectives of the WFD. During the development of the draft river basin management plan it became apparent that there would be a need to prioritise areas for collective action so that the best return on investment could be achieved. 190 Areas for action have been selected nationally in a process as described below. There are four areas for action in the Shannon North Estuary catchment.

8.1 Process of Selection

Following the publication of the draft river basin management plan in early 2017, the EPA and the Local Authority Waters and Communities Office (LAWCO) jointly led a collaborative regional workshop process to determine where, from a technical and scientific perspective, actions should be prioritised in the second cycle. The prioritisation process was based on the priorities in the draft river basin management plan, the evidence from the characterisation process, and the expertise, data and knowledge of public body staff with responsibilities for water and the different pressure types. The recommended areas for action selected during the workshops were then agreed by the Water and Environmental Regional Committees. Since this selection, the Local Authorities Water and Communities Office (LAWCO) have undertaken public engagement and feedback sessions in each local authority.

The recommended areas for action are an initial list of areas where action will be carried out in the second cycle. All water bodies that are At Risk still however, need to be addressed. As issues are resolved, or when feedback from the public engagement process is assessed, areas for action may be removed from the list and new areas will be added. If additional monitoring shows that new issues have arisen, new areas may become a priority and may need to be added to the work programme.

The initial list of areas for action is not therefore considered as a closed or finite list; it simply represents the initial areas where work will be carried out during the second WFD planning cycle 2018-2021.

8.2 Outcomes of process

The outcomes for the Shannon North Estuary catchment are summarised below.

- Four recommended areas for actions (Table 12, Figure 21) were selected.
- These are the Inchiquin and Atedaun lakes, Shallee, Carrigaholt and Broadford.
- These include five *At Risk* river and lake water bodies.
- Three groundwater bodies, that are *At Risk* or *Review* due to groundwater contribution of nutrients to surface water bodies, intersect with three of the recommended areas for action, see Table 10. Actions taken to improve surface water will need to take account of the groundwater contribution to surface water.

A remaining 51 *At Risk* and *Review* surface water bodies were not included in the recommended areas for action for the second cycle. The distribution of these is presented in Figure 22. These include:

- 43 river and lake water bodies – 24 *At Risk* and 19 *Review,* and
- eight transitional and coastal water bodies – three *At Risk* and five *Review.*

Table 12 Recommended Areas for Action in the Shannon North Estuary catchment

Recommended area for action	Number of water bodies	SCs	Local authority	Reason for Selection
Inchiquin & Atedaun Lakes	2	27_7	Clare	• Potential pilot project to examine nutrient impact in groundwater fed lakes in karst areas. • Building on existing work completed by Inland Fisheries Ireland. • Building on existing knowledge from research completed by Trinity College Dublin (David Drew) • Opportunity to work with farmers including in the expanded BurrenLIFE scheme. • Inchiquin is an important drinking water abstraction. • Important fishery (trout) - top 8 in the country. • Amenity value. • Inchiquin is one of the 5 arctic char lakes in Clare, deep lake so good candidate for reintroduction due to depth.
Shallee	1	27_3	Clare	• Part of Drumcliff Source protection zone. • Building on existing knowledge from works completed by Clare County Council. • Building on water quality improvements.
Carrigaholt	1	27_8	Clare	• Discharges into important shellfish area. • Active community groups with an interest in beach improvement. • Potential test case for agricultural measures and farm advisory measures. • Important area for sea angling.
Broadford	1	27_13	Clare	• Building on existing work completed by Clare County Council. • Manageable area: biological data previously collected by Clare County Council on inputting tributaries will narrow the scope of work. • One deteriorated water body.

Table 13 Groundwater bodies intersecting with surface water bodies in recommended areas for action

Groundwater bodies			Intersecting surface water bodies		Recommended Area for Action
Code	Name	Risk	Code	Name	
IE_SH_G_069	Craggaunboy	Review	IE_SH_27S010500	SHALLEE_010	Shallee Project
IE_SH_G_080	Ennis	At risk	IE_SH_27S010500	SHALLEE_010	
			IE_SH_27_108	Atedaun	Inchiquin & Atedaun Lakes
			IE_SH_27_130	Inchiquin CE	
IE_SH_G_229	Tulla-Newmarket on Fergus	Review	IE_SH_27B020300	BROADFORD_010	Broadford Project

9 Environmental Objectives

9.1 Surface Water

- Assuming resources are available and actions are taken in the recommended areas for action, of the five *At Risk* river and water bodies, it is predicted that all five will achieve their objective by 2027, see Table 14.

Table 14. Environmental objective dates for water bodies in the Recommended Areas for Action

Risk Category	No. of Water Bodies	No. of WBs for 2021 Improvement	No. of WBs for 2027 Status Improvement
Rivers			
At Risk	3	0	3
Review	0	0	0
Lakes			
At Risk	2	0	2
Review	0	0	0
Total	5	0	5

- Forty-five surface water bodies have met their 2015 environmental objective.
- As action is not yet planned to be taken in the remaining 27 *At Risk* surface water bodies, a 2027 date is applied to all 27 of the water bodies. For the 24 *Review* surface water bodies, the absence of information on these water bodies means that there is no scientific basis to quantify an environmental objective date and therefore a 2027 date is set for these water bodies, see Table 15.

