Lough Ennell/Dysart Stream Area for Action

Midland and Eastern Region

Desktop Assessment

AFA0113

AFA0113 Lough Ennell/Dysart Stream

Table of Contents

List of Figures

List of Graphs

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.

Acknowledgements

The authors would like to acknowledge the contributions of Westmeath County Council, the Office of Public Works, the National Parks and Wildlife Service, and Inland Fisheries Ireland who have carried out a significant amount of work in the Dysart (Lough Ennell)_010 waterbody in recent years and their support of the Local Authority Waters Programme.

This report compiles available information for the Lough Ennell/Dysart Priority Area or Action (PAA) from the assessment and datasets available from the EPA, Westmeath County Councils, the National Parks and Wildlife Service, the Office of Public Works, and Inland Fisheries Ireland.

1 Non-Technical Summary

The Dysart stream (Lough Ennell)_010 (waterbody code IE_SH_25D050400), is a single river waterbody set in the Lough Ennell/Dysart Stream Area for Action. The stream rises in the bog South of Rathconrath in the north of the catchment, flows in a South-Westerly direction towards Balrath then flows South-Eastwards until it enters the Southwestern side of Lough Ennell.

The Dysart stream (Lough Ennell)_010 is *At Risk* as the 2010-2015 ecological status is *Moderate*, driven by the biological status in the lower biological monitoring station *Bridge Upstream of Lough Ennell (Station code RS25D050400).* Hydromorphology, subcategory channelisation, is the significant pressure on the waterbody, however, based on the review of the conceptual model for the Area for Action, aerial imagery, data from Westmeath County Council and from initial assessments, it is likely that agriculture is also a significant pressure with sediment, phosphate and pathogens being the significant issues. The main pathways for sediment, phosphate and pathogens are similar, with point sources and overland flow pathways being most important.

Environmental protocols for channel maintenance will be discussed with the OPW in order to minimise impacts from channel maintenance, where possible.

Agriculture is the dominant land use and both diffuse and point source pollution from agriculture will be the focus of the field assessment, particularly within the middle to lower sections of the waterbody where the Surface Water Phosphorous Pollution Impact Potential (PIP) map indicate the higher risk categories.

A bridge survey, chemistry and microbial sampling will be initially undertaken in the Area for Action in the Dysart stream (Lough Ennell)_010, to confirm if phosphorous and pathogens are also significant issues in the waterbody.

Point sources of pollution should be eliminated in so far as possible in the catchment and mitigation options for diffuse agricultural pressures should focus on source reduction and pathway interception measures to target both phosphorous and pathogens flowing overland and along drains and ditches in the poorly draining areas.

2 Introduction

2.1 Background to the Priority Area for Action (PAA)

The Dysart Stream (Lough Ennell)_010 (waterbody code IE_SH_25D050400) is a one river waterbody that has been selected as a Priority Area for Action (PAA) as detailed in the River Basin Management Plan 2018-2021. It is 8.2 km in length and the waterbody is *At Risk* of not meeting its WFD objective of good status. It is currently at *Moderate* ecological status (2017).

The stream rises in the bog South of Rathconrath, in the North of the catchment, flows in a south-westerly direction towards Balrath, then flows South-Eastwards until it enters the southwestern side of Lough Ennell. The waterbody covers approximately 15 km^2 and one of thirteen lesser important inputting waterbodies into Lough Ennell with the Brosna (covering 43 $km^{2)}$, the main inputting waterbody).

Lough Ennell (waterbody code (IE_SH_25_188), the receptor/ receiving water of the Dysart Stream, is approximately 7.2 km in length and 3.2 km wide, with a surface area of 1151 ha and a maximum depth of 30 meters. It has an estimated residence time of 1.25 years (Source: EPA). This lake is one of the most important limestone lakes in the midlands, but the quality of the water has been generally poor owing to severe eutrophication in the 1970's. There has been a gradual improvement in water quality, however, and in 1990 it was classified as mesotrophic. The lake is categorised as typology class 12 by the EPA for the Water Framework Directive, i.e., deep (mean depth >4m), greater than 50ha and high alkalinity (>100mg/l CaCO3). It has a large area of shallow water with nearly two-thirds of its area being less than 8m, and almost half of it being less than 3m deep. The lake is dotted with islands, many of which have now become attached to the shoreline as the levels of the lake have changed due to drainage. Much of the lake shore is dry, stony ground, which was formerly part of the lakebed but is now as a result of drainage, colonised by calcareous grassland and alkaline fen. Lough Ennell is a Natura 2000 site, a Special Area of Conservation (SAC Site Code-000685) under the EU Habitats Directive, and a Special Protection Area (SPA Site Code 004044) under the EU Birds Directive. The Lough is of special conservational interest for a number of species (e.g., Pochard, Tufted Duck and Coot) and associated wetlands including alkaline fen (NPWS, 2014). A good diversity of charophytes have been recorded in the lake, including some of the rare species (two Red Data Book charophyte species). The lake is also Nutrient Sensitive Area under the Urban Wastewater Treatment Directive, as amended. In the 2013 to 2018 reporting period, the EPA assigned an overall ecological status or potential of *Good* to Lough Ennell.

AFA0113 Lough Ennell/Dysart Stream

Lilliput is the designated bathing water on Lough Ennell under the Bathing Water Quality Regulations 2008 (S.I. no. 79 of 2008). There are concerns about its recent quality with a marked deterioration from good to poor status in 2018 and *E. Coli*, including VTEC, 0157 and 026 were both detected by the HSE on the 25/07/2018 in the southern section of Lilliput bathing water. Currently (2019) there is a bathing prohibition notice in place. LAWPRO met with Westmeath County Council and the HSE on the 20/08/2019 to outline its work programme for the Lough Ennell/Dysart PAA and how it will contribute to resolving the deteriorating status of Lilliput Bathing Waters. The waterbody has a 2022-2027 Technical Environmental Objective Date for Good Status, however, due to serious concerns in the receiving water of Lough Ennell it was decided to start assessment in this waterbody in 2019.

The Lough and the surrounding feeder streams are also a particularly important fishery for the population of the resident wild brown trout (*Salmo trutta*) and is one of 13 wild brown trout fisheries in Europe. Lough Ennell produced Ireland's largest ever lake brown trout (11.8 kg) caught in 1894 and this record still stands today (IFI, 2017).

Land use in the PAA is dominated by pasture (approximately 70%), followed by tillage, forestry, and transitional woodland scrub (about 20%) with areas of peat bog and other agricultural land uses (10%). Agricultural land in the north of the catchment is good with most free draining in nature. There are some poorly draining soils in the middle and lower sections of the catchment, which follow the course of the stream. In these areas, the soil type is lacustrine sediment, which typically exhibit a high clay content resulting in poorly draining soils.

The Midlands and Eastern catchment assessment workshops were held in Ballycoolin, Dublin from the 9th to 12th May 2017. They were attended by representatives of local authority staff (operational staff on all days and both operational and senior staff on final day of the workshop), Local Authority Waters and Communities Office (LAWCO) (now part of the Local Authority Waters Programme LAWPRO), Irish Water, Inland Fisheries Ireland, Forest Service, Coillte, The National Parks and Wildlife Service, Teagasc, Department of Housing Planning and Local Government, Geological Survey Ireland, National Federation of Group Water Schemes, Department of Agriculture, Food and Marine, Bord na Móna, Waterways Ireland and Environmental Protection Agency. The workshop was facilitated jointly by LAWCO and EPA. The reason for the selection of this waterbody detailed in the Midlands and Eastern Outcomes Report are given below: The Dysart / Lough Ennell PAA was selected as a priority area for action in the 2nd cycle. The EPA report includes the following reasons:

(1) Important fishery – wild brown trout
(2) Building on restoration works completed by Inland Fisheries Ireland
(3) Potential hydromorphology pilot project

(4) Important for angling tourism
(5) Feeder stream to Lough Ennell
(6) Socio-economic benefit to the town

Figure 1 below illustrates the location of the waterbody and waterbody catchment areas of the Lough Ennell/Dysart Stream PAA. The assigned risk and the location of the EPA monitoring points within the PAA are also shown.

Local catchment assessment will focus on the nature and extent of impacts from hydromorphological changes from channelisation and will review and reduce sediment and nutrient levels, specifically phosphorous from agriculture. It will also try to identify and eliminate/reduce the overall levels of pathogens entering the waterbody and lake due to the designation of the lake as a bathing water.

