

Farahy  
Priority Area for Action Desk Study  
AFA 0077  
South-West Region



*Photograph of the WFD operational monitoring point at the Bridge Ballyshonock, taken on 26<sup>th</sup> of April 2019*

**Disclaimer:**

Although every effort has been made to ensure the accuracy of the material contained in this publication, complete accuracy cannot be guaranteed. The Local Authority Waters Programme (LAWPRO) nor the author(s) accept any responsibility whatsoever for loss or damage occasioned, or claimed to have been occasioned, in part or in full as a consequence of any person acting or refraining from acting, as a result of a matter contained in this publication.

Copyright ©LAWPRO, February 2020

This report cannot be reproduced without the prior written consent of LAWPRO.

## Table of Contents

Acknowledgements.....	3
Summary .....	4
1 Background .....	5
1.1 Location of Farahy Priority Area for Action and Reasons for Selection.....	5
1.2 Waterbody information .....	9
2 Receptor Assessment.....	11
2.1 Overview table .....	12
2.2 Q values.....	14
2.3 Hydrochemistry.....	17
2.4 Summary of Issues .....	19
3 Significant pressures .....	20
3.1 Initial EPA characterisation .....	20
3.2 Conclusions on the Significant Pressures.....	21
4 Pathways Information (diffuse pollution) .....	22
4.1 Conceptual Model Development .....	22
5 Interim conclusions on the PAA.....	28
6 Workplan.....	29
6.1 EPA further characterisation actions .....	29
6.2 Additional Information Requirements .....	30
6.3 Local Catchment Assessment.....	30
7 Review of possible mitigation options.....	32
8 Communications .....	33
9 Appendices.....	34

## List of Figures

Figure 1-1: Farahy Waterbodies .....	6
Figure 1-2: Farahy Priority Area for Action WFD Risk Map.....	7
Figure 1-3: Upper Caragh Priority Area for Action Ecological status (2015).....	8
Figure 2-1: WFD monitoring stations.....	11
Figure 2-2: Q value, at Br at Ballyshonock, Farahy_010 .....	14
Figure 2-3: Q value, at Br nr Ballyguyroe North, Farahy_010.....	15
Figure 2-4: Q value, at 1st Br d/s Farahy, Farahy_020.....	15
Figure 2-5: Annual average Total Oxidised Nitrogen levels (as N), at Br nr Ballyguyroe North, Farahy_010 .....	17
Figure 2-6: Annual average ammonia levels (as N), at Br nr Ballyguyroe North, Farahy_010 .....	17
Figure 2-7: Annual average ortho-Phosphate levels (as P), at Br nr Ballyguyroe North, Farahy_010..	18
Figure 2-8: BOD results at Br nr Ballyguyroe North, Farahy_010 .....	18
Figure 3-1: Conceptual Model .....	23
Figure 7-1: Sample locations for Farahy PAA.....	31
Figure 9-1: Pollution impact potential: surface water receptor phosphate PIP Map.....	34
Figure 9-2: Pollution impact potential: surface water receptor nitrate PIP Map.....	35
Figure 9-3: Pollution impact potential: ground water receptor nitrate PIP Map .....	36
Figure 9-4: Near Surface Phosphate Susceptibility.....	37
Figure 9-5: Soils Wet/Dry .....	38
Figure 9-6: Aquifer Vulnerability.....	39
Figure 9-7: Subsoil Permeability .....	40
Figure 9-8: Aquifer Type .....	41
Figure 9-9: Ground Waterbodies .....	42
Figure 9-10: Soil Type.....	43
Figure 9-11: Bedrock Aquifer .....	44
Figure 9-12: Land Use .....	45

## List of Tables

Table 1-1: Background information on the Farahy Priority Area for Action.....	5
Table 1-2: Summary table of individual waterbodies within the Farahy Priority Area for Action .....	9
Table 1-3:Monitoring point locations .....	10
Table 2-1: Receptor information for Farahy_010 and Farahy_020 .....	12
Table 2-3: Table of Q values.....	16
Table 3-1: Initial EPA characterisation .....	20
Table 4-1: Conceptual model.....	25
Table 7-1: EPA further characterisation actions .....	29

## Acknowledgements

The authors would like to acknowledge the contribution of Cork County Council staff to this report and thank them for their support of the Local Authority Waters Programme. The Council has carried out a significant amount of work in the Farahy catchment in recent years.

## Summary

The Farahy Priority Area for Action (PAA) consists of two waterbodies (Farahy\_010 and Farahy\_020). The river, which is a tributary of the Munster Blackwater, was selected as a PAA to build on completed and ongoing work by community groups in the area. The waterbodies are failing to achieve good ecological status and water quality status has deteriorated in both waterbodies. Also, the Funshion\_050 (receiving waters), which is a High Status Objective waterbody has dropped to Good status.

The Farahy\_010 is 7.03 km in length. Currently this waterbody is at moderate ecological status with biology (invertebrates) driving status. Available results indicate that sediment may be the significant issue and the significant pressures are forestry and anthropogenic activities (recreational facility). Surface pathways therefore need to be the focus for assessment.

Farahy\_020 is 6.78 km in length. No chemistry data are available for this waterbody but land use, soil and aquifer type indicate that the issue here may be nutrients (both phosphate and nitrate) from agriculture, diffuse and point sources. Land use and management must be investigated in this PAA. Both surface and groundwater flowpaths may potentially be delivering nutrients to the river.

### Recommended Actions:

- On Farahy\_010 undertake SSIS upstream and downstream of the Ballyguyroe landfill site. Also take samples for ammonia, ortho-Phosphate and total oxidised nitrogen (TON). Then undertake SSIS at the Autocross site. Assess siltation upstream and downstream of this point source. Finally undertake SSIS at the Br nr of Ballyguyroe and the Br at Ballyshonock. Also take samples for ammonia, ortho-Phosphate and TON at the Br at Ballyshonock. Take note of point sources of sediment from agriculture and/or forestry. Assess siltation upstream and downstream of any point sources. The results of this will inform if forestry and/or anthropogenic pressures are causing siltation and where they are located.
- On Farahy\_020 undertake SSIS at the tributary next to the Br at Ballyshonock. Assess siltation upstream and downstream of any point sources. Agriculture and forestry occur along the tributary stream. If the condition is less than good, undertake SSIS assessment further up the tributary stream. Carry out a SSIS assessment and take note of point sources of sediment from agriculture and/or forestry. The results of this will inform if agriculture and/or forestry is causing a sediment problem here. Finally undertake SSIS at the 1st Br d/s Farahy. Also take sample for ammonia, ortho-Phosphate and TON. The results of this will inform if forestry and/or agriculture are causing siltation and/or nutrients here. Take note of sediment.

Information from this first LCA will inform the extent of additional assessment and stream walks needed.

# 1 Background

## 1.1 Location of Farahy Priority Area for Action and Reasons for Selection

The Farahy River is a tributary of the Munster Blackwater. The river comprises two waterbodies (Farahy\_010 and Farahy\_020), both of which make up the priority area for action (PAA).

The Farahy river has been selected as a PAA to build on completed and ongoing work by community groups in the area. Status has deteriorated in the river with both waterbodies at Moderate status. Also, the Funshion\_050 (receiving waterbody) which is a High Status Objective waterbody, has dropped to Good status.

Table 1-1: Background information on the Farahy Priority Area for Action

Priority Area for Action	Catchment No.	Catchment Name	Sub catchment	Region	Local Authority
Farahy	18	Blackwater (Munster)	18_22 Funshion_SC_020	Southwest	Cork

Priority Area for Action	No. of At Risk WBs	No. of Review WBs	No. of dRBMP Prioritised WBs	No. of WBs for Status Improvement		
				2021	2027	Beyond 2027
Farahy	2	0	2	1	1	0

Farahy Priority Area for Action Desk Study

A map of the Farahy waterbodies is presented in figure 1.1 below:

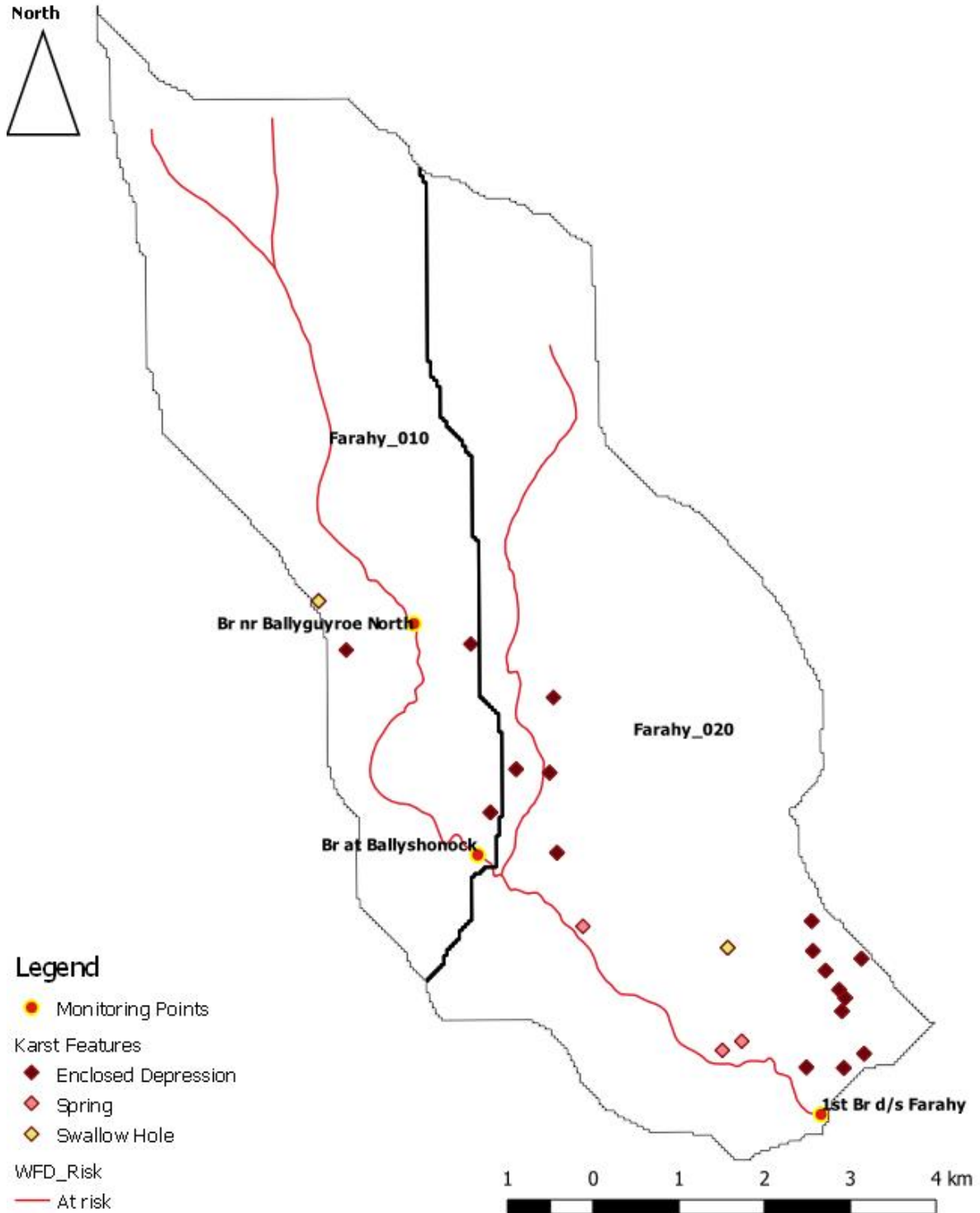


Source: EPA

Figure 1-1: Farahy Waterbodies

Farahy Priority Area for Action Desk Study

The Farahy River waterbody risk and status maps are shown on figures 1.2 and 1.3 respectively, with monitoring point locations.



Source: EPA 2018

Figure 1-2: Farahy Priority Area for Action WFD Risk Map

Farahy Priority Area for Action Desk Study

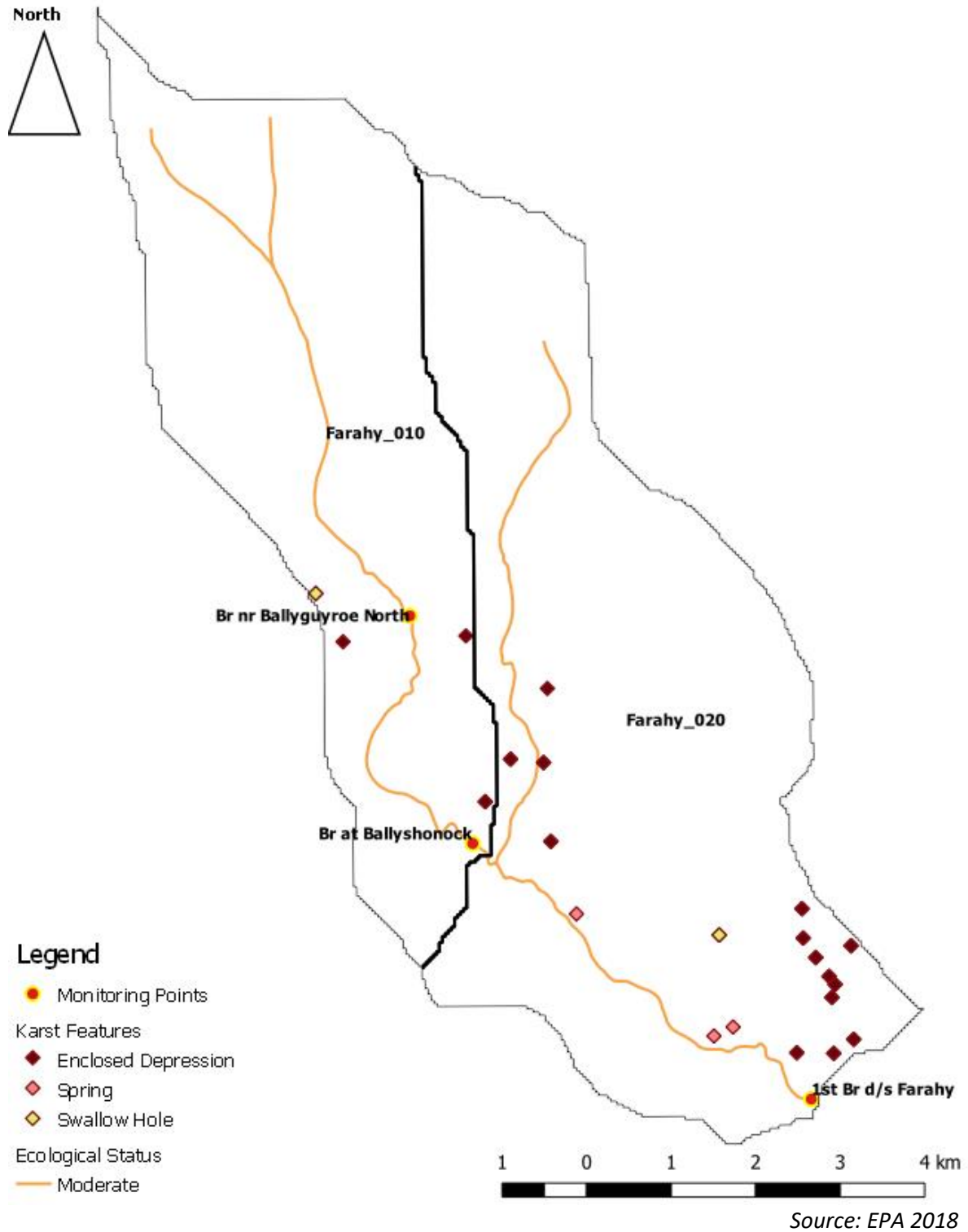


Figure 1-3: Upper Caragh Priority Area for Action Ecological status (2015)

## 1.2 Waterbody information

Table 1.2 outlines summary status and pressure information on each waterbody. Details of monitoring points on each waterbody are provided in table 1.3 and shown on the map in figure 1.1 above.