Table 15. Environmental objectives dates in the *At Risk* and *Review* surface water bodies not included in Recommended Areas for Action

Risk Category	No. of Water Bodies	No. of WBs for 2021 Improvement	No. of WBs for 2027 Status Improvement
Rivers			
At Risk	20	0	20
Review	13	0	13
Lakes			
At Risk	4	0	4
Review	6	0	6
TraC			
At Risk	3	0	3
Review	5	0	5
Total	51	0	51

9.2 Groundwater

- Thirteen of the 15 groundwater bodies are currently Good status and, therefore, have met their environmental objectives.
- Of the two groundwater bodies in the Shannon North Estuary, Limerick City Northwest and Industrial Facility (P0012-04), have a 2027 environmental objective.

10 Acknowledgements

This Shannon North Estuary Catchment Assessment (Version 3) has been produced by the Catchment Science & Management Unit, EPA, with the assistance of the following:

- Clare County Council
- Limerick City & County Council.
- Inland Fisheries Ireland.
- Local Authorities Waters & Communities Office.
- Irish Water.
- RPS Group.
- Ecological Monitoring & Assessment Unit, EPA.
- Hydrometric & Groundwater Section, EPA.
- Informatics Section, EPA.
- Laboratories, EPA.
- Office of Environmental Enforcement, EPA.
- Department of Housing, Planning and Local Government.
- DAFM Agriculture.
- DAFM Forest Service.
- Coillte.
- Teagasc.
- National Federation of Group Water Schemes.
- National Parks and Wildlife Service.
- Waterways Ireland.
- Board Iascaigh Mhara.
- Marine Institute.
- Sea Fisheries Protection Authority.
- Electricity Supply Board.

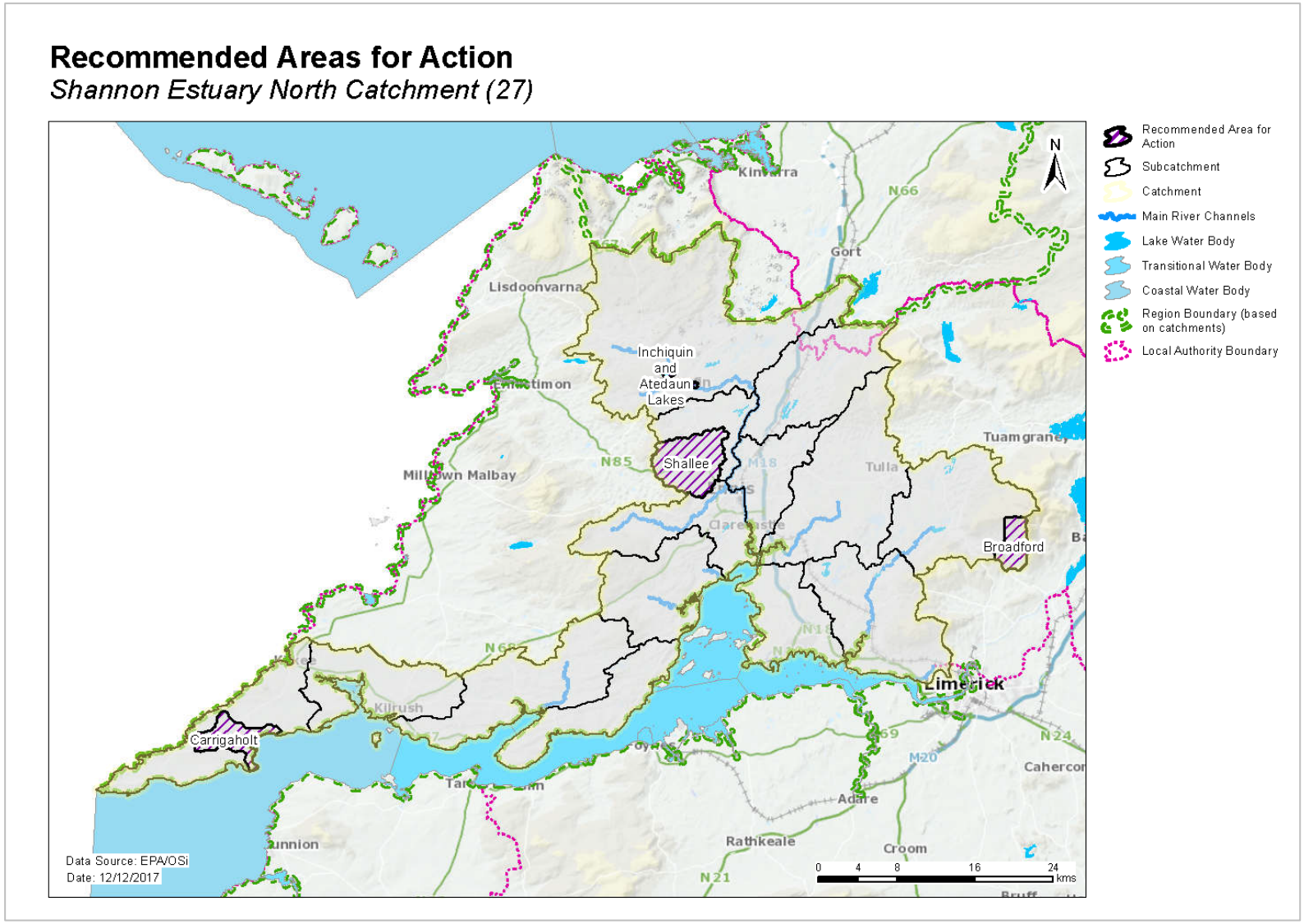


Figure 21. Location of Recommended Areas for Action in the Shannon North Estuary catchment

