

Duff Priority Area for Action AFA0071 Desk Study Report

LAWPRO (Border Region)

Version F01



AFA0071_Duff PAA

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1. Background

There are four waterbodies in the Duff sub-basin, the Duff River (Duff_010, Duff_020, Duff_030) and the Mullaghmore_010. The Mullaghmore River is located in the west of the sub-catchment but is hydraulically independent of the Duff Rivers main channel. The Duff River (*An Dubh*) starts in the Glenade Valley, Co. Leitrim and flows between the counties of Sligo and Leitrim before entering the Atlantic Ocean. The length of the Duff River network is approximately 23 km long.

Of the four waterbodies within the sub-catchment, one waterbody, the Mullaghmore was unassigned. Of the remaining three, the Duff_030 was classed as having high ecological status in 2015 while both the Duff_020 and Duff_010 declined from High to Good Ecological Status in the 2013-2015 cycle.

Land cover in the sub-catchment is predominantly peat and natural grassland with some forestry in the elevated lands to the south and south-east of the sub-catchment. The lower area toward the ocean comprises of a mixture of pasture, peat and mixed agricultural land with small pockets of forestry. Mullaghmore is the main urban centre.

There are a number of protected areas within the sub-catchment (Appendix A):

1. One water abstraction point (spring).
2. There are sand dune habitat SAC's around Mullaghmore.
3. Special Areas of Conservation (SAC) which are part of the Banduff Lough and Machair/Trawalua/Mullaghmore SAC, which is also a proposed Natural Heritage Area (NHA).
4. Part of the Sligo/Leitrim Uplands Special Protection Area (SPA) is located in the south and south-east of the sub-catchment along with the Ben Bulbin, Gleniff and Glenade Complex SAC and the Arroo Mountain SAC, all of which are proposed NHAs.

Reason why the area for action was chosen:

- Two deteriorated High Ecological Status objective water bodies that deteriorated recently to Good in the 2013-2015 monitoring cycle.
- Starting in the headwaters.
- Multiple pressures which can be investigated at the same time.

Fishing in general within the Duff Catchment is quite popular, with the bottom 3.5 miles being the most fished. This is a prolific little spate river for salmon. The Duff gets a good run of summer salmon and grilse. The fish start to enter the river at the end of May with the peak of the run in July/August.

Conclusion from the initial characterisation has identified agriculture as the main land use, with presence of large areas of peaty soils to contribute to the pressures within the Duff_010 and Duff_020 waterbodies. Forestry activities including recent clear felling reported may also be a significant pressure.

The initial characterisation sub-catchment assessment has recommended that the following further characterisation actions be undertaken:

Duff_010:

- "Local catchment assessment needed, with the focus of the assessments on agriculture, forestry and peat between the two monitoring stations."

Duff_020:

- "Local catchment assessment needed, and as there is agriculture and peat in the area, the assessment should focus on nutrients and sediment."

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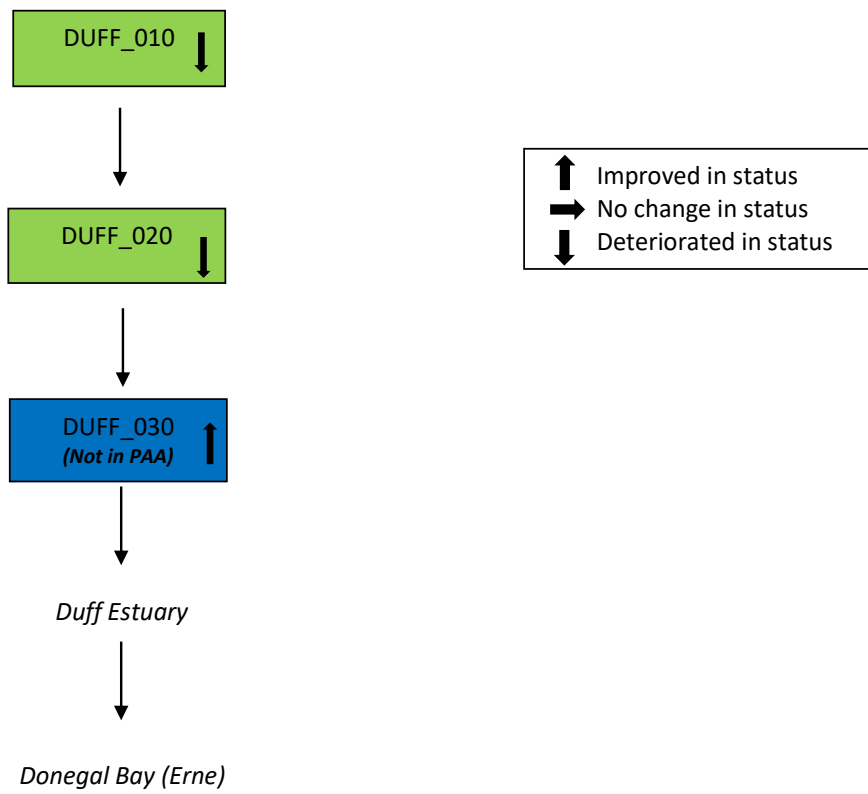


Figure 1 Flow direction of the waterbodies within the Duff PAA

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Table 1 Summary of waterbodies and pressure information on each waterbody within the Duff PAA.

WB Code	WB Name	WFD Risk	Status Objective	WFD Status				Bio 18/19	Pressure Category	Pressure Subcat.	Impact	Sig. Pressure	AA
				07-09	10-12	10-15	15-18						
IE_NW_35D050100	DUFF_010	At Risk	High (2021)	H	H	G	G	St. 50020 Q4-5 2018	Agriculture	Pasture	Nutrient Pollution	Y	Y
								St. 50100 Q 4 2018	Forestry	Forestry		N	
								Q4-5 2019	Extractive Industry	Peat		N	
IE_NW_35D050250	DUFF_020	At Risk	High (2021)	H	H	G	H	Q 4-5 2018	Extractive Industry	Peat	Nutrient Pollution	Y	Y
									Agriculture	Pasture		Nutrient Pollution	
IE_NW_35D050400	DUFF_030	Not At Risk	Good (2021)	G	G	H	G	Q 4 2018	Not Assigned	Not Assigned		Not Assigned	N

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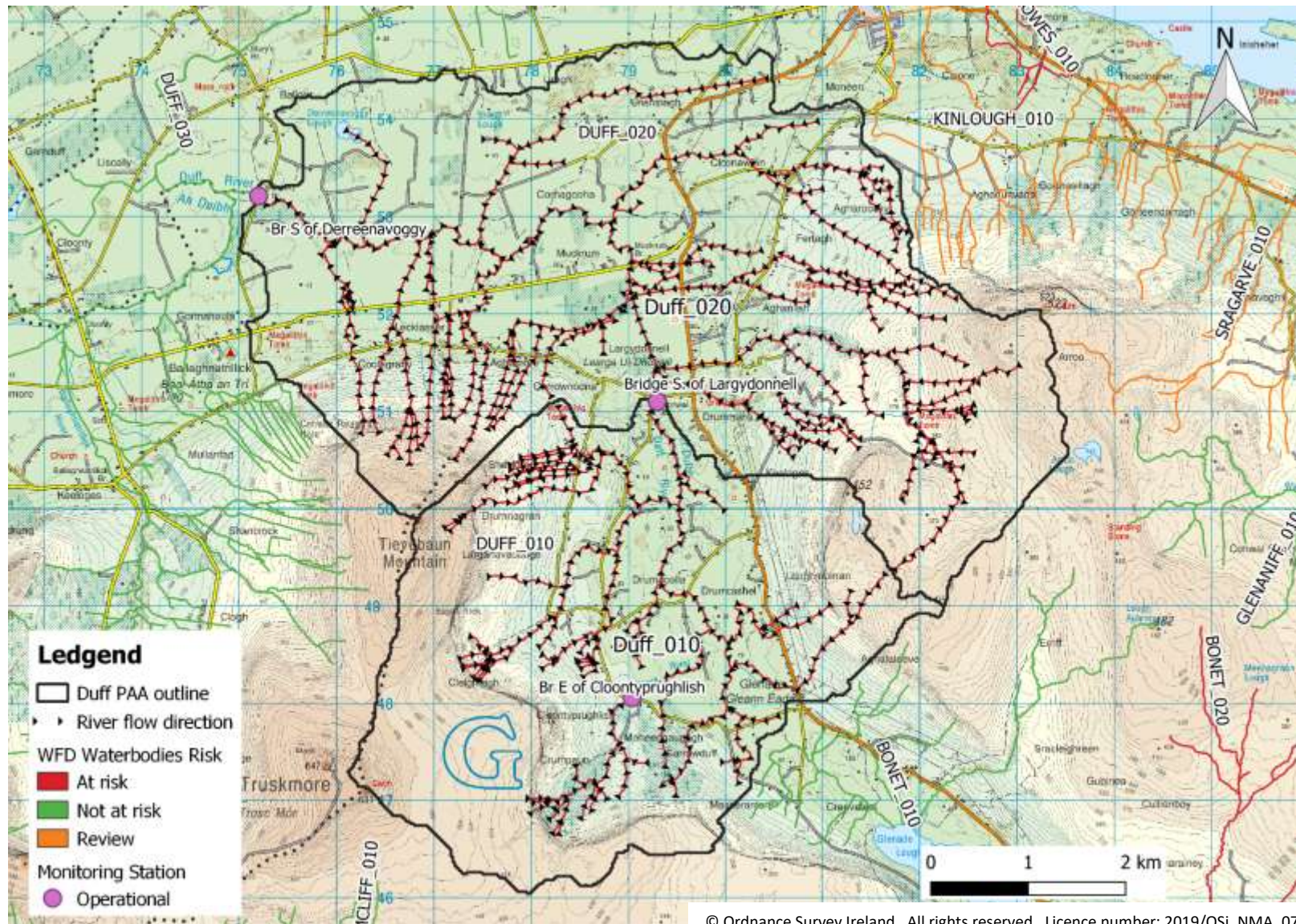


Figure 2 Monitoring stations located within the Duff PAA.

2. Receptor Information and Analysis

There are two waterbodies in the Duff sub-catchment which have been selected as a Priority Area for Action, both of these waterbodies have been identified as *At Risk* based on the reporting period 2010-2015. The biological status based on the latest Q-Value assessment (2015), categorises the Duff_010 and Duff_020 as Good Ecological Status (Table 2).

The monitoring stations within the Duff_010 PAA, labelled in Table 2 will be identified as follows:

- Br E of Cloontyprughlish: St. 50020
- Bridge S. of Largydonnell: St. 50100

The monitoring stations within the Duff_020 PAA, labelled in Table 2 will be identified as follows:

- Br. S of Derreenavoggy: St. 50250

Table 2 Receptor information for the Duff_010 and Duff_020 waterbodies.

Waterbody		IE_NW_35D050100 (Duff_010)		IE_NW_35D050250 (Duff_020)
Risk Category		<i>At Risk</i>		<i>At Risk</i>
Monitoring station		<i>Br E of Cloontyprughlish St. 50020</i>	<i>Bridge S. of Largydonnell St. 50100</i>	<i>Br. S of Derreenavoggy St. 50250</i>
Monitoring station type		<i>Operational</i>	<i>Operational</i>	<i>Operational</i>
Biology		High	High	High
Q values	2009	4-5	0	4-5
	2010	0	0	0
	2011	0	0	0
	2012	4-5	4-5	4-5
	2013	0	0	0
	2014	0	0	0
	2015	4-5	4	4
	2016	0	0	0
	2017	0	0	0
	2018	4-5	4	4-5
	2019	0	4-5	0
Water chemistry				
Monitoring station		<i>Br E of Cloontyprughlish St. 50020</i>	<i>Bridge S. of Largydonnell St. 50100</i>	<i>Br. S of Derreenavoggy St. 50250</i>
PO ₄ ⁺	2010			
	2011			
	2012			
	2013			
	2014			
	2015			
Ecological Threshold 0.025 mgP/L	2016	0.005		
	2017	0.005		
	2018			

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	2019	0.005		
Baseline PO ₄ (16-17)		0.005	n/a	n/a
NH ₄ ⁺	2010			
	2011			
	2012			
	2013			
	2014			
Ecological Threshold Ammonia 0.040 mgN/L	2016	0.010		
	2017	0.017		
	2018			
	2019	0.010		
Baseline NH ₄ (16-17)		0.014	n/a	n/a
TON	2010			
	2011			
	2012			
	2013			
	2014			
Ecological Threshold 3.5 mgN/L	2016	0.1		
	2017	0.1		
	2018			
	2019	0.1		
Baseline NO ₃ (16-17)		0.1	n/a	n/a
HYMO		n/a	0.921875 (High)	n/a
Comments (Fig. 25, Fig. 26)	<ul style="list-style-type: none"> The Bulben, Gleniff and Glenade Complex SAC is overlapping the western and southern border of the waterbody The Arroo Mountain SAC overlaps a small area in the north/east of the waterbody. The Sligo Leitrim Uplands SPA runs along the western and southern part of the waterbody. 		<ul style="list-style-type: none"> The Sligo Leitrim Uplands SPA runs in a small area in both the south/west and south/east of the waterbody. The Bulben, Gleniff and Glenade Complex SAC runs in a small area in the south-west of the waterbody. The Arroo Mountains SAC runs along the eastern part of the waterbody 	
Conceptual model required (Y/N)	Y	Y	Y	Y
Ecological Status (10-15)	Good		Good	
EPA Biologist comments (* EPA biology reports Appendix B)	Conditions in the Duff River remains satisfactory in 2018, with only slight enrichment reducing overall quality at some stations. Q4-5 was maintained in the uppermost reaches (St. 50020) while station (St. 50100) was a satisfactory Q4.		Conditions in the Duff River remains satisfactory in 2018, with only slight enrichment reducing overall quality at some stations. St. 50250 returned to high ecological condition.	
Significant issue: Monitoring Point	Q4-5 maintained in 2018	Q4 at monitoring point, this monitoring point is driving status		
Significant issue: Waterbody	NH₃ currently trending upwards,	Based on the characterisation information nutrients	Based on the characterisation information nutrients and sediment to be confirmed	

	<i>although still below the EQS</i>	<i>and sediment to be confirmed</i>	
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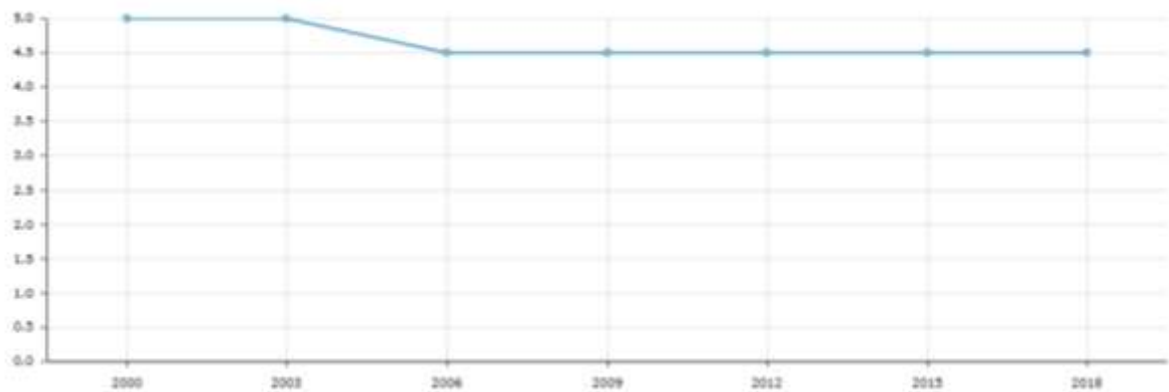
2.1. Duff_010

2.1.1. Monitoring Station – Br E of Cloontyprughlish (St. 50020)

The monitoring St. 50020 is an Operational Monitoring station located in the southern part of the waterbody (Figure 2).

Data summary:

- The 2018 biological data at this monitoring station characterises the river in the Duff_010 as High Ecological Status (Q4-5) (Table 2, Figure 3).
- This ecological status has remained at High Status since 2000 (Table 2, Figure 3).
- Monitoring for general chemistry has only been carried out since 2016. This station is on the EPA 2019 -2021 monitoring programme for supporting chemistry monitoring.
- Based on the two monitoring data points for PO₄ and TON their concentration trends have remained the same. However, NH₃ concentrations are currently trending upwards (Table 2, Figure 4-6).
- It is important to note that none of the parameters measured (NH₃, PO₄ and TON) are exceeding their retrospective EQS (Table 2, Figure 4-6).



