

Lower Shannon & Mulkear Catchment Assessment (HA 25D)



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 Lower Shannon and Mulkear 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/>

Table of contents

1	Introduction.....	1
2	Water body status and risk of not meeting environmental objectives.....	2
2.1	Surface water ecological status.....	2
2.1.1	Rivers and lakes.....	2
2.1.2	Transitional and coastal (TraC)	3
2.2	Groundwater status.....	5
2.3	Risk of not meeting surface water environmental objectives.....	7
2.3.1	Rivers and lakes.....	7
2.3.2	Transitional and coastal (TraC)	7
2.4	Risk of not meeting groundwater environmental objectives	7
2.5	Protected areas	9
2.5.1	Drinking water protected areas.....	9
2.5.2	Bathing waters	9
2.5.3	Shellfish areas	9
2.5.4	Nutrient sensitive areas	9
2.5.5	Natura 2000 sites	9
2.6	Heavily modified water bodies.....	9
3	Significant issues in At Risk water bodies	9
4	Significant pressures.....	10
4.1	Water bodies	10
4.1.1	Rivers, lakes, transitional and coastal (TraC)	10
4.1.2	Groundwater	10
4.2	Pressure type	11
4.2.1	Agriculture.....	11
4.2.2	Hydromorphology.....	11
4.2.3	Other significant pressures	13
4.2.4	Urban waste water treatment plants	14
4.2.5	Forestry	16
4.2.6	Extractive industry	16
4.2.7	Industry	16
4.2.8	Diffuse urban.....	16
4.2.9	Domestic waste water	16
5	Load reduction assessment.....	19
5.1	River water body load reductions	19
5.2	TraC load reductions.....	19
6	Further characterisation and local catchment assessments	21
7	Catchment summary	21
8	Areas for Action	22

8.1	Process of selection	22
8.2	Outcomes of process	22
9	Environmental Objectives	24
9.1	Surface Water	24
9.2	Groundwater	25
10	Acknowledgements	28

1 Introduction

This catchment covers an area of 1,041 km² and includes the lower reaches of the River Shannon to Limerick City and the catchment of the Mulkear River. The catchment is underlain by mostly impure limestones in low lying areas and the sandstone and metamorphic rocks in the uplands of the Slieve Bearnagh and Arra Mountains in the northwest, and the Silvermines and Slieve Feilim Mountains in the east.

The River Shannon flows into the catchment from Lough Derg before branching into the Old River Shannon channel and the Ardnacrusha headrace at Parteen Weir. Upstream of Parteen Weir the Ballyteige and Ardcloony Rivers which flow into the western side of the Shannon. The Kilmastulla River flows into the Shannon from the east. The majority of the Kilmastulla Valley is underlain by a highly productive sand and gravel aquifer. The Old Shannon passes through O'Brien's Bridge, with much reduced flow following the development of Ardnacrusha over 80 years ago. The hills north of Limerick City are drained by the Blackwater (Clare) River which flows under the Ardnacrusha head race before joining the Shannon upstream of Limerick City. The Old Shannon then passes Castleconnell before flowing through Limerick City, where it becomes tidal and is then re-joined by the Ardnacrusha tailrace at Parteen.

The Mulkear River and its main tributaries – the Dead, Bilboa and Kileengarrif Rivers – drain the majority of this catchment. The Gortdrum River flows north from Limerick Junction before being joined from the east by the Cautteen River. Now known as the Dead River, it moves northwest and is joined by a series of streams including the Cappaghwhite, Ayle and Cahermahallia and by the Reask River from the south. The Dead River is then joined by the Bilboa River from the north near Cappamore.

Now known as the Mulkear River, it flows northwest until it is joined by the Kileengarrif south of Barringtonsbridge. The Kileengarrif and its tributaries, the Annagh, Doonane and Newport Rivers, drain much of the central and western parts of the Silvermines and Slieve Feilim Mountains. Downstream of this confluence, the Mulkear flows past Annacotty and into the Shannon at Castletroy.

Estuarine embankments were completed along the Shannon in this catchment by the OPW from 1962 to 1971 and flood relief works were completed on the Mulkear around Newport, Ballymakeogh and Cappaghmore during 1998 and 2000. Downstream of Limerick the Shannon broadens into its estuary proper and makes its way out to sea between Loop Head and Kerry Head.

The Lower Shannon and Mulkear catchment comprises nine subcatchments (Table 1, Figure 1) with 48 river water bodies, two lakes, two transitional water bodies, and 18 groundwater bodies. There are two heavily modified and no artificial water bodies in the Lower Shannon and Mulkear catchment.

Table 1. List of subcatchments in the Lower Shannon and Mulkear catchment

Subcatchment ID	Subcatchment Name
25D_1	Newport[Tipperary]_SC_010
25D_2	Dead_SC_010
25D_3	Shannon[Lower]_SC_100
25D_4	Kileengarrif_SC_010
25D_5	Bilboa_SC_010
25D_6	Shannon[Lower]_SC_080
25D_7	Mulkear_SC_010
25D_8	Mulkear_SC_020
25D_9	Shannon[Lower]_SC_090

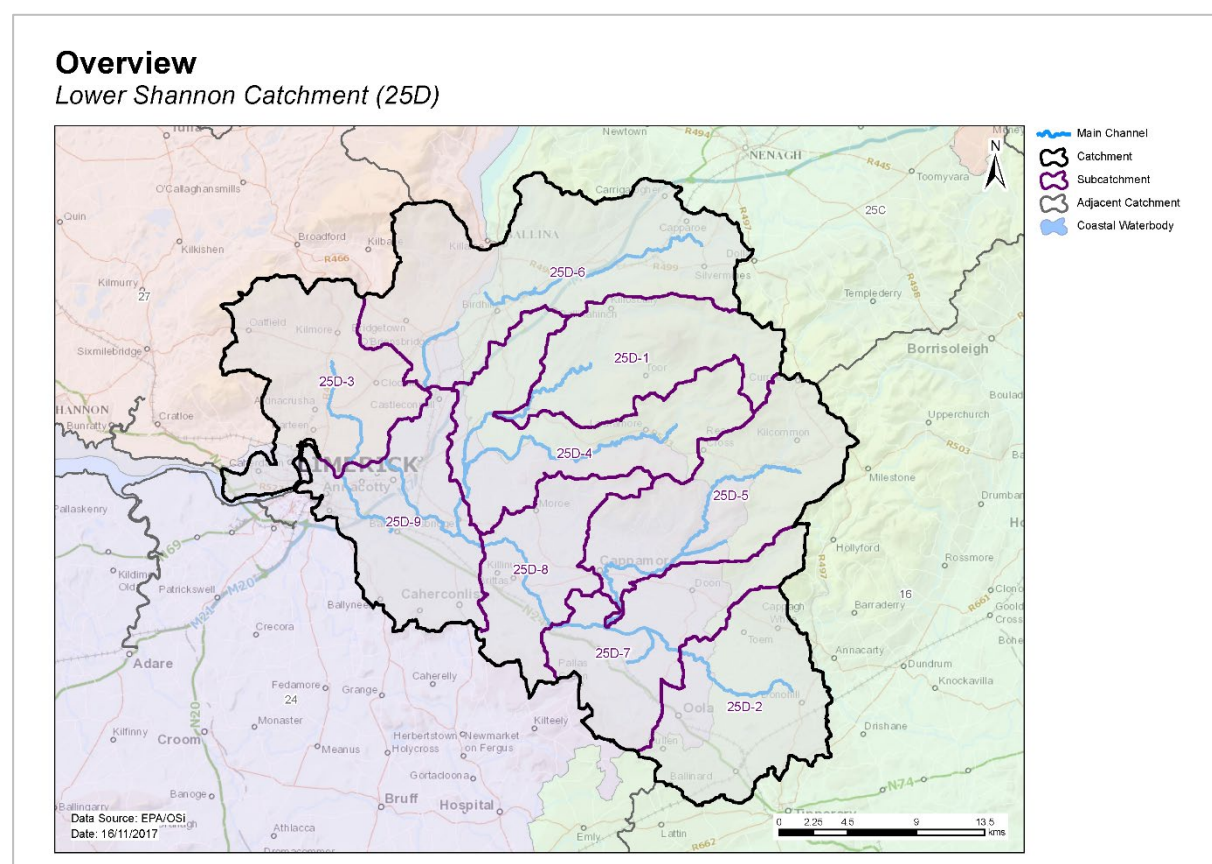


Figure 1. Subcatchments in the Lower Shannon and Mulkear catchment

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 28 (56%) river and lake water bodies at Good or High status, and 13 (26%) at less than Good status in 2015 (Table 2, Figure 2). Nine (18%) river and lake water bodies are unassigned.
- ◆ Five river water bodies and sites have a high ecological status objective. In 2015, two of these water bodies were at High status, and three were at Good (Figure 3, Appendix 1).

- ◆ The number of river water bodies at each status class in 2007-09 and 2010-15 are shown in Figure 4.
- ◆ Since 2007-09 when WFD monitoring began, seven water bodies have an improved status whereas seven have deteriorated (Figure 6).

The variation in nutrient concentrations and loads in the Mulkear (Limerick) main channel is illustrated in Appendix 2.

2.1.2 Transitional and coastal (TraC)

- ◆ There are two transitional water bodies in the Lower Shannon and Mulkear catchment, Limerick Dock (IE_SH_060_0900) and the Upper Shannon Estuary (IE_SH_060_0800) and they were at Moderate and Poor status respectively in 2015 (Figure 2).
- ◆ Limerick Dock deteriorated from Good to Moderate in 2007-09 and 2010-15, whilst Upper Shannon Estuary declined from Good to Poor during the same period.

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	48	3	24	10	2	0	9	23	8	17
Lakes	2	0	1	0	1	0	0	1	0	1
TraC	2	0	0	1	1	0	0	0	0	2

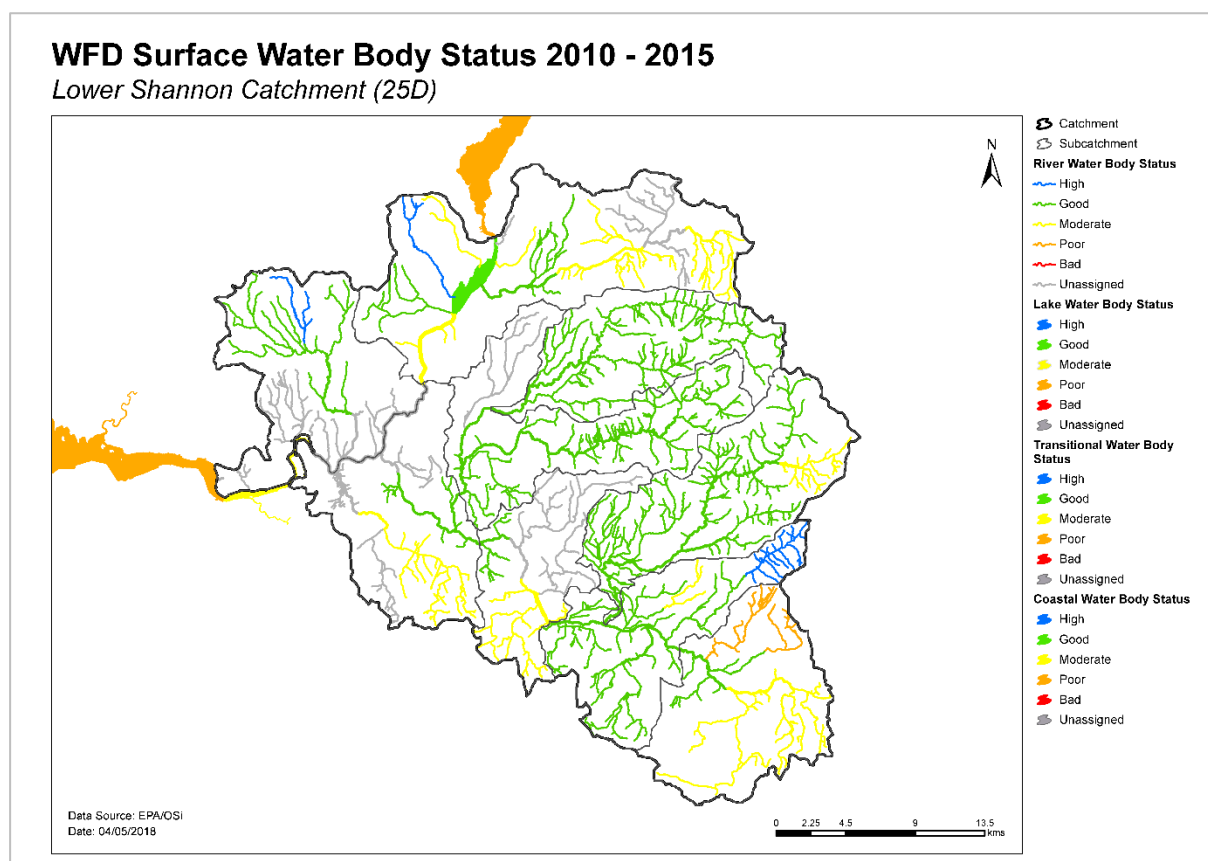


Figure 2. Surface water ecological status

High Status Objective Water Bodies and Sites

Lower Shannon Catchment (25D)

