

# Adrigole Priority Area for Action Desk Study AFA001 South West Region



Inchintaglin Bridge Adrigole\_010 taken on 13/02/2019

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## Acknowledgements

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## Summary

The Adrigole PAA consists of 2 waterbodies , a river waterbody (Adrigole \_010) and a transitional (Adrigole Harbour).

The Adrigole river is 90.09km in length and Adrigole harbour has an area of 1.81km<sup>2</sup>.

Much of the PAA is within the Caha mountains SAC with a number of habitats listed on Annex 1 of the E.U. habitats directive.

Adrigole\_010 is a protected area for drinking water. The Adrigole Public Water Supply (PWS) supplies the local area (approx. 235 individuals) with a volume of 237m<sup>3</sup>/d. The PWS was on the EPA's Remedial Action List (RAL) from January 2017 due to treatment and management issues which have since been resolved. It is currently compliant and was recommended for removal from the RAL in 2019.

The area is listed as a protected shellfish area for mussel and oyster.

EPA initial characterisation predicts the significant pressure to be clear felling of forestry. Domestic waste water treatment systems as well as agriculture may also present possible pressures.

The river has a high status objective while the harbour has a good status objective. Currently the river is reaching good status while the harbour is unassigned.

Geology is simple consisting of sandstone and siltstone overlying a poorly productive aquifer (a mix of LI and PI).

Soils are generally poorly draining with a mixture of very thin mineral soils with regular rock outcrops, extensive areas of peat and a few small areas of well-draining soil.

The main impacts are likely to be morphological with some drainage obvious. Sediment is likely to be an issue with potential sources including forestry and drainage for agriculture. Phosphate via overland flow in relatively more intensively managed areas could also be an issue as could ammonium in areas of drained peat.

Pathways are likely to be predominantly via overland flow and drains.

Recommended Actions:

- Assess current biological quality at EPA monitoring point.
- Assess if there is any impact from forestry plantations.
- Assess input of phosphate and sediment as well as hydromorphological status at key points surrounding potential agricultural pressures
- Assess potential sources of pathogen contamination of Adrigole Harbour from Adrigole\_010.

## 1 Background

### 1.1 Location of Area for Action and Reasons for Selection:

Table 1 Background information on the Adrigole PAA

Priority Area for Action	Catchment Number	Catchment Name	Sub catchment	Region	Local Authority
Adrigole	21	Dunmanus-Bantry-Kenmare	21_17	Southwest	Cork
<b>Reason for selection</b>	<ul style="list-style-type: none"> <li>• Amenity value.</li> <li>• Important oyster, lobster and crab fisheries.</li> <li>• Adrigole Harbour is failing to meet protected area objectives for Shellfish.</li> <li>• One <i>At Risk</i> High Ecological Status objective water body.</li> </ul>				

Priority Area for Action	No of <i>At Risk</i> WBs	No of <i>Review</i> WBs	No of dRBMP Prioritised WBs	IA Estimated Resources (approx) (Days)	No of WBs for Status Improvement:		
					2021	2027	Beyond 2027
Adrigole	1	0	2	46	0	2	0



Fig. 1 Aerial image of Adrigole PAA showing EPA monitoring point and river status

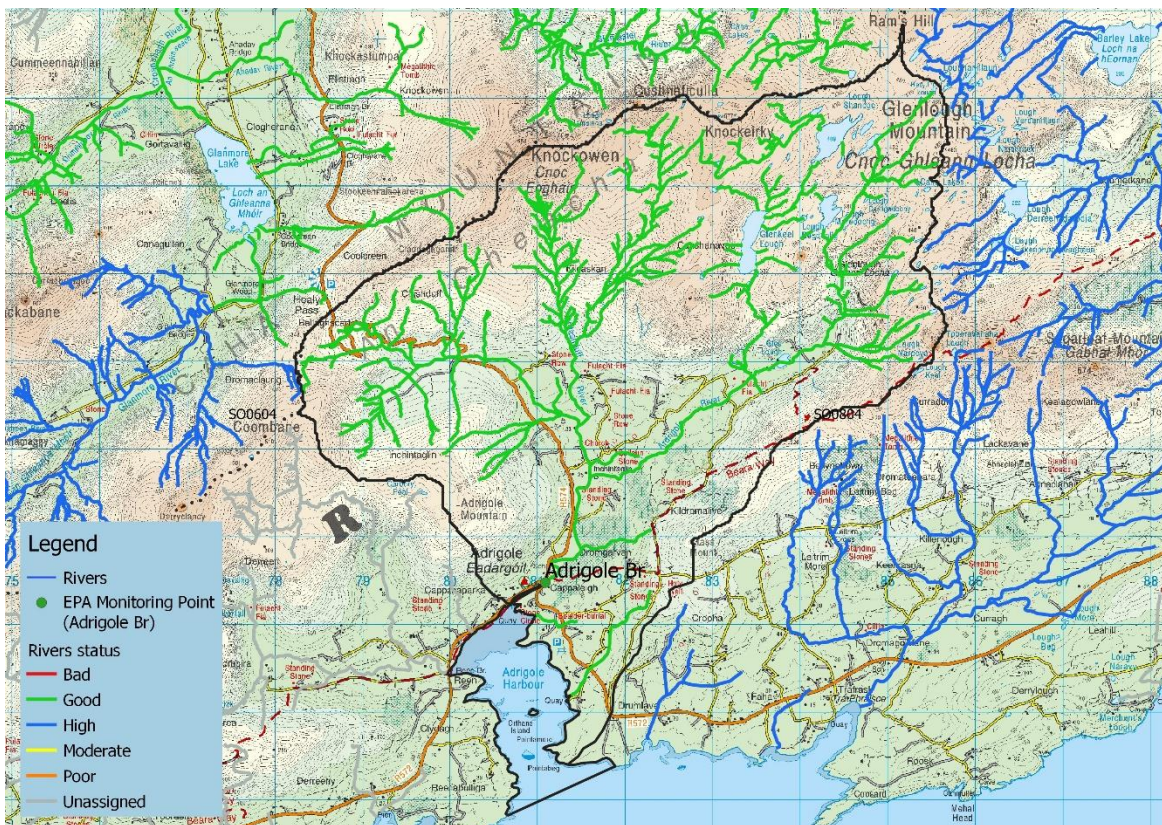


Fig. 2 OSI Map of Adrigole PAA showing EPA monitoring point and river status (@Ordnance Survey Ireland 2019/OSI\_NMA\_073)