	2000	2003	2006	2009	2012	2015	2018
Result	5	5	4.5	4.5	4.5	4.5	4.5
Classification	High	High	High	High	High	High	High
Q-Value	5	5	4.5	4.5	4.5	4.5	4.5

Figure 3 The biological trend and data for monitoring St. 50020 (2000 – 2018).

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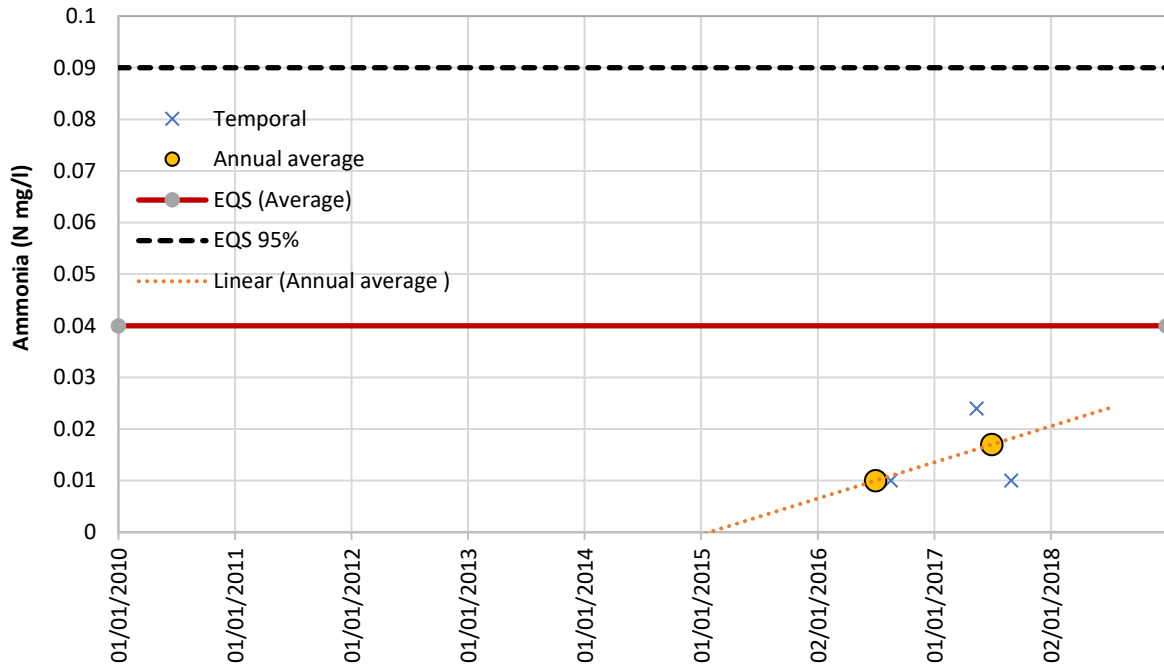


Figure 4 Ammonia (as N mg/l) trend chart for monitoring St. 50020 (2010 – 2018).

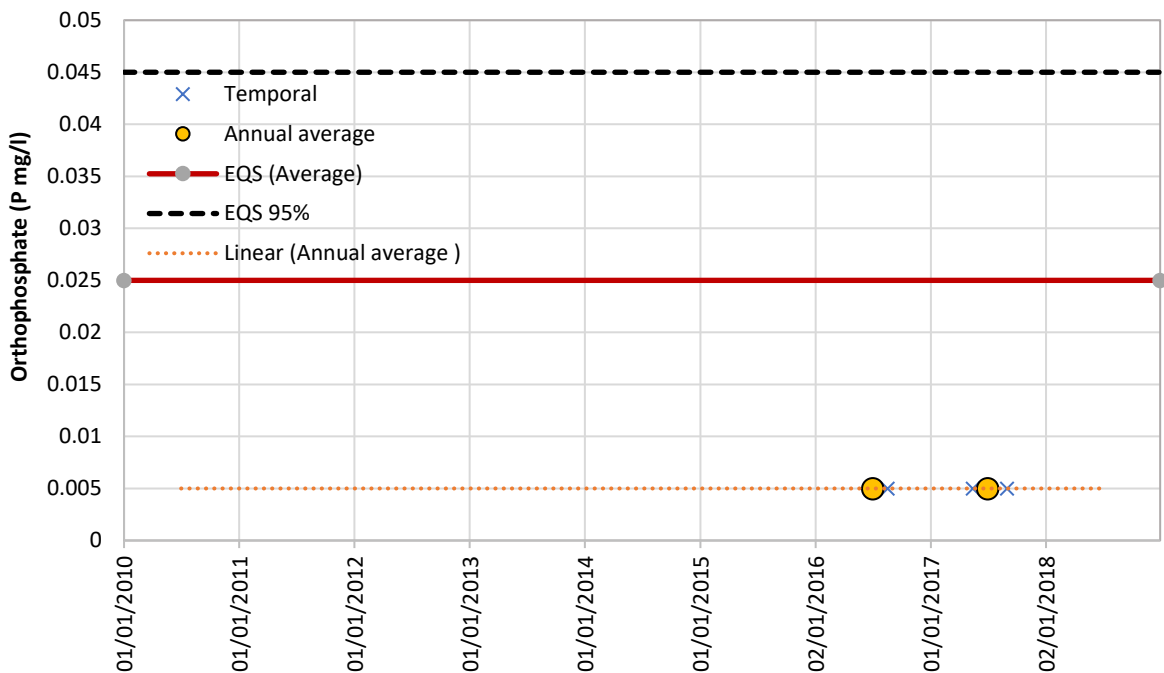


Figure 5 Ortho-Phosphate (as P mg/l) trend chart for monitoring St. 50020 (2010 – 2018).

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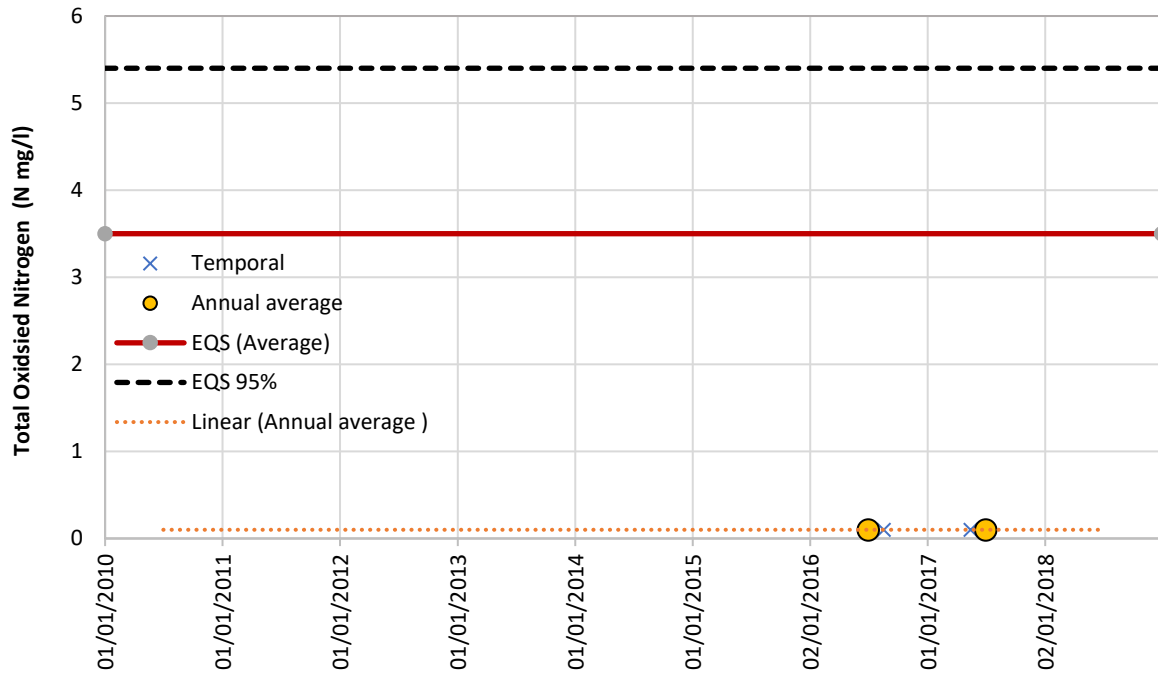


Figure 6 Total Oxidised Nitrogen (as N mg/l) trend chart for monitoring St. 50020 (2010 – 2018).

2.2.2. Monitoring Station – Br S. of Largydonnell (St. 50100)

The monitoring St. 50100 is an Operational Monitoring station located on the main river channel on the border of the Duff_010 and Duff_020 waterbodies (Figure 2).

Data summary:

- The 2019 Q data at this monitoring station characterises the river at the Duff_010 and Duff_020 boundary as Q4-5. (Table 2, Figure 7).
- Invertebrate status at this site has decreased from Q4-5 in 2012 to Q4 in 2015 (Table 2, Figure 7). (Note: Invertebrates are driving status at this monitoring point in the waterbody).
- The RHAT score was high (Table 2).
- There is no further data available at this monitoring station. This monitoring station is not included on the EPA monitoring programme for supporting chemistry monitoring.

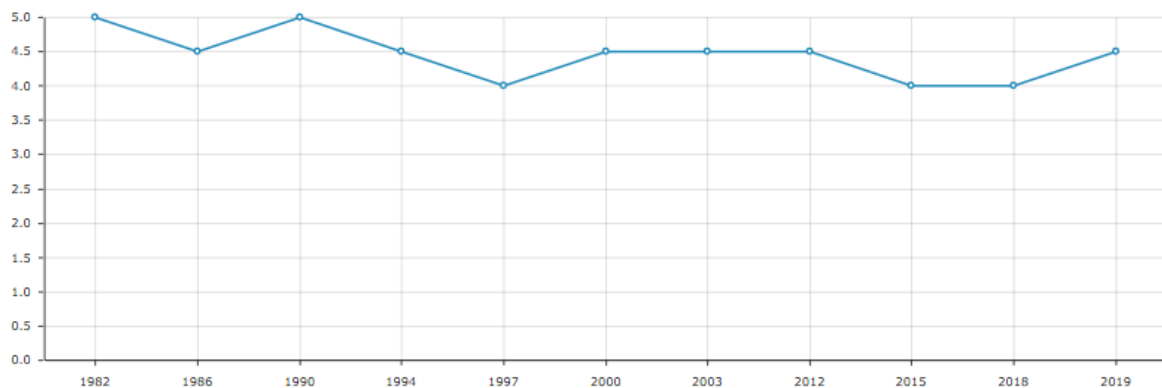


Figure 7 The biological trend and data for monitoring St. 50100 (1982 – 2019).

2.2. Duff_020

2.2.1. Monitoring Station – Br. S of Derreenavoggy (St. 50250)

The monitoring St. 50250 is an Operational Monitoring station located on the main river channel on the border of the Duff_020 and Duff_030 waterbodies (Figure 2).

Data summary:

- The 2018 Q at this station characterises the Duff River as Q4-5 (Table 2, Figure 8).
- Invertebrate status at this site has increased from Q4 in 2015 to Q4-5 in 2018 (Table 2, Figure 8).
- This waterbody has a High Status objective.
- There is no RHAT score for this monitoring point.
- There is no further data available at this monitoring station. This monitoring station is not included on the EPA monitoring programme for supporting chemistry monitoring.

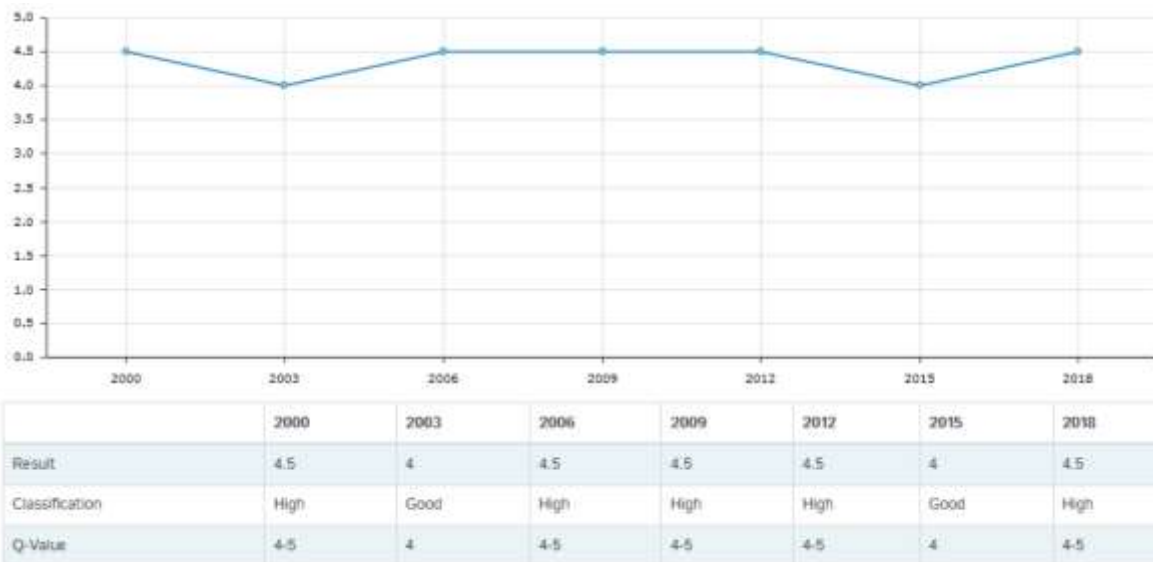


Figure 8 The biological trend and data for monitoring St. 50250 (2000 – 2018).

3. Significant Pressures

Any further additional information identified on the significant pressures outlined in Table 1 is detailed below. The significant pressures identified for the Duff_010 is agriculture while both agriculture and peat extraction have been identified as significant pressures for the Duff_020. Other pressures identified for the Duff_010 but are not considered to be significant are forestry and peat extraction.

Table 3 Summary of waterbodies and pressure information on each waterbody within the Duff PAA.

WB Name	Pressure Category	Pressure Subcat.	Impact	Sig. Pressure	Within AA	IA
DUFF_010	Agriculture	Pasture	Nutrient Pollution	Y	Y	IA8 High Status RWB Pressures: Local catchment assessment needed, with the focus of the assessments on agriculture, forestry and peat between the 2 monitoring stations.
	Forestry	Forestry		N	Y	
	Extractive Industry	Peat		N	Y	
DUFF_020	Extractive Industry	Peat	Nutrient Pollution	Y		IA8 High Status RWB Pressures: Local catchment assessment needed, and as there is agriculture and peat in the area, the assessment should focus on nutrients and sediment.
	Agriculture	Pasture	Nutrient Pollution	Y		
DUFF_030				Not Assigned	N	

3.1. Agriculture - Pollution Impact Potential Maps

Agriculture (nutrient pollution from pasture) has been identified as a significant pressure for both the Duff_010 and Duff_020 waterbodies.

3.1.1. Duff_010 waterbody:

- The surface water receptor PO₄ PIP maps indicate a high PIP ranking (PIP between 1 and 2) along the main river channel in the Duff_010. The remaining area within the Duff_010 waterbody has a moderate PO₄ PIP between 4 and 7 (Figure 9).
- There are no high areas of surface water receptor NO₃ PIP in the Duff_010 waterbody. The NO₃ surface receptor NO₃ PIP ranges between 5 and 7 (Figure 10).
- The groundwater receptor NO₃ PIP do not highlight any high or very high areas within the Duff_010 waterbody (Figure 11).

3.1.2. Duff_020 waterbody:

- As seen in the Duff_010 high PO₄ PIP in the surface water receptor are mainly located along the main river channels, ranging between 1 and 2. Along the smaller river channels the PO₄ PIP ranges between 4 and 7 (Figure 12).
- The surface water receptor NO₃ PIP maps indicate a number of small areas of high PIP in the south-west of the waterbody (PIP > 4) (Figure 13).
- The groundwater receptor NO₃ PIP maps show a small area of high PIP for NO₃ in the south-west of the waterbody (PIP > 5) (Figure 14).