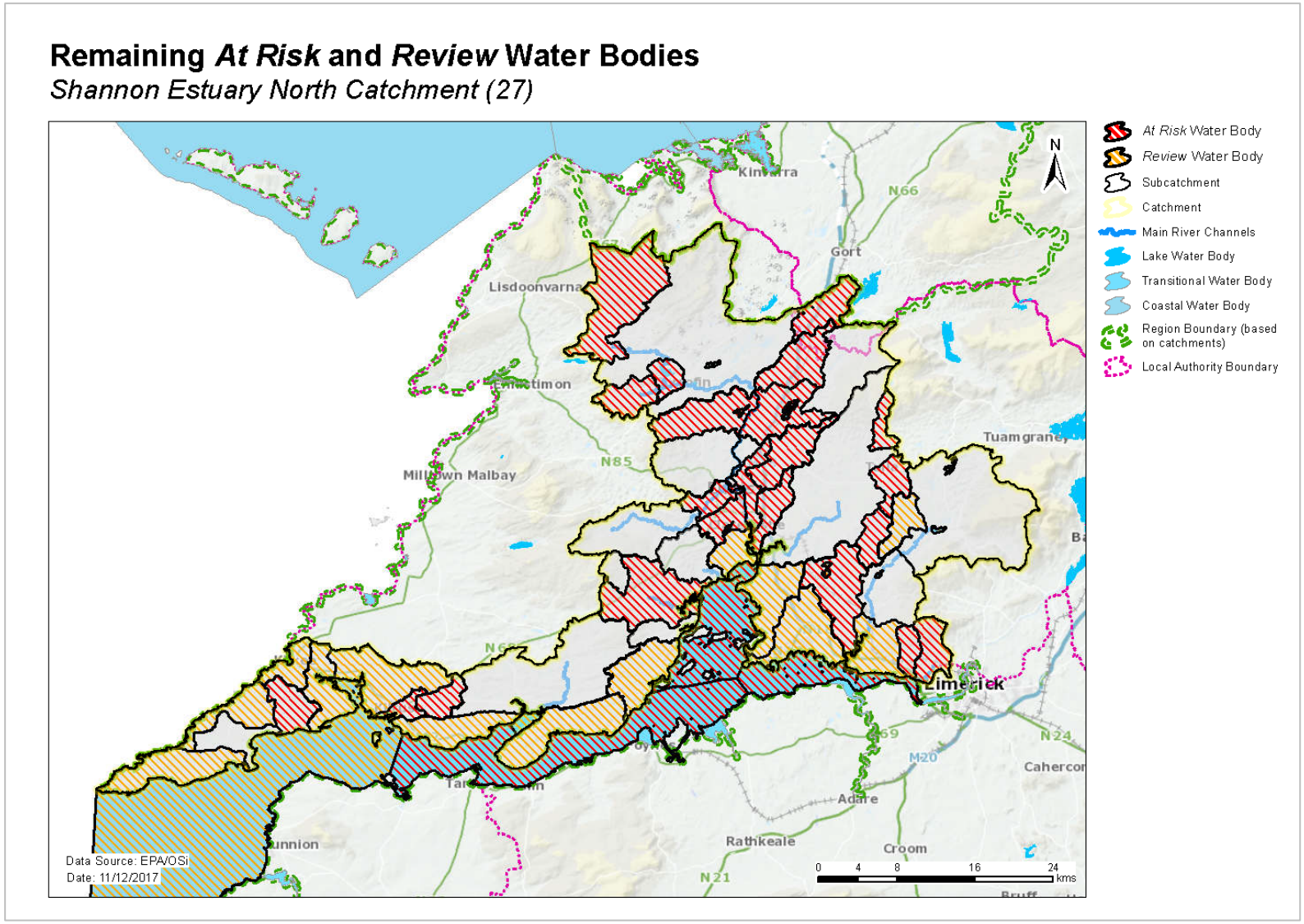


Figure 22. Location of *At Risk* and *Review* water bodies located outside Recommended Areas for Action in the Shannon North Estuary catchment