## 2 Receptor information

### 2.1 Receptor Status

Table 2 Summary of current and target status of relevant waterbodies, those with heavy outline make up the Priority Area for Action

Water body Name	Water body Type Name	Date to meet Environmental Objective	Recommended Area for Action Name	Risk	Status Objective	Eco Status 07-09	Eco Status 10-12	Eco status 10-15	Eco status 13-18	Improved/ Disimproved
Adrigole Harbour	Transitional		Adrigole	<i>Not at risk</i>	Good	Unassigned	Unassigned	Unassigned	Unassigned	
ADRIGOLE_010	River	2027	Adrigole	<i>At risk</i>	High	Good	Good	Good	Good	Stable

Table 3 Summary of significant pressures identified

Water body Name	Agriculture	Domestic Waste Water	Forestry	Urban Waste Water	No. Sig. Pressures	Multiple Pressures	Driver of status
Adrigole Harbour							
ADRIGOLE_010			Y		1		Macroinvertebrates/ Fish

## 2.2 Receptor Assessment

### 2.3 Overview

Table 4 Synopsis of current available data on receptor status

	Plot graph	Map Y/N	Adrigole_010	Adrigole Harbour
Monitoring station			Adrigole Br	
Risk Category			At Risk	Not at Risk
Biological Status	2015-2018		Good	N/A
	2013-2015		Good	N/A
	2010-2012		Good	
	trends in Q values			
Biological Status (Fish)	2015-2018		Good	N/A
Hydrochemistry (baseline 2013-2018)	Ortho-PO <sub>4</sub> (mg/l P)	<b>Error! Reference source not found.</b>	0.005 (0.005 baseline 2017)	N/A
	Ammonium (mg/l N)	<b>Error! Reference source not found.</b>	0.01 (0.012 baseline 2017)	N/A
	Total-PO <sub>4</sub> (mg/l P)			N/A
	TON (mg/l N)	<b>Error! Reference source not found.</b>	0.1 (0.104 baseline 2017)	N/A
	Chlorophyll			N/A
Hydrochemistry (baseline 2010-2015)	Ortho-PO <sub>4</sub> (mg/l P)		0.005 (0.006 baseline 2014)	N/A
	Ammonium (mg/l N)		0.01 (0.012 baseline 2014)	N/A
	Total-PO <sub>4</sub> (mg/l P)			N/A
	TON (mg/l N)		0.1 (0.116 baseline 2014)	N/A
	Chlorophyll			N/A
Hydrochemistry (Trends - significant?)	Ortho-P (mg/l P)	<b>Error! Reference source not found.</b>	No	N/A
	Ammonia (mg/l N)	<b>Error! Reference source not found.</b>	No	N/A
	TON (mg/l N)	<b>Error! Reference source</b>	No	N/A

Adrigole Priority Area for Action Desk Study

		Plot graph	Map Y/N	Adrigole_010	Adrigole Harbour
		not found.			
Other water quality data				N/A	N/A
Distance to threshold	Ortho-P (mg/l P)	Error! Reference source not found.		Far	N/A
	Ammonia (mg/l N)	Error! Reference source not found.		Far	N/A
	TON (mg/l N)	Error! Reference source not found.		Far	N/A
	Chlorophyll				N/A
Hydromorphology	RHAT score			N/A	N/A
	Evidence of arterial drainage				N/A
Ecological status	2013-2018			Good	N/A
	Element driving status			Fish	N/A
	change (since 1st cycle)			None	N/A
Protected areas				Yes (Caha mountains SAC, Drinking water, Shellfish)	Yes (Shellfish)
WFD objective.				High	Good
Relevant info. from notes of EPA biologist				Continuing satisfactory with Good ecological quality	N/A
Significant issue/impact for receptor (e.g. PO <sub>4</sub> )				Forestry/Altered habitat due to morphological changes	N/A

## 2.4 Hydrochemistry

Chemical monitoring results for phosphate (Fig. 3), Ammonium (Fig. 4), T.O.N. (Fig. 5) and B.O.D. (Fig. 6) are shown below. All nutrient parameters are generally well below EQS levels particularly in recent years. While average B.O.D. does not exceed the EQS there are some notable spikes which reflect organic impact potentially from agricultural activities.