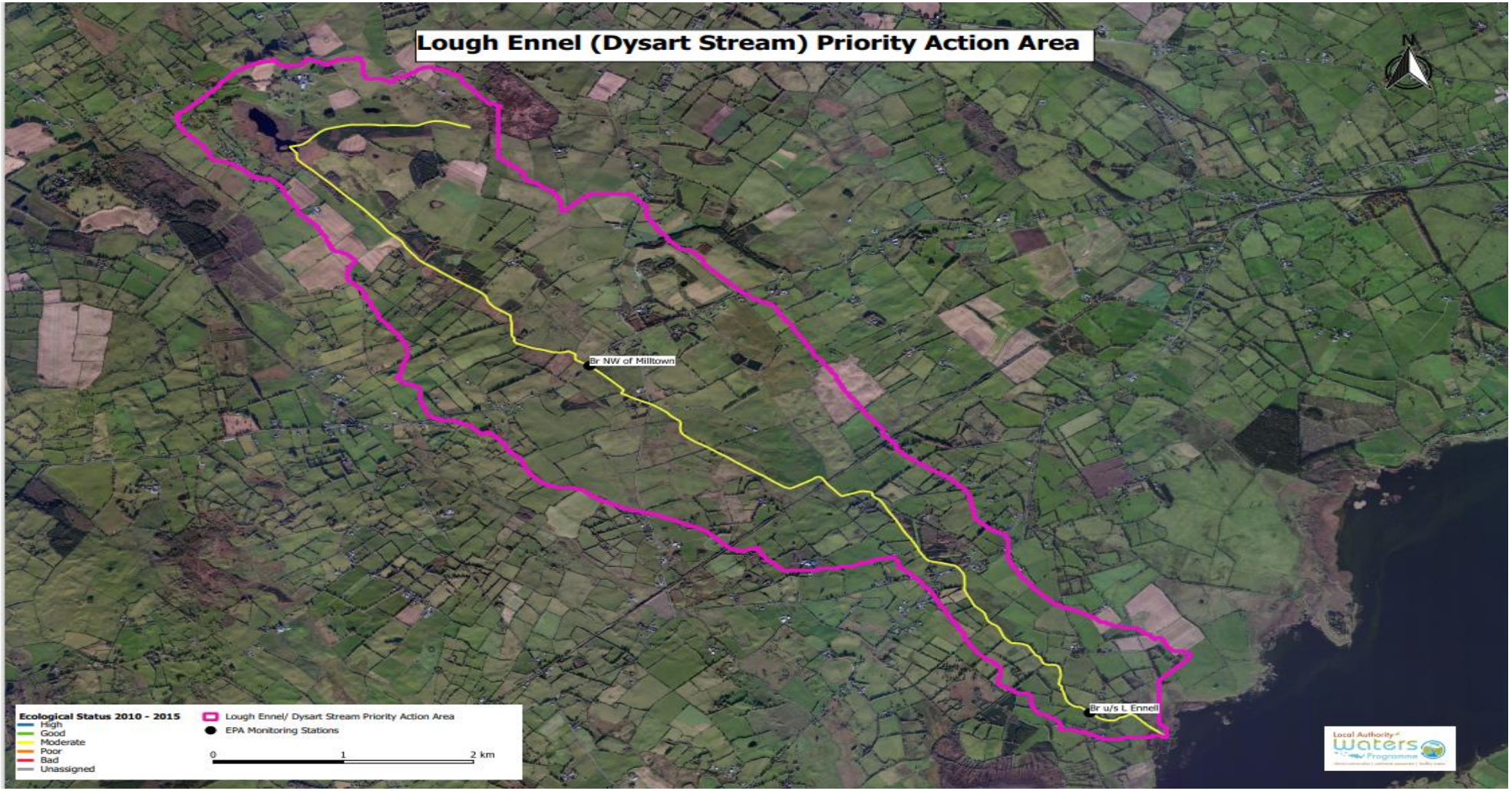


Figure 1 Lough Ennell/Dysart Stream PAA : Waterbody, catchment area & monitoring points.

2.2 Information Sources Consulted

Several information sources were consulted during the preparation of the desk study for the Lough Ennell/Dysart PAA including:

- WFD web application – EPA characterisation data
- IFI Sampling Fish for the Water Framework Directive, Lakes 2017 http://wfdfish.ie/wp-content/uploads/2018/11/Ennell_2017.pdf
- Data from Westmeath County Council
- Data from The Office of Public Works including the Natura Impact Statement for Arterial Drainage Maintenance Works - Brosna Arterial Drainage Scheme 2019-2023.
- Data from the Geological Survey of Ireland
- Data from The National Parks and Wildlife service.

2.3 PAA Summary Information

A summary of risk, ecological status, known pressures and associated significance for the Lough Ennell/Dysart PAA are presented in Table 1. There was a slight improvement in water quality in the period from 2010-2012, where the ecological status improved from *Poor* to *Moderate.*

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

Dysart_010_ IA1 Provision of Information:

- Samples have been taken six times per year by Westmeath Co. Co. This data is to be provided to EPA – (assigned to Westmeath County Council).

Dysart_010_ IA1 Provision of Information:

- Hydromorphology is considered the significant pressure - Arterial drainage schemes throughout - heavily channelised – (assigned to the EPA Hydromorphology Section).

3 Receptor Information and Assessment

3.1 Context and Setting

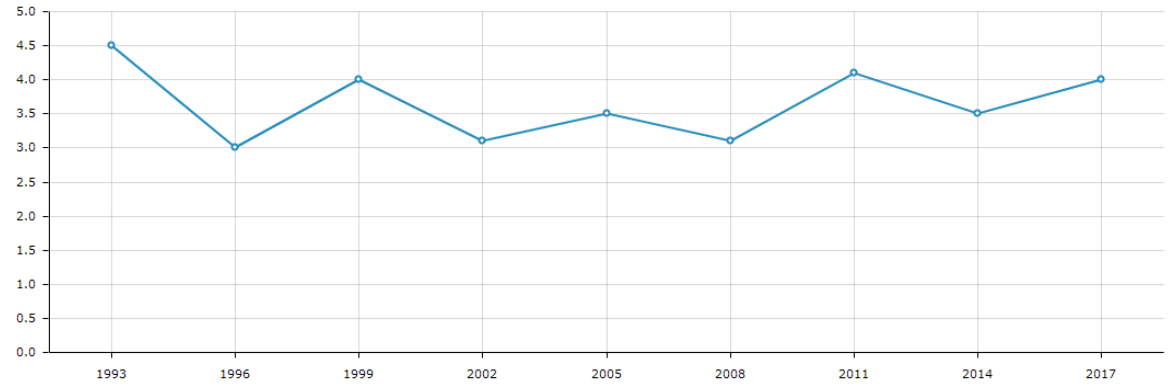
The Dysart Stream waterbody discharges directly to the southwestern section of Lough Ennell and is characterised as being *At Risk* of not meeting its objectives under the Water Framework Directive. There are approximately 12 other feeder streams into Lough Ennell outside the PAA, which contributes to the status of Lough Ennell. Lough Ennell is a Natura 2000 site and is a Special Area of Conservation Lough Ennell (SAC Site Code - 000685) under the Habitats Directive and a Special Protection Area (SPA Site Code) under the EU Birds Directive. Lilliput is the designated bathing water on Lough Ennell under the Bathing Water Quality Regulations 2008 (S.I. no. 79 of 2008). The current ecological status of Lough Ennell is good (2013-2018). The bathing water at Lilliput is classified as *Poor* (2018).

It is important to note that pathogens are not monitored routinely as part of the WFD monitoring programme. However, when assessing the impact on the receiving water, which in this instance include the Lilliput bathing water, available information on pathogens for the Dysart are included in the assessment (Appendix 1).

3.2 WFD Information

The EPA have two biological operational monitoring stations in the Dysart Stream PAA: The northern monitoring point is at *Bridge NW of* Milltown (Code RS25D050100) and the southern monitoring point Bridge Upstream of *Lough Ennell (Code RS25D050400).* At the northern monitoring point at Milltown Bridge, the biological status was *Good* in the 2011, *Moderate* in 2014 returning to *Good* in 2017 (Graph 1). Heavy silt was noted by the EPA biologist at this monitoring point in years 2002, 2008 and 2011 as denoted by the Asterix on the Q-Value in Graph 1. Moderate to heavy siltation of the riverbed was, however, noted again in field notes recorded by the EPA biologist in 2017.

Q Value - Chart

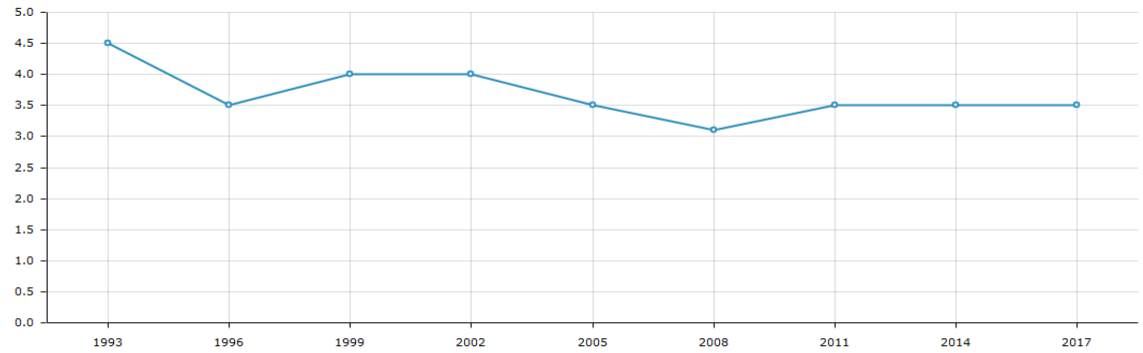


	1993	1996	1999	2002	2005	2008	2011	2014	2017
Result	4.5	3	4	3.1	3.5	3.1	4.1	3.5	4
Classification	High	Poor	Good	Poor	Moderate	Poor	Good	Moderate	Good
Q-Value	4-5	3	4	3*	3-4	3*	4*	3-4	4

Graph 1 Biological Monitoring at Bridge NW of Milltown.

The southern operational monitoring point is *Bridge Upstream of Lough Ennell (Code RS25D050400)*. This monitoring point has been assigned *Moderate* biological status (Q3-4) since 2011 and was last at *Good* Status in 2002. A total of 20 invertebrate taxa were recorded in 2017. The absence of sensitive taxa is a key indicator of a failure to meet Good ecological status or higher. The results of an examination of key toleranat taxa found: *Simuliidae* (Few), *Gammarus* (Common) and *Baetis rhodani* (few). *Cladophera* and *Vaucheria* were present and total macrophyte growth was at 15% coverage with filamentous algae at 10-25% coverage. The biologist indicated moderate to heavy instream siltation. The substrate was highly calcareous to compacted. In waterbodies where calcium levels in solution in the water are naturally very high, an aquatic flora dominated by algae and diatoms on the riverbed is evident. These plants, as part of their natural metabolism, can generate substantial quantities of calcium carbonate, which precipitate out as a solid causing concretion of formerly loose gravel beds and a reduction of habitat. The waterbody is due to be monitored again biologically in 2021. Local Catchment Assessment will be focused at trying to improve the lower stretches and monitoring point on the Dysart stream.

Q Value - Chart



	1993	1996	1999	2002	2005	2008	2011	2014	2017
Result	4.5	3.5	4	4	3.5	3.1	3.5	3.5	3.5
Classification	High	Moderate	Good	Good	Moderate	Poor	Moderate	Moderate	Moderate
Q-Value	4-5	3-4	4	4	3-4	3*	3-4	3-4	3-4

Graph 2 Biological Monitoring at Bridge Upstream of Lough Ennell

There is no operational physico-chemical data for the Dysart_010, however, some data exists for the waterbody from 2015/2016 and in 2019. Table 3.1 describes the current status, risk and pressures of the Dysart Stream PAA. The local catchment assessment process will further characterise the water body and confirm or otherwise the issues and pressures arising.

