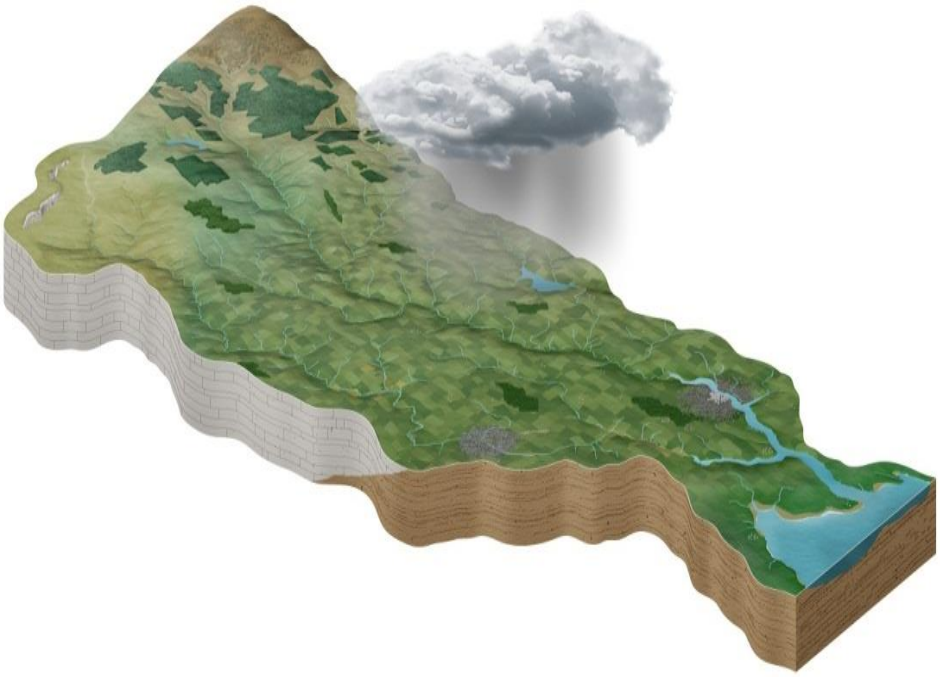
Upper Shannon (Lough Allen) Catchment Assessment 2010-2015 (HA 26A)



Catchment Science & Management Unit

Environmental Protection Agency

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Version no. 3

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Preface

This document provides a summary of the characterisation outcomes for the water resources of the Upper Shannon (A – Lough Allen) 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 covers an area of 604 km² and is characterised by the Breifne upland area including the shales and sandstones of Corry Mountain and Kilronan Mountain, areas where coal mining was undertaken in the past, the Lackagh Hills, the western slopes of Slieve Anierin (literally the Iron Mountain) and the karstified limestone southern slopes of Cuilcagh Mountain which surround the headwaters of the River Shannon (including the Shannon Pot) and Lough Allen.

Underground water tracing has shown that water flows through the limestones from Cuilcagh Mountain in County Fermanagh to the Shannon Pot, the historical source of the River Shannon. The Shannon is joined by numerous small tributaries flowing from the west and southern slopes of Cuilcagh Mountain, including the Owenmore River which drains the valley on the western side of Bellavally Gap, before the Shannon passes through Dowra. The Shannon is then joined by the Owennayle River before flowing into the northern end of Lough Allen.

The iron ore rich hills to the east of Lough Allen are drained by the Yellow and Stony Rivers, while the coal-bearing and in places karstified uplands to the west of the lough are drained by the Owengar and Arigna Rivers.

The Shannon continues from the southern end of Lough Allen, being joined from the west by the Feorish River which drains the Geevagh Valley including Loughs Skean and Meelagh. Upstream of Leitrim Town, the Shannon Erne Canal branches off to the northeast from the main Shannon channel. The Shannon then continues south past Leitrim towards Carrick-on-Shannon.

The Upper Shannon (A – Lough Allen) catchment comprises 6 sub-catchments (Table1, Figure 1) with 24 river water bodies, eight lakes, no transitional or coastal water bodies, and seven groundwater bodies. There are no heavily modified water bodies in the catchment.

Table 1. List of subcatchments in the Upper Shannon (A – Lough Allen) catchment

Subcatchment ID	Subcatchment Name
26A_1	Owengar[Leitrim]_SC_010
26A_2	Feorish[Ballyfarnon]_SC_010
26A_3	Shannon[Upper]_SC_020
26A_4	Arigna[Roscommon]_SC_010
26A_5	Shannon[Upper]_SC_010
26A_6	Yellow[Ballinaglera]_SC_010

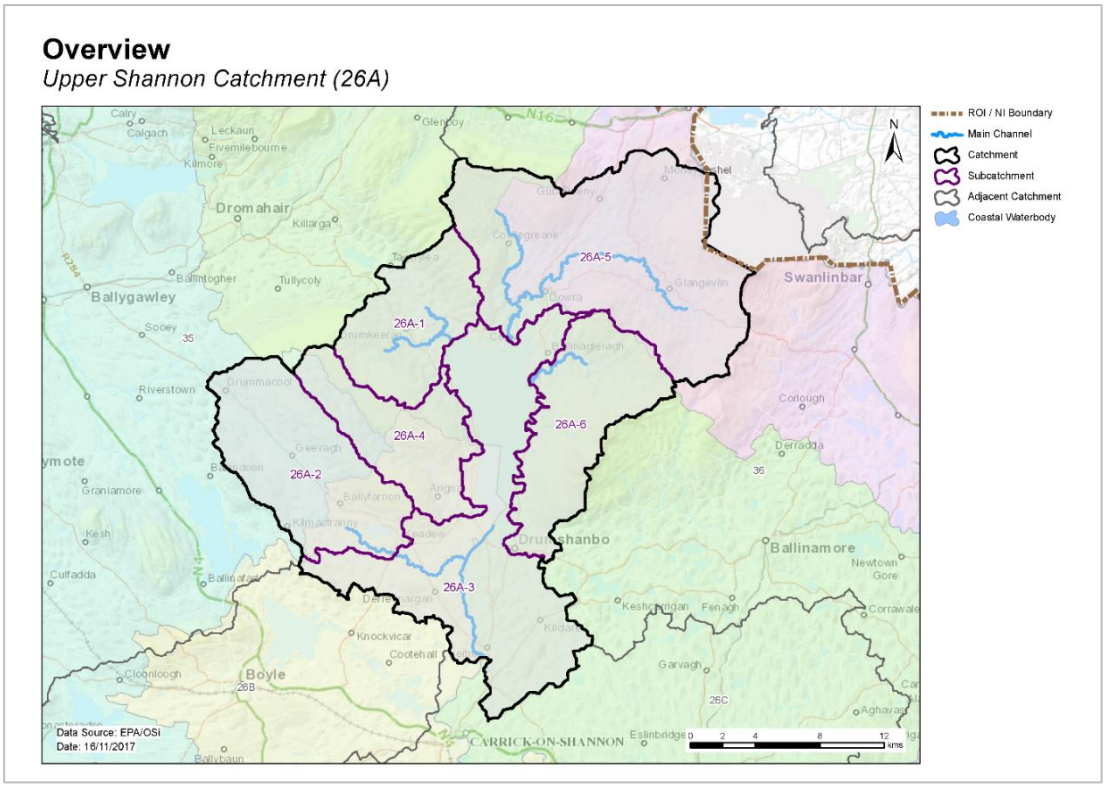

Figure 1. Location and subcatchments in the Upper Shannon (A – Lough Allen) catchment

2 Water body status and risk of not meeting environmental objectives

2.1 Surface water ecological status

- There were 14 (44%) river and lake water bodies (all rivers) at Good or High status, and eight (25%) at less than Good status in 2015 (Table 1 and Figure 2). Five (15%) river and five (60%) lakes water bodies are unassigned.
- Two surface water bodies have a high ecological status environmental objective. In 2015, both water bodies were at High ecological status (Figure 3, Appendix 1).
- The number of water bodies at each status class in 2007-09 and 2013-2015 are shown in Figure 4 (rivers) and Figure 5 (lakes).
- Status has remained stable in the majority of water bodies since 2007-09 when WFD monitoring began. Six river water bodies have improved and one has deteriorated. The locations are shown in Figure 6.
- The variation in nutrient concentrations and loads in the main channel is described and illustrated in Appendix 2.

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

	Number of water bodies	2010-2015 Status						Risk		
		High	Good	Mod	Poor	Bad	Unassigned	*Not at Risk*	*Review*	*At Risk*
Rivers	24	3	11	2	3	0	5	14	6	4
Lakes	8	0	0	1	2	0	5	3	2	3

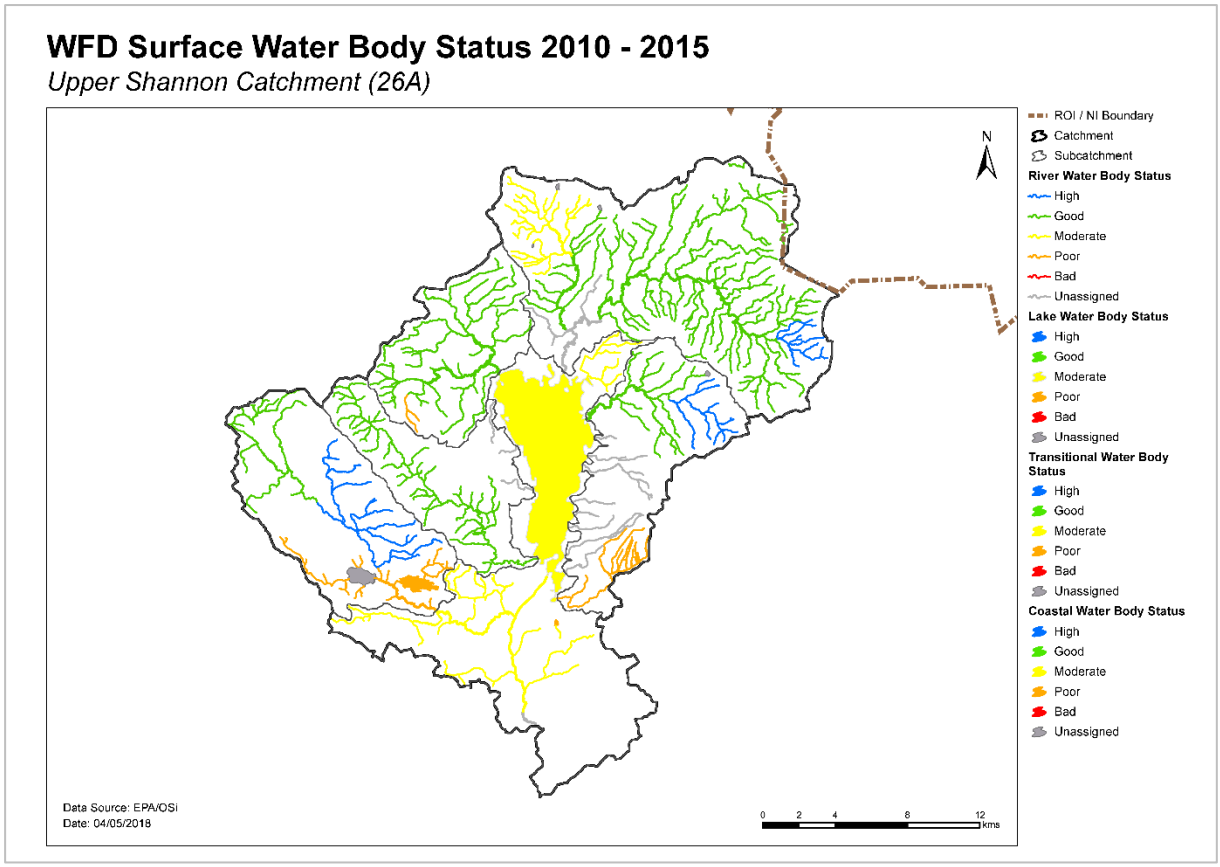

Figure 2. Surface water ecological status.