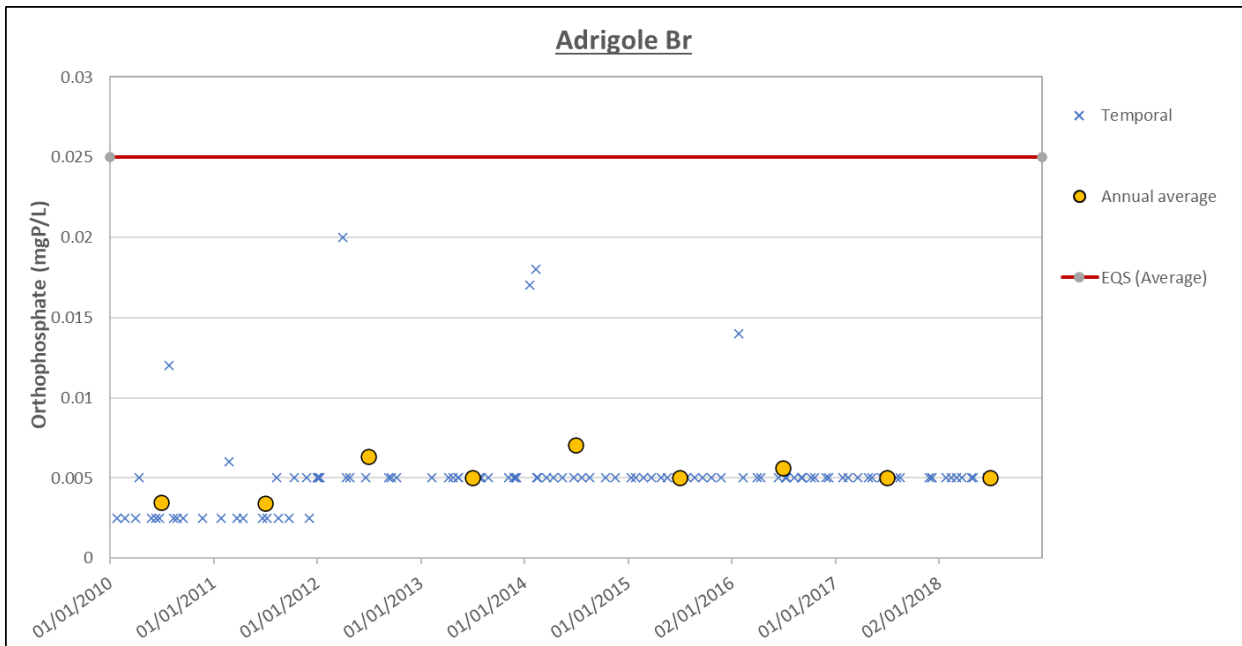


Fig. 3 Phosphate (mg/l-P) at Adrigole Br

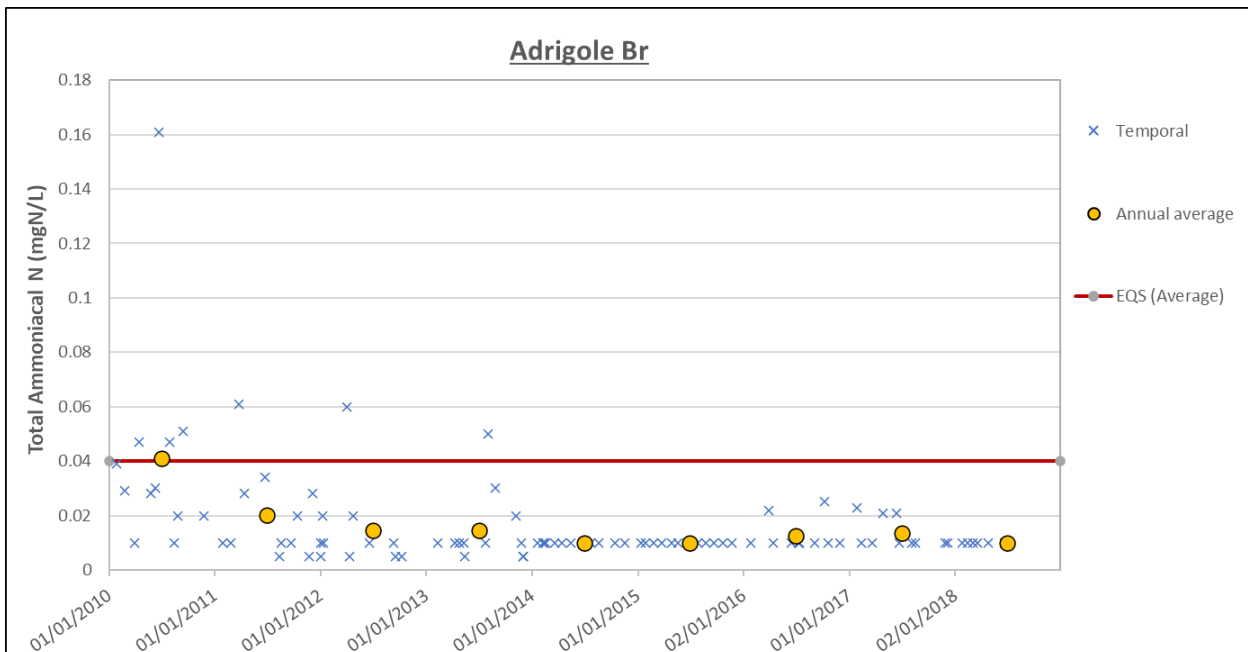


Fig. 4 Ammonium (mg/L-N) Adrigole Br

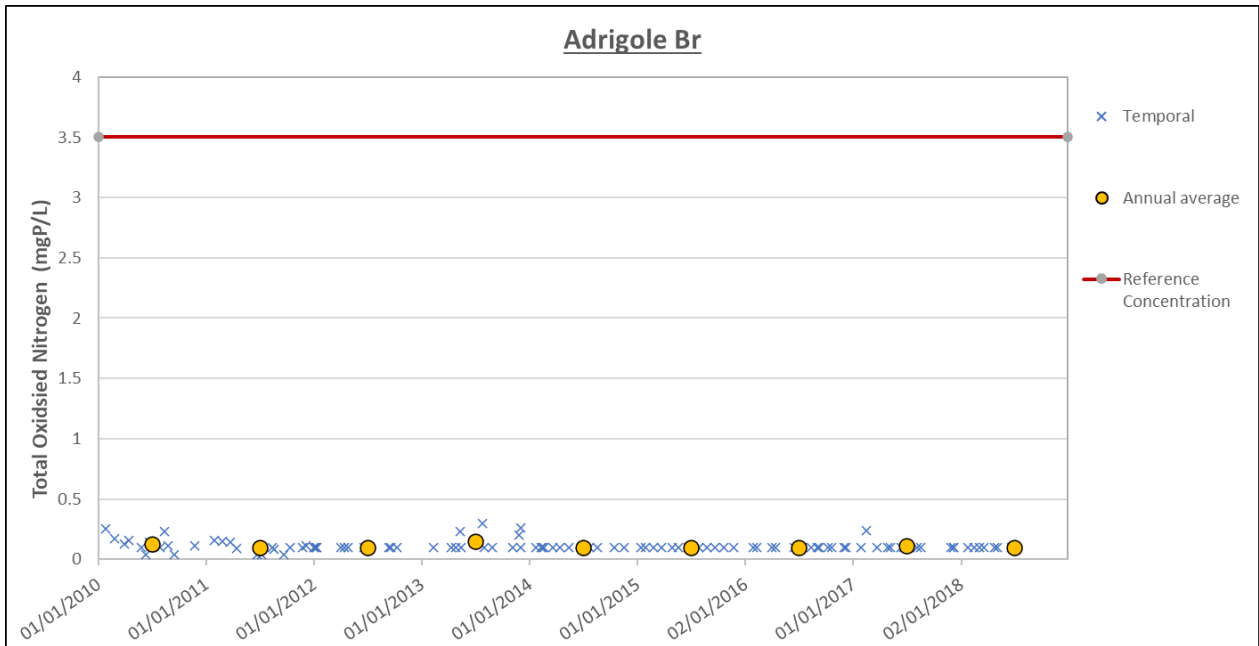


Fig. 5 TON (mg/l-N) at Adrigole Br

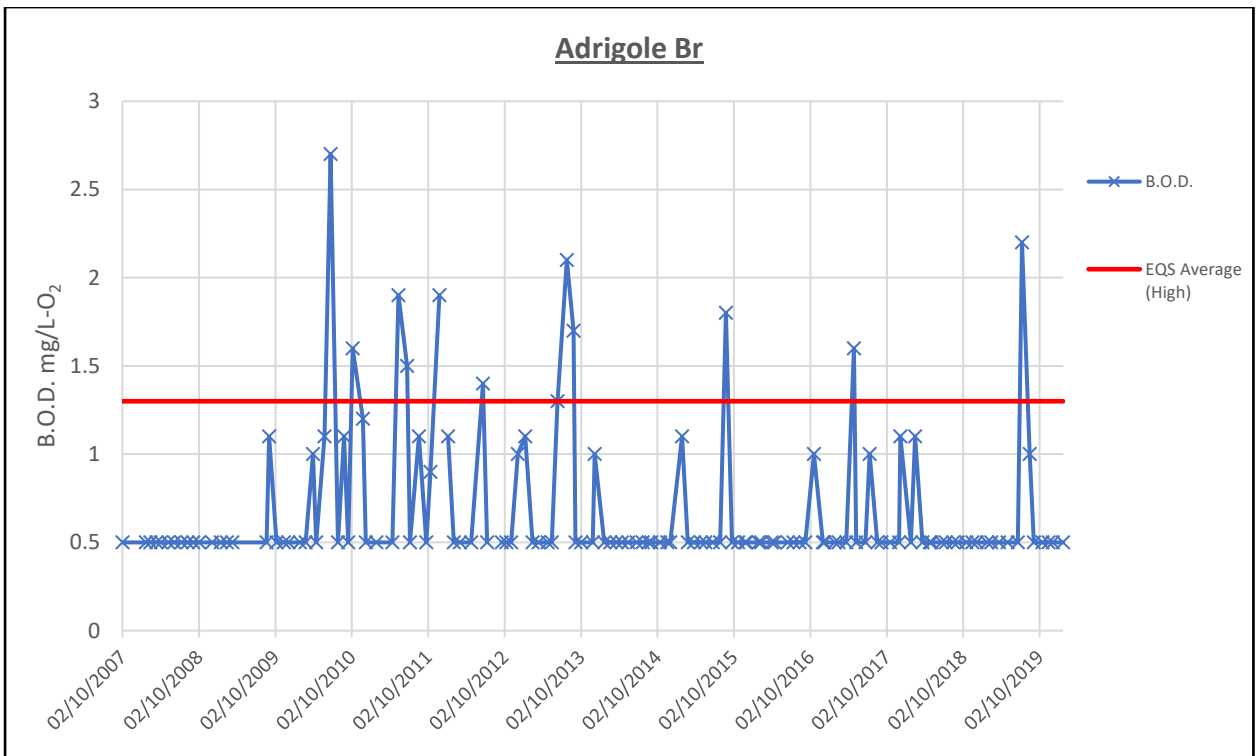


Fig. 6 Biological Oxygen Demand (mg/l-O2) at Adrigole Br

Adrigole Bridge is a surveillance monitoring station. Parameters are monitored every six years and include cadmium, chromium, copper, isotroturon, nickel, pentachlorophenol and zinc among others. The annual averages of these meet the relevant EQS's and the waterbody is at good chemical status.

