

Nadreegeel Priority Area for Action AFA0137 Desk Study Report

LAWPRO (Border Region)
Version F01



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1. Background

There are two rivers (Nadreegeel Lough Stream_010 and Nadreegeel Lough Stream_020) and one lake waterbody (Nadreegeel Loughs or Lacken Lakes) within the Nadreegeel sub-catchment. Only the Nadreegeel Lough Stream_020 and Nadreegeel Loughs are included in the Nadreegeel PAA as they are currently *At Risk* due to their less than Good Ecological Status. The headwaters of Nadreegeel Lough Stream_010 are in the north of the sub-catchment, with the waterbody comprising of several channels with surface waters flowing and converging to form Nadreegeel Lough Stream_010 main channel. Surface waters in turn flow into Nadreegeel Lough Stream_020. This waterbody comprises of several tributaries, including one which flows from the north-western boundary into the northern banks of Nadreegeel Loughs. Surface waters flow easterly, out of Nadreegeel Loughs from the south eastern side and continue to flow easterly, discharging into the middle reaches of Nadreegeel Lough Stream_020 main channel. Surface waters flow south easterly from the main channel into Blackwater (Kells_080 main channel, and then into the northern banks of Ramor (Lough).

Of the three waterbodies within the sub-catchment, one waterbody, the Nadreegeel Lough Stream_010 was classed at Good Ecological Status, the Nadreegeel Lough Stream_020 was classed as Moderate Ecological Status and Nadreegeel Loughs was classed as Poor Ecological Status in the 2013-2015 cycle.

Land cover in the Nadreegeel Lough Stream_020 is predominantly natural grassland with some arable land present in the north-east. Furthermore, there are some small areas of peat present in the north-east of the Nadreegeel Lough Stream_020 waterbody. The lower section of the Nadreegeel Lough Stream_020 flows into the town of Virginia. The Lake (Nadreegeel Loughs) is used for drinking water abstraction for the Billis and Lavey GWS. Nadreegeel Lough is also the water supply source for the Ballyjamesduff Regional Water Supply Scheme.

Reason why the area for action was chosen:

- The Cavan/Monaghan lakes scenario project.
- Headwaters to Nadreegeel Lough.
- Potential 'quick win'.
- Building on existing work completed by Cavan County Council.
- Will provide insight into question regarding river monitoring stations downstream of failing lakes.
- A group water scheme here abstracts immediately upstream.
- Public Water Abstraction.
- One deteriorated waterbody.

The Nadreegeel Lakes or otherwise known as Lacken Lakes cover an area of approximately 100 hectares, with depths to 6 meters. The two lakes are separated by a heavily reeded channel. Fishing in the lakes is quite popular with the lakes holding good stocks of pike, roach, rudd, hybrids and perch.

Conclusion from the initial characterisation has identified agriculture to contribute to the pressures within the Nadreegeel Lough Stream_020 and Nadreegeel Loughs waterbodies. An additional pressure identified for the Nadreegeel Lough Stream_020 includes domestic wastewater discharge.

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

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Nadreegeel Lough Stream_020:

- *“Start with visual assessment at monitoring station. Note enrichment and/or sedimentation and, if possible, determine which is driving status. Walk upstream of the RWB. Note point (drains, discharge pipes, septic tanks, farmyards) and diffuse (insufficient buffer zones) sources of nutrients and sediment. Collect field parameters (DO, pH, conductivity and temperature). Use results to guide the selection of water quality and SSRS in order to identify critical source areas for sediment.”*

Nadreegeel Lough:

- *“Walk along the lake shore and inputting tributaries. Identify point (drains, discharge pipes, farmyards, cattle access) and diffuse (inadequate buffer strips) sources of nutrients. Collect field parameters (DO, pH, temperature and conductivity). Use results to guide the selection of water quality and SSRS in order to identify critical source areas for nutrients.”*
- *“Walk along the lake shore and inputting tributaries. Identify point (drains, discharge pipes, farmyards, cattle access) and diffuse (inadequate buffer strips) sources of nutrients. Collect field parameters (DO, pH, temperature and conductivity). Use results to guide the selection of water quality and SSRS in order to identify critical source areas for nutrients.”*

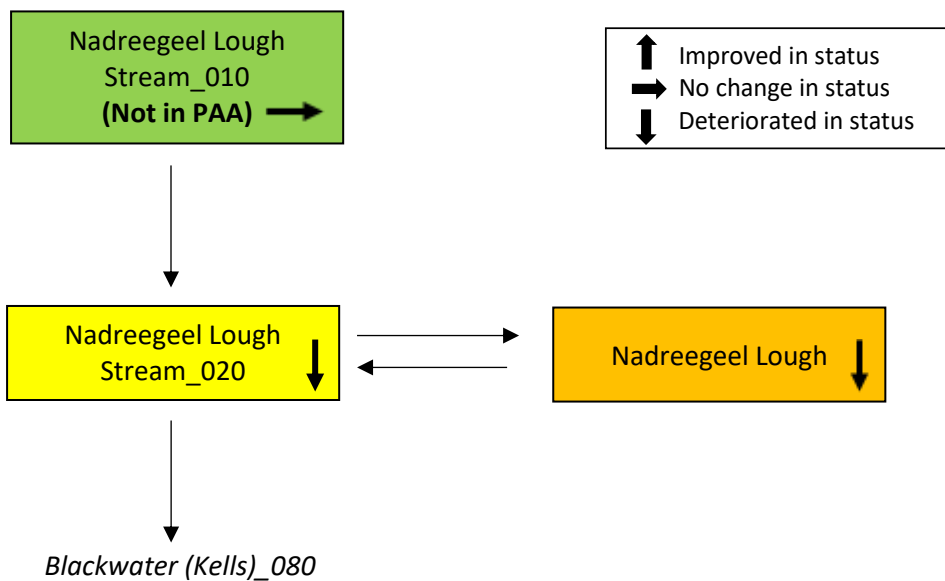


Figure 1 Flow direction of the waterbodies within the Nadreegeel PAA.

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Table 1 Summary of waterbodies within the Nadreegeel PAA.

WB Code	WB Name	WFD Risk	Status Objective	WFD Status				Bio 18	Pressure Category	Pressure Subcat.	Impact	Sig. Pressure	AA
				07-09	10-12	10-15	13-18						
IE_EA_07N010100	Nadreegeel Lough Stream_010	Not At Risk	Good (2021)	M	G	G	G	4					N
IE_EA_07N010500	Nadreegeel Lough Stream_020	At Risk	Good (2021)	G	G	M	P	Billis Br Q 4 (2006) Br nr Cranadillon Q 3	Agriculture, Domestic Waste Water	Pasture, Waste Water Discharge	Nutrient Pollution Nutrient and Organic Pollution	Y	Y
IE_EA_07_273	Nadreegeel Lough	At Risk	Good (2027)	M	M	P	M		Agriculture	Agriculture	Nutrient Pollution	Y	Y

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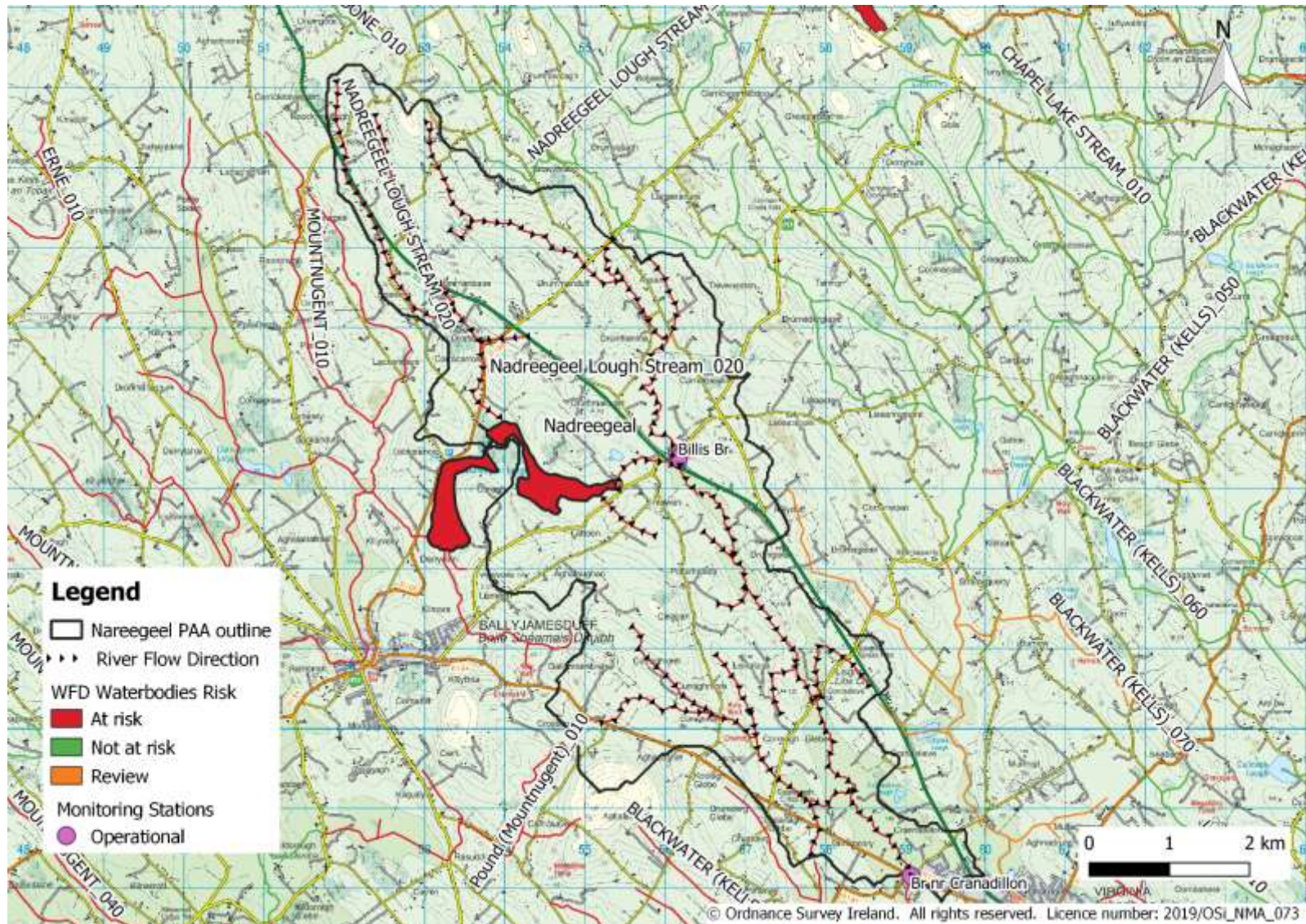


Figure 2 Monitoring stations located within the Nadreegeel PAA.

2. Receptor Information and Assessment

There are two waterbodies in the Nadreegeel sub-catchment which are a PAA and have been identified as *At Risk* based on the reporting period 2010-2015. These include the Nadreegeel Lough Stream_020 and the Nadreegeel Lough. The biological status for the Nadreegeel Lough Stream_020 waterbody based on the latest Q-value assessment (2015), categorises the waterbody as Moderate Ecological Status (Table 2). Monitoring data for Nadreegeel Lough will be identified in Table 3.

The monitoring stations within the Nadreegeel Lough Stream_020 waterbody, labelled in Table 2 will be identified as follows:

- Billis Br: St. 10200
- Br nr Crandillon: St. 10500

Table 2 Receptor information for the Nadreegeel Lough Stream_020 waterbody.

Waterbody		IE_EA_07N010500 Nadreegeel Lough Stream_020		
Risk Category		At Risk		
Monitoring station		<i>Billis Br</i>	<i>Br nr Cranadillon</i>	
Monitoring station type		<i>Operational</i>	<i>Operational</i>	
Biological Status			Poor	
Q values	2009	-	Q4	
	2010	-	-	
	2011	-	-	
	2012	-	Q4	
	2013	-	-	
	2014	-	-	
	2015	-	Q3-4	
	2016	-	-	
	2017	-	-	
	2018	-	Q3	
Water chemistry				
Monitoring station		<i>Billis Br</i>	<i>Br nr Cranadillon</i>	
PO ₄ ⁺	2010	0.016	0.017	
	2011	0.026	0.020	
	2012	0.019	0.032	
	2013	0.019	0.025	
	2014	0.019	0.024	
	2015	0.017	0.010	
	Ecological Threshold 0.035 mg P/L	2016	0.032	-
		2017	0.036	-
2018		0.024	-	
Baseline PO ₄		0.031	-	
NH ₄ ⁺	2010	0.040	0.033	
	2011	0.068	0.031	
	2012	0.030	0.083	
	2013	0.052	0.051	

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	2014	0.051	0.040
	2015	0.022	0.017
Ecological Threshold 0.065 mg N/L	2016	0.054	-
	2017	0.042	-
	2018	0.114	-
Baseline NH ₄		0.070	-
NO ₃ ⁻	2010	0.2	0.6
	2011	0.3	0.7
	2012	0.2	0.5
	2013	0.2	0.5
	2014	0.3	0.6
	2015	0.4	0.6
Ecological Threshold 3.5 mgN/L	2016	0.6	-
	2017	0.4	-
	2018	0.5	-
Baseline NO ₃		0.5	-
Supporting Conditions	Chemical	N/A	N/A
	Oxygenation	<i>BOD frequently exceeds the EQS of 1.5 mg/l, fluctuating between 0.5 mg/l to 4 mg/l since 2010</i>	<i>BOD <1.5 mg/l since 2016, prior to this BOD frequently exceeded the EQS of 1.5 mg/l</i>
	Acidification	N/A	N/A
HYMO	RHAT Score	N/A	
	Evidence of arterial drainage	N/A	
Comments			
Conceptual model required (Y/N)		Yes	
Ecological Status (2010-2015)		Moderate	
EPA Biologist comments			<i>The bridge near Cranadillon (St. 10500) had declined from Moderate to Poor ecological condition due to the absence of sensitive macroinvertebrate taxa</i>
Significant issue: monitoring point		<i>ortho P was above its respective EQS in 2017, while Ammonia exceeded its EQS in 2018. It is important to note this did not cause the baseline concentrations for 2016 – 2018, to exceed their respective EQS limit.</i>	<i>Biological parameters appear to be driving status as all available chemical data is below their respective EQS, with the exception of Ammonia in 2012.</i>
Significant issue: Waterbody		PO₄, NH₃ and Sediment	Not determined but the IA for the waterbody has indicated that sediment may be an issue
WFD Objective		2021	

2.1. Nadreegeel Lough Stream_020

2.1.1. Monitoring Station – Billis Br. (St. 10200)

The monitoring St. 10200 is an Operational Monitoring station located approximately 1 km downstream of Nadreegeel Loughs outflow (Figure 2).