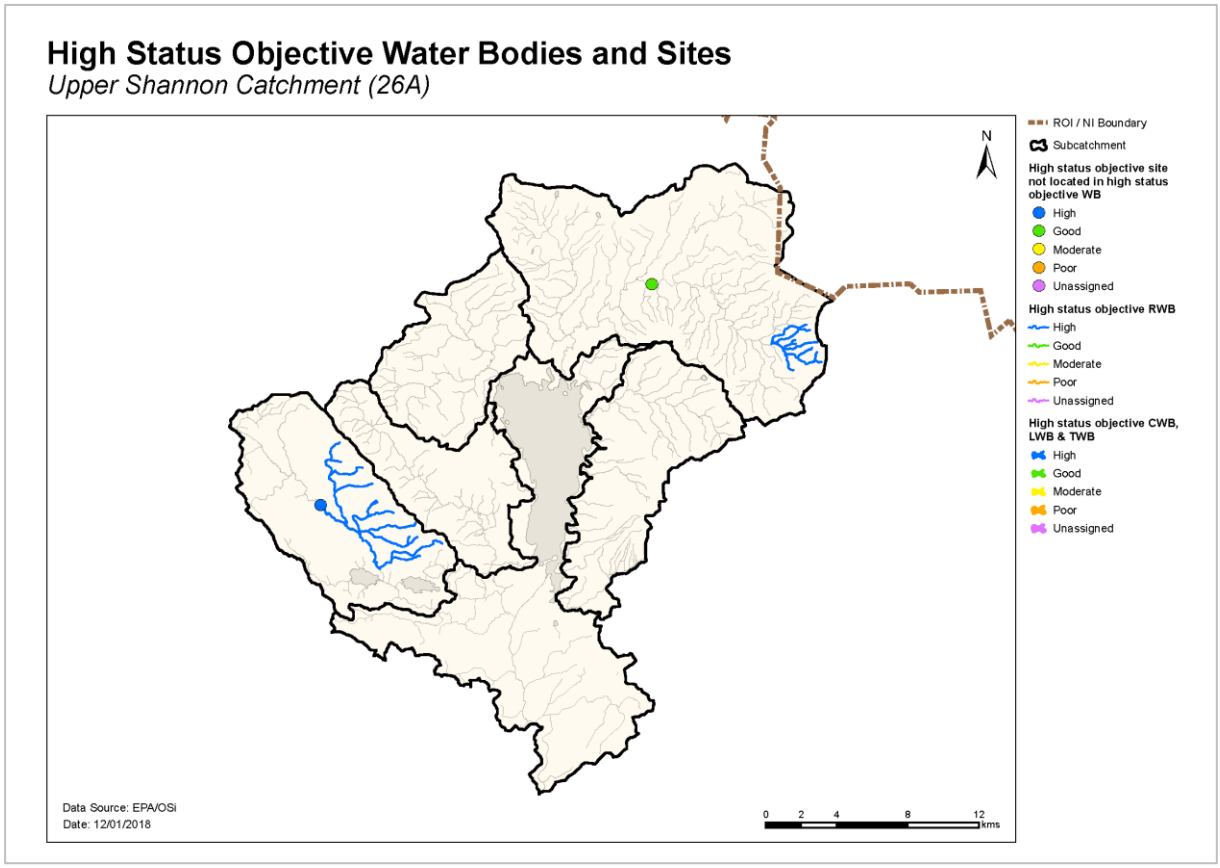

Figure 3. High ecological status objective water bodies and sites.

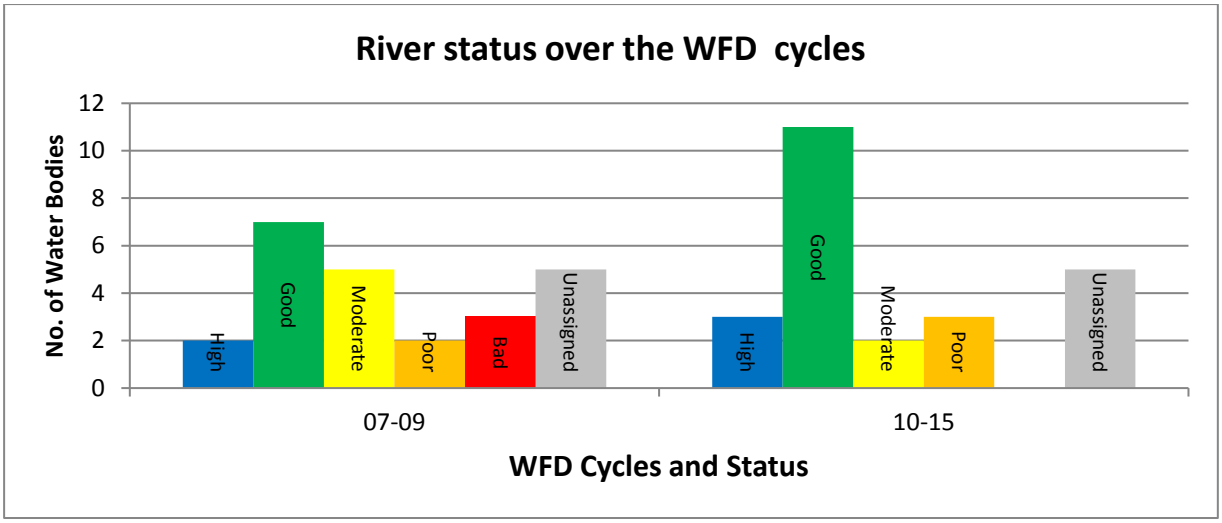

Figure 4. Number of rivers at each status class in 2007-09 and 2010-15

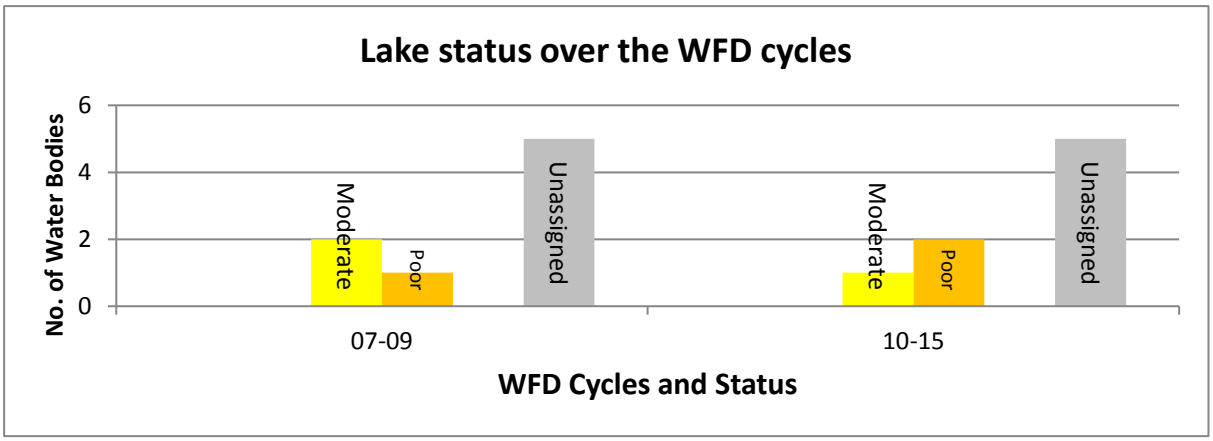

Figure 5. Number of lakes at each status class in 2007-09 and 2010-15

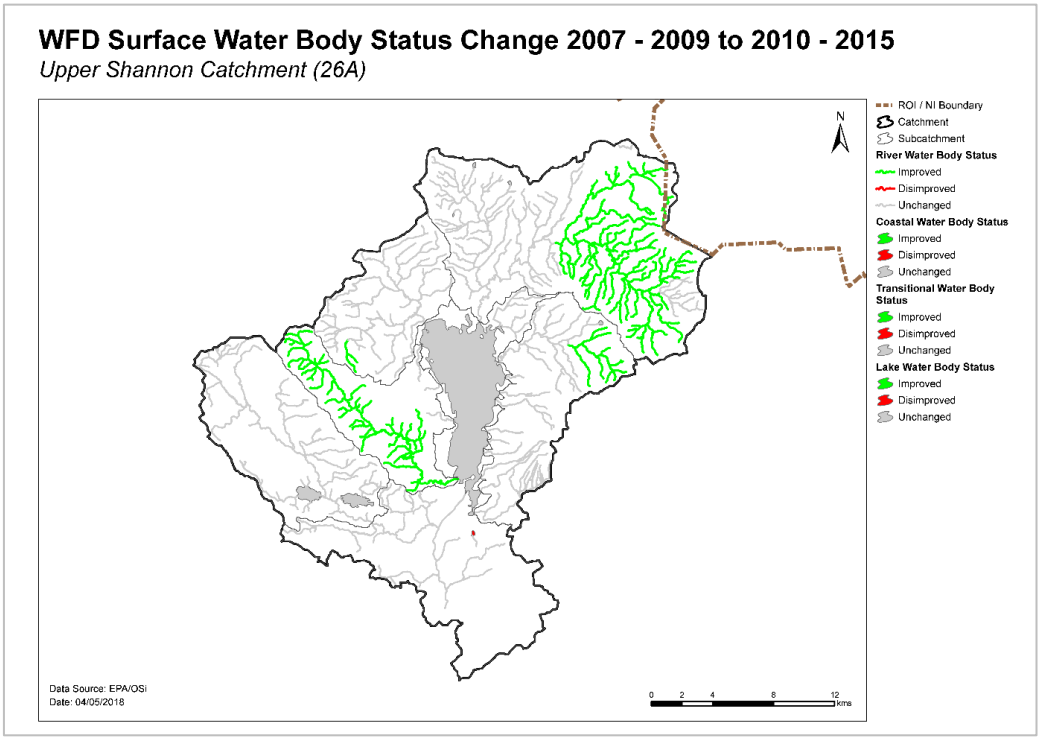

Figure 6. Surface water body status change from 2007-09 to 2010-15

2.2 Groundwater status

- All seven groundwater bodies in the catchment were at Good status in both 2007-12 and 2010-2015 (Table 3 and Figure 7).

