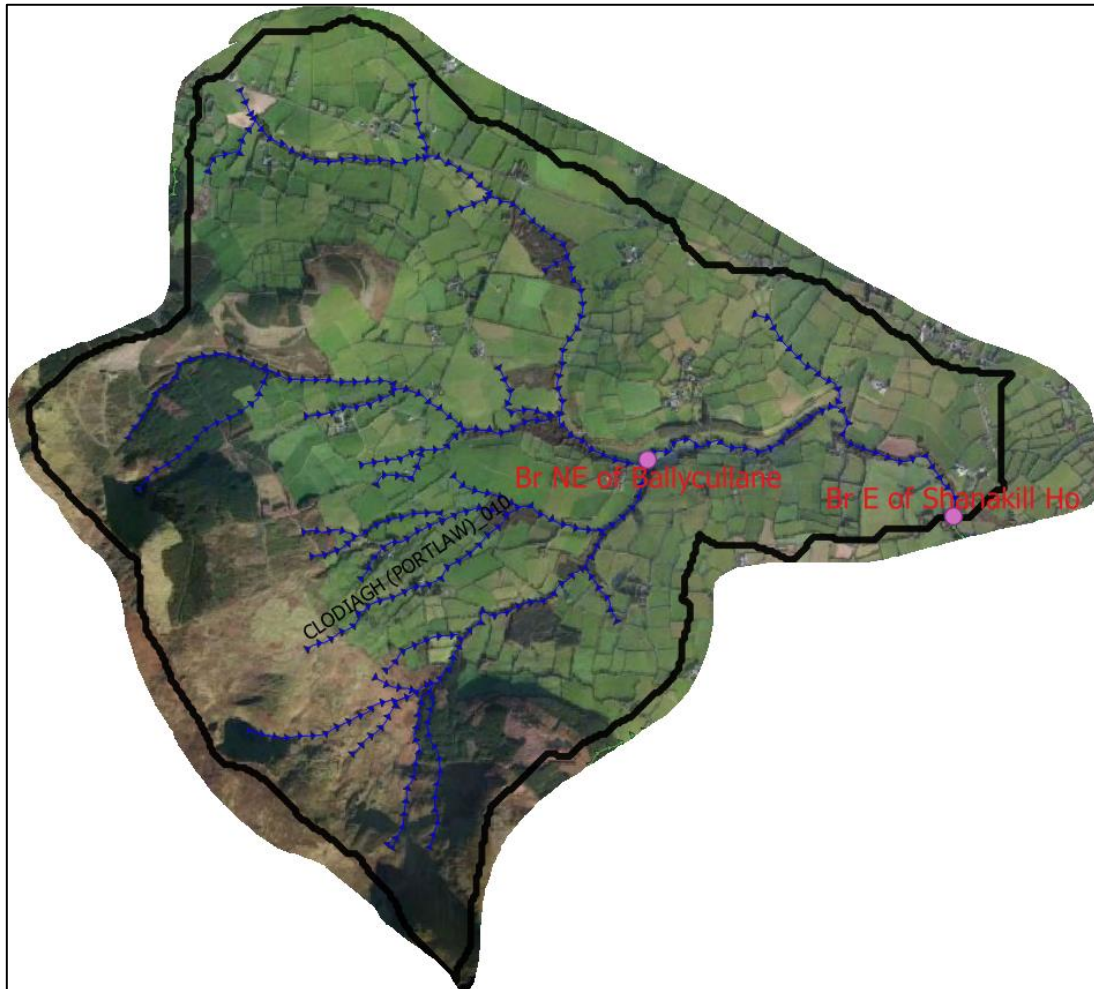


# Clodiagh (Portlaw) Priority Area for Action Desk Study (AFA0048)



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## Acknowledgements

The authors would like to acknowledge the contribution of the relevant agencies who have carried out a significant amount of work in the catchment in recent years and their support of the Local Authority Waters Programme.

## Data attribution

The following data sources were consulted in the preparation of this report:

Catchment boundaries, waterbodies and areas for action: EPA (2018)

Bedrock Unit: GSI (2008)

Aquifer Category: GSI (2015)

Groundwater body: EPA Catchments Unit (2018)

Soils & Subsoils Maps: Teagasc (2015)

IFS Soils: EPA (2006)

Susceptibility and Pollution Impact Potential Maps: EPA (2018)

WFD waterbody status: EPA (2018)

SAC and NHA boundaries: NPWS (2018)

## 1. Background

Clodiagh (Portlaw)\_010 is a single waterbody PAA. The nearest village is Rathgormack village Co. Waterford. It is a headwater which rises in the Comeragh mountains at lake Mohra and lake Coumduala. The objective for this water body is Good status.

Regional workshops were held in Roscrea on 6-9 June 2017 and were attended by representatives of local authorities (Kilkenny, Tipperary, Waterford City and County, Kildare, Laois, Offaly, Carlow, Wexford & Wicklow), and other agencies (Bord Iascaigh Mhara, DHPCLG, EPA, National Dairy Sustainability Forum, National Federation for Group Water Schemes, Sea Fisheries Protection Authority, Waterways Ireland, LAWCO, Irish Water, IFI, Forest Service, Coillte, NPWS, Teagasc, GSI, DAFM, Marine Institute and EPA). Based on the draft River Basin Management Plan priorities, a set of agreed principles and the priorities of the workshop attendees, 34 areas were recommended for action in the South East region and the Clodiagh (Portlaw)\_010 was selected because:

- It is not meeting its protected area objective for Freshwater Pearl Mussel habitat (19 of 27 catchments of S.I. 296 2009).
- It is a headwater of the Clodiagh (Portlaw) river and the only waterbody in the sub-catchment that is less than Good status.
- It is a potential pilot project (for measures) because it is in an area with a high number of derogation farms.

The Q-Value in 2017 was Good which is an improvement from Moderate in 2014 at the upstream monitoring point (Br NE of Ballycullane). The PAA outlet monitoring point (Br E of Shanakill Ho) Q-Value was 2017 and was Good in 2014 also. The waterbody length is 32.07km. The Clodiagh (Portlaw)\_20 is a receiving surface waterbody but it is *Not At Risk* status and it is outside this PAA.

### 1.1. New information

A report was also made available on the *“Morphological assessment in the context of Fresh water pearl mussel habitat of the Clodiagh”* by RPS and Waterford County Council (2009). A report on the fresh water pearl mussel was also made available by DEHLG (2010) – *“Clodiagh Sub-basin Management Plan”*. A paper was published also *“the status of the freshwater pearl mussel Margaritifera Margaritifera in east Cork and Part of Waterford Ireland”*.

New Q-Value information (Source: WFD App data) became available and changed the status of the waterbody Clodiagh (Portlaw)\_010 from “Good” to “High” at Ballycullane, and from “Good” to “High” at Shanakill Ho. In 2017 there was a welcome return to satisfactory conditions in the upper reaches, Station 0300 at Clonea Bridge fell again from High ecological condition in 2014 to Moderate ecological condition in 2017. Most recent assessment from the EPA biologist: This is of particular concern as this river is the only sub-catchment of HA16 that is designated for the protection of the freshwater pearl mussel under the EC Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. Most of the mussel population in this river is downstream of Clonea Bridge and need High ecological conditions for their survival. Additional surveys at the two uppermost stations (0040 and 0100) in June 2018 indicated continuing improvement with both of these locations returning to High ecological quality.