Data summary:

- Biological monitoring at this site has not occurred since 2006 which categorised the river at the time at this monitoring station as Good Ecological Status (Q4).
- The parameters measured at this monitoring station are NH₃, PO₄ and TON.
- Current trend for NH₃, PO₄ and TON at this station are trending upwards. However, none of the annual averages have breached their EQS, with the exception of PO₄ in 2017 and NH₃ in 2011 and 2018 (Table 2, Figure 3, Figure 4).
- When looking at the temporal data for PO₄ and NH₃ these breaches were not a once off occurrence, there are many spikes in temporal data for NH₃ and in particular PO₄ (Table 2, Figure 3, Figure 4).
- BOD frequently exceeds the EQS of 1.5 mg/l, fluctuating between 0.5 mg/l to 4 mg/l since 2010 (Table 2, Figure 6)

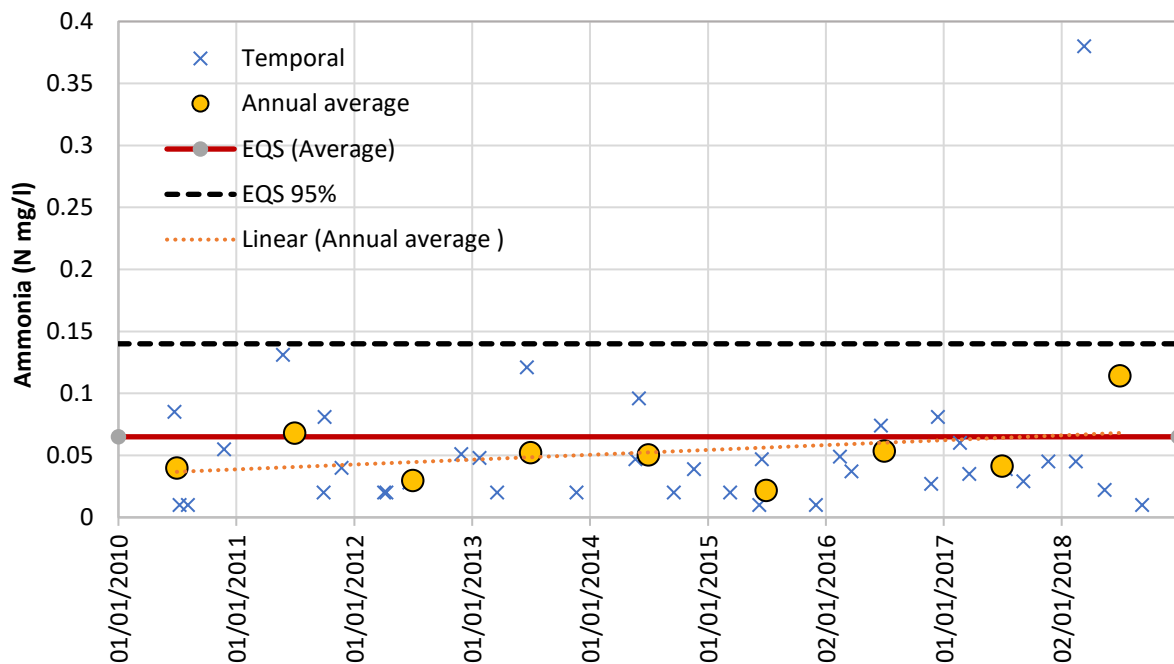


Figure 3 Ammonia (as N mg/l) trend chart for monitoring St. 10200 (2010 – 2018).

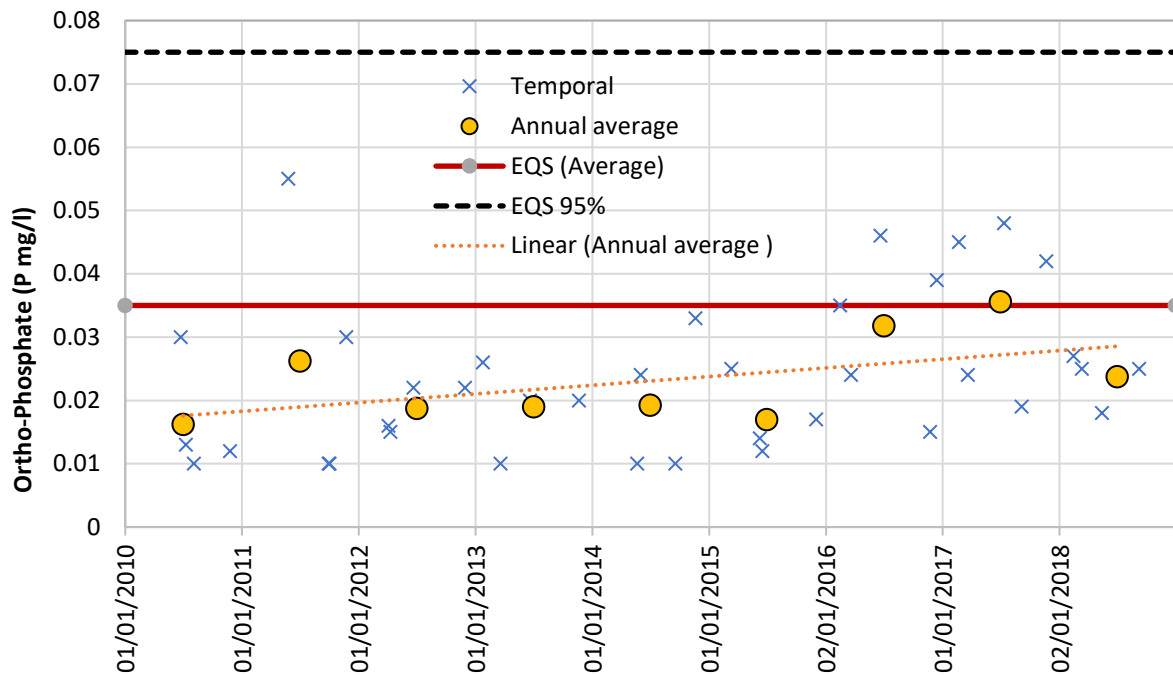


Figure 4 Ortho-Phosphate (as P mg/l) trend chart for monitoring St. 10200 (2010 – 2018).

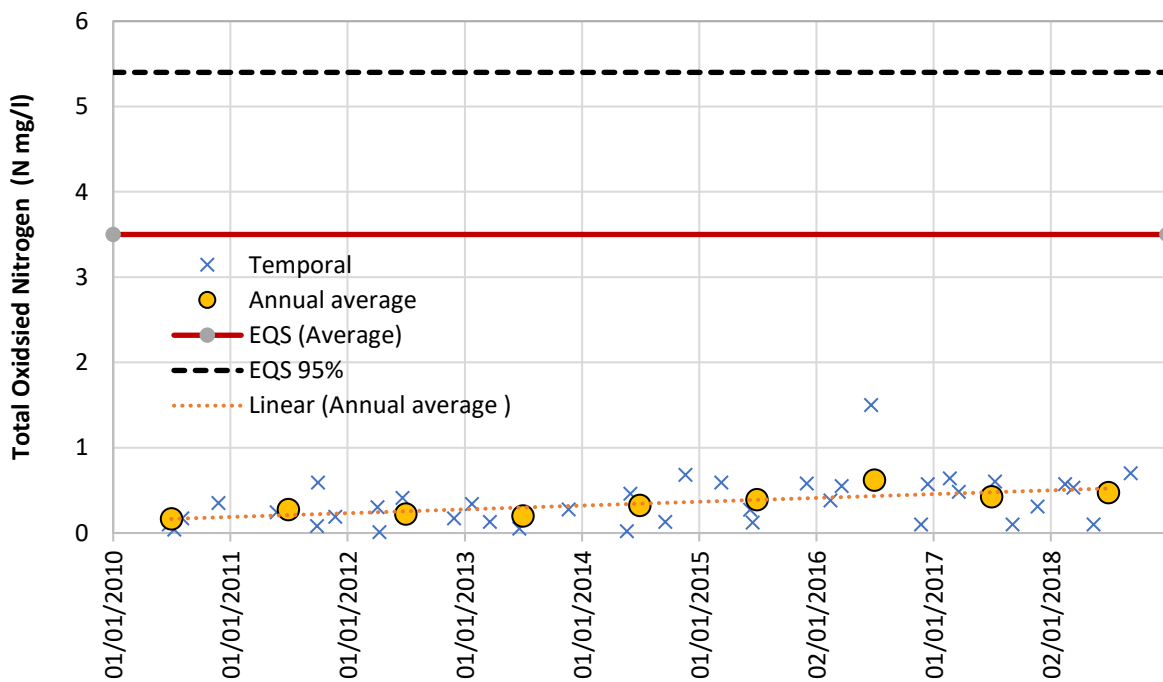


Figure 5 Total Oxidised Nitrogen (as N mg/l) trend chart for monitoring St. 10200 (2010 – 2018).

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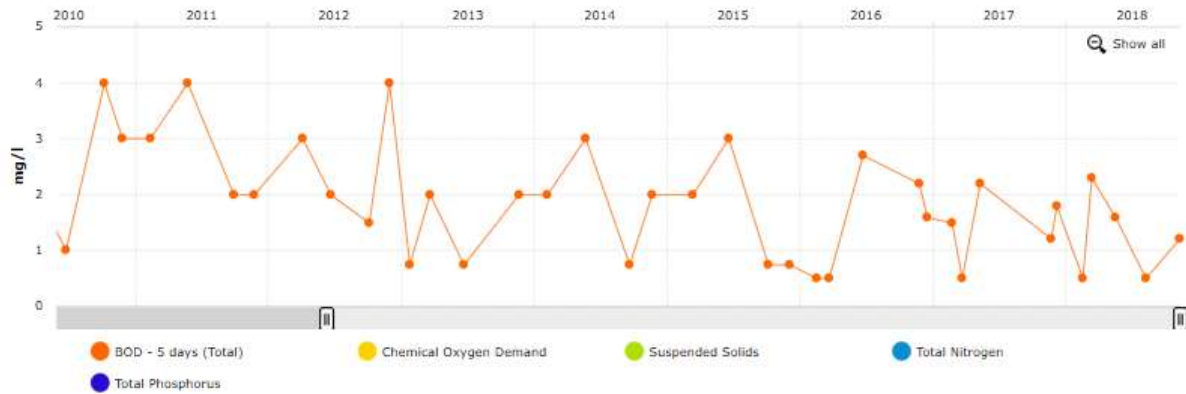


Figure 6 Biological Oxygen Demand (as mg/l) trend chart for monitoring St. 10200 (2010 – 2018).

2.1.2. Monitoring Station – Br nr Cranadillon (St. 10500)

The monitoring St. 10500 is an Operational Monitoring station located in the south of the waterbody on the main river channel (Figure 2).

Data summary:

- The 2018 biological data at this monitoring station characterises the river at the lower station in the Nadreegeel Lough Stream_020 (St. 10500) as Poor Ecological Status (Q 3) (Table 2, Figure 7).
- Ecological status at this site has steadily decreased from Q4 in 2012 to Q3-4 in 2015 to the current Q3 in 2018 (Table 2, Figure 7).
- Chemistry data for this station is only available up until 2016. Available data up to 2016 for NH₃, PO₄ and TON were trending downwards. However, a number of exceedances in the temporal data for NH₃ and PO₄ were seen between 2012-2015 (Table 2, Figure 8, Figure 9).
- BOD <1.5 mg/l since 2016, prior to this BOD frequently exceeded the EQS of 1.5 mg/l (Table 2, Figure 10).

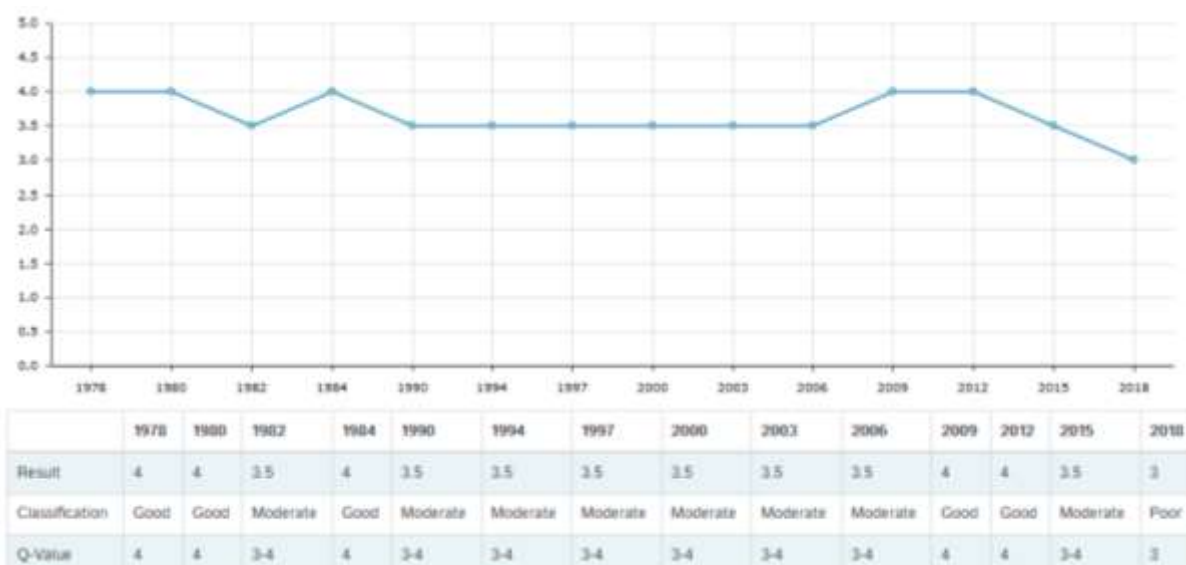


Figure 7 The biological trend and data for monitoring St. 10500 (1978 – 2018).

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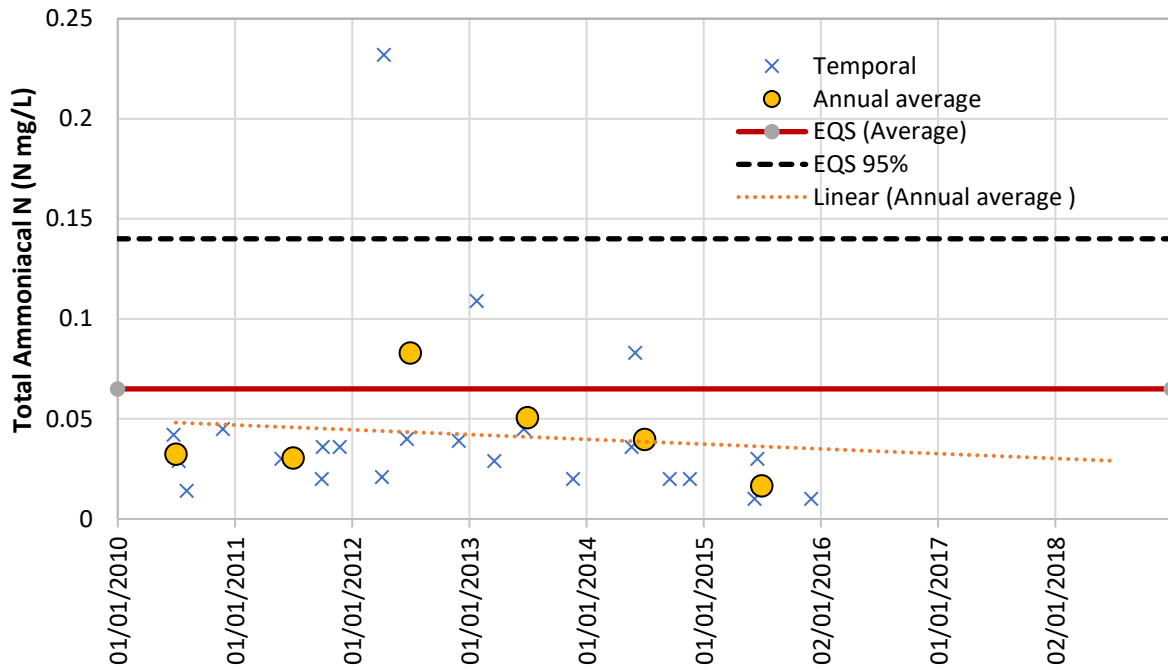


Figure 8 Ammonia (as N mg/l) trend chart for monitoring St. 10500 (2010 – 2018).