Table 3. Summary of groundwater body status and risk

	Number of water bodies	2010-2015 Status		Risk		
		Good	Poor	*Not at Risk*	*Review*	*At Risk*
Groundwater	7	7	0	4	2	1

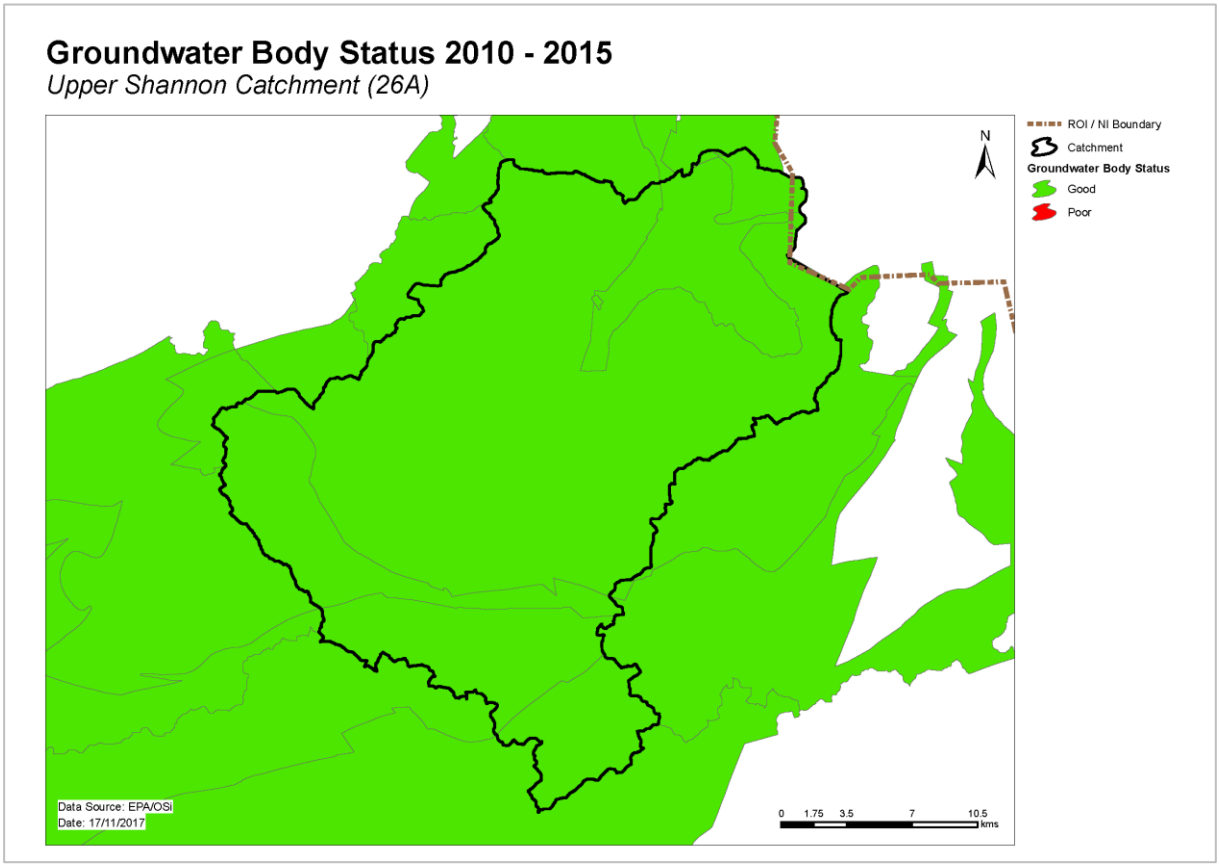

Figure 7. Groundwater body status

2.3 Risk of not meeting surface water environmental objectives

- Fourteen river water bodies and three lake water bodies are *Not at Risk* (Figure 8, Table 2) and require no additional characterisation or measures to be applied, other than those measures that are already in place.
- Six river water bodies and two lake water bodies are in *Review*. This applies to six water bodies where more information is required and three river water bodies where measures have recently been implemented and improvements have not yet been realised.
- Four river water bodies and three 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.

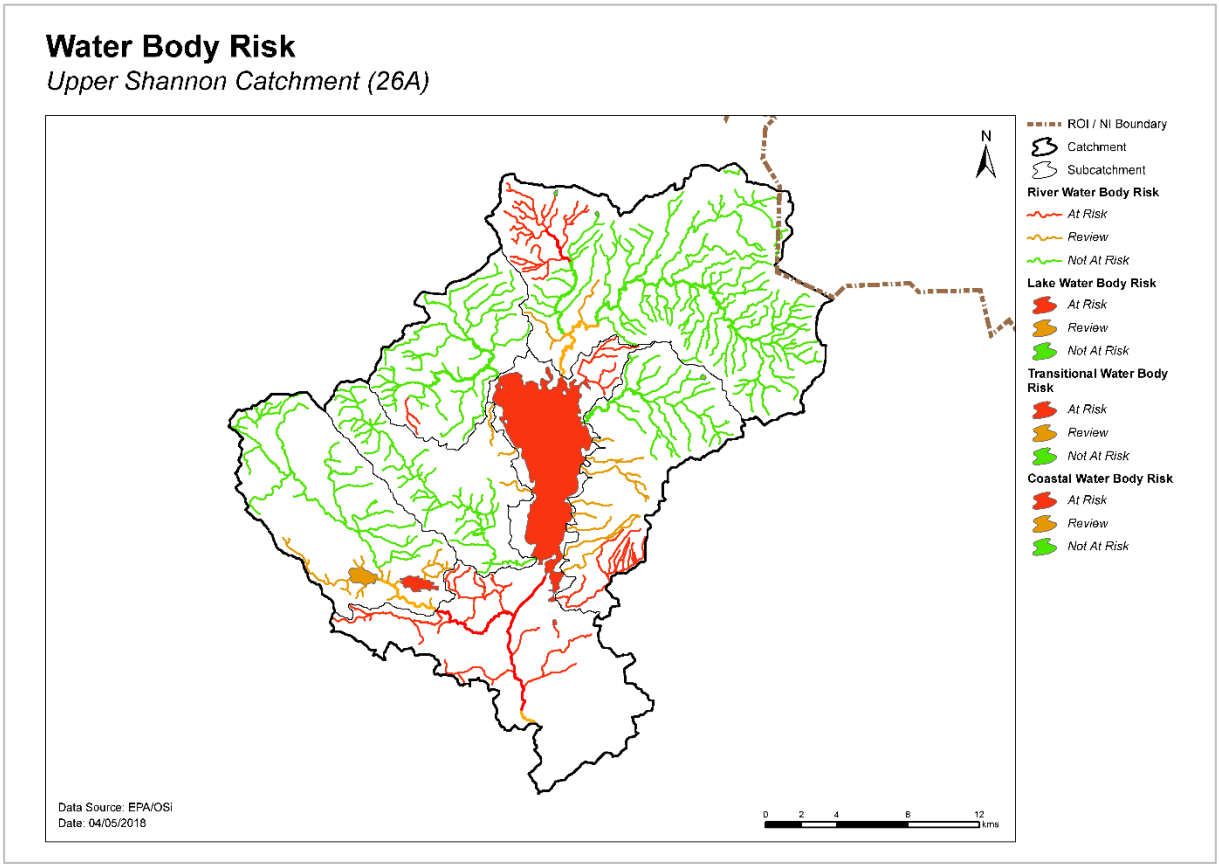

Figure 8. Surface water body risk.

2.4 Risk of not meeting groundwater body environmental objectives

- Four groundwater bodies are *Not at Risk* (Figure 9, Table 3) and require no additional characterisation or measures to be applied, other than those measures that are already in place.
- Two groundwater bodies are in *Review;* one because it is hydrologically linked to surface waters that are not meeting water quality objectives where it is considered likely that groundwater is a contributing source of nutrients; the second is linked to an historic landfill.
- One groundwater body IE_SH_G_105, in this catchment is *At Risk* of not meeting its water quality objectives. This is related to groundwater contribution of phosphate to surface waters that are *At Risk* of not meeting water quality objectives. Table 4.

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
Geevagh	IE_SH_26D050400	DRUMSHANBO or AGHAGRANIA STREAM_010

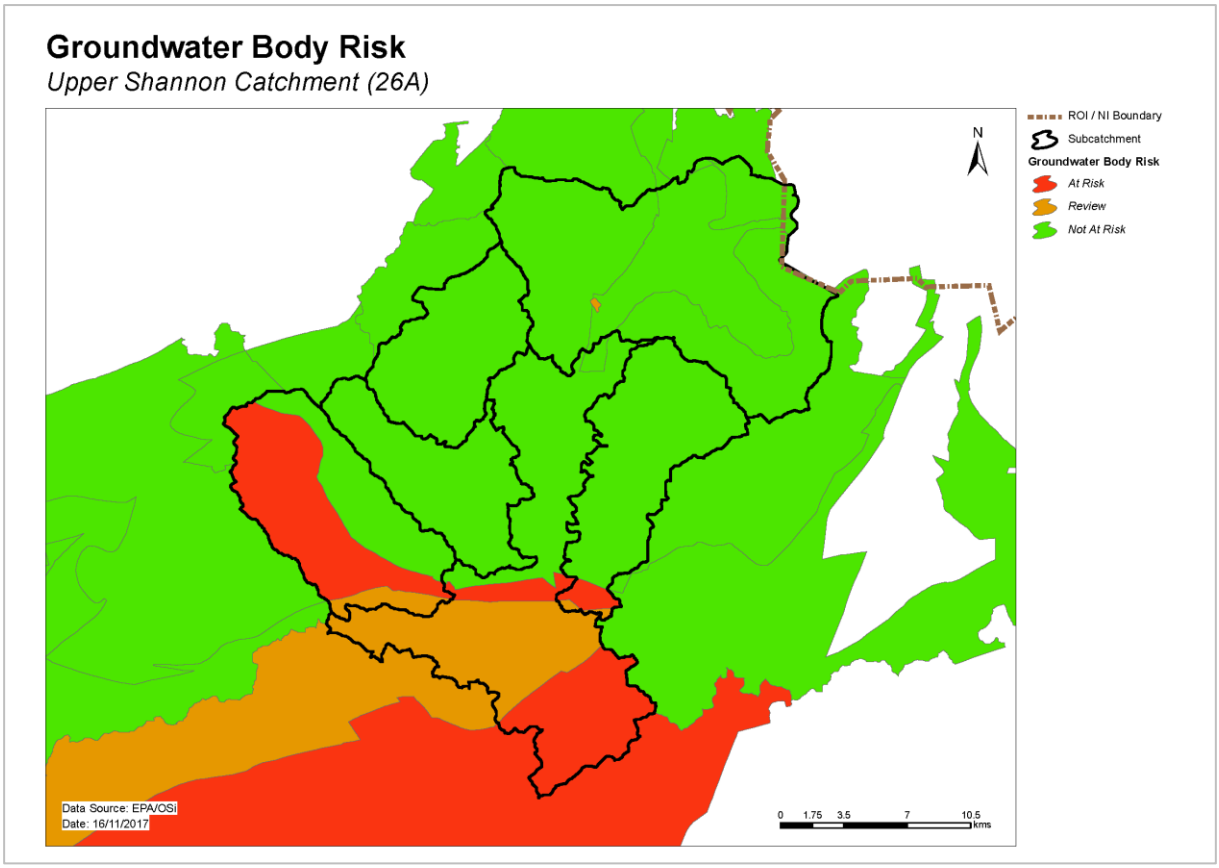

Figure 9. Groundwater body risk[1]

2.5 Protected Areas

2.5.1 Drinking Water Protected Areas

- There are 13 abstractions in the catchment comprising three group water schemes (Glangevlin GWS, Carrownadargney GWS and Doobally GWS), one private group scheme and 5 public supplies (Cornashamshogue, Arigna, Arigna Rover, Ballyfarnan and Keadue).
- Twelve of the abstractions are from two groundwater bodies (Lough Allen Uplands and Geevagh), one is from a river water body (Owennayle_020) and one from a lake (Lough Nawdellion). The list of the public supplies and the associated water bodies is provided in Appendix 4.
- All sources were compliant with the standards for nitrate and pesticides in 2015 and therefore have met their WFD objectives.