Table 1-2: Summary table of individual waterbodies within the Farahy Priority Area for Action

Water body Code	Water body Name	Water body Type Name	Date to meet Environmental Objective	Risk	Status Objective	Ecological Status			Pressures		
						07-09	10-12	10-15	Category	Sub Category	Significant
IE_SW_18F010300	Farahy_010	River	2021	At Risk	Good	Good	Good	Moderate	Forestry	Clearfelling	Yes
						High	Good	Moderate	Anthropogenic Pressures	Unknown	Yes
IE_SW_18F010500	Farahy_020	River	2027	At Risk	Good	Good	Moderate	Moderate	Forestry	Clearfelling	Yes
									Agriculture	Agriculture	Yes

Source: EPA 2018

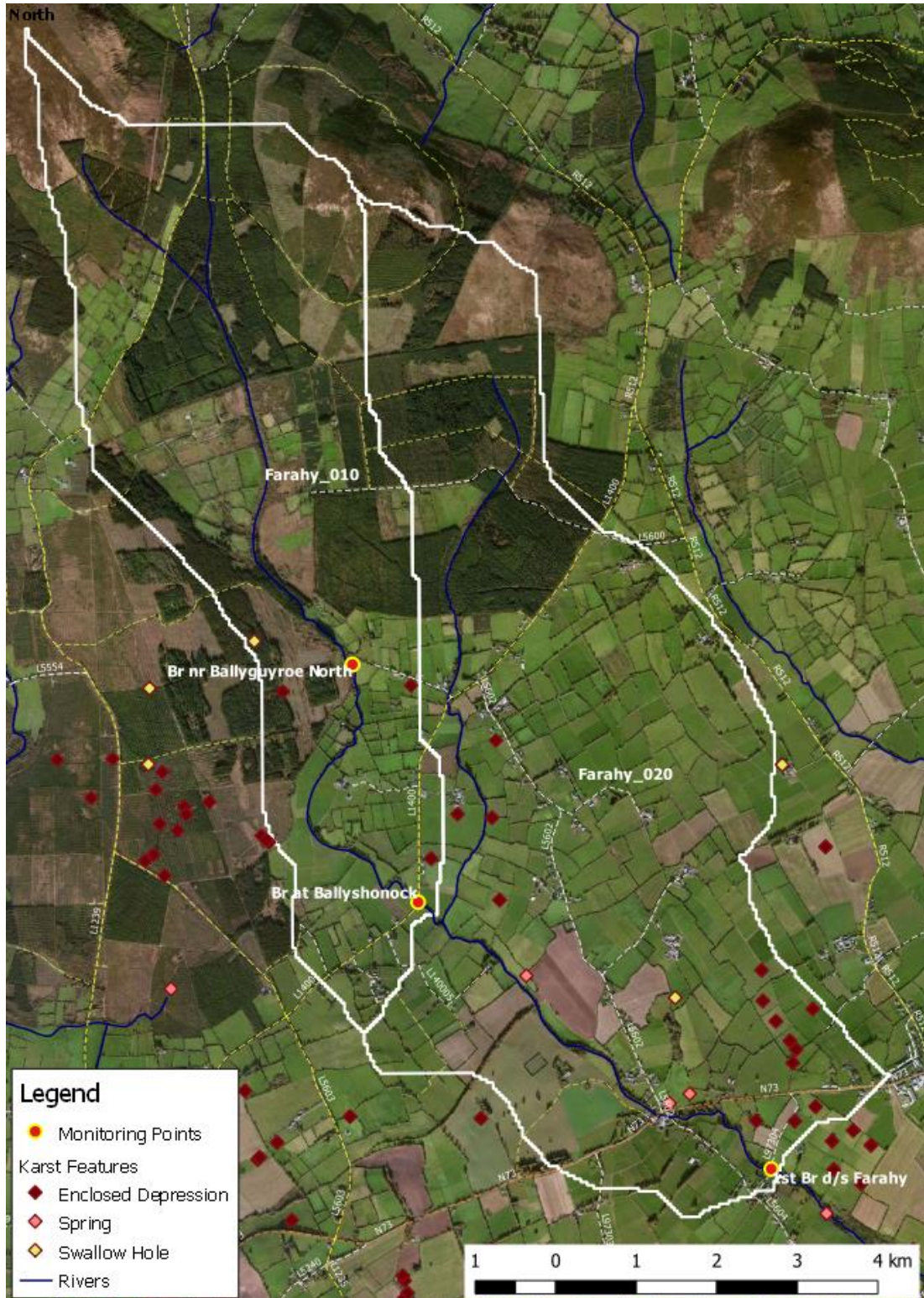
Table 1-3:Monitoring point locations

Waterbody	Monitoring Point Code	Name	Type	Comments
Farahy_010	RS18F010200	Br nr Ballyguyroe North	Operational	Includes Q data and chemistry data
	RS18F010300	Br at Ballyshonock	Operational	Includes Q data only
Farahy_020	RS18F010500	1st Br d/s Farahy	Operational	Includes Q data only

Source: EPA 2018

## 2 Receptor Assessment

Monitoring stations are shown on the map below:



Source: EPA

Figure 2-1: WFD monitoring stations

## 2.1 Overview table

Information on the receptor, including summary results for each operational monitoring point, is provided in table 2.1:

Table 2-1: Receptor information for Farahy\_010 and Farahy\_020

		Figures Tables	Farahy_010		Farahy_020
<b>Risk Category</b>			<i>At risk</i>		<i>At risk</i>
<b>Monitoring station</b>			RS18F010200	RS18F010300	RS18F010500
<b>Biological Status (Inverts)</b>	<b>2010-2015</b>	y	Moderate (3/4)	Moderate (3/4)	Moderate (3/4)
	<b>preliminary results 2018</b>		Moderate (3/4)	Moderate (3/4)	Moderate (3/4)
	<b>Trends in Q values</b>		Good status in 2012.	Good status in 2012.	Moderate status since 2012.
<b>Biological Status (fish)</b>			No data	No data	No data
<b>Hydrochemistry Data</b>					
<b>Ortho-P (mg/l P)</b>	<b>Baseline</b>	y	0.013ppm 2015 (Baseline 0.010)	No data	No data
	<b>Indicative quality</b>		High	No data	No data
	<b>Trends - significant?</b>		Yes, downwards	No data	No data
	<b>Distance to threshold</b>		Far	No data	No data
<b>NH4-N (mg/l N)</b>	<b>Baseline</b>	y	0.026ppm 2015 (Baseline 0.027)	No data	No data
	<b>Indicative quality</b>		High	No data	No data
	<b>Trends - significant?</b>		Yes, upwards	No data	No data
	<b>Distance to threshold</b>		Far	No data	No data
<b>TON (mg/l N)</b>	<b>Baseline</b>	y	0.675 ppm 2015 (Baseline 0.583)	No data	No data
	<b>Indicative quality</b>		Good	No data	No data

Farahy Priority Area for Action Desk Study

	Figures Tables	Farahy_010		Farahy_020
<b>Trends - significant?</b>		Yes, upwards	No data	No data
<b>Distance to threshold</b>		Far	No data	No data
<b>Supporting Conditions</b>	<b>Chemical conditions</b> <b>Oxygenation Conditions</b> <b>Acidification Conditions</b>	Pass	No data	No data
<b>Hydromorphology</b>				
<b>RHAT score</b>		No data	No data	No data
<b>Evidence of Arterial drainage</b>		No	No	No
<b>Ecological Status (2010–2015)</b>		<b>Moderate</b>		<b>Moderate</b>
<b>Trends (2010-2015)</b>		Good status in 2012.		Moderate status since 2012.
<b>Protected Areas</b>		Blackwater River SAC		Blackwater River SAC
<b>WFD Objective</b>		<b>Good</b>		<b>Good</b>
<b>EPA biologist notes (if any)</b>		Extract: There is a lot of forestry in the small portion of this water body that falls in Limerick. IA1 to FS		IA1 to forestry service as above. Water Quality Assessment-Funshion River and its tributaries Report 2015 noted elevated BOD at (18F010500).
<b>Significant issue/impact for receptor</b>		Sediment issue (Focus on forestry). See section 2.4		BOD and Sediment issue (Focus on forestry then agriculture). See section 2.4

Source: EPA 2018

## 2.2 Q values

### Farahy\_010 (*At Risk*)

There are two operational stations on Farahy\_010 the Br nr Ballyguyroe North, RS18F010200 and the Br at Ballyshonock, RS18F010300. Q results for the monitoring point at Br at Ballyshonock are Moderate (3/4) since 2015 (see below figure 2.2). Preliminary results for 2018 indicate that biological status remains Moderate (3/4).

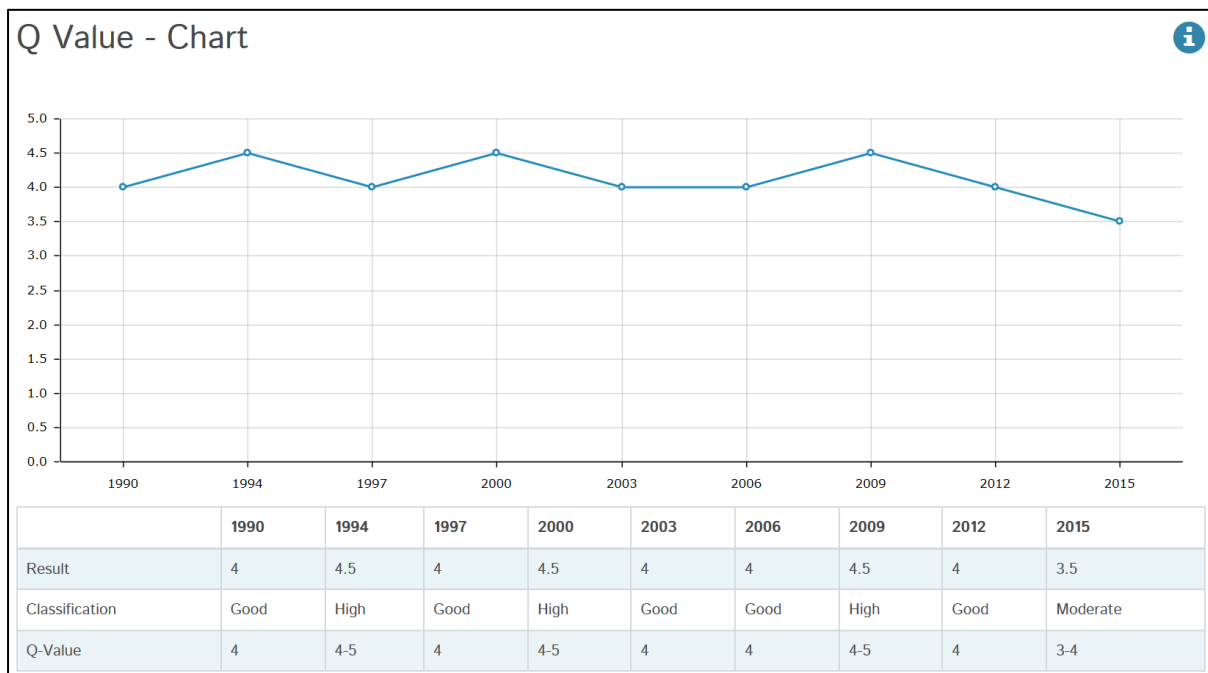


Figure 2-2: Q value, at Br at Ballyshonock, Farahy\_010

Biological monitoring results at this location deteriorated from good (Q4) in 2012 to moderate (Q3/4) in 2015. Q values are graphed below in figure 2.3. Preliminary results for 2018 indicate that biological status remains Moderate (Q3-4).