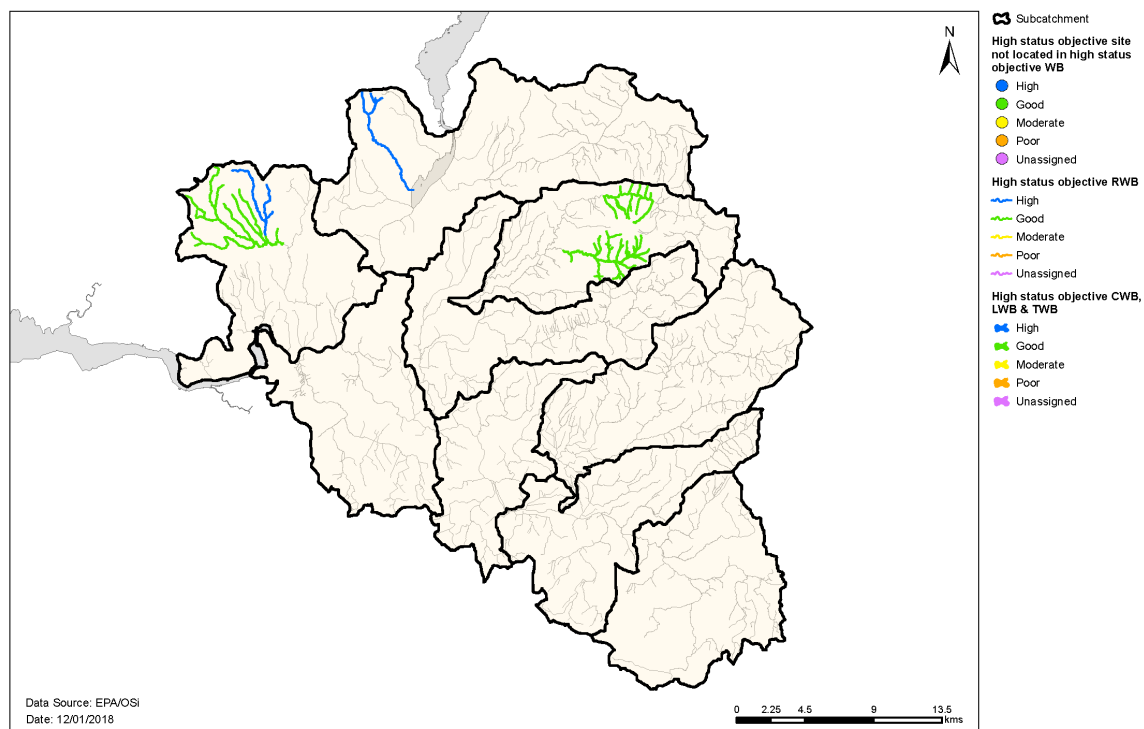


Figure 3. High ecological status objective water bodies and sites

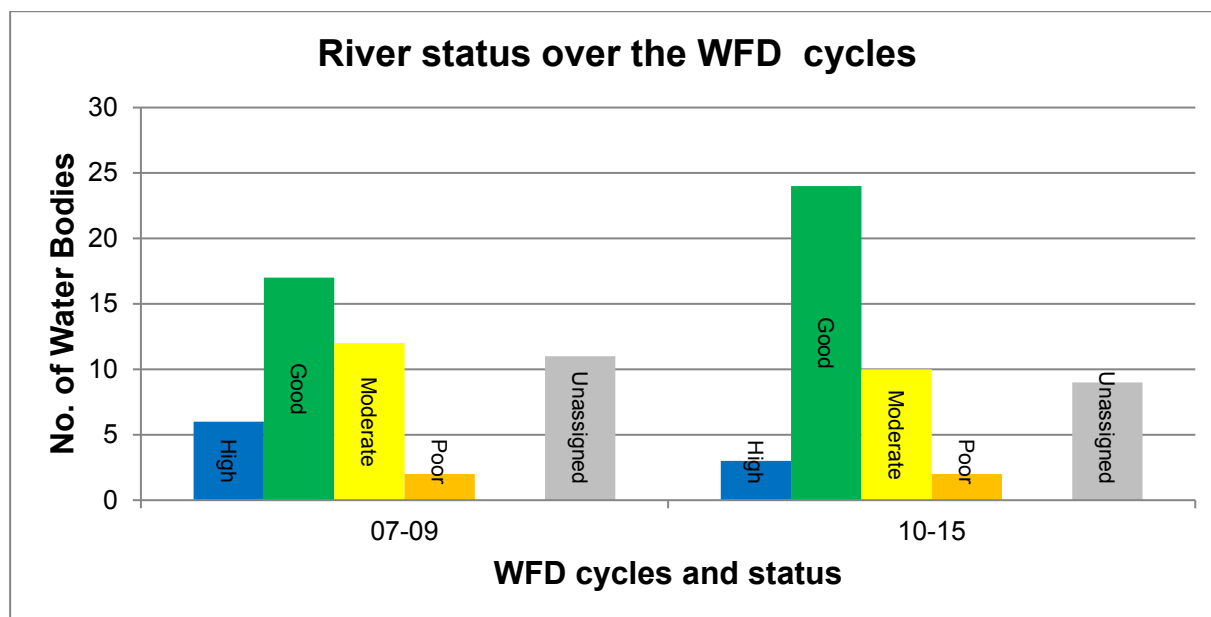


Figure 4. Number of rivers at each status class in 2007-09 and 2010-15

WFD Surface Water Body Status Change 2007 - 2009 to 2010 - 2015

Lower Shannon Catchment (25D)

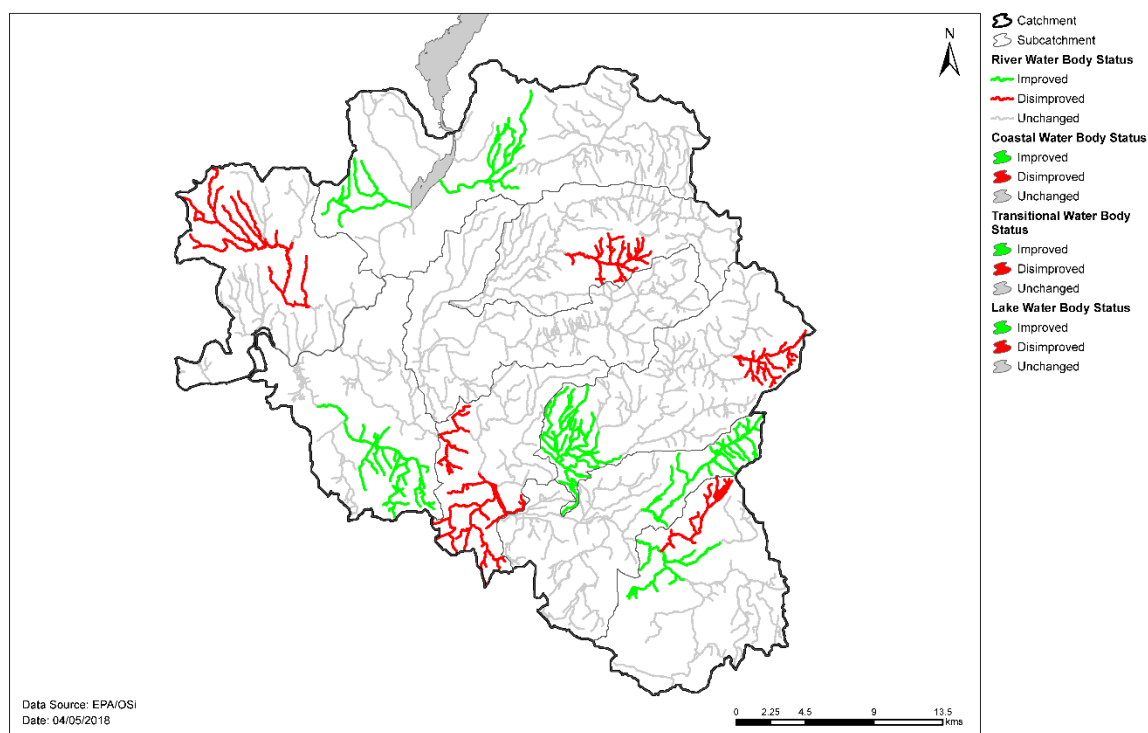


Figure 5. Surface water body status change from 2007-09 to 2010-15

2.2 Groundwater status

- ◆ There were 13 (72%) groundwater bodies at Good status and five (28%) at Poor status in 2015 (Table 3).
- ◆ Thirteen of the water bodies remained at Good status between 2007-12 and 2010-15, and three remained at Poor status during the same period (Limerick City Northwest, Industrial Facility (P0331-01) and Historic Mine (Silvermines)). Two groundwater bodies deteriorated from Good to Poor status (Limerick City East and Pallas Grean).
- ◆ The number of groundwater bodies at each status class in 2007-12 and 2010-15 are shown in Figure 6.

Table 3. Summary of groundwater body status and risk categories

	Number of water bodies	2010-15 Status		Risk Categories		
		Good	Poor	Not at Risk	Review	At Risk
Groundwater	18	13	5	5	7	6

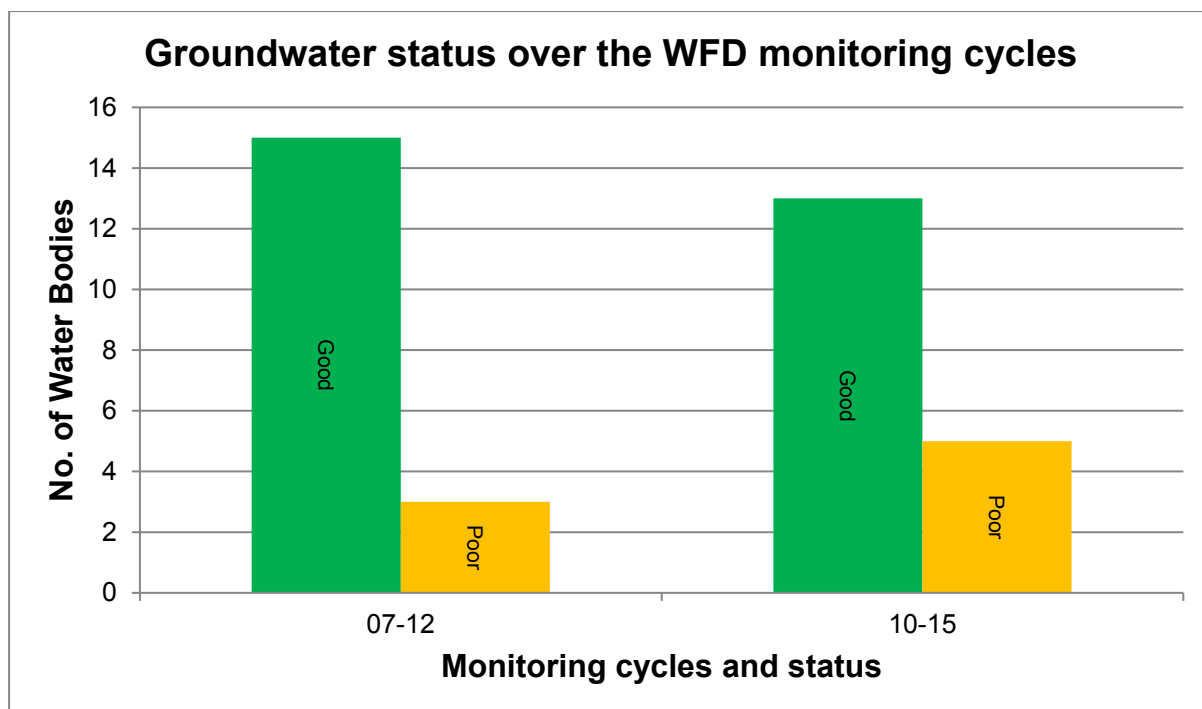


Figure 6. Number of groundwater bodies at each status class in 2007-12 and 2010-15

Groundwater Body Status 2010 - 2015

Lower Shannon Catchment (25D)

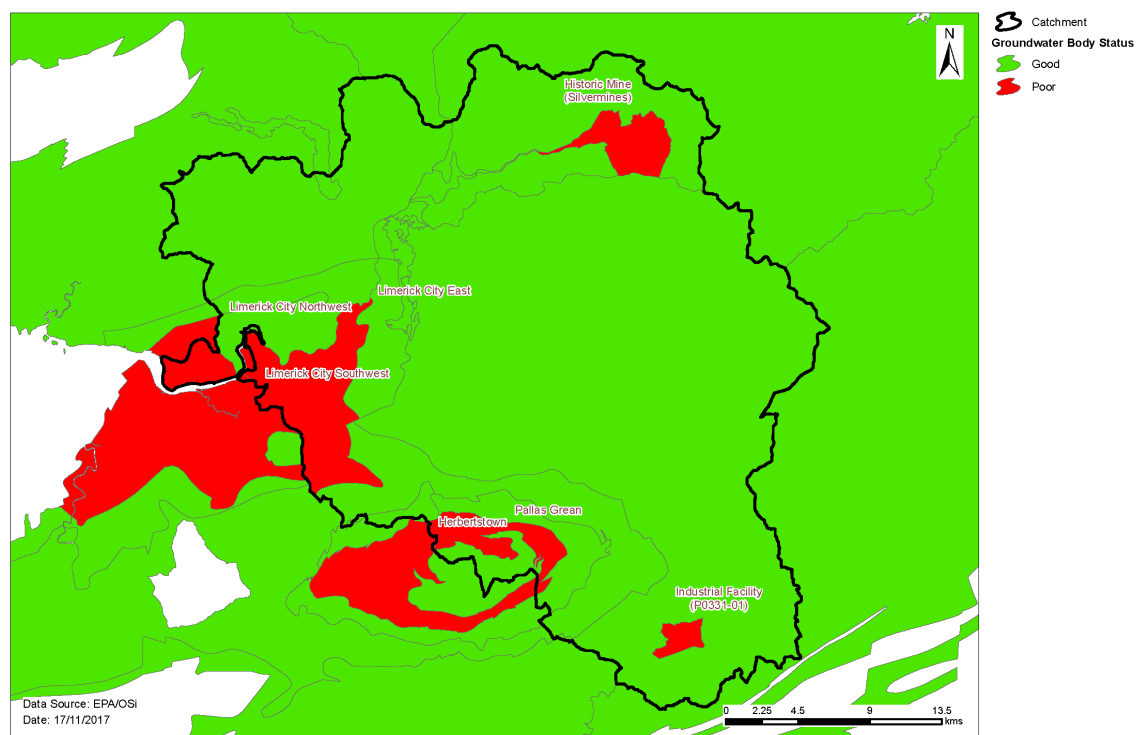


Figure 6a. Groundwater Status

2.3 Risk of not meeting surface water environmental objectives

2.3.1 Rivers and lakes

- ◆ There are 23 *Not at Risk* river water bodies and one lake water body (Figure 7, 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 eight surface water bodies in *Review*. This applies to two water bodies where more information is required and six water bodies where measures have recently been implemented and improvements have not yet been realised.
- ◆ Seventeen river water bodies and one lake water body 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 (100%) *At Risk* transitional water bodies (Limerick Dock IE_SH_060_0900 and the Upper Shannon Estuary IE_SH_060_0800) (Figure 7, Table 2). Measures will be needed in these water bodies to improve the water quality outcomes.

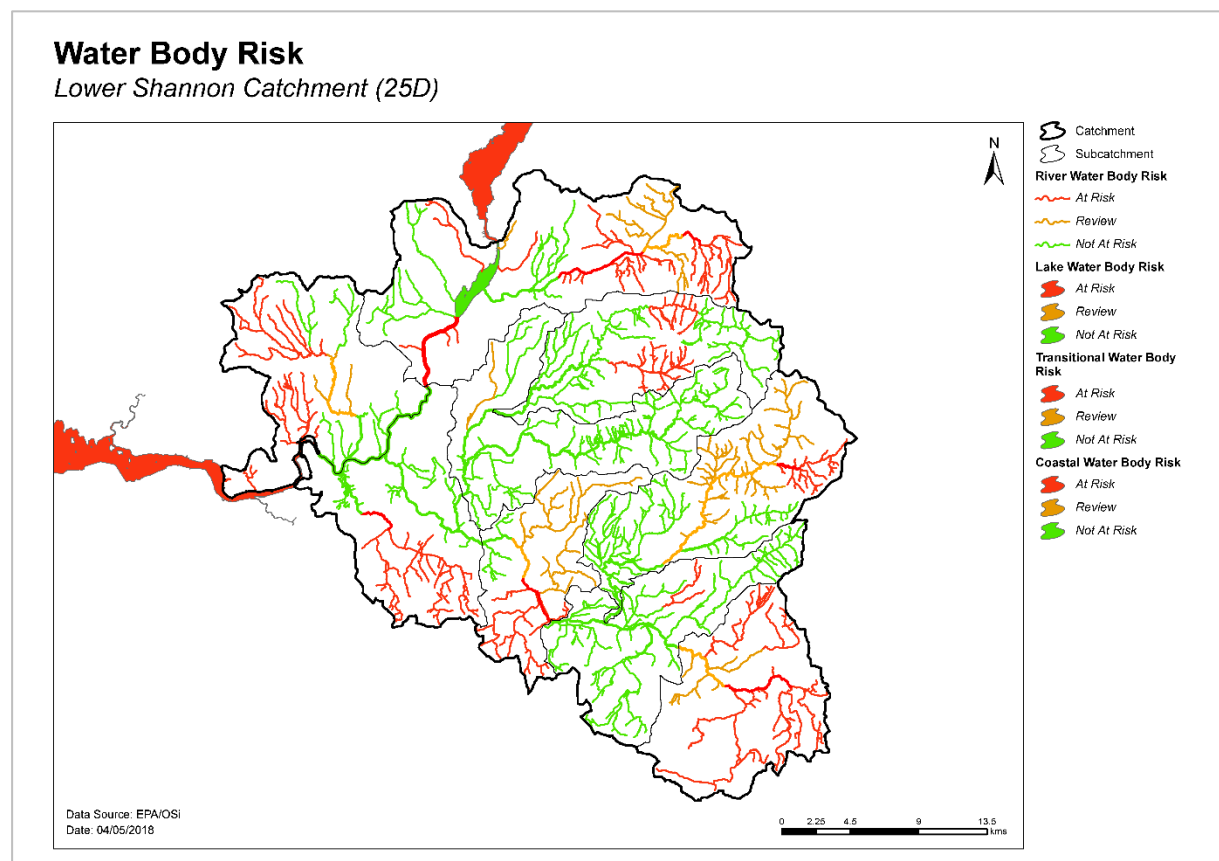


Figure 7. Surface water body risk

2.4 Risk of not meeting groundwater environmental objectives

- ◆ Five groundwater bodies are *Not at Risk* (Figure 8, Table 3) and require no additional investigative assessment or measures to be applied, other than those measures that are already in place.