WB Code	WB name	WB Type	Risk	High status obj.	2009	2012	2015	2017	No of pressures	Pressure category	Pressure subcategory
IE_SH_25D050400	DYSART STREAM (LOUGH ENNELL)_010	River	At risk	No	P	M	M	M	1	HYMO	Channelisation

Table 1 Summary of Risk, Ecological Status and Pressures within the Dysart Stream PAA (WFD App)

3.3 Supplementary Information

Westmeath County Council provided some investigative assessment monitoring on the Dysart Stream undertaken in 2016. Assessing this data shows that there was a Biochemical Oxygen Demand value of 14.7 mg/l taken at the Monitoring Point *Bridge Upstream of Lough Ennell* on the 17/11/2016. Given the moderate biological status in this section of the river, this suggests that there is a significant source of point source organic pollution occurring upstream, resulting in nutrient loving macrophytes evident in the lower monitoring point as observed by the EPA biologist in 2017. Phosphate was also elevated in the winter months but low in the summer months suggesting that some of it is bound up in macrophytes and macroalgae during the growing season. Some supplementary physio-chemistry was

taken in the lower section of the waterbody in 2019 and is in the appendices. Nutrients and BOD were generally below the Environmental Quality Standards.

Pathogen monitoring data from Westmeath County Council suggests that the Dysart is contributing to the overall pathogen loading to Lilliput Bathing Waters on Lough Ennell. The Dysart stream is located north of the identified bathing water (Lilliput). Results from microbiological samples at the *Bridge Upstream of Lough Ennell* monitoring point, are consistent and fluctuate around 3,000 E.coli cfu/100ml and 500 Intestinal Enterococci cfu/100ml levels, suggesting a pollution source or a number or pollution sources originating in the Dysart Stream. LAWPRO will work with Westmeath Co. Co. and the Agricultural Sustainability Support and Advice Programme (ASSAP) in order to identify and reduce the pathogens originating from this waterbody.

3.4 Conclusion on Significant issues

Hydromorphology, subcategory channelisation, is the significant pressure on the Dysart_010 and many sections have been straightened. The arterial drainage scheme is the key pressure driving hydromorphological quality within this water body with moderate conditions in some sections due to impacts on channel morphology. Drainage schemes may result in channelisation of some sections of the river which may result in slower flow conditions and complete absence of run/riffle habitat. This type of channel modification is particularly damaging to ecology and stream functioning with simplified depositional habitat, which is unsuitable for many species especially salmonids. It is generally characterised by low oxygen, high temperatures and high levels of deposited sediment. From initial assessments, there seems to have also been some artificial changes to the river course.

Based on additional biological data from Westmeath County Council, the review of the conceptual model for the PAA, aerial imagery, and from initial assessment, it is likely that agriculture is also an additional significant pressure with sediment, phosphate and pathogens being the significant issues. Excess sediment noted by EPA biologists at the operational monitoring station *Bridge NW of Milltown* in 2002, 2008 and 2011 and at the operational monitoring station *Bridge Upstream of Lough Ennell* in 2008 and it was recorded as being moderate to heavy in the 2017 biological assessment. The presence of nutrient loving filamentous algae *vaucheria* & *cladophora* in 2017 by the EPA biologist supports this conclusion. The main pathways for sediment, phosphate and pathogens are similar, with point sources and overland flow pathways being important.

4 Significant Pressure Information

4.1 Initial EPA Characterisation

Table 2 shows the Initial EPA characterisation of the waterbody (WFD App). Hydromorphology, sub-category channelisation, is listed as the significant pressure. Channel maintenance is generally carried out on the Dysart on a 5-year cycle by the Office of Public Works.

Water body Name	Id	Category	Subcategory	Name	Significant?	Pressure & Impact details
Dysart	IE_SH_25D050400	Hydromorphology	Channelisation	OPW Brosna Arterial Drainage Scheme	Yes	Excess Sediment Altered habitats due to morphological changes Increased macrophyte growth

Table 2 Initial EPA characterisation

4.2 Hydromorphology

The Dysart (Main channel (C37(1)) along with its 3 no. tributaries; C37(2), C37(3) & M32A form part of the Brosna Arterial Drainage Scheme, which is located between Counties Offaly, Laois, and Westmeath. This section is maintained on a five-year basis and scheduled for maintenance in the Summer 2019. The OPW is statutorily obligated to maintain arterial drainage channels under the 1945 Arterial Drainage Act, amended to transpose EU Regulations and Directives such as the EIA, SEA and Habitat Directives and Aarhus Convention. A Strategic Environmental Assessment was carried out for the Brosna Drainage District. In the Natura Impact statement 2019-2023, a Stage 1 Screening Assessment was conducted in line with guidance produced for the OPW in 2014. This methodology is based on source, pathway, receptor chain principles and involves assessing likely significant effects on Natura 2000 sites within the zone of influence of the proposed drainage maintenance in relation to three pathways: Surface water, Land & Air and Groundwater. The screening assessment involved assessing the impacts of drainage maintenance operations within the arterial drainage scheme, and its zone of influence, in relation to each of the three pathways individually. Conclusions were then drawn to identify if maintenance works upon the channels within the scheme, could impact upon Natura 2000 sites. Sites that had the potential to be impacted by the maintenance works were determined to be within the zone of influence and these sites require further assessment. The alkaline fens around Lough Ennell were highlighted as one of the special conservation interest areas that could be significantly affected by arterial drainage, however, no detailed information on location of habitat

within the SAC is available for assessment. It was determined that drainage maintenance activities may impact on alkaline fens via all three pathways. The mapping and location of these alkaline fens will be highlighted as a priority action to Westmeath County Council and OPW as an outcome of this report due to the water purification, flood attenuation and other co-benefits that fen provide.

Some sections of the Dysart stream are exhibiting moderate conditions with regard the Morphological Quality Index (MQI). The OPW arterial drainage scheme is the key pressure driving the moderate hydromorphological quality within this water body.

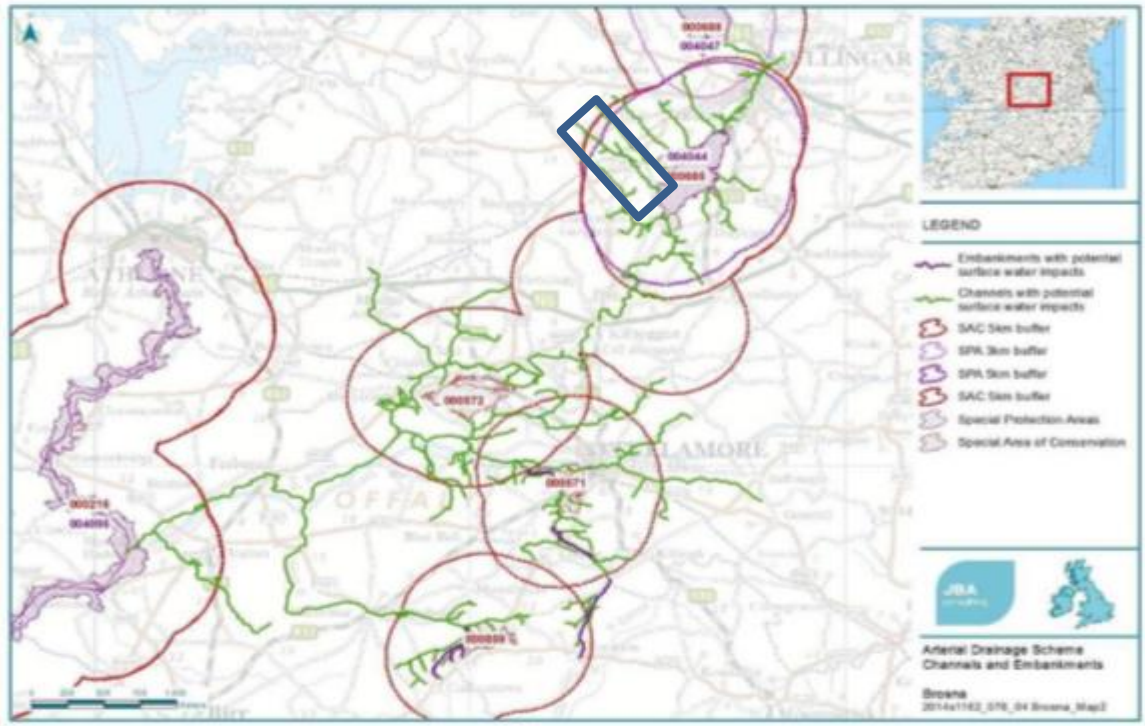


Figure 2 Brosna Arterial Drainage Scheme Channels with potential impacts via surface water pathways are highlighted. The Dysart Stream is highlighted in the blue box – Source OPW.

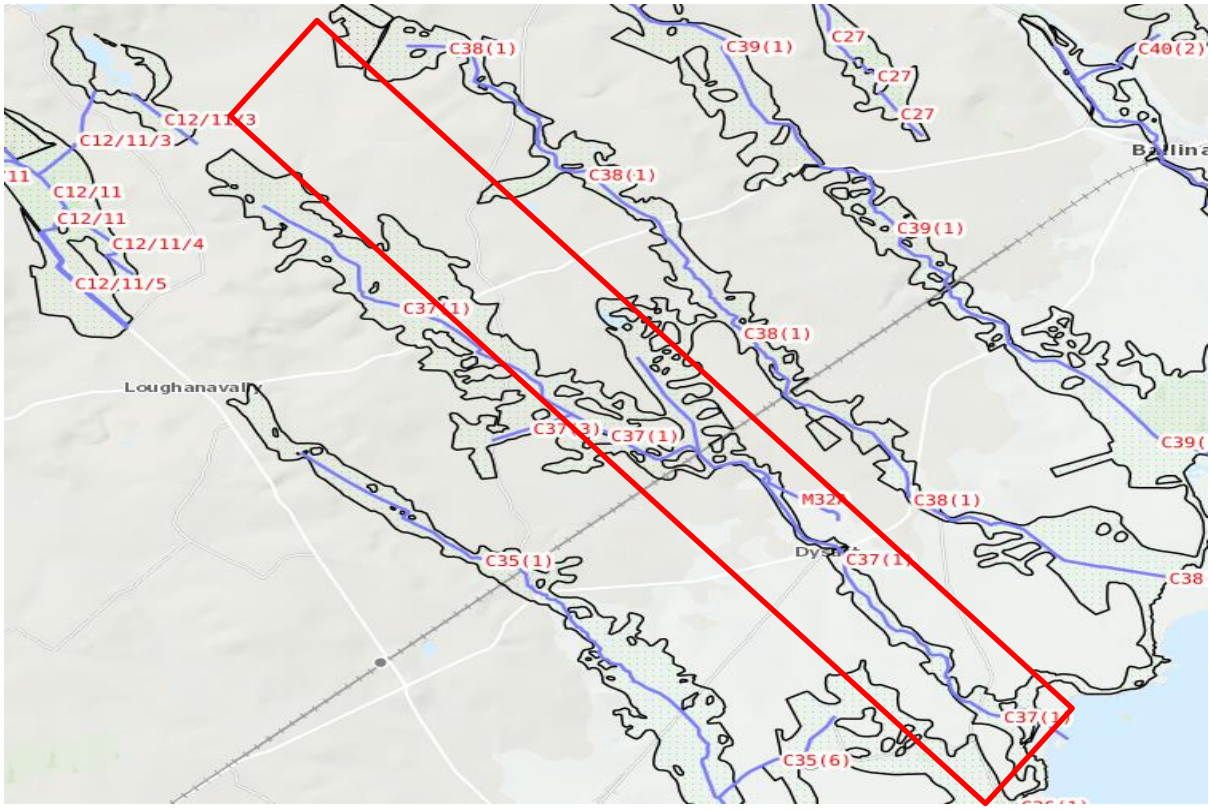


Figure 3 Arterial Drainage on the Dysart Stream Source https://maps.opw.ie/drainage/map/

It appears that the Dysart stream has a long history of artificial drainage as evidenced by the 1837 to 1842 6" maps. There is extensive hydromorphological impact in the upper main channel of the Dysart stream caused by arterial drainage works, which have been carried out on the mainstream channel and surrounding land. This has resulted in severe channelisation of long sections of the stream with slower flow conditions and complete absence of run/riffle habitat. This type of channel modification is particularly damaging to ecology and stream functioning with simplified depositional habitat, which is unsuitable for many species. It is generally characterised by low oxygen, high temperatures and high levels of deposited sediment.