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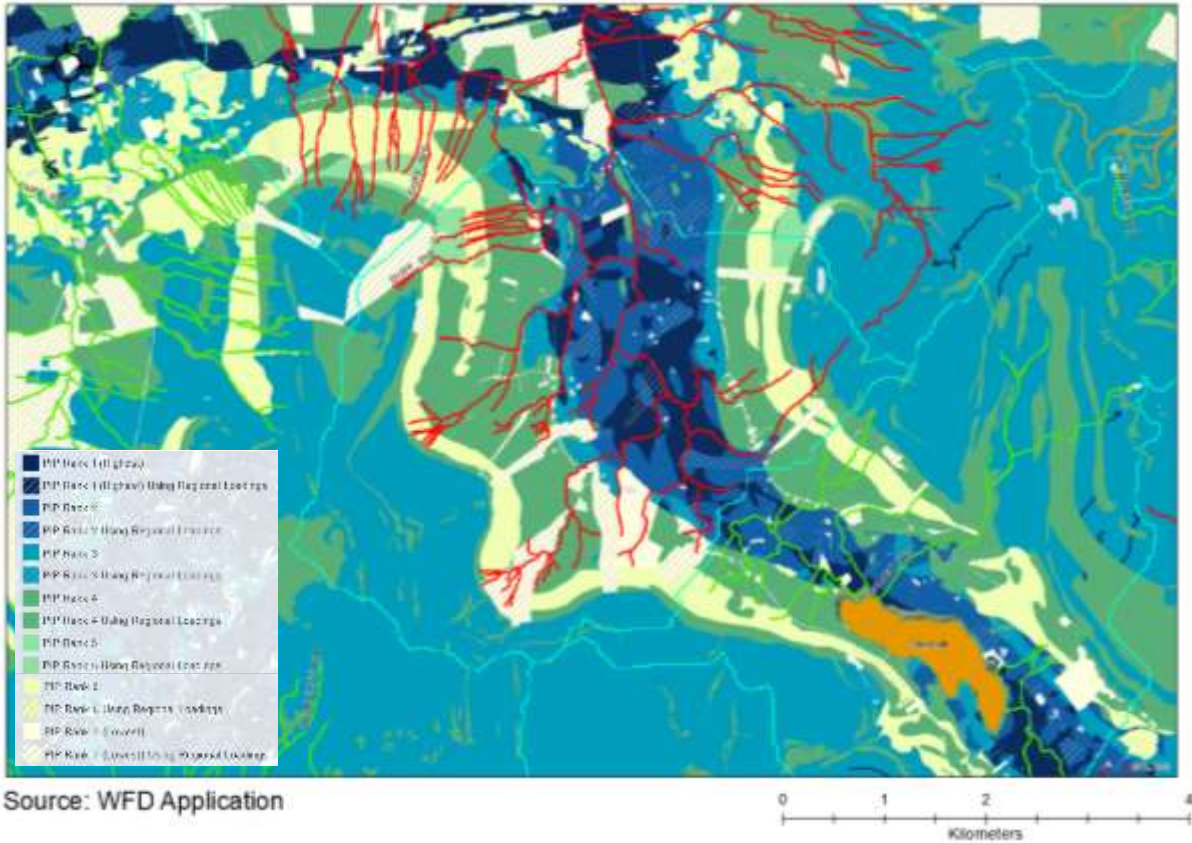


Figure 9 Surface water receptor PO₄ PIP maps for the Duff_010 waterbody.

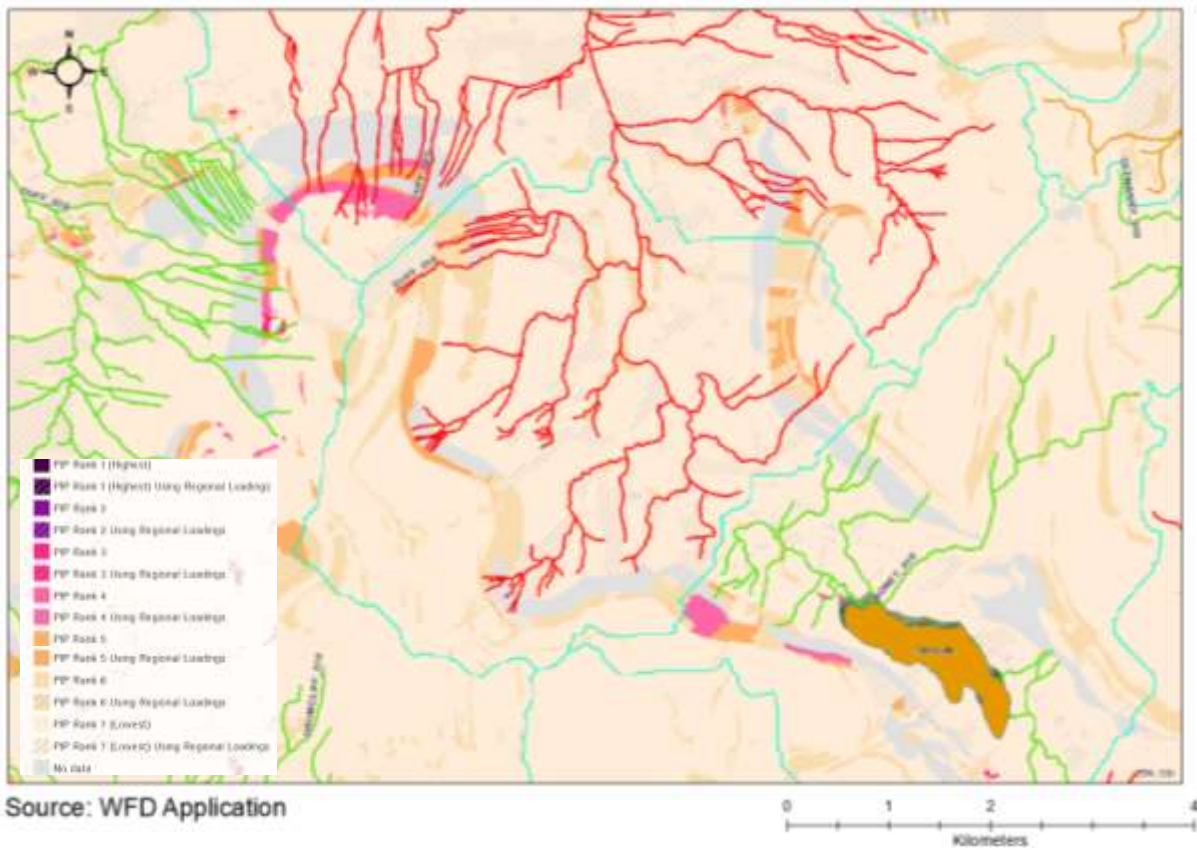


Figure 10 Surface water receptor NO₃ PIP maps for the Duff_010 waterbody.

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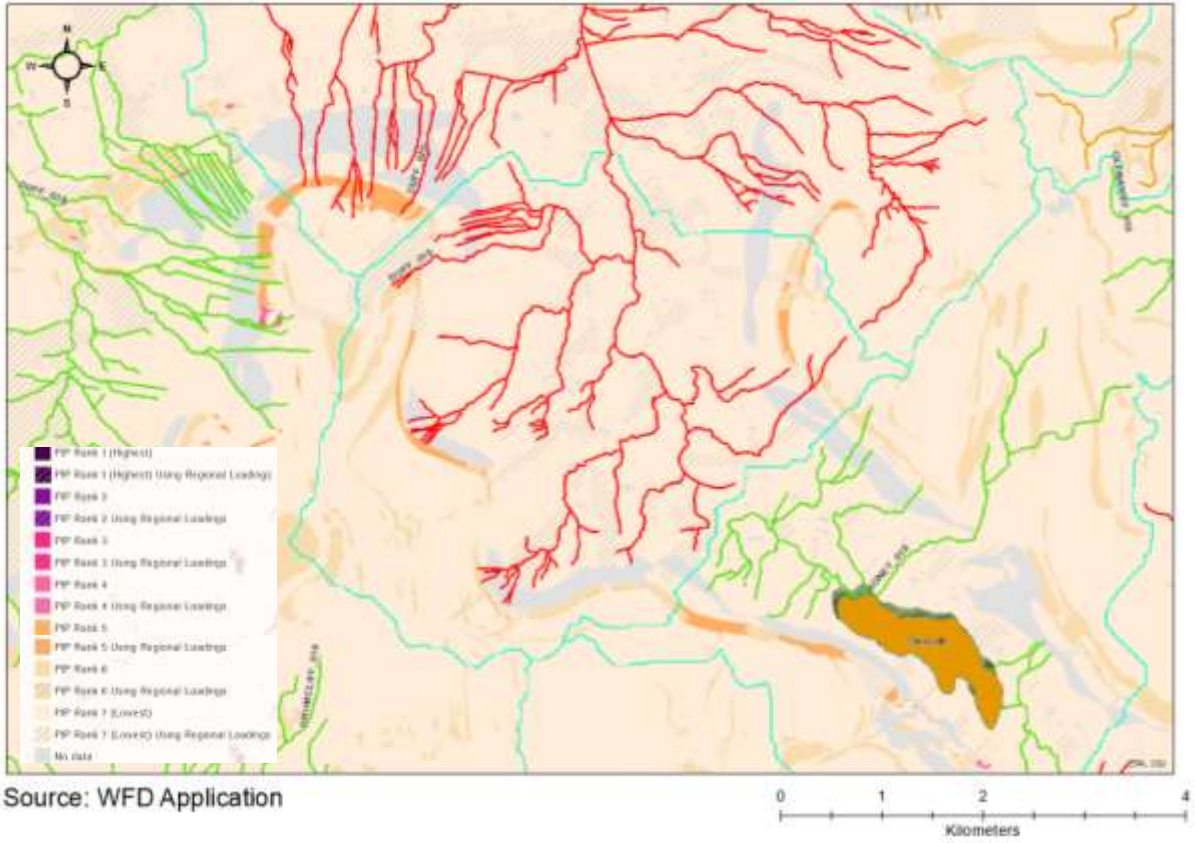


Figure 11 Groundwater receptor NO₃ PIP maps for the Duff_010 waterbody.

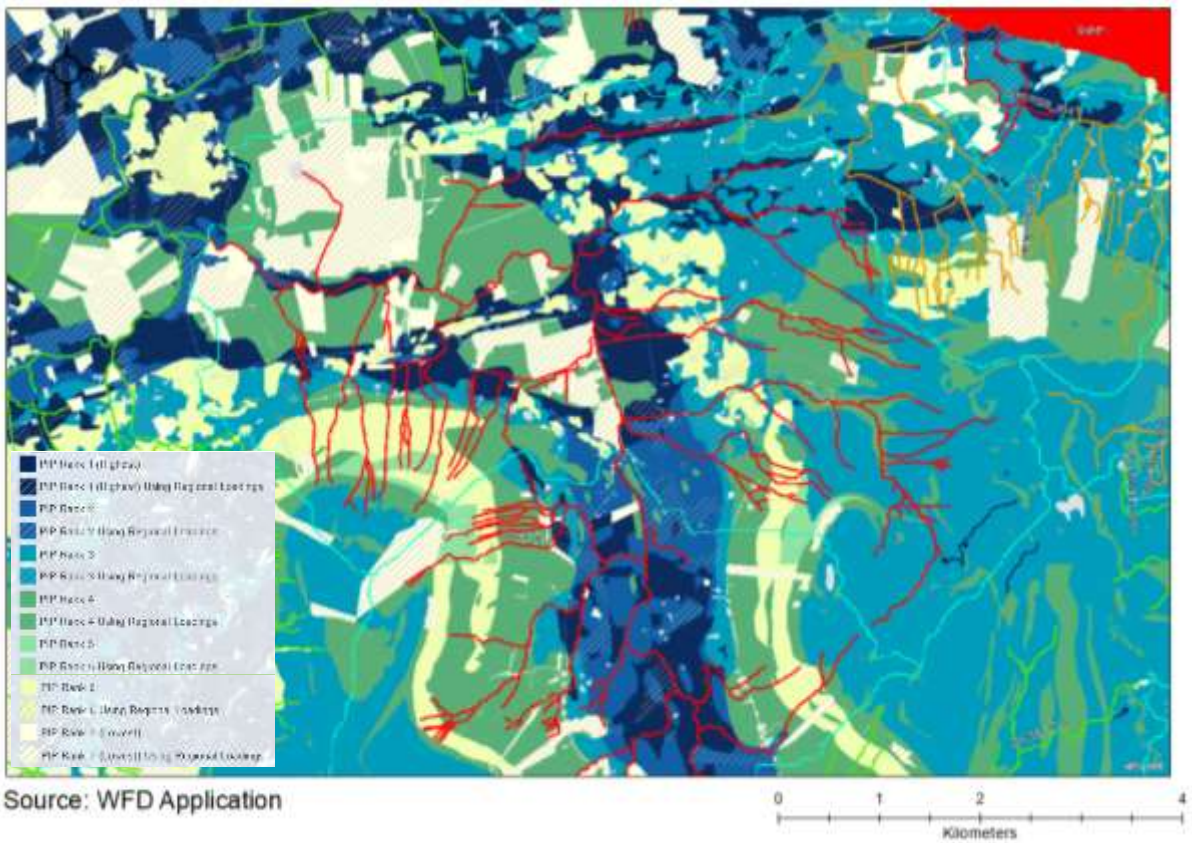


Figure 12 Surface water receptor PO₄ PIP maps for the Duff_020 waterbody.

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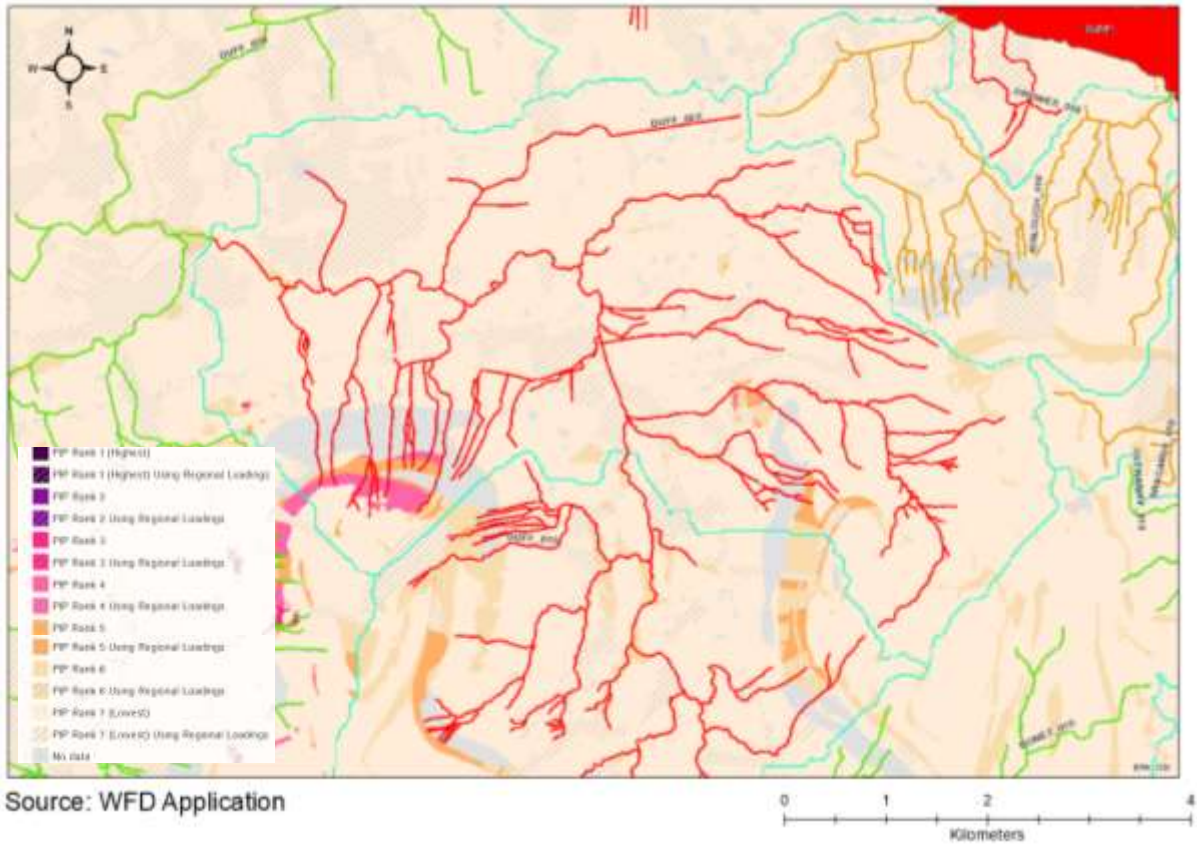


Figure 13 Surface water receptor NO₃ PIP maps for the Duff_020 waterbody.

