



North South Shared Aquatic Resource (NS SHARE)



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## Neagh Bann International River Basin District Article 5 Characterisation - Technical Summary Report (NS Share T9 (1) – 2.1)



Environment & Heritage Service  
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Project part financed  
by the European Union

## North South Shared Aquatic Resource (NS Share)

### Water Framework Directive

A Directive establishing a new framework for Community action in the field of water policy (2000/60/EC) came into force in December 2000. This Water Framework Directive (WFD) rationalises and updates existing legislation and provides for water management on the basis of River Basin Districts (RBDs). The WFD was transposed into national law in Northern Ireland by the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003 and in the Republic of Ireland by the European Communities (Water Policy) Regulations 2003. The primary objective of the WFD is to maintain the “high status” of waters where it exists, prevent deterioration in existing status of waters and to achieve at least “**good status**” in relation to all waters by 2015.

### NS Share Study Area

NS Share is a cross border project and incorporates three River Basin Districts as set out in the joint North/South Consultation paper *Managing our Shared Waters*:

1. North Western International River Basin District (NWIRBD);
2. Neagh Bann International river Basin District (NBIRBD);
3. North Eastern River Basin District (NERBD).

The NW and NB are International River Basin Districts as they share their waters between Northern Ireland (NI) and Republic of Ireland (ROI). The NERBD is contained wholly within NI.

### NS Share Project

The overall objective of the project is to strengthen inter-regional capacity for environmental monitoring and management at the river basin district level, to improve public awareness and participation in water management issues, and to protect and enhance the aquatic environment and dependent ecosystems.

The NS Share project aims to facilitate delivery of the objectives of the WFD within the project area between August 2004 and March 2008.

The NS Share project is funded by the EU INTERREG IIIA Programme for Ireland / Northern Ireland. The Department of the Environment (NI) and the Department of the Environment, Heritage and Local Government (ROI) are implementing agents for the project. Donegal County Council is the project promoter. Technical support is provided by the Environment and Heritage Service an agency within the Department of the Environment (NI), and the Environmental Protection Agency (ROI). RPS Consulting Engineers in association with Jennings O'Donovan are the principal consultants.

Assistance was also provided by the Marine Institute, Central Fisheries Board, Geological survey Ireland, Geological survey Northern Ireland, Loughs Agency, North West Regional Fisheries Board, and Cavan, Leitrim, Longford, Louth, Meath, Monaghan, and Sligo County Councils.

Project publications are available at [www.nsshare.com/publications](http://www.nsshare.com/publications)

**PREFACE**

*The work presented in this paper was carried out as part of the NS SHARE project, which is funded by the European Union INTERREG IIIA programme for Ireland/Northern Ireland. The implementing agents for the NS SHARE project are the Department of Environment (DOE), Northern Ireland, and the Department of Environment Heritage and Local Government (DEHLG), Republic of Ireland. Donegal County Council (DCC) is the project promoter.*

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# NS SHARE PROJECT

## Characterisation Summary Report – Neagh Bann International River Basin District (NBIRBD)

### DRAFT

This is a report which summarises the WFD Article 5 characterisation for the NBIRBD. It draws on the results of the characterisation process carried out in the Republic of Ireland and Northern Ireland for the NBIRBD and provides a summary of the respective national reports, dealing specifically with the NBIRBD.

#### REVISION CONTROL TABLE

Rev.	Description of Changes	Prepared by	Checked by	Approved by	Date
0	Issued for internal review	MM, SD, YC, LH	GG	AGB	07/02/06
1	Revised following comments received from client representatives	MM, SD, YC, LH	GG	AGB	20/01/07
The User is Responsible for Checking the Revision Status of this Document					

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## Executive Summary

A Directive establishing a new framework for Community action in the field of water policy (2000/60/EC) came into force in December 2000. The Directive, generally known as the Water Framework Directive (WFD) rationalises and updates existing water legislation and provides for water management on the basis of River Basin Districts (RBDs). The WFD was transposed into national law in Northern Ireland by the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003 and in the Republic of Ireland by the European Communities (Water Policy) regulations 2003. The primary objective of the WFD is to maintain the “high status” of waters where it exists, prevent deterioration in the existing status of waters and to achieve at least “**good status**” in relation to all waters by 2015.

The Neagh Bann International River Basin District (NBIRBD) is one of three shared river basin districts (IRBDs) within the island of Ireland. The basin was delineated jointly by the Department of the Environment (DOE) in Northern Ireland (NI) and the Department of the Environment, Heritage and Local Government (DEHLG) in the Republic of Ireland (RoI).

Article 5 of the WFD required that each member state carry out an assessment of and report on the characterisation of the RBDs in their jurisdiction, a review of the impacts of human activity on all waters and an economic analysis of water use within each district. This report represents a summary of the characterisation process for the NBIRBD and is based national reports prepared by the competent authorities in each jurisdiction, i.e. the Environment and Heritage Service (EHS) in Northern Ireland (NI) and the Environmental Protection Agency in Republic of Ireland (RoI).