Drainage is generally poor in the middle section of the waterbody and so field/land drain density is high. Land drains may also present a risk of elevated sedimentation especially when being maintained. It is likely that the Dysart stream originated in the Mount Dalton Lake historically and flowed down to Lough Ennell with the fall of the land. There have been artificial changes of the river course in the headwaters. The historic six-inch maps show that this lake has been drained considerably in the last century and has reduced in size by over 50%. Channelisation and drainage are visible when comparing the latest aerial photography and the historic 6" maps most notably southwest of Barrettstown. In Dysart village, an old corn mill, dam and millrace also resulted in the alteration of the natural course of the river.

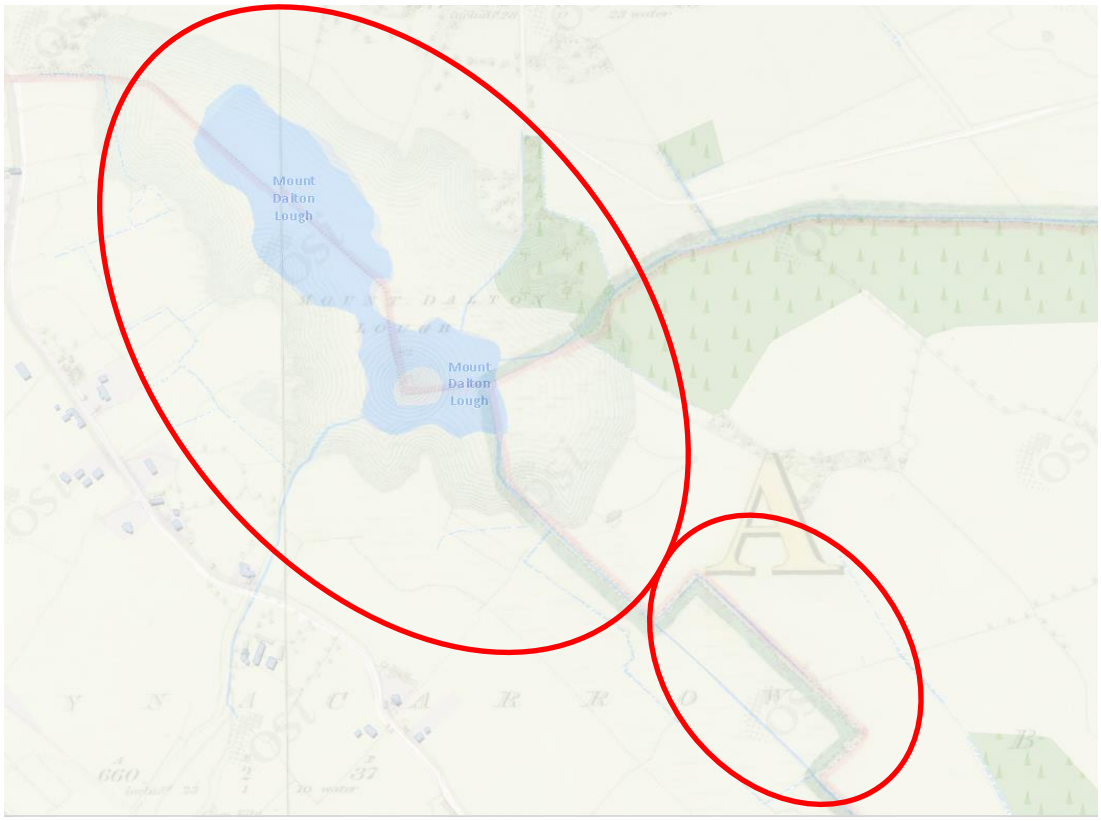


Figure 4 Some examples of historic drainage alterations in the Dysart_010. Mount Dalton has reduced considerably in size and the main channel diverted in sections.

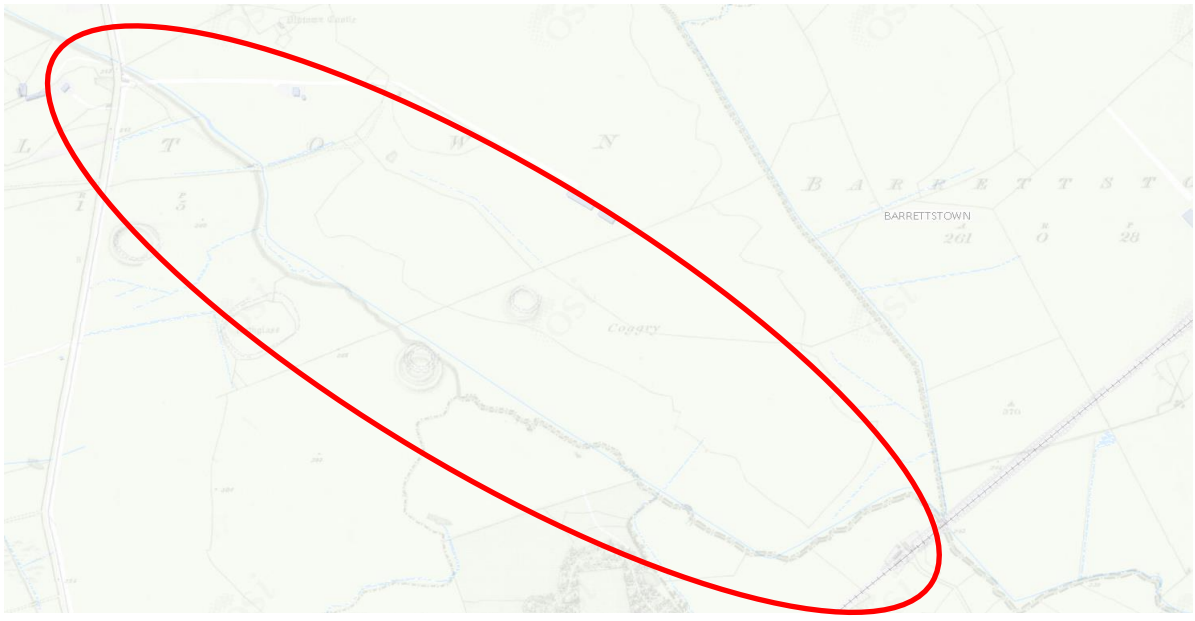


Figure 5 An example of historic drainage alterations in the Dysart_010 – channalisation.

It should be noted that the propagation of most aquatic macrophytes such as *spargaium erectum* occurs vegetatively, via fragments especially if rhizomes are broken up. After dispersal, the fragments may exhibit two survival strategies: colonization (the ability to develop roots) and regeneration (the

ability to develop new propagules that can disperse). This, coupled with nutrient rich silt, may substantially increase plant numbers in the channel, which may require for additional maintenance.

The lake shoreline has changed over time and Lough Ennell has decreased in size as can be seen below in Fig. 4.5 due to drainage works and this may have implications for the surrounding alkaline fens habitats, which the lake is renowned for. Land drainage and reclamation may also have implications for the land spreading of slurries and as some of land is low lying and poorly draining due to lacustrine sediment deposition. This will increase the potential for overland flow and diffuse nutrient pollution if there is poor land management and nutrient management practices in place and appropriate set-back distances are not adhered to.

Figure 6 The changing shoreline of Lough Ennell (blue is the current shoreline and the grey area is the historic shoreline.

Figure 7 The changing shoreline of Lough Ennell

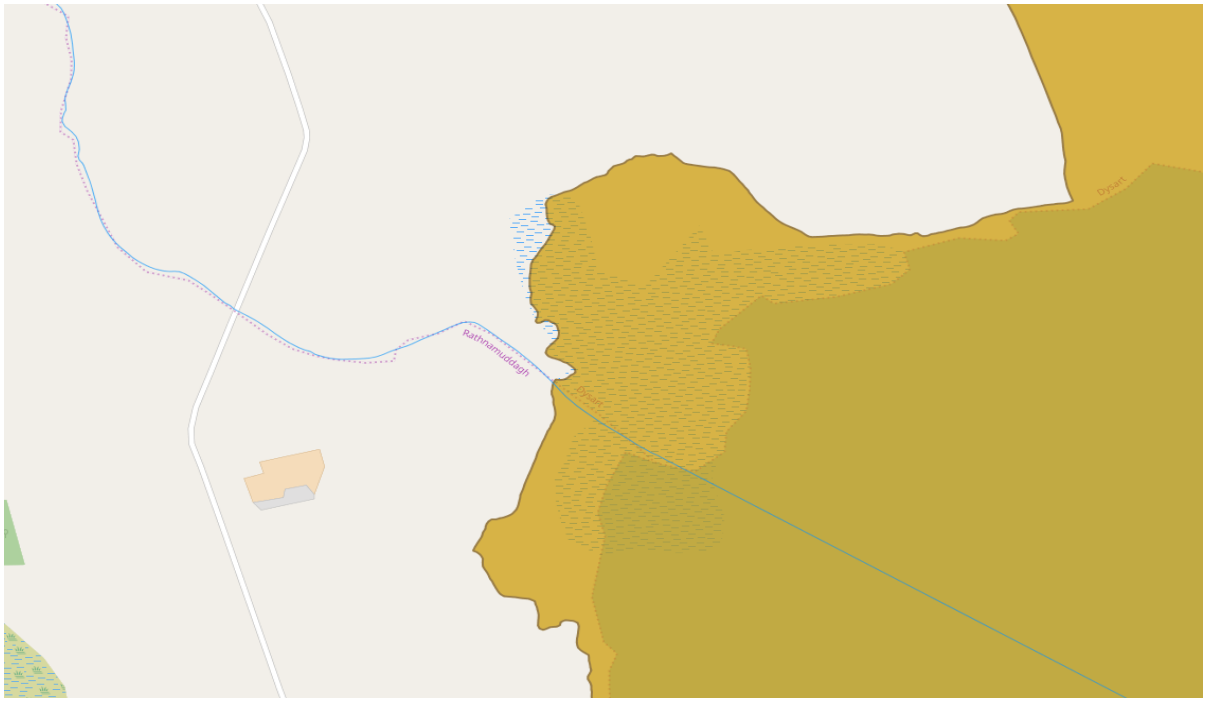


Figure 8 The Dysart (Lough Ennell)_010 and Lough Ennell Special Area of Conservation boundary (Habitats). Site Code 00685.