## 3 Significant Pressures

### 3.1 Initial EPA characterisation

Table 5 Initial EPA characterisation

Water body Name	Id	Category	Sub Category	Name	Sig?	Pressure & Impact details
Adrigole_010	WBP0005698	Forestry	Clearfelling	n/a	Yes	Altered habitat due to morphological changes
Adrigole Harbour	n/a	n/a	n/a	n/a	n/a	n/a

### 3.2 Conclusion on Significant Pressures

The biological status at Adrigole Br had remained high (Q4/5) since monitoring began in 1990 until it deteriorated to good between 2010 and 2012 and where it has remained since. This was initially driven by fish status with invertebrate status remaining high but falling to good between 2012 and 2015 where it has remained since. Clear felling of forestry is the only suspected significant pressure listed and while there is a relatively small amount of forestry within the catchment, the bulk of this is just upstream of the monitoring point (Fig. 7). All nutrient parameters appear to be relatively low although there are some minor spikes in B.O.D. (**Error! Reference source not found.**).

Adrigole Harbour is unassigned and considered not at risk of achieving WFD objectives however it was included as it is an important shellfish area. The 2016 sanitary survey carried out by the Sea Fisheries Protection Authority suggested that potential sources of contamination include slurry spreading and domestic waste water treatment systems. The bacteriological report showed 50% A and 50% B results for oysters with 69% class A, 25% class B and 6% class C for mussels. The report goes on to state that the most likely source of contamination is the Adrigole river. Any potential sources of microbiological contamination which are observed during LCA will be assessed and referred to the relevant responsible authority.

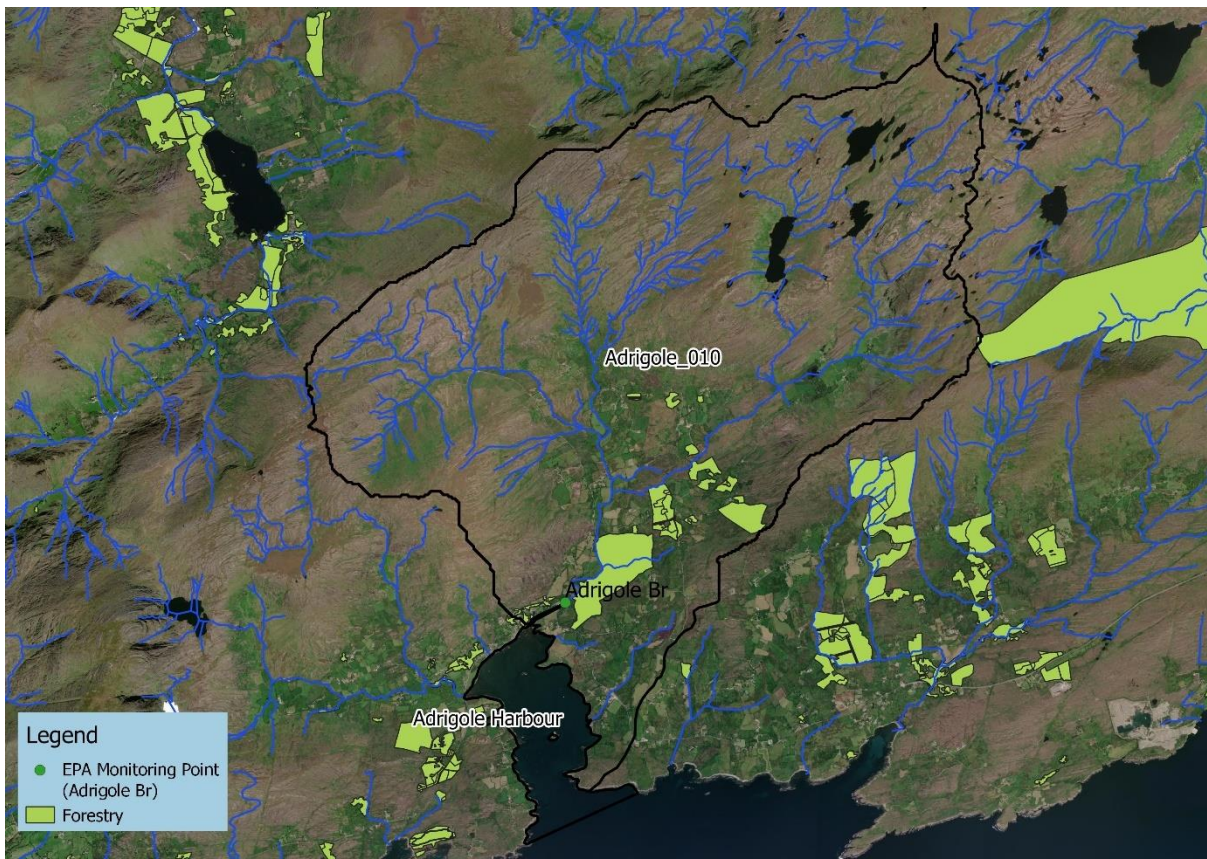


Fig. 7 Forestry in Adrigole PAA

## 4 Pathways Information

### 4.1 Conceptual Model Development

The PAA is entirely underlain by the Beara Sneem groundwater body. The geology is generally a mix of sandstones and siltstones which have no intergranular permeability and so any groundwater flow is via faults. Due to the generally low permeability of the aquifers within this GWB and the high slopes, a high proportion of the recharge will discharge rapidly to surface watercourses via the upper layers of the aquifer. Aquifers in the PAA are unproductive (Fig. 10) and are treated as one for the purpose of the conceptual model. Soils and subsoils in the PAA are generally low permeability, there are fairly extensive areas of peat and a few limited areas of well-draining soil. There are 3 compartments which are based on soil type and permeability. Compartment 1 (Fig. 8) has poorly draining soil, flow will generally be surface but with the possibility of shallow subsurface flow via faults. Compartment 2 (Fig. 8) is peaty with deeper soil and subsoil. Flow is likely to be overland. There are also some improved fields in this compartment which are likely to be drained and so may be contributing ammonium to waterways. Compartment 3 (Fig. 8) comprises a few limited areas of well-draining soil as well as a limited area of scree and flow is likely to be subsurface.