All waters have been classified into types (e.g. different river types based on physical attributes such as geology and slope), and grouped into management units called water bodies which form the basic management unit for reporting and assessing compliance with the WFD’s objectives. The NBIRBD has 320 river water bodies, 13 lake water bodies, 14 transitional water bodies, 5 coastal water bodies and 37 groundwater bodies.

An assessment of the impacts of human activity on all waters was undertaken for the NBIRBD. Impacts were assessed based on known impact results (e.g. river monitoring programmes in both jurisdictions) and through predictive impact assessments i.e. looking at human activities that cause pressures on water bodies. A wide range of pressures were assessed e.g., abstractions, morphology (e.g. physical alterations such as the dredging of rivers, flood control), point, diffuse pressures and the impact of alien species (i.e. non native species). All waters were then placed in one of 4 risk categories on the basis of this assessment: 1a – at risk, 1b – probably at risk, 2a – probably not at risk, and 2b – not at risk. These categories indicate the risk of a water body not achieving the Directive’s objectives by

2015. This assessment was based on the best information currently available and does not take account of future changes for any pressures assessed.

The risk assessment for rivers identified that of the 320 waterbodies assessed in the NBIRBD almost 99% are considered to be at risk. The main sources of human pressures acting on rivers are from diffuse sources such as agriculture and unsewered populations and morphological pressures including channelisation and intensive land use. The lake risk assessment has established that all the lakes considered in the assessment are “at risk” or “probably at risk”. Diffuse source pollution and morphological pressures are the most significant pressures.

There are 70% of the transitional waterbodies considered at risk in the NBIRBD. Closer analysis of the assessment reveals that morphological pressures are the main pressure source with dredging (channelisation) representing the human activity that is posing the greatest morphological threat to transitional waters.

The marine impact assessment (pollution from diffuse and point sources) and morphological pressures due to fishing and shoreline development are the main pressures acting on the coastal waterbodies in the NBIRBD that are at risk of failing the environmental objectives of the WFD.

Four alien species are now present in the NBIRBD in particular the Australian Swan has been found on Lough Neagh, Lough Beg, Lough Island Reavy and the Gosford River. Common Cord Grass and Japanese weed have been found in the coastal waters of Carlingford Lough. Water Fern has been found in Lough Neagh and the River Bann together with Water Pennywort in Sixmilewater River.

Of the groundwater bodies in the NBIRBD 76% are considered to be at risk or probably at risk. The main pressures on groundwater bodies are chemical pollutants from both point and diffuse source pollution, particularly mobile nutrients, e.g. nitrate.

The next activity of the WFD, further characterisation, will involve collection of additional datasets to fill data gaps and additional monitoring and use of modelling techniques in order to improve confidence in the risk assessment process and identify the significant water management issues with the RBD.

The next major reporting deadline under the WFD is the publication of a “significant water issues report” in 2007. The report will further inform the public of the water management priorities in the NBIRBD. The first River Basin Management Plan (RBMP) for the NBIRBD will be drafted during 2008 and finalised after a year’s consultation in 2009.

## 1.0 Introduction

### 1.1 Water Framework Directive

As part of a substantial restructuring of European Union (EU) water policy and legislation, a Directive establishing a new framework for Community action in the field of water policy (2000/60/EC) came into force in December 2000. The Directive, generally known as the Water Framework Directive (WFD) rationalises and updates existing water legislation and provides for water management on the basis of River Basin Districts (RBDs).

The WFD is a wide ranging and ambitious piece of European environmental legislation setting clear objectives to ensure that all waters achieve at least “good status” by 2015; “high status” is maintained where it exists and any deterioration in the existing status of waters is prevented. The initiative applies to all Europe’s groundwaters, rivers, lakes, transitional waters (estuaries) and coastal waters.

The WFD sets common EU wide objectives for water. It provides for a new, strengthened system for the protection and improvement of water quality and dependent ecosystems. The overall ethos of the Directive is to bring about the effective co-ordination of water environment policy and regulation across Europe in order to:

- protect and enhance the status of aquatic ecosystems (and terrestrial ecosystems and wetlands directly dependent on aquatic ecosystems);
- promote sustainable water use based on long-term protection of available water resources;
- provide for sufficient supply of good quality surface water and groundwater as needed for sustainable, balanced and equitable water use;
- provide for enhanced protection and improvement of the aquatic environment by reducing / phasing out of discharges, emissions and losses of priority substances;
- contribute to mitigating the effects of floods and droughts;
- protect territorial and marine waters and;
- establish a register of 'protected areas' e.g. areas designated for protection of habitats or species.

Article 3 of the WFD requires individual river basins to be identified and assigned to **river basin districts**, which, for the purposes of the Directive, are then used as the main unit for managing the water environment. A river basin can include several individual river catchments and is defined as:

*“The area of land from which all surface run-off flows through a sequence of streams rivers, and possibly lakes into the sea at a single river, mouth, estuary or delta.”*

River basins refer to the natural, environmental unit rather than to administrative or legal boundaries and as such, can cross international borders. The WFD permits two

or more river basins to be combined into one River Basin District (RBD). Coastal and groundwater bodies are also assigned to river basin districts.