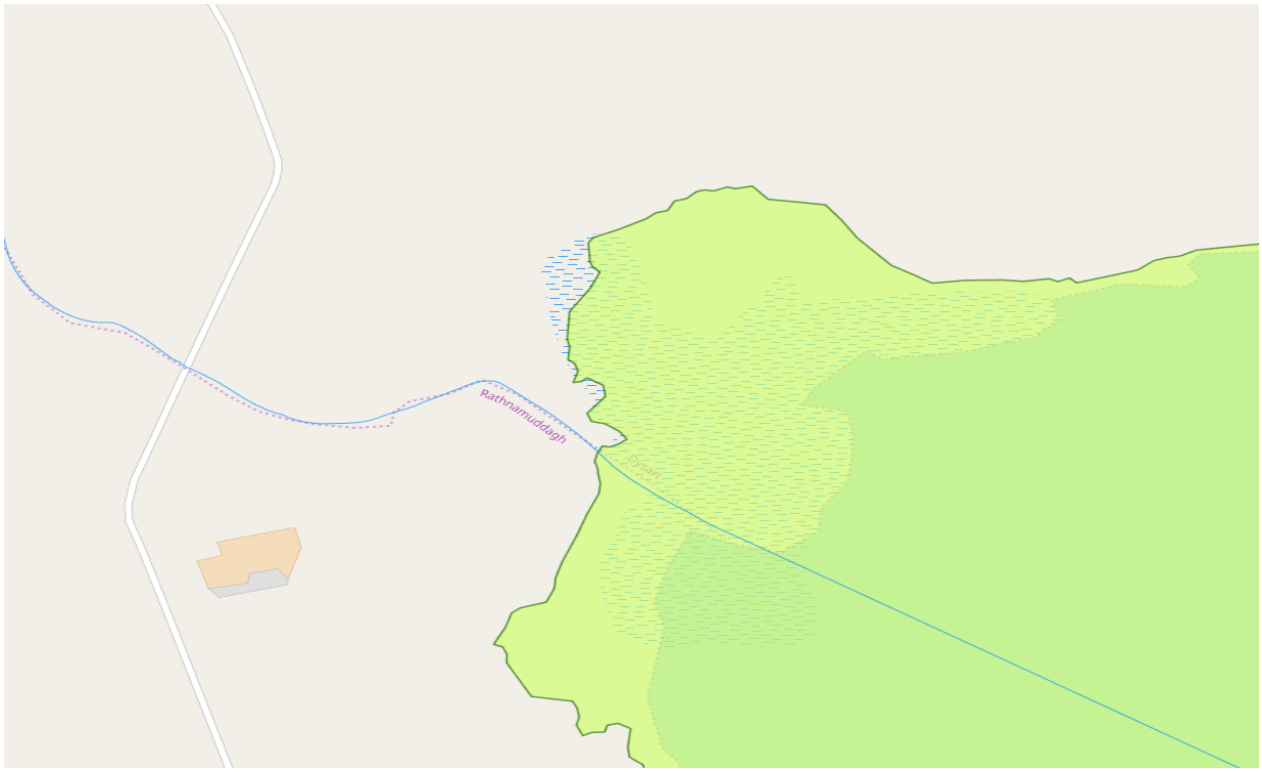


Figure 9 The Dysart_010 and Lough Ennell Special Protection Area (Birds) Site code 004044.

4.3 Fish

There is no fish data for the Dysart stream, however, anecdotal, and local knowledge from Inland Fisheries Ireland staff suggest that it is a very important spawning habitat and contributes about 30% of the fish stock to Lough Ennell which feeds the wider Brosna sub-catchment. The Kilpatrick (Bugán) and Tudenham streams are also important spawning feeder streams to the Lake.

4.4 Other issues and pressure not identified as significant / invasive species

There are no other pressures e.g., Section 4 licences, abstractions identified at present on the Dysart Stream.

The non-native Zebra Mussel Dreissena (Dreissena) polymorpha was recorded in channel C35(2) at the confluence of the Brosna River and Lough Ennell by the OPW. It is unclear how much of the lake/river is colonised by this invasive species.

4.5 Conclusion on Significant Pressures

Hydromorphological impacts of channel maintenance is most likely to be a significant pressure on the Dysart_010. Impacts can arise from a variety of drainage maintenance activities, including removal of in-stream silt and vegetation, aquatic vegetation cutting, bank protection works and bush cutting,

branch trimming and tree cutting. Specific impacts included in the OPW Natura Impact statement for the Brosna Arterial Drainage Scheme include:

- **Release of suspended solids**

It can impact on surface water dependent habitats, such as alkaline fens, indirectly through increased turbidity, which can reduce photosynthesis levels. This can then impact upon species within the lake macroinvertebrate communities by reducing habitats and food availability through changed water quality. This increase in sediment production can be expected to result in higher suspended sediment concentrations within the waterbody. In the appropriate conditions, this sediment may also be deposited within the stream channel, resulting in the infilling of interstitial voids with a consequent decrease in the flow of water and oxygen within the bed material pertinent to macroinvertebrates survival and fish spawning.

- **Release or changes in nutrient levels/pollutants**

It can impact on surface water dependent habitats indirectly through causing eutrophication. This can then impact upon species by reducing habitat and food availability through changed water quality. There is also the potential for pollutants (e.g., fuel) to be released from construction activities with machinery working in or near water as a result of pollution incidents, fuel spillages or poorly maintained machinery.

- **Changes in water levels/channel morphology**

It can occur from maintenance activities that deepen and widen the channel back to the original design level. This can impact on surface water dependent habitats through increased capacity and flow in the channel leading to hydrological impacts. It can also impact on the species for which the SAC is designated for by causing a loss of suitable habitat and impacting upon food chains. Removal of vegetation could cause a lowering of the water table within the local area, improving drainage to the channels that are connected to waterbodies or wetland habitats, reducing the quality of alkaline fen habitat, that is present in Lough Ennell SAC.

- **Increased risk of biohazards and Invasive Species**

Maintenance activities can increase the risk of biohazards such as crayfish plague and increase risk of invasive dispersal if site specific invasive species management plans are not strictly adhered to or personnel are not adequately trained.

AFA0113 Lough Ennell/Dysart Stream

Agriculture/pathogens

Agriculture is also a significant pressure in the waterbody. As per the Corine data the main land use in the catchment is agriculture with most of the waterbody in permanent pasture (approx. 70%). Pathogens, sediment, and orthophosphate results are elevated in the catchment. ASSAP will engage with all famers in the PAA based on the outcome of the field assessment. Land and Nutrient Management practices with a focus on pathogens and sediment will be assessed by ASSAP to ensure that best practices are in place.

5 Pathway information & analysis

The bedrock geology in the waterbody is limestone of various degrees of purity and shale the aquifer type within the catchment is classified as being locally important (LI) - Locally Important Aquifer – Bedrock, which is Moderately Productive only in Local Zones. The subsoil is generally till derived from limestone making the upper reaches of the catchment is free draining however there are pockets of peat around Mount Dalton. Regarding quaternary deposits or subsoils, there are significant deposits of Lacustrine Sediment in the middle and lower sections of the catchment thus the soil is poorly draining and is more prone to overland flow. These sediments generally run parallel to the course of the river. The overland flow pathway is an important pathway by which sediment, phosphorus and pathogens would travel to the surface water. The waterbody has no operational physico-chemical water quality data, however, supplementary data suggests phosphorous could be elevated during the Winter months and is potentially bound up in macrophytes in the Summer months. Nitrate (surface and ground) Pollution Impact Potential (PIP) maps indicate that it is not significant in this catchment. In order to further characterise what the significant issue is in the waterbody; additional fieldwork is required. This will focus on visual assessment, water sampling and ecological assessment.