Table 6 Summary of conceptual model and pathways information

	Compartment 1	Compartment 2	Compartment 3
<b>Location</b>	See Fig. 8	See Fig. 8	See Fig. 8
<b>Direct</b>	unknown	unknown	unknown
<b>Aquifer type</b>	LI: Locally important aquifer which is moderately productive only in local zones. PI: Poor aquifer which is generally unproductive except for local zones	LI: Locally important aquifer which is moderately productive only in local zones. PI: Poor aquifer which is generally unproductive except for local zones	LI: Locally important aquifer which is moderately productive only in local zones. PI: Poor aquifer which is generally unproductive except for local zones
<b>Topography</b>			
<b>Bedrock unit</b>	Sandstone and siltstone	Sandstone and siltstone	Sandstone and siltstone
<b>Gwb</b>	Beara Sneem	Beara Sneem	Beara Sneem
<b>Gwb flowpath</b>	In general, groundwater flow is concentrated in the upper 15 m of the aquifer, although deeper inflows from along fault zones or connected fractures can be encountered.	In general, groundwater flow is concentrated in the upper 15 m of the aquifer, although deeper inflows from along fault zones or connected fractures can be encountered.	In general, groundwater flow is concentrated in the upper 15 m of the aquifer, although deeper inflows from along fault zones or connected fractures can be encountered.
<b>Subsoil type</b>	Rck, TDSs	Bkpt	TDSs
<b>Subsoil permeability</b>	Mostly <3m, otherwise moderate	Mostly <3m, otherwise moderate	Mostly Moderate, otherwise <3m
<b>Soil type</b>	AminSRPT, AminPDPT, AlluvMIN, AminPD	Bkpt	AminDW, Scree
<b>Soil drainage</b>	Poor	Poor	Good
<b>Groundwater vulnerability</b>	High to extreme or rock at or near surface	High to extreme	Extreme or rock at or near surface
<b>PO<sub>4</sub> susceptibility</b>	High	High	Low
<b>NO<sub>3</sub> susceptibility</b>	Low	Low	High
<b>PO<sub>4</sub> pip surface water</b>	Mostly moderate, some high	Mostly moderate	Low
<b>NO<sub>3</sub> pip surface water</b>	Low	Low	Generally low with some localised areas of high
<b>Flowpaths</b>	Surface	Surface	Subsurface, through subsoil or shallow groundwater via faults