2.5.2 Bathing Waters

- There are no designated Bathing Water Areas in the catchment.

2.5.3 Shellfish Waters

- There are no designated Shellfish Water Areas in the catchment.

2.5.4 Nutrient Sensitive Areas

- There are no designated Nutrient Sensitive Areas in the catchment.

[1] Note this *At Risk* GWB (IE_SH_G_048 Carrick on Shannon) is at risk for potential to contribute phosphate to surface water but the associated *At Risk* SWB are outside of Cross Border Region (it is a large GWB which intersects 26A, 26B, 26C and is dealt with in 26B).

2.5.5 Natura 2000 Sites

- There are two Special Areas of Conservation (SACs) in the catchment (Appendix 5).
- All water bodies with water dependent qualifying interests within these SACs have met their WFD Protected area objective, except Killooman lake where the water quality is unknown.
- There are no Special Protected Areas (SPAs) in the catchment.

2.6 Heavily modified and artificial water bodies

- There are no designated heavily modified water bodies (HMWBs) in the catchment.
- There is one designated artificial water body (AWB) in the catchment, the Shannon-Erne Waterway, which was at Moderate Ecological Potential in 2015.

3 Significant issues in *At Risk* water bodies

- Excess nutrient loss to surface waters, primarily phosphorus, which can lead to eutrophication, is the most significant issue in this catchment.
- Sediment loss impacting on habitats/hydromorphological conditions is also noted as an issue in surface waters.
- Zebra Mussels are a significant issue in two lakes and can impact ecology through modifications to lake bed morphology, altering the lake habitat. Other impacts include changes to nutrient cycles, reduced levels of phytoplankton and impact to native species e.g. attaching to native mussels.
- Groundwater bodies act as a pathway to surface waters and may be contributing some of the phosphorus in places.

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.
- Figures 10 shows a breakdown of the number of *At Risk* water bodies respectively in each significant pressure category.
- The significant pressures affecting the water bodies includes invasive species, followed by other (anthropogenic), agriculture, forestry and urban waste water.

4.1.1 River and lakes

- Significant pressures have been identified through the initial characterisation process in seven water bodies, three of which have multiple pressures. The significant pressures will be refined as further characterisation (Section 6) is carried out.

4.1.2 Groundwater

- The significant pressure affecting the IE_SH_G_105 Geevagh groundwater body is likely to be agriculture, due to the groundwater contribution of phosphate to *At Risk* surface water bodies. The key parameter of concern is phosphate.

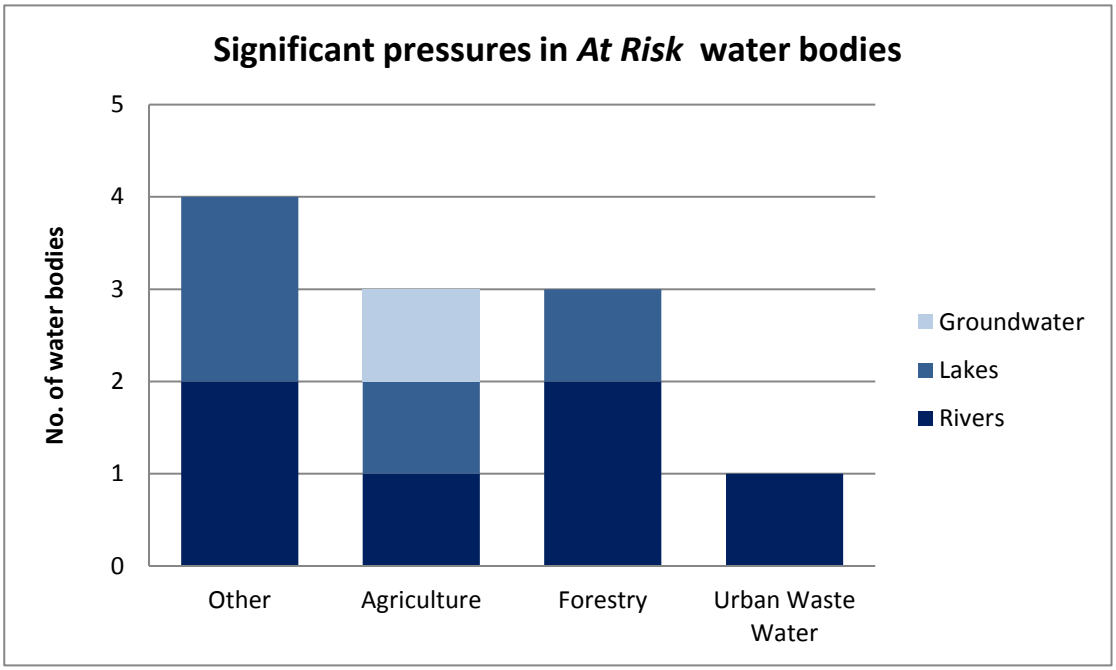

Figure 10. Significant pressures impacting on *At Risk* water bodies.

4.2 Pressure type

4.2.1 Other

- *Invasive species*
  In the Upper Shannon (A – Lough Allen) catchment, three water bodies are impacted by 'other' pressures (Figure 11). These are further subdivided into invasive species and unknown. Invasive species are a pressure in two lake water bodies, Lough Allen and Lough Meelagh. In both cases, the invasive species is the Zebra Mussel.

- *Anthropogenic Pressures*
  The unknown pressure is located in the Gowlaunrevagh_010 and Shannon (Upper)_040, river water bodies. (Figure 12.)

4.2.2 Agriculture

- Agriculture is a significant pressure in two surface water bodies; the locations of the water bodies affected by farming are shown in Figure 13. The issues related to agriculture in this catchment is diffuse phosphorus loss to surface waters from, 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 crossing. The pollution impact potential map showing areas of relative risk for phosphorus loss from agriculture to surface water is given in Appendix 6.

- The significant pressure affecting the IE_SH_G_105 Geevagh groundwater body is likely to be agriculture, due to the groundwater contribution of phosphate to *At Risk* surface water bodies.

4.2.3 Forestry

- Forestry has been identified as a significant pressure in three water bodies (Figure 14). The significant issues are a combination of general forestry pressures including road construction. The effects of these activities include increased nutrient loads and alteration of habitat due to siltation. Evidence of acidification is noted in one of the water bodies.

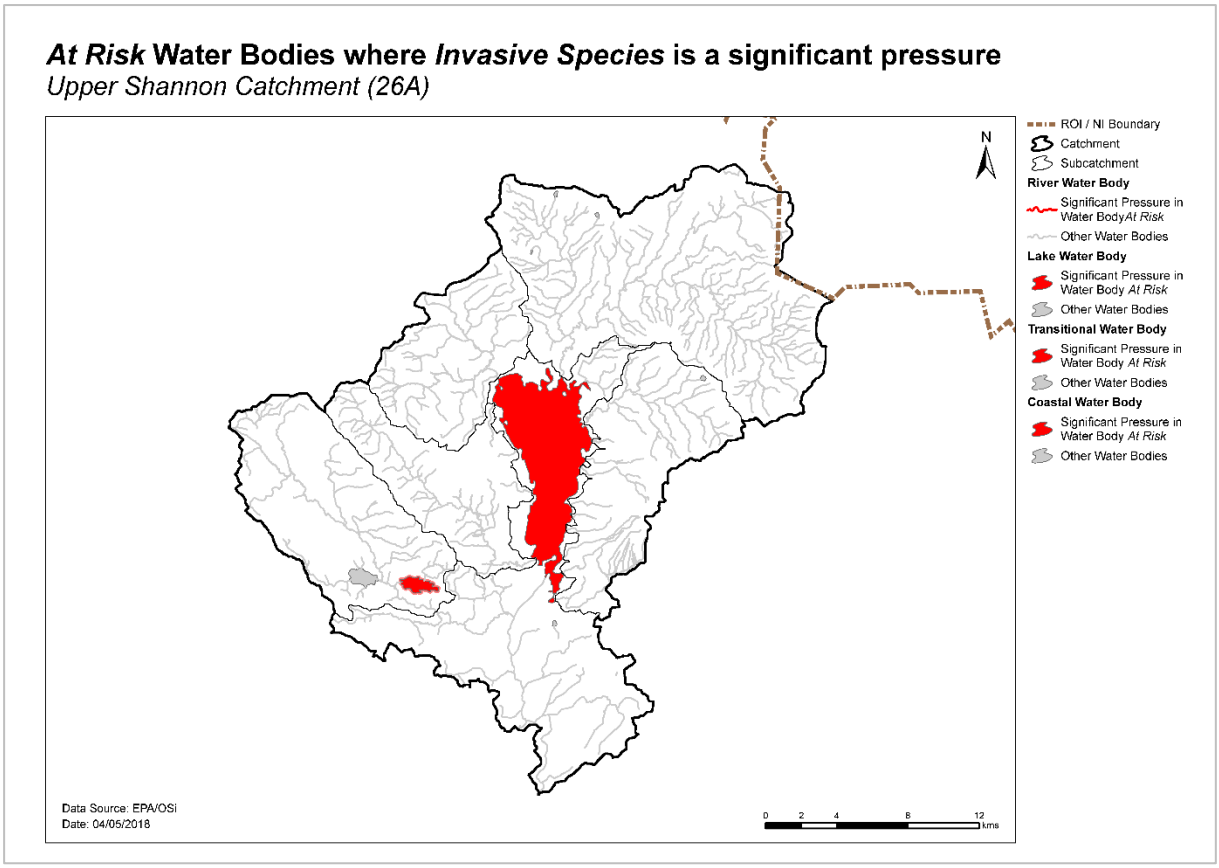

Figure 11. Water bodies that are *At Risk* and are impacted by Invasive species

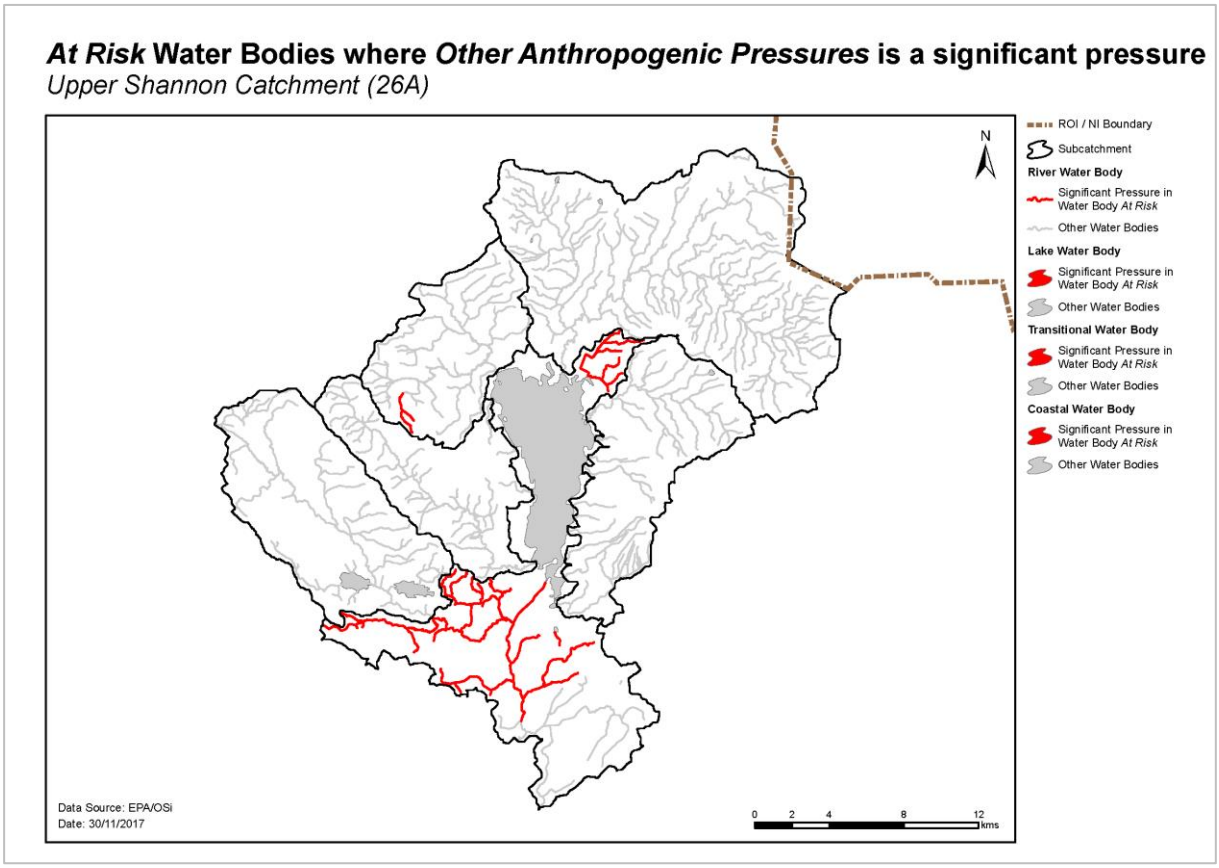

Figure 12. Water bodies that are *At Risk* and are impacted by other Anthropogenic pressures