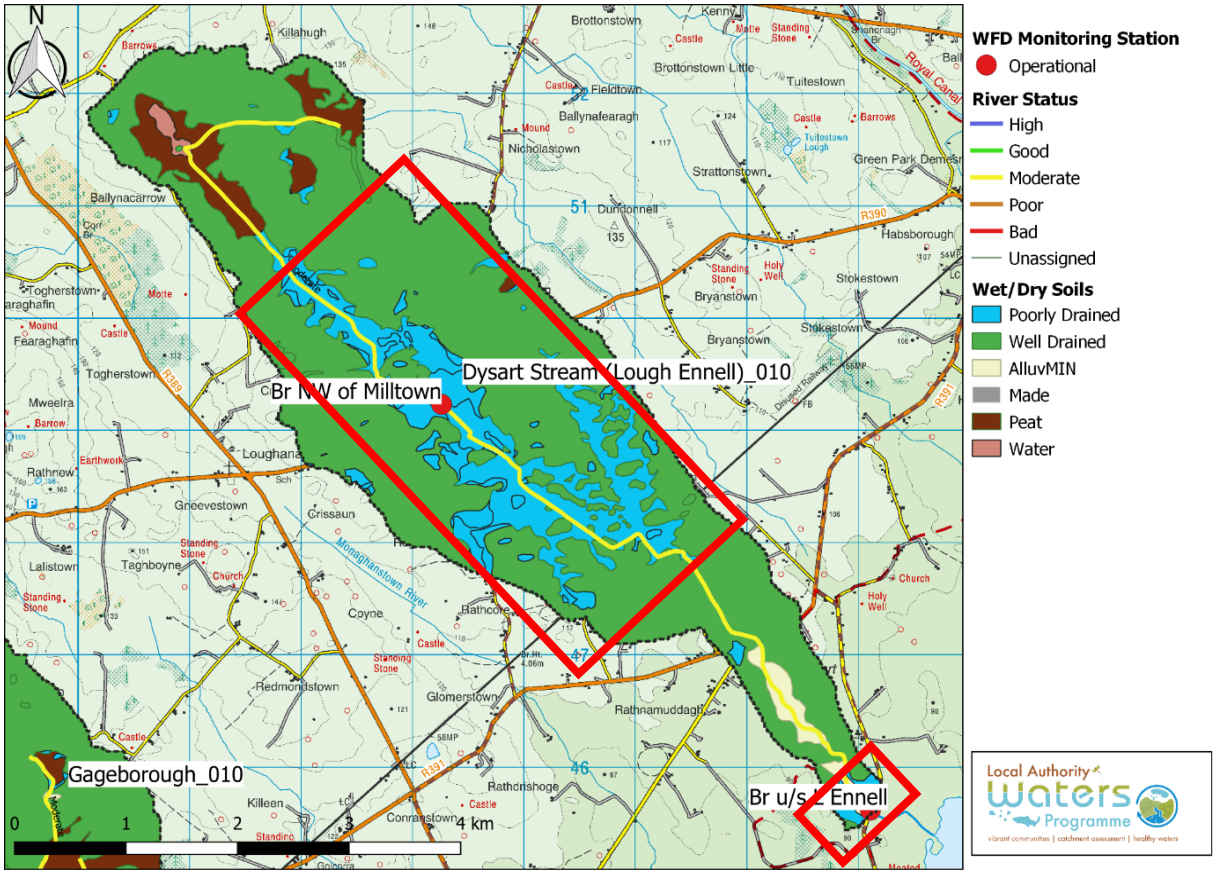


Figure 10 Dysart_010 IE_SH_25D050400: Wet/dry Soil map. The wetter soils in the middle and lower end of the waterbody gives more favourable conditions to overland flow of phosphorous and microbial pathogens.

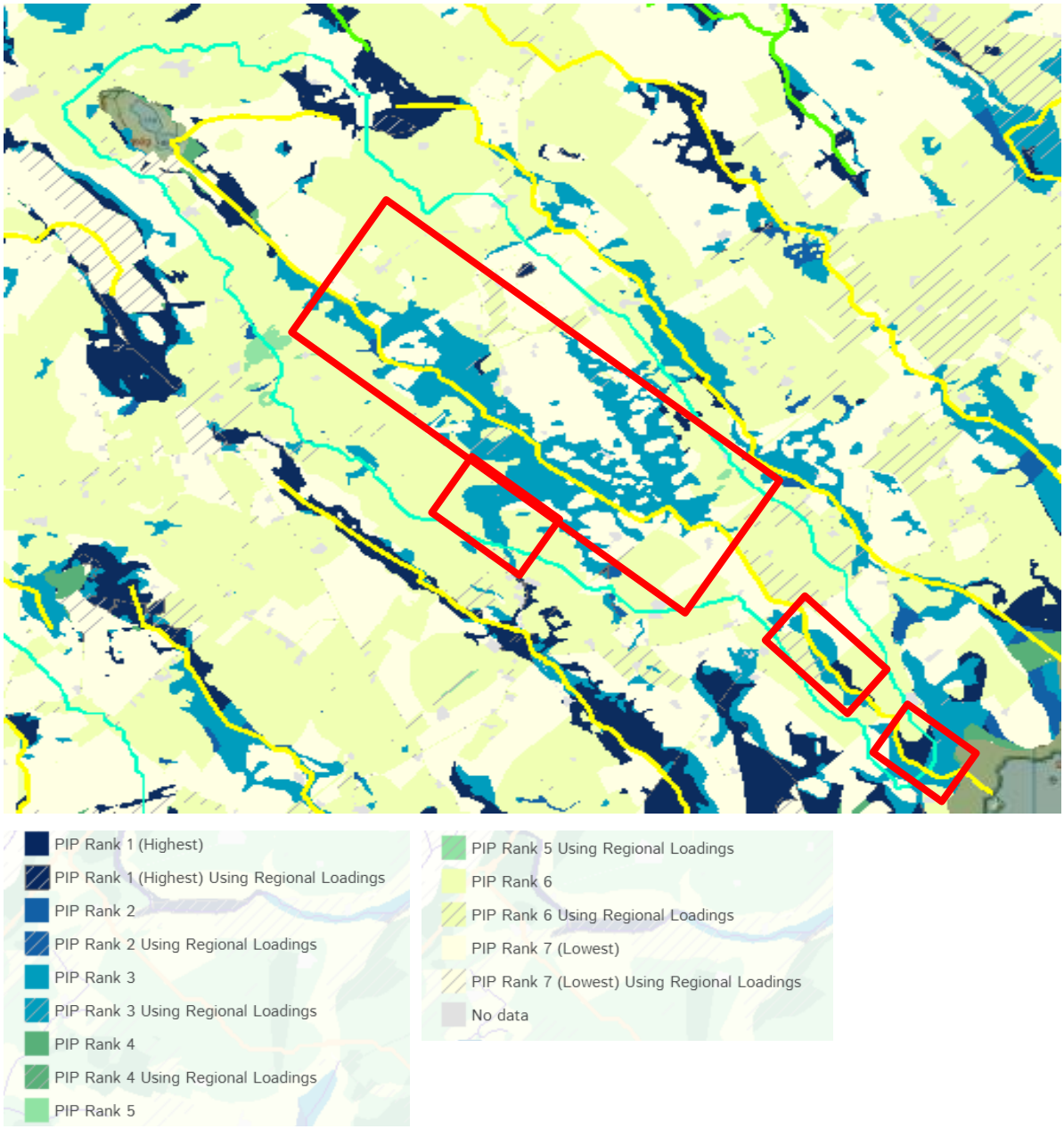


Figure 11 Dysart_010 IE_SH_25D050400: Phosphate Pollution Impact Potential (PIP) map for the PAA – High potential loss areas of phosphorous located along the course of the river in the middle sections and at the lower end of the waterbody. There is more potential for overland flow in these areas.

6 Interim story of the Area for Action based on the Desk Study

In summary, the Dysart_010 is *At Risk* of not meeting its Water Framework Directive objectives as the 2010-2015 ecological status is *Moderate.* The status class is driven by its *Moderate* biological status in the lower monitoring point - *Bridge upstream of Lough Ennell (Code RS25D0504000)* as the upper monitoring point *Bridge NW of Milltown* (Code RS25D050100) is reaching *Good* Status (Q4) (2017).

Hydromorphology subcategory channelisation is the significant pressure on the waterbody, however, based on the review of the conceptual model for the Area for Action, aerial imagery, data from Westmeath County Council and the EPA biologists and from initial assessments, it is likely that agriculture is also a significant pressure with sediment, phosphate and pathogens being the significant issues. The main pathways for sediment, phosphate and pathogens are similar, with point sources and overland flow pathways being most significant.

Agriculture is the dominant land use and both diffuse and point source pollution from agriculture will be the focus of the field assessment, particularly within the middle to lower sections of the waterbody where the Surface Water Phosphorous PIP map indicates the higher risk categories.

A stream walk is required moving back upstream and conducting SSIS and chemical sampling where deemed necessary. Also, by rectifying any pressures at the upper monitoring location depending on whether the issue is significant or not may improve the lower reaches of the stream.

Spot sampling will be undertaken during the Winter of 2019 when there is vegetation die off. This may indicate if phosphorous is elevated in the catchment. Appropriate measures can then be implemented to reduce both point and diffuse phosphorous loss.

It is important to engage with Westmeath County Council and the National Parks and Wildlife Service to ensure there is no encroachment of protected wetlands / alkaline fens from agriculture and to ensure that there is no habitat loss removal of co-benefits such as water filtration and purification that these ecosystem services provide.

Engagement will be made with the Office of Public Works and assessment of the channel maintenance procedures in place to ensure that all mitigation measures e.g., silt management are in place for any in-stream works.

7 Workplan

1. Monitoring Data has been received from Westmeath County Council and will be uploaded to the WFD App.
2. Field work is to be completed in the Summer of 2019 and Winter 2019/2020.
3. Winter sampling and flow measurements within the PAA will be carried out.
4. Targeted stream walks from the lower monitoring point *(Bridge Upstream to Lough Ennell*) to the headwater approx. 8km upstream with an emphasis on cattle access points, piped discharges, overland pathways and run-off from farmyards. It is likely that there are several point source and diffuse critical source areas between the two monitoring points most probably in closer proximity to the lower monitoring point. Referrals will be made to ASSAP advisors as appropriate.
5. Engagement with the Office of Public Works to assess what environmental protocols will be implemented when carrying out channel maintenance in the Dysart PAA with a focus on silt management.
6. Engagement with the EPA Catchments Unit regarding possible Morphological Quality Index (MQI) condition assessment for the Dysart stream. This assessment may provide an indication of ecological quality, and will indicate status of sites on OPW channels, where original arterial drainage as well as on-going maintenance, have been undertaken. Completion of a condition assessment will support identification of rivers that require hydromorphological measures and these measures will need to be based on best practice, restoring processes, implemented at an appropriate scale, suitable for that river type with multiple benefits for its ecology.

8 Review of mitigation options

1. Review Environmental Protocols for the Dysart Stream particularly EP 10 Silt Management Procedure to ensure that appropriate mitigation measures are in place.
2. Ensure that the timings and locations of EPA biological monitoring points is communicated to the OPW.
3. Review Environmental Protocols for the Dysart River particularly EP Silt Management and EP8 Environmental River Enhancement Procedure to see if these can be incorporated in the catchment to restore habitat. The EP8 Environmental River Enhancement Procedure relates to channels where the construction of appropriate physical measures matches the channels natural characteristics will enhance the environmental quality of the channel to ensure the improvement of salmonid and other aquatic species habitats.
4. Regarding agriculture, assessment should be focused on the poorly draining areas, and critical source areas need to be identified as it is likely that agriculture is also a significant issue. Catchment walks will be required to identify sources of pollution. Cattle access points shall be assessed and will be referred to ASSAP advisors with an aim to eliminate, reduce and improve practices.
5. The installation of drinking water points will be encouraged to reduce sediment, pathogens, and nutrient release in the waterbody. Identification of critical source areas (CSAs) in the catchment, and the recommendation for vegetative buffers will be communicated to ASSAP advisors for implementation where possible.