The River Basin Management Planning process requires the preparation, implementation and review of a river basin management plan (RBMP) every six years for each RBD identified. This requires an approach to river basin planning and management that encompasses all relevant factors in addressing issues. There are four main elements of the process:

1. **Environmental** and **economic assessment** or '**characterisation**' of the river basin district and the pressures and impacts on the water environment;
2. Environmental **monitoring** based on river basin characterisation;
3. Setting of environmental **objectives**; and
4. Design and implementation of a **programme of measures** to achieve environmental objectives.

A timetable for the Directive's main requirements is shown in Table 1.1 (Ref 1).

The RBMP will ensure that the management of our waters are planned and implemented in a way that achieves the best possible balance between the protection and improvement of the water environment and the interests of those who depend on it for their livelihood and quality of life.

Within the European Union there are many "international river basin districts" which are shared between Member States. An important feature of the WFD is a planning mechanism, which requires co-operation between Member States to ensure that water quality targets for shared waters are met.

## 1.2 Implementation of the WFD in Ireland

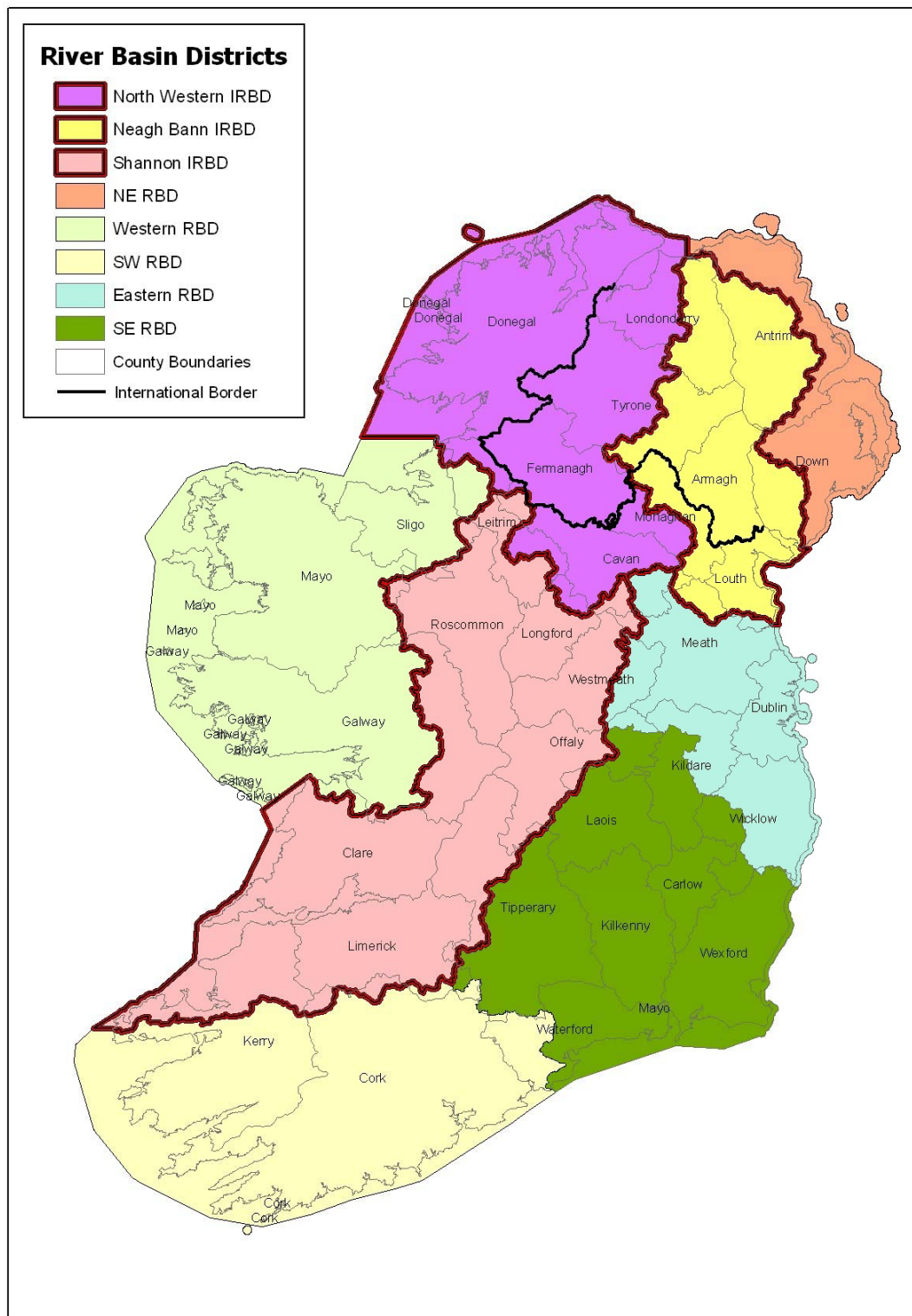
The WFD was transposed into national law in Northern Ireland by the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003 and in the Republic of Ireland by the European Communities (Water Policy) regulations 2003. Both these statutory instruments provide for essential, technical transposition of the Directive (Table 1.1).