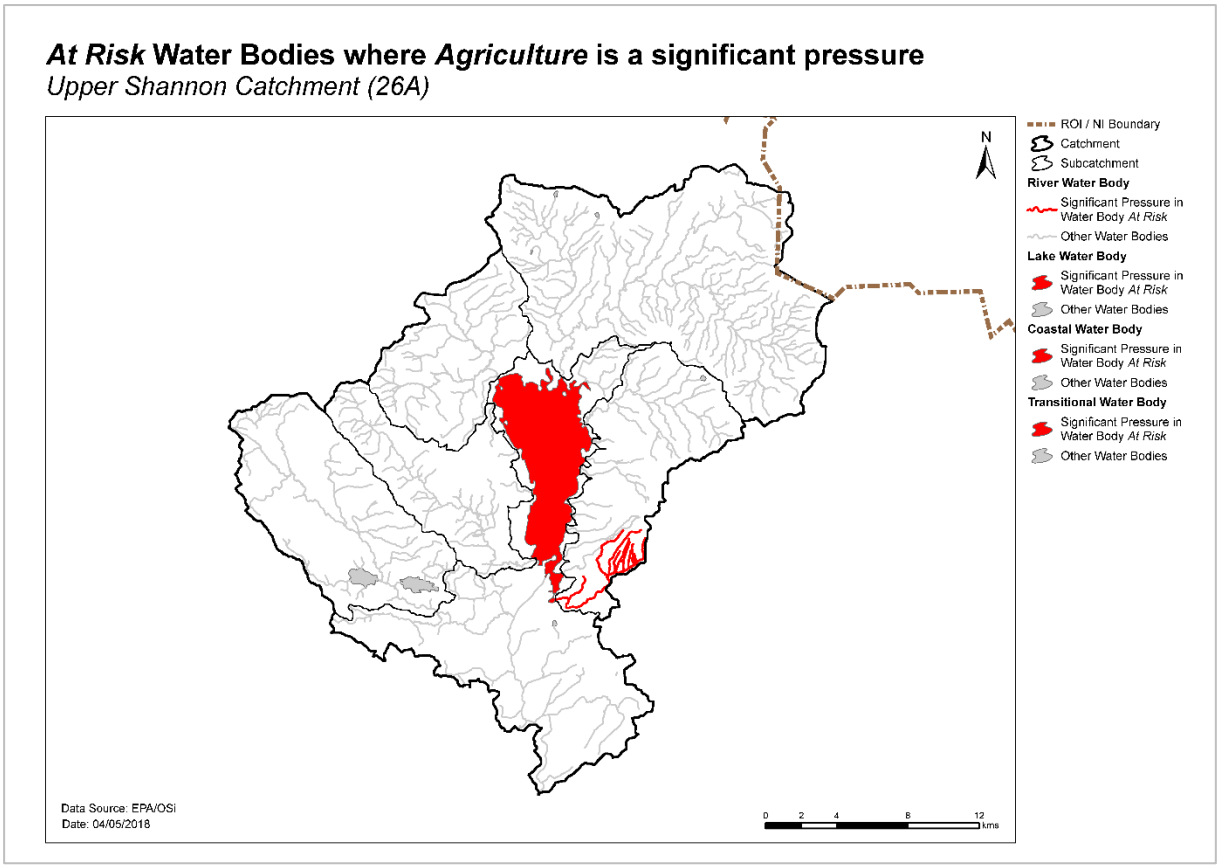

Figure 13. Water bodies that are *At Risk* and are impacted by Agricultural pressures

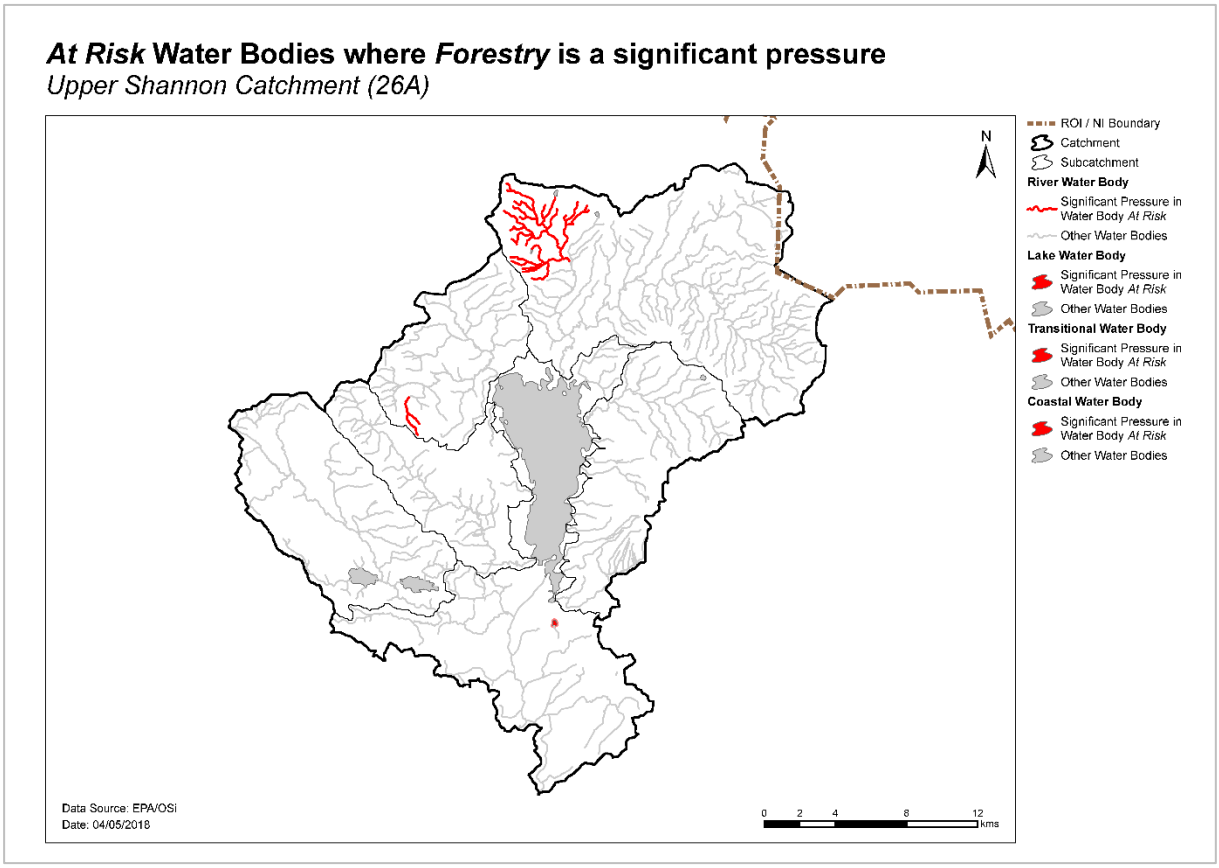

Figure 14. Water bodies that are *At Risk* and are impacted by forestry activities

4.2.4 Urban Waste Water Treatment Plants

- Urban Waste Water Treatment Plants (WWTPs) have been identified as a significant pressure in one *At Risk* water body, Drumshanbo_010; details are given in Table 5 and Figure 15. Drumshambo WWTP, which impacts Drumshanbo_010, is scheduled to be upgraded by 2022.

Table 5. Waste Water Treatment Plants identified as Significant Pressures in *At Risk* water bodies.

Facility name	Facility Type	Water Body	10-15 Ecological Status	Expected Completion Date
Drumshanbo D0144	2,001 to 10,000 p.e.	Drumshanbo_010	Poor	2022

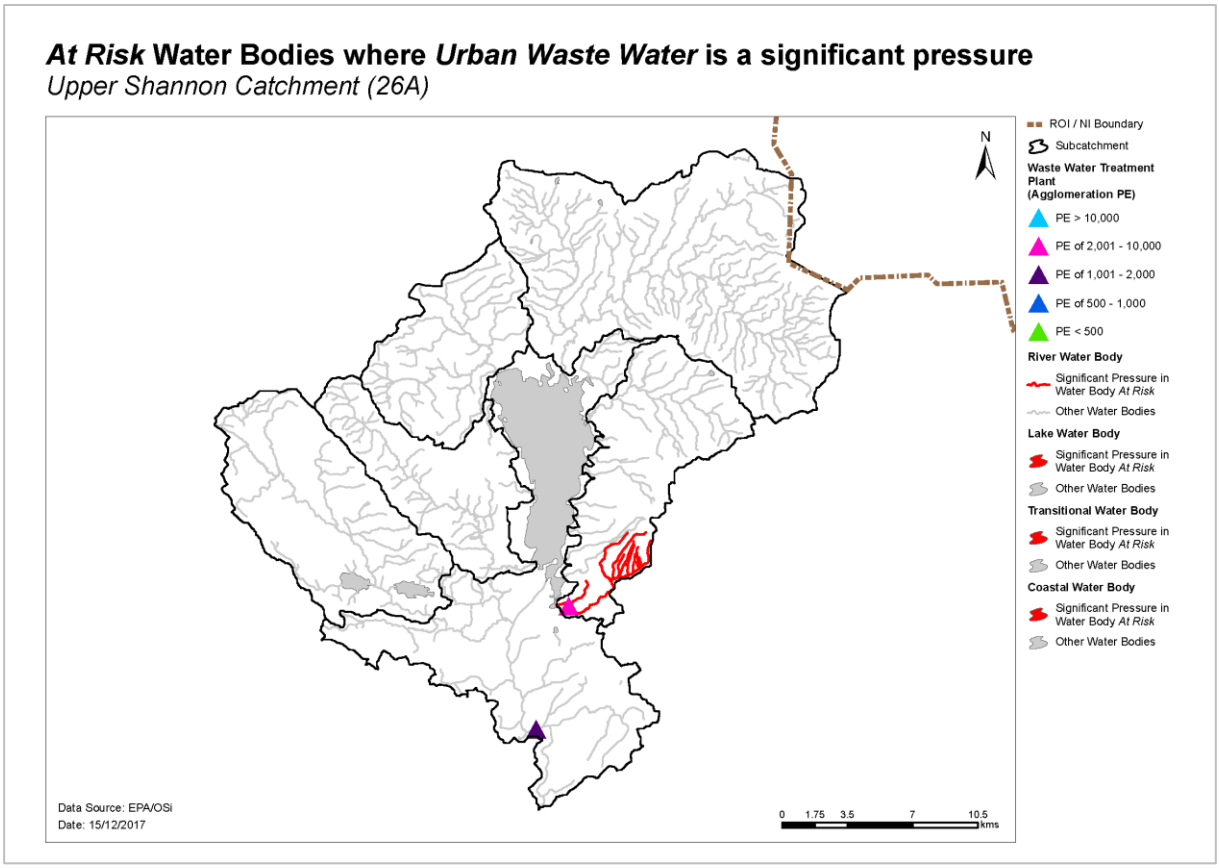

Figure 15. Water bodies that are *At Risk* and are impacted by Urban Waste Water pressures

5 Load reduction assessment

5.1 River water body load reductions

- 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.