Appendix 1 High ecological status objective water bodies and sites

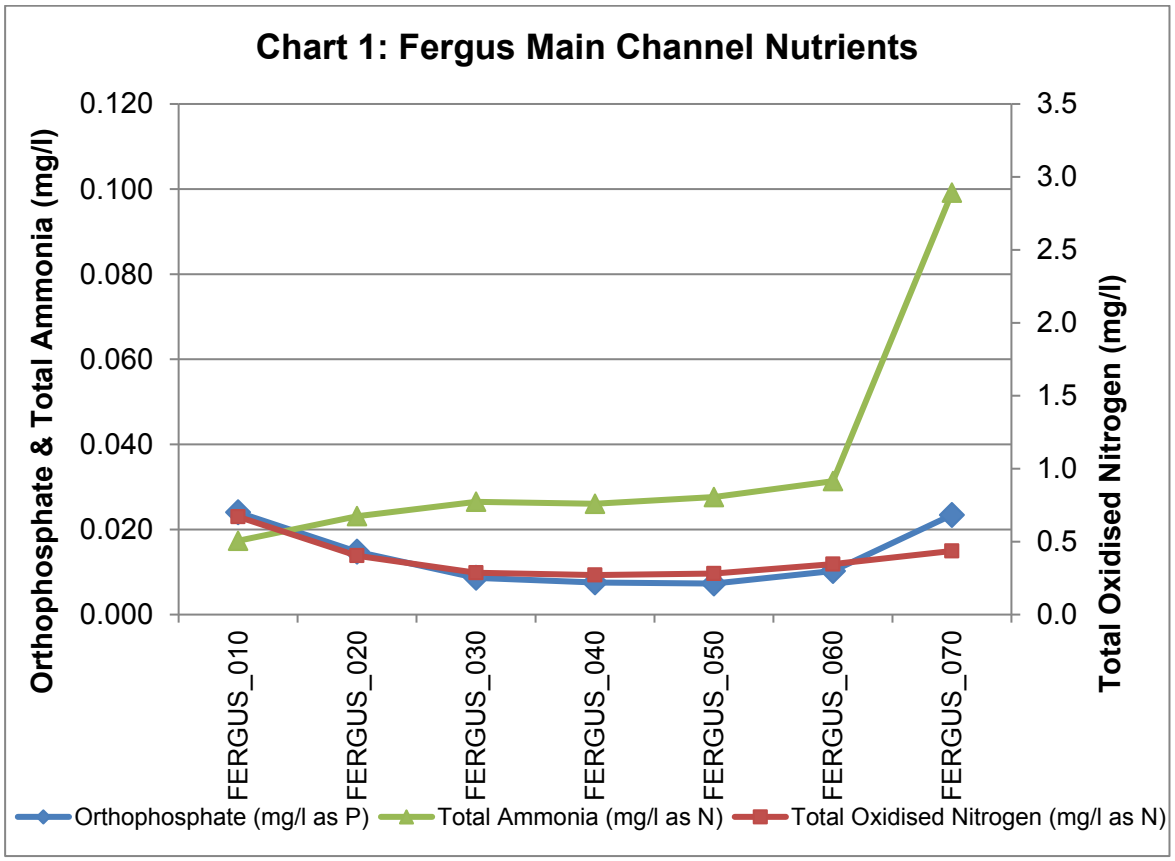
Water body/ Site	Type	Codes	2015 Status
Broadford_020	River	IE_SH_27B020600	High
Owenagarney_010	River	IE_SH_27B020600	High
Owenagarney_020	River	IE_SH_27O010300	High
Cullaun	Lake	IE_SH_27_115	Good
Owenslieve_010	River	IE_SH_27O020600	High

Appendix 2 Catchment scale nutrient concentrations and in-stream loads

The results of the instream water quality assessment for the Fergus main channel are illustrated in Chart 1. The assessment is based on the mean concentrations between 2013 and 2015 at each site from the headwaters down to the estuary. Orthophosphate concentrations are relatively low throughout river, ranging from 0.008 to 0.024mg/l and remain well below the EQS for good status (0.035mg/l). Peak concentrations occur at the headwaters (0.024mg/l) and at FERGUS_070 (0.023mg/l).

The total oxidised nitrogen (TON) profile mirrors the orthophosphate profile with highest concentrations occurring at the river headwaters. TON concentrations throughout the main channel are well below the 2.6mg/l threshold.

The EQS for ammonia (0.065mg/l) is exceeded at FERGUS_070 where there is a significant increase in concentration from 0.031mg/l at Fergus_060 to 0.099mg/l at Fergus_070. In the remainder of the channel, ammonia concentrations are uniformly low ranging from 0.017 to 0.031mg/l.