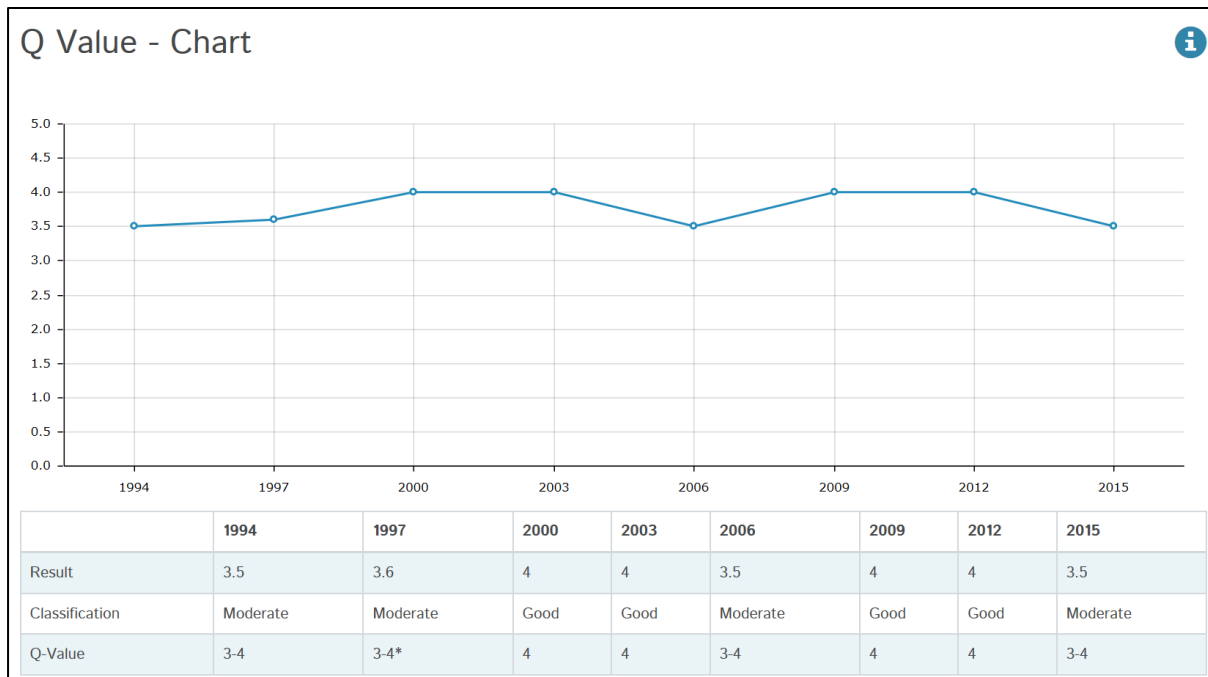


Figure 2-3: Q value, at Br nr Ballyguroe North, Farahy\_010

#### Farahy\_020 (At Risk)

There is one operational station on Farahy\_020 the 1st Br d/s Farahy, RS18F010500. Q results for the monitoring point on have been consistently moderate (Q3/4) since 2012 (see below figure 2.4). Preliminary results for 2018 indicate that biological status remains Moderate (Q3-4).

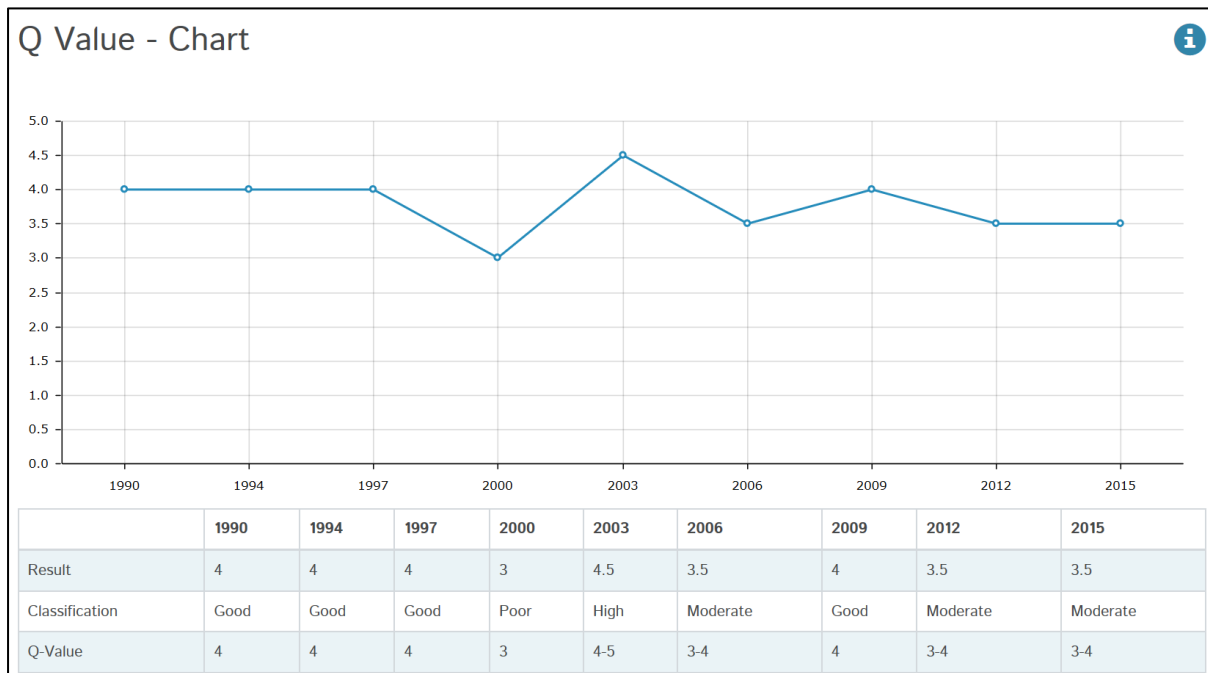


Figure 2-4: Q value, at 1st Br d/s Farahy, Farahy\_020

Farahy Priority Area for Action Desk Study

Table 2-2: Table of Q values

Water body Name	Monitoring Point	1990	1994	1997	2000	2003	2006	2009	2012	2015	Preliminary results 2018
FARAHY_010	Br nr Ballyguyroe North	-	Moderate	Moderate	Good	Good	Moderate	Good	Good	Moderate	Moderate
	Br at Ballyshonock	Good	High	Good	High	Good	Good	High	Good	Moderate	Moderate
FARAHY_020	1st Br d/s Farahy	Good	Good	Good	Poor	High	Moderate	Good	Moderate	Moderate	Moderate

Source: EPA 2018

### 2.3 Hydrochemistry

Annual average TON results for Farahy\_010 are satisfactory (see below figure 2.5).

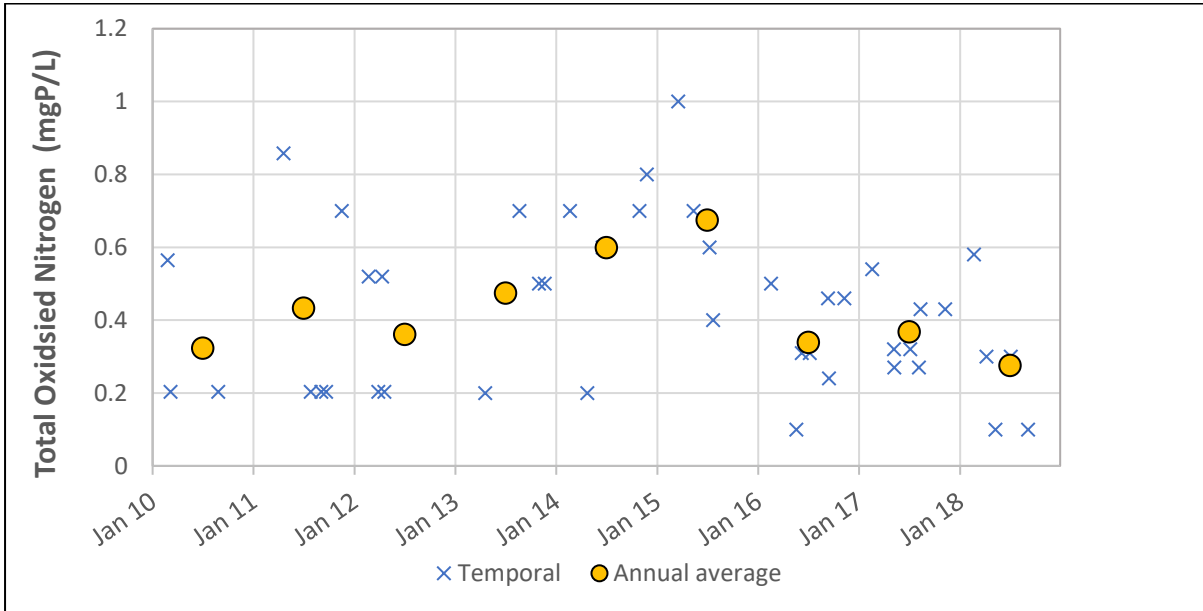


Figure 2-5: Annual average Total Oxidised Nitrogen levels (as N), at Br nr Ballyguyroe North, Farahy\_010

Annual average ammonia concentrations are low. The result for 2018 was 0.015mg/l. Results are stable with a slight upward trend. Note baseline figure was slightly higher with 0.023mg/l mean EQS (see below figure 2.6).

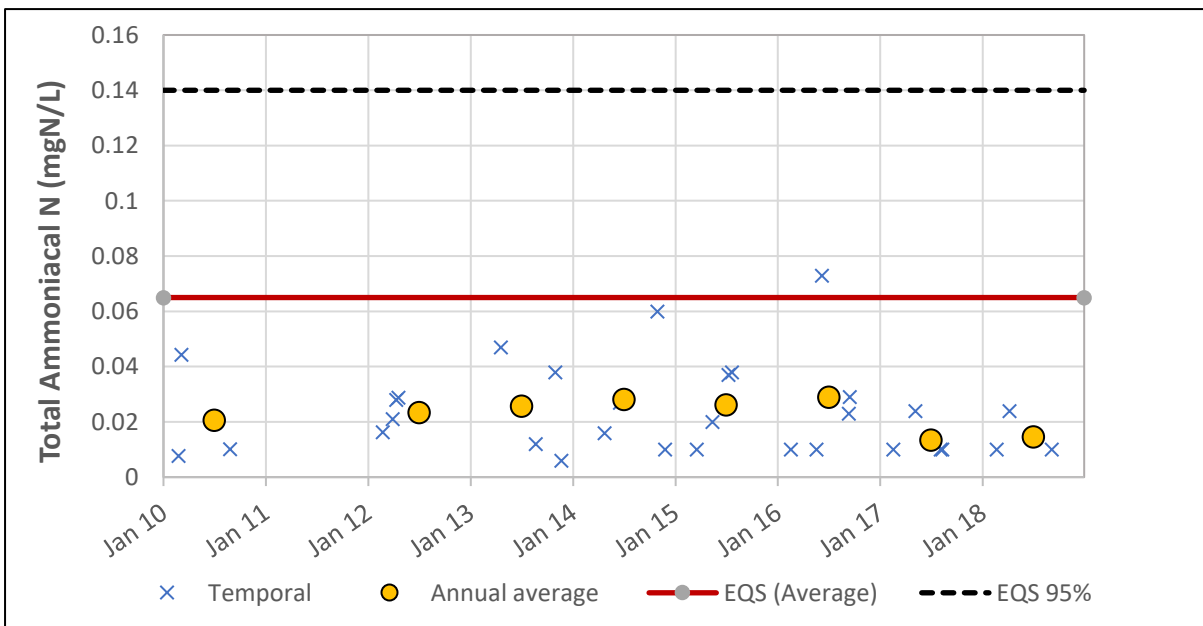


Figure 2-6: Annual average ammonia levels (as N), at Br nr Ballyguyroe North, Farahy\_010

Farahy Priority Area for Action Desk Study

Annual average orthophosphate levels are low (the result for 2018 was 0.008mg/l) and are stable with a downwards trend (see below figure 2.7). The Indicative quality is high.

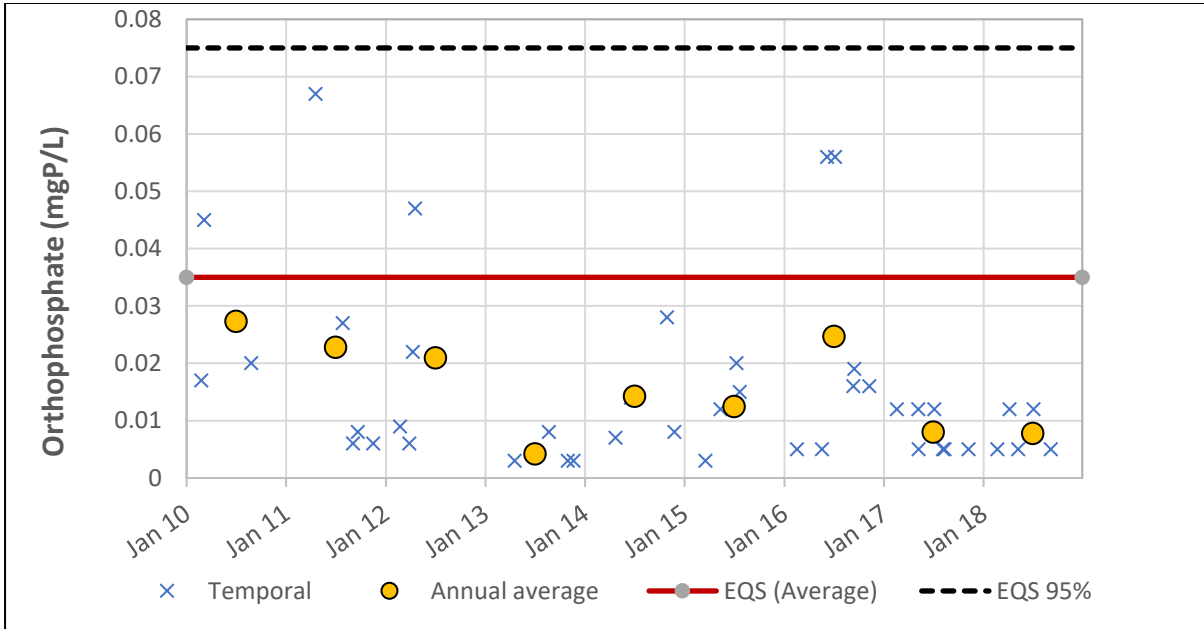


Figure 2-7: Annual average ortho-Phosphate levels (as P), at Br nr Ballyguyroe North, Farahy\_010

BOD results are graphed in figure 2.8 (from WFD App). There are periodic spikes apparent, up to 5.2 mg/l, but these don't appear to be seasonal.

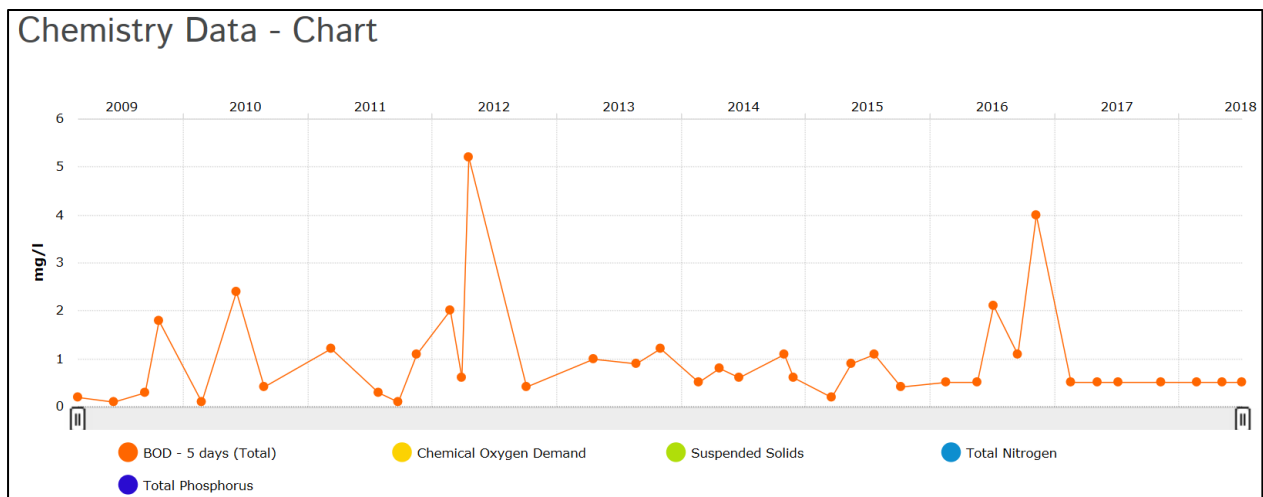


Figure 2-8: BOD results at Br nr Ballyguyroe North, Farahy\_010

## 2.4 Summary of Issues

### Farahy\_010 (*At Risk*)

Farahy\_010 is at moderate status at both monitoring sites and is *At Risk*. The WFD App lists forestry and anthropogenic pressures as the significant pressures on the waterbody and Cork County Council have advised that management of runoff from a local recreational facility may have contributed to the water quality deterioration here.