- Water chemistry data were only available for two of the water bodies that were *At Risk* within this catchment, neither of which appear to require a reduction in P load.

6 Further characterisation and investigative assessments

- Further characterisation through local catchment assessments is needed in seven of the *At Risk* water bodies to refine the understanding of the significant pressures at the site/field scale so that specific and targeted measures can be identified (Table 7).
- 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, if necessary, specific and targeted measures can be identified.

Table 7: Local Catchment Assessment Allocation for *At Risk* and *Review* River and Lake water bodies in the Catchment.

Risk	IA 1	IA 2	IA 3	IA 4	IA 5	IA 6	IA 7	IA 8	IA 9	IA 10	Total
At Risk	3	0	0	0	2	0	1	0	2	0	8
Review	3	0	6	0	0	0	0	0	0	0	9
Note water bodies may have multiple categories of Local Catchment Assessments											

7 Catchment summary

- Of the 24 river water bodies, four are *At Risk* of not meeting their WFD objective.
- Three of the eight lake water bodies are *At Risk* of not meeting their WFD objective.
- The *At Risk* water bodies are predominantly in the centre and south of the catchment. Excess nutrient loss to surface waters, primarily phosphorus, which can lead to eutrophication, is the most significant known issue requiring action in this catchment. There are also unknown pressures present.
- One groundwater body (IE_SH_G_105 Geevagh) is *At Risk* due to elevated phosphate concentrations in the overlying surface water bodies. This is an area of karstified limestone in the south-west and south-east of the catchment. In karstified limestone areas, the karst features represent a close interaction between surface water and groundwater. Any contamination of surface water can be rapidly transported into the groundwater system, and vice versa.

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 is 1 area for action in the Shannon (Lough Allen) 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.

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, areas for action will 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 Upper Shannon (A – Lough Allen) catchment are summarised below.

- One recommended area for action (Table 8, Figure 16) was selected.
- This was Lough Allen.
- It includes three *At Risk* and four *Review* river and lake water bodies.
- Two groundwater bodies, that are *At Risk* or *Review* due to groundwater contribution of nutrients to surface water bodies, intersect with one of the recommended areas for action, see Table 9. Actions taken to improve surface water will need to take account of the groundwater contribution to surface water.

A remaining eight *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 17. These include:

- four river bodies two *At Risk* and two *Review,* and
- four lake water bodies two *At Risk* and two *Review*.

Table 8. Recommended Areas for Action in the Upper Shannon (A – Lough Allen) Catchment

Recommended area for action	Number of water bodies	SCs	Local authority	Reason for Selection
Lough Allen	7	26A_3	Leitrim	• Multiple pressures which can be investigated at the same time. • Long term challenge requiring cross agency approach.

Table 9. 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_105	Geevagh	At risk	IE_SH_26D050400	DRUMSHANBO or AGHAGRANIA STREAM_010	Lough Allen
			IE_SH_26S020500	SHANNON (Upper)_040	
			IE_SH_26_716	Allen	
IE_SH_G_073	Curlew Mountains	Review	IE_SH_26D050400	DRUMSHANBO or AGHAGRANIA STREAM_010	
			IE_SH_26S020500	SHANNON (Upper)_040	
			IE_SH_26_716	Allen	

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 area for action, of the three *At Risk* surface water bodies, it is predicted that one (33%) will improve by 2021, and two (66%) will achieve their objective by 2027. For the four *Review* surface water bodies, 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 10.

Table 10. 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	2	1	1
Review	4	0	4
Lakes			
At Risk	1	0	1
Review	0	0	0
Total	7	1	6

- Seventeen surface water bodies have met their 2015 environmental objective.
- As action is not yet planned to be taken in the remaining four *At Risk* surface water bodies, a 2027 date is applied to all four water bodies. For the four *At 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 applied, see Table 11.

Table 11. 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	2	0	2
Review	2	0	2
Lakes			
At Risk	2	0	2
Review	2	0	2
Total	8	0	8

9.2 Groundwater

- All seven groundwater bodies in the catchment are Good status and, therefore, have met their environmental objectives.

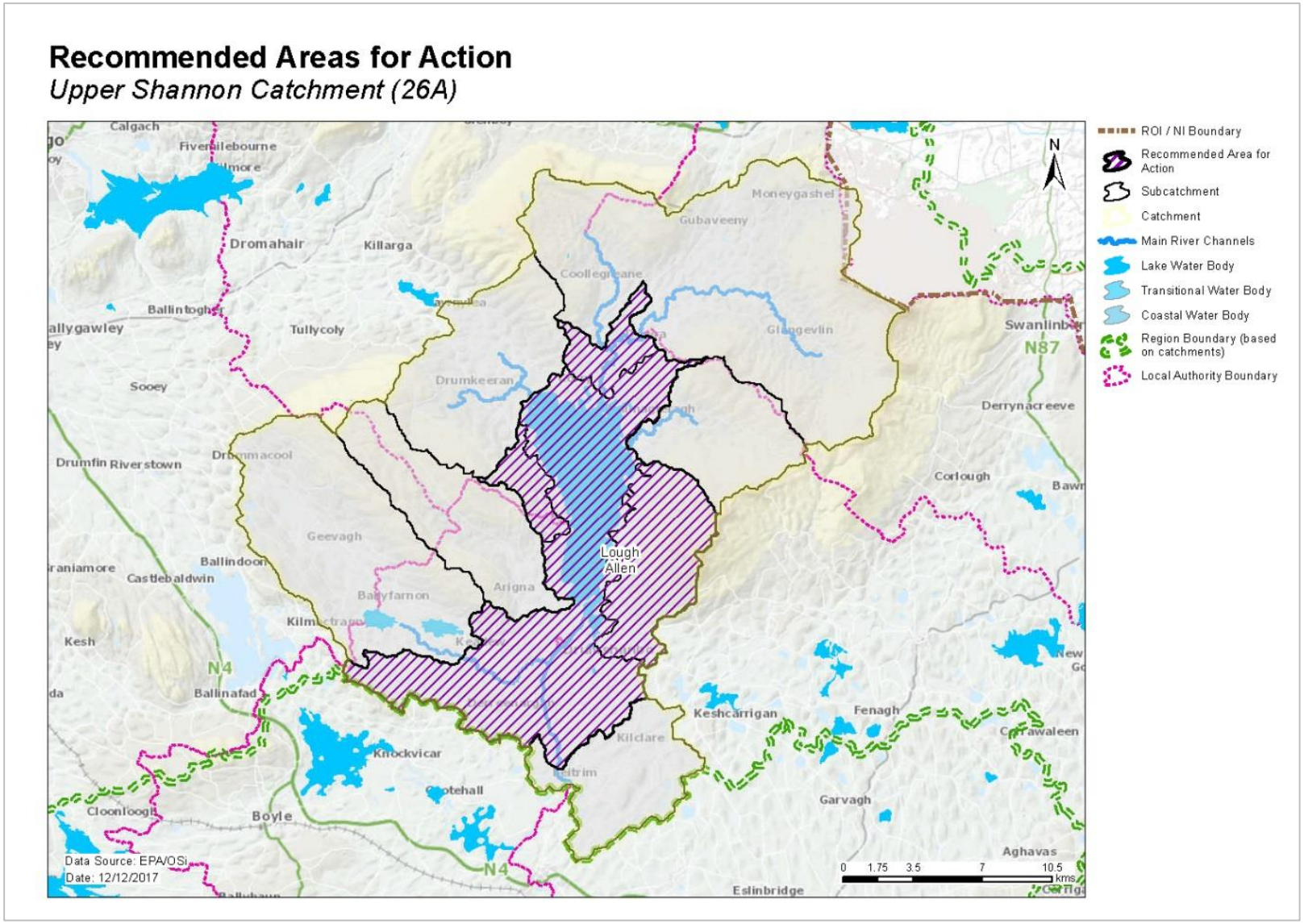

Figure 16. Location of Recommended Areas for Action in the Upper Shannon (A – Lough Allen) Catchment

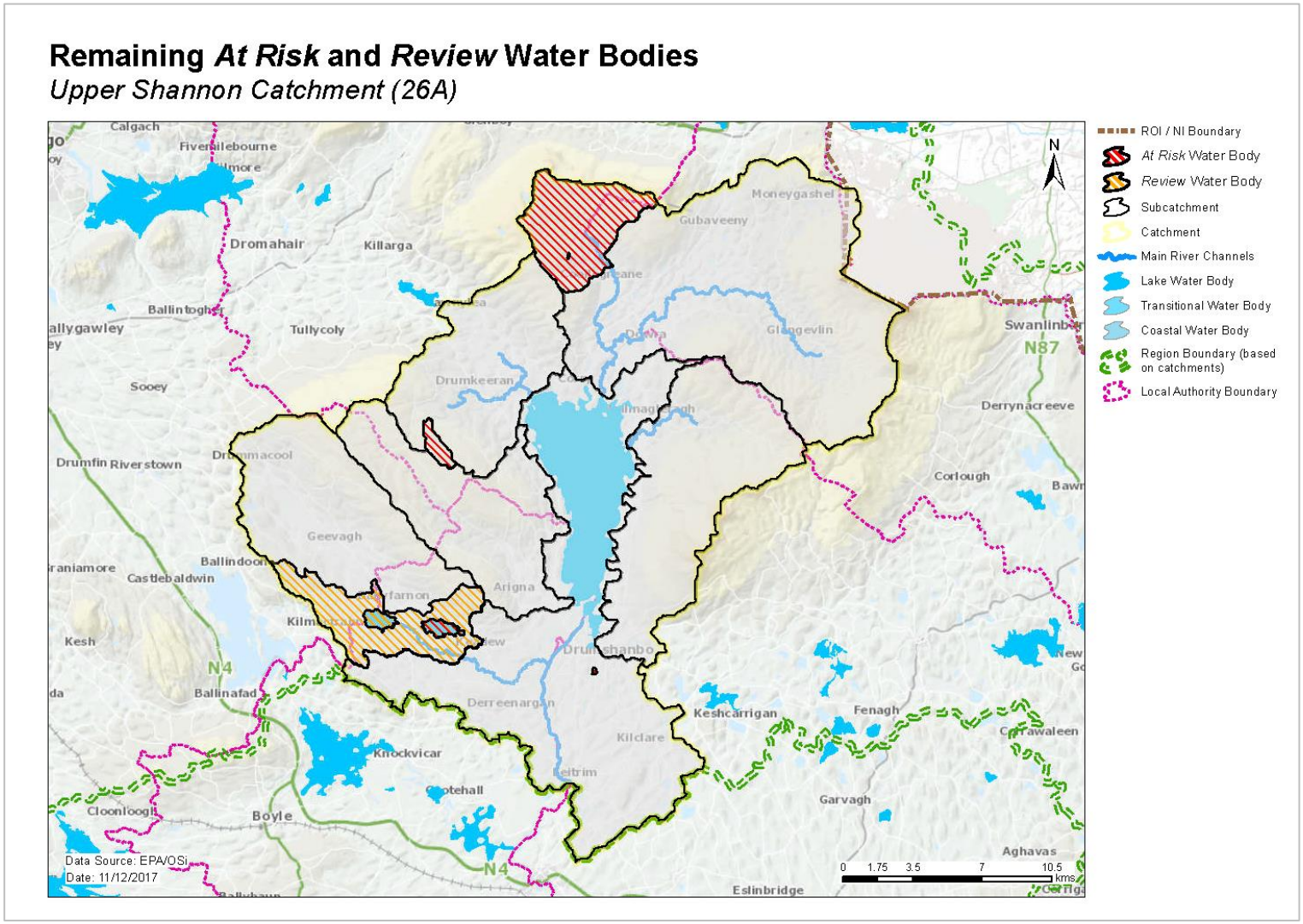

Figure 17. Location of *At Risk* and *Review* water bodies located outside Recommended Areas for Action in the Upper Shannon (A – Lough Allen) Catchment