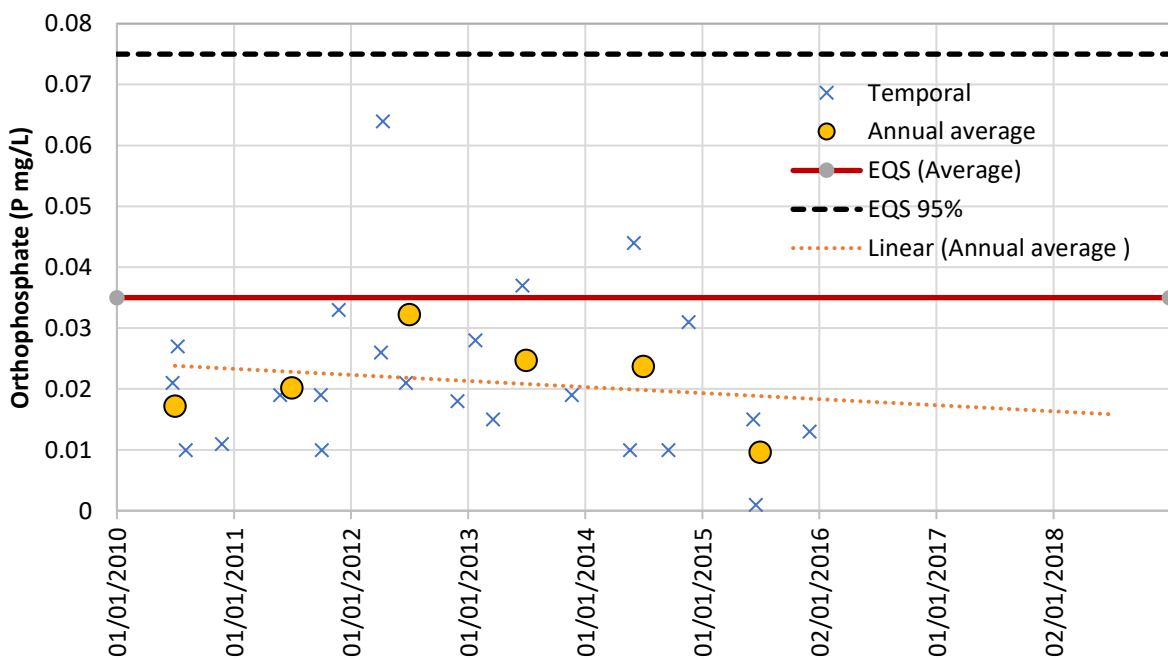


Figure 9 Ortho-Phosphate (as P mg/l) trend chart for monitoring St. 10500 (2010 – 2018).

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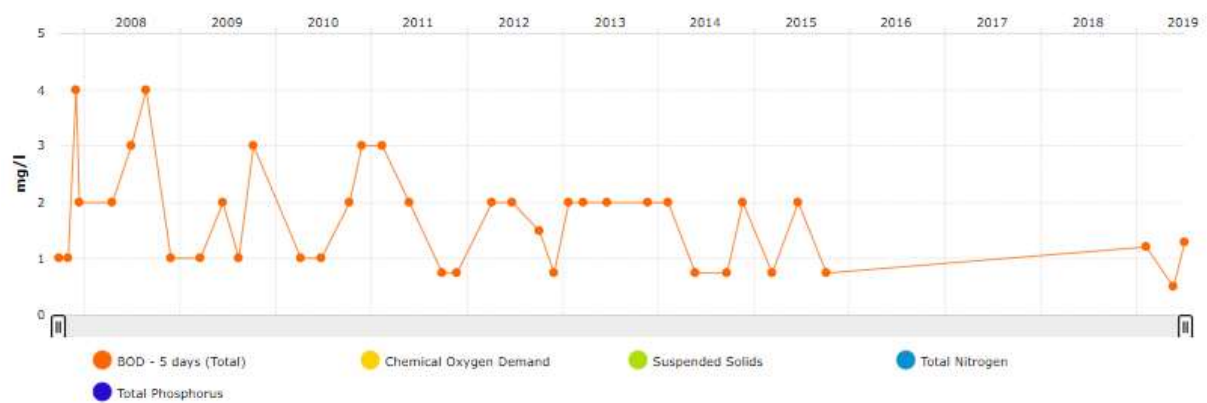


Figure 10 Biological Oxygen Demand (as mg/l) trend chart for monitoring St. 10500 (2010 – 2018).

2.2. Nadreegeel Lough

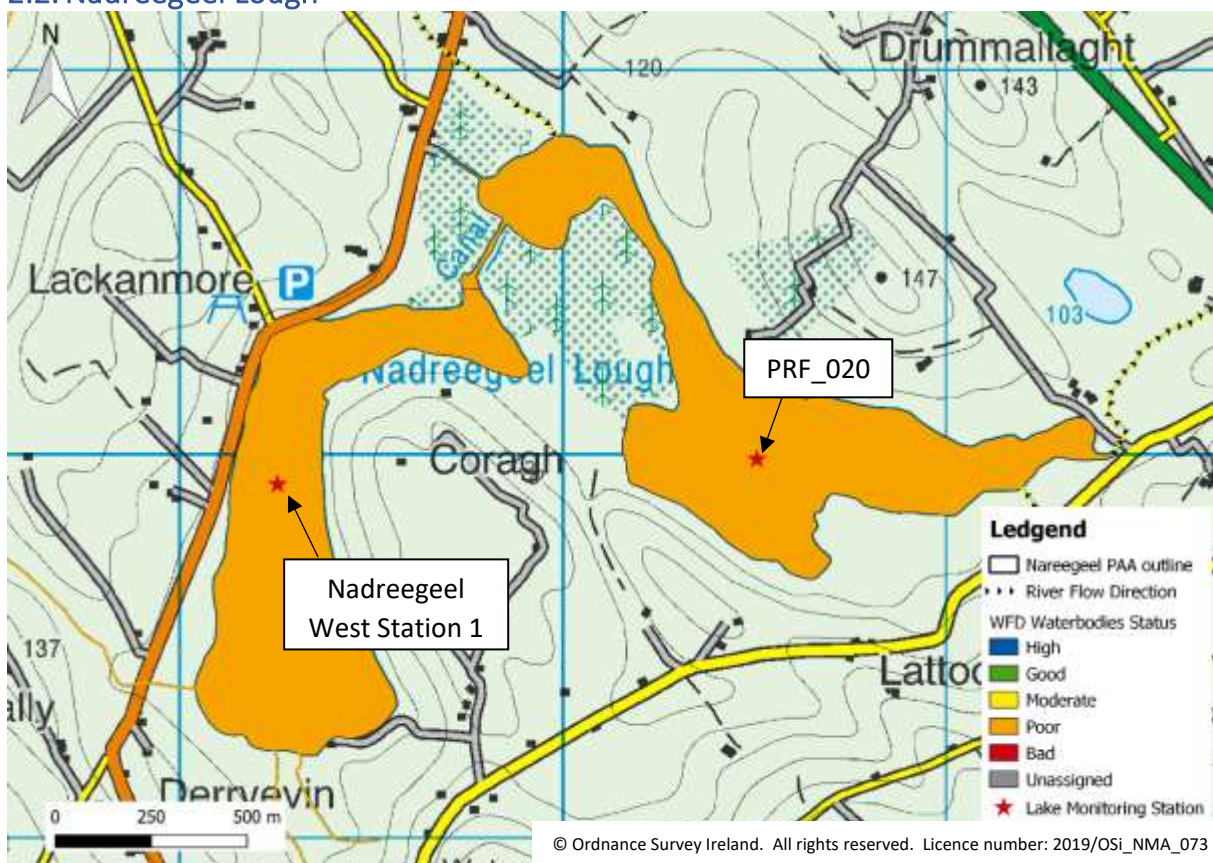


Figure 11 Lake monitoring stations in the Nadreegeel Lough.

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Table 3 Receptor information for the Nadreegeel Lough waterbody.

Waterbody		IE_EA_07_273 Nadreegeel Loughs	
Risk Category		At Risk	
Monitoring station type		Operational	Operational
Water chemistry			
Monitoring station		PRF_020	Nadreegeel West Station1
	2010	0.016	0.030
	2011	0.022	0.021
	2012	0.034	0.043
Ammonia	2013	0.013	0.024
	2014	0.013	0.017
	2015	0.024	0.020
Indicative Threshold 0.065 N mg/L	2016	0.025	0.024
	2017	0.017	0.032
	2018	0.093	0.021
Baseline NH ₃		0.045	0.026
	2010	0.083	0.040
	2011	0.040	0.044
	2012	0.027	0.025
Total Phosphorus	2013	0.038	0.028
	2014	0.040	0.034
	2015	0.034	0.035
Ecological Threshold 0.025 P mg/L	2016	0.043	0.034
	2017	0.040	0.043
	2018	0.039	0.029
Baseline TP		0.041	0.035
	2010	18	16
	2011	15	16
	2012	22	7
Chlorophyll <i>a</i>	2013	25	14
	2014	25	24
	2015	33	14
Indicative Threshold 10 µg/L	2016	13	12
	2017	24	13
	2018	39	13
Baseline Chl <i>a</i>		25	13
MCPA	MCPA detection in drinking water sample results for Ballyjamesduff regional 16/07/19 (0.11 µg/l)		
HYMO	N/A		
Comments			
Conceptual model required (Y/N)	Y		
Ecological Status (2010-2015)		Poor	

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Significant issue: monitoring point	<i>TP and Chl_a are above their respective EQS since 2010. NH₃ exceeded its EQS in 2018.</i>	<i>TP and Chl_a are above their respective EQS since 2010, with the exception of Chl_a in 2012</i>
Significant issue: Waterbody	TP, Chl_a and NH₃ and possibly MCPA	TP and Chl_a and possibly MCPA
WFD Objective	2027	

2.2.1. Monitoring Station – Eastern Lake (St. PRF_020)

The monitoring St. PRF_020 is an Operational Monitoring station located in the eastern lake (Figure 11).

Data summary:

- The parameters measured at this monitoring station are NH₃, TP and Chl_a (Table 3).
- Current trend for NH₃ and Chl_a at this station are trending upwards (Figure 12, Figure 13).
- Ammonia has breached its EQS of 0.065 mg/L on two occasions, October 2012 and July 2018 (Table 3, Figure 12).
- Total P is currently trending downwards at this monitoring station. However, concentrations recorded at this monitoring station are consistently above the 0.025 mg/L threshold (Table 3, Figure 13).
- Chl_a consistently breaches its EQS of 10 µg/L (Table 3, Figure 14).

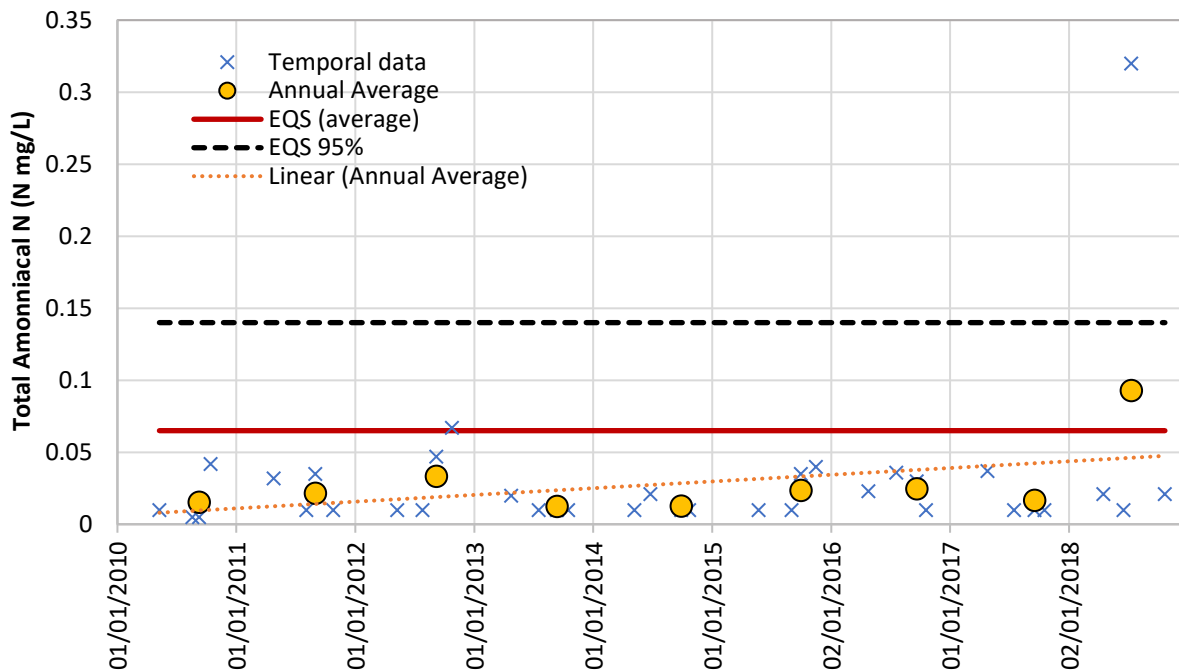


Figure 12 Ammonia (N mg/l) trend for PRF_020 in Nadreegeel Lough (2010 – 2018).