Table 1 Summary table of waterbodies within and outside the Clodiagh PAA

<b>WB Code &amp; WB Name</b>	<b>Risk &amp; Status of Obj.</b>	<b>2011</b>	<b>2014</b>	<b>2017</b>	<b>Pressure Category (Pressure Sub-Category) Significant Pressure</b>	<b>Action &amp; Local Authority</b>
IE_SE_16C030100 & Clodiagh (Portlaw)_010	At Risk & Not High-Status Objective	MP1 Good	MP1 Moderate	MP1 Good	Forestry (Forestry) Yes - Significant & Agriculture (Pasture) Yes - Significant	IA7 Multiple Sources in Multiple Areas & Waterford City & County Council
		MP2 Good	MP2 Good	MP2 Good		

Note: Monitoring point = MP

## 2. Receptor information and assessment

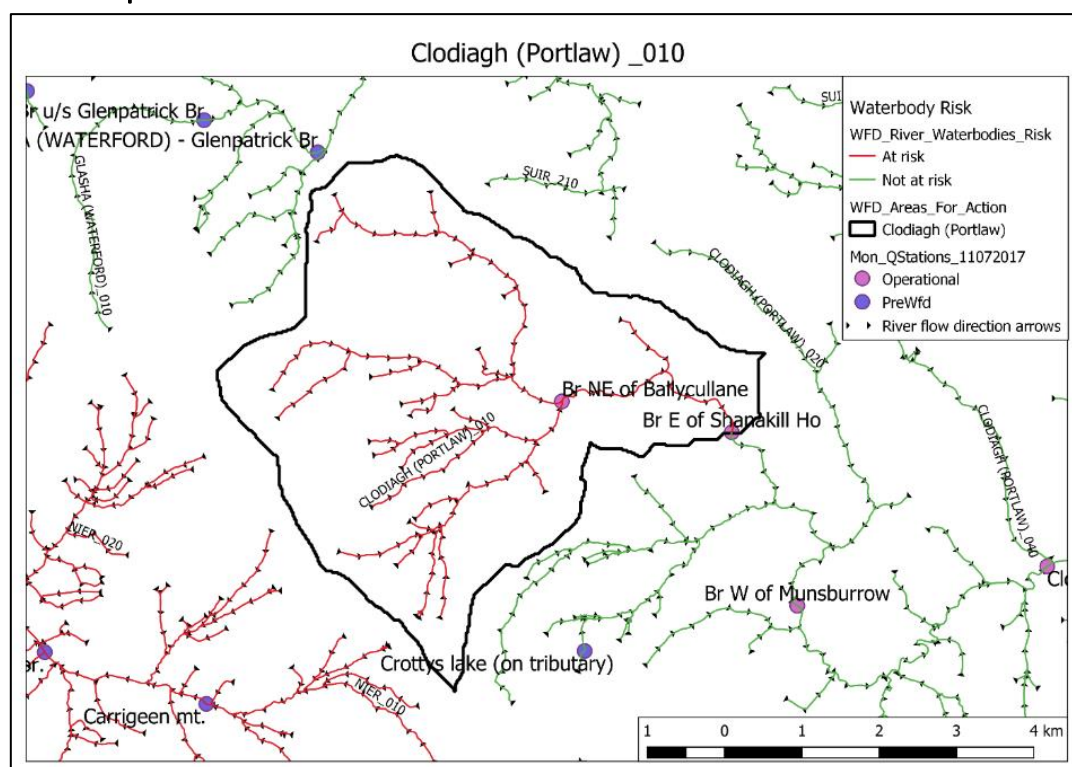


Figure 1. Overview map of Clodiagh PAA boundary with At Risk waterbody and two monitoring points

## 2.1. Clodiagh (Portlaw)\_10

- Nitrate<sup>1</sup> is not a significant issue as concentrations recorded do not generally exceed 3.5mg/l (Fig. 5). However, nitrate is classified as moderate where the concentrations of TON exceed 1.8 mg/l N<sup>2</sup> and so background nitrate levels are slightly elevated in this waterbody. *Note: Fig. 5 includes only 2 sample results from 2018 and so is not representative of the entire year, which normally includes 3-5 sample results.*
- Ammonia is not a significant issue. Ammonia levels are below the EQS mean and 95%ile (Fig. 6)
- Ortho-phosphate is not a significant issue. Average ortho-phosphate background levels have been generally low/moderate but in 2012 and 2013 the mean was high – 0.032 and 0.040 mg/l respectively (Fig. 4). The ortho-phosphate levels then decreased again to 0.014 and 0.015 mg/l in 2014 and 2015.

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<sup>1</sup> Nitrate is generally measured as nitrate and nitrite together (i.e. Total Organic Nitrogen, TON) as the concentration of nitrite is usually negligible.

<sup>2</sup> From LCA Manual: At the moment, it is unclear what is considered a 'high' concentration of nitrate. In the experience of the EPA Catchment Unit, it is between 3.5-4.5 mg/l as N; however, this is a topic for further consideration and discussion.

Table 2 Summary table of waterbody results

Waterbody (Monitoring point)	Graph/ Map ID	Clodiagh portlaw_010 (Br NE of Ballycullane) – Upstream	Clodiagh portlaw_010 (Br E of Shanakill Ho) – Outlet
<b>Risk Category</b>		<i>At Risk</i>	<i>At Risk</i>
<b>Biological Status</b> Monitoring Station(s) with Q- Values 2009-2015 Status Trends in Q value since 2009 2016-2018 Q value data	Fig. 2, Fig. 3	Br NE of Ballycullane  N/A Up and down. (Moderate 2008, Good 2011, Moderate 2014) Good 2017 – 4	Good  Br E of Shanakill Ho  Moderate Declining. (High 1999, Good 2002, Good 2014) Good 2017 – 4
<b>Hydrochemistry Data</b>			
Monitoring Station(s) with data		N/A	Br E of Shanakill Ho
Existing	Fig. 4, Fig. 5, Fig. 6, Fig. 12	N/A	Ortho-Phosphate, Total Oxidised Nitrogen, Ammonia, Biological Oxygen Demand (BOD)
New		N/A	N/A
<b>Trends in PO<sub>4</sub>, NH<sub>3</sub> and NO<sub>3</sub></b>			
In App (until 2015)		N/A	<b>PO<sub>4</sub></b> : Downwards <b>NH<sub>3</sub></b> : Downwards <b>NO<sub>3</sub></b> : Upwards
All available data		N/A	N/A
Other water quality data		N/A	BOD: Range: 0.500 to 5.000 mg/l. Highest in 2010, 2012, 2013.
2014 Baseline Concentration		N/A	<b>PO<sub>4</sub></b> : 0.023 mg/l <b>NH<sub>3</sub></b> : 0.021 mg/l <b>NO<sub>3</sub></b> : 2.737 mg/l
Distance to threshold			<b>PO<sub>4</sub></b> : Near <b>NH<sub>3</sub></b> : Far <b>NO<sub>3</sub></b> : Far
<b>Supporting Conditions</b>			
Chemistry	Fig. 13		Pass
Oxygenation	Fig. 13		Pass
Acidification	Fig. 13		Pass
<b>Hydro-morphology</b>			
RHAT Score			Report available for Clodiagh_30 only
Evidence of arterial drainage			None