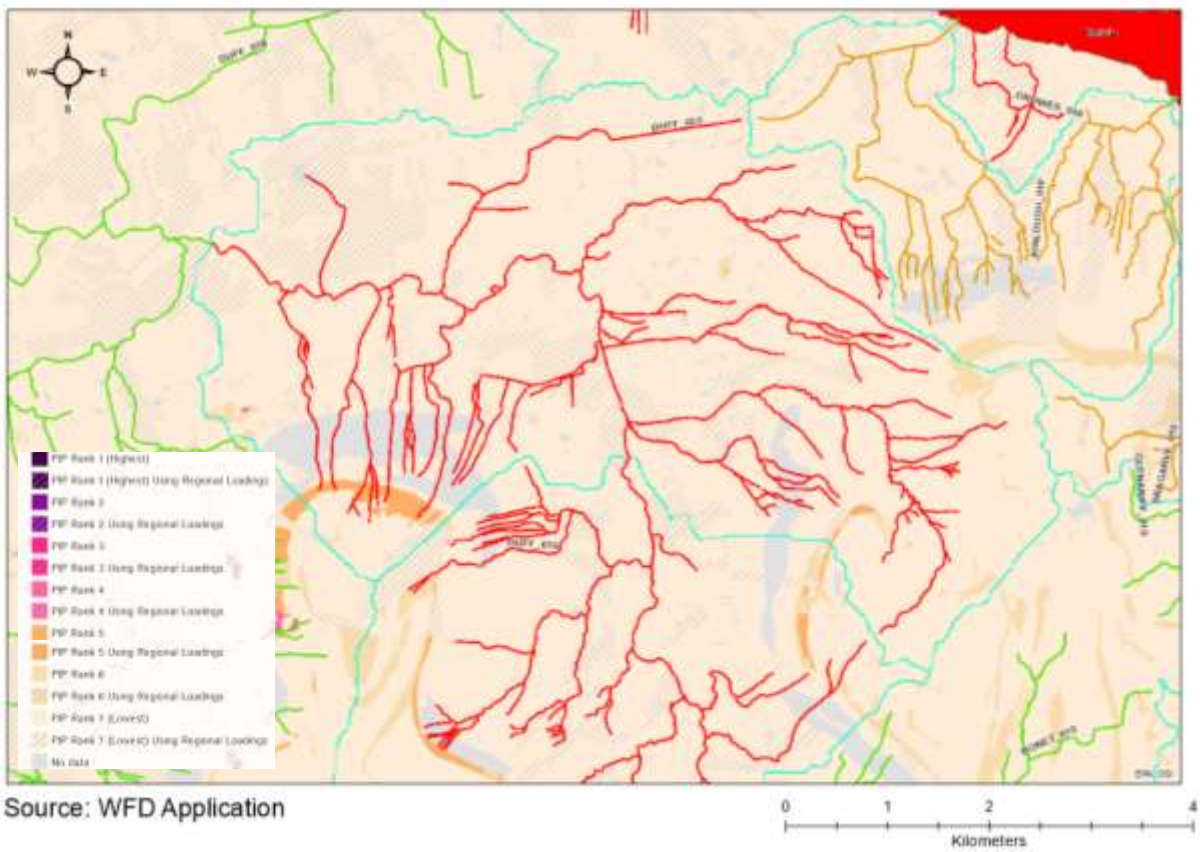


Figure 14 Groundwater receptor NO₃ PIP maps for the Duff_020 waterbody.

3.2. Extractive Industry - Peat

Peat extraction has been identified as a significant pressure for the Duff_020 waterbody and a pressure, however, not significant for the Duff_010 waterbody. The aerial imagery highlights a large area where peat extraction has taken place in the north-west of the Duff_020 waterbody in close proximity to the watercourse (Figure 15). Within the Duff_010 there are a number of small areas where peat extraction has occurred or is taking place. The main impacts associated with peat extraction can include the release of ammonia and fine sediment as well as the alteration of the physical habitat which may result from increased connectivity of drains and possible alterations to flow and sediment regimes.

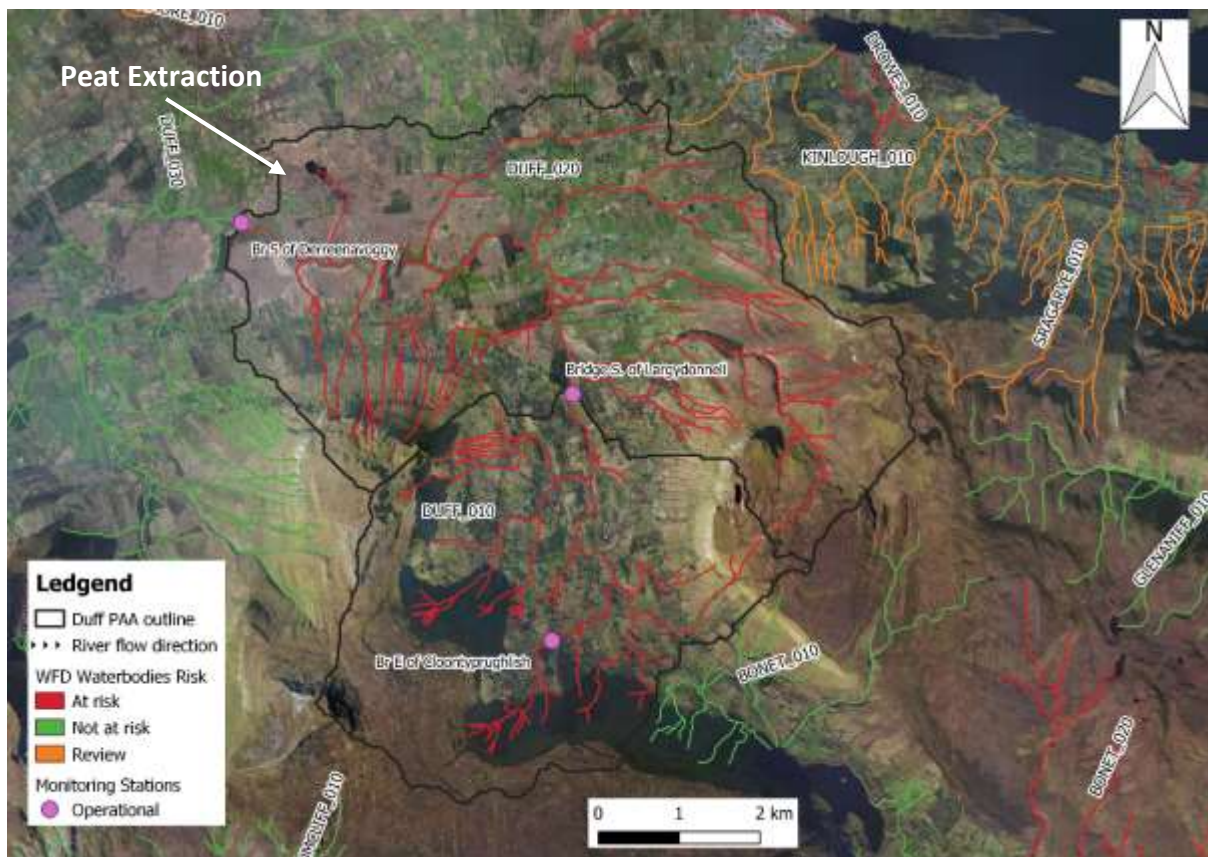


Figure 15 Aerial imagery highlighting areas where peat extraction has occurred within the Duff_020 and Duff_010 PAA

3.3. Other Pressure - Forestry

Forestry has been identified as a pressure for the Duff_010 waterbody, however, it has not been identified as a pressure Duff_020 waterbody. Within the Duff_010 and Duff_020 there are areas of both privately owned and Coillte planted forestry (Figure 16, Figure 19). For the Coillte planted forestry three land types have been identified, these include Conifer High Forest, Bare Unplanted and Bare Marginal (Figure 20). The main forest cover for the Coillte planted areas are Sitka spruce (Figure 21). In relation to the privately owned forestry Broadleaf High, Conifer High and Mixed High forested areas were identified (Figure 17, Figure 18).

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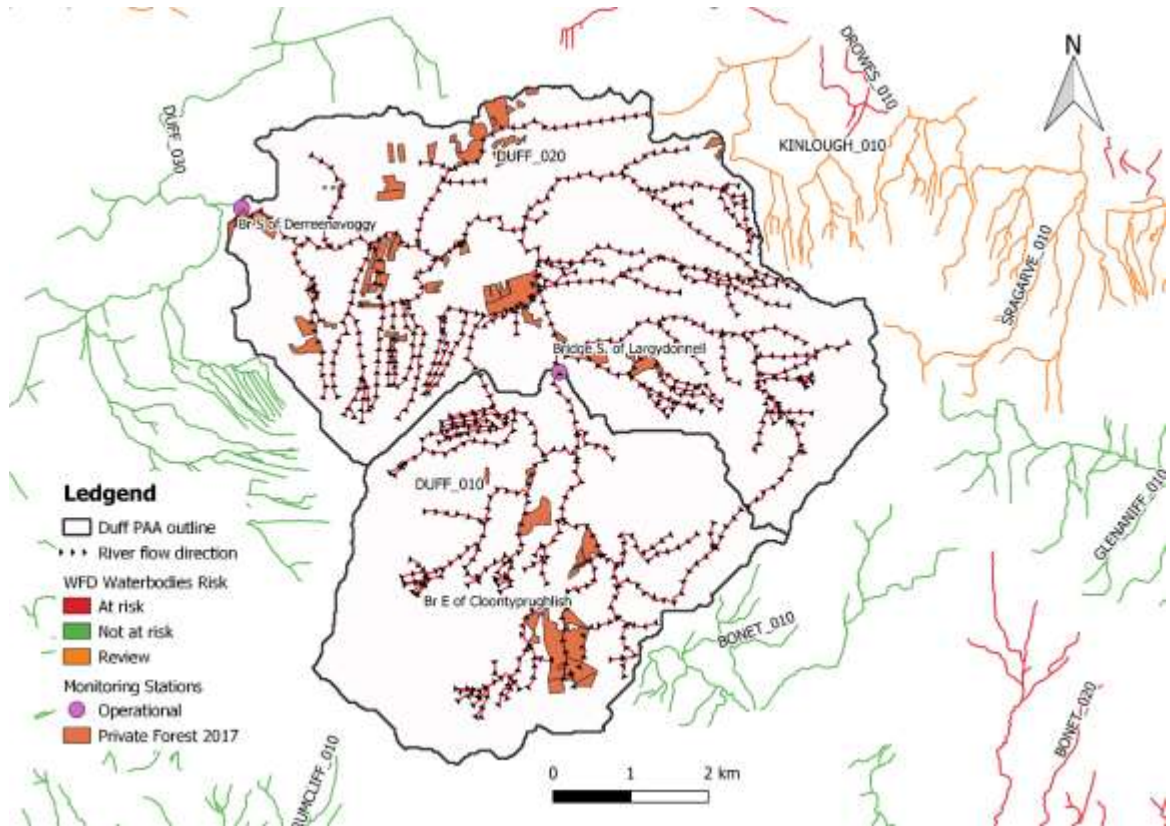


Figure 16 Private Forestry register 2017 for the Duff_010 and Duff_020 waterbodies.

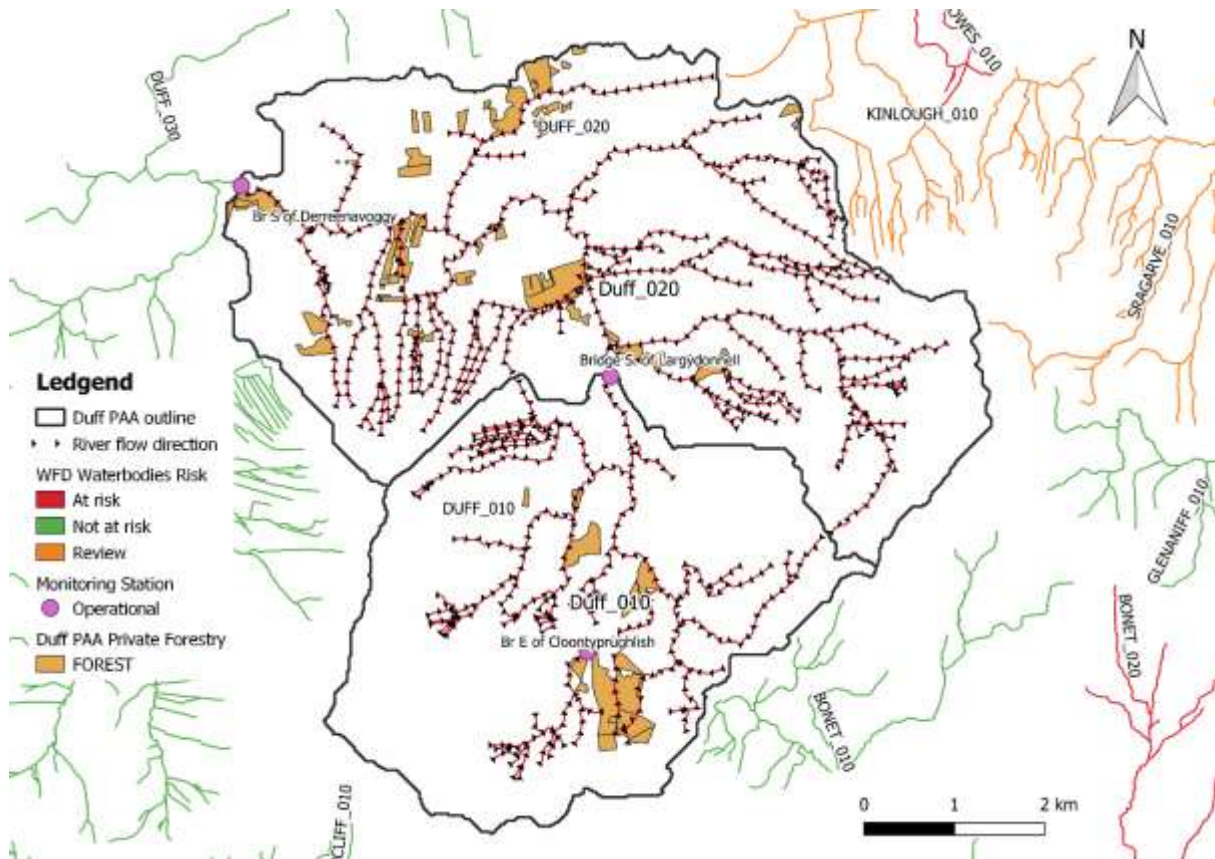


Figure 17 Private Forestry land use type for the Duff_010 and Duff_020 waterbodies.

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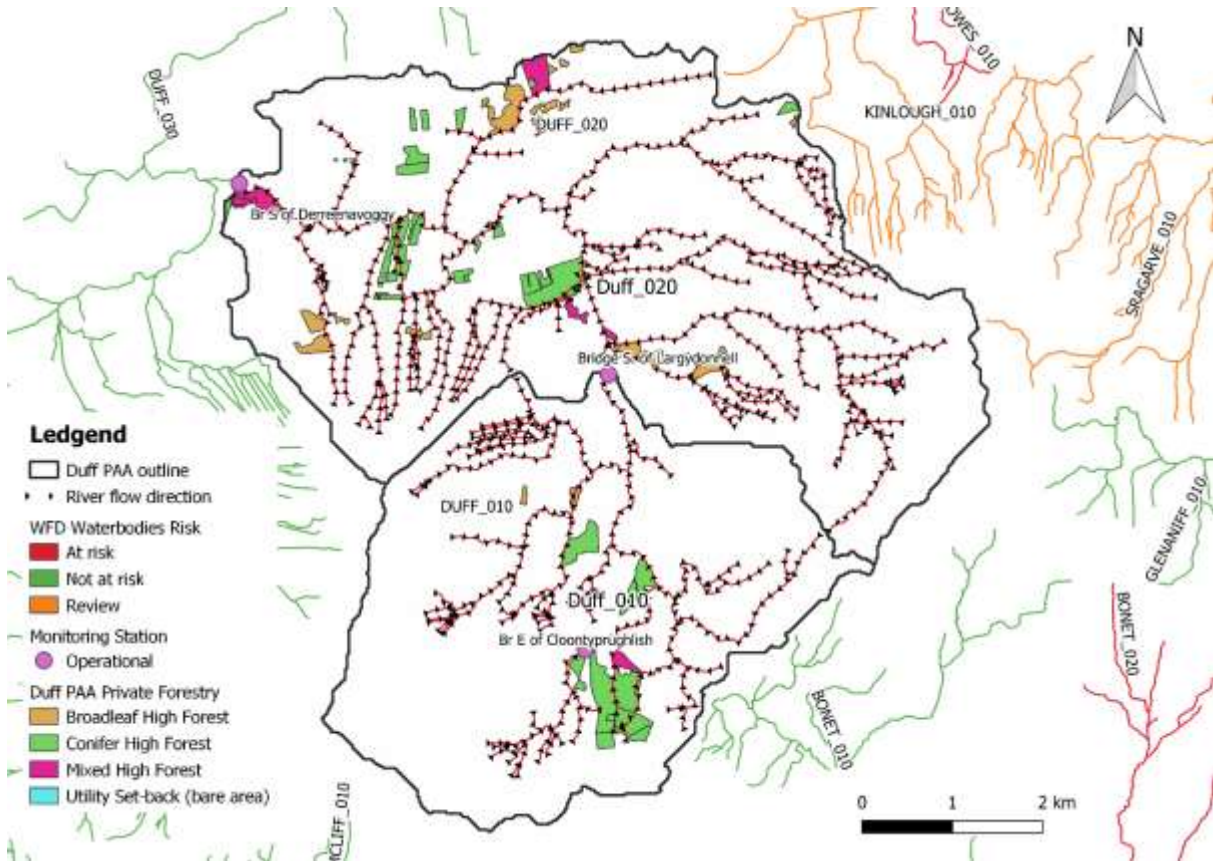


Figure 18 Private Forestry Land Use Cover for the Duff_010 and Duff_020 waterbodies.