Biological status for the monitoring points has been Moderate since 2015. Chemistry results indicate that nutrients are not the significant issue in this waterbody. This is supported by the PIP maps for the catchment (see figure 9.1) with low risk of surface P except in the lower reaches of Farahy\_010. Sediment may be the significant issue on this waterbody. Flow paths for pollutant transfer are likely to be via diffuse overland flow and land drains with possible contribution from small point sources).

Land use maps show that the bulk of Farahy\_010 is under forestry. Land use and land management, including forestry and the recreational facility on Farahy\_010 must be investigated to confirm the significant issue and significant pressure/s here.

### Farahy\_020 (*AT Risk*)

Farahy\_020 is at moderate status and is *At Risk*. There are no chemistry data available for this station. The WFD App gives the significant pressure as forestry (clearfelling) and agriculture. Land use and soil type indicate that the issue on Farahy\_020 may be phosphate; the PIP maps indicate that the upstream area is high rank for surface phosphate (see figure 9.1). There is also potential for sediment loss to the river from this area. To the south on Farahy\_020, the nature and vulnerability of the underlying aquifer indicates potential for groundwater pathways to deliver nutrients to the river.

A report on the Water Quality Assessment of the Funshion River and its tributaries was provided to the LAWPRO scientist by the Mitchelstown and Kildorrery Trout Anglers Association. The study which was undertaken in 2015, noted elevated BOD at EPA monitoring station 1<sup>st</sup> Bridge d/s Farahy (RS18F010500). This is potentially indicative of point source pollution.

### 3 Significant pressures

#### 3.1 Initial EPA characterisation

Table 3-1: Initial EPA characterisation

Waterbody Name	Id	Category	Sub Category	Name	Significant	Pressure & Impact details
Farahy_010	WBP0004294	Forestry	Clearfelling	n/a	Yes	Altered habitat due to Morphological changes
	WBP0005749	Anthropogenic Pressures	Unknown	n/a	Yes	Altered habitat due to Morphological changes
Farahy_020	WBP0004295	Forestry	Clearfelling	n/a	Yes	Altered habitat due to Morphological changes
	WBP0005750	Agriculture	Agriculture	n/a	Yes	Nutrient Pollution  Altered habitat due to Morphological changes

## 3.2 Conclusions on the Significant Pressures and Issues

### Farahy\_010

The WFD App lists the significant pressures on Farahy\_010 as forestry and anthropogenic pressures. Biological status at the two operational monitoring points on Farahy\_010 has been Moderate (Q3/4) since 2015. Nutrients don't seem to be the issue impacting on the invertebrates in this waterbody. Sediment is likely to be the significant issue in this waterbody, arising from either forestry or a local recreational facility or both.

### Farahy\_020

The WFD App lists the significant pressure on Farahy\_020 as forestry and agriculture. As there are no water chemistry data available it is difficult to know which pollutant is impacting the invertebrates here. Biological status at the operational monitoring point on Farahy\_020 has been consistently moderate (Q3/4) since 2012. Land use and soil type indicate that the issue here may be phosphate in the upper reaches (also see figure 9.1, surface P PIP maps) and/or nitrate via groundwater flowpaths in the lower reaches of the waterbody. Forestry and agriculture on the poorly draining soils may have resulted in sediment issues on Farahy\_020. In addition, a report on the Water Quality Assessment of the Funshion River and its tributaries noted elevated BOD at the WFD operational monitoring station.

## 4 Pathways Information (diffuse pollution)

### 4.1 Conceptual Model Development

The conceptual model is based largely on a combination of aquifer type and groundwater vulnerability, soil type, PIP maps and susceptibility maps.

The centre of the PAA overlies the Ballyhoura Kiltorcan groundwater body (regionally important aquifer-fissured bedrock) with poorly draining soils and moderate groundwater vulnerability. Groundwater nutrient pathways are unlikely to be significant here. Lands to the north (mainly in Farahy 10) overlie the Ballyhoura groundwater body (locally important aquifer) with mainly poorly draining soils, therefore groundwater pathways are unlikely to be significant here also.

The significant issue in Farahy\_020 could potentially be nutrients and/or sediment. The lower section of Farahy\_020 overlies the Mitchelstown groundwater body (regionally important aquifer-karstified (diffuse) (see figure 9.9) with shallow well-draining soils and mainly high to extreme groundwater vulnerability. Groundwater pathways for nutrient transfer to the river are likely to exist in this area, indicating that the lower section of this aquifer should be considered as a separate compartment.

The remainder of the PAA above this is considered as one compartment due to the presence of mainly poorly draining soils overlying (predominantly) a locally important aquifer. However particular attention should be paid to the high PIP and high surface P susceptibility area running across the lower section of Farahy\_010 and the upper section of Farahy\_020 (see figure 9.4) due to the increased risk of surface pathways for phosphate here.

The conceptual model is shown in figure 4.1 below with details provided in table 4.1.

Conceptual Model Map

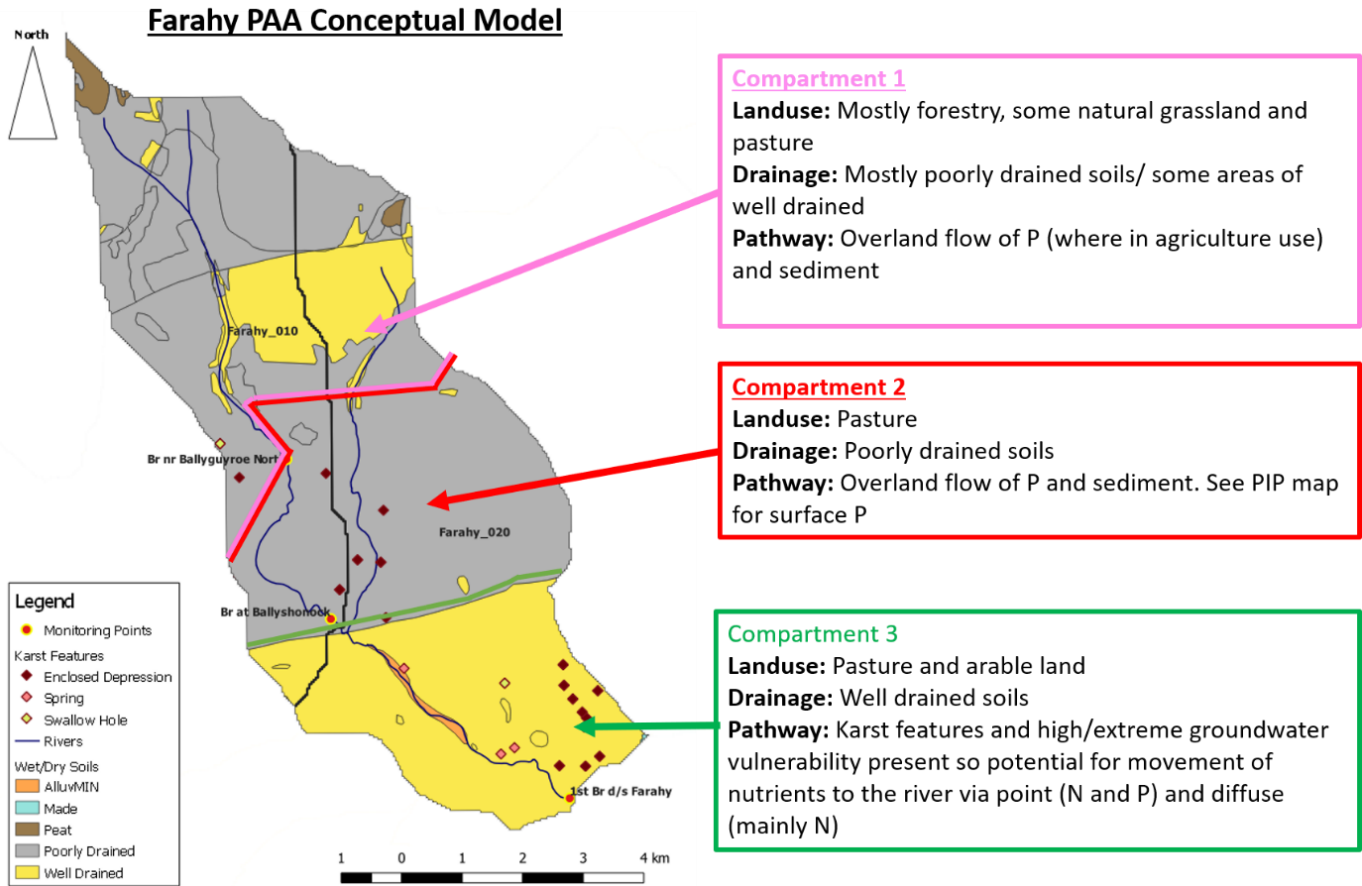


Figure 3-1: Conceptual Model

Compartment 1 corresponds to the north of PAA (mainly in Farahy 10) overlies the Ballyhoura groundwater body. Most of the area is covered by poorly draining soils as can be seen in figure 3.1. The main flow paths including drains are diffuse overland flow for surface phosphate (and potentially sediment). The compartment is high risk for surface P loss (see figure 9.1). These areas should be the focus for stream walks in assessing phosphate (and potentially sediment). Note that there are a few areas of well-draining soil. The main flowpaths in these areas are near surface recharge via outcrops. There may be limited phosphate contribution via this pathway but it is likely to be insignificant in comparison to the overall loadings on the catchment. Therefore, this area will not be considered for this assessment.

Compartment 2 corresponds to the high PIP areas for surface phosphate (and potentially sediment). The surface phosphate PIP map shows areas of high/very high PIP Rank in this compartment and these areas should be the focus for stream walks in assessing phosphate (and potentially sediment) loadings. There is also potential for both nitrate and phosphate to move to the river via groundwater flow paths in the karst areas of this compartment.

Compartment 3 corresponds to the lower part of the Mitchelstown groundwater body, regionally important karstified aquifer (Rkd) overlain by well drained soils. Surface phosphate pathways would not be expected here except possibly in areas where soils are thin, with rock near surface. Nitrate PIP maps indicate high risk of nitrate loss via groundwater flowpaths.

Farahy Priority Area for Action Desk Study

Table 4-1: Conceptual model

Factor	Map Y/N	Description and relevance		
		Compartment 1	Compartment 2	Compartment 3
<b>Location</b>	y	North of the PAA (mainly in Farahy_10) overlies the Ballyhoura groundwater body	Centre of the PAA overlies the Ballyhoura Kiltorcan groundwater body	Lower section of Farahy_020 overlies the Mitchelstown groundwater body
<b>Topography</b>		Upland	Steeply sloping	Steeply sloping
<b>Soil type</b>	y	AminSRPT (shallow, lithosolic-podzolic type soils potentially with peaty topsoil), AminPDPT (Poorly drained soils with peaty topsoil), AminDW (deep well drained soils), AminPD, (deep poorly drained soils), BktPt (Blanket Peats), AminSW (shallow well drained soils), AminSP (shallow poorly drained soils), Scree	AminPD, (deep poorly drained soils), AminDW (deep well drained soils), BminSW (shallow well drained soils), AminPDPT (Poorly drained soils with peaty topsoil)	AminDW (deep well drained soils), AlluvMIN (Mineral alluvium), BminSW (shallow well drained soils)
<b>Subsoil type</b>	y	TDSs (Sandstone till Devonian), RckNCa (Bedrock at surface-Non calcareous), BktPt (Blanket Peats), TLPSS (Lower Palaeozoic Sandstone and shale till), Scree	TDSs (Sandstone till Devonian), RckNCa (Bedrock at surface-Non calcareous)	TDSs (Sandstone till Devonian), RckNCa (Bedrock at surface-Non calcareous), A (Alluvium undifferentiated)
<b>Subsoil permeability</b>	y	Mostly low and subsoil less than 3 metres	Mostly moderate; localised areas of low and subsoil less than 3 metres	Mostly moderate and subsoil less than 3 metres
<b>Soil drainage</b>	y	Mostly poorly drained; small part of well drained	Poorly drained soil	Well drained soil
<b>Gwb</b>	y	Ballyhoura groundwater body	Mitchelstown and Ballyhoura Kiltorcan groundwater bodies	Mitchelstown groundwater bodies
<b>Gwb flowpath</b>		These rocks have no intergranular permeability. Groundwater flow occurs in faults and joints. Most groundwater flow probably occurs in an upper shallow weathered zone. Below this in the deeper zones water-bearing fractures and fissures are less frequent and less well	Groundwater flow generally occurs through faults and joints. In general, groundwater flow is concentrated in the upper 30 m of the aquifer, although deeper inflows can be encountered. The upper half of the Kiltorcan Sandstones is generally the most permeable. Groundwater flow is influenced by topography and	Groundwater flows through the many faults and joints formed by deformation that were subsequently enlarged by karstification. Most groundwater flow occurs in an upper shallow highly karstified weathered zone of a few metres thick in which groundwater moves quickly in rapid response to recharge. Below this is a deeper zone where