AFA0137_Nadreegeel PAA

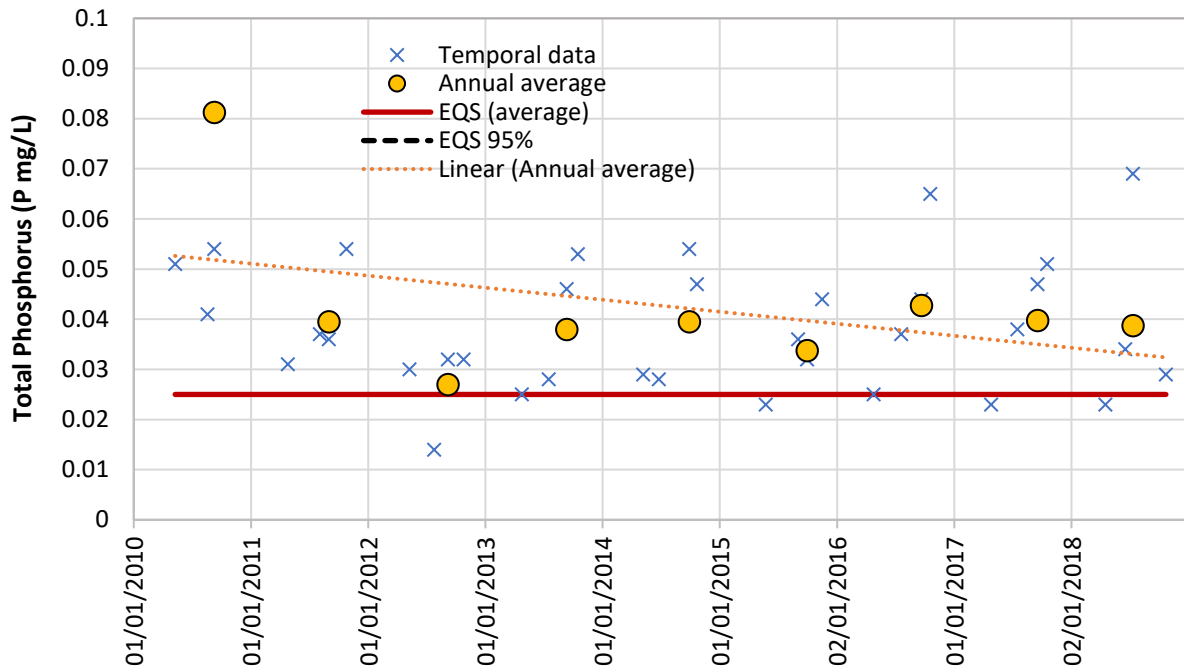


Figure 13 Total Phosphorus (P mg/l) trend for PRF_020 in Nadreegeel Lough (2010 – 2018).

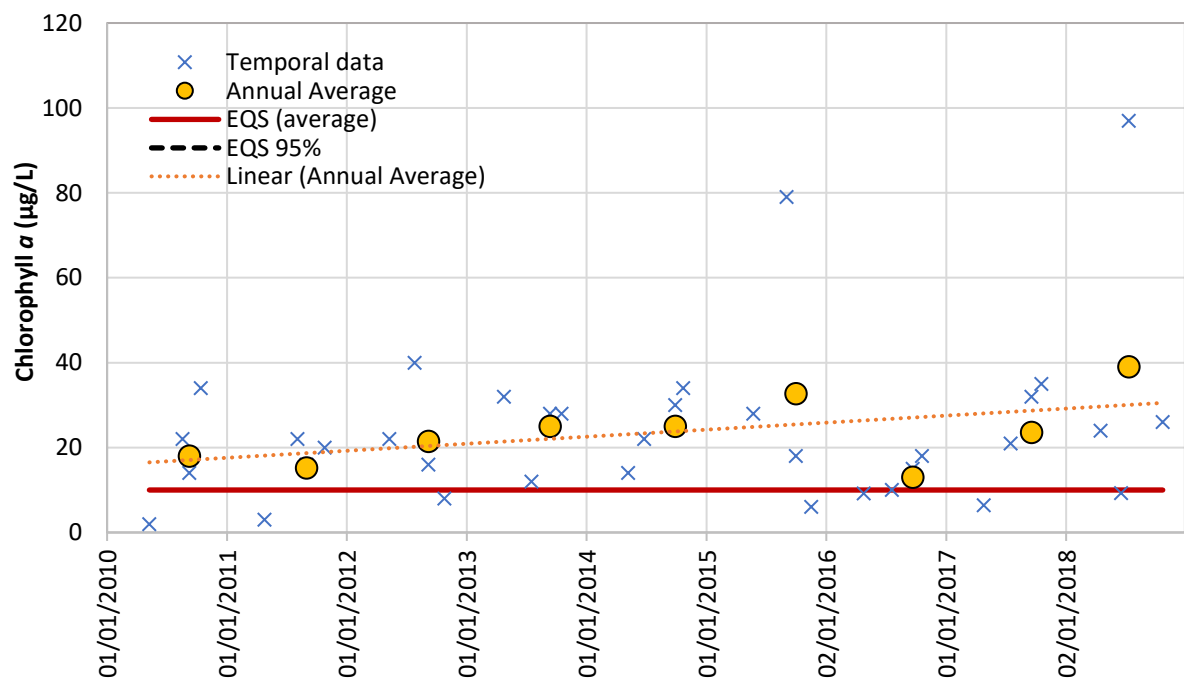


Figure 14 Chlorophyll a (µg/l) trend for PRF_020 in Nadreegeel Lough (2010 – 2018).

2.2.2. Monitoring Station – Nadreegeel West Station 1

The monitoring station West Station 1 is an Operational Monitoring station located in the western lake (Figure 11).

Data summary:

- The parameters measured at this monitoring station are NH₃, TP and Chl_a (Table 3).
- Current trend for NH₃, TP and Chl_a at this station are trending downwards (Figure 15, Figure 16, Figure 17).

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- Temporal data for NH₃ have identified two breaches above the EQS of 0.065 mg/l on two separate occasions in 2012. However, the annual average for NH₃ has consistently remained below the EQS (Figure 15).
- Both TP and Chl_a have consistently breached their retrospective EQS on numerous occasions since 2010, forcing their annual averages to also breach the EQS (Table 3, Figure 16, Figure 17).

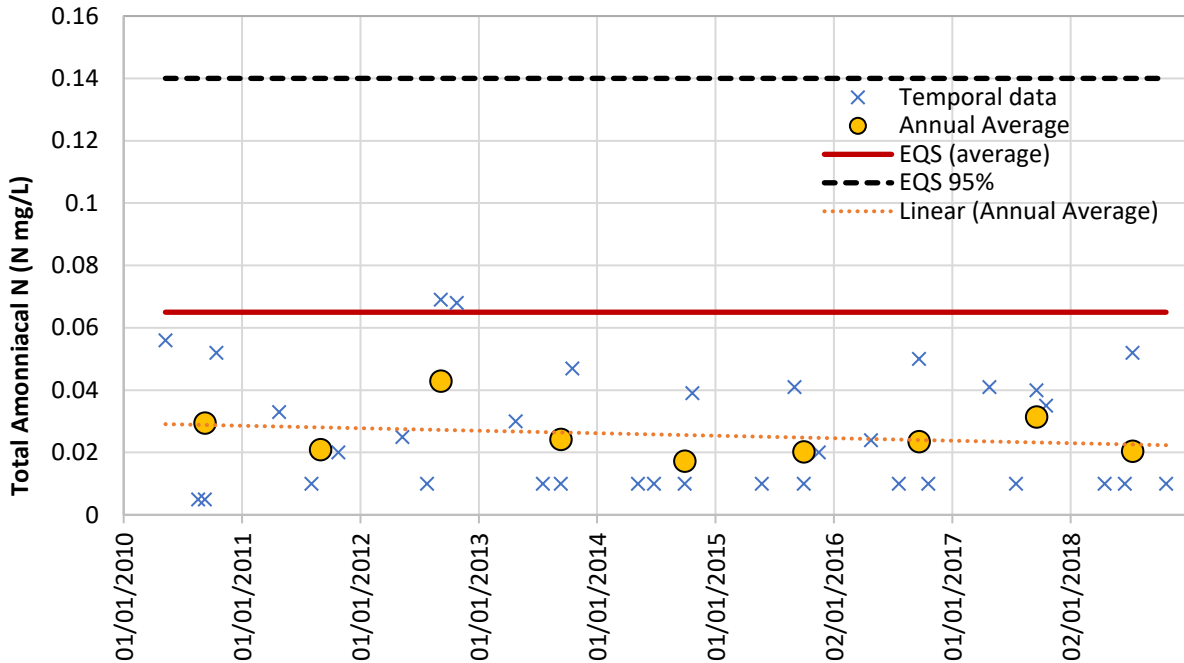


Figure 15 Ammonia (N mg/l) trend for West Station 1 in Nadreegeel Lough (2010 – 2018).

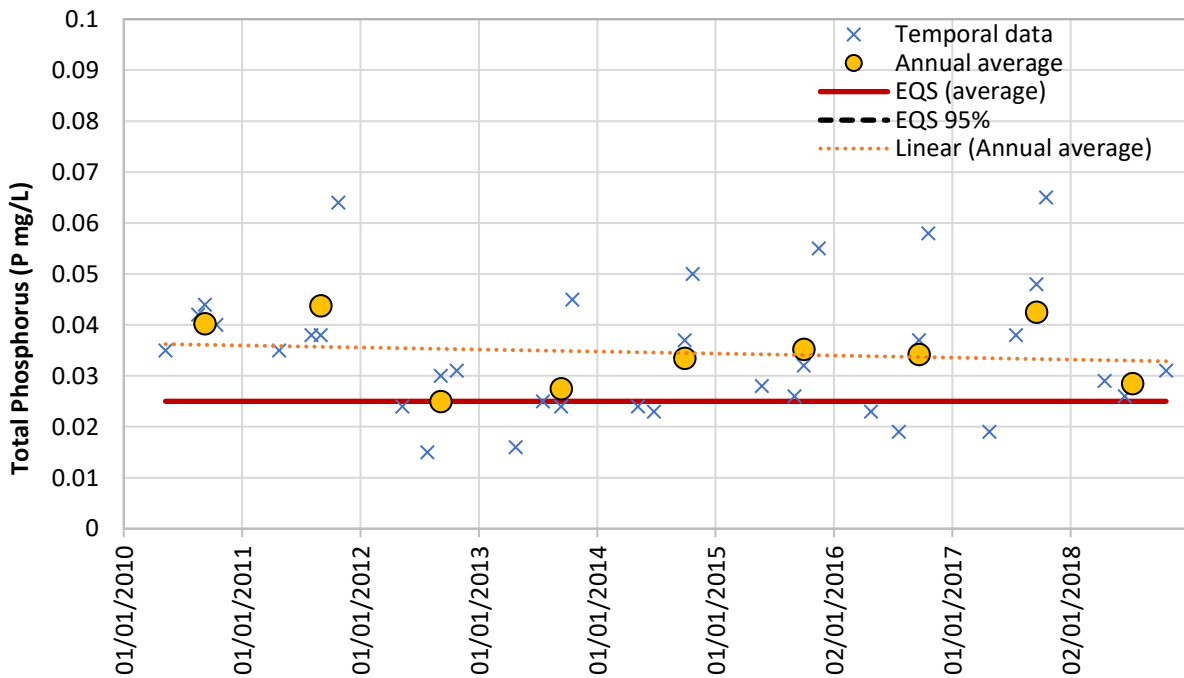


Figure 16 Total Phosphorus (P mg/l) trend for West Station 1 in Nadreegeel Lough (2010 – 2018).

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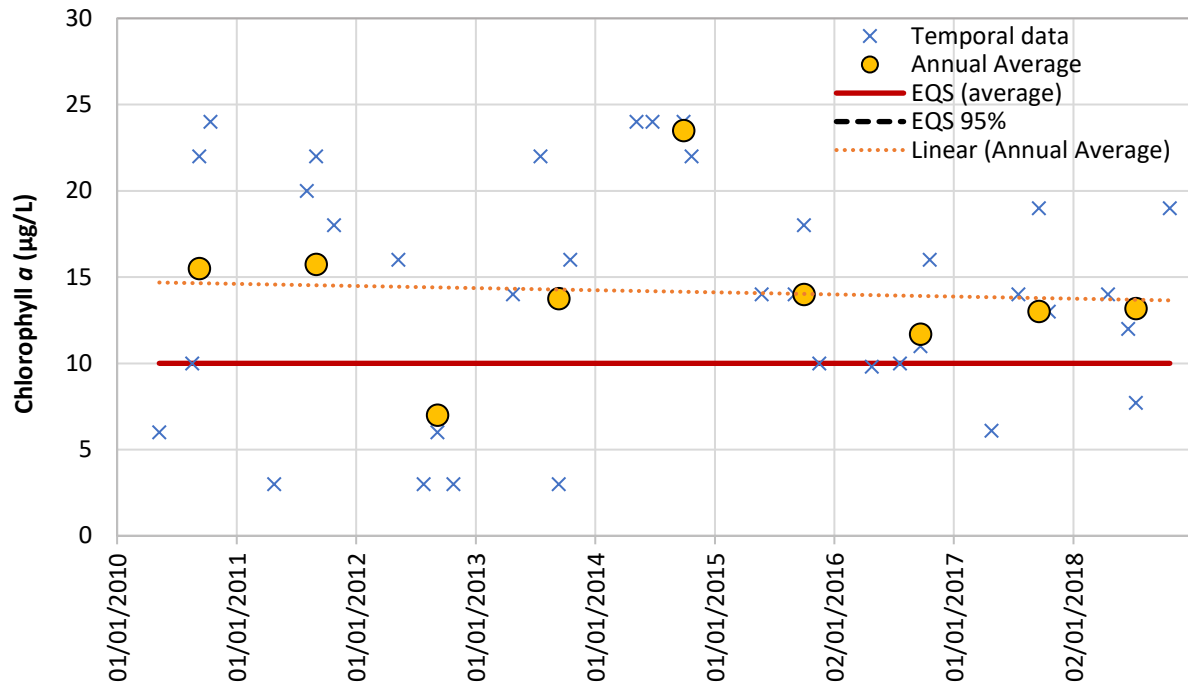


Figure 17 Chlorophyll *a* (µg/l) trend for West Station 1 in Nadreegeel Lough (2010 – 2018).

3. Significant Pressures

Any further additional information identified on the significant pressures outlined in Table 1 is detailed in Table 4. The significant pressures identified for the Nadreegeel Lough Stream_020 is agriculture and DWWT, while agriculture has been identified as the sole significant pressures for Nadreegeel Lough.

Table 4 Summary of waterbodies and pressure information on each waterbody within the Nadreegeel PAA

WB Name	Pressure Category	Pressure Subcat.	Impact	Sig. Pressure	Within AA	IA
Nadreegeel Lough Stream_020	Agriculture	Pasture	Nutrient Pollution	Yes	Y	<p>IA7 RWB Pressure: Start with visual assessment at monitoring station. Note enrichment and/or sedimentation and, if possible, determine which is driving status. Walk upstream of the RWB. Note point (drains, discharge pipes, septic tanks, farmyards) and diffuse (insufficient buffer zones) sources of nutrients and sediment. Collect field parameters (DO, pH, conductivity and temperature). Use results to guide the selection of water quality and SSRS in order to identify critical source areas for sediment.</p>
	Domestic Waste Water	Waste Water Discharge	Nutrient and Organic Pollution	Yes		
Nadreegeel Lough	Agriculture	Agriculture	Nutrient Pollution, Organic Pollution an Chemical Pollution	Yes	Y	<p>IA9 LWB Pressure: Walk along the lake shore and inputting tributaries. Identify point (drains, discharge pipes, farmyards, cattle access) and diffuse (inadequate buffer strips) sources of nutrients. Collect field parameters (DO, pH, temperature and conductivity). Use results to guide the selection of water quality and SSRS in order to identify critical source areas for nutrients.</p> <p>IA9 LWB Pressure: Walk along the lake shore and inputting tributaries. Identify point (drains, discharge pipes, farmyards, cattle access) and diffuse (inadequate buffer strips) sources of nutrients. Collect field parameters (DO, pH, temperature and conductivity). Use results to guide the selection of water quality and SSRS in order to identify critical source areas for nutrients.</p>

3.1. Agriculture

Agriculture has been identified as a significant pressure for both the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies (Table 4).