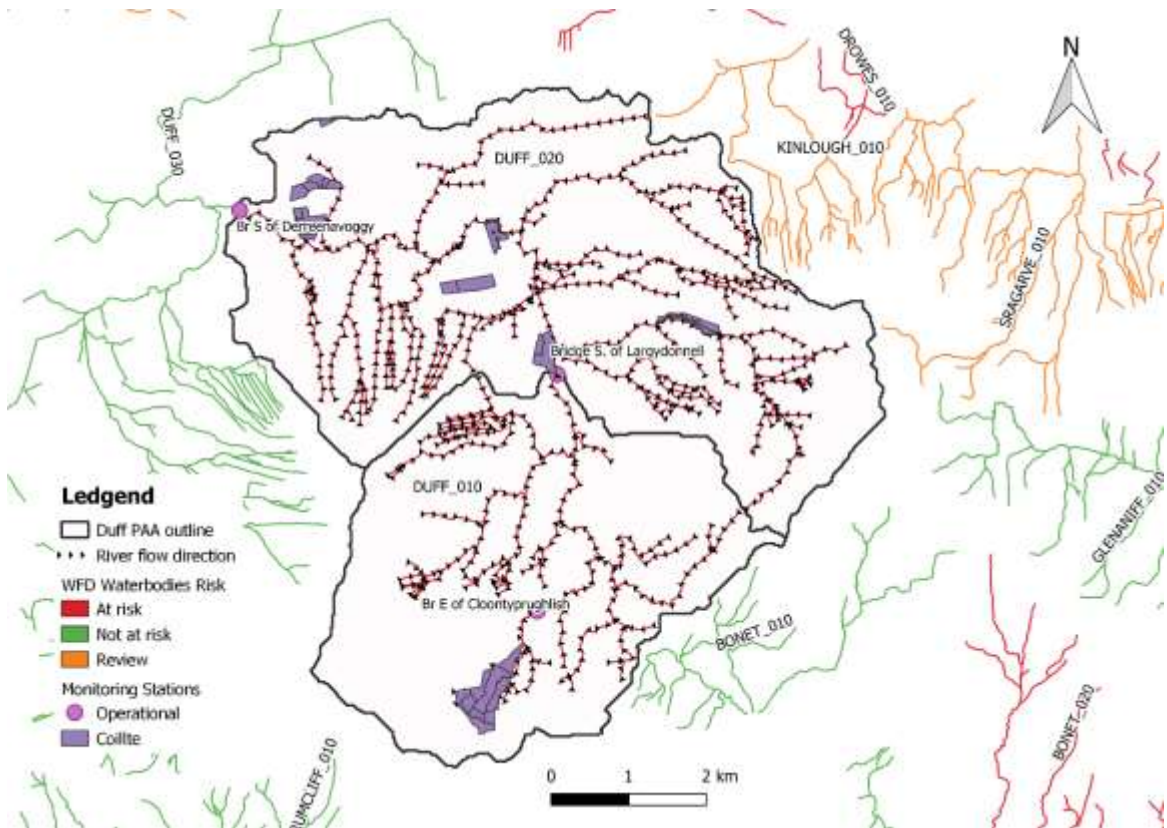


Figure 19 Coillte Forestry register 2017 for the Duff_010 and Duff_020 waterbodies.

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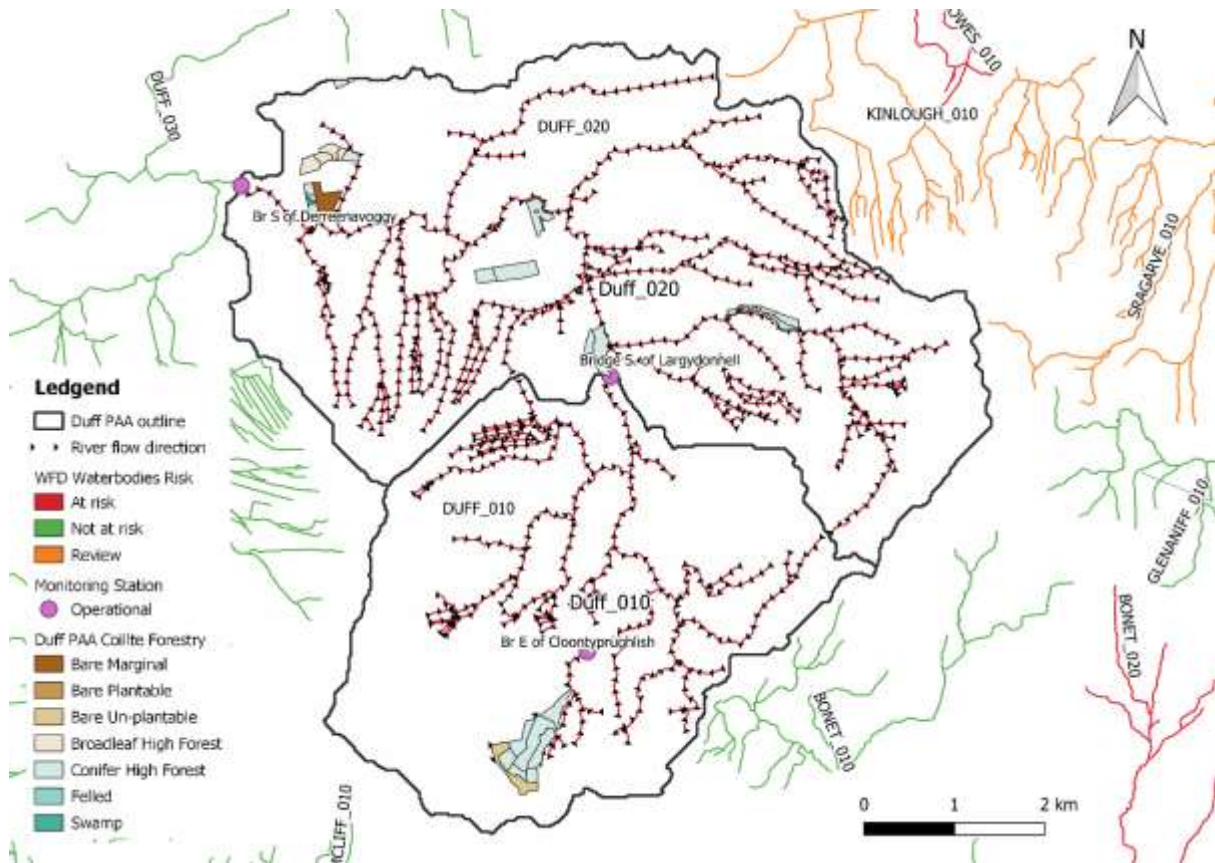


Figure 20 Coillte Forestry Land Use Type for the Duff_010 and Duff_020 waterbodies.

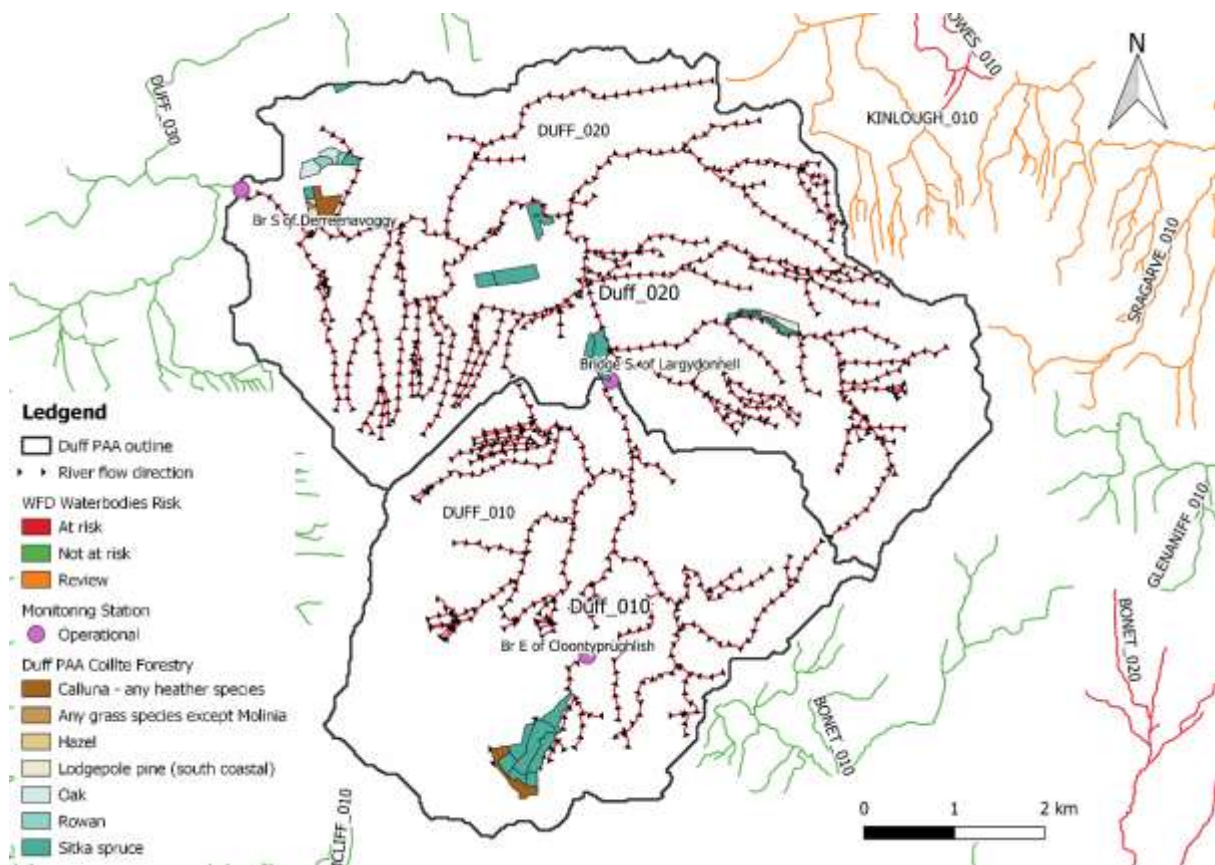


Figure 21 Coillte Forestry Land Use Cover for the Duff_010 and Duff_020 waterbodies.

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3.4. Other Pressure - OPW Channel Maintenance

The Duff_010 and Duff_020 are part of the OPW channel maintenance programme, the areas of which are outlined in Figure 22. No planned channel maintenance within the Duff_010 and Duff_020 waterbodies was put on programme for 2019.

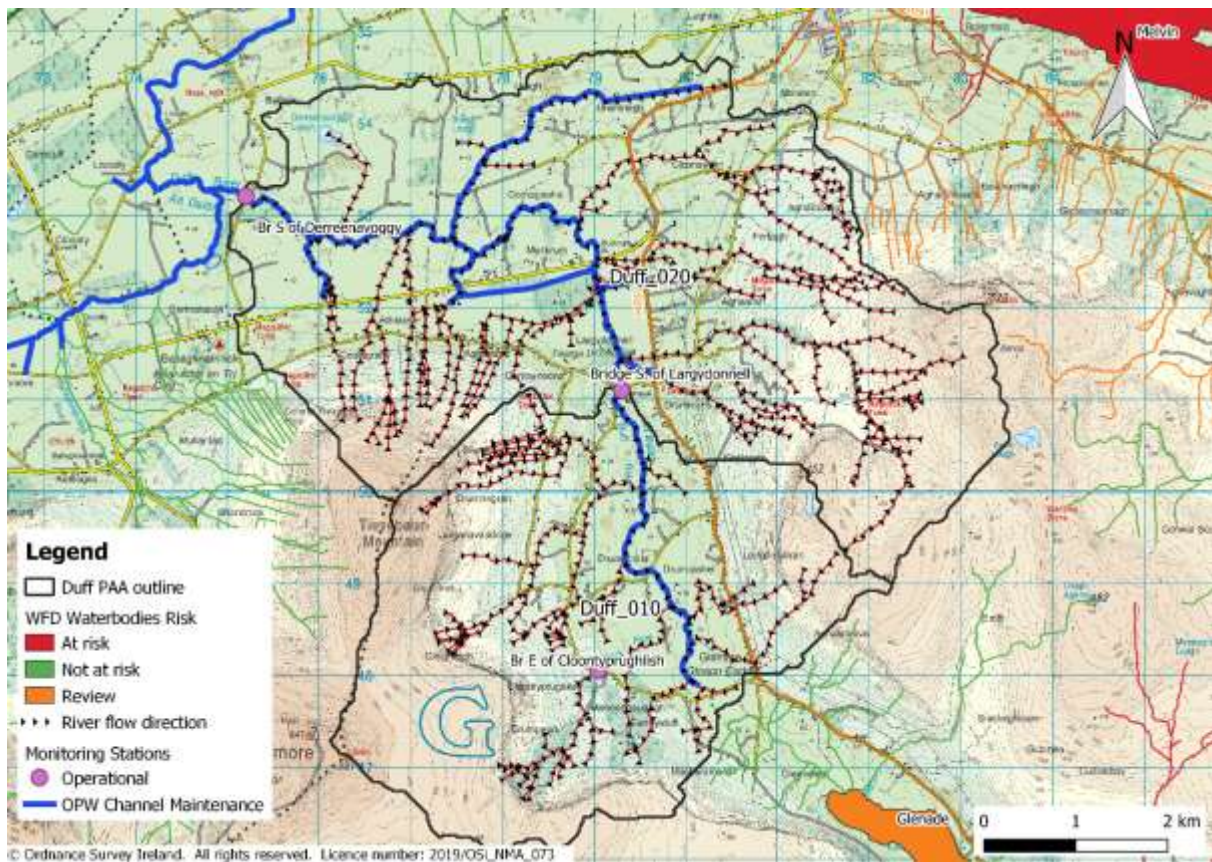


Figure 22 Location of the OPW channel maintenance areas within Duff_010 and Duff_020 waterbodies.

4. Pathways Information and Analysis

4.1. Overview of Pathways in the PAA

The drivers for this section are the significant issues(s), as these dictate the pathways that are relevant. The regional pathway framework is provided by the aquifers in the PAA (Figure 23). Three compartments are identified:

1. Locally Important Aquifer Bedrock which is Generally Moderately Productive (Lm)
2. Locally Important Aquifer Bedrock which is Moderately Productive only in Local Zones (LI)
3. Regionally Important Aquifer Karstified (conduit) (Rkc)

As a regionally important aquifer karst (conduit) was identified any karst features such as swallow holes, caves and springs were identified and highlighted for the PAA as a potential pathway (Figure 24). These features have the potential to directly input from surface waters to groundwater. Geological Survey Ireland have noted that features in Sligo are not well mapped, so this will be kept in mind when doing local catchment assessment work.

Using the well/poorly drained soils map the one compartment is further sub-divided into 8 sub-compartments (Figure 25, Table 4).