Appendix 3 Summary information on *At Risk* and *Review* surface water bodies

Subcatchment code	Water body code	Water body name	Water body type	Risk	Ecological Status 07-09	Ecological Status 10-15	High Ecological Status Objective Water Body Y/N	Significant Pressures	Date to Meet Environmental Objective	Recommended Area for Action Name
27_1	IE_SH_27C070400	Carrownanelly_010	River	At Risk	Moderate	Poor	N	Ag,DU	2027	
27_1	IE_SH_27F010700	Fergus_060	River	At Risk	Poor	Poor	N	Hymo,UWW	2027	
27_1	IE_SH_27F010780	Fergus_070	River	At Risk	Poor	Poor	N	Hymo,UWW	2027	
27_1	IE_SH_27S030400	Spancelhill_010	River	At Risk	Good	Poor	N	Other	2027	
27_1	IE_SH_060_1100	Fergus Estuary	Transitional	At Risk	Moderate	Moderate	N	Ag	2027	
27_2	IE_SH_27C810990	Cloonkerry_East_010	River	Review	Unassigned	Unassigned	N		2027	
27_2	IE_SH_27K030900	Killadysert Stream_010	River	Review	Unassigned	Unassigned	N		2027	
27_2	IE_SH_060_0300	Lower Shannon Estuary	Transitional	At Risk	Moderate	Moderate	N	Other	2027	
27_2	IE_SH_060_1200	Clonderalaw Bay	Transitional	Review	Unassigned	Unassigned	N		2027	
27_3	IE_SH_27_82	Dromore	Lake	Review	Moderate	Good	N		2027	
27_3	IE_SH_27S010500	Shallee_010	River	At Risk	Poor	Moderate	N	Other	2027	Shallee
27_4	IE_SH_27M040900	Moyasta 27_010	River	Review	Unassigned	Unassigned	N		2027	
27_4	IE_SH_27T250960	Termon_East_010	River	Review	Unassigned	Unassigned	N		2027	
27_4	IE_SH_27W010100	Wood 27_010	River	At Risk	Poor	Poor	N	Ag	2027	
27_4	IE_SH_27W010200	Wood 27_020	River	At Risk	Poor	Poor	N	Ag,DU,For,Other	2027	
27_4	IE_SH_060_0000	Mouth Of The Shannon (Has 23;27)	Coastal	Review	Moderate	Moderate	N		2027	
27_4	IE_SH_060_1300	Scattery Island Lagoon	Coastal	Review	Unassigned	Unassigned	N		2027	
27_5	IE_SH_27T230880	Tonavoher_010	River	Review	Unassigned	Unassigned	N		2027	
27_6	IE_SH_27C130300	Cloondanagh Lough Stream_010	River	At Risk	Moderate	Poor	N	Ag,For	2027	
27_6	IE_SH_27C140100	Cullaun_010	River	At Risk	Moderate	Moderate	N	Other	2027	
27_6	IE_SH_27L010200	Liskenny_010	River	At Risk	Poor	Poor	N	Ag,UWW	2027	
27_7	IE_SH_27_108	Atedaun	Lake	At Risk	Moderate	Moderate	N	Ag	2027	Inchiquin & Atedaun Lakes
27_7	IE_SH_27_115	Cullaun	Lake	At Risk	High	Good	Y	Ag	2027	
27_7	IE_SH_27_130	Inchiquin CE	Lake	At Risk	Moderate	Moderate	N	Ag	2027	Inchiquin & Atedaun Lakes
27_7	IE_SH_27_177	Fiddaun	Lake	Review	Unassigned	Unassigned	N		2027	
27_7	IE_SH_27_70	Doo GY	Lake	Review	Unassigned	Unassigned	N		2027	
27_7	IE_SH_27C010900	Castlelodge_010	River	At Risk	Poor	Poor	N	Ag,For	2027	
27_7	IE_SH_27C030300	Clooneen (Clare)_010	River	At Risk	Poor	Poor	N	Ag,For	2027	
27_7	IE_SH_27C040600	Craggaunboy_010	River	At Risk	Poor	Poor	N	Ag,For	2027	
27_7	IE_SH_27F010300	Fergus_020	River	At Risk	Good	Moderate	N	Ag,DU	2027	

Subcatchment code	Water body code	Water body name	Water body type	Risk	Ecological Status 07-09	Ecological Status 10-15	High Ecological Status Objective Water Body Y/N	Significant Pressures	Date to Meet Environmental Objective	Recommended Area for Action Name
27_8	IE_SH_27C840930	Carrownaweelaun_010	River	Review	Unassigned	Unassigned	N		2027	
27_8	IE_SH_27D010100	Doonaha_010	River	At Risk	Poor	Poor	N	Ag	2027	
27_8	IE_SH_27K600990	Kiltrellig_010	River	Review	Unassigned	Unassigned	N		2027	
27_8	IE_SH_27K650930	Kilkee_Lower_010	River	Review	Unassigned	Unassigned	N		2027	
27_8	IE_SH_27M010150	Moyana_010	River	At Risk	Poor	Poor	N	Ag,DWW,Ind	2027	Carrigaholt
27_8	IE_SH_060_1400	Cloonconeen Pool	Coastal	Review	Unassigned	Unassigned	N		2027	
27_9	IE_SH_27O020900	Owenslieve_020	River	At Risk	Poor	Moderate	N	Ag	2027	
27_10	IE_SH_27_123	Ballybeg	Lake	Review	Poor	Unassigned	N		2027	
27_10	IE_SH_27L380630	Lissan_West_010	River	Review	Unassigned	Unassigned	N		2027	
27_11	IE_SH_27B670560	Boheraroan_010	River	Review	Unassigned	Unassigned	N		2027	
27_11	IE_SH_27U010950	Urlan_Beg_010	River	Review	Unassigned	Unassigned	N		2027	
27_11	IE_SH_060_0800	Upper Shannon Estuary	Transitional	At Risk	Good	Poor	N	Ag	2027	
27_11	IE_SH_060_1000	Shannon Airport Lagoon	Transitional	Review	Moderate	Moderate	N		2027	
27_12	IE_SH_27_127	Finn CE	Lake	Review	Unassigned	Unassigned	N		2027	
27_12	IE_SH_27_74	Castle CE	Lake	At Risk	Moderate	Moderate	N	Ag,Other	2027	
27_12	IE_SH_27C080300	Cratloe_010	River	At Risk	Good	Moderate	N	Ag,DWW,Hymo	2027	
27_12	IE_SH_27C090600	Crompaun (East)_010	River	At Risk	Good	Moderate	N	Ag,DWW,For,Hymo	2027	
27_12	IE_SH_27C100600	Cloverhill Stream_010	River	At Risk	Poor	Poor	N	Ag,DWW,Hymo	2027	
27_12	IE_SH_27O011200	Owenogarney_060	River	Review	Unassigned	Unassigned	N		2027	
27_13	IE_SH_27_117	Bridget	Lake	At Risk	Moderate	Moderate	N	Ag,Other	2027	
27_13	IE_SH_27_121	Duin CE	Lake	Review	Unassigned	Unassigned	N		2027	
27_13	IE_SH_27B020300	Broadford_010	River	At Risk	Moderate	Poor	N	Hymo	2027	Broadford
27_13	IE_SH_27D070840	Derrymore_East 27_010	River	Review	Unassigned	Unassigned	N		2027	