Waterbody (Monitoring point)	Graph/ Map ID	Clodiagh portlaw_010 (Br NE of Ballycullane) – Upstream	Clodiagh portlaw_010 (Br E of Shanakill Ho) – Outlet
<b>Ecological Status (2010-2015)</b>			Good
Trends 2010-2015			Not significantly deteriorating
<b>Protected Areas</b>			No
<b>WFD Objective</b>			Good status
<b>EPA biologist notes (if any)</b>		<p>While there has been a welcome return to satisfactory conditions in the upper reaches, Station 0300 at Clonea Bridge has fallen again from High ecological condition in 2014 to Moderate ecological condition in 2017 vs table above. This is of particular concern as this river is the only sub-catchment of HA16 that is designated for the protection of the freshwater pearl mussel under the EC Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. Most of the mussel population in this river is downstream of Clonea Bridge and need High ecological conditions for their survival.</p> <p><i>Note: This comment refers to areas outside the Clodiagh PAA boundary.</i></p>	

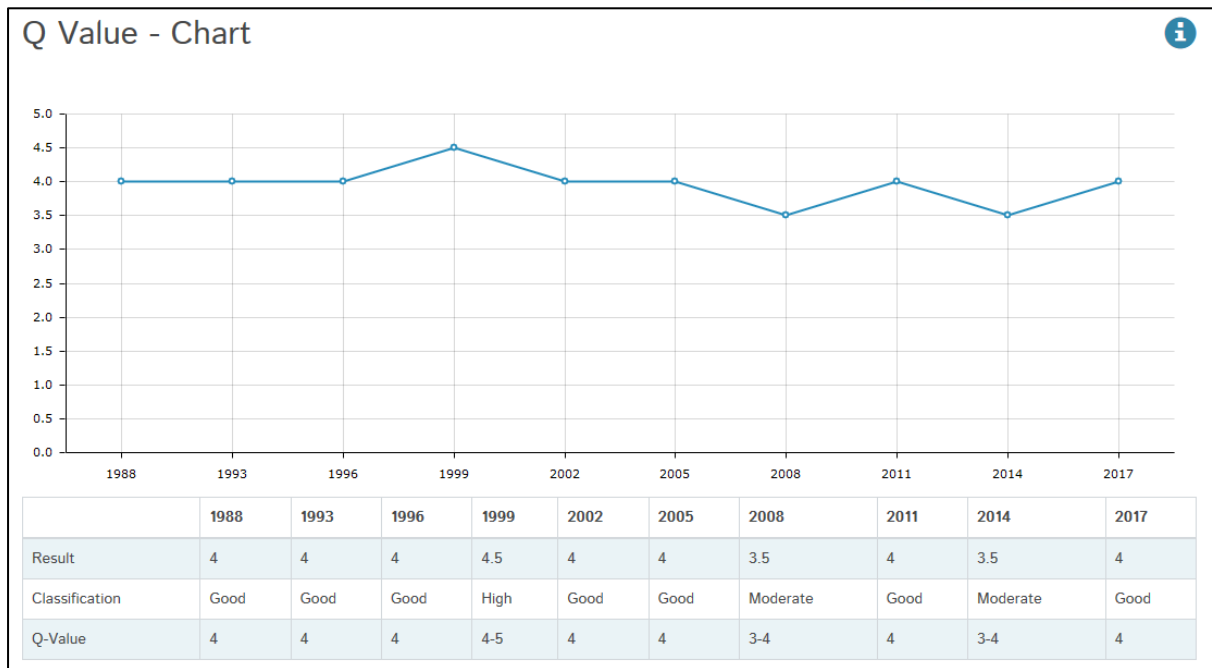


Figure 2 Q-Value graph for Br NE of Ballycullane (upstream MP) – Clodiagh (Portlaw) \_010