These regulations established river basin districts for the whole island of Ireland. The Neagh Bann International River Basin District (NBIRBD) is one of three shared river basin districts (IRBDs) within the island of Ireland (Map 1.1). The basin was delineated jointly by the Department of the Environment (DOE) in Northern Ireland (NI) and the Department of the Environment, Heritage and Local Government (DEHLG) in the Republic of Ireland (RoI). These authorities responsible for the implementation of the WFD in Ireland are co-operating to ensure the co-ordinated

sustainable management of our water environment and appropriate administrative arrangements are being put in place in accordance with the Directive.

**Table 1.1 Timetable of Directive's Requirements (Ref 1)**

Year	Requirement
2000	<ul style="list-style-type: none"> <li>• Directive entered into force</li> </ul>
By 2003	<ul style="list-style-type: none"> <li>• Transpose Directive into domestic law</li> <li>• Identify river basin districts (RBDs), International River Basin Districts (IRBDs) and Competent Authorities empowered to implement the Directive</li> </ul>
By 2004	<ul style="list-style-type: none"> <li>• Complete first characterisation and assessment of impacts on RBDs</li> <li>• Complete first economic analysis of water use</li> <li>• Establish a register of protected areas in each RBD</li> </ul>
By 2005	<ul style="list-style-type: none"> <li>• In the absence of a groundwater daughter directive (Article 17) being agreed at European Commission (EC) level, establish criteria for:               <ul style="list-style-type: none"> <li>- assessment of good groundwater chemical status; and</li> <li>- identification of significant upward trends and starting points for trend reversal</li> </ul> </li> </ul>
By 2006	<ul style="list-style-type: none"> <li>• Establish water monitoring programmes</li> <li>• Publish a timetable and work programme for producing the first River Basin Management Plans (RBMPs) including consultation measures</li> <li>• Establish environmental quality standards for priority substances and controls on principal sources</li> </ul>
By 2007	<ul style="list-style-type: none"> <li>• Publish, for consultation, interim overview of the significant water management issues in each RBD</li> </ul>
By 2008	<ul style="list-style-type: none"> <li>• Publish draft RBMP for consultation</li> </ul>
By 2009	<ul style="list-style-type: none"> <li>• Publish first RBMP to include:               <ul style="list-style-type: none"> <li>- Environmental objectives</li> <li>- Programme of measures</li> <li>- Monitoring networks</li> <li>- Register of protected areas</li> <li>- Heavily modified and artificial water designations</li> </ul> </li> </ul>
By 2010	<ul style="list-style-type: none"> <li>• Ensure water pricing policies meet WFD requirements</li> </ul>
By 2012	<ul style="list-style-type: none"> <li>• Ensure programme of measures is operational</li> <li>• Publish timetable and work programme for second RBMPs</li> <li>• Report progress in implementing measures</li> </ul>
By 2013	<ul style="list-style-type: none"> <li>• Review for the first RBMP:               <ul style="list-style-type: none"> <li>- Characterisation assessments</li> <li>- Economic analysis</li> </ul> </li> <li>• Consult on significant water management issues overview for second RBMP</li> </ul>
By 2015	<ul style="list-style-type: none"> <li>• Achieve environmental objectives of first RBMP</li> <li>• Publish second RBMP and thereafter every six years</li> </ul>



**Map 1.1 River Basin Districts and International River Basin Districts delineated for Ireland and Northern Ireland**

The main competent authorities as required under Article 3 of the Directive in relation to the international river basin districts are –

(a) the relevant local authorities acting jointly for the purposes of the establishment of environmental objectives and programmes of measures and the making of river basin management plans in accordance with articles 12 and 13 of the Directive, respectively, and

(b) the EHS/EPA for the purposes of reporting to the European Commission and for such other functions as are assigned under the Water Policy Regulations and the Water Framework Directive Regulations, e.g. the characterisation of the river basin districts, the economic analysis of water use, the compilation of a register of protected areas, the development of a programme for monitoring water status and development of environmental objectives and a programme of measures to be applied in order to achieve those objectives.

### 1.3 Neagh Bann International River Basin District

#### 1.3.1 Background

Map 1.2 illustrates the extent of the NBIRBD showing the main population centres and county boundaries. The NBIRBD drains significant portions of Counties Antrim, Armagh, Louth and County Monaghan. Counties Cavan, Londonderry, Meath and Tyrone have smaller drainage areas within the NBIRBD. The NBIRBD covers an area of approximately 7,900 km<sup>2</sup>, with approximately 5,740 km<sup>2</sup> falling within NI and the remainder (2,160 km<sup>2</sup>) located within the RoI. It is bound to the north by the North Channel, to the south by the Eastern RBD, to the west by the North Western International RBD and to the east by the North Eastern RBD and the Irish Sea.