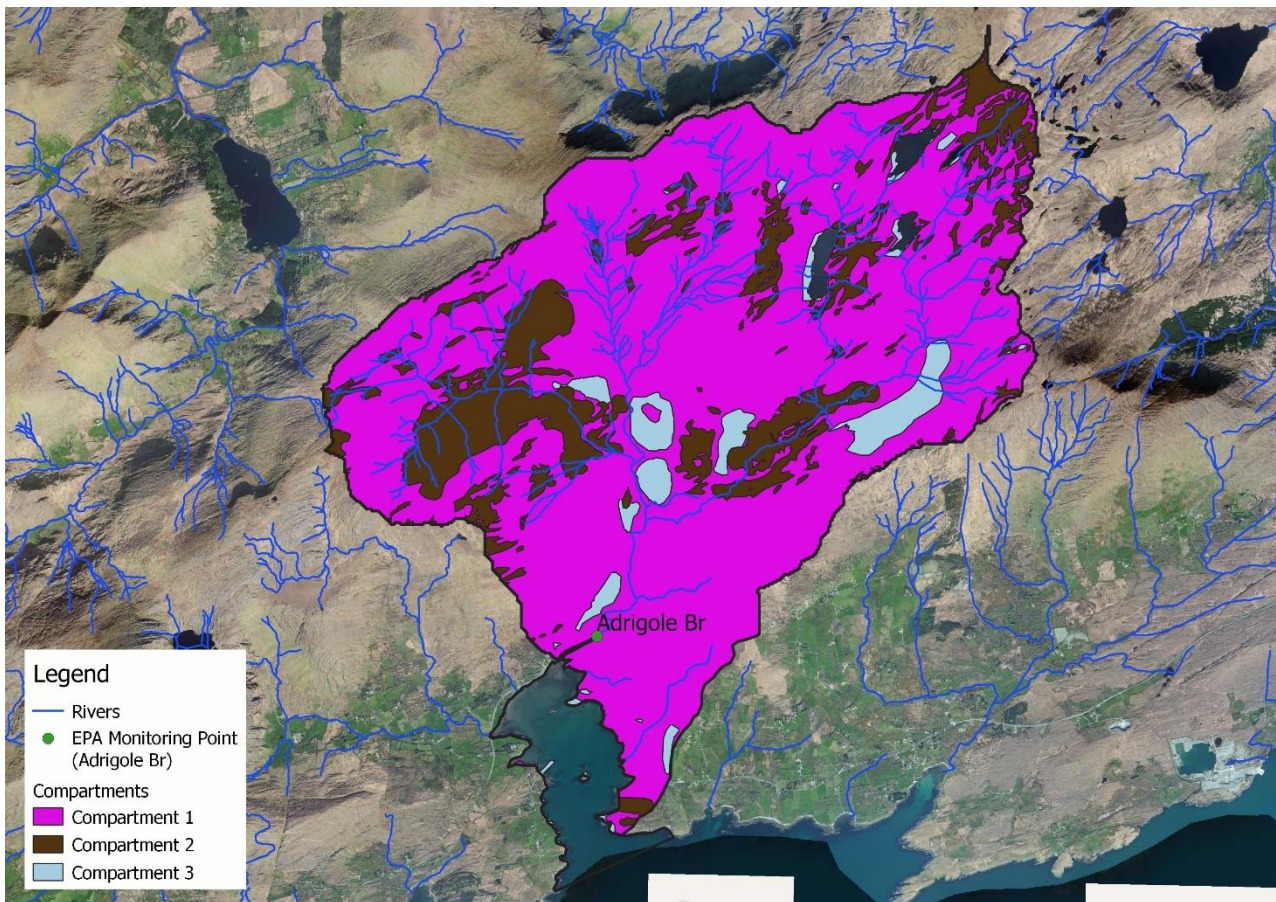


Fig. 8 Adrigole PAA compartments for conceptual model

## 5 Interim conclusions on the PAA

The Adrigole PAA consists of 2 waterbodies, a river waterbody (Adrigole\_010) and a transitional waterbody (Adrigole Harbour).

Adrigole Harbour:

No monitoring data are available on Adrigole Harbour, it is a protected area for shellfish and so would be sensitive to bacterial contamination. It is notable that there is another river inputting into the harbour (Cappanaparka\_East\_010). This is not included in the PAA but may also be a potential source of contamination, it is currently unassigned.

Adrigole\_010:

- This is a high status objective (Blue Dot) waterbody and as such relatively small pressures may prove significant.
- It has failed to reach its status objective since 2012.
- All chemical parameters are satisfactory although some minor peaks in B.O.D. appear to be occurring. Impacts may be related to agriculture or seasonally occupied dwellings.
- Characterisation has identified hydromorphological impacts related to forestry clear felling as the only suspected significant pressure.

- All potential significant pressures need to be assessed here because of the high status objective.

## 6 Communications

Public meetings will be required for this PAA.

Key messages:

- Sediment is affecting water quality on the Adrigole river. It is likely that sediment making its way to the streams from multiple sources including forestry, agriculture and possibly peat harvesting. Nutrient enrichment may also be causing issues and this will be assessed by the team.
- The SW team will undertake local catchment assessments to identify what the significant pressures are and will work with the relevant stakeholders/implementing bodies to identify the appropriate local measures for the catchment.

## 7 Work Plan

### 7.1 Additional information requirements

- Contact Sea Fisheries Protection Authority about any potential information or monitoring data available on inputs from the river waterbody.

### 7.2 Local catchment assessment

Adrigole\_010

- Confirm ecological quality at EPA monitoring point (Adrigole Br, Fig. 9 Site 1) by performing SSIS.
- Perform SSIS at site 2 (Fig. 9) to assess any difference U/S and D/S of forestry near to monitoring point.
- Perform SSIS at sites 3-9 (Fig. 9) to assess
  - if there is any impact from other activities particularly dwellings and agriculture.
  - to narrow down which if any tributaries are affected.