9 Communications

9.1 Community information meeting

- ASSAP farmer streamside event meeting held on the 1/07/2019 in the Dysart in County Westmeath
- Number of attendees excluding LAWPRO and ASSAP representatives: 19

9.2 Supplementary communications

- Meeting with Westmeath County Council and the HSE on the 16/08/2019.
- Meeting with Lough Ennell Trout Preservation Association on the 3/10/2019.
- Meeting with the OPW 24/10/2019.

Date of completion of Desk Study:

20/11/2019

Appendices

Appendix 1 2019 Monitoring data from Westmeath County Council for the Dysart Stream Bridge U/s Ennell (unaudited results).

				Ammonia NH3-N	Biological Oxygen Demand	E Coli	Enterococci	Ortho-Phosphate MRP	Visual Inspection
Station	Station Code	Sample Method	Sample Date	mg/l	mg/l	cfu/100mls	cfu/100mls	mg/l	Descriptive
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	30/04/2019	0.28	< 2	317	7	0.01	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	08/05/2019	0.07	< 2	387	140	0.05	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	13/05/2019	0.04	< 2	512	68	0.06	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	20/05/2019	0.01	< 2	272	82	0.01	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	27/05/2019	0.02	< 2	755	192	0.02	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	04/06/2019	0.1	2.43	> 2420	> 200	0.06	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	11/06/2019	0.01	< 2	367	70	0.02	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	17/06/2019	0.03	< 2	1200	135	0.07	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	24/06/2019	0.02	< 2	1020	65	0.02	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	01/07/2019	0.12	< 2	1986	130	0.06	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	08/07/2019	0.06	< 2	> 2420	165	0.01	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	16/07/2019	0.11	< 2	1203	195	0.05	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	22/07/2019	0.01	< 2	2990	452	0.05	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	23/07/2019			770	105		clear

Dysart Stream (Lilliput)	BPBNS320014130004	Grab	24/07/2019			488			clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	29/07/2019	0.05	< 2	1930	140	0.1	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	06/08/2019	0.03	< 2	3250	615	0.05	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	12/08/2019	0.18	< 2	285	45	0.07	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	19/08/2019	0.01	< 2	345	115	0.04	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	26/08/2019	0.08	< 2	135	25	0.15	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	02/09/2019	0.03	< 2	228	85	0.1	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	04/09/2019			517	380		
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	09/09/2019	0.01	< 2	291	55	0.08	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	18/09/2019	0.05	< 2	3780	65	0.03	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	23/09/2019		< 2	6290	1150	0.06	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	01/10/2019	0.22	< 2	6870	750	0.07	clear
Dysart Stream (Lilliput)	BPBNS320014130004	Grab	09/10/2019	0.06	< 2	345	45	0.08	clear

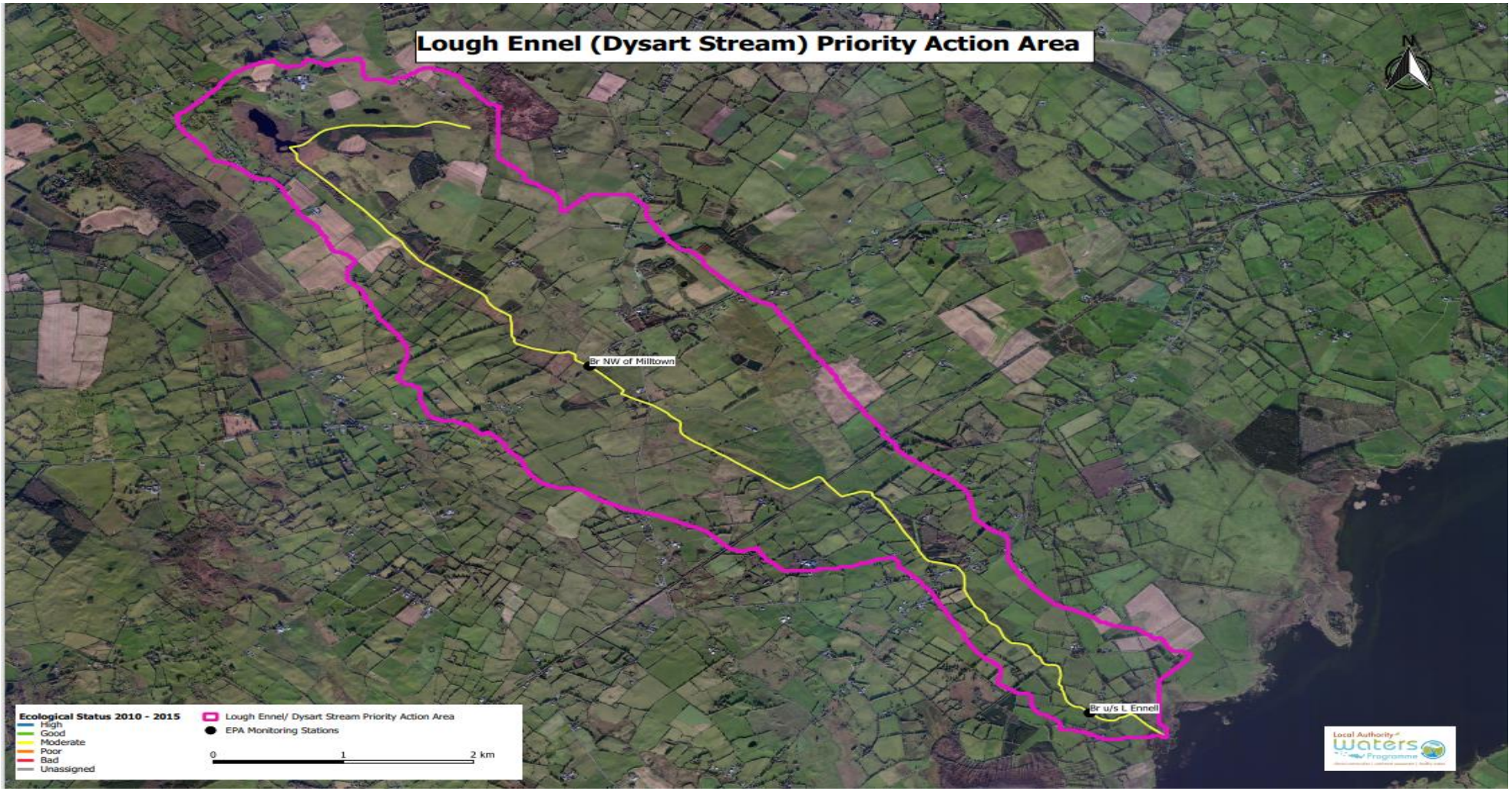
Appendix 2 2015/2016 Monitoring data from Westmeath County Council (unaudited results).

River	Sample Date	Ammonium (N)	BOD (mg/l)	Ortho-phosphate(P)	Nitrates(N)
Dysart	21/07/2015	0.037	1.1	0.009	0.956
Dysart	16/09/2015	0.019	0.7	0.007	0.626
Dysart	25/11/2015	0.028	1.2	0.017	1.893
Dysart	20/01/2016	0.038	0.8	0.014	2.07
Dysart	21/03/2016	0.021	1.3	0.009	1.751
Dysart	22/06/2016	0.022	1.2	0.013	0.769
Dysart	26/07/2016	0.016	0.7	0.006	0.77
Dysart	13/09/2016	0.097	1.3	0.037	0.976
Dysart	17/11/2016	0.3	14.7	0.086	0.561

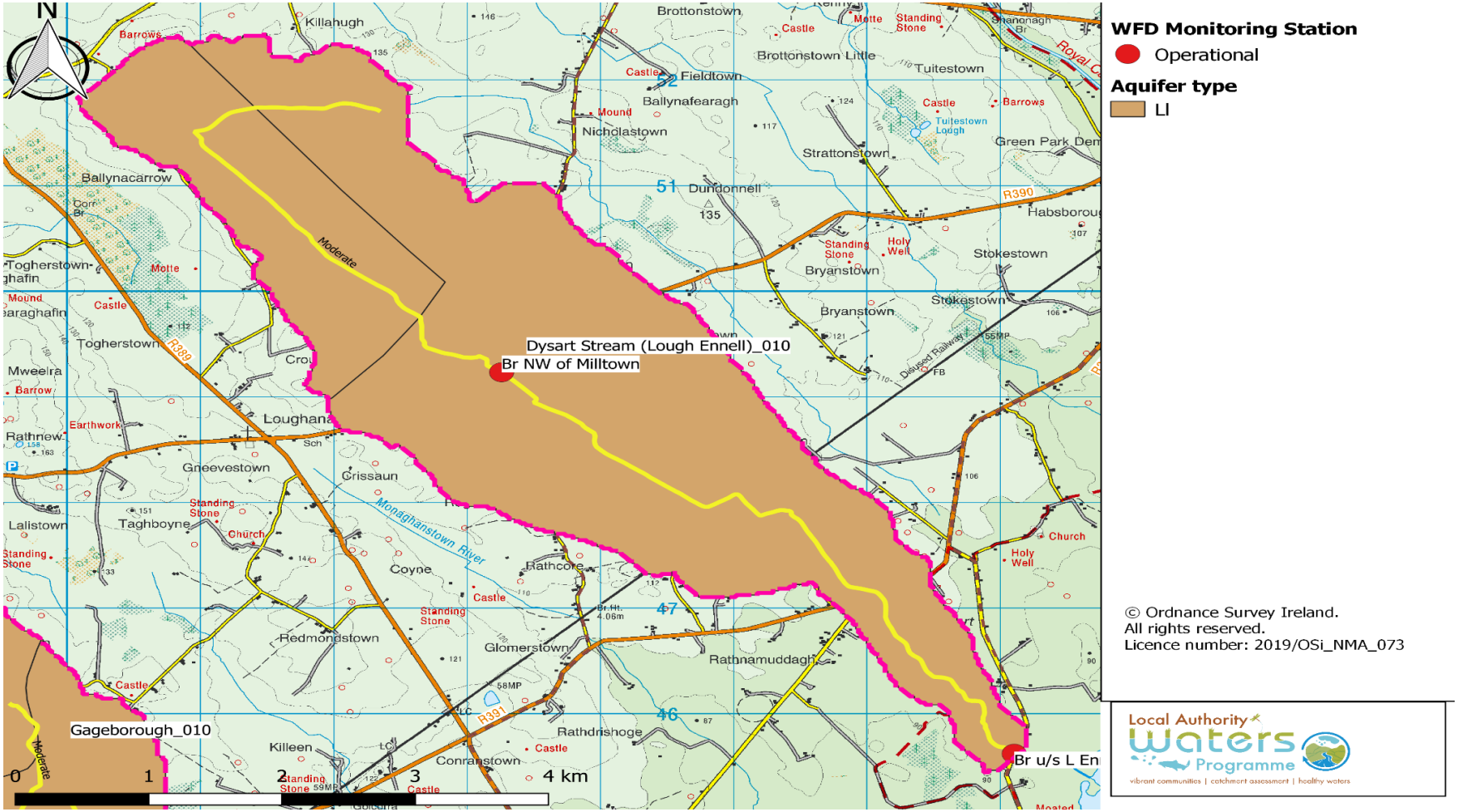
Appendix 3 2019 Monitoring data from LAWPRO (unaudited results)