Subcatchment code	Water body code	Water body name	Water body type	Risk	Ecological Status 07-09	Ecological Status 10-15	High Ecological Status Objective Water Body Y/N	Significant Pressures	Date to Meet Environmental Objective	Recommended Area for Action Name
27_14	IE_SH_27_126	Inchicronan	Lake	At Risk	Good	Moderate	N	Other	2027	
27_14	IE_SH_27F010500	Fergus_040	River	At Risk	Moderate	Poor	N	Ag,For	2027	
27_14	IE_SH_27M020700	Moyree_030	River	At Risk	Moderate	Moderate	N	Hymo	2027	

Ag: Agriculture

DWW: Domestic Waste Water

For: Forestry

Hymo: Hydromorphology

Ind: Industry

M+Q: Mines and Quarries

Peat: Peat Drainage and Extraction

DU: Diffuse Urban

UWW: Urban Waste Water

Note: Significant Pressures for Review water bodies have not been included as they will need to be confirmed as part of an Investigative Assessment.

Protected Area: If a water body is one or more of the following: Drinking Water Protected Area; Bathing Water; Shellfish Area; Nutrient Sensitive Area or; a Natura 2000 site with a water dependent qualifying interest with a water quality and/or quantity conservation objective, then it has been highlighted as a protected area in this table.

Appendix 4 Drinking water supplies in the catchment

Scheme Code	Scheme Name	Water Body	Water Body Code	Objective met? Yes /No	Reason why not met
0300PRI2000_1	Bodyke	Tulla – Newmarket on Fergus GWB	IE_SH_G_229	Yes	N/A
0300PRI2005_1	Killone	Ennis GWB	IE_SH_G_080	Yes	N/A
0300PRI2005_2	Killone	Fergus_070	IE_SH_27F010780	Yes	N/A
0300PRI2006_1	Ranaghan	Ennis GWB	IE_SH_G_080	Yes	N/A
0300PRI2009_1	Lemanagh/ Roughan	Burren GWB	IE_SH_G_047	Yes	N/A
0300PRI2011_1	Killinaboy	Ennis GWB	IE_SH_G_080	Yes	N/A
0300PRI2012_1	Toonagh/Dysart	Ballyallia LWB	IE_SH_27_72	Yes	N/A
0300PRI2013_1	Monreagh	Ennis GWB	IE_SH_G_080	Yes	N/A
0300PRI2013_2					
0300PRI2041_1	Shannon Airport	Rosroe Lake on Cloverhill Stream_010	IE_SH_27_120 IE_SH_27C100600	Yes	N/A
0300PUB1003_1	Lislanahan Lake	Kilkee Lower_010	IE_SH_27K650930	Yes	N/A
0300PUB1008_1	Killadysert PWS	Gortglass LWB	IE_SH_27_122	Yes	N/A
0300PUB1009_1	Ennis PWS	Ennis GWB	IE_SH_G_080	Yes	N/A
0300PUB1010_1	Corrofin PWS	Fergus_020	IE_SH_27F010300	Yes	N/A
0300PUB1012_1	Mountshannon PWS	Ennis GWB	IE_SH_G_080	Yes	N/A
0300PUB1015_1	Ballycar Lake	Cloverhill Stream_010	IE_SH_27C100600	Yes	N/A
0300PUB1027_1	Broadford PWS	Tulla – Newmarket on Fergus GWB	IE_SH_G_229	Yes	N/A
0300PUB1031_1	Carran PWS	Burren GWB	IE_SH_G_047	Yes	N/A
0300PUB1040_1	Shannon/ Sixmilebridge RWSS	Castle CE LWB	IE_SH_27_74	No	2015 MCPA & 2,4-D
1200PRI0585_1	Tubber	Ennis GWB	IE_SH_G_080	Yes	N/A

Appendix 5 Prioritisation of water bodies with Natura 2000 site qualifying interests

River water bodies that are designated as salmonid rivers (under Salmonid Regulations (S.I. 293 / 1988)) but that are not located within SACs have also been listed.