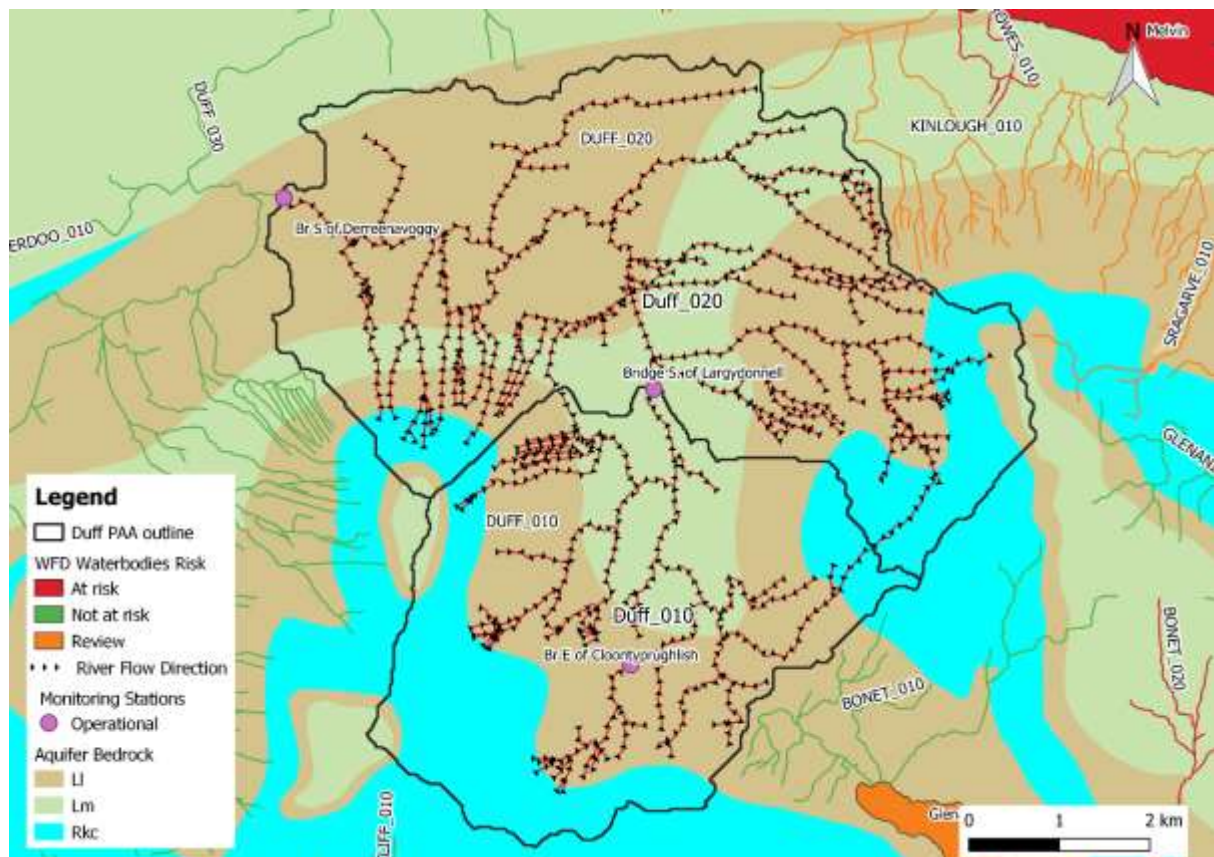


Figure 23 The aquifer bedrock for the Duff_010 and Duff_020 waterbodies.

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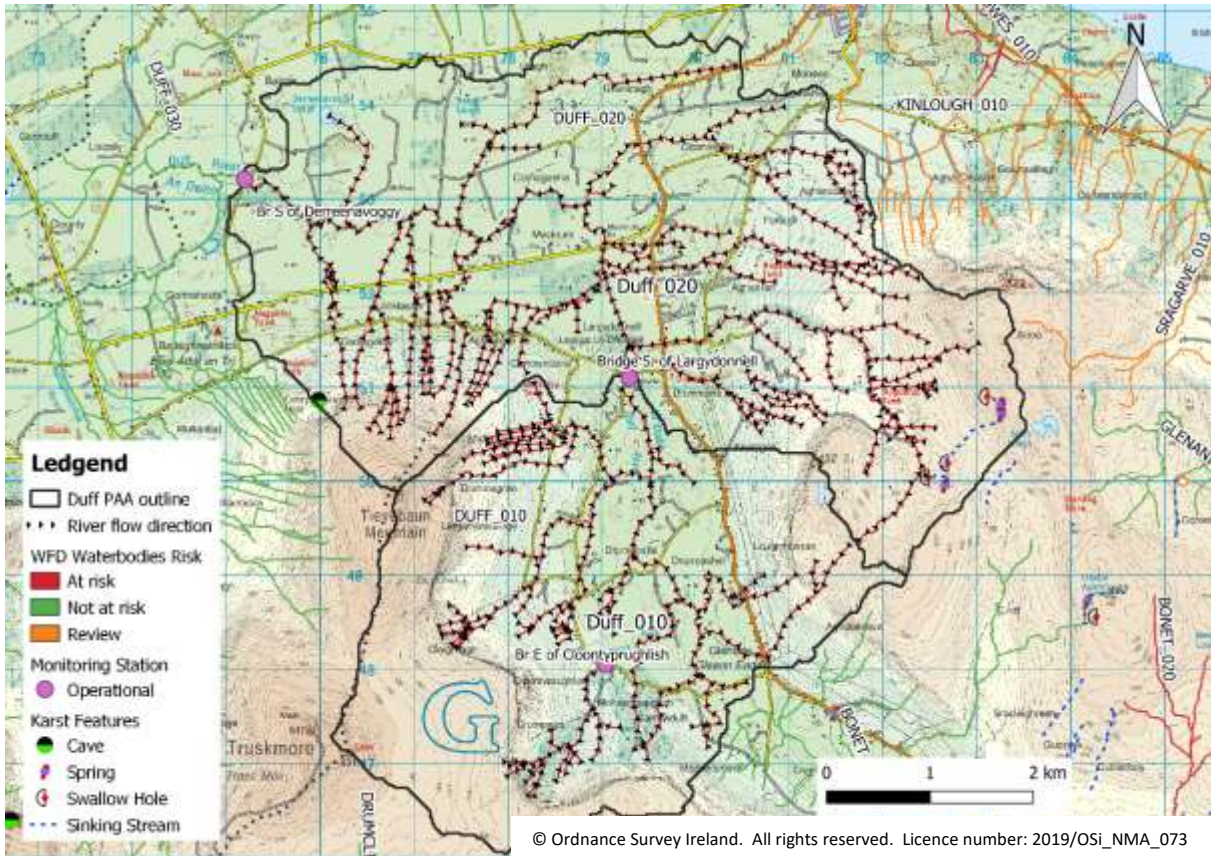


Figure 24 Karst features identified within the Duff_010 and Duff_020 waterbodies.

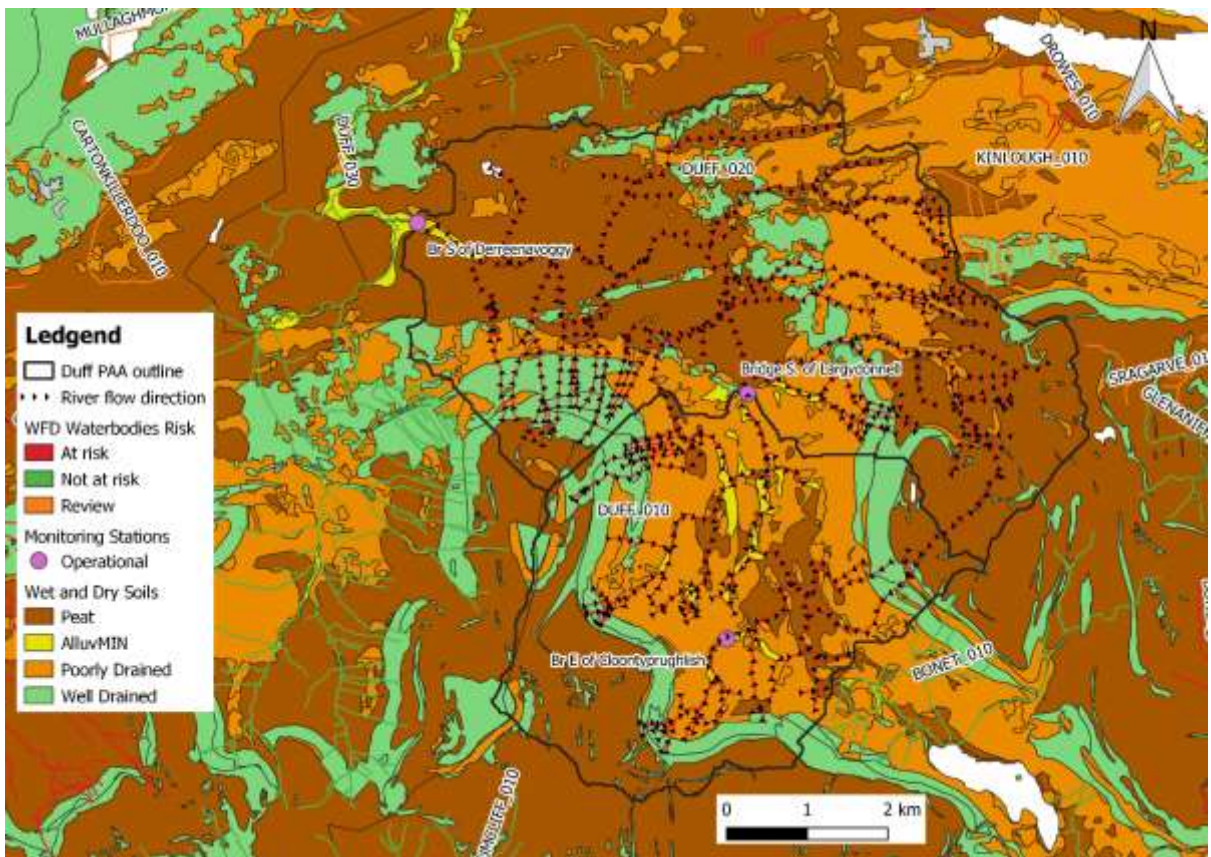


Figure 25 The wet and dry soils for the Duff_010 and Duff_020 waterbodies.

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Table 4 Conceptual model information for the pathways in the Duff_010 and Duff_020 waterbodies.

	Compartment 1			Compartment 2			Compartment 3	
Direct ¹	Drains			Drains			Drains	
Aquifer (Fig. 23)	Lm			LI			Rkc	
Rock Units	Dinantian Sandstone			Dinantian Shales and Limestones, Dinantian Upper Impure Limestone and Dinantian Mixed Sandstone, Shales and Limestone			Dinantian Pure Bedded Limestone	
	Sub-Comp. 1A	Sub-Comp. 1B	Sub-Comp. 1C	Sub-Comp. 2A	Sub-Comp. 2B	Sub-Comp. 2C	Sub-Comp. 3A	Sub-Comp. 3B
Soil type (Fig. 25)	Poorly drained	Well drained	Peat	Poorly drained	Well drained	Peat	Well drained	Peat
Subsoil	Till (diamictons)	Till (diamictons)	Cut over peat	Till (diamictons), Bedrock at surface	Till (diamictons), Scree, Bedrock at surface	Cut over peat, Blanket peat	Karstified limestone bedrock at surface	Blanket peat
Subsoil K	Low	N/A	Low	Low	Low	Low	N/A	N/A
Groundwater Vulnerability (Fig. 26)	M, L	X	E, M, L	X, E, H	X	H	E	E, H
PO ₄ Susceptibility (Fig. 27)	Mod - High	Low - Mod	Mod - High	Low - Mod	Low	Mod - High	Mod	Mod - High
NO ₃ Susceptibility (Fig. 28 & Fig 29)	Mod	Mod	Mod	Low	Mod	Low	Low	Low
PO ₄ PIP (Fig. 9 & Fig. 12)	High – V High	Low	High – V High	Low - Mod	Low	Mod - High	Low	High
NO ₃ PIP (Fig. 10, Fig. 11, Fig. 13 & Fig. 14)	Low	Mod - High	Low	Low	Mod	Low	High	Mod
Main Flow Paths	Overland, near surface flow and land drains	Near surface and groundwater flow	Overland, near surface, groundwater flow and land drains	Overland, near surface and groundwater flow and land drains	Near surface and groundwater flow	Surface, near surface flow and land drains	Surface water - groundwater interactions (Karst Features)	Surface water - groundwater interactions (Karst Features) and land drains

¹ Point discharges to the water body

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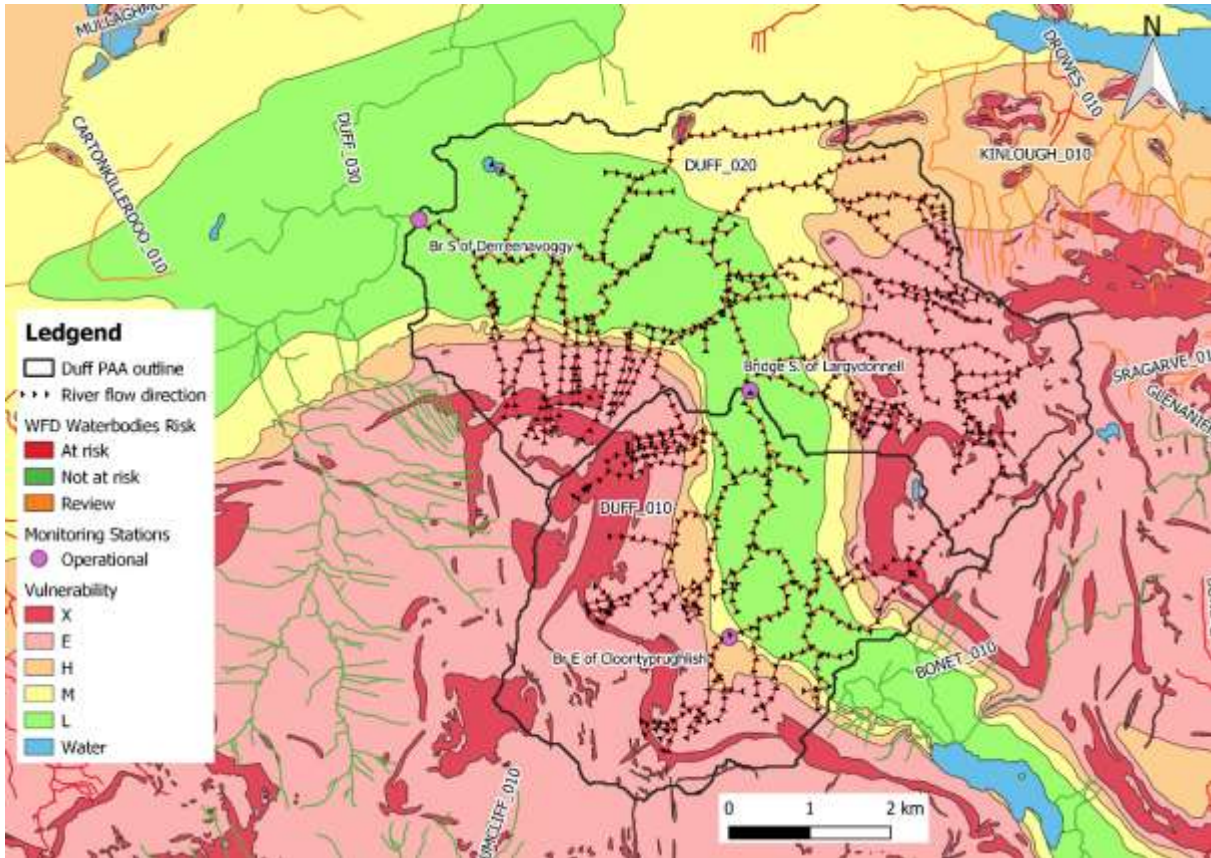


Figure 26 The groundwater vulnerability map for the Duff_010 and Duff_020 waterbodies.



Figure 27 The near surface PO₄ susceptibility map for the Duff_010 and Duff_020 waterbodies.

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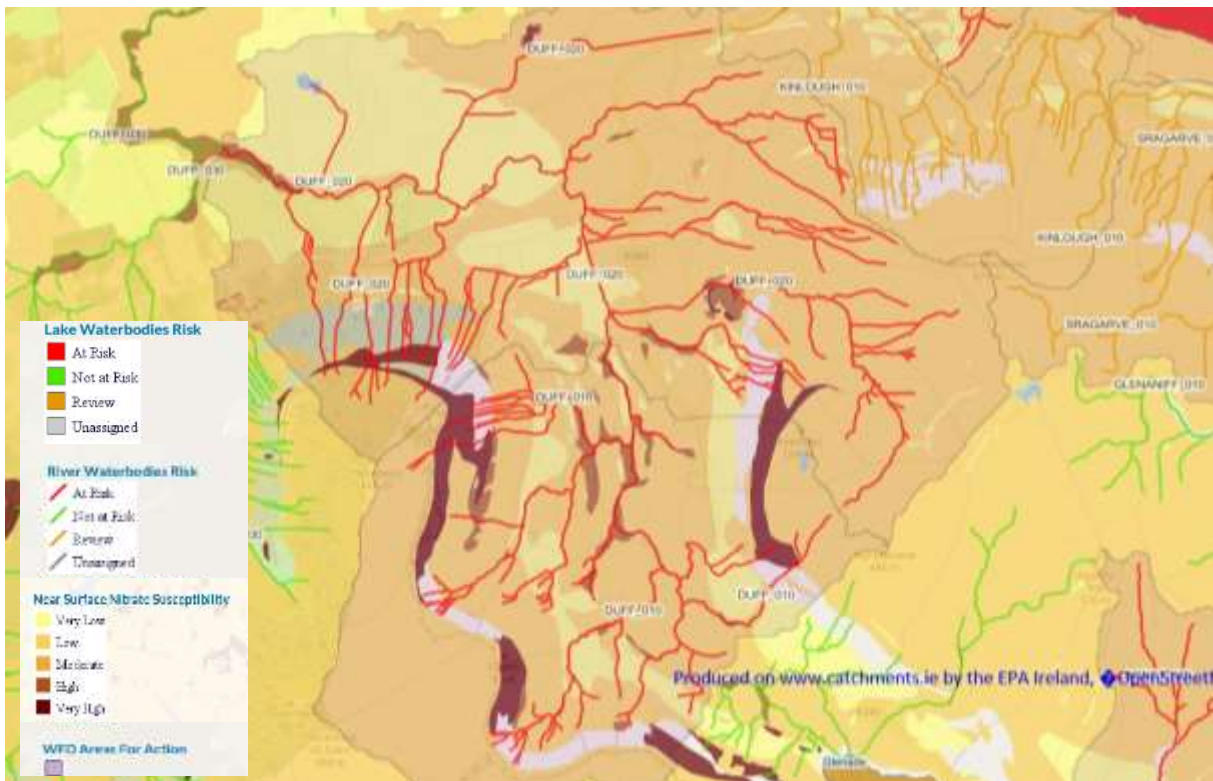


Figure 28 The near surface NO₃ susceptibility map for the Duff_010 and Duff_020 waterbodies.