The main river basins located within the NBIRBD include the Lough Neagh/River Bann System with smaller river basins draining into Carlingford Lough and Dundalk Bay. The main lake within the IRBD is Lough Neagh, which at 396 km<sup>2</sup> is the largest freshwater lake in the British Isles. The Sperrin Mountains delineate part of the western boundary whilst the Antrim Hills run along a small portion of the eastern boundary.

The main population centres in the NBIRBD are Coleraine; Ballymena; Craigavon; Armagh; Newry; Monaghan; Cavan; Dundalk and Ardee.

#### 1.3.2 Land Use

The land use around the Lough Neagh basin is typified by improved pasture but also includes some internationally important wetland habitats. Lough Neagh itself is designated as a Special Protection Area (SPA), under the EC Directive on Conservation of Wild Birds, 1979, and a Ramsar site, under the Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat, 1971. North of Lough Neagh, the Lower Bann River valley is very fertile and supports highly

productive farmland. To the south of Lough Neagh the landscape is dominated by drumlins that stretch across the south of NI and into Counties Monaghan and Louth. Agriculture is also the predominant land use in this area.

### 1.3.3 Geology

Palaeogene basalts underlie the majority of the northern and central area of the IRBD. Significant areas of Palaeogene clays and silts surround southern Lough Neagh with Ordovician / Silurian greywackes and mudstones, intruded by younger granites, occurring further south. In the west of the IRBD a variety of Devonian and Carboniferous mudstones; limestones and sandstones occur along with areas of Permo-triassic sandstones. There is extensive coverage of superficial deposits consisting of mainly till but also sand and gravels.

With relatively high rainfall, upland areas suitable for the collection and storage of water and the presence of Lough Neagh, not surprisingly, surface water is the dominant source of water supply in the NBIRBD. Groundwater nevertheless is still an important source of water for public drinking water and for industrial, agricultural and domestic supply. For the most part the NBIRBD is underlain by poorly productive aquifers however modest and occasionally more significant supplies can be obtained from the Tertiary basalts and the Devonian sandstone and limestone sequences and the numerous Quaternary sand and gravel deposits located mainly within the river valleys, such as those in the River Main valley around Clogh Mills.

### 1.3.4 Relief

The relief over the extent of the NBIRBD is wide ranging. The lowlands in the immediate hinterland of Lough Neagh are at an elevation less than 20m Above Ordnance Datum (AOD) whilst the upland areas and in particular the Mourne Mountains extend to an elevation of over 600m AOD.

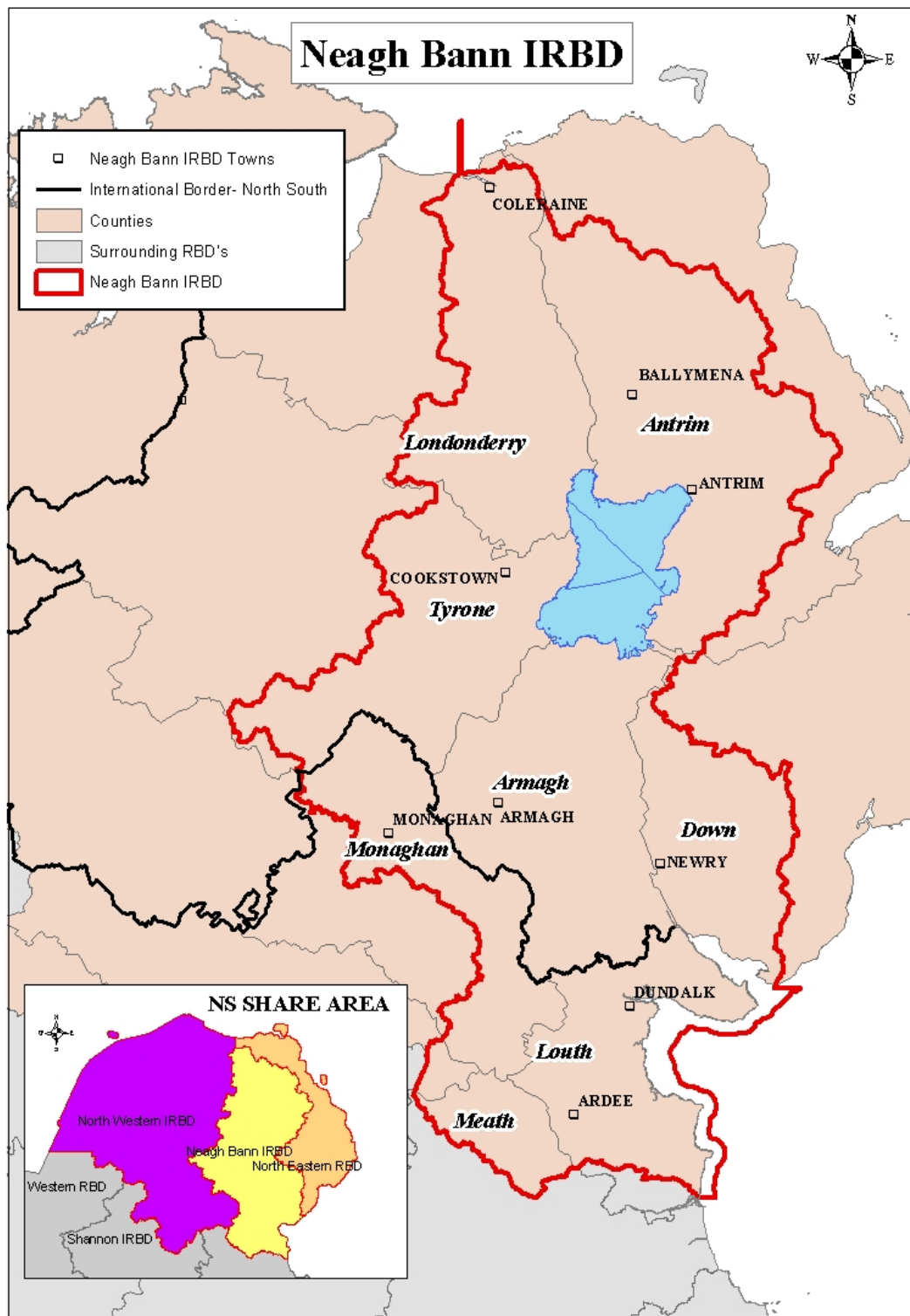
The NBIRBD is flanked by numerous mountainous and upland regions including:

- The Sperrins to the north west (maximum elevation Slieve Gallion 530m AOD);
- The Antrim Hills to the north east (maximum elevation, Slemish 437m AOD)
- The Mournes (maximum elevation, Slieve Muck 673m AOD);
- The Armagh Hills form the southern extent of the Lough Neagh / River Bann river basin (maximum elevation Slieve Gullion 573 m AOD)

Due to the varied nature of the terrain, the different river basins range from lowland rivers with wide valleys and slow discharge velocities to upland rivers with steep valley slopes and a flashy flow regime.

### 1.3.5 Climate and Rainfall

The climate is temperate, with the average rainfall per year ranging from 800 mm in the Lough Neagh Basin to 1200 mm per year towards the upland areas of the Sperrin and the Mourne mountains.



**Map 1.2 Neagh Bann International River Basin District (NBIRBD)**

## 1.4 The NS Share Project

The **North South SHared Aquatic REsource** (NS Share) Project is jointly funded by the EU INTERREG IIIA Programme for Ireland/Northern Ireland (refer to Chapter 8.0); the DOE, Northern Ireland, and the DEHLG, Ireland. The overall objective of the Project is to strengthen inter-regional capacity for environmental monitoring and management capacity at the river basin district level, to improve public awareness and participation in water management issues and to protect and enhance the aquatic environment and dependent ecosystems. The Project's study area includes three RBDs, two of which are international (the North Western IRBD and the Neagh-Bann IRBD), whilst the third is contained within NI (the North Eastern RBD).

The summary list of NS Share Project tasks, set to support the WFD's objectives, is as follows:

1. **Develop an Ecological Classification System.** This task will involve the development of ecological classification tools to define the water quality status of aquatic ecosystems having regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystem.
2. **Develop a mechanism to define Heavily Modified Waterbodies (HMWBs) and Artificial Waterbodies (AWBs).** HMWBs are waterbodies that have been altered due to human pressures to an extent where they can no longer achieve the maximum ecological status that would be expected for a natural waterbody. AWBs are those waterbodies that are totally man made, e.g. canals. For both designations it is necessary to define the maximum ecological potential achievable and whether restorative procedures are feasible based on an economic analysis.
3. **Address the discharge, control and monitoring of Dangerous Substances.** A list of relevant dangerous substances including information on their source and usage must be prepared for the study area. Those waterbodies that are at risk of failing to achieve good ecological status as a result of the dangerous substances should be identified. Environmental Quality Standards have to be assigned to each of the relevant dangerous substances which involve the identification of an acceptable concentration of the dangerous substance within the waterbody. The analytical capabilities of the agencies also have to be assessed to provide an indication of the monitoring capabilities within both jurisdictions.
4. **Initial Characterisation of the study area.** The initial characterisation of the study area requires the identification of the various waterbodies and their typology (physical characteristics). The study includes groundwater bodies, all surface waterbodies and groundwater dependent terrestrial ecosystems and their interaction.
5. **Compile, maintain and update a Register of Protected Areas.** All member states must establish a register of protected areas lying within each river basin district which have been designated as requiring special

protection under European legislation for the protection of surface of groundwaters or the conservation of habitats and species directly dependant upon water. The register of protected areas will be kept under review and up to date.