10 Acknowledgements

This Upper Shannon (A – Lough Allen) Catchment Assessment (Version 2) has been produced by the Catchment Science & Management Unit, EPA, with the assistance of the following:

- Cavan County Council
- Leitrim County Council.
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- Local Authorities Waters & Communities Office.
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- Informatics Section, EPA.
- Laboratories, EPA.
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- DAFM Agriculture.
- DAFM Forest Service.
- Coillte.
- Teagasc.
- Health Service Executive.
- National Parks and Wildlife Service.
- Loughs Agency.
- National Federation of Group Water Schemes.
- Office of Public Works.

Appendix 1 High ecological status objective water bodies and sites

Water body/ Site	Type	Codes	2015 Status
FEORISH (BALLYFARNON)_020	River	IE_SH_26F020250	High
BELLAVALLY STREAM_010	River	IE_SH_26B320120	High

Appendix 2 Catchment Scale Nutrient concentrations and in-stream loads

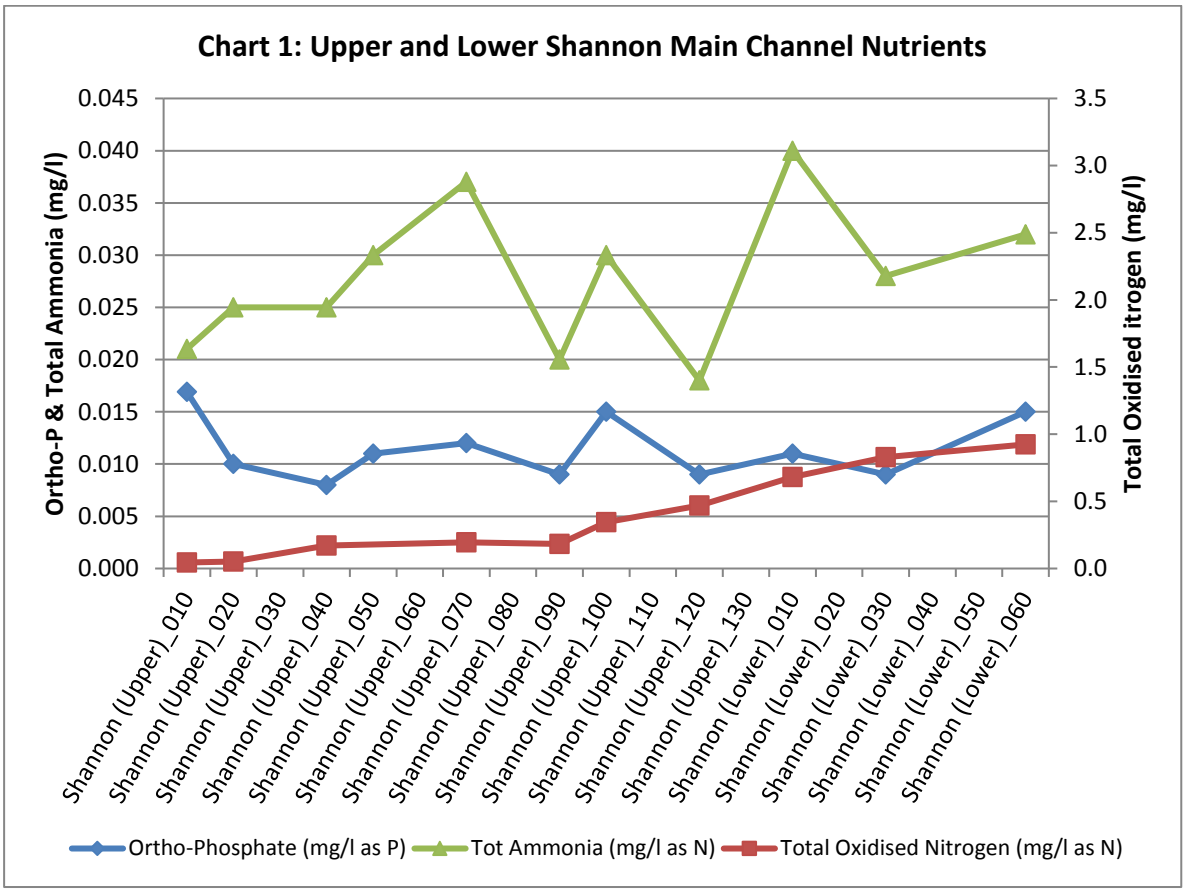
River Shannon Main Channel Nutrient Trends

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

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 Castleroy 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 drinking water threshold value throughout the channel.



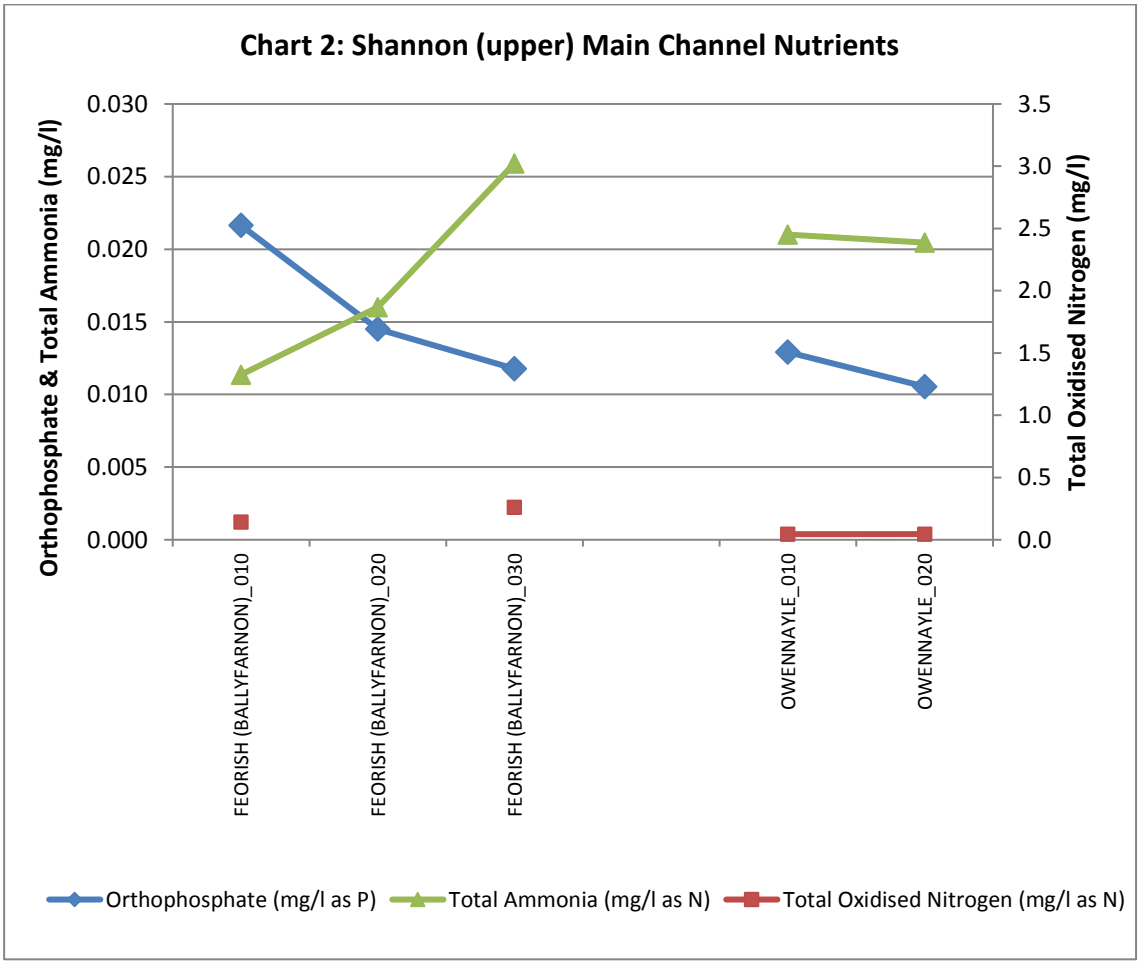
26A UPPER Shannon Main Channel Nutrient Trends

The Owenayle River flows into the SHANNON (UPPER)_030 while the Feorish River flows into SHANNON (UPPER)_040. SHANNON (UPPER)_030 is also the receiving water body for SHANNON (UPPER)_020, while SHANNON (UPPER)_040 is also the receiving water body for the ARIGNA (ROSCOMMON)_020 and the YELLOW (BALLINAGLERA)_020. The results for the water quality trend assessment for the Feorish and Owenayle Rivers are presented in Chart 2 and Chart 3.

Average orthophosphate concentrations along the Feorish River decrease from 0.022mg/l at the headwaters to 0.012mg/ at FEORISH_030. In the Owenayle River, average orthophosphate concentrations were 0.013 and 0.011mg/l at OWENAYLE_010 and OWENAYLE_020 respectively. The EQS for orthophosphate (0.035mg/l) was not exceeded at any of the main channel monitoring points in both rivers.