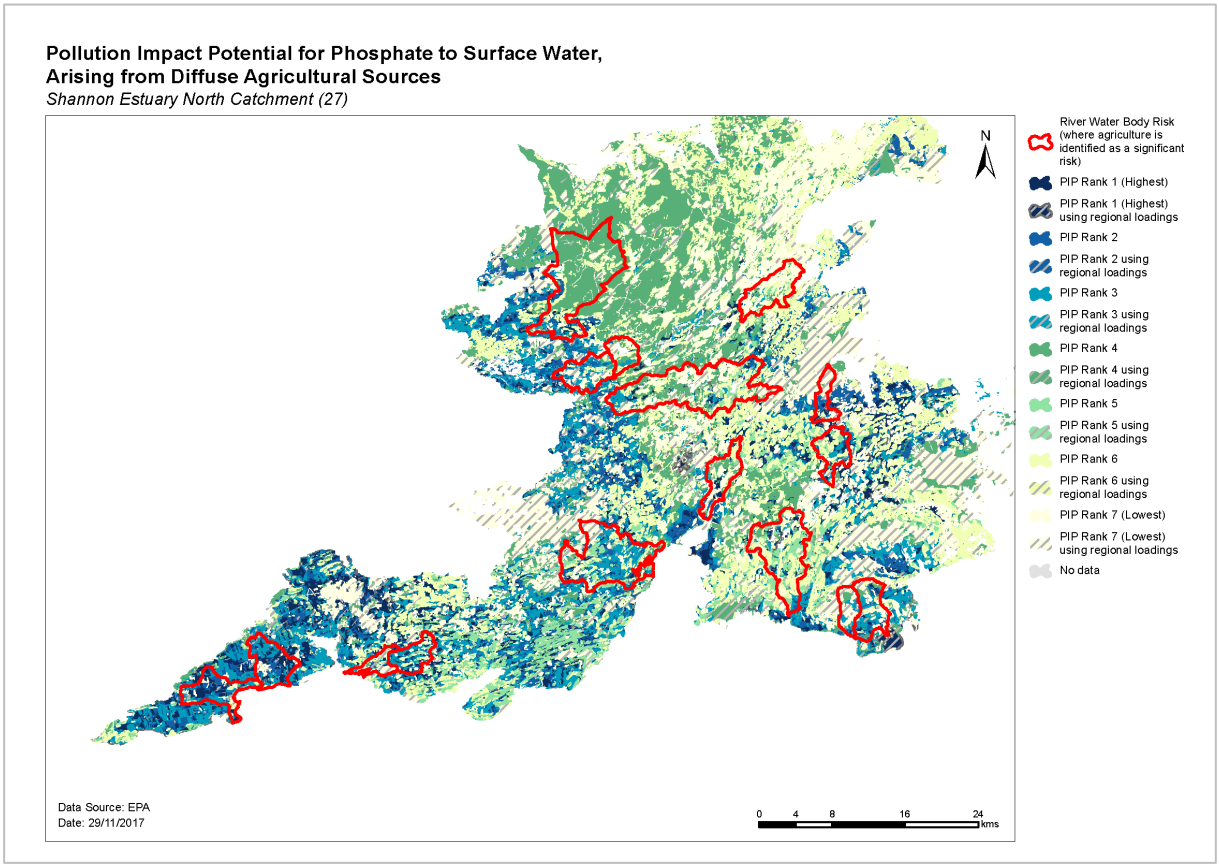
SAC Name	Relevant Qualifying interests	Target status	Water body type	Water bodies	Status (risk)	Prioritise?	Code	Survey data?
Ballyallia Lake SAC 000014	3150	At least Good	Lake	Ballyallia	Unassigned (NAR)	No	IE_SH_27_72	No
	1106	Good	River	Fergus_050	Good (NAR)	No	IE_SH_27F010600	Yes
Ballycullinan Lake SAC 000016	none							
Ballycullinan, Old Domestic Building SAC 002246	none							
Ballyogan Lough SAC 000019	none							
Cregg House Stables, Crusheen SAC 002317	none							
Danes Hole, Poulnalecka SAC 000030	none							
Dromore Woods and Loughs SAC 000032	3150	Good	Lake	Dromore	Good (R)	No	IE_SH_27_82	No
			Lake	Black CE	Unassigned (NAR)	No	IE_SH_27_246	No
			Lake	Ballyline	Unassigned (NAR)	No	IE_SH_27_63	No
			Lake	Ballyteige	Unassigned (NAR)	No	IE_SH_27_56	No
	1106	Good	River	Fergus_040	Poor (AR)	Yes	IE_SH_27F010500	Yes
East Burren Complex SAC 001926	3140	At least Good	Lake	Gortlecka	Unassigned (NAR)	No	IE_SH_27_102	No
			Lake	Ballyeighter Rockforest	Unassigned (NAR)	No	IE_SH_27_106	No
			Lake	Muckanagh CE	High (NAR)	No	IE_SH_27_94	No
			Lake	Ballyeighter Garvillaun	Unassigned (NAR)	No	IE_SH_27_119	No
			Lake	Aglish	Unassigned (NAR)	No	IE_SH_27_303	No
			Lake	Callaun	Good (AR - HES Obj)	No	IE_SH_27_115	No
			Lake	Shandangan	Unassigned (NAR)	No	IE_SH_27_33	No
			Lake	Atedaun	Moderate (AR)	Yes	IE_SH_27_108	No
			Lake	Inchiquin CE	Moderate (AR)	Yes	IE_SH_27_130	No
	3180	Good GW level/quality	Groundwater	Ennis GWB	Good (AR)	No	IE_SH_G_080	No
			Groundwater	Burren GWB	Good (R)	No	IE_SH_G_047	No
	7230	Good GW level	Groundwater	Ennis GWB	Good (AR)	No	IE_SH_G_080	No
			Groundwater	Burren GWB	Good (R)	No	IE_SH_G_047	No