Farahy Priority Area for Action Desk Study

Factor	Map Y/N	Description and relevance		
		Compartment 1	Compartment 2	Compartment 3
		connected. The water table is generally within 10 m of the surface. Groundwater in this groundwater body is generally unconfined. Local groundwater flow is towards the rivers and streams, and flow path will not usually exceed a few hundred metres in length.	groundwater flow will be to the south and west away from the higher ground towards the valleys. The groundwater body is recharged diffusely via rainfall percolating through the subsoil over the groundwater body and by runoff from the Ballyhoura and Galtee Mountains to the north and east. Most of the recharge to the aquifer will take place in the unconfined portion of the groundwater body, where the subsoil cover is less than 5 m and where the aquifer is most vulnerable to pollution.	there are two components to groundwater flow. Groundwater flows through interconnected, solutionally enlarged conduits and cave systems that are controlled by structural deformation. Groundwater flow paths can be up to several kilometres long, but may be significantly shorter in areas where the water table is very close to the surface. Overall groundwater flow is away from the surrounding uplands to the main rivers draining the valleys. Recharge to this groundwater body is both point and diffuse. The uplands surrounding this groundwater body provide runoff which supplies recharge to the limestone aquifer in the valley. Swallow holes, collapse features and sinking streams provide the means for point recharge to the karstified aquifer. Diffuse recharge will occur over the entire groundwater body via rainfall percolating through the subsoil. The lack of surface drainage in much of this groundwater body indicates that potential recharge readily percolates into the groundwater system. There is a high degree of interaction between surface water and groundwater in this groundwater body.
<b>Bedrock unit</b>	y	Devonian Old Red Sandstones	Devonian Kiltorcan Sandstones	Dinantian Pure Unbedded Limestones
<b>Aquifer type</b>	y	Mostly LI	Rkd (Regionally important karstified aquifer) and Rf (Regionally important fissured aquifer),	Rkd (Regionally important karstified aquifer)
<b>Groundwater vulnerability</b>	y	Mostly X, extreme and high; some areas of low and moderate	Mostly moderate, some areas of high and extreme	Mostly extreme and high; some areas of moderate
<b>Karst features</b>	y	Enclosed depressions and swallow holes	Enclosed depressions	Enclosed depressions, swallow holes and springs
<b>PO4 susceptibility (surface)</b>	y	Mainly moderate and high on the poorly drained soil. Locally low on well drained soils	High due to poorly drained soil.	Very low due to well drained soil

Farahy Priority Area for Action Desk Study

Factor	Map Y/N	Description and relevance		
		Compartment 1	Compartment 2	Compartment 3
<b>NO3 susceptibility (sub surface)</b>		Mostly low/very low. Locally high/very high.	Mainly low	Moderate/high
<b>NO3 susceptibility (surface)</b>		Mostly low/very low. Locally moderate.	Low on the poorly drained soil.	Moderate/high on the well drained soil
<b>Po4 PIP (Surface water)</b>	y	Mostly low as there is a lot of forestry. Locally moderate/high where poorly drained soil in agriculture.	Very high/high as poorly drained soil in agriculture.	Low as well drained in agriculture.
<b>NO3 PIP (ground water)</b>	y	Very low.	Very low.	Moderate/high.
<b>NO3 PIP (Surface water)</b>	y	Mostly very low. Very locally high/very high on the well drained soil.	Mostly very low. Very locally high/very high on the well drained soil.	High/very high on the well drained soil
<b>Likely main pathway(s)</b>		Overland flow (including land drains) of P and sediment where poorly draining soils are under agricultural use	Overland flow (including land drains) of P and sediment	Karst features and high/extreme groundwater vulnerability present so potential for movement of nitrate to the river (diffuse). Also potential for N and P point sources

## 5 Interim conclusions on the PAA

### Farahy\_010

- Farahy\_010 is at Moderate ecological status and is categorised as *At Risk*.
- Biological status at the two EPA monitoring points on Farahy\_010 have been moderate (Q3/4) since 2015.
- The WFD App lists forestry and anthropogenic pressures as the significant pressures on the waterbody and Cork County Council has advised that management of runoff from a local recreational facility may have contributed to the water quality deterioration here.
- There are chemistry data available for this waterbody and results indicate that nutrients don't seem to be the issue; phosphate and ammonia results are well below the relevant EQS's. This is supported by the PIP maps for the catchment with low risk of surface phosphate except in the lower reaches of Farahy\_010.
- EPA biologist noted that "there is a lot of forestry in the small portion of this water body that falls in Limerick. Forestry is the pressure here. Need silt traps". However, it is also noted that substrate/siltation is clean.
- Sediment may be the significant issue on this waterbody.
- Elevated sediment issues may have arisen due to forestry and/or the recreational facility.
- Flow paths for pollutant transfer are likely to be via diffuse overland flow and land drains with possible contribution from small point sources).
- Land use maps show that the bulk of Farahy\_010 is under forestry.
- Land use and land management, including forestry and the recreational facility on Farahy\_010 must be investigated to confirm the significant issue and significant pressure/s here.

### Farahy\_020

- Farahy\_020 is at Moderate ecological status and is categorised as *At Risk*.
- Biological status at the operational monitoring point on Farahy\_020 have been consistently moderate (Q3/4) since 2012.
- The WFD App gives the significant pressure for Farahy\_020 as forestry (clearfelling) and agriculture.
- Land use and soil type indicate that the significant issue in Farahy\_020 may be phosphate; the PIP maps indicate that the upstream area is high rank for surface phosphate. There is also potential for sediment loss to the river from this area.
- To the south on Farahy\_020, the soil type and underlying aquifer indicates potential for groundwater pathways to deliver nutrients (N) to the river.
- As there are no water chemistry data available, it is difficult to know which pollutant is impacting the invertebrates here.
- A report on the Water Quality Assessment of the Funshion River and its tributaries undertaken in 2015 noted elevated BOD at EPA monitoring station 1<sup>st</sup> Bridge d/s Farahy (RS18F010500). This is indicative of point source pollution.
- Land use and soil type indicate that the issue here may be phosphate, sediment and/or nitrate.
- Land use and land management, including forestry and agriculture forestry on Farahy\_020 must be investigated to confirm the significant issue and significant pressure/s here.

## 6 Workplan

### 6.1 EPA further characterisation actions

Table 6-1: EPA further characterisation actions

WB Name	Id	Action	Responsible Organisation	Further Characterisation Action details
Farahy_010	FC001645	IA1 Provision of Information	Environmental Protection Agency	Notify the forestry service of impact of clearfelling in this FWPM sub-catchment.
	FC002900	IA7 Multiple Sources in Multiple Areas	Cork County Council	Confirm that forestry is the significant pressure. Assess impact from the recreational facility
Farahy_020	FC001646	IA1 Provision of Information	Environmental Protection Agency	Notify the forestry service of impact of clearfelling in this FWPM sub-catchment.
	FC002901	IA7 Multiple Sources in Multiple Areas	Cork County Council	Focus on sediment from forestry, and nutrients and sediment from agriculture.

The estimated resource for this local catchment assessment is 61 days.

## 6.2 Additional Information Requirements

- Talk to Cork County Council for further information on potential significant pressures including agriculture, forestry and Autocross site.
- Talk to local forest service regarding woodland management practices and recent felling in the catchment.

## 6.3 Local Catchment Assessment

Field investigations to be undertaken at seven locations as outlined below and as shown on figure 7.1. The focus is on elevated sediment loadings in Farahy\_010 and elevated phosphate and/or sediment loadings in Farahy\_020. Identification of tributary streams contributing sediment and/or possible phosphate loadings will help to focus the work of ASSAP in this PAA.

### Point 1 (Ballyguyroe landfill site)

- Undertake SSIS upstream and downstream of the Ballyguyroe landfill site. Also take sample for ammonia, ortho-Phosphate and TON at upstream and downstream locations (possible public perception regarding this PAA). The results of this will inform if any further investigation is required. Physical chemistry at site.

### Point 2 (Autocross site)

- Undertake SSIS upstream and downstream of the recreational facility. Take note of any sediment from this site. Assess siltation upstream and downstream of this point source. The results of this will inform if siltation is still occurring here.

### Points 3 (Br nr of Ballyguyroe, RS18F010200), 4 (Br at Ballyshonock, RS18F010300) and 5

- Undertake SSIS at these locations. Also take sample for ammonia, ortho-Phosphate and TON at point 4. Take note of point sources of sediment from agriculture and/or forestry at these locations. Assess siltation upstream and downstream of any point sources. The results of this will inform if agriculture and/or forestry is causing siltation here.

### Point 6

- If the condition of point 5 is less than good, undertake SSIS assessment at point 6. Carry out a SSIS assessment and take note of point sources of sediment from agriculture and/or forestry. The results of this will inform if agriculture and/or forestry is causing a sediment problem here.

### Point 7 (1st Br d/s Farahy, RS18F010500)

- Undertake SSIS here Also take sample for ammonia, ortho-Phosphate and TON. Note sediment levels Carry out a SSIS assessment and take samples for ammonia, orthophosphate and total oxidised nitrogen at this monitoring point. Also take note of sediment.

Farahy Priority Area for Action Desk Study

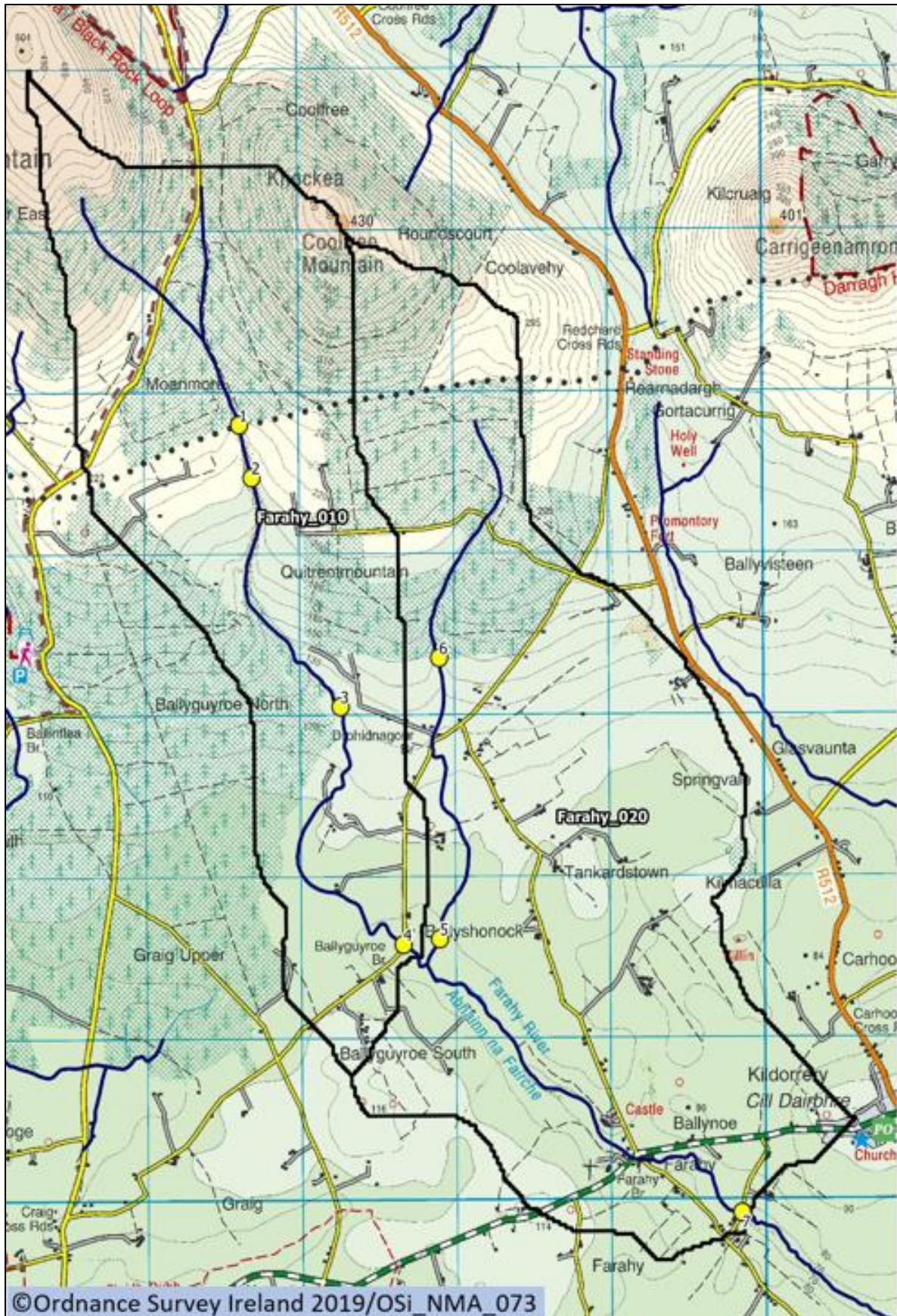


Figure 7-1: Sample locations for Farahy PAA

## 7 Review of possible mitigation options

The initial characterisation information and desk study findings identified forestry, anthropogenic pressures and agriculture as the significant pressures in this PAA. Sediment and nutrients (phosphate and possibly nitrate) are the significant issues. The local catchment assessment process will confirm the significant pressures and issues and help to inform the nature of the mitigation measures required.

If forestry is confirmed as a significant pressure here, then improved management will be required e.g. silt traps/drain blocking/carefully managed felling. Where agriculture is the significant pressure and phosphate and/or sediment are identified as the significant issue, measures should be focussed on areas of poorly draining soils to minimise loss to surface waters. Identify critical source areas and break pollutant pathways.

## 8 Communications

- Public meeting will be required for this PAA.
- According to the initial characterisation significant pressures include agricultural, forestry and anthropogenic pressures. As agriculture is a significant pressure for this catchment farm engagement will be needed. ASSAP will contact local farming community to attend public meeting.

### Key messages for this PAA

The Local Authority Waters Catchment Assessment Team is to identify areas in the catchment where significant pressures are occurring and to recommend measures to address these. This will be done by reviewing all the information available and walking the key areas in the catchment. Initial assessments have identified Forestry and anthropogenic pressures as the significant pressures in Farahy\_010. Nutrients don't seem to be the issue impacting on the invertebrates in this waterbody. Elevated sediment issues possibly from anthropogenic pressures and forestry operations may have occurred. Next steps in the catchment assessment will be to undertake SSIS and water quality samples assessments on the Farahy\_010.