- ◆ Seven groundwater bodies are in *Review*, all of which are at Good status. Nenagh is in *Review* due to contribution of phosphate to surface water bodies. Ardnacrusha, Ballyneety, Castleconnell, Broadford Gravels, Silvermines Gravels and O'Briensbridge Gravels are in *Review* due to elevated nitrate concentrations.
- ◆ There are six *At Risk* groundwater bodies. Four Limerick City East, Limerick City Northwest, Pallas Grean and Limerick City North due to elevated phosphate potentially contributing to associated at Risk surface water bodies and one due to PAHs from an industrial facility and one due to metals contamination from an historic mine (Silvermines). Measures will be needed in these water bodies to improve water quality outcomes.

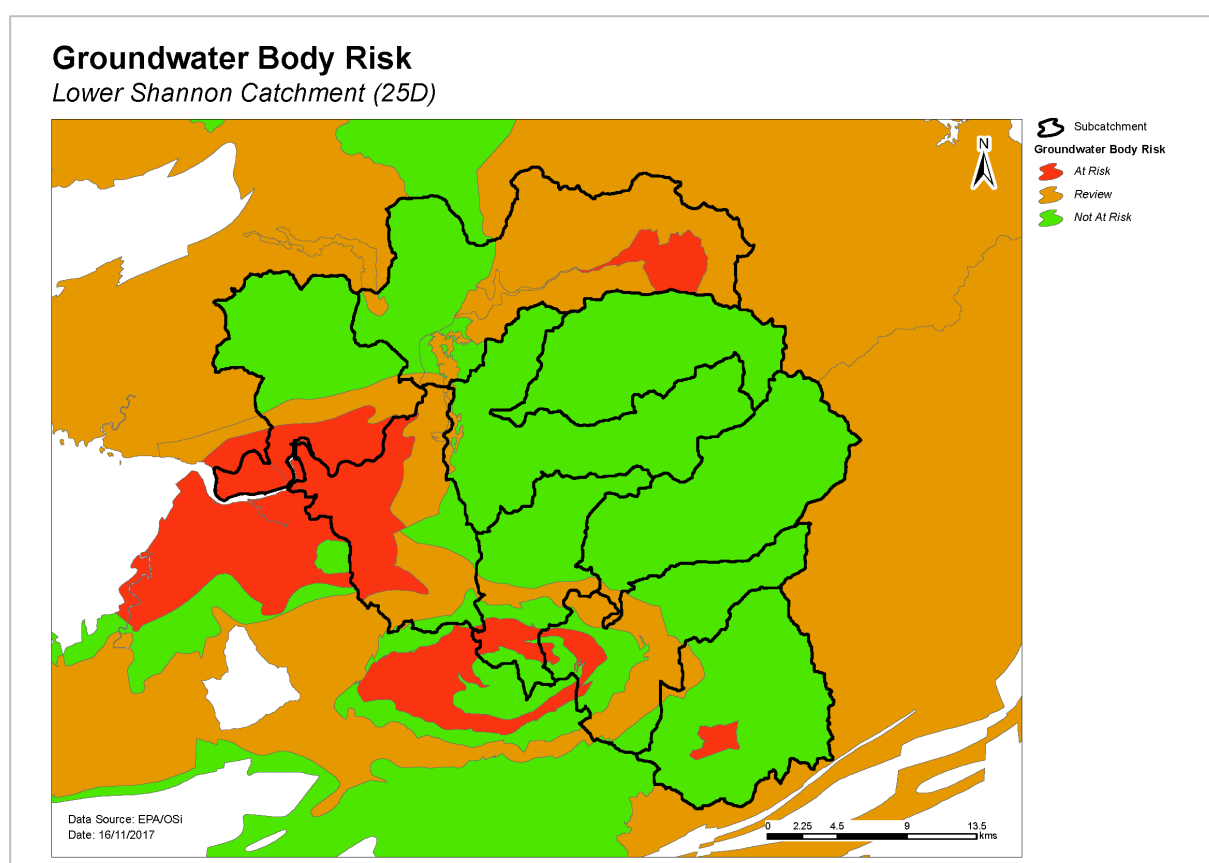


Figure 8. Groundwater body risk

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
Limerick City East	IE_SH_25G050200	Groody_010
Limerick City East	IE_SH_25W210770	Whitehall 25_010
Limerick City North	IE_SH_25N170970	North Ballycannon_010
Limerick City Northwest	IE_SH_25N170970	North Ballycannon_010
Limerick City Northwest	IE_SH_27C090600	Crompaun (East)_010
Pallas Grean	IE_SH_25M040200	Mulkear (Limerick)_020

2.5 Protected areas

2.5.1 Drinking water protected areas

- ◆ There are 34 abstractions in the Lower Shannon and Mulkear Catchment comprising 16 public water supply schemes and six private group water schemes (Appendix 4).
- ◆ Thirty of the abstractions are from seven groundwater bodies and four are from three river water bodies (Shannon (Lower)_050, Shannon (Lower)_060 and Newport (Tipperary)_030). 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 supply was non-compliant for pesticides (MCPA) in 2015 – Newport RWSS, 2800PUB1004. The non-compliant sample was taken at Mulcair River/O’Gorman Well.

2.5.2 Bathing waters

- ◆ There are no designated bathing waters in the catchment.

2.5.3 Shellfish areas

- ◆ There are no designated shellfish areas in the catchment.

2.5.4 Nutrient sensitive areas

- ◆ There are no nutrient sensitive areas in the catchment.

2.5.5 Natura 2000 sites

- ◆ There are 11 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.
- ◆ Three river water bodies have been prioritised for action as the water conservation objectives for their species and/or habitats are not being supported by ecological status (Appendix 5).
- ◆ There are three Special Protected Areas (SPAs) in the catchment:
 - Lough Derg (Shannon) SPA
 - River Shannon and River Fergus Estuaries SPA
 - Slievefelim to Silvermines 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.

2.6 Heavily modified water bodies

- ◆ There are two designated heavily modified water bodies (HMWB) in the catchment; Derg HMWB due to power generation and Limerick Dock due to port facilities. Derg HMWB was classified as having Good Ecological Potential in 2013-15, while Limerick Dock was Moderate.
- ◆ 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 river and lake water bodies. While excess ammonia is also of concern, it is only for a limited number of water bodies.
- ◆ Alteration of hydromorphological (or physical) conditions is also a concern in rivers and lakes in the Lower Shannon and Mulkear Catchment due to physical modifications, impacts by excess sediment

and alteration of water level in the lake. Such impacts have altered the morphology of water bodies and in turn, altered habitat conditions.

- ◆ Altered habitats due to morphological change, and fish status are the significant issues in Limerick Dock. The Upper Shannon Estuary is *At Risk* due to benthos status.
- ◆ Of the 18 groundwater bodies, six are *At Risk*. For Historic Mine (Silvermines), the significant issue relates to heavy metals (Ag, Hg and Pb). For Industrial Facility (P0331-01) the significant issue is PAH emission from the site. The remaining groundwater bodies groundwater bodies are *At Risk* due to elevated nutrient concentrations.

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 9 gives a breakdown of the number of *At Risk* water bodies in each significant pressure category.
- ◆ The significant pressure affecting the greatest number of water bodies is agriculture, followed by hydromorphological pressures, other, urban waste water, forestry, extractive industry, industry, diffuse urban and domestic waste water and (Figure 9).

4.1.1 Rivers, lakes, transitional and coastal (TraC)

- ◆ Significant pressures have been identified, through the initial characterisation process, in 17 river water bodies and one lake water body, nine of which have multiple pressures. Additional significant pressures will be refined as further characterisation is carried out.
- ◆ Hydromorphological is the significant pressure for Limerick Dock, which is designated as a HMWB due to the port facilities. Further work is needed to determine the significant pressure impacting on fish. Further work is also required to understand the pressures impacting on the benthos in the Upper Shannon Estuary.

4.1.2 Groundwater

- ◆ There are six *At Risk* groundwater bodies. Limerick City East, Limerick City Northwest and Pallas Grean are *At Risk* as they are at Poor status and are hydrologically connected to surface water bodies that are also *At Risk* where groundwater contribution of phosphate is having an impact. Limerick City North is also *At Risk* due to groundwater contribution of phosphate to surface water bodies that are *At Risk*; however, the groundwater body itself is at Good status.
- ◆ Industrial Facility (P0331-01) is *At Risk* due to release of PAH from an industrial facility. Historic Mine (Silvermines) is *At Risk* due to heavy metal contamination from historic mines (As, Hg and Pb). Measures will be needed in these water bodies to improve water quality outcomes.

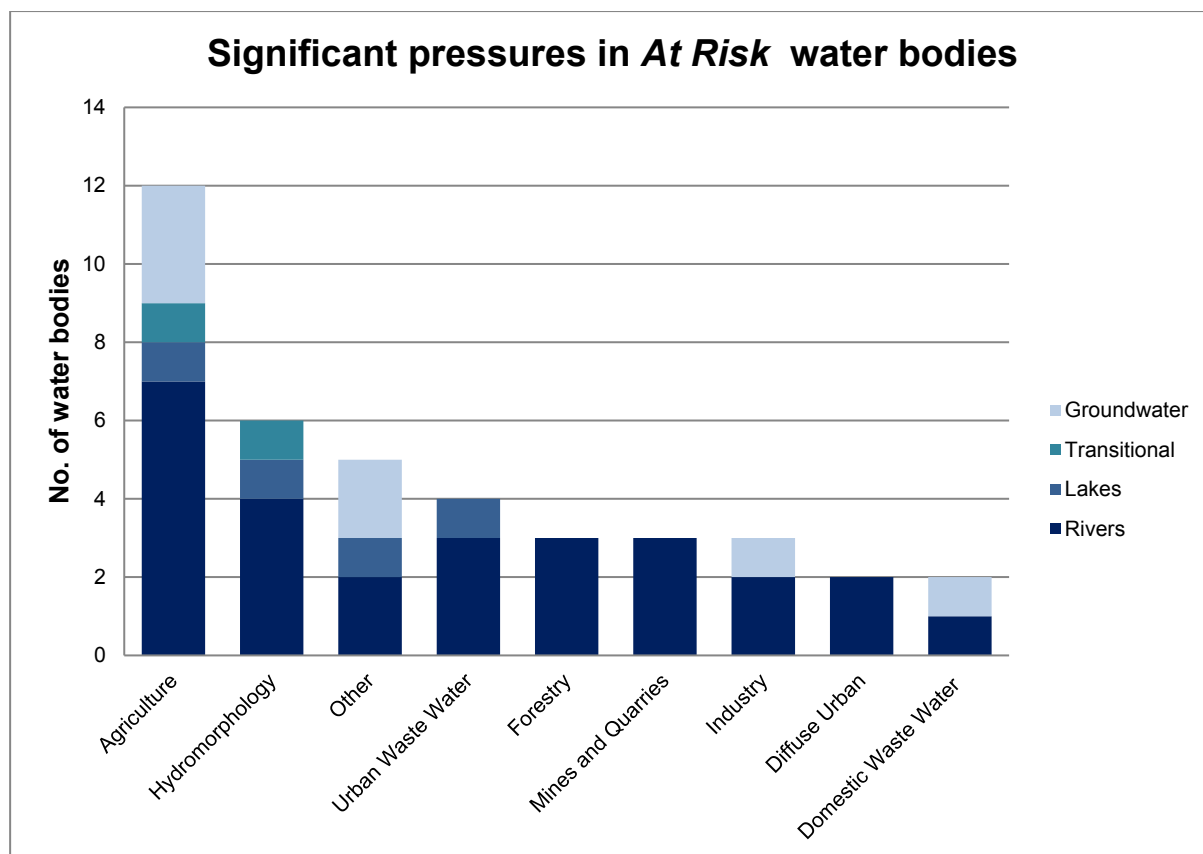


Figure 9. Significant pressures impacting on *At Risk* water bodies

4.2 Pressure type

4.2.1 Agriculture

- ◆ Agriculture is a significant pressure in 12 water bodies across several subcatchments. The water bodies affected by agricultural activities are shown in Figure 10. The issues related to farming in this catchment are diffuse phosphorus loss to surface waters, for example, direct discharges; or runoff from yards, roadways or other compacted surfaces, or runoff from poorly draining soils. Sediment can also be a problem from land drainage works, bank erosion from animal access or stream crossings. These impacted surface waters may be in turn, hydrologically connected to areas where groundwater contribution of phosphate is having an impact.
- ◆ The pollution impact potential map, showing areas of relative risk for phosphorus loss from agriculture to surface water, is given in Appendix 6.

4.2.2 Hydromorphology

- ◆ Both Newport (Tipperary)_020 and Doonane_010 located within the Newport [Tipperary] (SC25D_1) subcatchment are subject to modification of the riparian zone. On the Shannon (Lower)_050, which is located in the Shannon [Lower] (SC25D_6) subcatchment, IFI have noted that an impoundment has resulted in the loss of spawning grounds. In Lough Derg it is noted that the water levels are artificially maintained. In Limerick Dock, embankments are the main pressure. Water bodies that are impacted by hydromorphological pressures are illustrated in Figure 11.