SAC Name	Relevant Qualifying interests	Target status	Water body type	Water bodies	Status (risk)	Prioritise?	Code	Survey data?
East Burren Complex SAC 001926	1106	Good	River	Fergus_010	Good (NAR)	No	IE_SH_27F010100	Yes
			River	Fergus_020	Moderate (AR)	Yes	IE_SH_27F010300	Yes
			River	Fergus_030	Good (NAR)	No	IE_SH_27F010400	Yes
Kilkee Reefs SAC 002264	none							
Kilkishen House SAC 002319	none							
Knockanira House SAC 002318	none							
Lough Cutra SAC 000299	none							
Lough Gash Turlough SAC 000051	3180	Good GW level/quality	Groundwater	GWDTE-Lough Gash Turlough (SAC000051)	Good (R)	No	IE_SH_G_259	No
Lower River Shannon SAC 002165	1150	Good	Transitional	Shannon Airport Lagoon	Moderate (AR)	Yes	IE_SH_060_1000	Yes
	1029 (19 of 27 catchments of S.I. 296 2009)	Good	River	Cloon (Clare)_010	Good (NAR)	No	IE_SH_27C020200	Yes
			River	Cloon (Clare)_020	Good (NAR)	No	IE_SH_27C020400	Yes
	1106	Good	River	Fergus_050	Good (NAR)	No	IE_SH_27F010600	Yes
			River	Fergus_060	Poor (AR)	Yes	IE_SH_27F010700	Yes
			River	Fergus_070	Poor (AR)	Yes	IE_SH_27F010780	Yes
Moneen Mountain SAC 000054	7220	Good GW level	Groundwater	Burren GWB	Good (R)	No	IE_SH_G_047	No
Moyree River System SAC 000057	7230	Good GW level	Groundwater	Ennis GWB	Good (AR)	No	IE_SH_G_080	No
Newgrove House SAC 002157	none							
Newhall And Edenvale Complex SAC 002091	none							
Old Domestic Building (Keevagh) SAC 002010	none							
Old Domestic Buildings, Rylane SAC 002314	none							
Old Farm Buildings, Ballymacrogan SAC 002245	none							
Pouladatig Cave SAC 000037	none							
Poulnagordon Cave (Quin) SAC 000064	none							
Ratty River Cave SAC 002316	none							
Slieve Bernagh Bog SAC 002312	none							

SAC Name	Relevant Qualifying interests	Target status	Water body type	Water bodies	Status (risk)	Prioritise?	Code	Survey data?
Toonagh Estate SAC 002247	none							
Tullaher Lough And Bog SAC 002343	none							
Salmonids (outside SACs)	1106	Good	River	Clooneen (Clare)_010	Poor (AR)	Yes	IE_SH_27C030300	Yes

Appendix 6 Pollution Impact Potential (PIP) Map for Phosphorus

For areas where agriculture is deemed as the significant pressure, areas of high risk to surface water can be targeted. The map below shows relative risk of loss of phosphorus to surface water. The risk of phosphorus losses is strongly correlated on whether the land is poorly draining or free draining and the loadings applied i.e. significant loadings applied on poorly draining areas result in a high potential risk to surface water. However, this figure does not imply that actual losses from these areas are occurring but is a useful tool for informing where resources should be focused (i.e. by allowing high risk areas to be identified and prioritised for further investigation). PIP maps are available online at a scale of 1:20,000 and can be accessed by public bodies via the EDEN process.



Appendix 7 Local Catchment Assessment Categories

Category	Assessment & Measures Evaluation Details
IA1	Further information provision (e.g. from IFI, LAs, EPA)
IA2	Point source desk-based assessment
IA3	Assessment of unassigned status water bodies, requiring field visit(s)
IA4	Regulated point sources, requiring field visit/s
IA5	Stream (catchment) walk to evaluate multiple sources in a defined (1 km) river stretch (used as the basis for estimating resource requirements)
IA6	Stream (catchment) walk in urban areas
IA7	Stream (catchment) walk along >1 km river stretches
IA8	Stream (catchment) walk along high ecological status (HES) objective rivers
IA9	Lakes assessment, requiring field visits
IA10	Groundwater assessments, requiring field visits