- The surface water receptor PO₄ PIP maps indicate a high PIP ranking (PIP above 3) throughout the Nadreegeel Lough Stream_020 and the land surrounding the lakes. Pathways for P and sediment may also be relevant for MCPA. There are a few small areas within the Nadreegeel Lough Stream_020 waterbody which have low PIP ranking (PIP < 4), which are located in the well-drained areas of the catchment (Figure 18).
- There are two small areas within the Nadreegeel Lough Stream_020 which have high NO₃ PIP ranking (PIP above 4). These areas are situated in the well-drained soil areas of the waterbody (Figure 19).
- The groundwater receptor NO₃ PIP maps show that NO₃ isn't an issue in the groundwater of the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies (Figure 20).

AFA0137_Nadreegeel PAA

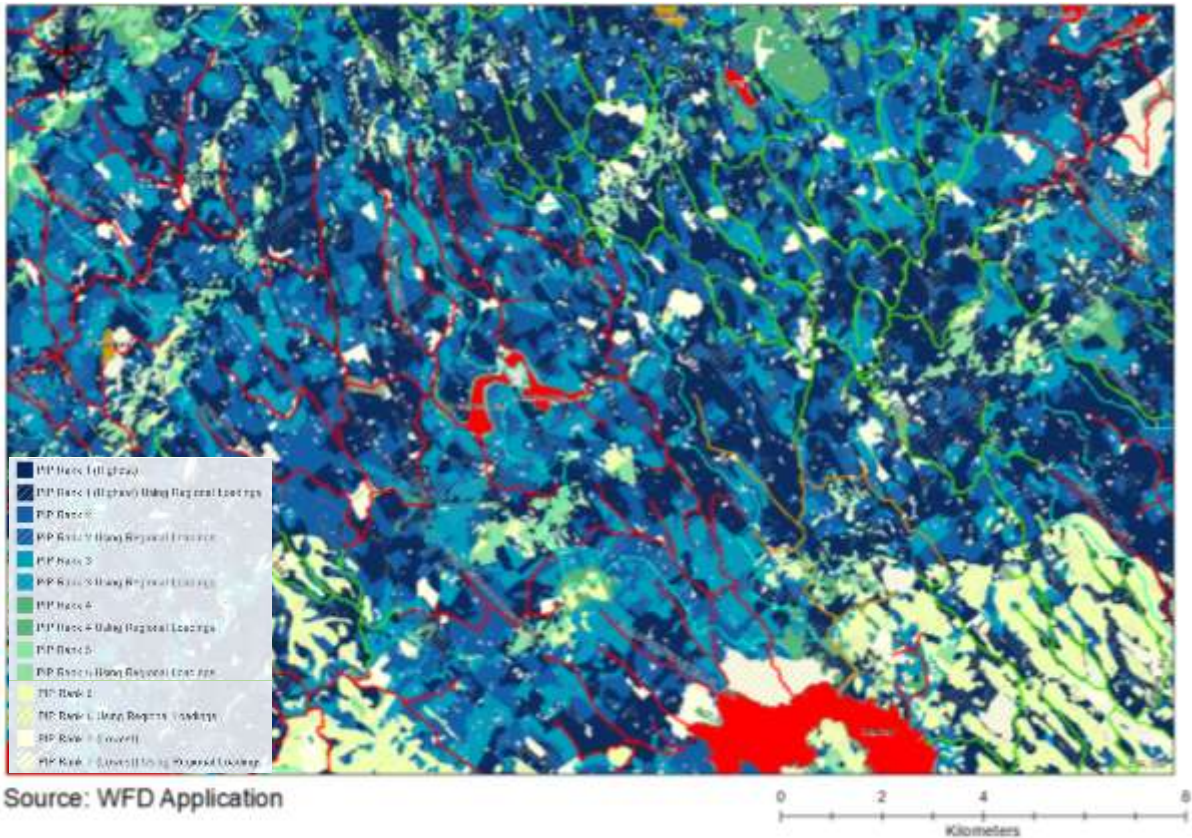


Figure 18 Surface water receptor PO₄ PIP maps for the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies.

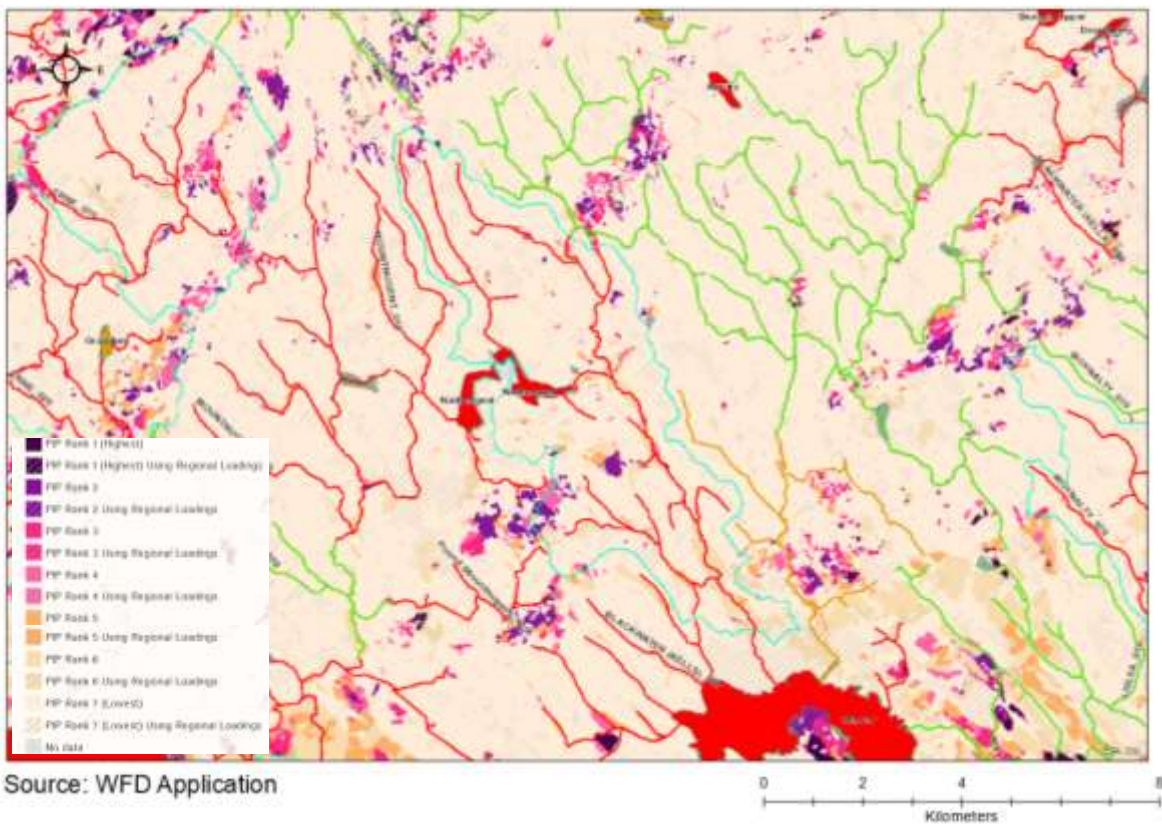


Figure 19 Surface water receptor NO₃ PIP maps for the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies.

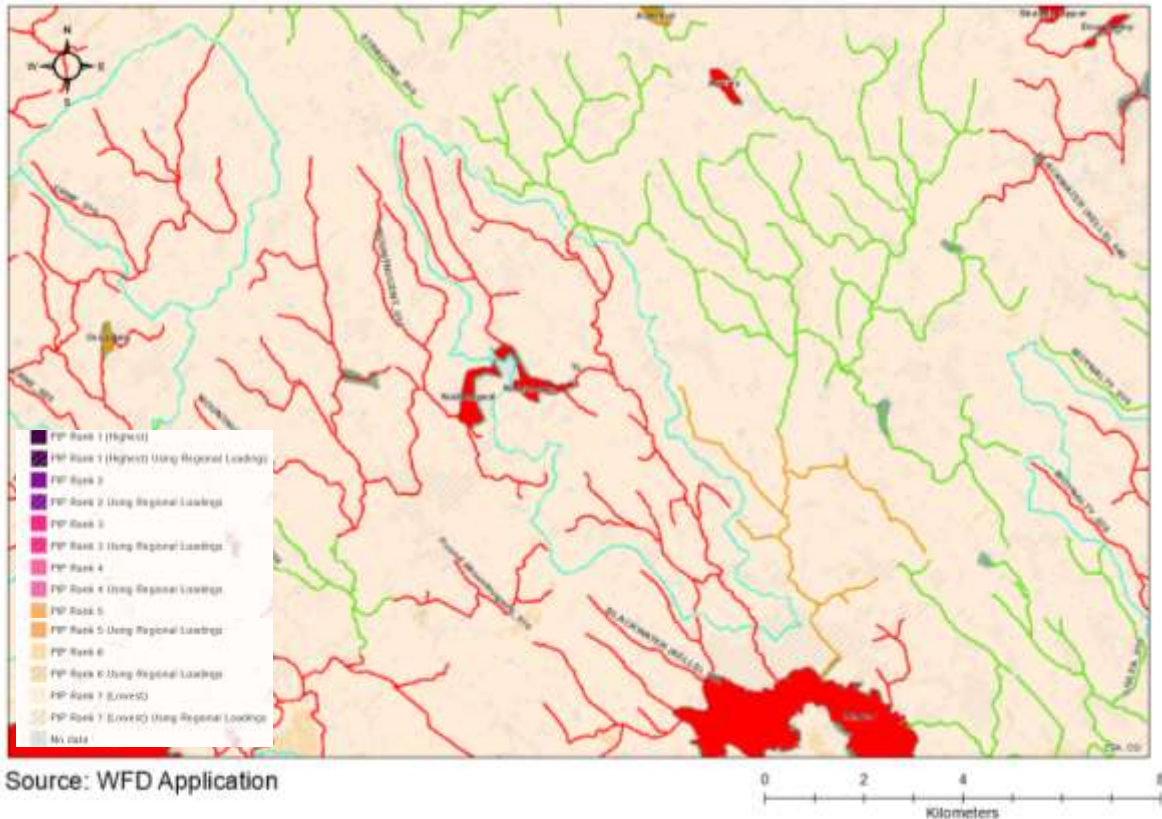


Figure 20 Groundwater receptor NO₃ PIP maps for the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies.

3.2. Domestic Waste Water Treatment Systems (DWWTs)

Domestic Waste Water has been highlighted as a significant pressure for the Nadreegeel Lough Stream_020 waterbody (Table 4). The Domestic Waste Water Impact Potential map highlights areas where DWWTs may be a potential pressure and their location and density will be considered during the LCA to determine their potential impact.

3.3. Potential Pressures

- While Licenced Facilities have not been highlighted as a significant pressure within the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies, due to their proximity to the watercourse, consideration will be taken on their potential impact during the LCA work (Figure 21). These licenced facilities range from private and public water supplies, agricultural and commercial facilities.
- Furthermore, there are a number of areas located along the watercourse which are identified as private forestry within the PAA. These areas will be assessed for their potential impact during the LCA (Figure 22).

AFA0137_Nadreegeel PAA

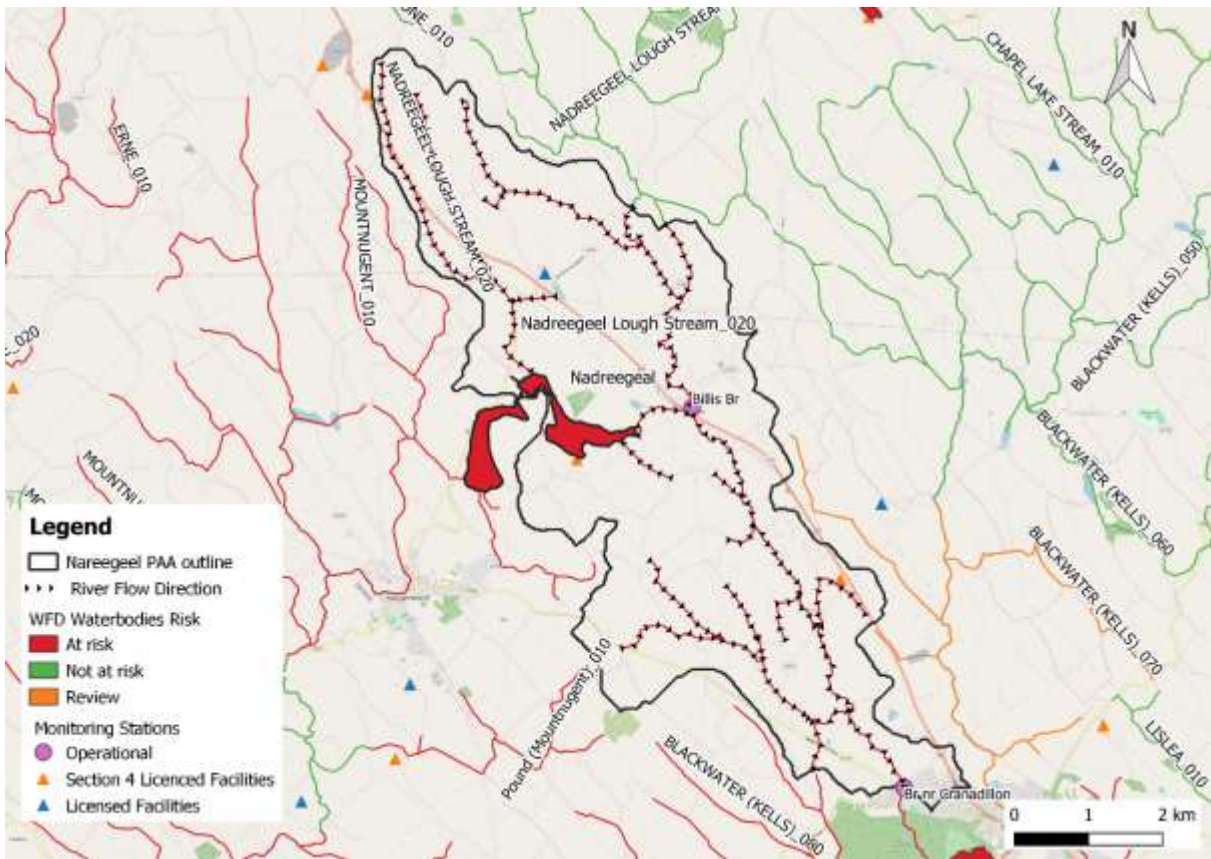


Figure 21 Section 4 and IE Licenced Facilities locations within to the Nadreegeel PAA