At Risk Water Bodies where Agriculture is a significant pressure
Lower Shannon Catchment (25D)

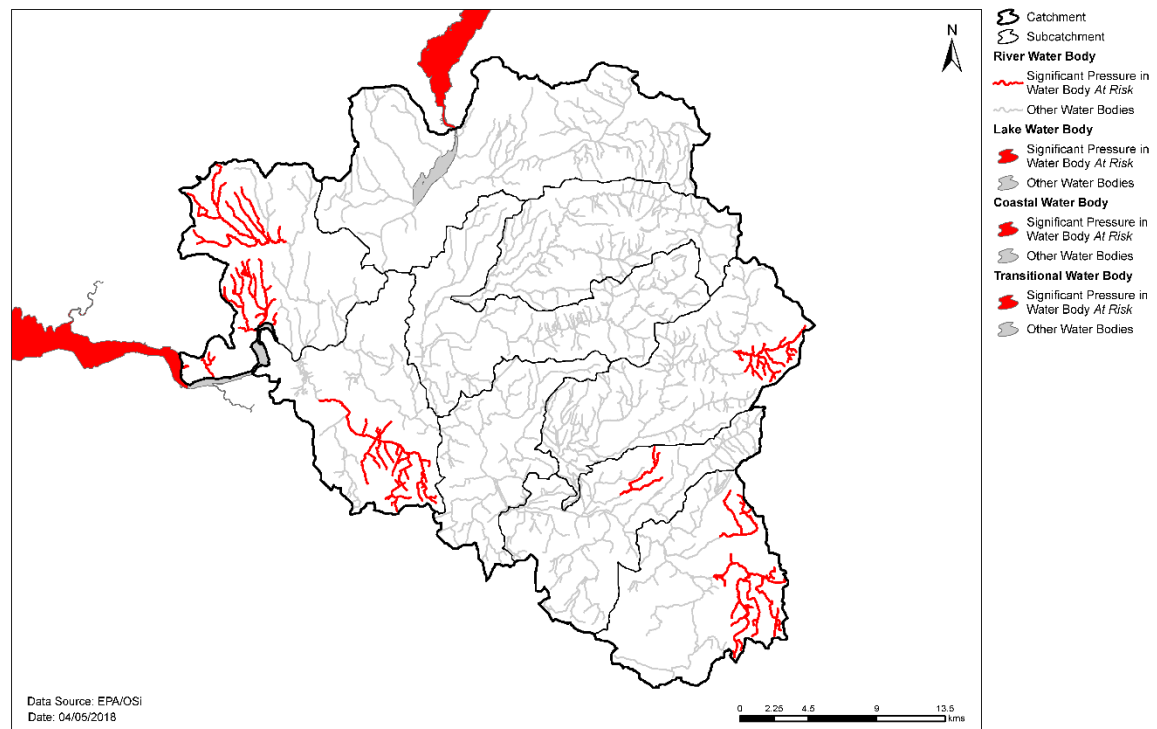


Figure 10. Water bodies that are *At Risk* and are impacted by agricultural activities

At Risk Water Bodies where Hydromorphology is a significant pressure
Lower Shannon Catchment (25D)

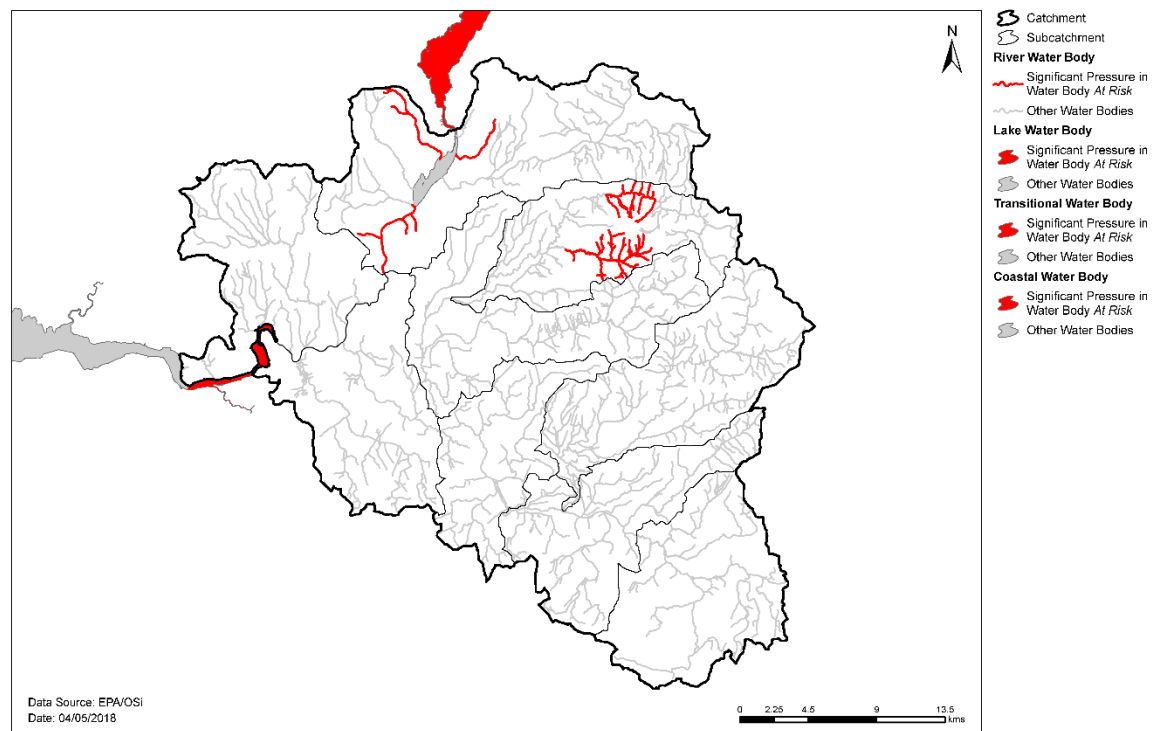


Figure 11. Water bodies that are *At Risk* and are impacted by hydromorphological pressures

4.2.3 Other significant pressures

Invasive Species

- ◆ One of the lake water bodies Derg TN IE_SH_25_191a has zebra mussels present, which have been identified as a significant pressure. In addition, Lough Derg has Asian clams and up to 14 other alien species according to IFI and the Lough Derg Science Group. The bank of the river water body Toem Stream_010 was reported to be infested with Giant Hogweed (Figure 12).

Unknown Anthropogenic

- ◆ The significant pressure in one *At Risk* Mulkear (Limerick)_020 is not known IE_SH_25M040200. The local authority highlighted recent exploration drilling may have had a negative localised impact.
- ◆ The historic Silvermines is a significant pressure on one groundwater IE_SH_G_248, with high level of As, Hg, and Pb. Whilst the significant pressure on groundwater Pallas Grean IE_SH_G_196 is unknown. Figure 13.

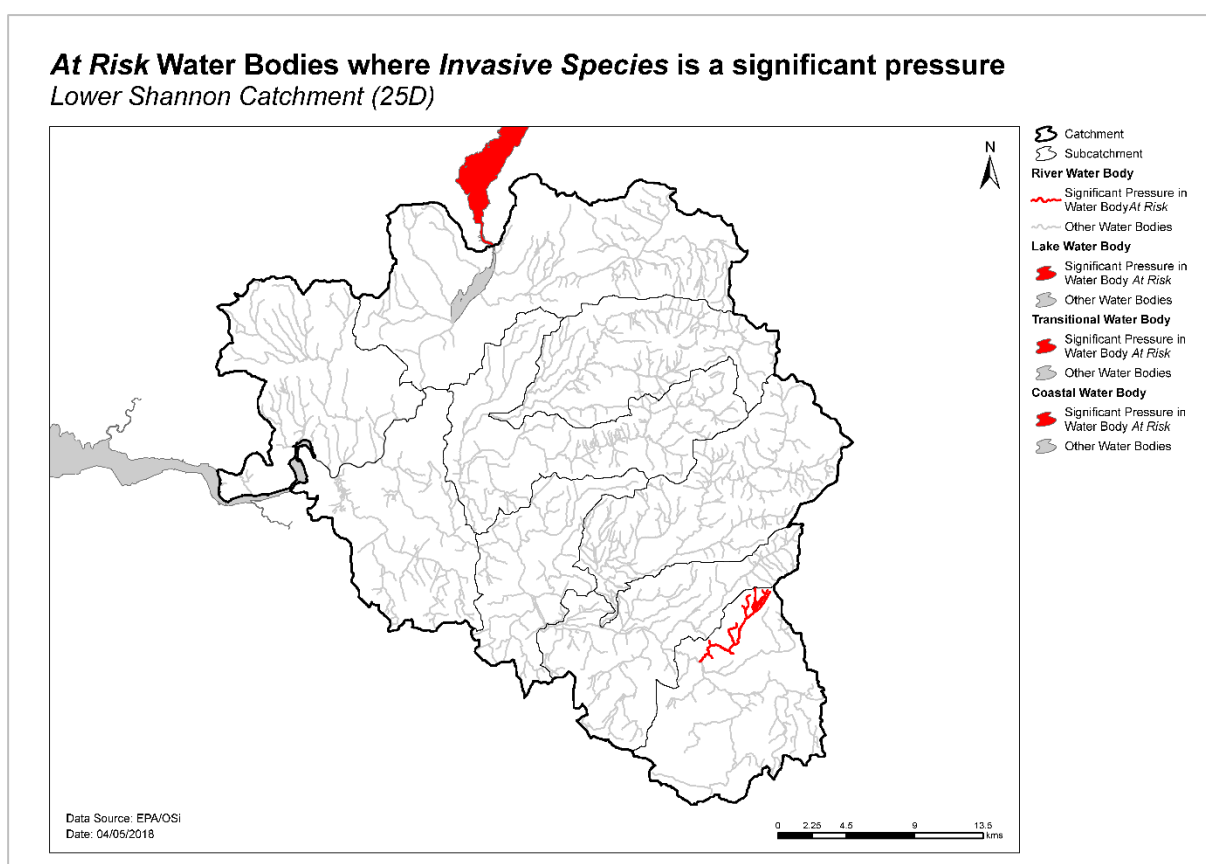


Figure 12. Water bodies that are *At Risk* and are impacted by invasive species

At Risk Water Bodies where Other Anthropogenic Pressures is a significant pressure
Lower Shannon Catchment (25D)

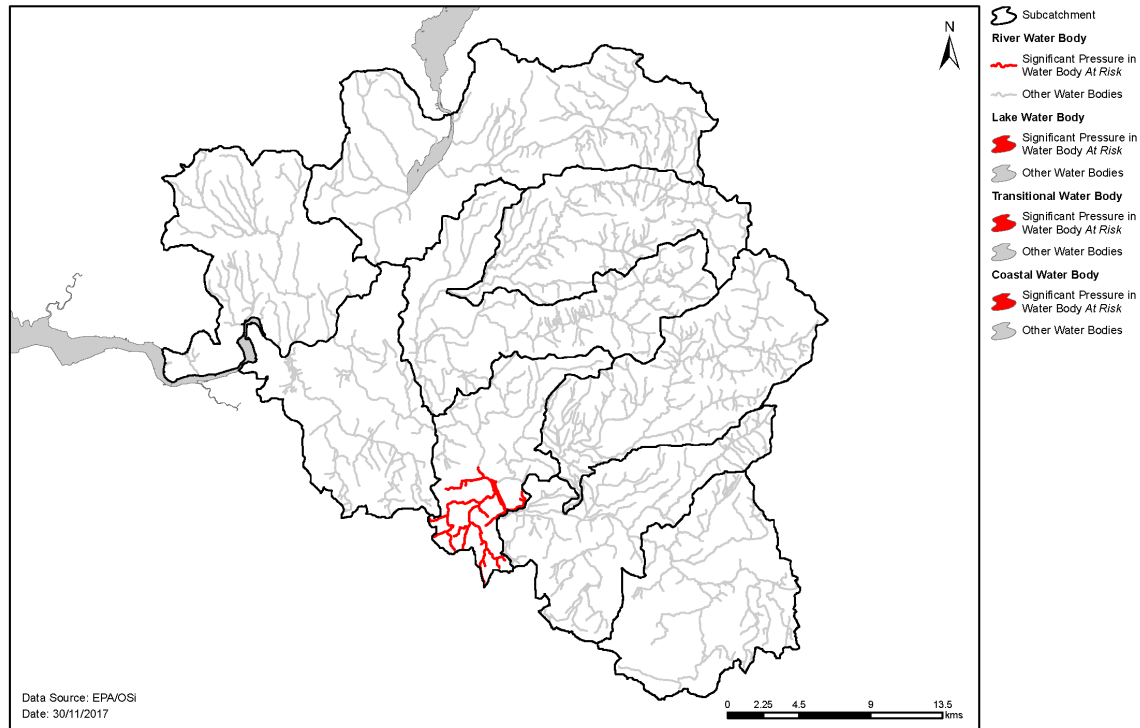


Figure 13. Water bodies that are *At Risk* and are impacted by other anthropogenic pressures

4.2.4 Urban waste water treatment plants

- ◆ Urban Waste Water Treatment Plants (WWTPs) have been identified as a significant pressure in three *At Risk* water bodies; details are given in Table 5 and Figure 14. The Ballina WWTP, which impacts Derg TN and Shannon (Lower)_050, is scheduled to be upgraded by 2024.

Table 5. Waste Water Treatment Plants 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
Limerick Junction D0457	500 to 1,000 p.e.	Dead_010	Moderate	NA ¹
Ballina D0016	> 10,000 p.e.	Derg TN	Poor	2024
Ballina D0016	> 10,000 p.e.	Shannon (Lower)_050	Moderate	2024

¹ Currently not specified in improvement plans

At Risk Water Bodies where *Urban Waste Water* is a significant pressure Lower Shannon Catchment (25D)

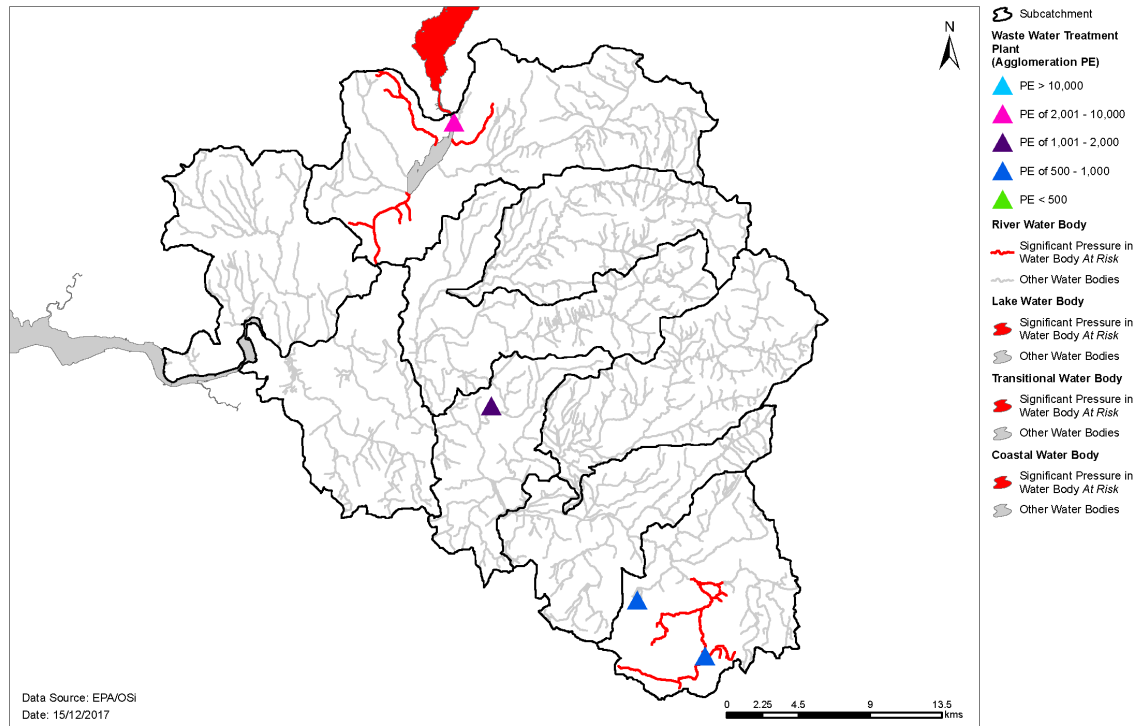


Figure 14. Water bodies that are in *At Risk* and are impacted by urban waste water