								Parameter	Biological Oxygen Demand	Ortho-Phosphate PO4-P	Ammonia N	Nitrate NO3-N
								Max.	--	--	--	--
								Min.	--	--	--	--
								Test Method	--	--	--	--
Category	Entity	Station	Sample Reference	Sample Date	Sample Method	Sampled By	Reason	Analyst Conclusion	mg/l	mg/l	mg/l	mg/l
WFD Investigative	East & Midlands	Dysart Drain	19442726	7-Aug-2019	Grab	LAWSAT	Investigative	-	< 1	0.007	0.032	0.691
WFD Investigative	East & Midlands	Dysart Main Channel	19442727	7-Aug-2019	Grab	LAWSAT	Investigative	-	< 1	0.006	0.045	0.94
WFD Investigative	East & Midlands	Dysart Farm Drain	19442728	7-Aug-2019	Grab	LAWSAT	Investigative	-	< 1	< 0.006	0.037	0.8
WFD Investigative	East & Midlands	Dysart D/S Farm Drain	19442729	7-Aug-2019	Grab	LAWSAT	Investigative	-	1.6	0.046	0.043	0.934
WFD Investigative	East & Midlands	Dysart U/S Farm Drain	19442730	7-Aug-2019	Grab	LAWSAT	Investigative	-	< 1	< 0.006	0.027	0.785
WFD Investigative	East & Midlands	Dysart Referral	19442732	7-Aug-2019	Grab	LAWSAT	Investigative	-	2.4	0.056	0.065	0.153

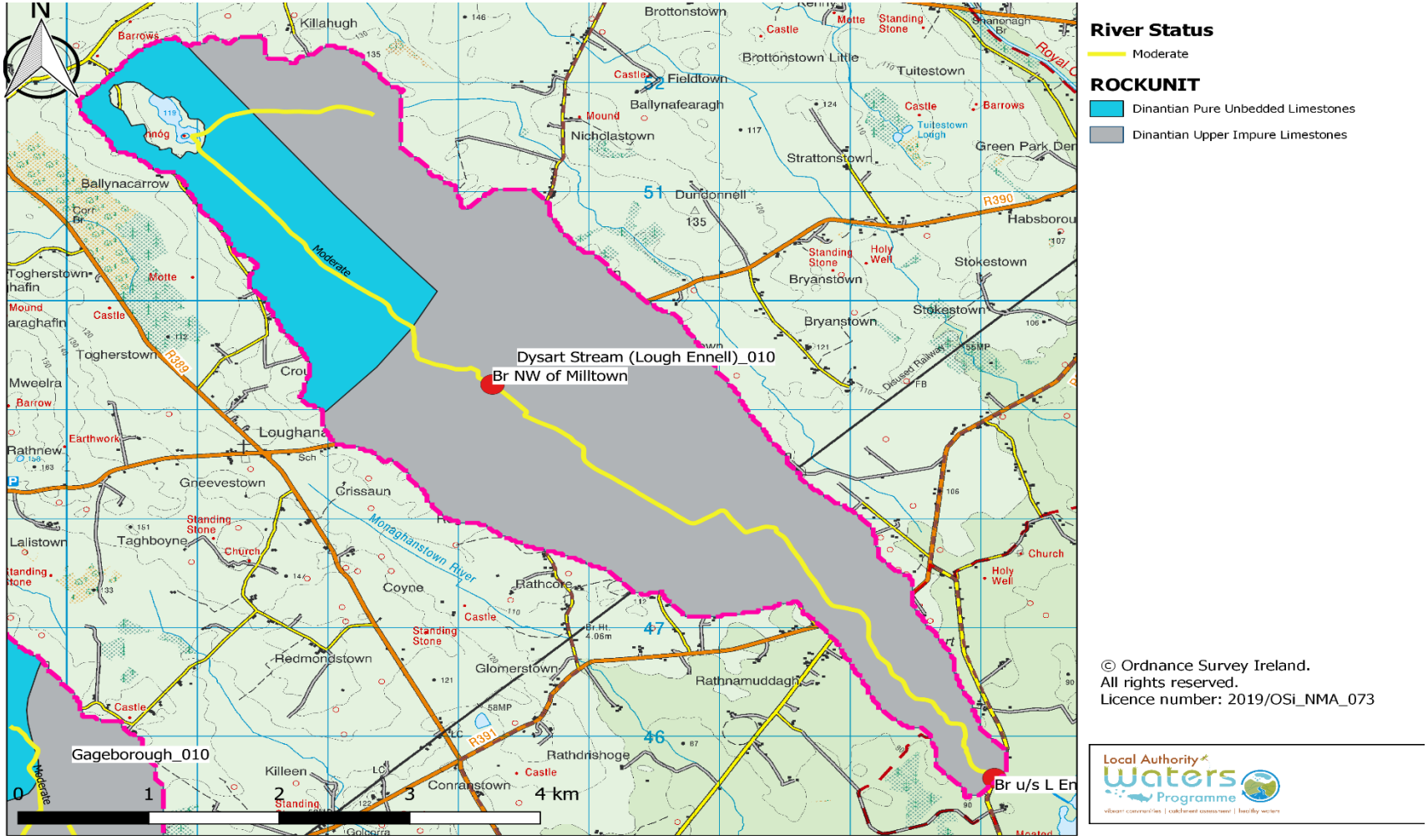
Appendix 4 OSI Map of Dysart Stream PAA



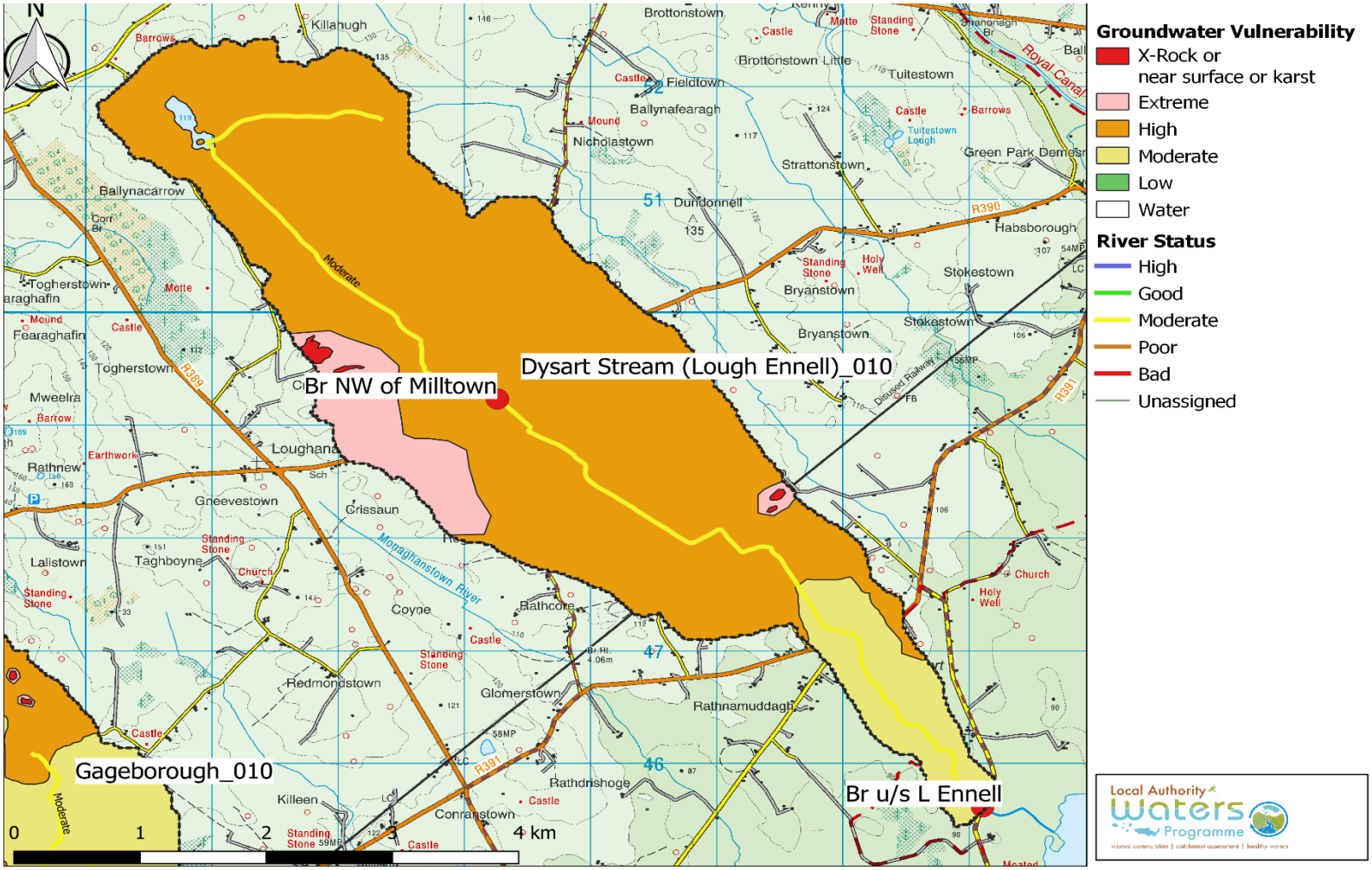
Appendix 5 Aquifer classification map of the Dysart Stream PAA



Appendix 6 Bedrock geology of the Dysart Stream PAA



Appendix 7 Groundwater Vulnerability of the Dysart Stream PAA



Appendix 8 Wet/dry soils map of the Dysart Stream.