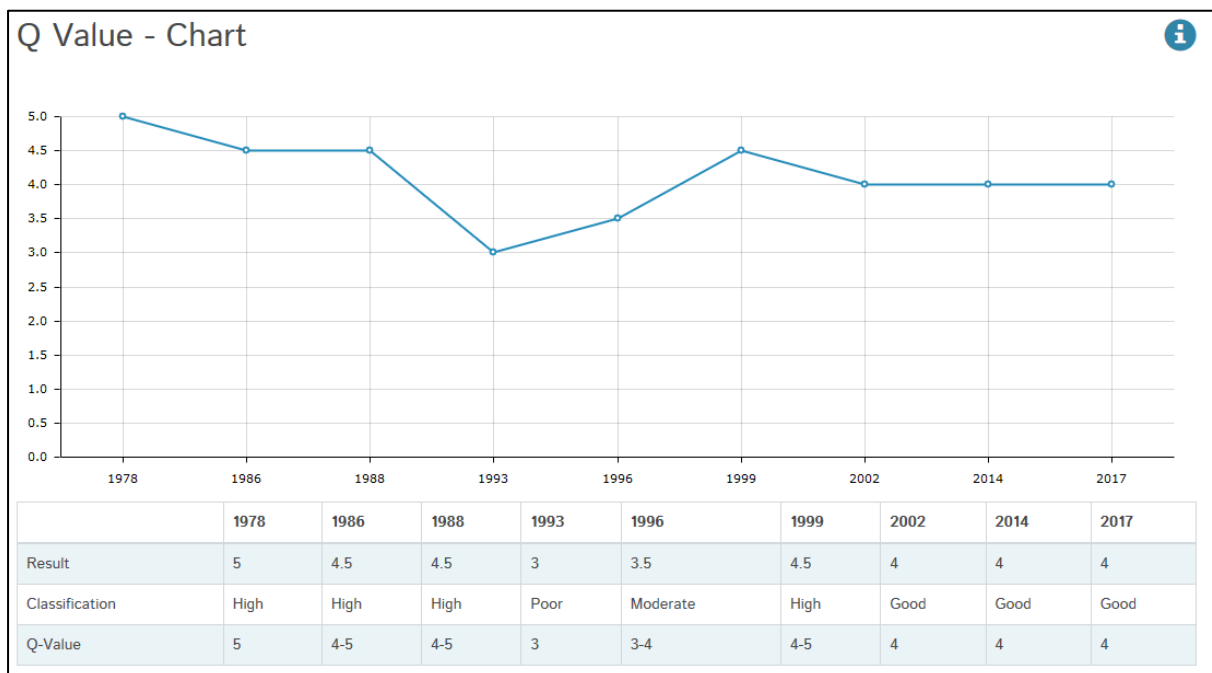


Figure 3 Q-Value graph Br E of Shanakill Ho (outlet MP) Clodiagh (Portlaw) \_010

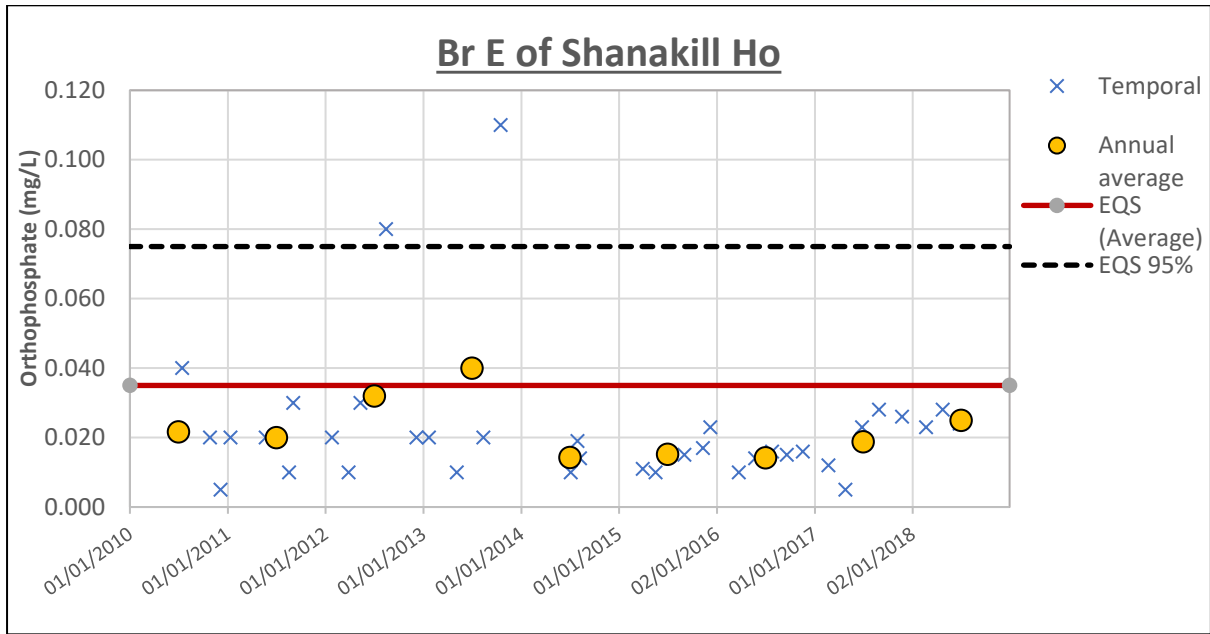


Figure 4 Clodiagh (Portlaw)\_10 Ortho P values

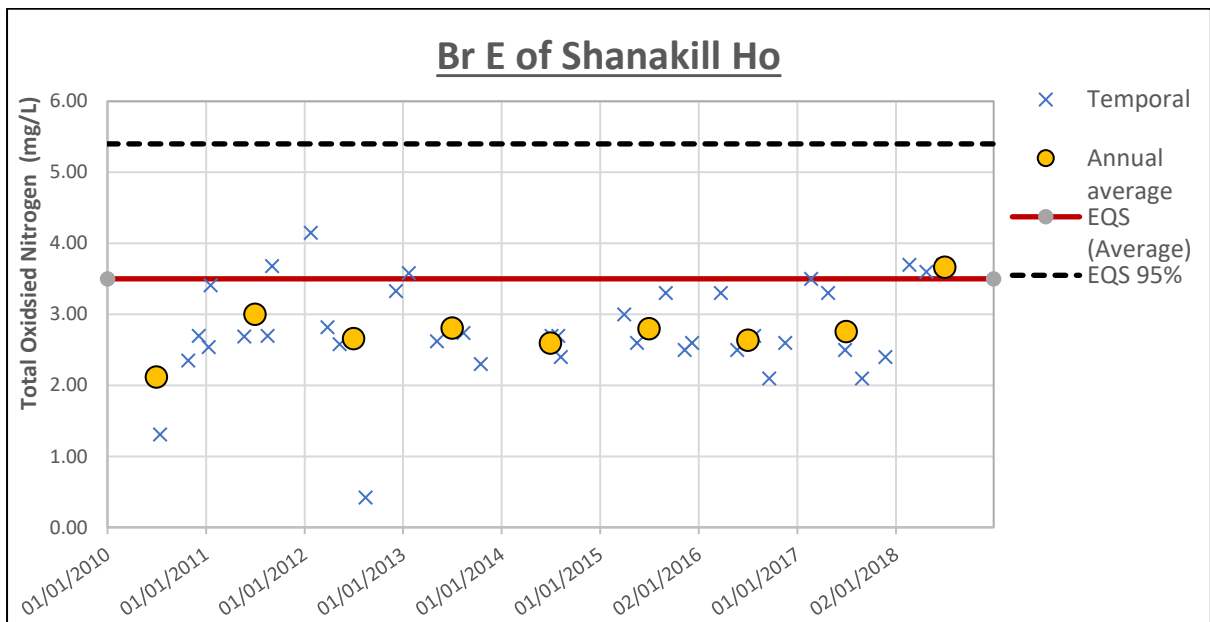


Figure 5 Clodiagh (Portlaw)\_10 TON values

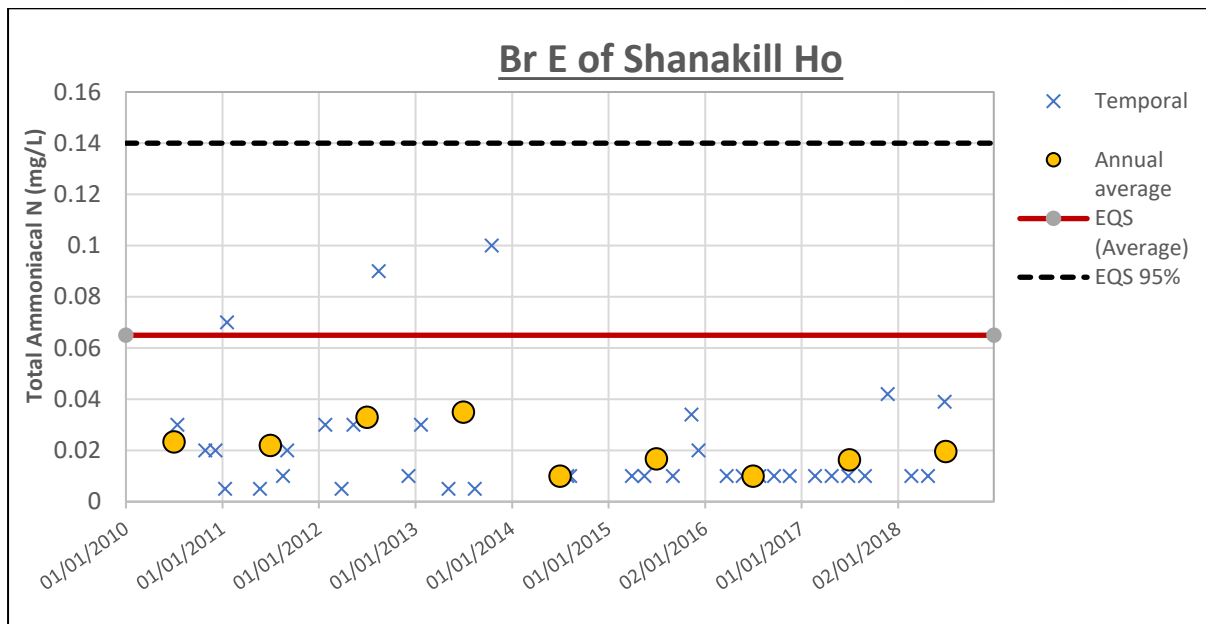


Figure 6 Clodiagh (Portlaw)\_10 Ammonia values

### 3. Significant pressures

Table 3 Significant pressures Clodiagh\_10

Waterbody	Pressure Category	Sub-category	Significant Pressure	Impact
Clodiagh (Portlaw)_10	Forestry (WBP0003054)	Forestry	Yes	Nutrient pollution
	Agriculture (WBP0003055)	Pasture	Yes	Nutrient pollution

#### 3.1. Clodiagh (Portlaw)\_10

- There is agency and private stands of forestry (purple) (Fig.7) which may potentially cause an impact (nutrient pollution and sediment) when harvesting events occur. If required, stands may need to be ground-truthed as harvest events may have occurred since the aerial photograph was taken. As nutrient pollution is the impact associated with Forestry (Table 3), historic fertiliser events for forests should be ruled in or ruled out as a potential contributor nutrient levels in this waterbody. Or forested areas near waterbodies that are receiving fertiliser inputs.
- If required, areas of high Nitrate PIP (Fig. 8) can be used to address nitrate issues coming from agricultural sources.