At Risk Water Bodies where *Forestry* is a significant pressure Lower Shannon Catchment (25D)

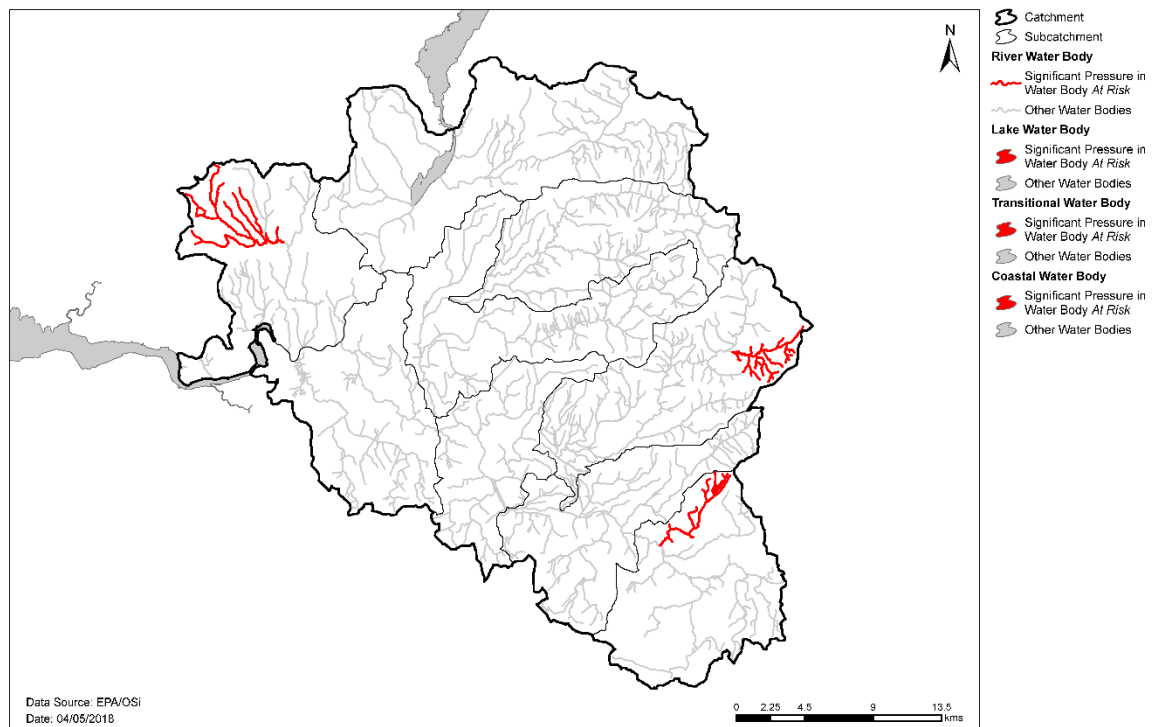


Figure 15. Water bodies that are *At Risk* and are impacted by forestry activities

4.2.5 Forestry

- ◆ Forestry has been identified as a significant pressure in three water bodies – Toem Stream_010, Blackwater (Clare)_010 and Inch (Bilboa)_010 (Figure 15). The significant issues are a combination of general forestry practices such as road construction, planting and clearfelling, which have resulted in heavy siltation.

4.2.6 Extractive industry

◆ *Mines and Quarries*

Mines have been identified as a significant pressure in three water bodies – Kilmastulla_010, Kilmastulla_030 and Kilmastulla_040 (Figure 16). The issues relate to elevated heavy metal concentrations from the historic Silvermines zinc and lead mining site.

4.2.7 Industry

Industry has been identified as a significant pressure in two river water bodies Mulkear (Limerick)_020 and Dead_010 (Figure 17). One is a point pressure arising from an industrial discharge, resulting in nutrient issues and another is from the discharge from a drilling site. The groundwater IE_SH_G_219, has an Industrial facility (P0331-01) resulting in PAH discharges.

4.2.8 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 two river water bodies – Groody_010 and Whitehall_010 (Figure 18). Elevated concentrations of phosphate and ammonia are the significant issues.

4.2.9 Domestic waste water

- ◆ Domestic waste water has been identified as a significant pressure in one water body – Whitehall_010 (Figure 19). Whilst there is a high concentration of domestic waste water treatment systems on the upper catchment that are likely to be affecting water quality, there is also potential that due to the size of the stream it may never achieve an improvement on Q3 due to lack of species diversity. Further characterisation is therefore required.

At Risk Water Bodies where *Extractive Industry* is a significant pressure
Lower Shannon Catchment (25D)

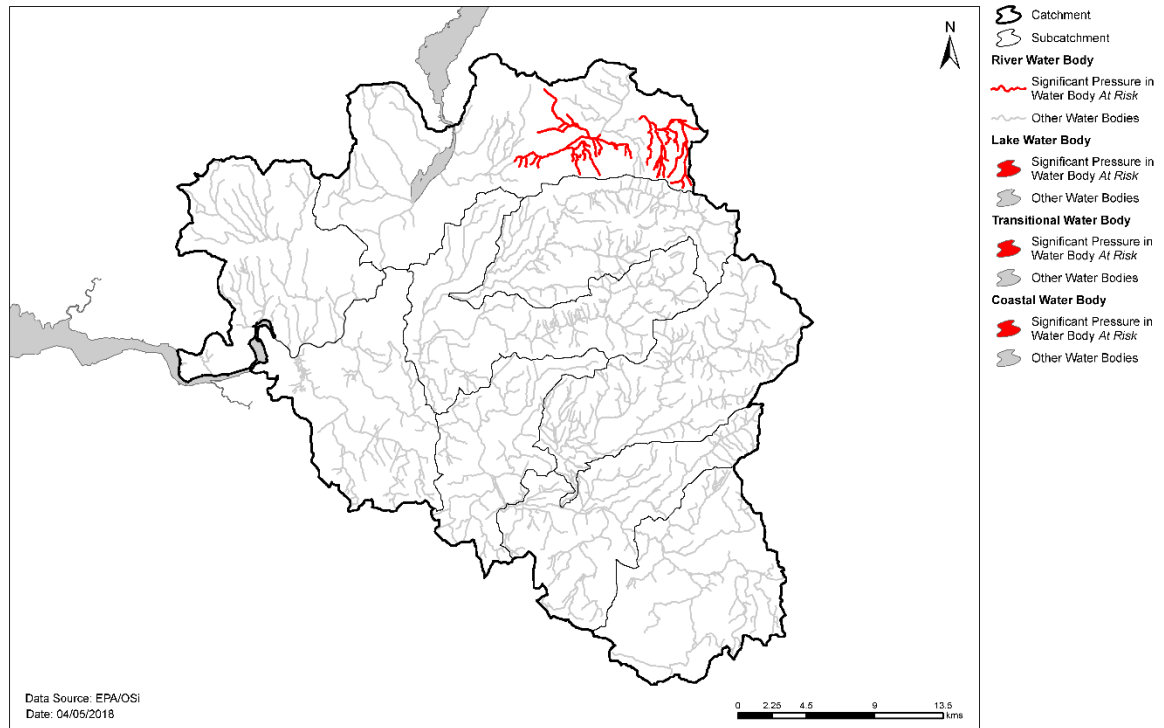


Figure 16. Water bodies that are *At Risk* and are impacted by the extractive industry

At Risk Water Bodies where *Industry* is a significant pressure
Lower Shannon Catchment (25D)

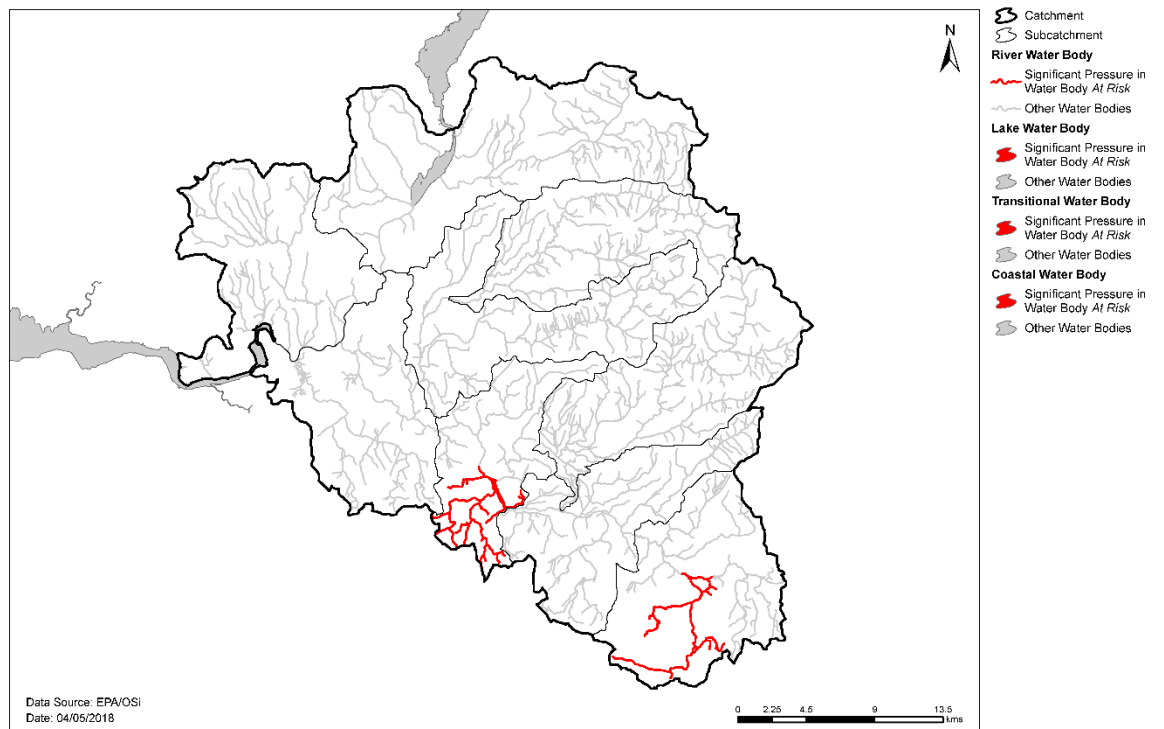


Figure 17. Water bodies that are *At Risk* and are impacted by industrial activities

At Risk Water Bodies where *Diffuse Urban* is a significant pressure
Lower Shannon Catchment (25D)

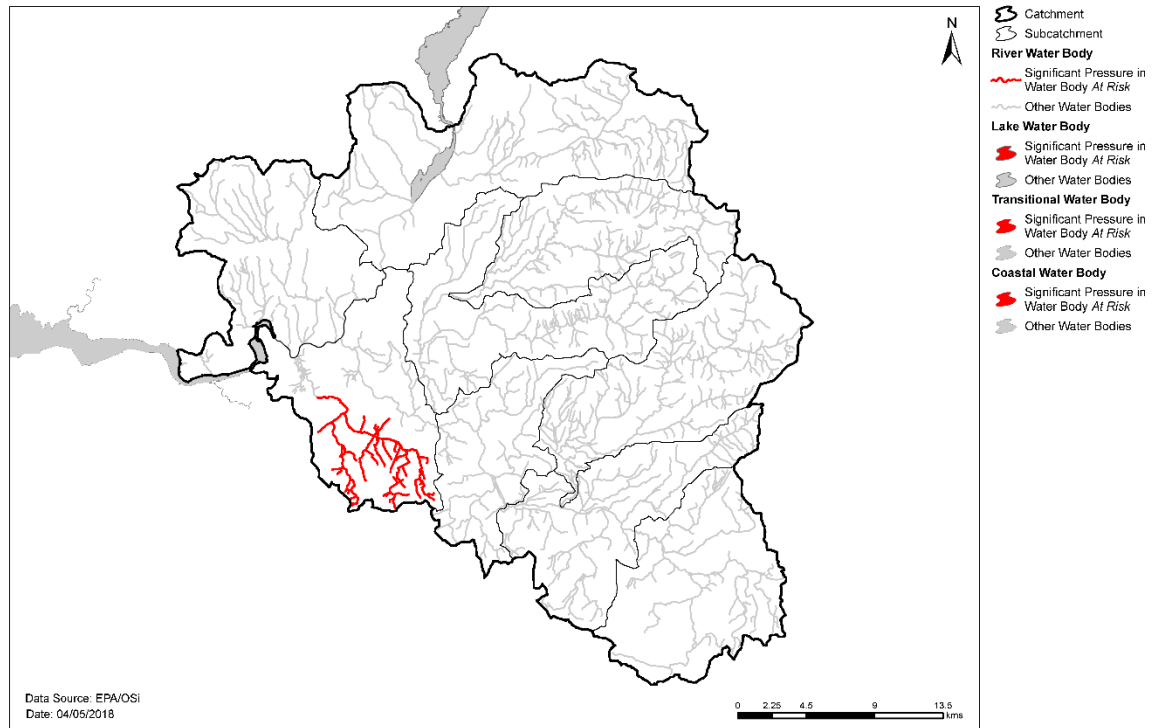


Figure 18. Water bodies that are *At Risk* and are impacted by diffuse urban impacts

At Risk Water Bodies where *Domestic Waste Water* is a significant pressure
Lower Shannon Catchment (25D)

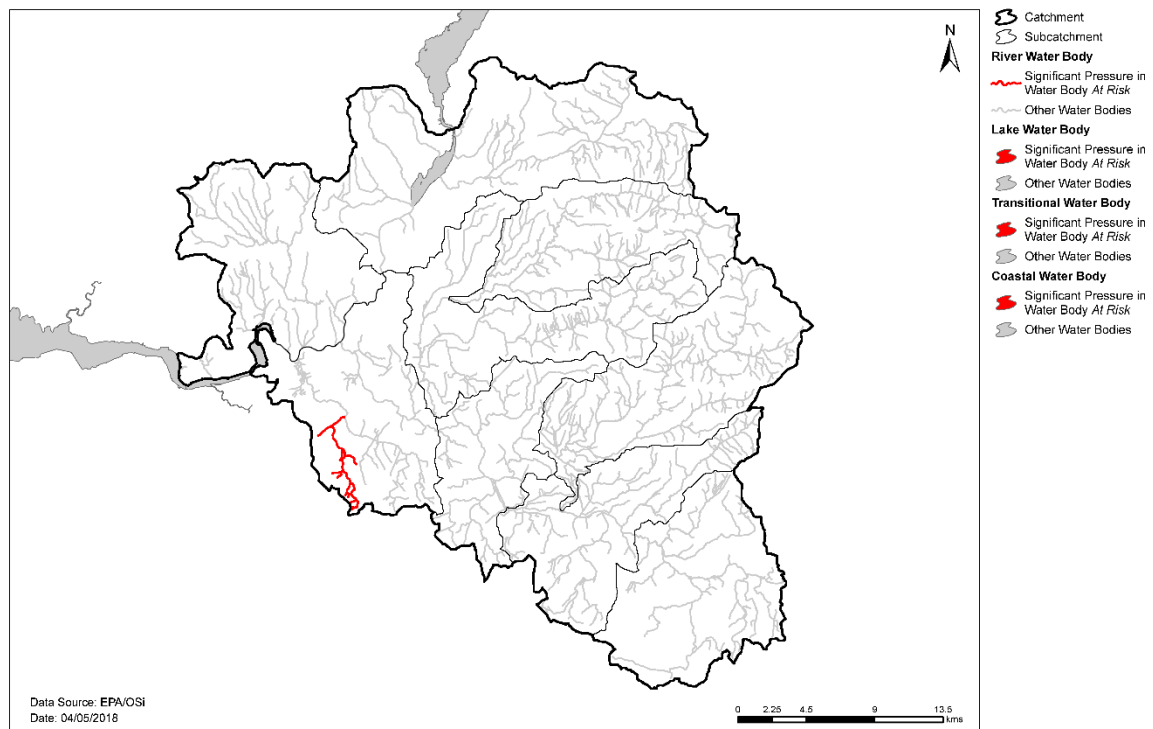


Figure 19. Water bodies that are *At Risk* and are impacted by domestic waste water

5 Load reduction assessment

5.1 River water body load reductions

- ◆ The results of the main channel assessment for the Mulkear (Limerick) 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 Lower Shannon and Mulkear catchment, the available water chemistry data indicate that load reduction is required in two river water bodies (Table 7).