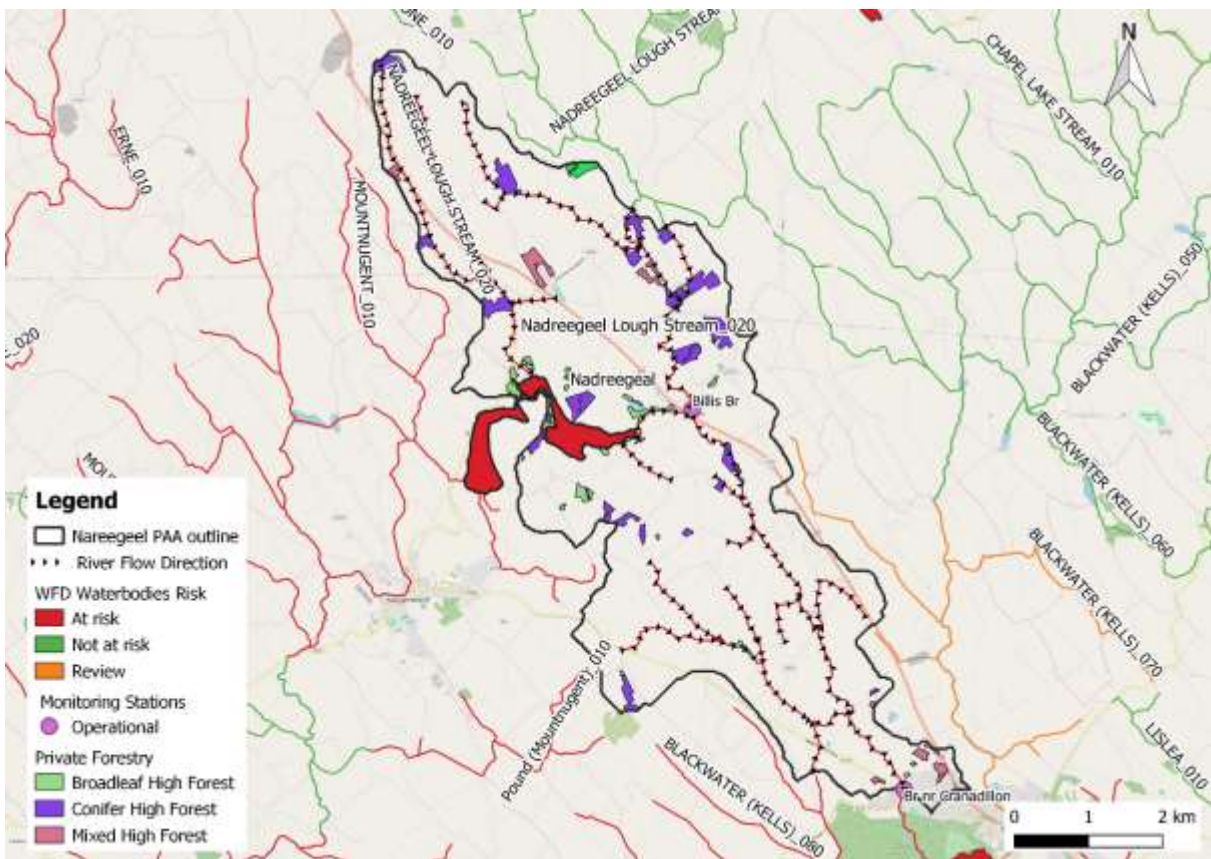


Figure 22 Private forestry locations within the Nadreegeel PAA

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). One compartment has been identified:

1. Poor Aquifer - Bedrock which is Generally Unproductive, except for Local Zones (PI)

Based on the well/poorly drained soils map the one compartment is further sub-divided into 3 sub-compartments (Figure 24, Table 5).

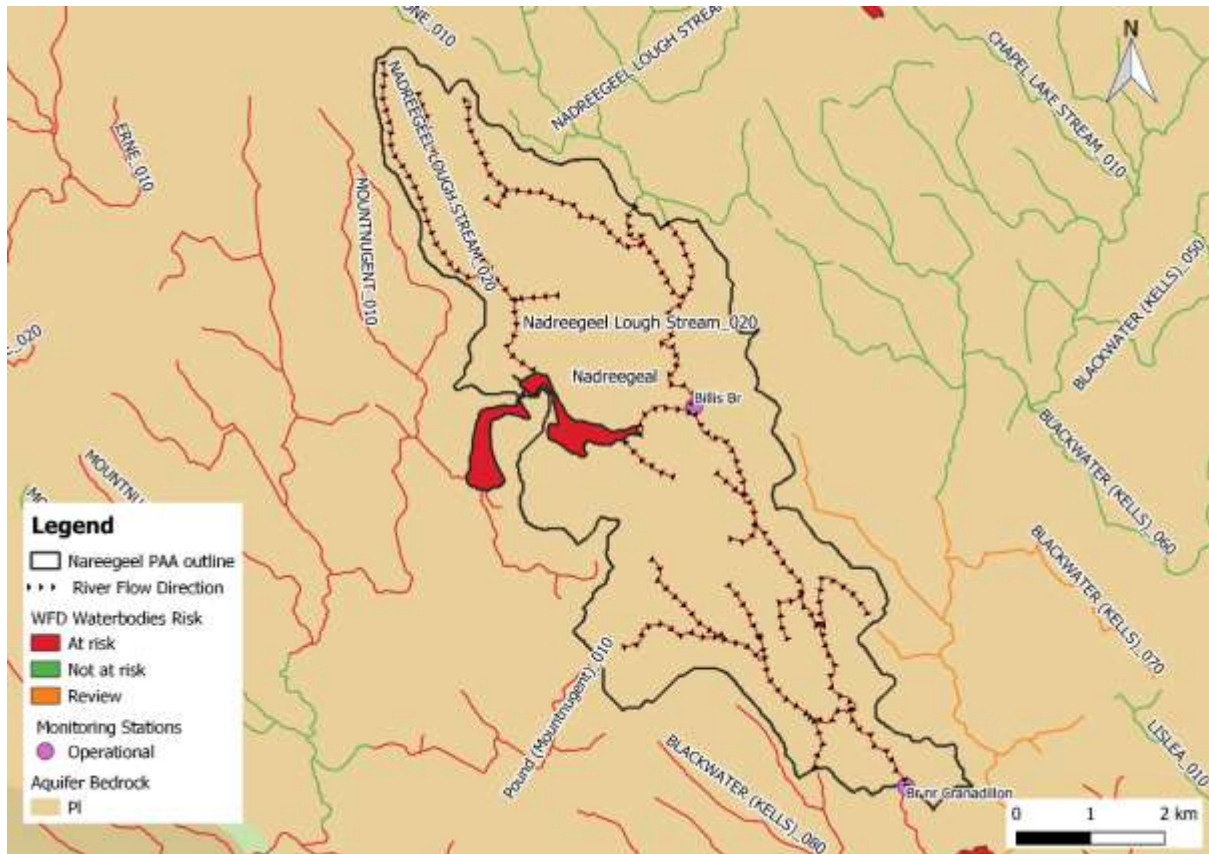


Figure 23 The aquifer bedrock for the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies.

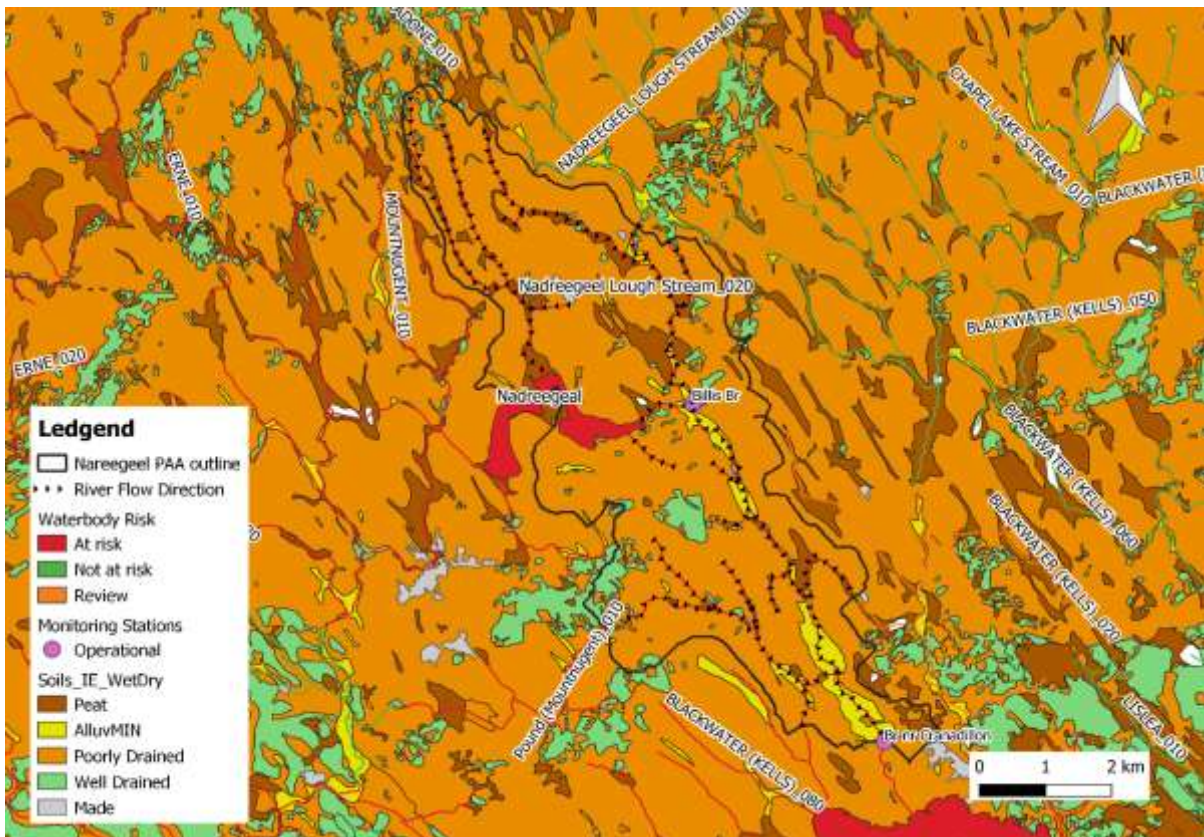


Figure 24 The wet and dry soils for the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies.

Table 5 Conceptual model information for the pathways in the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies.

Compartment 1			
Direct ¹	DWWT and drains		
Aquifer (Fig. 23)	PI		
Rock Units	Ordovician Metasediments and Silurian Metasediments and Volcanics		
	Sub-Comp. 1A	Sub-Comp. 1B	Sub-Comp. 1C
Soil type (Fig. 24)	Poorly drained	Well drained	Peat
Drainage Density	High (Note not on OPW drainage scheme)		
Subsoil	Sandstone and Shale Till (Lower Palaeozoic)	Rock	Alluvial Sediment
Subsoil K	Low	N/A	Low
Groundwater Vulnerability (Fig. 25)	L, M, H, E	X and E	L, M, H, E, X
PO ₄ Susceptibility (Fig. 26)	High	Low	High
NO ₃ Susceptibility (Fig. 27 & Fig. 28)	Low	Very High	Low
PO ₄ PIP (Fig. 18)	High – V High	Low	High – V High
NO ₃ PIP (Fig. 19 & Fig. 20)	Low	High	Low
Main Flow Paths	Overland, near surface flow and groundwater flow. Land drains also an issue in this area	Near surface, shallow subsurface and groundwater flow	Overland, near surface and land drains

¹ Point discharges to the water body

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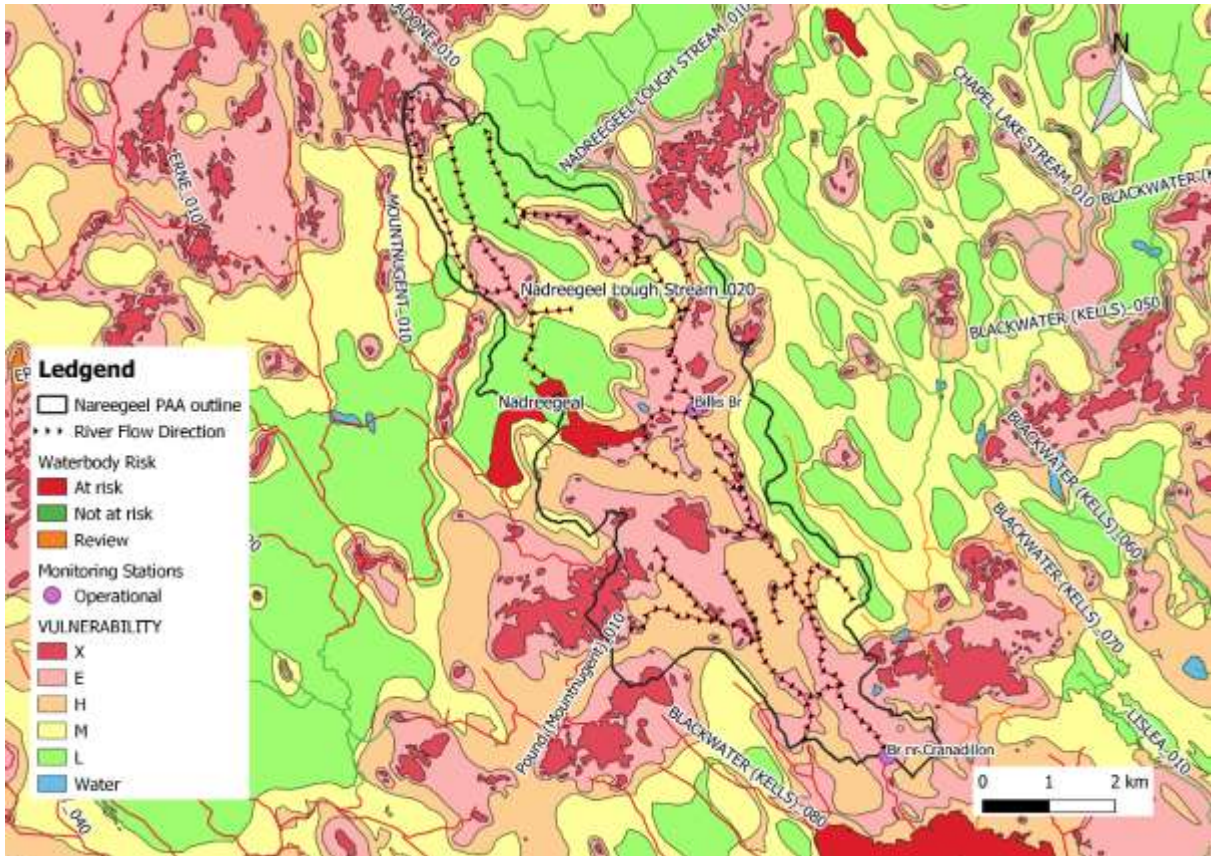


Figure 25 The groundwater vulnerability map for the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies.