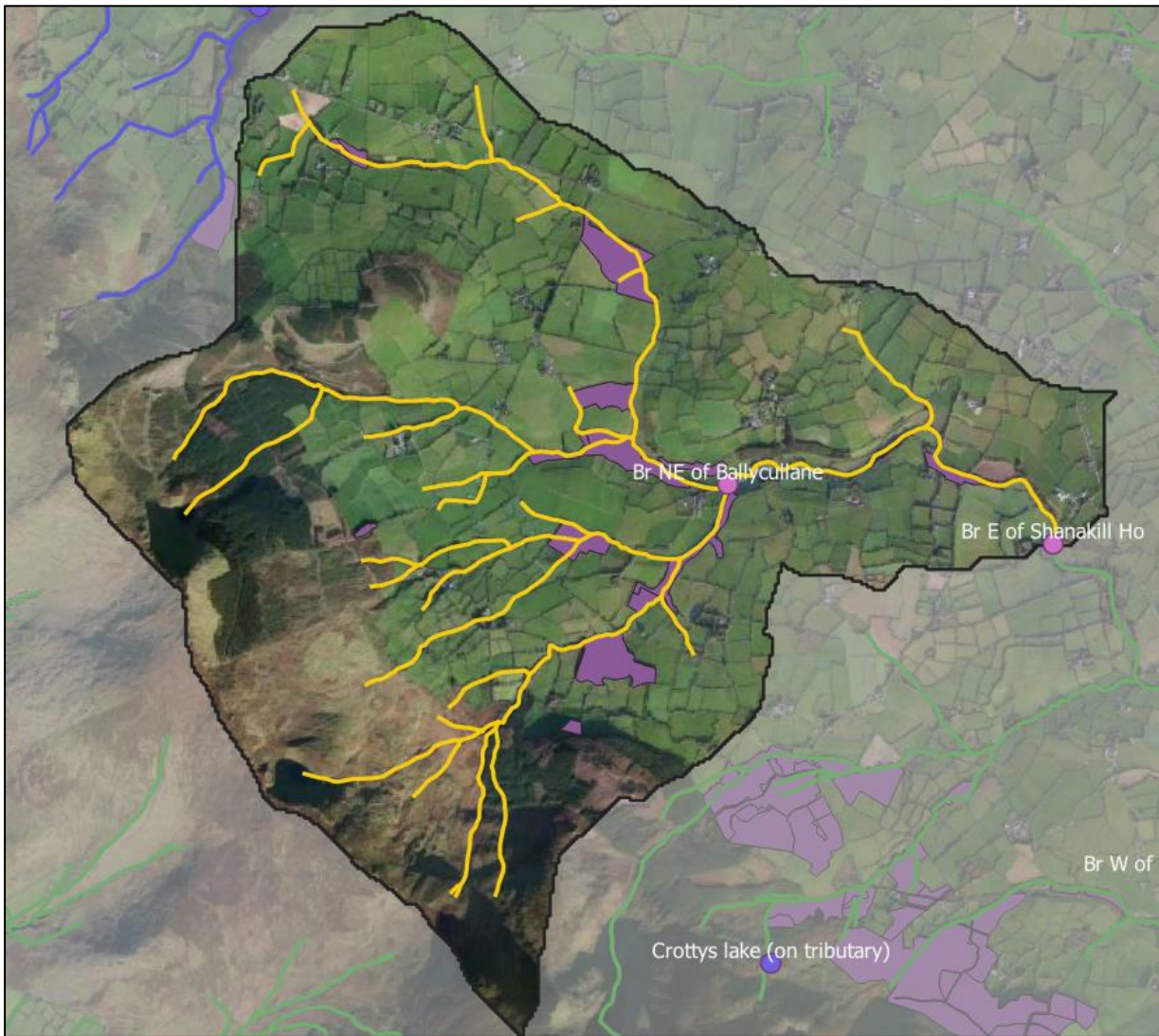


Figure 7 Aerial photo of catchment - showing agricultural land use and forested areas (private forestry in purple)