Table 7. Relative load reductions required in monitored water bodies that are *At Risk*.

Water body	P Load Reduction Required
Dead_010	High
Cappawhite Stream_010	Med

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 is 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 Limerick Dock and the Upper Shannon Estuary are satisfactory and it appears that no further reductions are required.

As part of the Ireland's commitment to the OSPAR Convention, nutrient flux or load monitoring has been carried out on the Shannon Estuary since 1990 (Figure 19a to 19d). Further analysis of these nutrient load trends is available at <http://dx.doi.org/10.3318/BIOE.2016.23>

Figure 19a and 19b – Total Nitrogen Load (Tonnes/year) 1990-2015

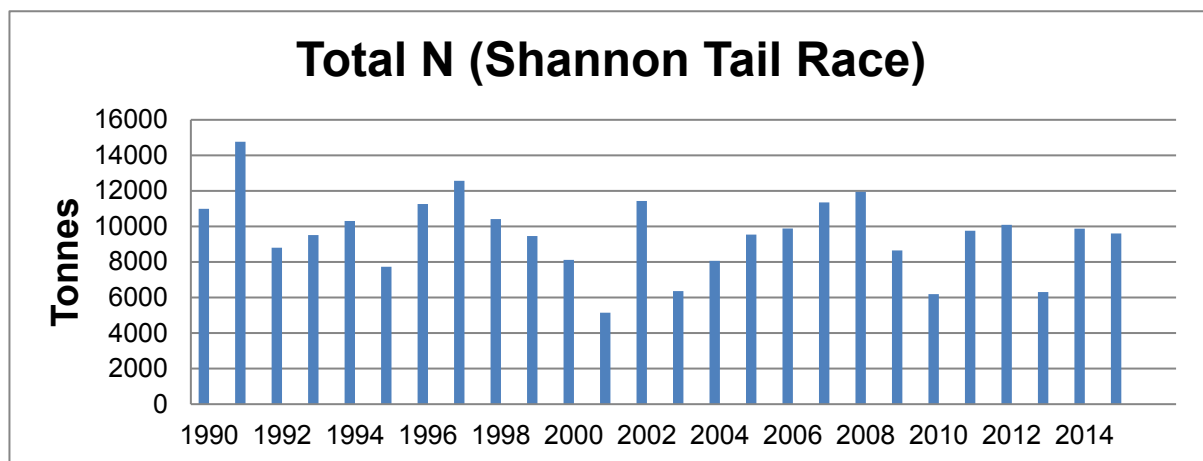
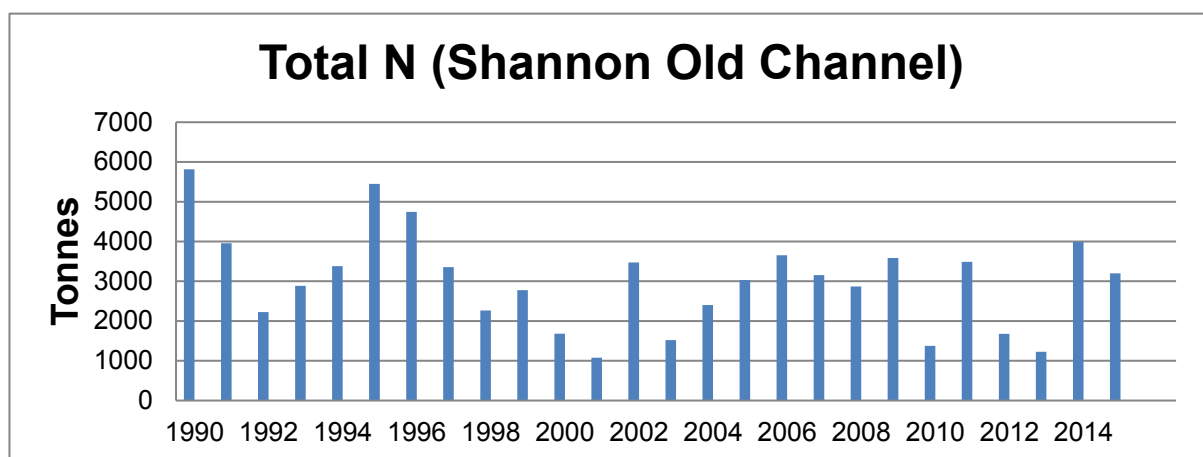
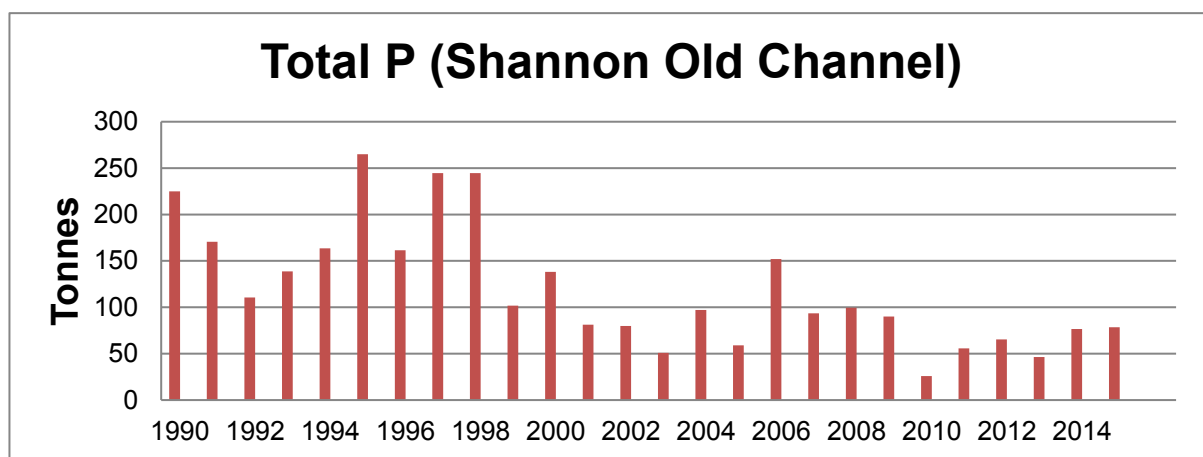
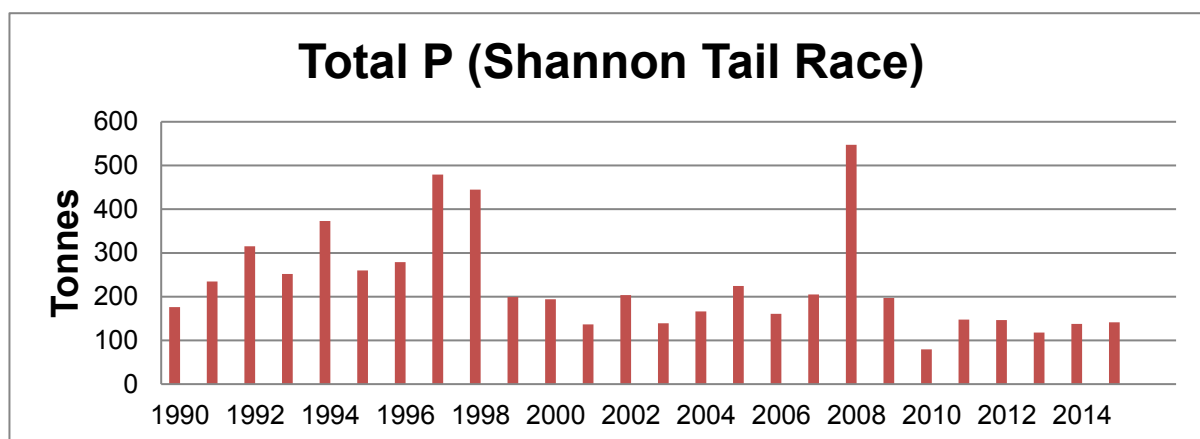


Figure 19c and 19d – Total Phosphorus Load (Tonnes/year) 1990-2015





6 Further characterisation and local catchment assessments

- ◆ Further characterisation through local catchment assessments is needed in 18 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 eight 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 assessment scenarios are given in Appendix 7.

Table 8. 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	Total
At Risk	8	0	0	0	2	2	9	3	2	26
Review	6	0	2	0	0	0	0	0	0	8

Note water bodies may have multiple categories of Local Catchment Assessments

7 Catchment summary

- ◆ Of the 48 river water bodies, 17 are *At Risk* of not meeting their WFD objectives.
- ◆ One out of the two lake water bodies is *At Risk* of not meeting its WFD objectives.
- ◆ Excess phosphorus leading to eutrophication is a major issue for several water bodies. While excess ammonium is also of concern, it is only for a limited number of water bodies.
- ◆ Both Limerick Dock and the Upper Shannon Estuary are *At Risk*. For Limerick Dock, this is due to hydromorphological pressure (designated as HMWB due to port facilities). For the Upper Shannon Estuary, the pressure is not certain but the status is driven by benthos alone.
- ◆ Hydromorphological (or physical) conditions (including the input of excessive fine sediment) and poor habitat quality are also a concern for several surface water bodies.
- ◆ There are six groundwater bodies which are *At Risk*, four of which are *At Risk* due to contribution of phosphate to associated *At Risk* surface water bodies. Industrial Facility (P0331-01) is *At Risk* due to

release of PAH from an industrial facility. Historic Mine (Silvermines) is *At Risk* due to heavy metal contamination from historic mines (As, Hg and Pb).

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. In the Shannon, Lower and Mulkear catchment, 5 recommended areas for action were selected.

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 from 2018 to 2021.

8.2 Outcomes of process

The outcomes for the Lower Shannon and Mulkear catchment are summarised below.

- ◆ Five recommended areas for actions (Table 9, Figure 20) were selected.
- ◆ These are the Groody, Mulkear (Limerick), Toem and Cappawhite, Inch (Bilboa), and Dead and Cauteen.
- ◆ These include nine river water bodies – eight *At Risk* and one *Review*.
- ◆ Three groundwater bodies, that are *At Risk* or *Review* due to groundwater contribution of nutrients to surface water bodies, intersect with two 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 19 *At Risk* and *Review* water bodies were not included in the recommended areas for action for the second cycle. The distribution of these is presented in Figure 21. These include:

- ◆ 17 river and lake water bodies – ten *At Risk* and seven *Review*, and
- ◆ two *At Risk* transitional water bodies.

Recommended area for action	Number of water bodies	SCs	Local authority	Reason for Selection
Groody	2	25D_9	Limerick	<ul style="list-style-type: none"> • Building on improvement to fishery; salmon has returned to the lower section of the river. • Zoned for amenity use in Local Area Plan. • Active community interest, including Caherconlish tidy towns. • Urban stream. • Potential to tie in with Limerick regeneration project. • One potential 'quick win'.
Mulkear (Limerick)	2	25D_8	Limerick	<ul style="list-style-type: none"> • Building on completed and ongoing work by the MulkearLIFE project. • Building on improvements from in-stream works. • Important trout spawning streams. • Failing to meet protected area objective for salmon. • One deteriorated water body.
Toem and Cappawhite	2	25D_2	Tipperary	<ul style="list-style-type: none"> • Opportunity to look at integration of planning and forestry activities. • Potential to link with the Mulkear After LIFE Plan • Important salmon spawning rivers. • Headwaters to the river Dead. • One deteriorated water body.
Inch (Bilboa)	1	25D_5	Tipperary	<ul style="list-style-type: none"> • Opportunity to look at integration of planning and forestry activities. • Headwaters of one of the most important spawning streams in the system. • One deteriorated water body. • Water body is not meeting protected area objectives for Salmon.
Dead and Cauten	2	25D_2	Tipperary	<ul style="list-style-type: none"> • Headwaters to the river Cauten and the river Dead. • Strong local farming involvement • Opportunity to build on awareness initiatives by Limerick County Council.

Table 9. Recommended Areas for Action in the Lower Shannon and Mulkear catchment

Table 10. 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_138	Limerick City East	At risk	IE_SH_25G050200	GROODY_010	Groody
IE_SH_G_138		At risk	IE_SH_25W210770	Whitehall 25_010	
IE_SH_G_036	Ballyneety	Review	IE_SH_25G050200	GROODY_010	
IE_SH_G_036		Review	IE_SH_25W210770	Whitehall 25_010	
IE_SH_G_036		Review	IE_SH_25D020400	DOOGLASHA (CAPPAMORE)_010	Mulkear (Limerick)
IE_SH_G_036		Review	IE_SH_25M040200	MULKEAR (LIMERICK)_020	
IE_SH_G_196	Pallas Grean	At risk	IE_SH_25M040200	MULKEAR (LIMERICK)_020	

9 Environmental Objectives

The environmental objectives are the target status for each *At Risk* or *Review* water body and the date by which that status is expected to be achieved (Appendix 3). Where a water body is *Not at Risk* and is already at its target status, the environmental objective is deemed to have been met.

9.1 Surface Water

- Assuming resources are available and actions are taken in the recommended areas for action, of the eight *At Risk* water bodies, it is predicted that one (13%) will achieve improvements by 2021 and the remaining seven (88%) will achieve their objective by 2027. For the one *Review* water body, the absence of information on this water body means that there is no scientific basis to quantify an environmental objective date and therefore a 2027 date is set for this water body, see Table 11.

Table 11. 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			
<i>At Risk</i>	8	1	7
<i>Review</i>	1	0	1
Total	9	1	8

- Twenty-four water bodies have met their 2015 environmental objective. One of the 24 *Not at Risk* river water bodies met its 2015 environmental objective for ecological status but failed to meet its protected area objectives.
- As action is not yet planned to be taken in the remaining 12 *At Risk*, a 2027 date is applied to nine of the water bodies, while the remaining three have a less stringent objective designation. For the seven *Review* water bodies, the absence of information on six of the seven water bodies means that there is no scientific basis to quantify an environmental objective date and therefore a 2027 date is set. For the remaining water body, information on the impact from historic mines indicates that a designation of a less stringent objective is sought for a beyond 2027 target., see Table 12.