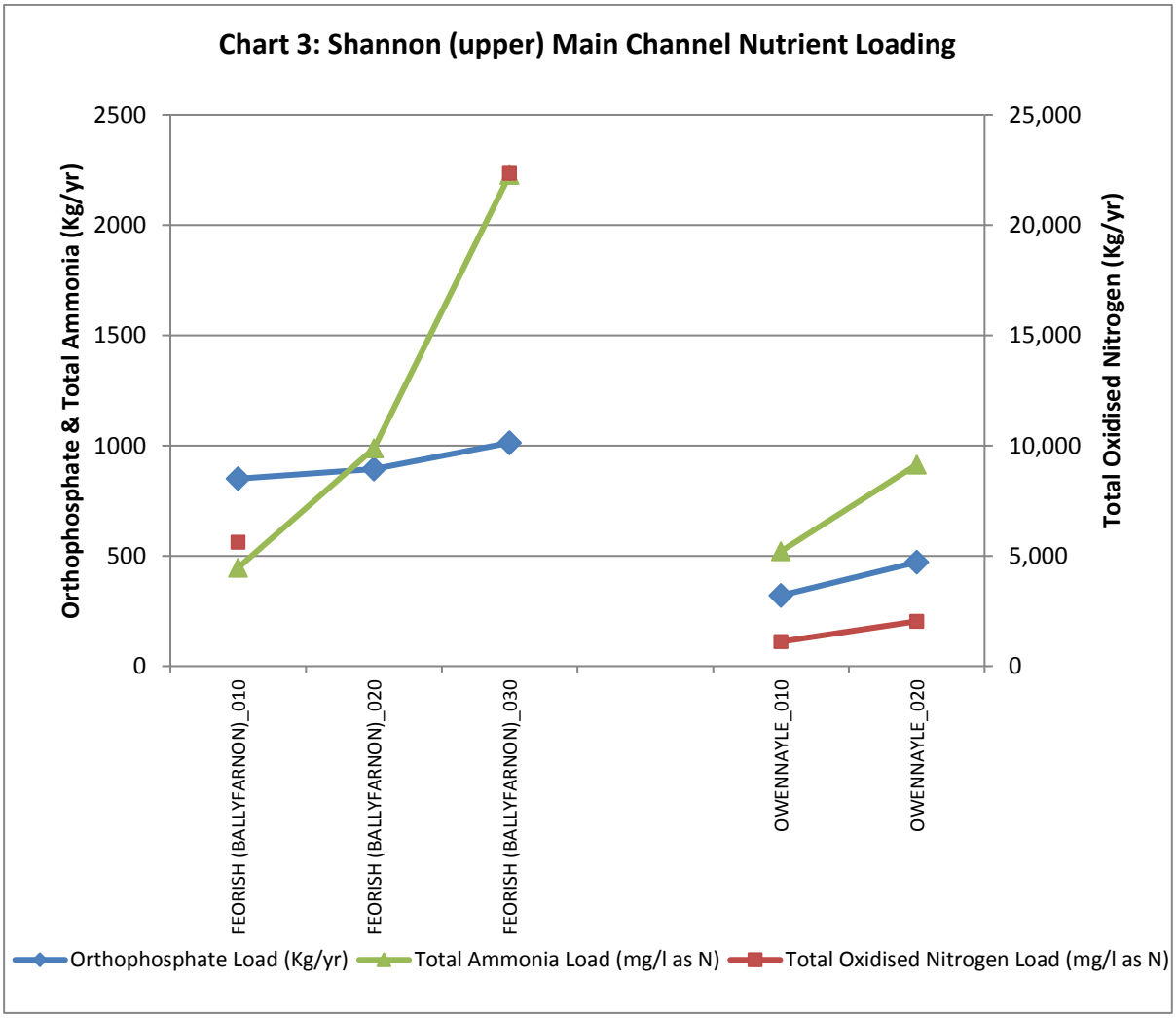
Total oxidised nitrogen (TON) concentrations are negligible in both the Feorish and Owenayle channels, and show no spatial trend.

Average ammonia in the Feorish River increases downstream, but remains well below the EQS (0.065mg/l) at all monitoring points. Similarly, in the Owenayle channel, ammonia is uniformly low, without exceeding the EQS.



The results for Feorish and Owenayle nutrient loading trend assessment are presented in Chart 3. In the Feorish channel, stream discharge increases from the headwaters at FEORISH_010 to

FEORISH_030, ranging from 1.2 to 2.7m3/s. In the Owenayle, stream discharge increases from 0.8m3/s at OWEAYLE_010 to 1.4m3/s at OWEAYLE_020. In both channels, orthophosphate, TON and ammonia loads increase downstream with increasing flow.



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
26A_1	IE_SH_26G120050	Gowlaunrevagh_010	River	At Risk	Bad	Poor	N	For,Other	2027	
26A_2	IE_SH_26_673	Skean	Lake	Review	Unassigned	Unassigned	N		2027	
26A_2	IE_SH_26_711	Meelagh	Lake	At Risk	Poor	Poor	N	Other	2027	
26A_2	IE_SH_26F020400	Feorish (Ballyfarnon)_030	River	Review	Poor	Poor	N		2027	
26A_3	IE_SH_26_681	Acres	Lake	At Risk	Moderate	Poor	N	For	2027	
26A_3	IE_SH_26_716	Allen	Lake	At Risk	Moderate	Moderate	N	Ag,Other	2027	Lough Allen
26A_3	IE_SH_26S020500	Shannon (Upper)_040	River	At Risk	Moderate	Moderate	N	Other	2021	Lough Allen
26A_3	IE_SH_26S020550	Shannon (Upper)_050	River	Review	Unassigned	Unassigned	N		2027	
26A_4	IE_SH_26T050840	Tarmo_26_010	River	Review	Unassigned	Unassigned	N		2027	Lough Allen
26A_5	IE_SH_26_698	Killooman	Lake	Review	Unassigned	Unassigned	N		2027	
26A_5	IE_SH_26O050050	Owennayle_010	River	At Risk	Moderate	Moderate	N	For	2027	
26A_5	IE_SH_26S020340	Shannon (Upper)_030	River	Review	Unassigned	Unassigned	N		2027	Lough Allen
26A_6	IE_SH_26D050400	DRUMSHANBO Or AGHAGRANIA STREAM_010	River	At Risk	Poor	Poor	N	Ag,UWW	2027	Lough Allen
26A_6	IE_SH_26S090100	Stony_010	River	Review	Unassigned	Unassigned	N		2027	Lough Allen
26A_6	IE_SH_26S650770	Sheskinacurry_010	River	Review	Unassigned	Unassigned	N		2027	Lough Allen

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 water body is one or more of the following, Drinking Water Protected Area, Bathing Water, Shellfish Water, Nutrient Sensitive Area or a Natura 2000 site with qualifying interest, then it has been highlighted as a protected area in this table.

Appendix 4 Drinking water supplies in the catchment

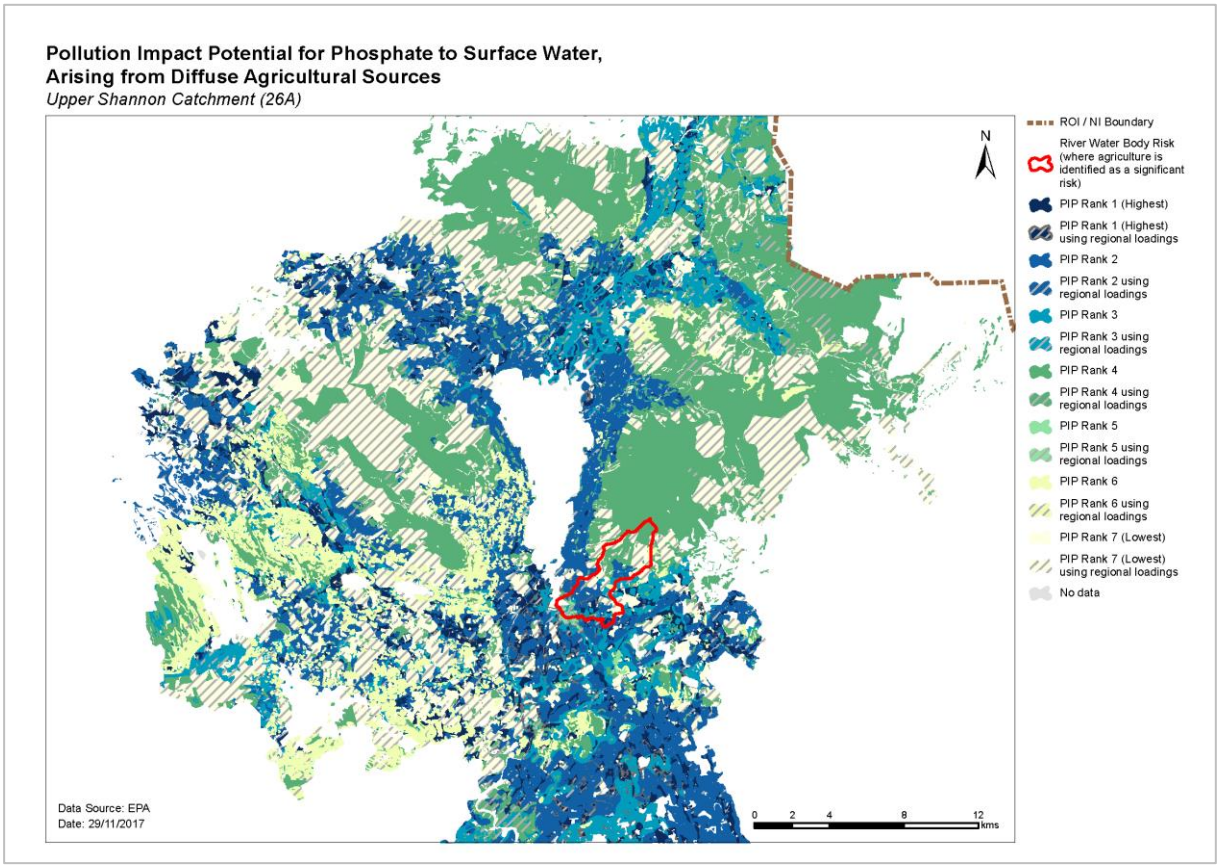
Scheme Code	Scheme Name	Water Body	Water Body Code
0200PRI2018	Glangevlin GWS	Lough Allen Uplands (GWB)	IEGBNI_SH_G_002
1700PRI1086	Mohercregg Gpr Well 1	Lough Allen Uplands (GWB)	IEGBNI_SH_G_002
	Mohercregg Gpr Well 2	Lough Allen Uplands (GWB)	IEGBNI_SH_G_002
	Mohercregg Gpr Well 3	Lough Allen Uplands (GWB)	IEGBNI_SH_G_002
	Mohercregg Gpr Well 4	Lough Allen Uplands (GWB)	IEGBNI_SH_G_002
1700PUB1202	Cornashamshogue	Lough Allen Uplands (GWB)	IEGBNI_SH_G_002
2600PUB1005	Arigna	Lough Allen Uplands (GWB)	IEGBNI_SH_G_002
2600PUB1008	Arigna Rover	Lough Allen Uplands (GWB)	IEGBNI_SH_G_002
2600PUB1009	Ballyfarnan	Geevagh (GWB)	IE_SH_G_105
2600PUB1010	Keadue	Geevagh (GWB)	IE_SH_G_105
2700PRI1027	Carrownadargney GWS	Lough Allen Uplands (GWB)	IEGBNI_SH_G_002
0200PRI2015	Doobally GWS	Owennayle_020 (RWB)	IE_SH_26O050100

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?
Boleybrack Mountain SAC	Potential 3160	At least Good	Lake	Naweleian	Unassigned (NAR)	No	IE_SH_26_411	Yes
			Lake	Killooman	Unassigned (R)	No	IE_SH_26_698	Yes
Cuilcagh – Anierin Uplands SACs 000584	Potential 3110/3160	At least Good	Lake	Nambrack	Unassigned (NAR)	No	IE_SH_26_536	Yes
	7220	Good GW level	Groundwater	Lough Allen Uplands	Good (NAR)	No	IEGBNI_SH_G_002	Yes
			Groundwater	Anierin-Cuilcagh East	Good (NAR)	No	IEGBNI_NW_G_035	Yes
			Groundwater	Claddagh-Swanlibar	Good (NAR)	No	IEGBNI_NW_G_040	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 are 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