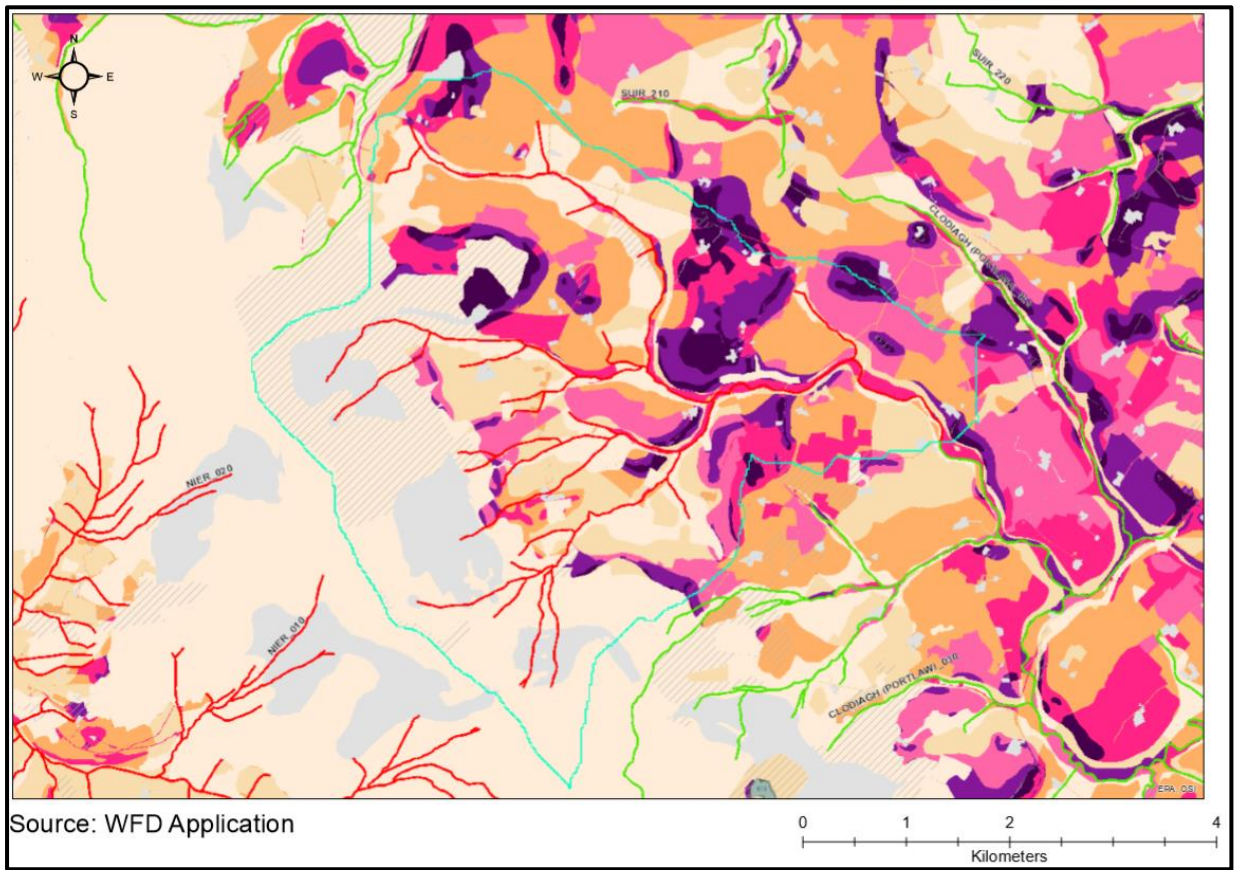


Figure 8 Surface water Nitrate PIP

## 4. Pathway information and analysis

### 4.1. Overview

- There are two compartments based on the aquifers (Fig.9), Locally Important (LI) and Poor (PI) aquifers. LI is Moderately Productive, and PI is Unproductive, but both have low transmissivity (< 10m<sup>3</sup>/d).
- Both compartments have sub-compartments which are based on wet and dry soils (Fig.10).
- The main pathways are near surface flows. The water would be expected to flow in the space above the aquifers of low productivity and below the well drained soil. The low depth of sub-soils (<3m) decreases the nutrient attenuation capacity also. As a result, that is where the pathway to the receptor is most likely.
- The well-drained areas (Fig. 10), Nitrate to Surface Water Pollution Impact Potential (Fig. 8) are the best indication of Critical Source Areas for this PAA.

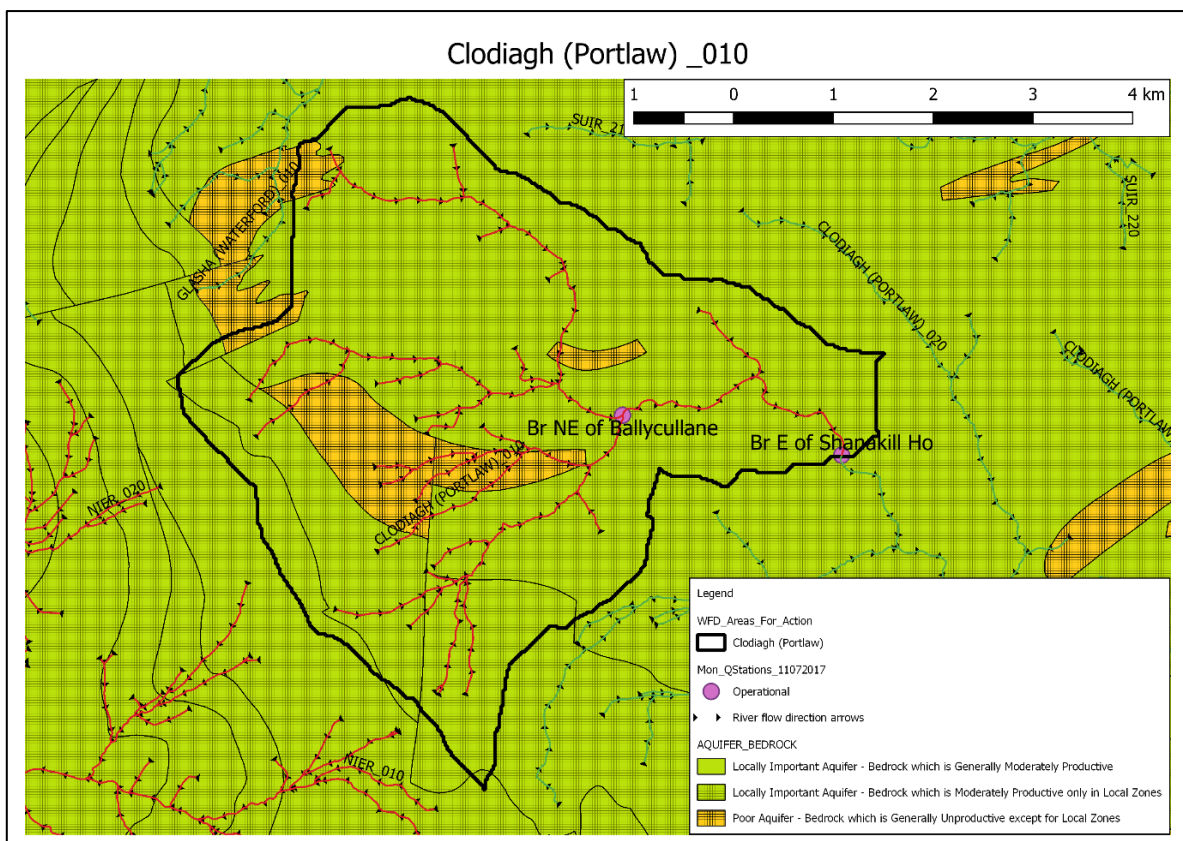


Figure 9 Aquifer map



Table 4 Pathways information checklist

<b>Factors</b>				
<b>Topography</b> ○ Contour map ○ Aerial imagery	Fig. 14 Fig. 7			
<b>Compartment</b>	Compartment 1		Compartment 2	
<b>Aquifer (transmissivity)</b>	LI - Locally Important – Moderately productive only in local zones (< 40 m <sup>3</sup> /d)		PI – Poor – Unproductive except for local zones (< 40 m <sup>3</sup> /d)	
<b>Bedrock</b>	SMV DORS – Devonian Old Red Sandstones		SMV – Silurian Meta-sediments and Volcanics	
<b>Sub-compartment</b>	Sub-compartment 1A	Sub-compartment 2B	Sub-compartment 1A	Sub-compartment 2B
<b>Soil wet/dry</b>	Poorly drained	Well drained	Poorly drained	Well drained
<b>Sub-soil</b>	○ Till derived from Devonian Sandstone ○ Bedrock Outcrop and sub-crop ○ Peat	○ Alluvium	○ Till derived from Devonian Sandstone ○ Bedrock Outcrop and sub-crop ○ Peat	○ Alluvium
<b>Sub-soil permeability</b>	Moderate	Moderate	Moderate	Moderate
<b>GW vulnerability</b>	X,E & H	H	X,E & H	H
<b>Karst features</b> ○ Tracing	None	None	None	None
<b>Hydrology</b> ○ Drainage density ○ Arterial	N/A	N/A	N/A	N/A
<b>Susceptibility</b> ○ PO <sub>4</sub> to SW ○ NO <sub>4</sub> to GW ○ NO <sub>3</sub> to SW				
<b>Likely main pathways</b>	Overland	Near surface	Overland	Near surface
<b>Likely CSA</b>	Use Nitrate PIP map			

#### 4.2. Clodiagh (Portlaw)\_10

- **Significant issue:** There was no significant nutrient issue, however TON and Ortho P baseline levels were slightly elevated.
- **Significant pressure:** Forestry and agriculture
- **Relevant pathway:** As this is a Poorly Productive aquifer, near surface flow via well drained soils over low depth sub-soils (<3m) are the most likely pathways.