Table 12. Environmental objectives dates in the *At Risk* and *Review* 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	Less stringent objective
Rivers				
<i>At Risk</i>	9	0	6	3
<i>Review</i>	7	0	6	1
Lake				
<i>At Risk</i>	1	0	1	
<i>Review</i>	0	0	0	0
Transitional				
<i>At Risk</i>	2	0	2	0
<i>Review</i>	0	0	0	0
Total	19	0	15	4

9.2 Groundwater

Thirteen of the 18 groundwater bodies are currently Good status and, therefore, have met their environmental objectives. Of the five groundwater bodies that are less than Good status, four have a 2027 environmental objective, while the remaining one has a less stringent objective designation.

Table 13 Environmental Objective dates of Poor status groundwater bodies in the Lower Shannon and Mulkear catchment

Water body code	Water body name	Environmental Objective
IE_SH_G_138	Limerick City East	2027
IE_SH_G_140	Limerick City Northwest	2027
IE_SH_G_196	Pallas Grean	2027
IE_SH_G_219	Industrial Facility (P0331-01)	2027
IE_SH_G_248	Historic Mine (Silvermines)	less stringent objective

Recommended Areas for Action

Lower Shannon Catchment (25D)

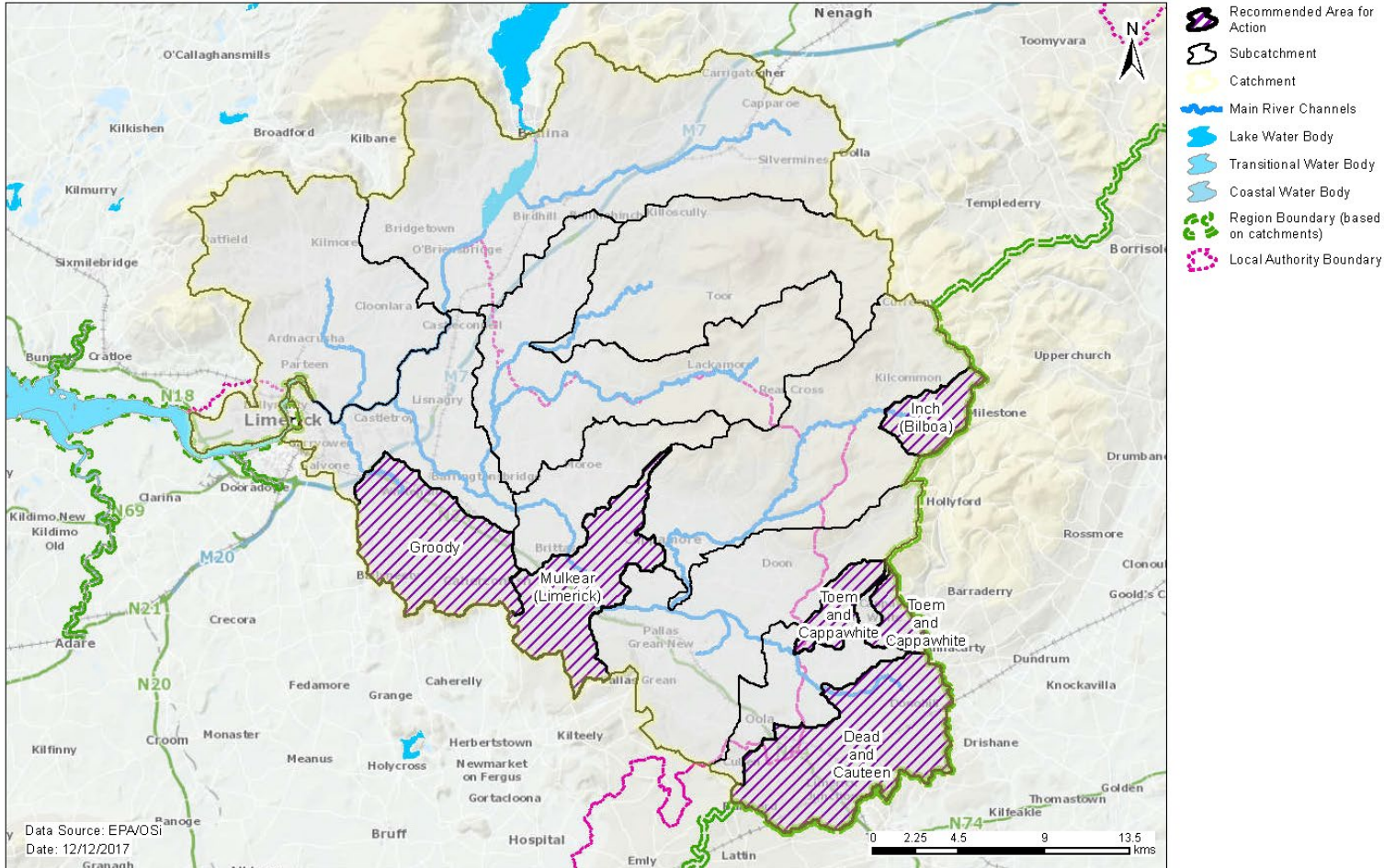
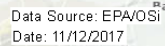


Figure 20. Location of Recommended Areas for Action in the Lower Shannon and Mulkear catchment

Lower Shannon Catchment (25D)



27

10 Acknowledgements

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

- Limerick City & County Council
- Tipperary County Council.
- Clare County Council.
- Galway 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.

Appendix 1 High ecological status objective water bodies and sites

Water body/ Site	Type	Codes	2015 Status
Mountrice_010	River	IE_SH_25M030300	High
Ardcloony_010	River	IE_SH_25A030100	High
Doonane_010	River	IE_SH_25D040200	Good
Newport (Tipperary)_020	River	IE_SH_25N020080	Good
Blackwater (Clare)_010	River	IE_SH_25B060120	Good

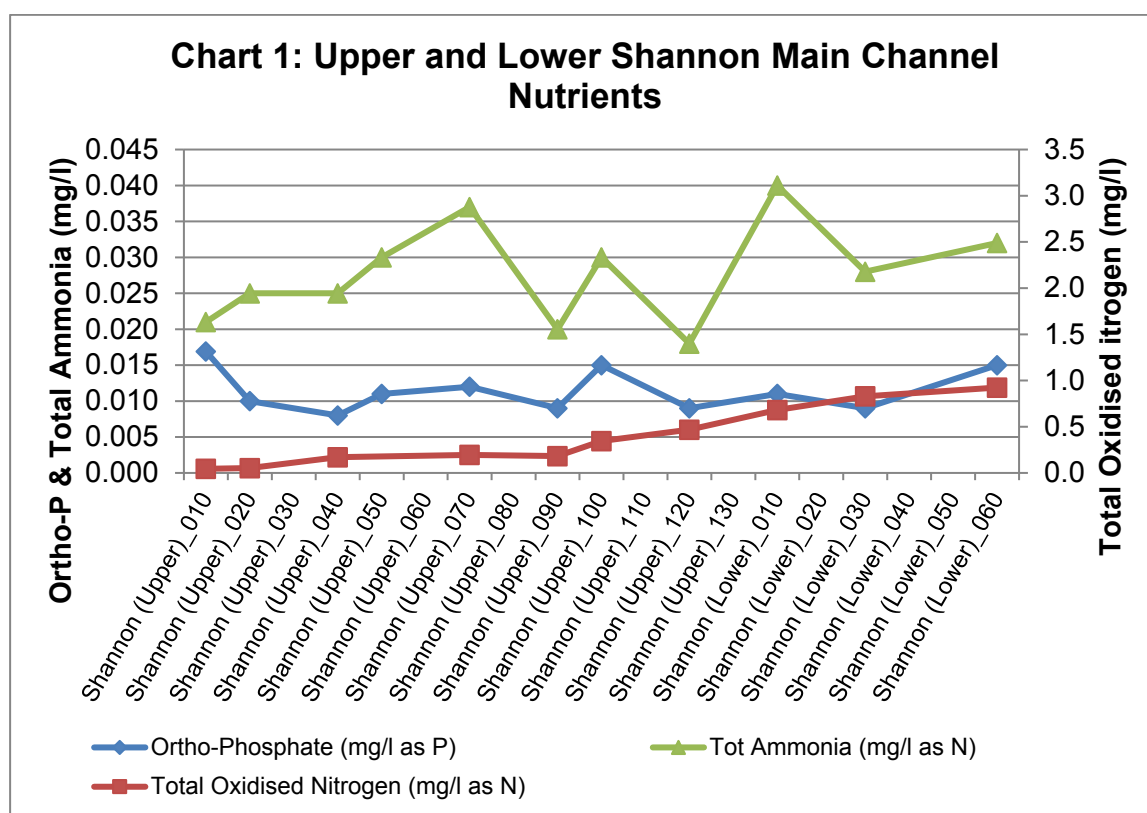
Appendix 2 Catchment scale nutrient concentrations and in-stream loads

The results of the instream water quality assessment for the Shannon (Upper and Lower) main channel are illustrated in Chart 1. Only 12 of the 17 main channel water bodies have water quality data associated with them. The assessment is based on the mean concentrations between 2013 and 2015 at each site from the headwaters down to the estuary

The results show that average nutrients concentrations in the Shannon main channel are below their corresponding threshold values. Concentrations of orthophosphate range from 0.008 to 0.017mg/l, with the highest concentration observed in the headwater SHANNON (UPPER)_010. Small spikes of orthophosphates are observed in the SHANNON (UPPER)_100, which receives water from the FEORISH (TARMONBARRY)_020 of poor ecological status, and the SHANNON (LOWER)_060 which is the receives the primary discharge from the Castletroy Waste Water Treatment Plant (WWTP).

Ammonia concentrations show no significant trend along the main channel and range from 0.018 to 0.037mg/l. The small concentration spikes of ammonia are observed in SHANNON (UPPER)_070 and SHANNON (LOWER)_010. The SHANNON (UPPER)_070 is the receiving water body for a number of small WWTPs including Dromod, Drumsna, Jamestown and Roosky & Environs. The SHANNON (LOWER)_010 is the receiving water body for the Banagher WWTP.

TON concentrations are low at the head waters but increase from 0.018mg/l in the SHANNON (UPPER)_090 to 0.92mg/l in the SHANNON (LOWER)_060. TON remains well below the 2.6mg/l threshold value throughout the channel.

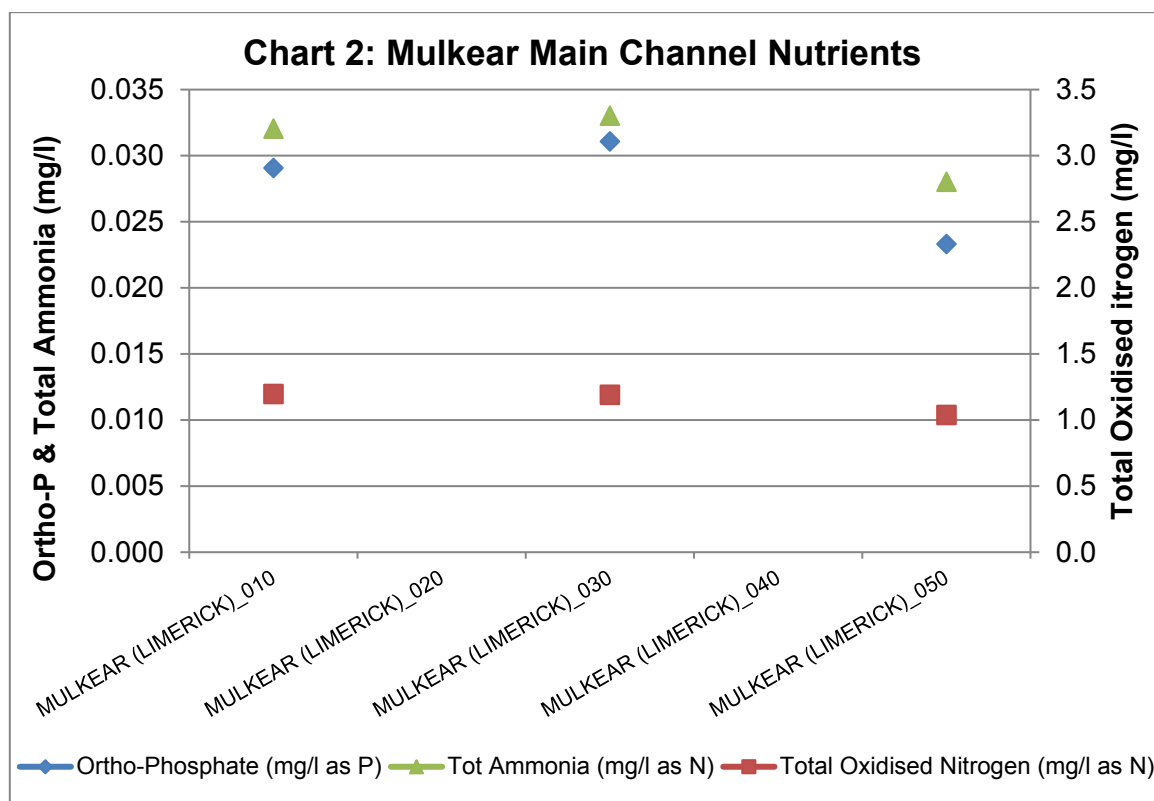


25D Lower Shannon Main Channel Nutrient Trends

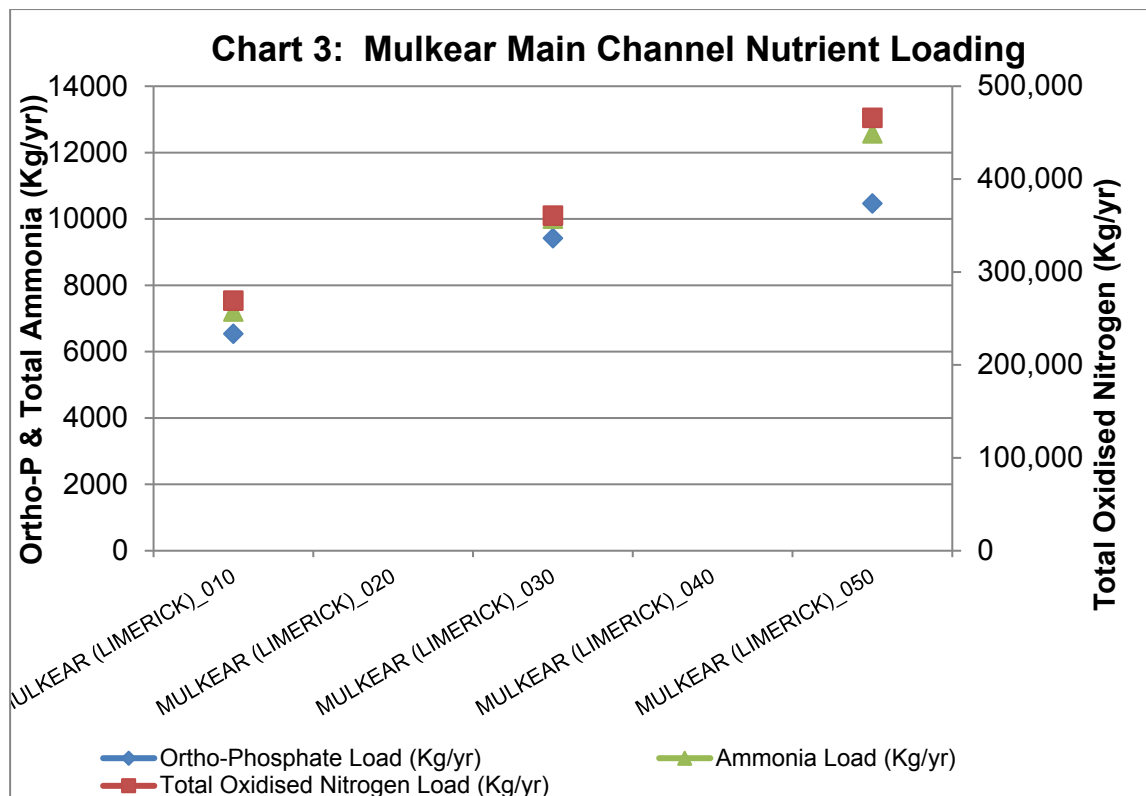
The Mulkear River is the main river in the 25D Lower Shannon catchment which flows into the SHANNON (LOWER)_060. The SHANNON (LOWER)_060 is also the receiving water for the SHANNON (LOWER)_050, the BLACKWATER (CLARE)_020 and the GROODY_010 water bodies. The results for the Mulkear water quality trend assessment are presented in Chart 2.