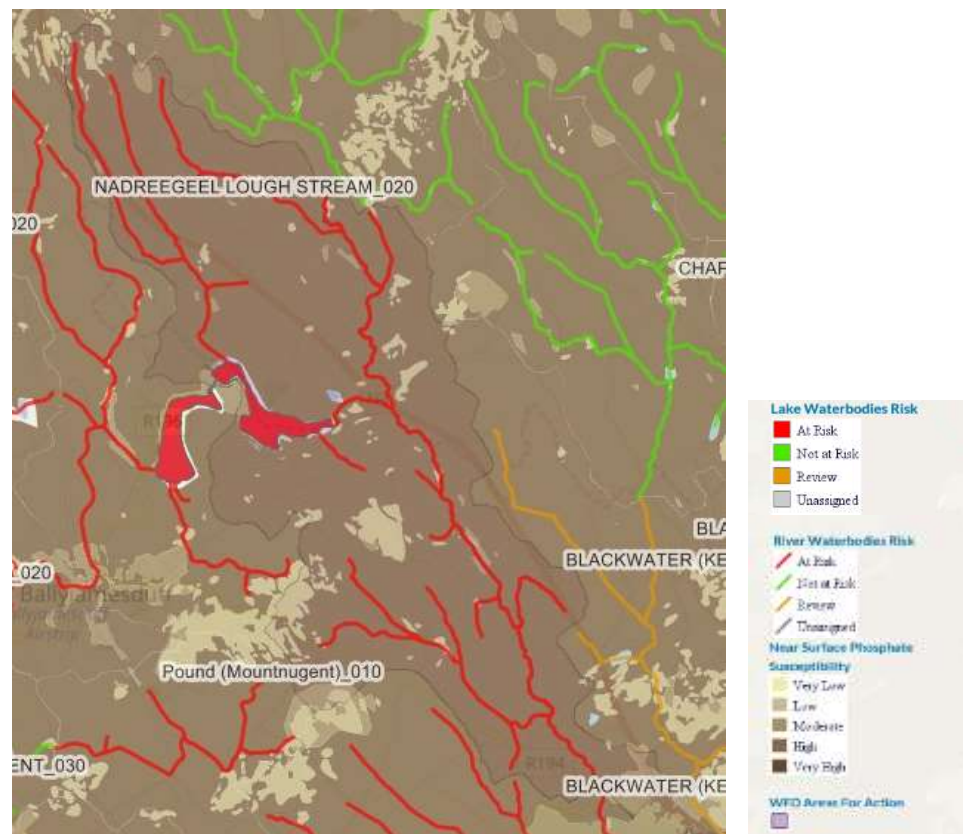


Figure 26 The near surface PO₄ susceptibility map for the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies.

AFA0137_Nadreegeel PAA

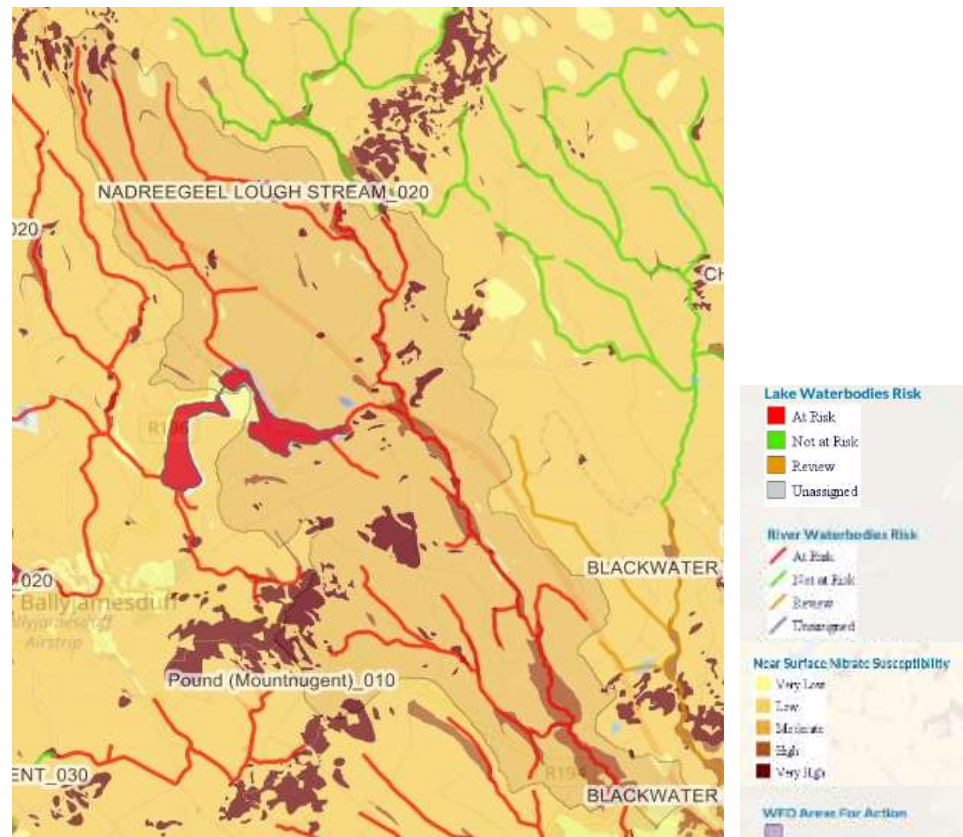


Figure 27 The near surface NO₃ susceptibility map for the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies.

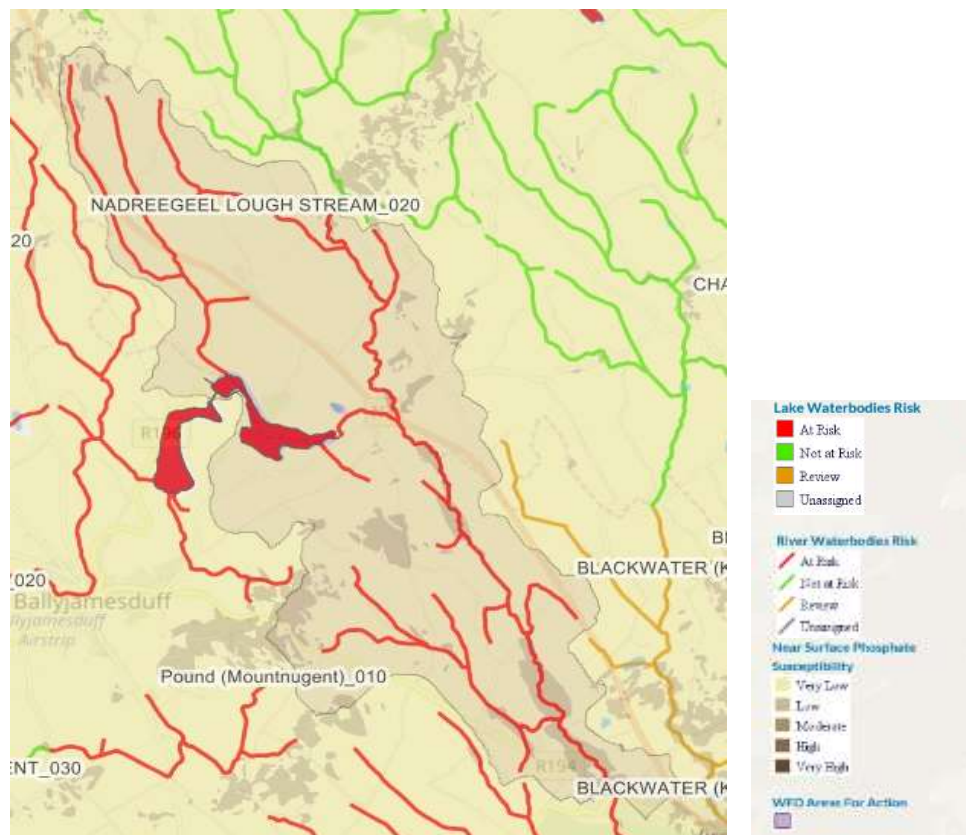


Figure 28 The sub-surface NO₃ susceptibility map for the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies.

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

The desktop study for the Nadreegeel PAA has identified both agriculture and DWWTs to be the significant pressures. Ecological status is currently Moderate in the Nadreegeel Lough Stream_020 and Poor in Nadreegeel Lough. The main pathways for the Nadreegeel PAA are overland and near surface flow, with PO₄ and NH₃ identified as the significant issue for the Nadreegeel Lough Stream_020 while TP, Chl_a and MCPA are identified as the significant issue for Nadreegeel Lough.

5.1. Nadreegeel Lough Stream_020 waterbody

Risk category: *At Risk*

Status: Moderate

Hydrochemistry summary: St. 10200 (2018): NH₃ **0.114 mg/l**, PO₄ 0.024 mg/l, TON 0.500 mg/l

Baseline Concentration: St. 10200: NH₃ **0.070 mg/l**, PO₄ 0.031 mg/l, TON 0.500 mg/l

Significant issue: St. 10200: PO₄ and NH₃ have been identified as the significant issue based on the 2018 chemistry data. It is important to note that at the monitoring station (Br nr Cranadillon), which is located at the outflow of the waterbody, no chemical monitoring has been sampled since 2015. However, the latest biological monitoring at the outflow station has recorded a drop from a Q3-4 in 2015 to a Q3 in 2018.

Significant pressure: Agriculture (Pasture) and DWW (Waste Water Discharge).

Relevant pathways: Main pathways identified are areas of overland, shallow sub-surface flow and land drains. Groundwater flow where exposed rock has been identified is also a potential pathway in this waterbody.

5.2. Nadreegeel Lough waterbody

Risk category: *At Risk*

Status: Current status is Poor which is a drop from the Moderate Status recorded in the 2010–2012 monitoring cycle.

Hydrochemistry summary: St. PRF_020 (2018): NH₃ **0.093 mg/l**, TP 0.039 mg/l, Chl_a **39 mg/l**

West Station 1 (2018): NH₃ 0.021 mg/l, TP 0.029 mg/l, Chl_a **13 mg/l**

Baseline Concentration: St. PRF_020 (2018): NH₃ 0.045 mg/l, TP **0.041 mg/l**, Chl_a **25 mg/l**

West Station 1 (2018): NH₃ 0.026 mg/l, TP 0.035 mg/l, Chl_a **13 mg/l**

Significant Issue: TP, Chlorophyll *a* and MCPA. Irish Water have reported exceedances in MCPA in 2018 for the Ballyjamesduff Regional Water Supply Scheme which is supplied by Nadreegeel Lough.

Significant pressure: Agriculture (Pasture)

Relevant pathways: Main pathways identified are areas of overland, shallow sub-surface flow and land drains. Groundwater flow where exposed rock has been identified is also a potential pathway in this waterbody.

The environmental objective date for all the waterbodies in the Nadreegeel sub-catchment is Good Status for the Nadreegeel Lough Stream_020 by 2021, and Good Status for Nadreegeel Lough by 2027.

6. Communications Plan

A community information meeting will be held in Billis Community Hall, on the 14th of November 2019 from 7:30 – 9:00 pm.

Review the finding of the desktop with Cavan County Council and any other interested organisations for their input and knowledge of the sub-catchment.

AFA0137_Nadreegeel PAA

Discuss with Cavan County Council on whether they have any additional information which may be relevant to the Nadreegeel Lough Stream_020, particularly in relation to DWWTS and farm surveys which may have been carried out in the PAA.

Furthermore, discuss with Cavan County Council on whether they have any further information regarding Nadreegeel Lough in relation to the abstraction for the Ballyjamesduff Public Water Supply.

Review the finding of the desktop with IFI for their input and knowledge of the sub-catchment.

Discuss with the National Federation of Group Water Schemes about the Billis/Lavey GWS.

Due to agriculture being a significant pressure for this PAA, close communication between the LAWPRO team and the ASSAP advisors for this area is required.

Include Pesticides/MCPA in the messaging for this PAA.

7. Work Plan

7.1. Further Characterisation Actions Assigned

Nadreegeel Lough Stream_020:

- **IA7:** *“Start with visual assessment at monitoring station. Note enrichment and/or sedimentation and, if possible, determine which is driving status. Walk upstream of the RWB. Note point (drains, discharge pipes, septic tanks, farmyards) and diffuse (insufficient buffer zones) sources of nutrients and sediment. Collect field parameters (DO, pH, conductivity and temperature). Use results to guide the selection of water quality and SSRS in order to identify critical source areas for sediment.”*

Nadreegeel Lough:

- **IA9:** *“Walk along the lake shore and inputting tributaries. Identify point (drains, discharge pipes, farmyards, cattle access) and diffuse (inadequate buffer strips) sources of nutrients. Collect field parameters (DO, pH, temperature and conductivity). Use results to guide the selection of water quality and SSRS in order to identify critical source areas for nutrients.”*
- **IA9:** *“Walk along the lake shore and inputting tributaries. Identify point (drains, discharge pipes, farmyards, cattle access) and diffuse (inadequate buffer strips) sources of nutrients. Collect field parameters (DO, pH, temperature and conductivity). Use results to guide the selection of water quality and SSRS in order to identify critical source areas for nutrients.”*

7.2. Further Information Required

- Discuss with the National Federation of Group Water Schemes about the Billis/Lavey GWS in the catchment, in particular the location of the GWS abstraction point.
- Enquire with Cavan County Council on whether there is any further information available in relation to DWWTS in the PAA.
- Enquire from Cavan County Council on whether any further information is available in relation to farm survey which may have been carried out in the PAA.
- Discuss with the National Federation of Group Water Schemes about the Billis/Lavey Group Water Scheme in the catchment.
- Discuss with Cavan Co. Co. and Irish Water regarding the high levels of MCPA detected in Nadreegeel Lough.

7.3. Local Catchment Assessment

7.3.1 Nadreegeel Lough Stream_020

Nadreegeel Lough Stream_020 has dropped from Good to Moderate in the 2010-2015 river waterbody status. This appears to have further deteriorated in 2018 with the biological data at the lower monitoring station (Br nr Cranadillon) dropping to a Q3. Both PO₄ and NH₃ have been highlighted as the significant issue for the Billis Bridge monitoring station, however, there is no recent chemistry data to indicate the significant issue at the lower monitoring station (Br nr Cranadillon). The PO₄ and NO₃ PIP and susceptibility maps do indicate that between the two monitoring station both P and N could still be a potential issue for this region. Initial field assessment for this waterbody will require a number of SSIS/RA assessments on all the inflowing tributary streams, to identify any areas which may potentially be eliminated as causing an impact. Furthermore, chemistry sampling will be required at the lower monitoring station (Br nr Cranadillon), to determine the potential impact of P and N in the lower section of the waterbody. Additional chemistry sampling maybe required once the SSIS/RA assessments have been completed and potential impacting streams have been identified. This will be followed up with stream walks on the potentially impacting streams with the aim of identifying what the significant pressures are, bearing in mind that both agriculture and DWWTS have been highlighted as the significant pressure for this waterbody.