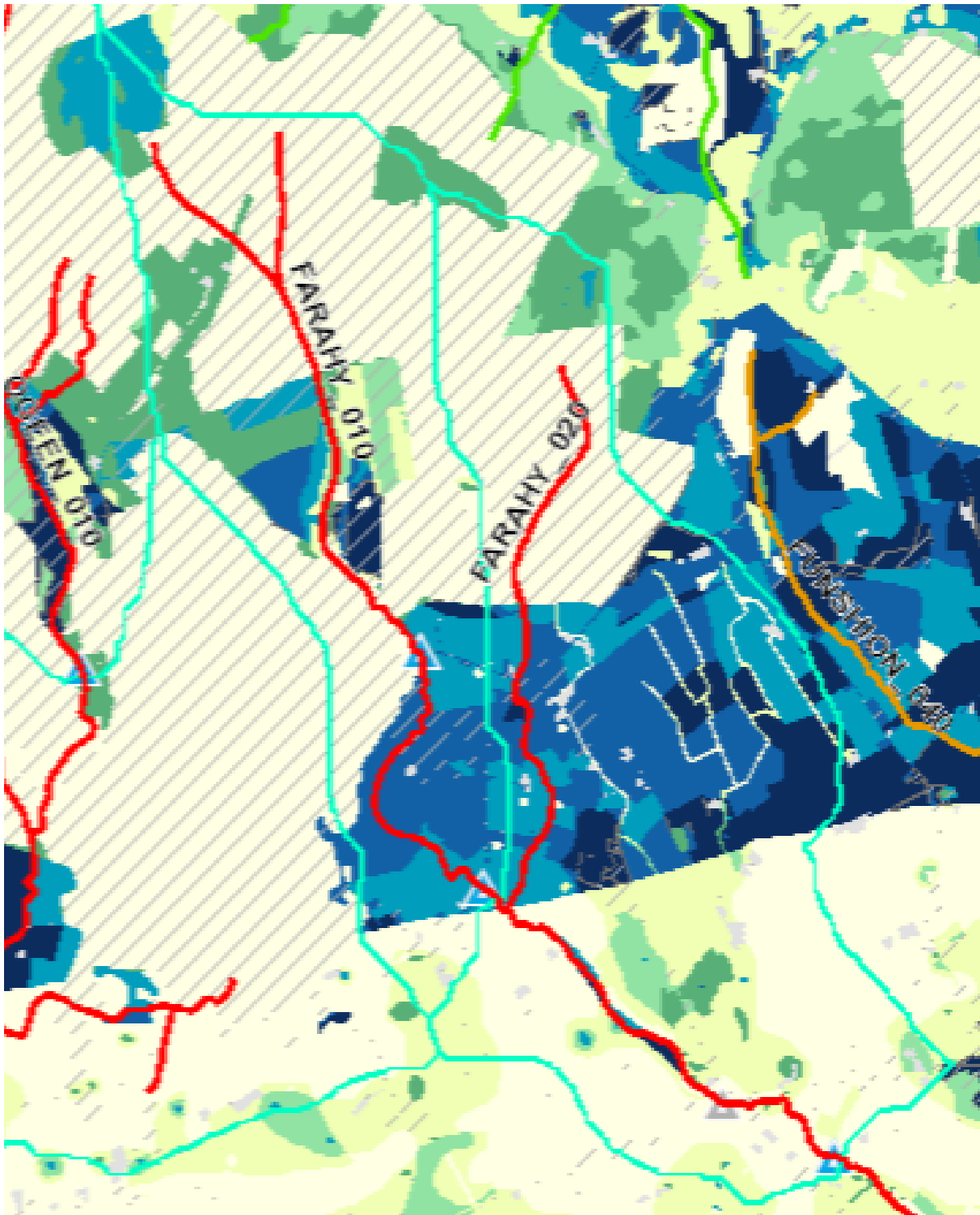
Initial assessments have identified Forestry and agriculture as the significant pressures in Farahy\_020. As there are no water chemistry data available it is difficult to know which pollutant is impacting the invertebrates here. The significant issues may be phosphate, nitrate and/or sediment.

If agriculture is confirmed as a significant pressure in the catchment, the ASSAP advisor will work with local landowners to identify suitable mitigation measures. Phosphate and sediment loss via overland flow including drains is the main risk to surface waters on poorly drained soils. Forestry and/or agriculture may be causing the sedimentation issues. Consideration must be given to agriculture for overland flow including drains for phosphate and sediment transport over poorly draining soils. There are also numerous rock outcrops across the entire sub catchment with potential for nitrate (and phosphate) to infiltrate groundwater. Although this pathway is likely to be insignificant in comparison to the overall loadings on the catchment. A catchment assessment will be to undertake SSIS/RA and water quality samples assessments on the Farahy\_020.

Staff from the Local Authority Waters programme will work in the catchment to identify the issues impacting on water quality and to confirm whether agricultural, forestry and/or anthropogenic pressures are causing the water quality problems. The LAWPRO team will work with the relevant stakeholders to address any issues identified.

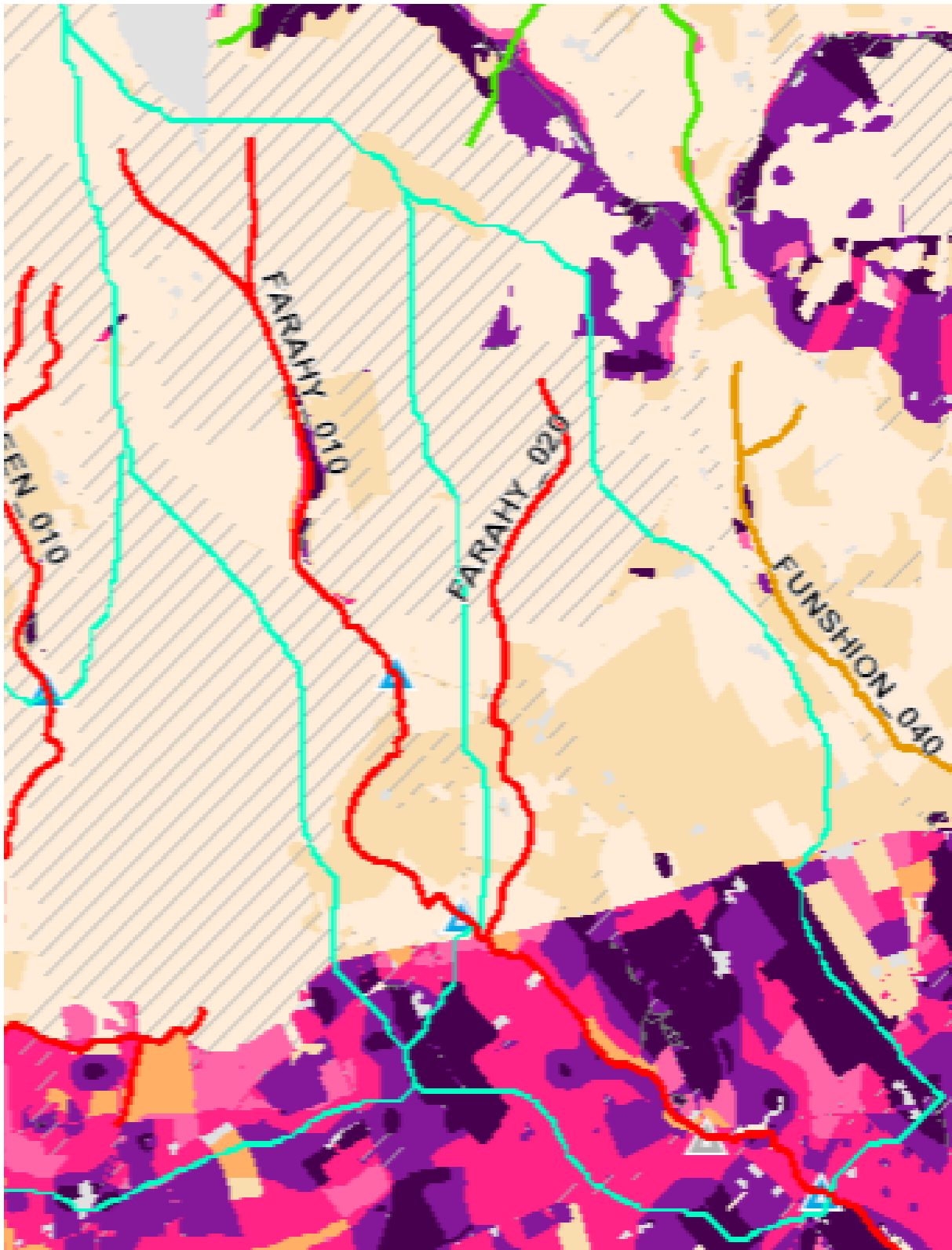
Date of completion of the desk study: 22 March 2019

## 9 Appendices



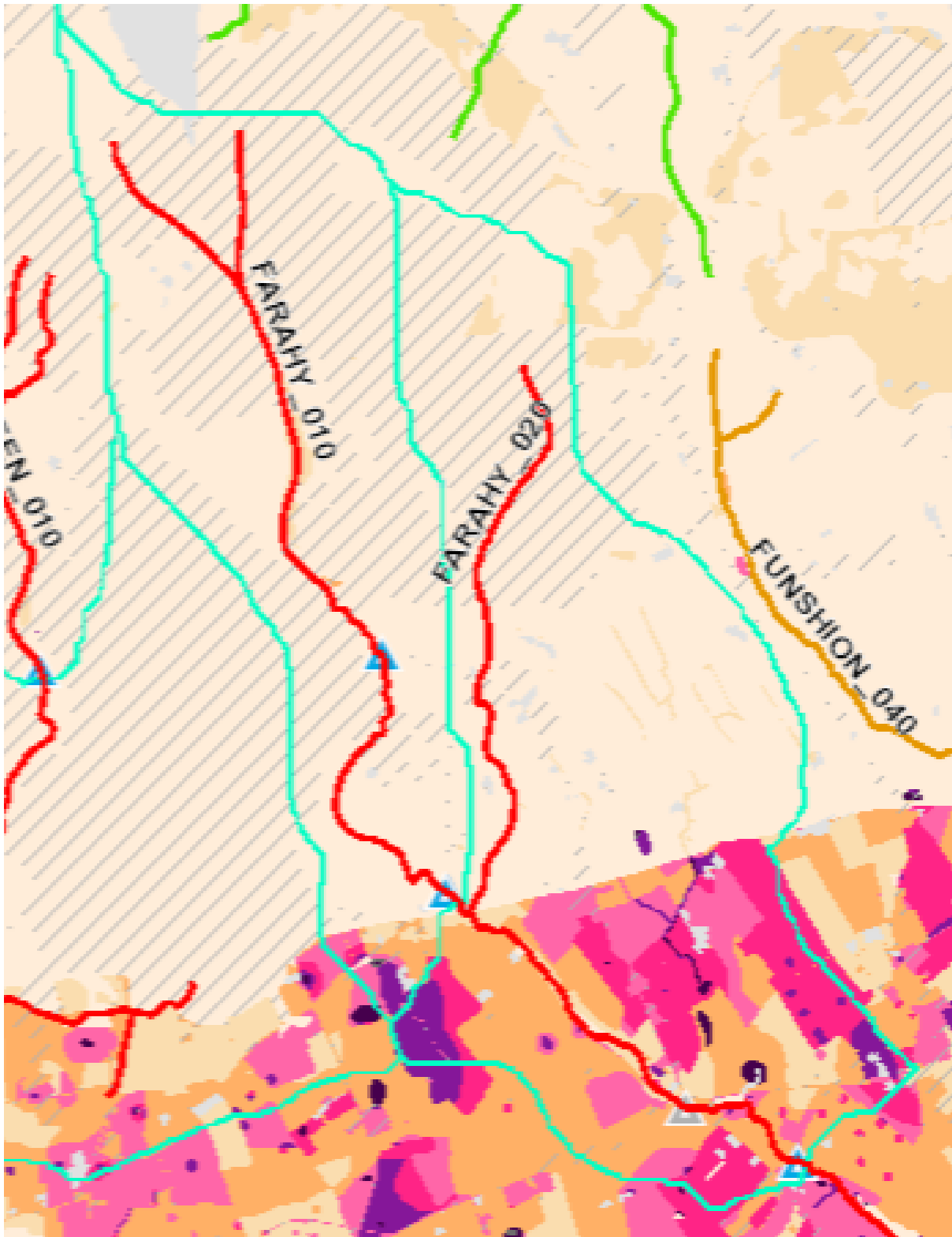
Source: EPA 2016

Figure 9-1: Pollution impact potential: surface water receptor phosphate PIP Map



Source: EPA 2016

Figure 9-2: Pollution impact potential: surface water receptor nitrate PIP Map



Source: EPA 2016

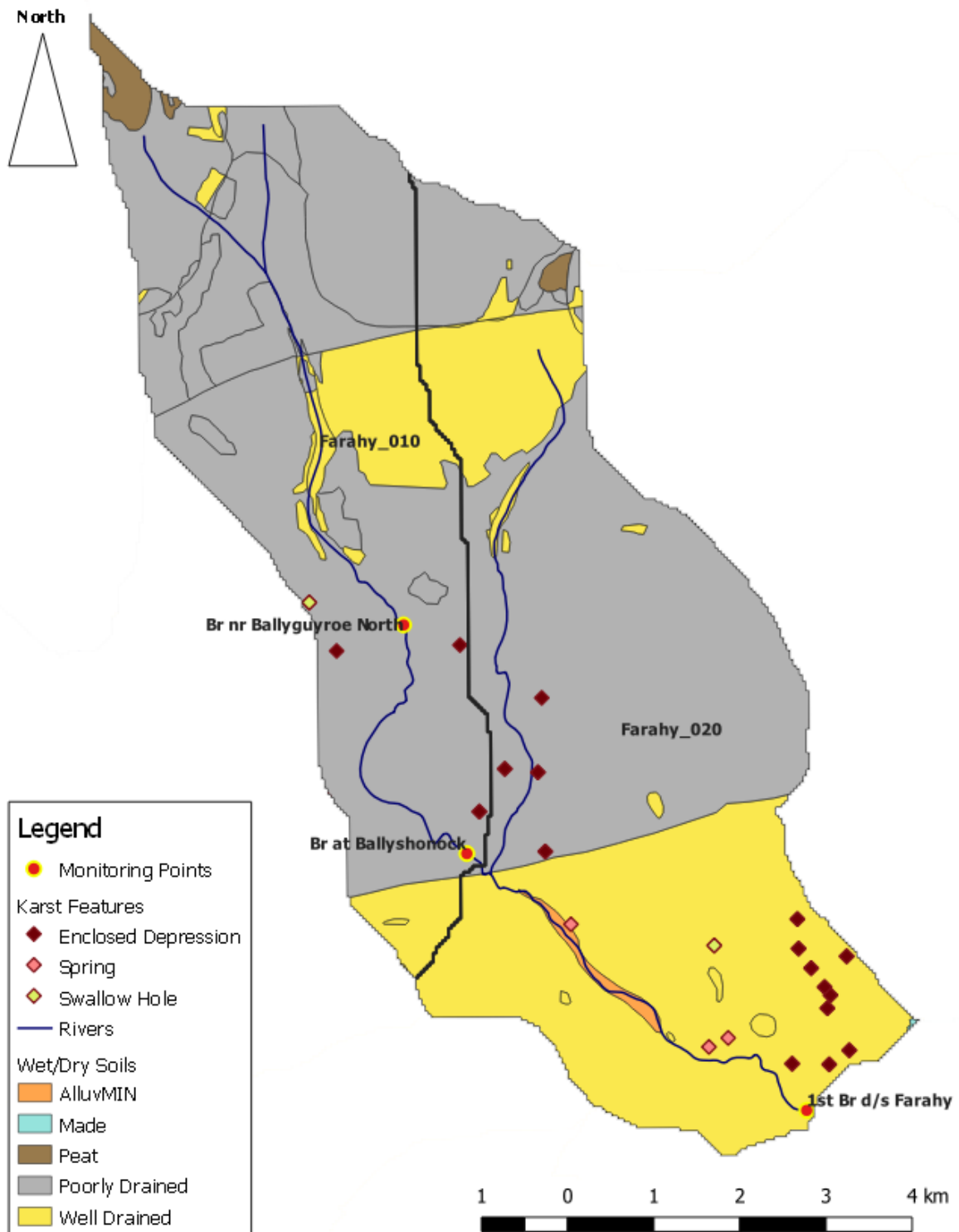
Figure 9-3: Pollution impact potential: ground water receptor nitrate PIP Map