## 5. Interim conclusions on the Priority Area for Action based on desk study

### 5.1. Clodiagh (Portlaw)\_10 & overview of PAA

- This waterbody is *At Risk*, it has a Good Status objective.
- It was at Moderate status in 2009-2015 for both ecological and biological status.
- There are no significant nutrient issues as none of the supporting chemistry parameters exceed the relevant EQS<sup>3</sup>. However, nitrate (which does not have an EQS) is classified as moderate as the concentrations of TON exceed 1.8 mg/l N<sup>4</sup>.
- The significant pressures identified in the initial characterisation were Forestry and Agriculture – Nutrient pollution.
- The main CSA would be on agricultural land with fields that were well drained over low depth sub soils that are receiving high nutrient loadings for N or where forest stands have been fertilised and specific areas are directly and hydrologically connected to this receptor.

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<sup>3</sup> European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended)

<sup>4</sup> From LCA Manual: At the moment, it is unclear what is considered a 'high' concentration of nitrate. In the experience of the EPA Catchment Unit, it is between 3.5-4.5 mg/l as N; however, this is a topic for further consideration and discussion.

## 6. Work plan

- The further characterisation actions recommended by the EPA are:
  - IA7 Multiple Sources in Multiple Areas: examine potential impacts from forestry and sediment, and also farmyards and septic tanks. Focus on the area u/s of the headwaters sampling station (Br NE of Ballycullane as the d/d stn was at Good status in 2014. Details: Complete septic tanks inspections. Complete catchment walk - walk along stream and tributaries, pay particular attention to areas where wet soils are aligned with forestry and septic tanks. Record any point discharges, areas where forestry and sediment may be influencing water quality. Include spot samples for field chemistry (DO, pH, temperature and conductivity), using the field chemistry as a guide to select WQ sample and SSRS locations.
- Carry out fieldwork plan
- Speak to ASSAP agency about general advice for mitigating Nitrate losses from well drained agricultural areas and best practice nitrogen management (timing, input type, quantity, distribution/placement). Note also that this is a fresh water pearl mussel catchment and that lime use near waterways is potentially dangerous for pearl mussels.
- Communicate with forest owners and Forest Service to identify past and future harvest events. Identify if forest fertilisation events took place. Consider placing preventative measures in place for future forest clear felling and appropriate buffers for waterways.

### 6.1. Fieldwork plan

The work plan can be split into two goals (Fig. 11): 1) To gather evidence of point source nutrient issues from farmyards and/or septic tanks 2) To gather evidence of sediment issues. Start at Rathgormack.

**First Investigation coordinates:** 52.2981382,-7.5290054. (Can be copied into google maps/earth)

This is a confluence point in the river. It is also the location of the upstream monitoring point - Br NE of Ballycullane. One stream flows in from the North. The second stream flows in from the South. Carry out an SSIS on both streams. If no difference is found, test the usual field parameters (conductivity, DO, pH, temperature). Pollution may be detected in both streams however nutrient problems are expected in the North stream and sediment issues in South stream. Or a combination of both.

If issues are identified in the North stream, then there are two other bridges that could help narrow down where the problem is occurring: 52.3148668,-7.5427369 and 52.3019914,-7.5516152. If issues are identified in the South stream go to "Second Investigation".

**Second Investigation:** 52.2940177,-7.5378198.

This is a very narrow stream. Test the waterbody for signs of nutrient pollution and sediment. If possible, walk the banks of the stream in the direction of water flow until a confluence point is reached. Then sample this joining waterbody for issues relevant to sediment. It's important that this location is reached and sampled because it's the base of a large tributary and may show impacts of forestry which is adjacent to this large tributary.

If further investigations are required make observations at 52.2949136,-7.5535125 and also 52.2909549,-7.5523342 – go to the end of the road, there is potentially a small stream at the end of it – this may require landowners permission.

**Note:** It appears to a single lane road that connects all these stop points. The road is a turn off the R678, there are two junctions off this road and either one will bring you to the coordinates.

*Table 5 Factors to be aware of during fieldwork*

Sediment issues – What’s likely in this PAA	Point sources – what to look out for
<ul style="list-style-type: none"> <li>○ Land drainage</li> <li>○ Cattle poaching &amp; cattle access along banks</li> <li>○ Forestry planting and clear felling</li> <li>○ Construction of dwellings of buildings along banks</li> <li>○ Barriers to water flow</li> <li>○ Potentially other sediment related risks</li> </ul>	<ul style="list-style-type: none"> <li>○ Physical point source – hidden pipes/discharge points</li> <li>○ Farmyards near streams or drains</li> <li>○ One off dwellings on wet soils (rushes)</li> <li>○ Sewage fungus</li> </ul>
Goal	Goal
<ul style="list-style-type: none"> <li>○ Determine what is natural sediment and unnatural sediment levels – what is the baseline sediment over time</li> <li>○ Freshwater Pearl Mussel have a zero-tolerance policy for artificially elevated levels of siltation in their habitat</li> </ul>	<ul style="list-style-type: none"> <li>○ Land drains are point sources too – preferential flow</li> </ul>
Measurements	Measurements
<ul style="list-style-type: none"> <li>○ Observations</li> <li>○ Turbidity</li> <li>○ Suspended concentration/total suspended solids</li> </ul>	<ul style="list-style-type: none"> <li>○ Walk along the bank – observations</li> <li>○ Parameters (conductivity, DO, pH, temperature)</li> </ul>

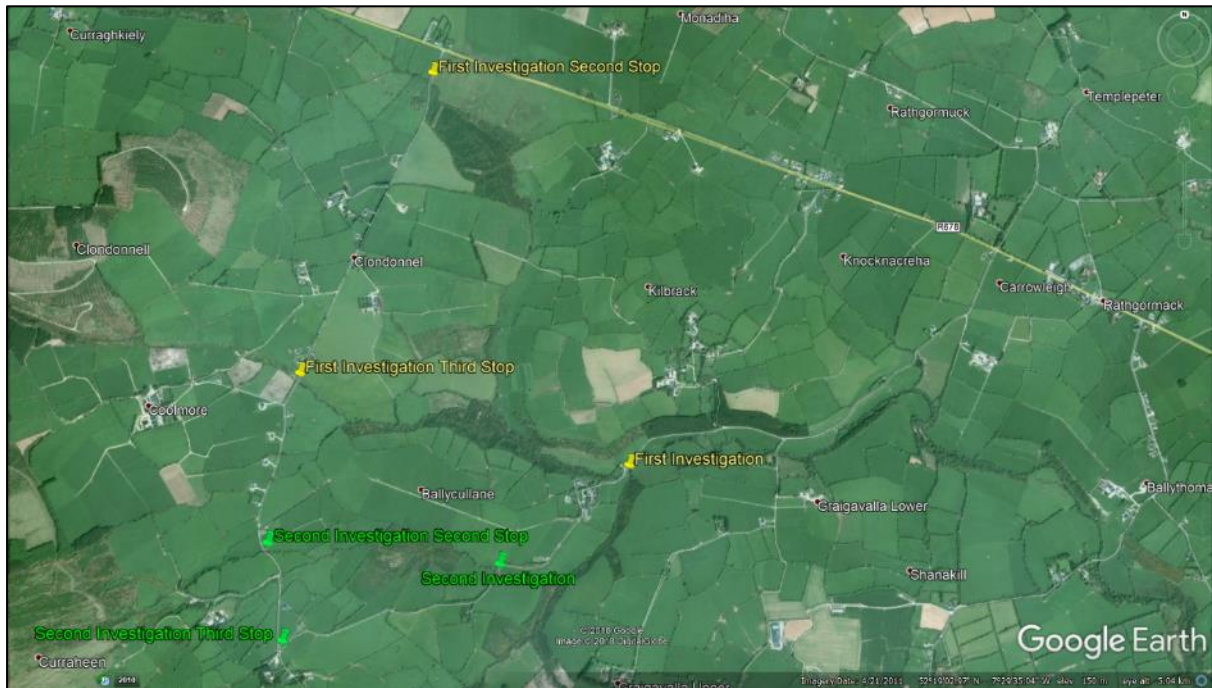


Figure 11 Google Earth – Names for suggested stop co-ordinates. Note Rathgormac in Centre Right of the map.