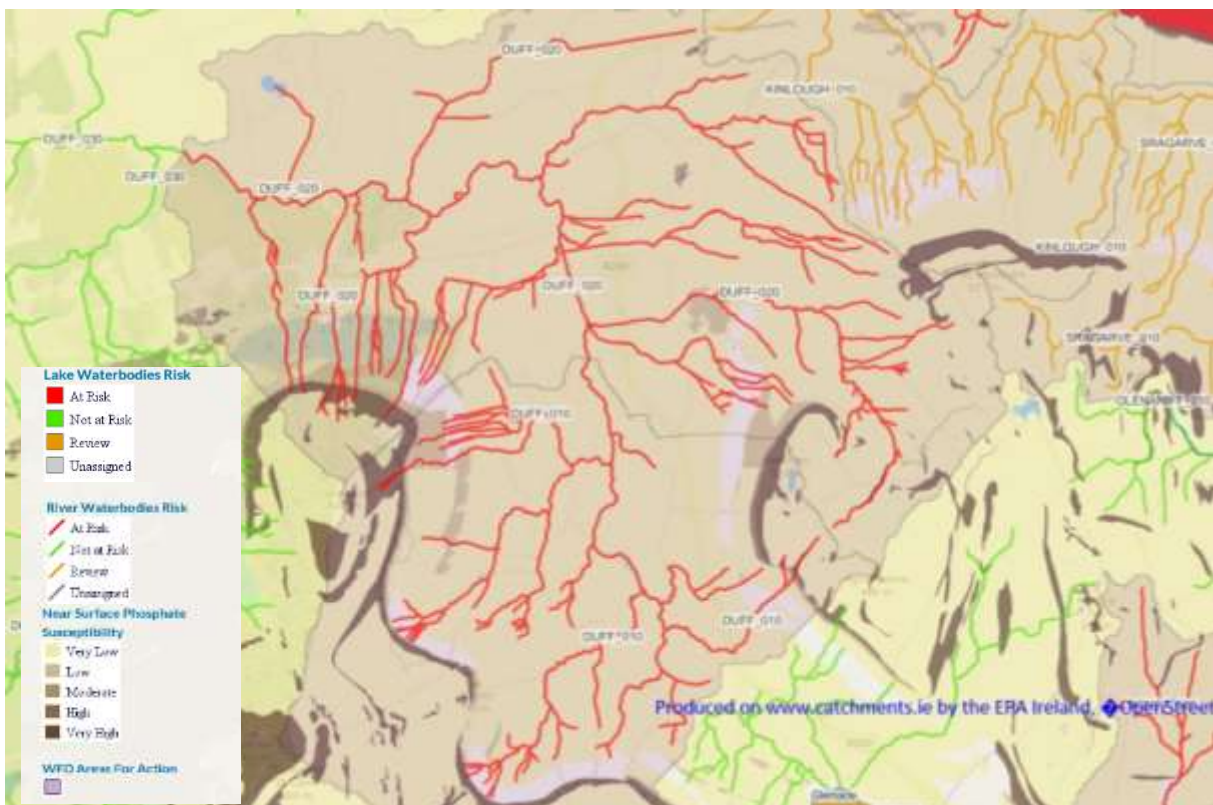


Figure 29 The sub-surface NO₃ susceptibility map for the Duff_010 and Duff_020 waterbodies.

5. Interim 'Story' of the Priority Area for Action

The desk study for the Duff PAA has identified both agriculture and peat extraction to be the potential significant pressures. Ecological Status is currently Good in the Duff_010 and Duff_020 waterbodies and increases to High Ecological Status in the Duff_030 waterbody. The main pathways identified for the Duff PAA were overland flow, near surface flow and land drains in the poorly drained and peaty soils, while in the well-drained soils the main pathways were near surface and ground water flow. Karst features were identified in the Duff_020 in both well-drained and peaty soils indicating predominantly ground water interactions in those areas. As no chemistry data were available for the outflow monitoring stations for both the Duff_010 and Duff_020, the significant issue was not identified. However, from the initial characterisation for the Duff_020, both nutrients and sediment have been identified as being the potential issue for this waterbody. The latest Q-Value monitoring programme for the Duff_010 has seen an increase at both monitoring stations (St. 50020 and St. 50100) from a Q4 to a Q4-5 in 2018 and 2019 respectively. The latest Q-Value in the Duff_020 waterbody also came up to a Q4-5 in 2018.

5.1. Duff_010 waterbody

Risk category: *At Risk*

Status: Good. The latest Q data (2018) at St. 50020 classifies the headwaters of the Duff_010 waterbody as High (Q4-5), with the most recent Q data for St. 50100 at the outflow of the waterbody also coming up to a Q4-5 in 2019.

Status Objective: High

Hydrochemistry summary: Upper most St. 50020 (2017): NH₃ 0.017 mg/l, PO₄ 0.005 mg/l, TON 0.100 mg/l. There is no chemistry data available for St 50100 located at the outflow of the Duff_010 waterbody.

Baseline Concentration: St. 50020: NH₃ 0.014 mg/l, PO₄ 0.005 mg/l, TON 0.100 mg/l. No chemistry for St. 50100

RHAT Score: 0.921875

Significant issue: Upper most St. 50020: no issues identified. The Q-value is driving the status at the lowermost monitoring station St. 50100.

Significant pressure: Agriculture (Pasture)

Relevant pathways: Areas of overland, near surface and groundwater flow, with land drains also identified as a potential pathway for this waterbody.

5.2. Duff_020 waterbody

Risk category: *At Risk*

Status: Good. The latest Q data (2018) at St. 50250 shows an improvement in the Q-Value at the outflow of this waterbody with the Q coming up to a Q4-5 at St. 50250 in 2018.

Status Objective: High

Hydrochemistry summary: The significant issues for this waterbody are not determined as no chemistry data is available for the monitoring station (St. 50250) located at the outflow of the Duff_020 waterbody. However, the characterisation information for this waterbody has highlighted nutrients and sediment as a significant issue. The PIP and P susceptibility maps indicate PO₄ to be an issue mainly along areas surrounding the river channel. However, overall PO₄ only appears to be a moderate issue for the Duff_020 waterbody. In regard to, the NO₃ PIP and susceptibility maps, nitrogen does not appear to be a significant issue for this waterbody, with the exception of a small area in the lower south-western section of the waterbody, which is susceptible to groundwater flow.

Baseline Concentration: Non determined

RHAT Score: Non determined

Significant Issue: Based on the characterisation information nutrients and sediment

Significant pressure: Agriculture (Pasture) Extractive Industry (Peat)

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Relevant pathways: Areas of overland and near surface flow paths with a small area of predominantly groundwater (Karst) flow located in the south-west of the waterbody.

The environmental objective date for all the waterbodies in the Duff sub-catchment is high status by 2021.

6. Communications Plan

A community information meeting will be held in Cliffoney Hall, Cliffoney, Co. Sligo, F91 DP71 on Monday the 24 Jun from 7–9pm.

The key message in this PAA is that the Duff_10 and Duff_20 waterbodies have a High Status objective.

Review the finding of the desktop with Leitrim and Sligo County Council and any other interested organisation for their input and knowledge of the sub-catchment. Discuss with Leitrim and Sligo County Council on whether they have any additional information for the Duff River, particularly in relation to the two monitoring stations at the outflow of the Duff_010 (St. 50100) and Duff_020 (St. 50250) waterbodies.

Communicate and review the desk study findings and the planned local catchment assessment work with the Local Authority Waters Programme Blue Dot Coordinator due to the High Status objective of both the Duff_010 and Duff_020 waterbodies.

7. Work Plan

7.1. Further Characterisation Action Assigned

Duff_010:

- **IA8:** “Local catchment assessment needed, with the focus of the assessments on agriculture, forestry and peat between the two monitoring stations.”

Duff_020:

IA8: “Local catchment assessment needed, and as there is agriculture and peat in the area, the assessment should focus on nutrients and sediment.”

7.2. Further Information Required

- Discuss with Leitrim and Sligo County Council on any additional information available for the waterbodies, particularly in relation to the two monitoring stations at the outflow of the Duff_010 (St. 50100) and Duff_020 (St. 50250) waterbodies.
- Review the findings of the desktop with ASSAP.
- Review the findings with the Forest Service, if forestry pressures are suspected during local catchment assessment work.
- Drinking water supply, what scheme does it serve.

7.3. Local Catchment Assessment

7.3.1. Duff_010

The Duff_010 has dropped down to Good Ecological Status in the 2010-2015 monitoring round, this is stemming from the Q data (Q4) obtained at the monitoring station (St. 50100) at the outflow of the waterbody. The Q data at the monitoring station (St. 50020) in the headwaters of the Duff_010 waterbody is indicating high ecological status (Q4-5). This can thus narrow down the focus area to between these monitoring points.

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This desk study has identified PO₄ to be an issue for this waterbody, with high PIP areas mainly concentrated to the river channel along the centre of the waterbody. This should therefore, become one of the focus areas when carrying out the LCA walks. In addition, as diffuse agriculture has been identified as the main pressure PO₄ issues related to diffuse practices should become the focus point.

The EPA have outlined their planned monitoring for the Duff_010 for the next three years on the Eden App which is summarised in Table 5.

Table 5 Planned EPA monitoring for the Duff_010 (2019 – 2021).

	Br E of Cloontyprughlish (St. 50020)			Bridge S of Largedonnel (St. 50100)		
	2019	2020	2021	2019	2020	2021
Chemical Surface Water Status	0	0	0	0	0	0
Fish Status or Potential	0	0	0	0	0	0
General Conditions	5	5	5	0	0	0
Hydromorphological Conditions	0	0	0	0	0	0
Invertebrate Status or Potential (AWIC)	0	0	0	0	0	0
Invertebrate Status or Potential (Q-Value)	0	0	1	0	0	1
Macrophyte Status or Potential	0	0	0	0	0	0
Phytobenthos Status or Potential	0	0	0	0	0	0
Specific Pollutant Conditions	0	0	0	0	0	0

7.3.2. Duff_020

The Duff_020 has come up to Good Ecological Status in the 2010 -2015 monitoring round, this is stemming from the Q data (Q4) obtained in 2015 at the monitoring station (St. 50250) at the outflow of the waterbody. The most recent Q data (Q4-5, 2018) at this site would indicate that the Duff_020 has potentially increased back to High Ecological Status.

From this desk study PO₄ has been identified as the main issue for this waterbody, with the high PIP areas concentrated to both the east and south-west of the waterbody mainly following the main river channels. The main pathways within these high PO₄ PIP areas are surface, near surface and groundwater flow. It is important to note that within the eastern section where high PO₄ PIP has been highlighted, there are a number of swallow holes and springs. The area where high PO₄ PIP has been identified should be focused on particularly in relation to diffuse agricultural and extractive (peat) industries which are identified as the significant pressure. Regarding the swallow holes and springs identified in the waterbody, GSI has noted that pathways from these sources may not be solely linked to the area within the PAA. If these features are identified during the LCA walk as being potential pressures, further discussion with GSI on the potential source and pathway will be required.

Regarding NO₃ there is a small area of high NO₃ PIP located in the south-west of the waterbody. This high NO₃ area is linked with near-surface and groundwater flow paths.

Further information which this desk study has identified from the aerial photography, is an area of intensive peat extraction in the north-west of the waterbody near the monitoring station (St. 50250). This area in the desk study is associated with high PO₄ which follow a surface and near surface flow path. As its proximity is relatively close to the monitoring station impacts from this area may be having a direct result on the macroinvertebrate species. Local Catchment Assessments including catchment walk and SSIS/RA visual assessment above and below this area will be carried out to determine impact.

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Furthermore, the EPA have outlined their planned monitoring for the Duff_020 for the next three years on the Eden App which is summarised in Table 6.

Table 6 Planned EPA monitoring for the Duff_020 (2019 – 2021).

	Br S of Derreenavoggy (St. 50250)		
	2019	2020	2021
Chemical Surface Water Status	0	0	0
Fish Status or Potential	0	0	0
General Conditions	0	0	0
Hydromorphological Conditions	0	0	0
Invertebrate Status or Potential (AWIC)	0	0	0
Invertebrate Status or Potential (Q-Value)	0	0	1
Macrophyte Status or Potential	0	0	0
Phytobenthos Status or Potential	0	0	0
Specific Pollutant Conditions	0	0	0

8. Review of Mitigation Options

- Overland mitigation options need to be considered when looking at pathway interception options for this PAA.
- In areas where Karst have been identified in the Duff_020 waterbody any pollution pathways identified will need to regard sub-surface and groundwater flow mitigation measures.
- As this is a High Status waterbody it is important to remember that even small pressures can have an impact on the status of the waterbody.

Date of Completion of Desk Study: 25/11/2019

Work Plan Summary:

1. Ask Leitrim and Sligo Co. Co. if there is any additional investigative-chemical data available for the three monitoring stations (St. 50020, St. 50100 and St. 50250) on the Duff River.
2. Review general chemistry results as they become available from Station 50020 which is on the EPA 2019-2021 monitoring programme.
3. Currently an increase in the Q value obtained at St. 50250 in the Duff_020 indicates that the waterbody is back to High Ecological Status (Q4-5), IA8 High Status catchment walk required to determine the reason for deterioration and to identify measures which may be required to prevent further deterioration.
4. The latest Q data for the Duff_010 has indicated that there is potentially no change in status (Good Ecological Status). The area which needs to be focused on has been narrowed down to the area between the two monitoring stations as the upper monitoring station (St. 50020) has retained its High Ecological Status (Q4-5, 2018). Local catchment assessment needed, with the focus on the assessment on agriculture, forestry and peat will be carried out between the two monitoring stations.
 - Carry out an SSIS, Rapid Assessments, visual assessments and portable instream measurements (DO, pH and conductivity) at the locations marked on the map (Figure 34, Appendix C), this may potentially rule out some of the inflowing tributaries on the main Duff River channel.
 - Determine if chemistry samples are required at St. 50100 or on impacted or indeterminate streams.
 - Where inflowing streams have been identified as impacted, walk back up the stream channel to identify any pressures. It is important to keep in mind the PO₄ PIP maps to narrow down these stream walks.
 - Important to keep in mind vulnerable groundwater areas where there may be interaction between ground and surface water, GIS have highlighted that karst features in Sligo are poorly mapped so keep this in mind when carrying out LCA.
 - Refer any pressures related to agriculture from the stream walks to the local ASSAP advisor. Consult with Landowners/Forest Service for extractive industry and forestry pressures,
 - A map of initial survey points is included below (Figure 34, Appendix C)
 - Review work plan at the end of each LCA day to determine if certain areas can be ruled out.
 - Prepare area for action report.

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Appendix A

Additional information regarding SACs and SPAs have been outlined for the Duff PAA and are shown in Figure 30 and Figure 31.