Farahy Priority Area for Action Desk Study



Figure 9-4: Near Surface Phosphate Susceptibility

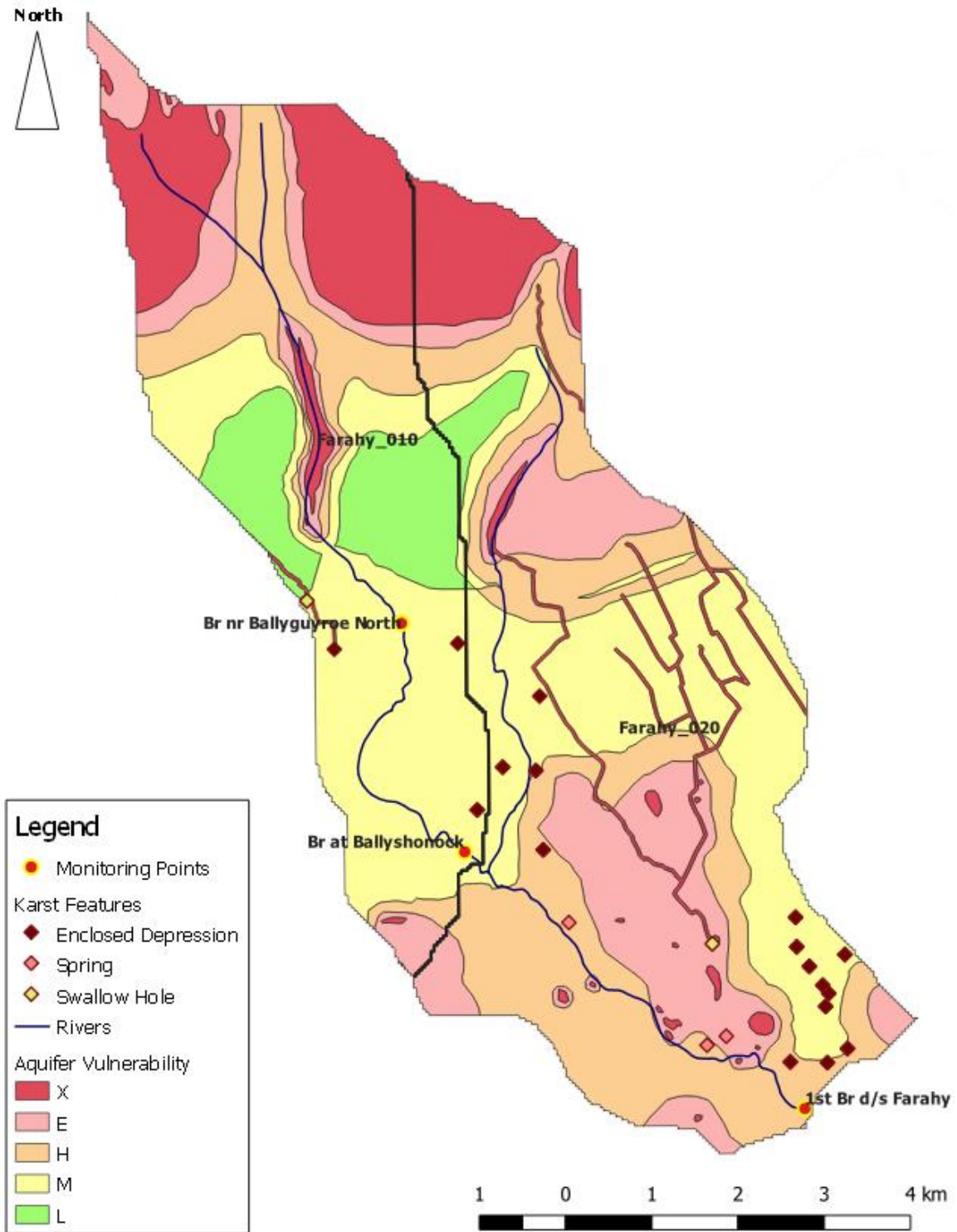
Farahy Priority Area for Action Desk Study



Source: Teagasc-EPA

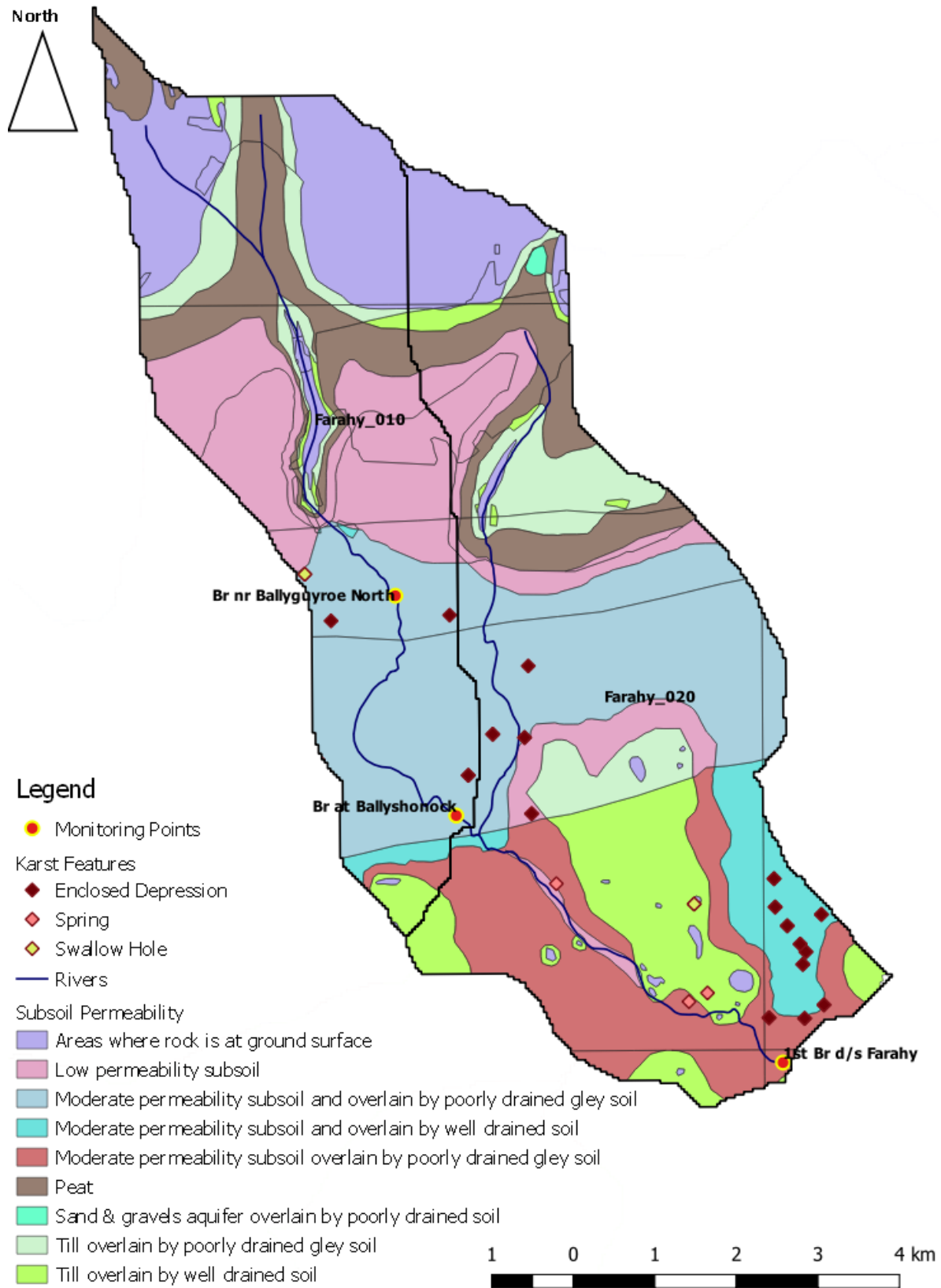
Figure 9-5: Soils Wet/Dry

Farahy Priority Area for Action Desk Study



Source: GSI (2015)

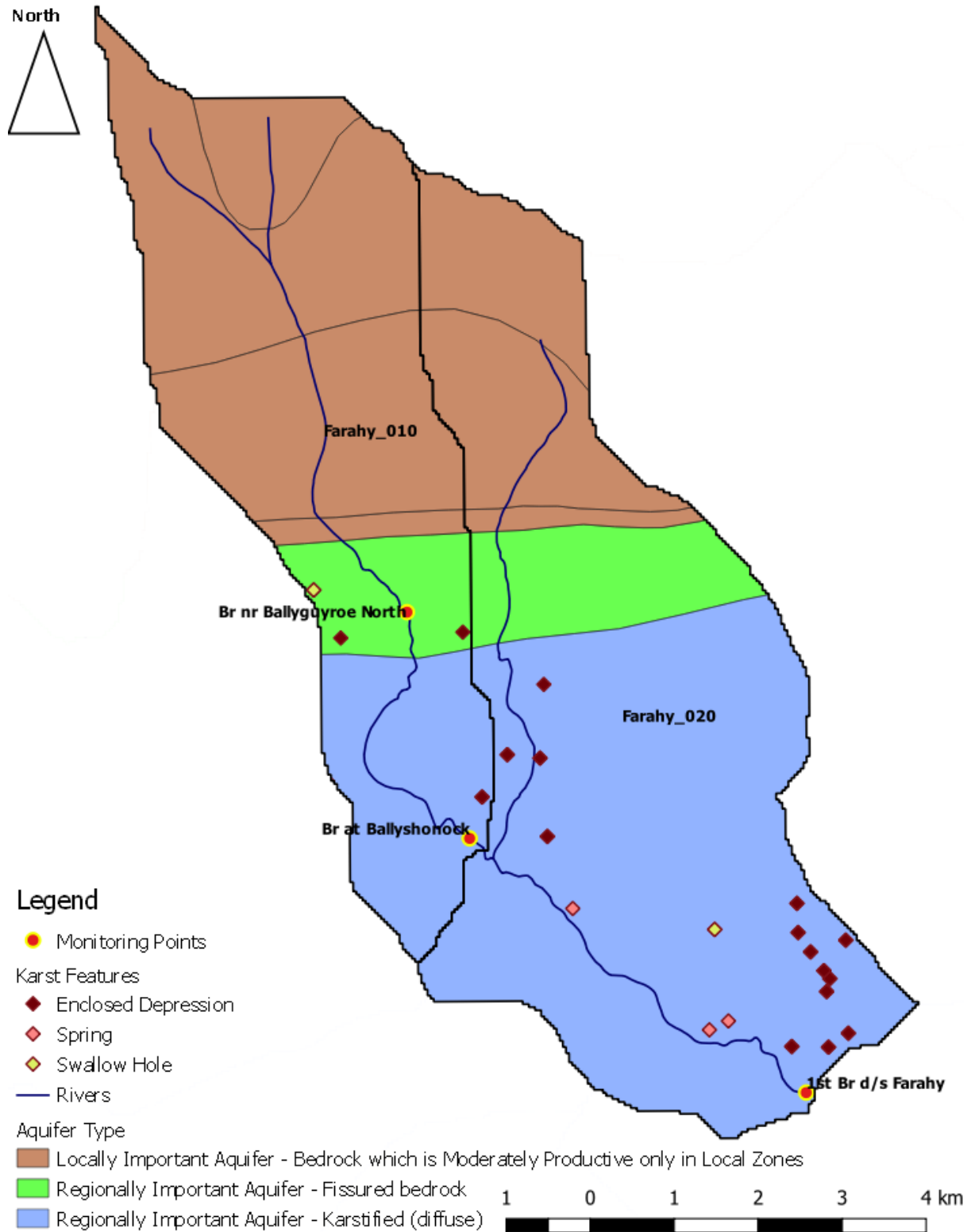
Figure 9-6: Aquifer Vulnerability



Source: GSI (2015)