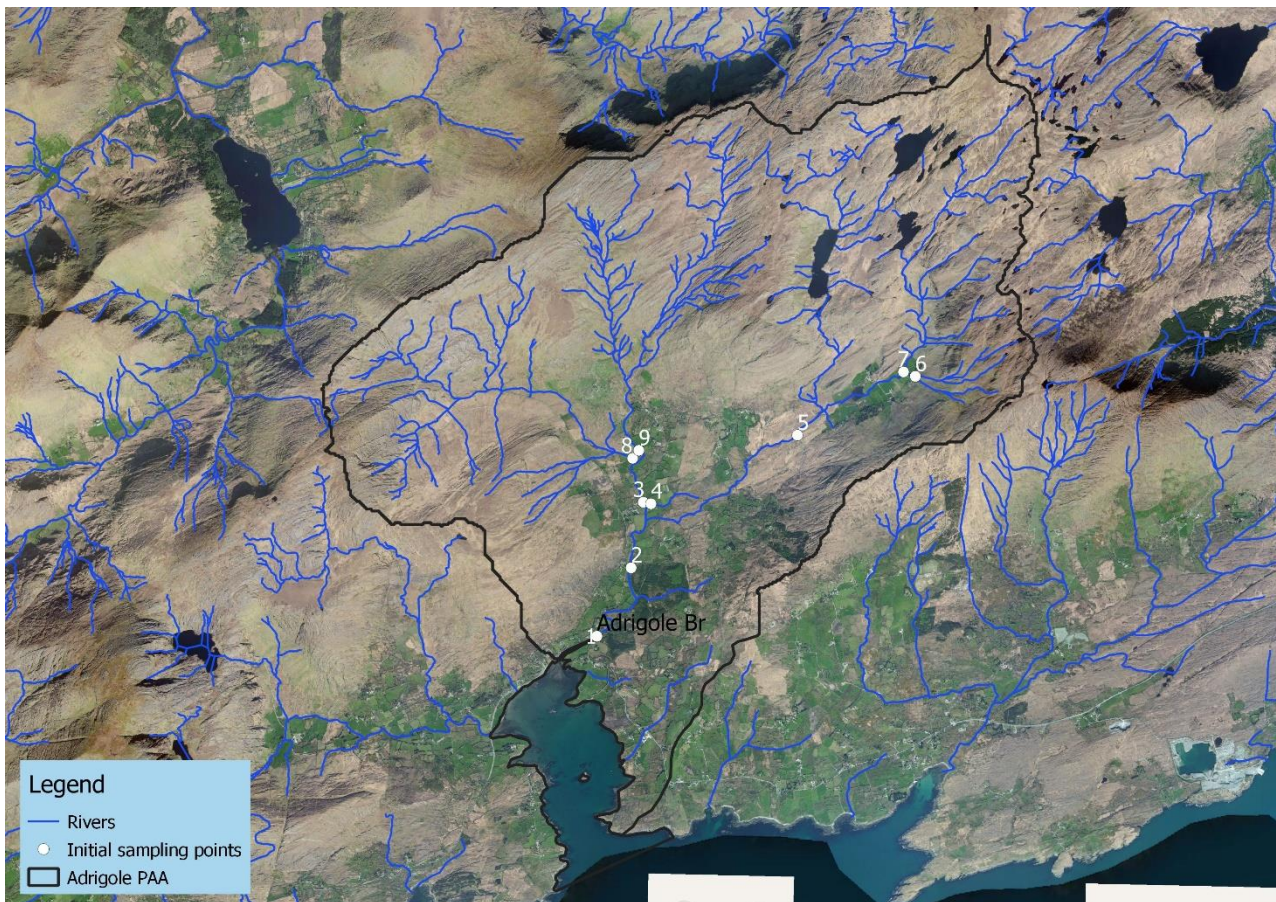


Fig. 9 Adrigole PAA field sites for initial sampling

## 8 Possible Mitigation Actions

Mitigation actions will depend heavily on the findings of assessments.

- The impact of any forestry activities just U/S of the EPA monitoring point must be assessed particularly for sediment inputs and any nutrients leaching from brash which may be left onsite. Mitigation may include sediment retention measures particularly during and after clear felling and possibly removal of brash.
- Given the context of this PAA, potential impacts from agriculture are likely to include sediment and nutrient inputs resulting from drainage and land use change as well as point sources from farmyards such as silage effluent and sheep dip products. Mitigation actions for these may include appropriate drainage maintenance and proper/improved storage and land spreading practices.

Date of completion of desk study: based on data on or before 23/06/2020

## Appendices

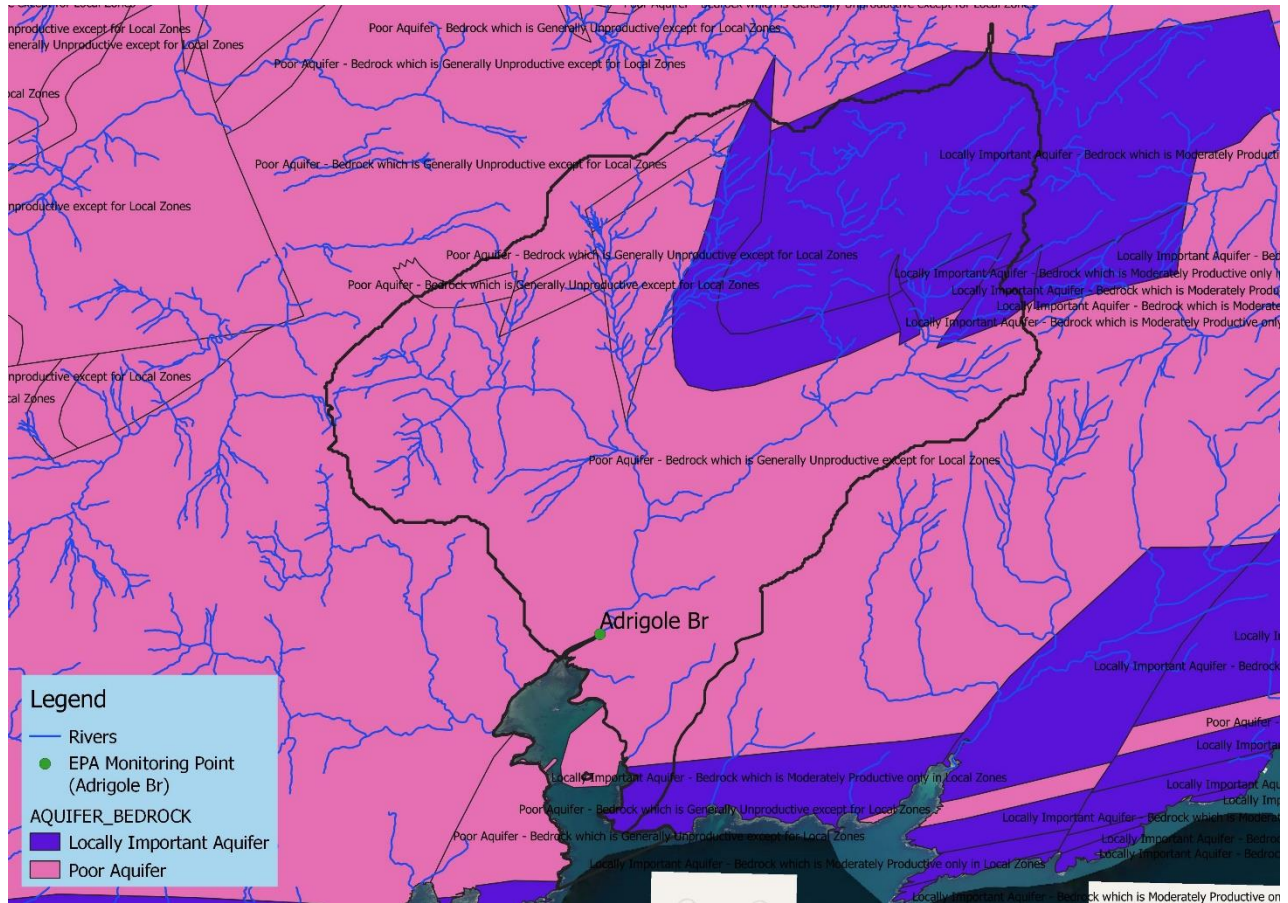


Fig. 10 Adrigole PAA Aquifer Bedrock