Average orthophosphate concentrations along the Mulkear River are 0.029, 0.031 and 0.023mg/l at MULKEAR_010, MULKEAR_030 and MULKEAR_050 respectively. The Environmental Quality Standard (EQS) of 0.035mg/l is not exceeded at any of the main channel monitoring points where water chemistry data is available.

Total oxidised nitrogen (TON) concentrations are low and remain below the 2.6mg/l threshold at each monitoring point. Similarly, ammonia concentrations remain below the EQS for good status (0.065mg/l) at each monitoring point where water chemistry data is available.



The results of the Mulkear channel nutrient loading trend assessment are presented in Chart 3. In the Mulkear channel, stream discharge increases from the headwaters at MULKEAR_010 to MULKEAR_050, ranging from 7.1 to 14.2m³/sec. Orthophosphate, TON and ammonia loads increased downstream corresponding to increasing flow along the channel, despite a decrease in nutrient concentrations between MULKEAR_030 and MULKEAR_050



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
25D_1	IE_SH_25D040200	Doonane_010	River	At Risk	High	Good	Y	Hymo	2027	
25D_1	IE_SH_25N020080	Newport (Tipperary)_020	River	At Risk	Unassigned	Good	Y	Hymo	2027	
25D_2	IE_SH_25C040500	Cauteen_010	River	At Risk	Moderate	Moderate	N	Ag	2027	Dead and Cauteen
25D_2	IE_SH_25C100200	Cappawhite Stream_010	River	At Risk	Poor	Poor	N	Ag	2027	Toem and Cappawhite
25D_2	IE_SH_25D010100	Dead_010	River	At Risk	Moderate	Moderate	N	Ind,UWW	2027	Dead and Cauteen
25D_2	IE_SH_25D010200	Dead_020	River	Review	Moderate	Good	N		2027	
25D_2	IE_SH_25T050600	Toem Stream_010	River	At Risk	Good	Poor	N	For,Other	2027	Toem and Cappawhite
25D_3	IE_SH_25B060120	Blackwater (Clare)_010	River	At Risk	High	Good	Y	Ag,For	2027	
25D_3	IE_SH_25B060250	Blackwater (Clare)_020	River	Review	High	Good	N		2027	
25D_3	IE_SH_25N170970	North Ballycannan_010	River	At Risk	Unassigned	Unassigned	N	Ag	2027	
25D_3	IE_SH_060_0800	Upper Shannon Estuary	Transitional	At Risk	Good	Poor	N	Ag	2027	
25D_3	IE_SH_060_0900	Limerick Dock	Transitional	At Risk	Good	Moderate	N	Hymo	2027	
25D_4	IE_SH_25B770990	Ballyard 25_020	River	Review	Unassigned	Unassigned	N		2027	
25D_5	IE_SH_25B030080	Bilboa_010	River	Review	Good	Good	N		2027	
25D_5	IE_SH_25I010008	Inch (Bilboa)_010	River	At Risk	Good	Moderate	N	Ag,For	2027	Inch (Bilboa)
25D_6	IE_SH_25_191a	Derg TN	Lake	At Risk	Poor	Poor	N	Ag,Hymo,Other,UWW	2027	
25D_6	IE_SH_25G100100	Grange (Tipperary)_010	River	Review	Unassigned	Unassigned	N		2027	
25D_6	IE_SH_25K040120	Kilmastulla_010	River	At Risk	Moderate	Moderate	N	M+Q	less stringent objective	
25D_6	IE_SH_25K040300	Kilmastulla_020	River	Review	Unassigned	Unassigned	N		less stringent objective	
25D_6	IE_SH_25K040800	Kilmastulla_030	River	At Risk	Moderate	Moderate	N	M+Q	less stringent objective	
25D_6	IE_SH_25K040910	Kilmastulla_040	River	At Risk	Moderate	Moderate	N	M+Q	less stringent objective	
25D_6	IE_SH_25S012500	Shannon (Lower)_050	River	At Risk	Moderate	Moderate	N	Hymo,UWW	2027	
25D_7	IE_SH_25D030600	Doon Stream_010	River	At Risk	Moderate	Moderate	N	Ag	2027	
25D_8	IE_SH_25D020400	Dooglasla (Cappamore)_010	River	Review	Unassigned	Unassigned	N		2027	Mulkear (Limerick)
25D_8	IE_SH_25M040200	Mulkear (Limerick)_020	River	At Risk	Good	Moderate	N	Ind,Other	2027	Mulkear (Limerick)
25D_8	IE_SH_25M040300	Mulkear (Limerick)_030	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
25D_9	IE_SH_25G050200	Groody_010	River	At Risk	Poor	Moderate	N	Ag,DU	2021	Groody
25D_9	IE_SH_25W210770	Whitehall 25_010	River	At Risk	Unassigned	Unassigned	N	DU,DWW	2027	Groody

Ag: Agriculture

M+Q: Mines and Quarries

DWW: Domestic Waste Water

Peat: Peat Drainage and Extraction

For: Forestry

DU: Diffuse Urban

Hymo: Hydromorphology

UWW: Urban Waste Water

Ind: Industry

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
0300PUB1002_1	Killaloe PWS	Lough Graney GWB	IE_SH_G_157	Yes	N/A
0300PUB1002_2					
0300PUB1002_3					
0300PUB1002_4	Killaloe PWS	Shannon (Lower)_050	IE_SH_25S012500	Yes	N/A
0300PUB1014_1	Ardataggle*	Lough Graney GWB	IE_SH_G_157	Yes	N/A
0300PUB1016_1	Ardataggle Borehole	Lough Graney GWB	IE_SH_G_157	Yes	N/A
0300PUB1018_1	O'Briensbridge	Slieve Phelim GWB	IE_SH_G_213	Yes	N/A
1800PUB1001_1	Limerick City Water Supply	Shannon (Lower)_060	IE_SH_25S01s2600	Yes	N/A
1800PUB1001_2					
1900PRI3069_1	Murroe (Glenstal)	Slieve Phelim GWB	IE_SH_G_213	Yes	N/A
1900PRI3200_1	Cahernarry	Limerick City East GWB	IE_SH_G_138	Yes	N/A
1900PRI3257_1	Ashroe	Slieve Phelim GWB	IE_SH_G_213	Yes	N/A
1900PUB1015_1	Caherconlish PUB DWS	Ballyneety GWB	IE_SH_G_036	Yes	N/A
1900PUB1024_1	Lacka, Doon	Slieve Phelim GWB	IE_SH_G_213	Yes	N/A
1900PUB1024_2	Cooga, Doon				
1900PUB1026_1	Foileen	Slieve Phelim GWB	IE_SH_G_213	Yes	N/A
1900PUB1041_1	Murroe PUB DWS	Slieve Phelim GWB	IE_SH_G_213	Yes	N/A
1900PUB1041_2					
1900PUB1043_1	Cloghadalton, Oola**	Slieve Phelim GWB	IE_SH_G_213	Yes	N/A
1900PUB1043_2					
1900PUB1043_3					
1900PUB1044_1	Pallasgrean PUB DWS	Knockroe East GWB	IE_SH_G_129	Yes	N/A
1900PUB1052_1	Carrigmore Water Supply	Slieve Phelim GWB	IE_SH_G_213	Yes	N/A
1900PUB1102_1	Montpelier (Clare) Water Supply	Slieve Phelim GWB	IE_SH_G_213	Yes	N/A
2800PRI2137_1	Patrickswell GWS	Nenagh GWB	IE_SH_G_178	Yes	N/A
2800PRI2137_2					
2800PRI2137_3					
2800PRI2137_4					
2800PRI2284_1	Shallee GWS	Historic Mine (Silvermines) GWB	IE_SH_G_248	Yes	N/A
2800PUB1004_1	Newport RWSS	Slieve Phelim GWB	IE_SH_G_213	No	2015 MCPA
2800PUB1004_2	Newport RWSS	Newport (Tipperary)_030	IE_SH_25N020200	No	2015 MCPA
2800PUB1015_1	Kilcommon PWS	Slieve Phelim GWB	IE_SH_G_213	Yes	N/A
2900PUB0202_1	Glengar PWS	Slieve Phelim GWB	IE_SH_G_213	Yes	N/A
3700PRI9120_1	Scraggeen GWS	Slieve Phelim GWB	IE_SH_G_213	Yes	N/A

*Decommissioned

** Three springs but only one in use

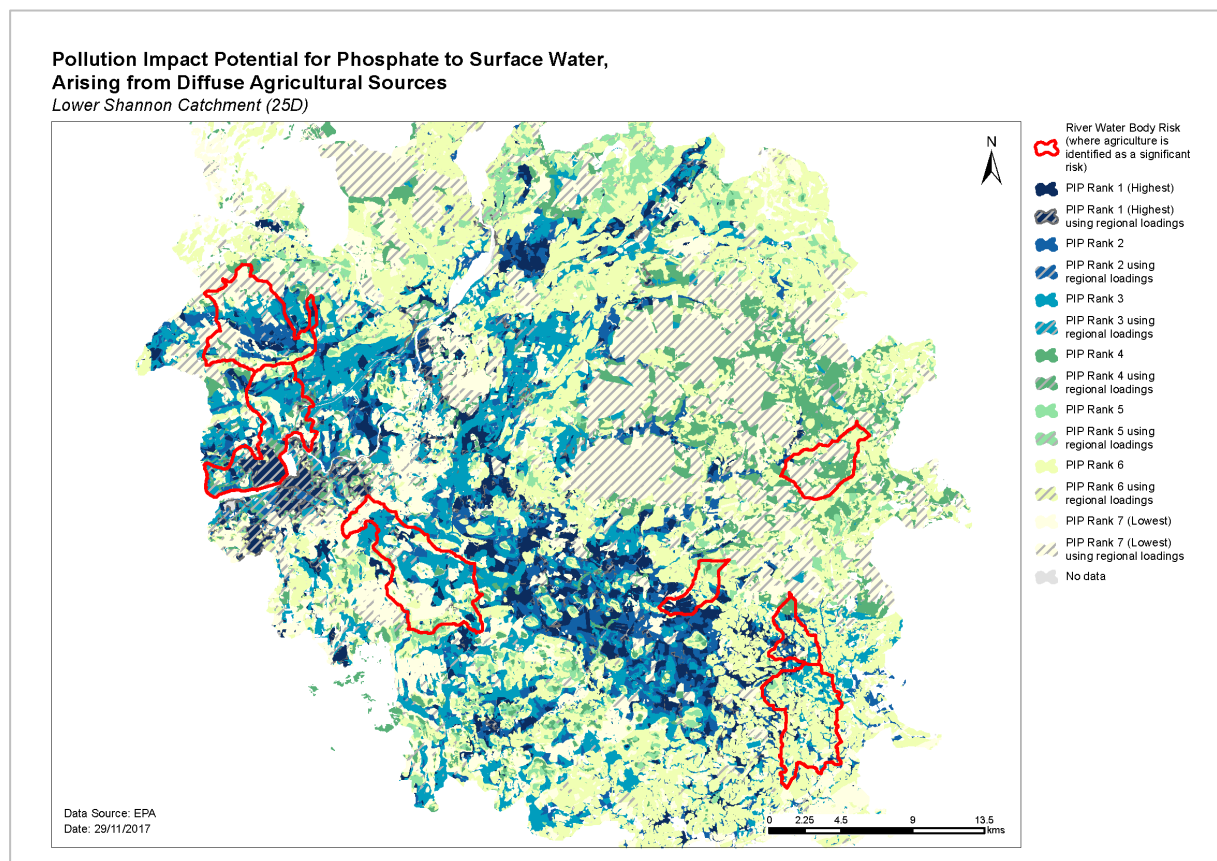
Appendix 5 Prioritisation of water bodies with Natura 2000 site qualifying interests

SAC Name	Relevant Qualifying interests	Target status	Water body type	Water bodies	Status (risk)	Prioritise?	Code	Survey data?
Bolingbrook Hill SAC 002124	none							
Clare Glen SAC 000930	none							
Glenomra Wood SAC 001013	none							
Glenstal Wood SAC 001432	none							
Lower River Suir SAC 002137	none							
Philipston Marsh SAC 001847	none							
Slieve Bernagh Bog SAC 002312	none							
Silvermine Mountains SAC 000939	none							
Silvermines Mountains West SAC 002258	none							
Keeper Hill SAC 001197	none							
Lower River Shannon SAC 002165	1106	Good	River	Bilboa_010	Good (R)	No	IE_SH_25B030080	No
			River	Bilboa_020	Good (NAR)	No	IE_SH_25B030500	No
			River	Inch (Bilboa)_010	Moderate (AT RISK)	Yes	IE_SH_25I010008	No
			River	Gortnageragh_010	Good (NAR)	No	IE_SH_25G030300	No
			River	Glashacloonaraveela_010	Good (NAR)	No	IE_SH_25G020500	No
			River	Dooglasha (Cappamore)_010	Unassigned (R)	No	IE_SH_25D020400	No
			River	Mulkear (Limerick)_010	Good (NAR)	No	IE_SH_25M040100	No
			River	Mulkear (Limerick)_020	Moderate (AT RISK)	Yes	IE_SH_25M040200	No
			River	Mulkear (Limerick)_030	Unassigned (R)	No	IE_SH_25M040300	No

SAC Name	Relevant Qualifying interests	Target status	Water body type	Water bodies	Status (risk)	Prioritise?	Code	Survey data?
Lower River Shannon SAC 002165	1106	Good	River	Mulkear (Limerick)_050	Good (NAR)	No	IE_SH_25M040590	No
			River	Newport (Tipperary)_010	Good (NAR)	No	IE_SH_25N020060	No
			River	Newport (Tipperary)_020	Good (AT RISK - HES Obj)	No	IE_SH_25N020080	No
			River	Newport (Tipperary)_030	Good (NAR)	No	IE_SH_25N020200	No
			River	Newport (Tipperary)_040	Good (NAR)	No	IE_SH_25N020330	No
			River	Doonane_010	Good (AT RISK - HES Obj)	No	IE_SH_25D040200	No
			River	Killeengarriff_010	Good (NAR)	No	IE_SH_25K020150	No
			River	Grange (Tipperary)_010	Unassigned (R)	No	IE_SH_25G100100	No
			River	Shannon (Lower)_050	Moderate (AT RISK)	Yes	IE_SH_25S012500	No
			River	Shannon (Lower)_060	Unassigned (NAR)	No	IE_SH_25S012600	No

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