Figure 9-7: Subsoil Permeability

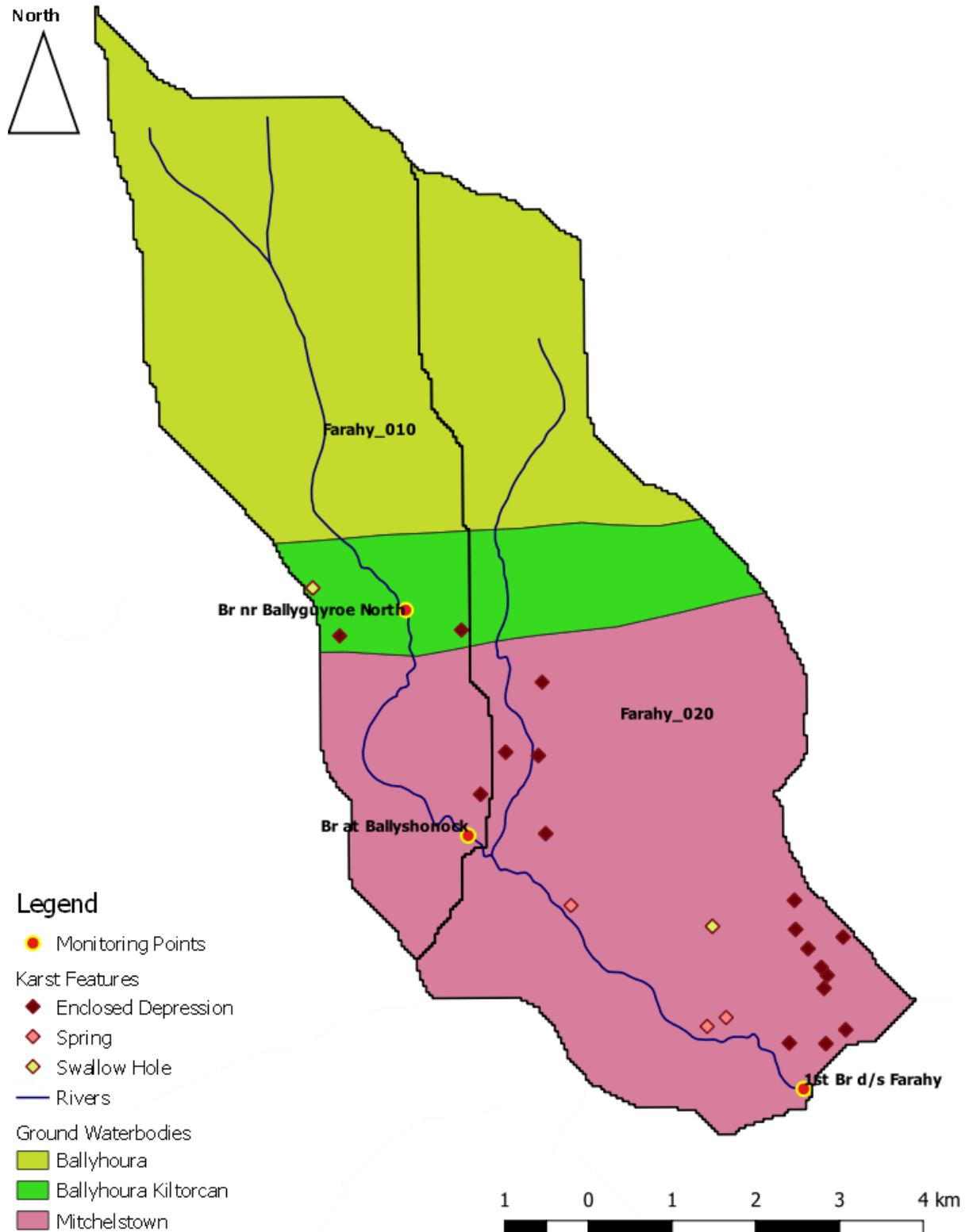
Farahy Priority Area for Action Desk Study



Source: GSI (2015)

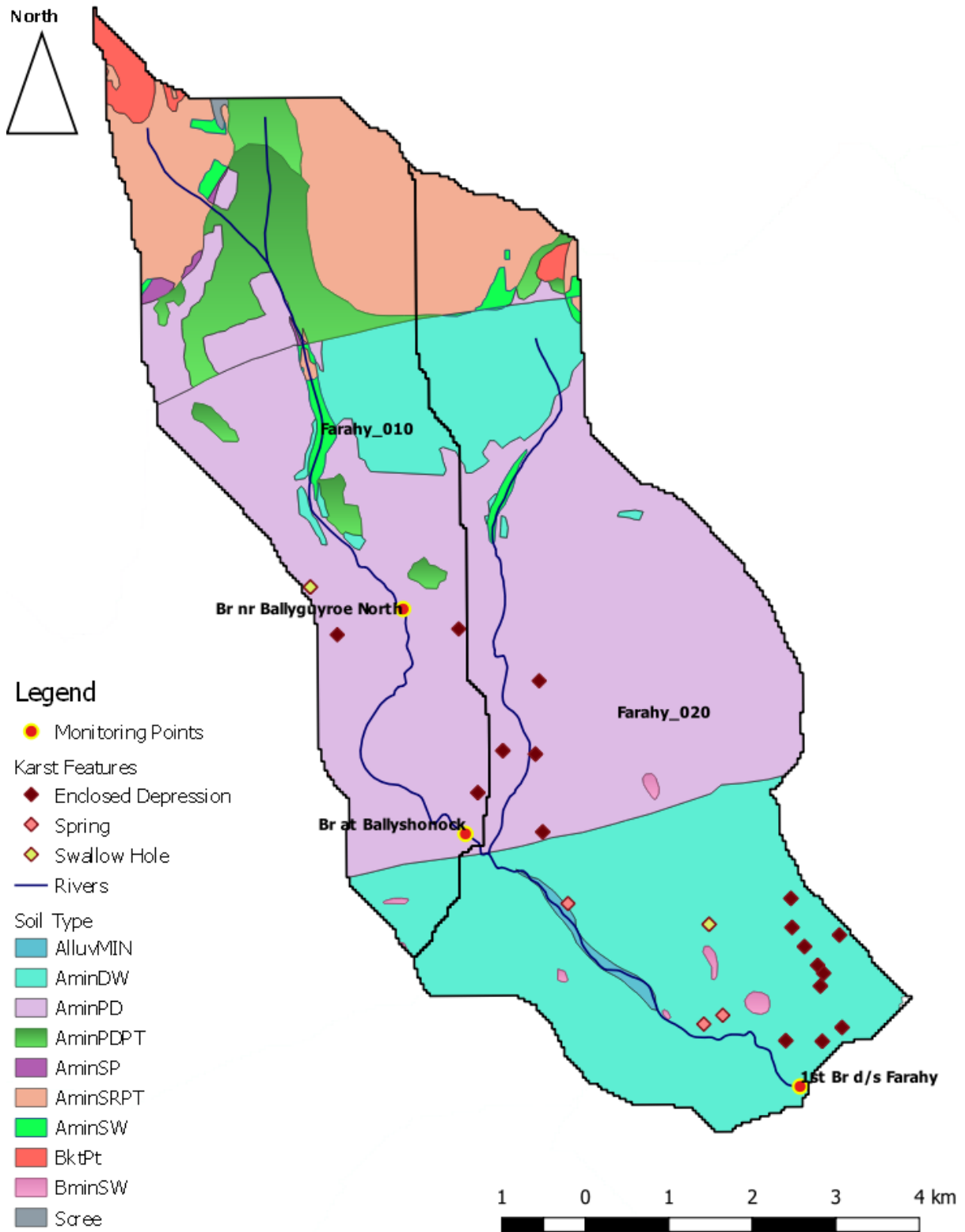
Figure 9-8: Aquifer Type

Farahy Priority Area for Action Desk Study



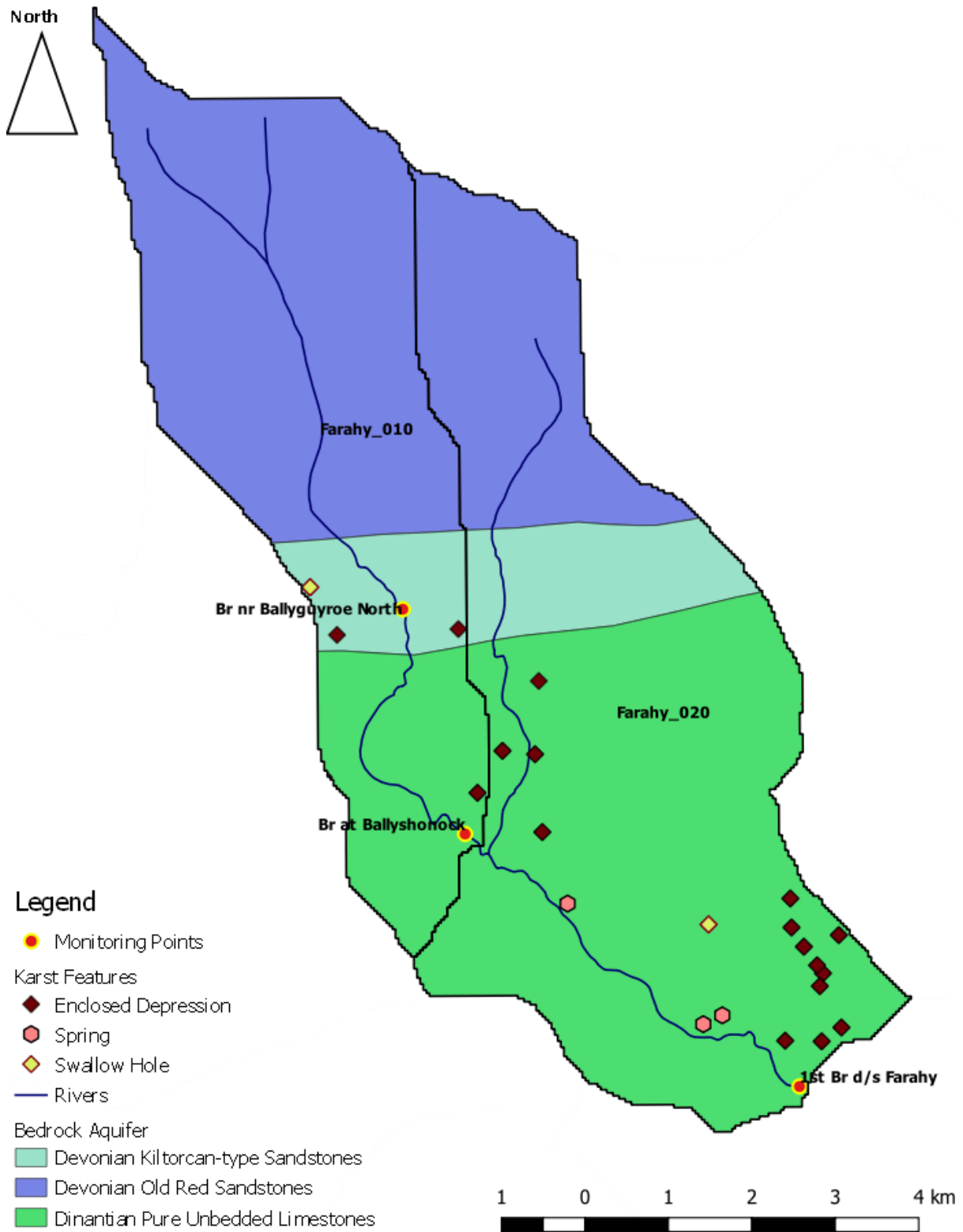
Source: EPA (2016)

Figure 9-9: Ground Waterbodies



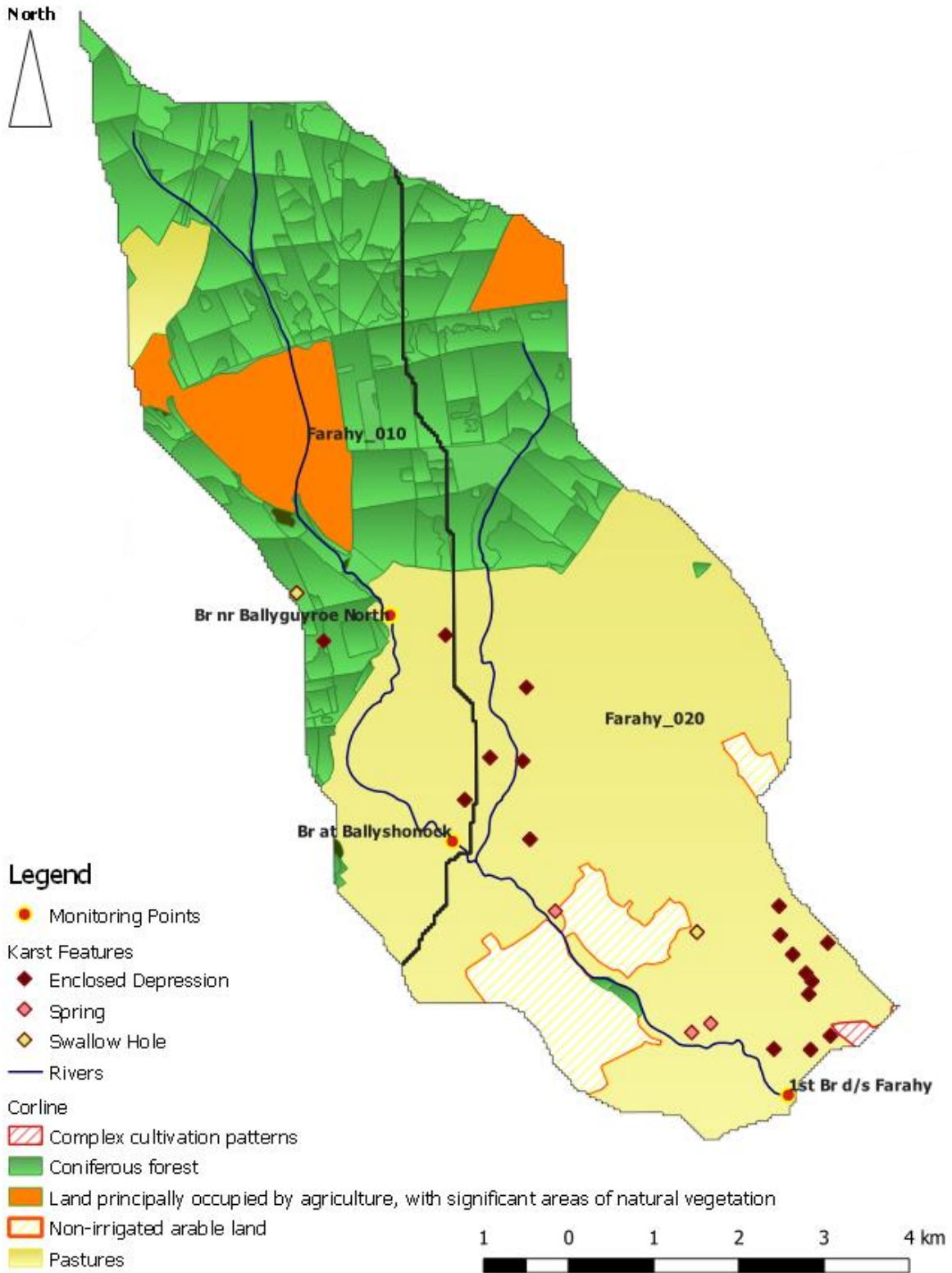
Source: EPA

Figure 9-10: Soil Type



Source: GSI (2008)

Figure 9-11: Bedrock Aquifer



Source: EPA (2018)

Figure 9-12: Land Use