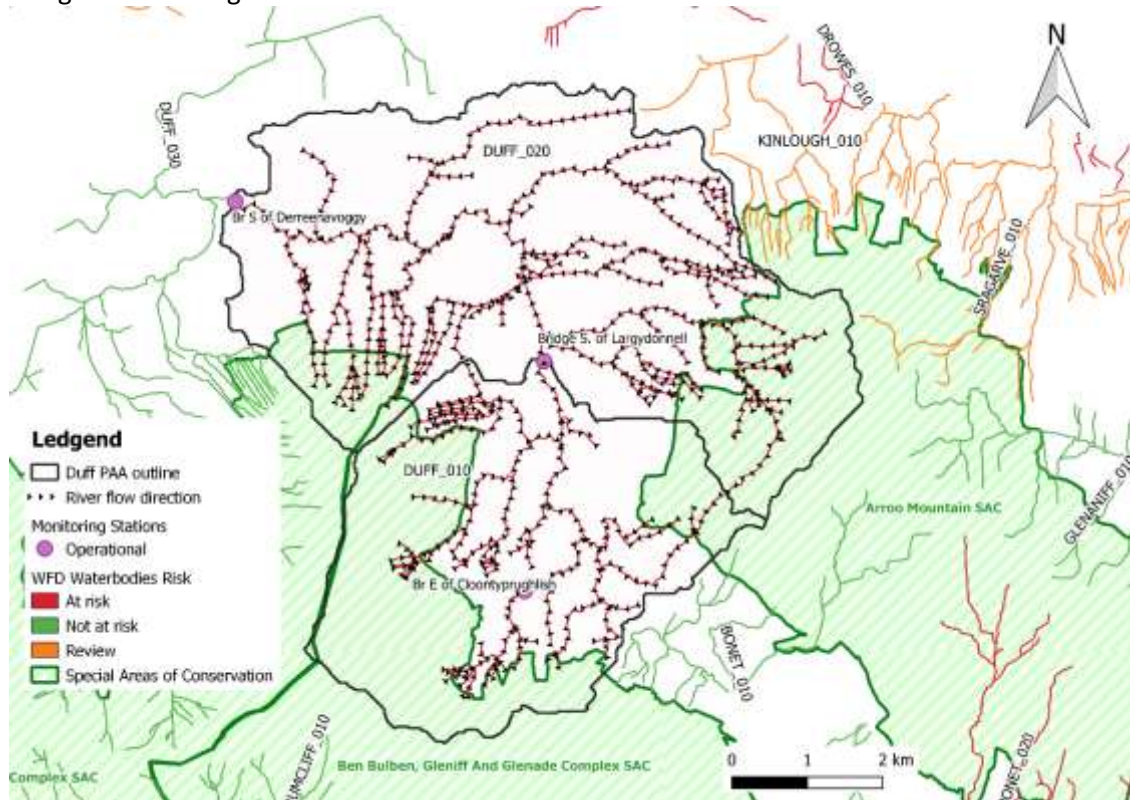


Figure 30 Special Areas of Conservation for the Duff PAA.

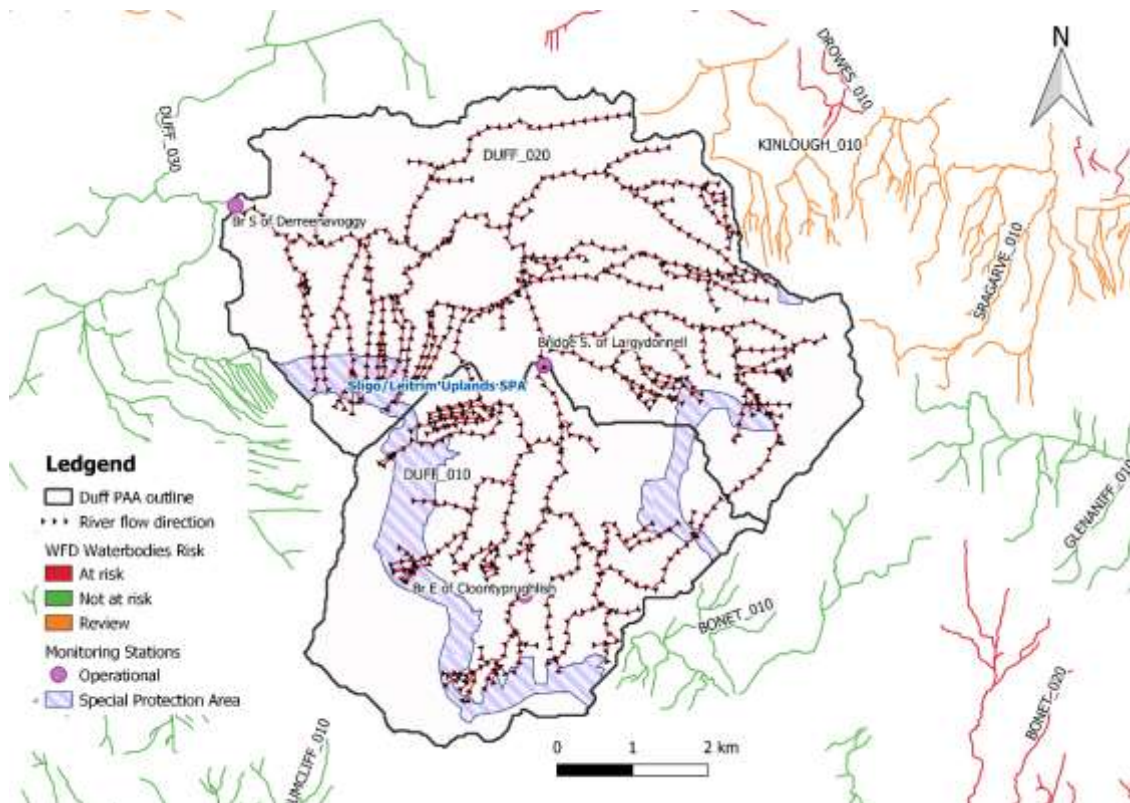


Figure 31 Special Protection Areas for the Duff PAA.

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Appendix B

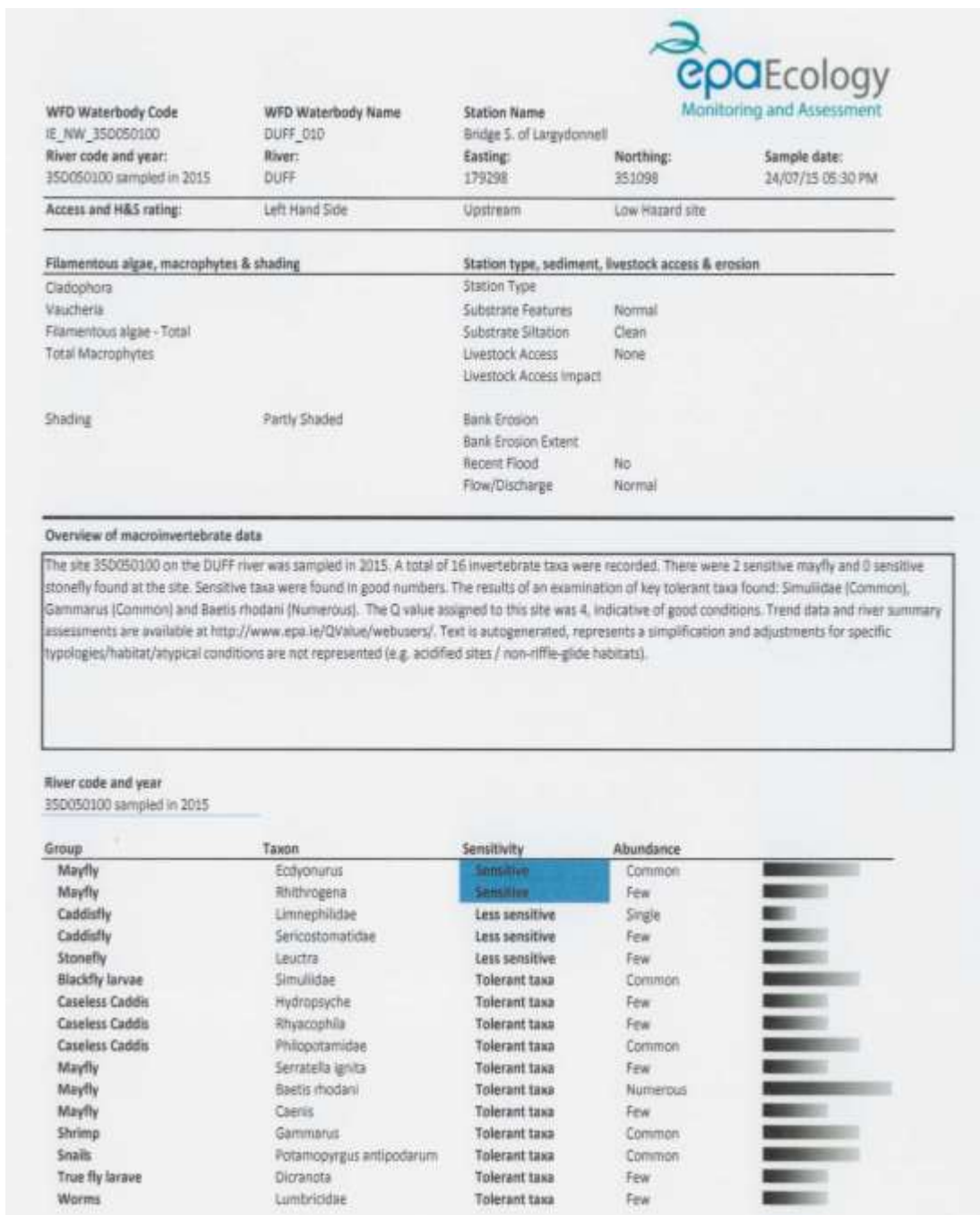


Figure 32 The 2015 EPA biologist report for the Duff_010.

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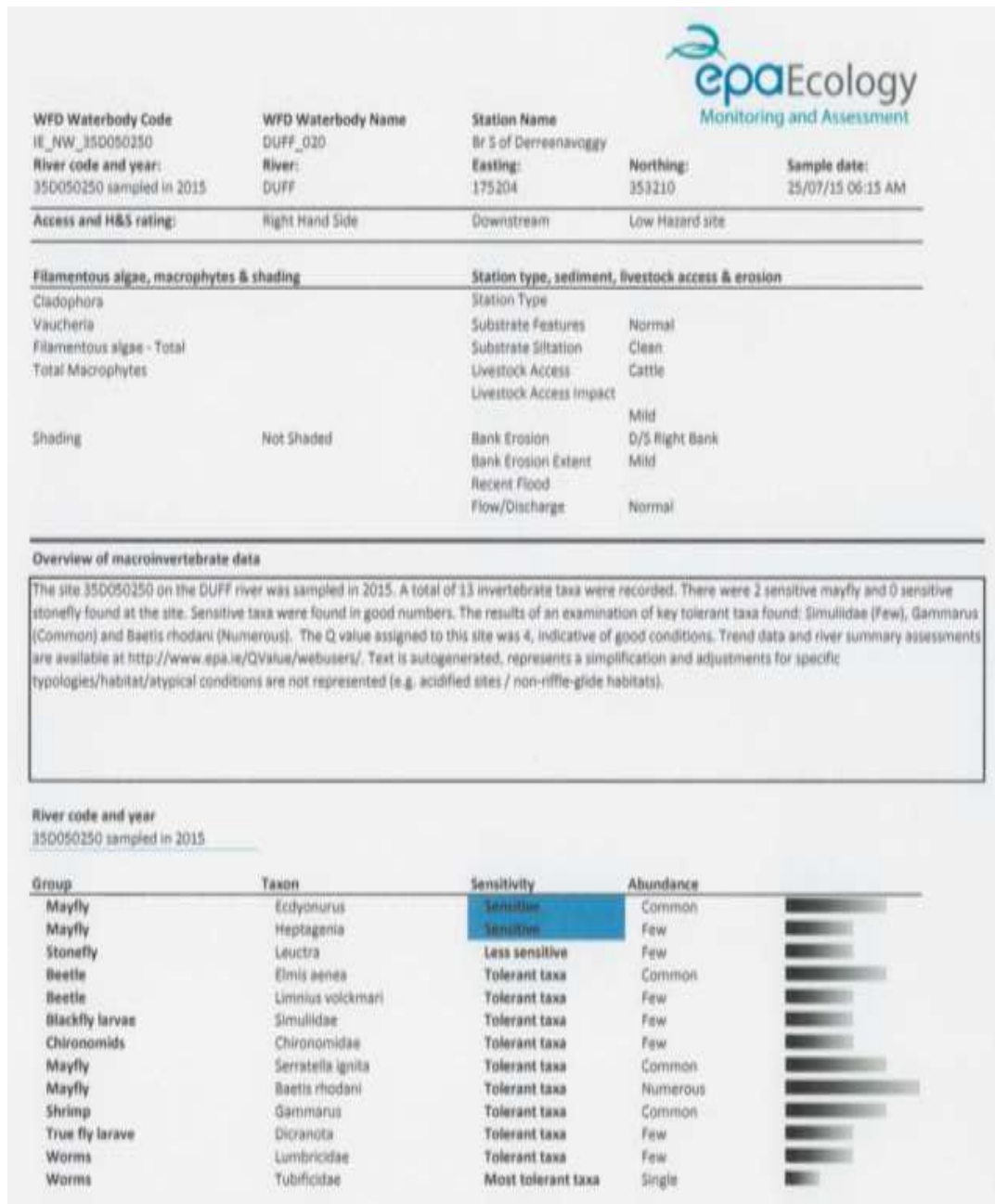


Figure 33 The 2015 EPA biologist report for the Duff_020.

Appendix C

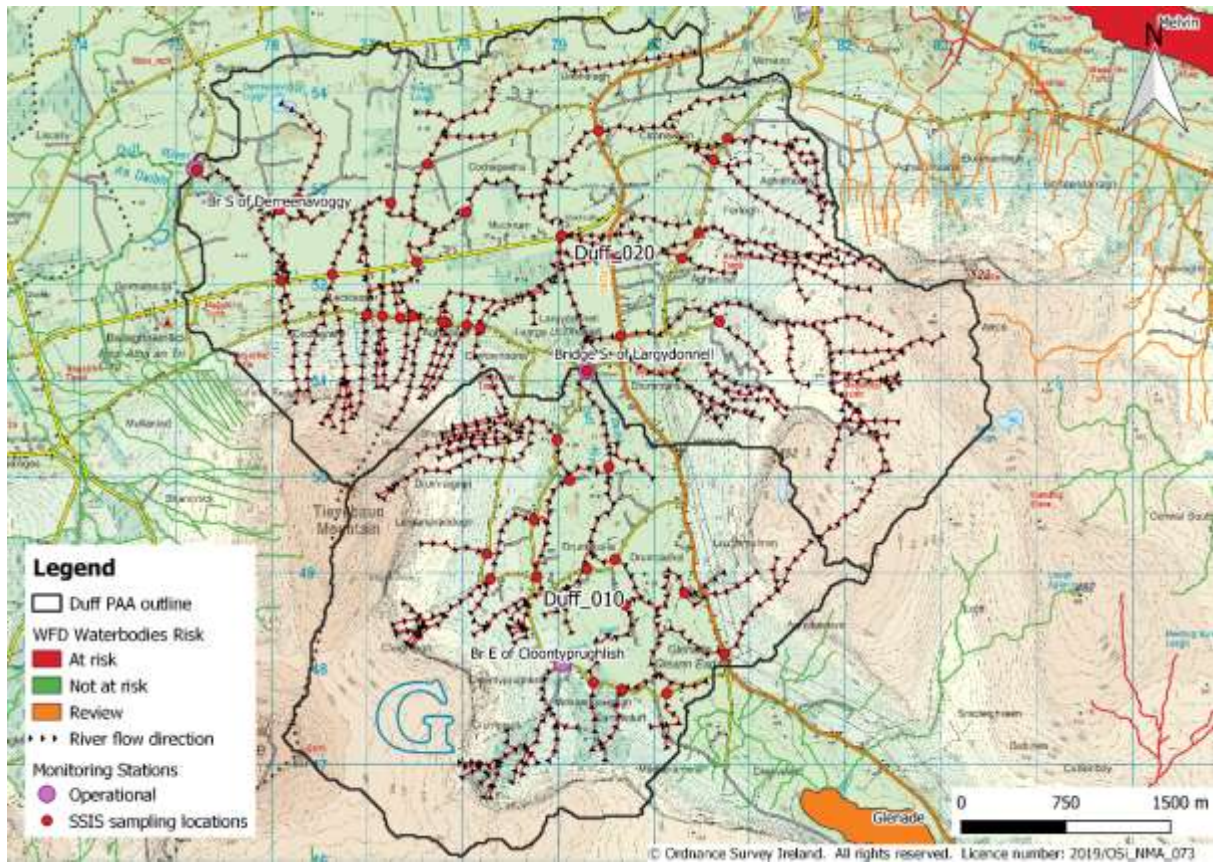


Figure 34 Initial sampling locations for SSIS analysis in the Duff PAA.