The EPA have outlined their planned monitoring for the Nadreegeel Lough Stream_020 waterbody for the next three years on the EDEN App which is summarised in Table 6.

Table 6 Planned EPA monitoring for the Nadreegeel Lough Stream_020 (2019 – 2021).

	Br nr Cranadillon (St. 10500)		
	2019	2020	2021
Chemical Surface Water Status	0	0	0
Fish Status or Potential	0	0	0
General Conditions	5	5	5
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

7.3.2. Nadreegeel Lough

Nadreegeel Lough has dropped from Moderate to Poor in the 2010-2015 river waterbody status, with nutrient (TP and Chl_a) being identified as the significant issue. An improvement in status for Nadreegeel Lough which is shallow in depth may be achievable by the work plan suggested for the Nadreegeel Lough Stream_020. This is mainly due to PO₄ being identified as the significant issue for the Nadreegeel Lough Stream_020 which inadvertently affects the TP levels in the lake itself due to overland flow being identified as the main pathway for both waterbodies. As agriculture has been identified as the significant pressure, impacts related to agriculture in particular will be the focus for the LCA work.

The EPA have outlined their planned monitoring for Nadreegeel Lough for the next three years on the EDEN App which is summarised in Table 6.

Table 7 Planned EPA monitoring for Nadreegeel Lough (2019 – 2021).

	PRF_020 (LS070015911200020)			Nadreegeel West Station 1 (LS070015911200010)		
	2019	2020	2021	2019	2020	2021
	Chemical Surface Water Status	0	0	0	0	0
Fish Status or Potential	0	0	0	0	0	0
General Conditions	4	4	4	4	4	4
Hydromorphological Conditions	0	0	0	0	0	0
Invertebrate Status or Potential (AWIC)	0	0	0	0	0	0
Macrophyte Status or Potential	0	0	0	0	0	0
Phytobenthos Status or Potential	0	0	0	0	0	0
Phytoplankton Status or Potential	0	0	0	0	0	0
Specific Pollutant Conditions	0	0	0	0	0	0

8. Review of Mitigation Options

- Throughout the Nadreegeel Lough Stream_020, where phosphate and ammonia have been identified as a significant issue, mitigation options in relation to overland flow and land drainage pathways interception will need to be considered.

Date of Completion of Desk Study: 29/11/2019

Work Plan Summary:

1. Ask Cavan Co. Co. if there is any additional investigative-chemical data available for the Bridge near Cranadillon (St 10500) monitoring station since 2015 on the Nadreegeel River.
2. Review general chemistry results as they become available from Station 10500 which is on the EPA 19-21 monitoring programme.
3. The latest Q data for the Nadreegeel Lough Stream_020 has indicated that the waterbody has potentially declined in status (Moderate to Poor Ecological Status). Local catchment assessment needed, with the focus on the assessment of agriculture and DWWTS will be carried out throughout the waterbody.
 - Carry out an SSIS, RA, visual assessments and portable instream measurements (DO, pH and conductivity) at the locations marked on the map (Figure 31, Appendix C), this may potentially rule out some of the inflowing tributaries on the main Nadreegeel River channel. Initial SSIS locations shown in Figure 31 below.
 - Determine if chemistry samples are required at St. 10200, St 10500 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 and NO₃ PIP maps to narrow down these stream walks.
 - Note: keep in mind vulnerable groundwater areas where there may be interaction between ground and surface water.
 - Refer any pressures related to agriculture from the stream walks to the local ASSAP advisor.
 - A map of initial survey points is included below (Figure 31, 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.
4. As nutrient issues and agricultural pressures have been identified for both Nadreegeel Lough and the Nadreegeel Lough Stream_020, LCA work proposed for the Nadreegeel Lough Stream_020 has the potential to subsequently help improve the lakes status. Therefore, initial LCA work will focus on the Nadreegeel River system with an aim to aid further improvements in the lake.

Appendix A

The catchment area for the Billis/Lavey GWS has been outlined for the Nadreegeel PAA (Figure 29).

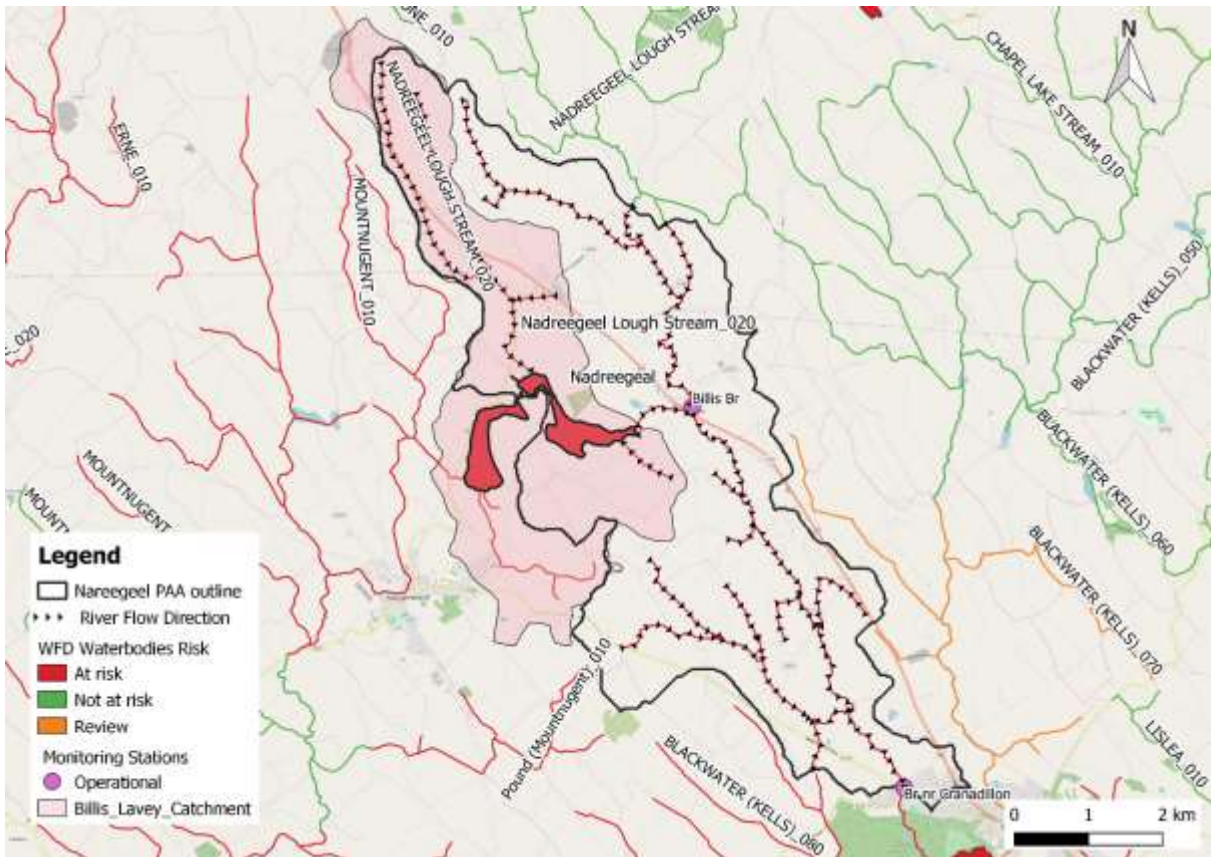


Figure 29 The catchment boundary area for the Billis/Lavey GWS located within the Nadreegeel PAA.

Appendix B



WFD Waterbody Code IE_EA_07ND10500	WFD Waterbody Name NADREEGEEL LOUGH STREAM_0218r nr Cranadillon	Station Name 259073	Northing: 288161	Sample date: 04/06/15 11:20 AM
River code and year: 07ND10500 sampled in 2015	River: NADREEGEEL LOUGH STREAM	Easting: 259073		
Access and H&S rating:	Right Hand Side	Downstream	Low Hazard site	

Filamentous algae, macrophytes & shading	Station type, sediment, livestock access & erosion
Cladophora	Station Type
Vaucheria	Substrate Features Normal
Filamentous algae - Total	Substrate Siltation
Total Macrophytes	Livestock Access None
	Livestock Access Impact
Shading Not Shaded	Bank Erosion D/S Left Bank
	Bank Erosion Extent Mild
	Recent Flood No
	Flow/Discharge Normal

Overview of macroinvertebrate data

The site 07ND10500 on the NADREEGEEL LOUGH STREAM river was sampled in 2015. A total of 23 invertebrate taxa were recorded. There were 0 sensitive mayfly and 0 sensitive stonefly found at the site. This absence of sensitive taxa is most often a key indicator of failure to achieve good ecological status or higher. The results of an examination of key tolerant taxa found: Simuliidae (Absent), Gammarus (Few) and Baetis rhodani (Few). Chironomidae larvae, many species of which are tolerant to pollution, were found in high abundance at this site. The Q value assigned to this site was 3-4, indicative of moderate conditions. Trend data and river summary assessments are available at <http://www.epa.ie/QValue/webusers/>. Text is autogenerated, represents a simplification and adjustments for specific typologies/habitat are not represented (e.g. acidified sites / non-riffle-glide habitats).

River code and year
 07ND10500 sampled in 2015

Group	Taxon	Sensitivity	Abundance	
Caddisfly	Hydroptilidae	Less sensitive	Few	2
Caddisfly	Limnephilidae	Less sensitive	Few	2
Mayfly	Paraleptophlebia	Less sensitive	Common	3
Mayfly	Baetis muticus	Less sensitive	Few	2
Mayfly	Baetidae	Less sensitive	Few	2
Stonefly	Leuctra	Less sensitive	Few	2
Beetle	Elmis aenea	Tolerant taxa	Few	2
Beetle	Halplidae	Tolerant taxa	Few	2
Beetle	Dytiscidae	Tolerant taxa	Few	2
Caseless Caddis	Polycentropodidae	Tolerant taxa	Few	2
Chironomids	Chironomidae	Tolerant taxa	Dominant	5
Leeches	Piscicola	Tolerant taxa	Few	2
Mayfly	Serratella ignita	Tolerant taxa	Few	2
Mayfly	Baetis rhodani	Tolerant taxa	Few	2
Mayfly	Caenis	Tolerant taxa	Few	2
Shrimp	Gammarus	Tolerant taxa	Few	2
Snails	Ancylidae	Tolerant taxa	Few	2
Snails	Potamopyrgus antipodarum	Tolerant taxa	Numerous	4
Snails	Acroloxus lacustris	Tolerant taxa	Few	2
Water mites	Hydrachnidae	Tolerant taxa	Few	2
Crayfish	Austropotamobius pallipes	Tolerant taxa	Few	2
Hoglouse	Asellus	Very tolerant taxa	Few	2
Clam	Sphaeriidae	Very tolerant taxa	Few	2

Figure 30 The 2015 EPA biologist report for the Nadreegeel Lough Stream_020.

Appendix C

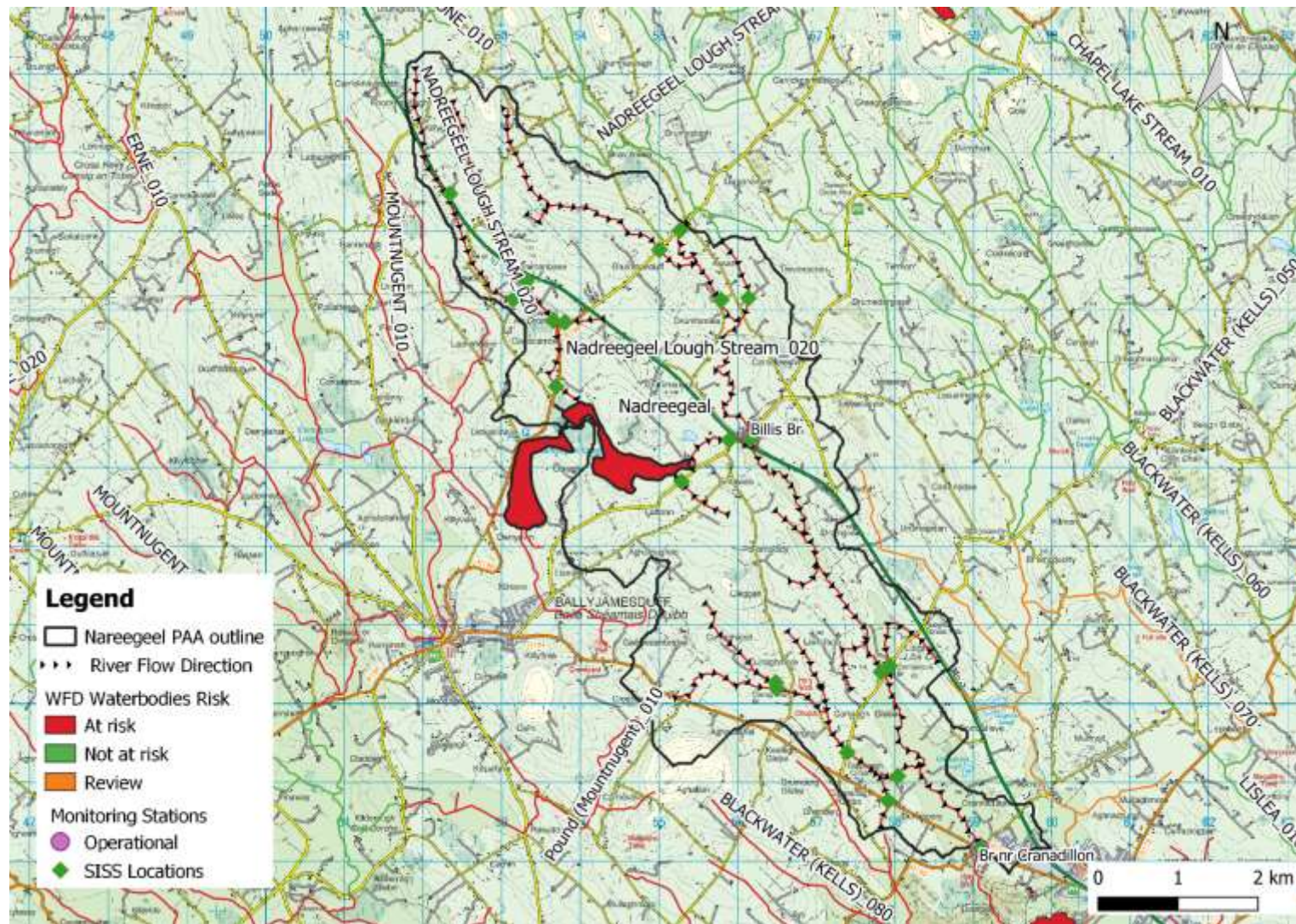


Figure 31 Initial SSIS locations for the Nadreegeel Lough Stream_020 and Nadreegeel Lough waterbodies.