Table 6 Sampling Coordinates

Name	Coordinates
First Investigation	52.2981382,-7.5290054
First Investigation Second Stop	52.3148668,-7.5427369
First Investigation Third Stop	52.3019914,-7.5516152
Second Investigation	52.2940177,-7.5378198
Second Investigation Second Stop	52.2949136,-7.5535125
Second Investigation Third Stop	52.2909549,-7.5523342

## 7. Review of mitigation options

- Agricultural general measures
  - Catchment wide farmer discussion group
  - Provide support and advice on clean farmyards and field scale nutrient management on different soil types
- Forestry measures
  - Appropriate buffers
  - Watercourse protection during harvest events e.g. prevent sediment run-off

## Appendices

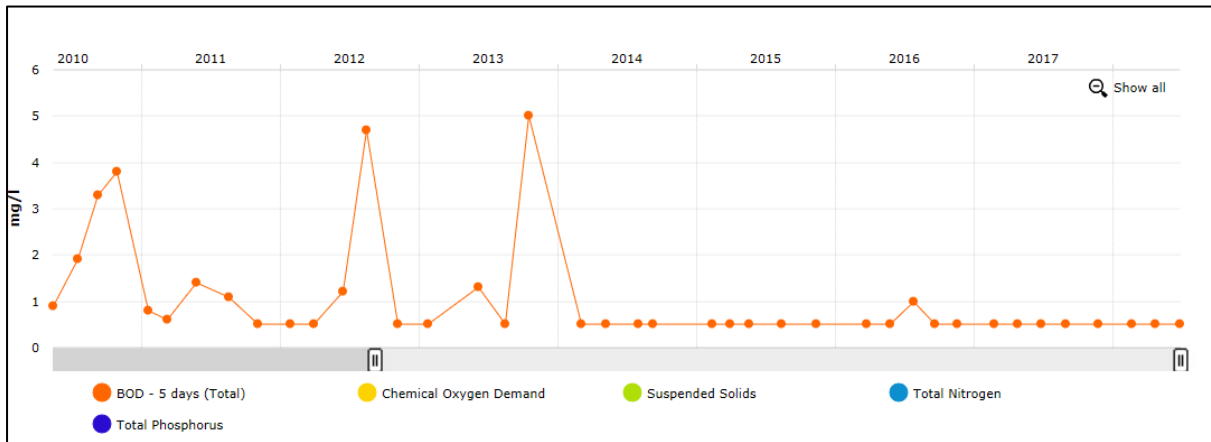


Figure 12 Br E of Shanakill Ho monitoring point - Biological Oxygen Demand (BOD)

















Status Details		
SW 2010-2015		
Status Iterations	SW 2010-2015	
Ecological Status or Potential	Moderate	
Biological Status or Potential	Moderate	
Invertebrate Status or Potential	Moderate	
Supporting Chemistry Conditions	Pass	
General Conditions	Pass	
Oxygenation Conditions	Pass	
Dissolved Oxygen (% Sat)	Pass	
Other determinand for oxygenation conditions	High	
Acidification Conditions	Pass	
pH	Pass	
Nutrient Conditions	Pass	
Nitrogen Conditions	Moderate	
Nitrate	Moderate	
Ammonium	High	
Phosphorous Conditions	High	
Orthophosphate	High	

Figure 13 Status details, chemistry, biology, acidification

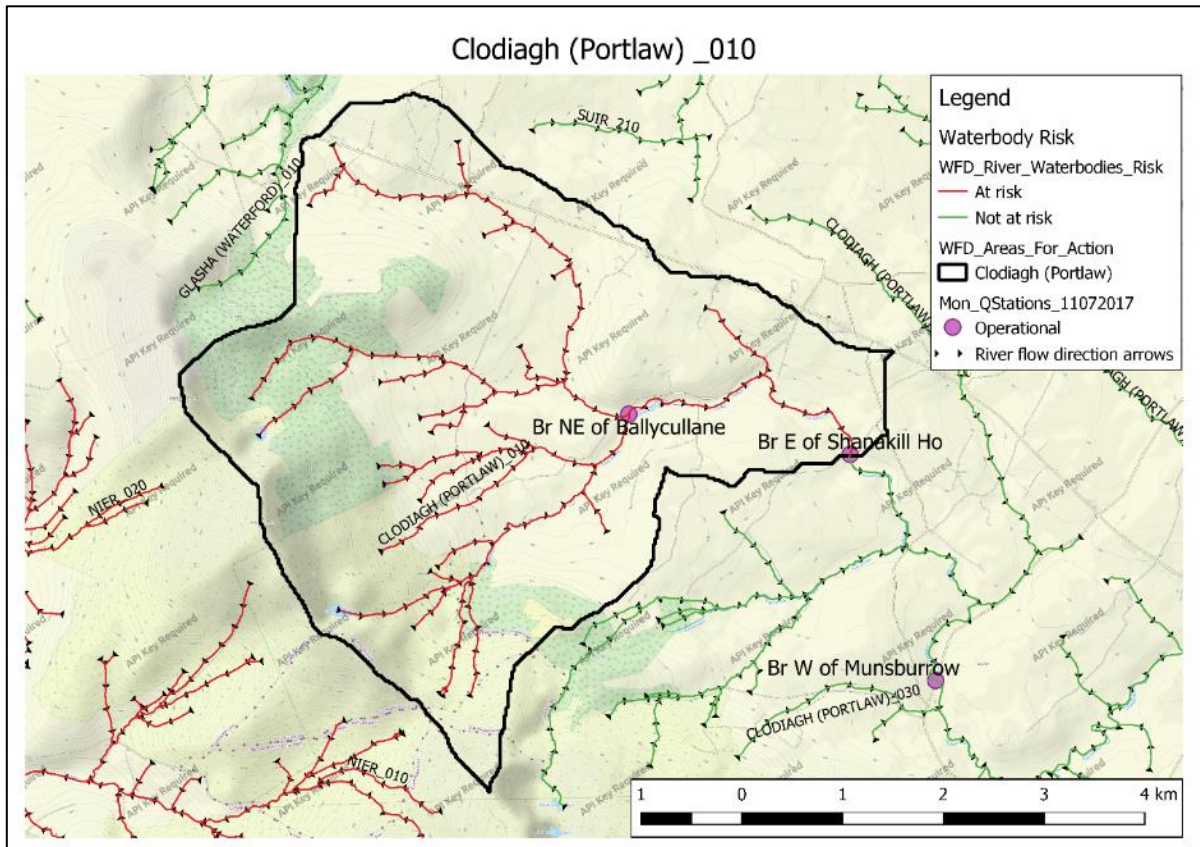


Figure 14 Contour map of Clodiagh\_10