6. **Undertake Pressures and Impacts Analysis.** The principal aim of the pressures and impacts analysis is to identify where and to what extent human activities are placing the achievement of the Directive's environmental objectives at risk.
7. **Prepare Economic Analysis.** This task will include an economic analysis of water use and non-use and will make an assessment of the most cost effective way to implement a programme of measures to address water quality issues in the RBD.
8. **Production of a GIS and Data Management System.** The project requires the collation of many different data types from disparate sources. It is essential that this information is managed in an efficient and appropriate manner through GIS compatible databases. It is therefore necessary to develop a system to store this data which will allow the two way transfer of data back to the data owners. This system will act as a depository for data and is not intended to replace existing systems.
9. **Prepare a Characterisation Report.** This report will be based on the work undertaken in tasks 2-8. The report will detail the characteristics of the RBD; a review of the impact of human activity on the status of surface waters and groundwaters and a summary of the economic analysis of water use.
10. **Review of monitoring needs.** This involves a technical review of the existing monitoring programmes and will identify data gaps and make recommendations to improve inter-regional capacity for environmental monitoring and management.
11. **Undertake Further Characterisation to identify Significant Water Management Issues.** Following the completion of the initial characterisation report, there is a need to further characterise the significant water management issues, through refining the pressure and impacts analysis undertaken under task 6. This will be carried out for those waterbodies identified as being 'at risk' or 'probably at risk' in order to establish a more precise assessment of the significance of such risk and the identification of any measures required to achieve the environmental objectives of the WFD.
12. **Develop a Programme of Measures.** Taking into account the work carried out under the foregoing tasks it is necessary to develop a programme of measures to address the environmental objectives specific to each RBD in the attainment of the requirements of the WFD. The programme of measures will be developed after consideration of all water uses and impacts. Any management options will be subject to a cost benefit analysis before being taken forward to the programme of measures. The integrated programme of measures will be open to debate and agreed with all interested parties. The objectives of each management

option and the agency responsible for each will be clearly stated in the programme.

- 13. Produce a River Basin Management Strategy for each RBD.** The strategy will incorporate all the elements outlined in the above tasks and will advise on major issues within cross border catchments and on the measures that must be implemented if agreed objectives are to be achieved. The strategy will explore all of the ecological expectations, water uses and management opportunities within each cross border catchment. The strategy will need to be developed as a building block to contribute to the management of the river basin districts and will lead to the production of a River Basin Management Plan by the respective Governments.
- 14. Interested Party Participation.** The public participation strategy should make use of a wide range of media and techniques to involve the public in raising awareness of the WFD in the RBD and to ensure the integrated involvement of all relevant parties.
- 15. Printed Reports.** Reports will be prepared and required in both printed and electronic format. It will be necessary to produce reports that are for both technical and non-technical audiences depending on specific deliverables within the project.
- 16. Capacity Building.** It will be necessary to develop the capacity for a joint understanding of the technical systems developed across the RBD for each of the jurisdictions involved. This will include joint training and capacity building for the participating agencies and the development of operating procedures/protocols for ongoing support and maintenance of the systems developed.

In addition, the NS Share Project has an overall responsibility to promote harmonisation of the activities undertaken throughout the study area and to ensure compliance with the objectives of the WFD.

## 1.5 Purpose of this report

One of the first major milestones required of Member States by the WFD was the preparation of Summary Characterisation Reports (under Article 5) for each River Basin District (RBD) in their jurisdiction. The reports for Northern Ireland and Republic of Ireland can be found at the following websites:

- <http://www.ehsni.gov.uk/pubs/publications/article5report.pdf>;
- <http://www.wfdireland.ie>.

The Article 5 characterisation reports required:

- an analysis of RBD characteristics,
- a review of the impact of human activity on the status of waters, and
- an economic analysis of water use.

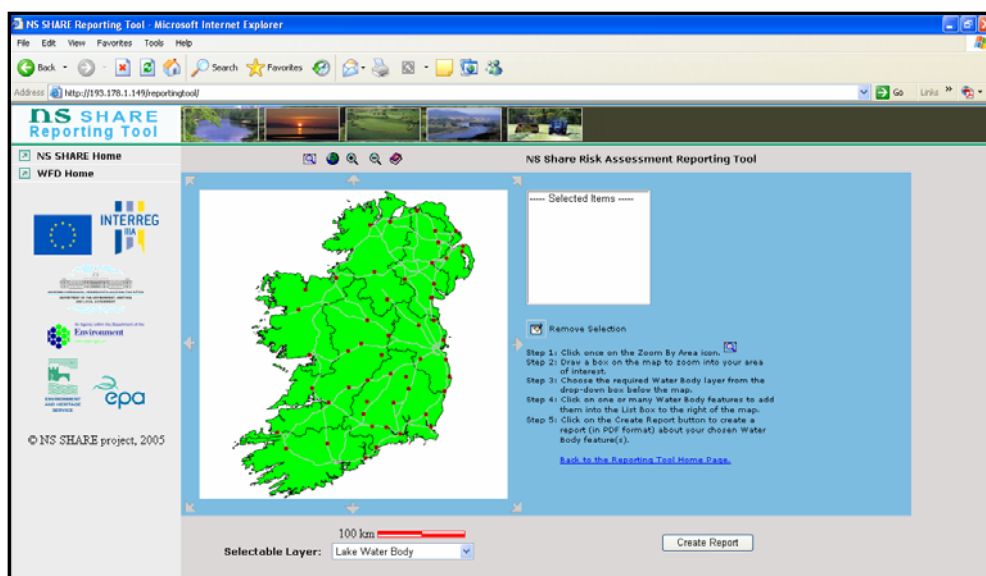
This document provides the general public with summary characterisation information extracted from the above reports specifically by outlining those waterbodies in the NBIRBD that fall into each of the risk categories. These categories indicate the risk of a waterbody not achieving the Directive's objectives by 2015 and are listed below:

- At Risk
- Probably at Risk
- Probably not at Risk
- Not at Risk

The report also highlights the key pressures acting in the basin. Information relating to the results of the pressure and impact assessment can be reviewed on the NS SHARE website ([www.nsshare.com](http://www.nsshare.com)). The NS SHARE project has developed an interactive map and database system for use by the public and specialist users alike. The Reporting Tool provides point-and-click access from River Basin District maps to risk assessment data and results prepared under Article 5 of the EU Water Framework Directive. This can be accessed via the NS SHARE website at the following link: <http://www.nsshare.com/reportingtool.html>

Figure 1.1 illustrates the reporting tool Map Selection web page. The user can point and select an area of interest on the map of Ireland and access the risk assessment data for a particular waterbody.

Further characterisation is currently underway to refine the results summarised in this report and the NS SHARE interactive reporting tool. Work tasks currently being undertaken include refinement of freshwater morphology risk assessments; refinement of diffuse source pollution risk assessments; and refinement of point source pollution work packages. In addition, work on cross-border waterbodies is being undertaken relating to their characterisation.



**Figure 1.1 NS SHARE Interactive Reporting Tool – Map Selection Web Page**

## 2.0. Typology

### 2.1 Surface Waters

The WFD requires the surface waters of a (I)RBD to be placed into one of four natural categories – river; lake; transitional (estuaries); or coastal; or alternatively, identified as an artificial or heavily modified. Artificial Water Body (AWB) is defined as a body of surface water created by human activity. Heavily Modified Water Body (HMWB) is a body of surface water which as a result of physical alterations by human activity is substantially changed in character, and as such is designated under Annex II of the WFD.

Each water category is further split into “waterbodies” which form the basic management unit for reporting and assessing compliance with the WFD’s objectives. The WFD recognises that important physical factors (such as altitude, depth, size, flow, catchment rock type and tidal regime), dictate the plants and animals that would typically be found within a waterbody. For example the type of insects found in a fast flowing hardwater river will be very different from those supported by a sluggish siliceous river. Consequently, the Directive requires that surface waterbodies are differentiated according to “type” using appropriate physical characteristics. A more detailed description of the typology processes can be obtained from the Article 5 characterisation reports for Northern Ireland (Ref 1) and Ireland (Ref 2).

#### 2.1.1 Rivers

Irish rivers have been allocated to one of 12 primary types, which have been shown to be ecologically meaningful in unimpacted river systems. The Irish typology system is based on geology (associated with its impact on water hardness) and channel slope (representative of water velocity). 71 waterbodies have been identified in the portion of the NBIRBD within RoI, approximately half of these are calcareous (or hard water) types covering a range of channel slope conditions.

The current typology of rivers in the NI portion of the IRBD uses a system based on altitude, catchment size and geology to define river types. The application of this typology has identified 12 types in NI. The total number of river waterbodies completely within the NI portion of the NBIRBD is 249; just under half of these are low altitude, small, calcareous waterbodies. The delineation of shared waterbodies is ongoing and a risk assessment will be carried out on these waterbodies once they have been finalised.

The Irish typology system has been tested by Northern Irish authorities and is at present being applied to NI’s river waterbodies. This will achieve full harmonisation of the typology system across all the river waterbodies within the NBIRBD.

#### 2.1.2 Lakes

The typology system for lakes in the RoI has identified thirteen general types using alkalinity (as a surrogate for geology), depth and size as the determining parameters. There are 2 large lake waterbodies in the RoI portion of the NBIRBD. Typology

information is available for one of the lakes (above the WFD reporting threshold of 50 hectares).

The lake typology system applied in NI has identified 20 different types using altitude, depth, size (based on surface area) and geology. Application of this typology to the twelve large lakes in the NI portion of the NBIRBD results in four types with most of the waterbodies described as low altitude, calcareous, non peat lakes. The remainder comprise mid -calcareous peat or mid -siliceous non peat.

The Rol lake typology system has been tested by NI authorities and is at present being applied to Northern Ireland's waterbodies. This will achieve full harmonisation of the typology system across all lake waterbodies within the entire NBIRBD.

### **2.1.3. Transitional and Coastal**

A common typology system was applied to all transitional and coastal waterbodies in both NI and the Rol. The typology scheme uses the factors of tidal range, salinity and exposure with special categories for coastal and transitional lagoons.

Applying the typology factors to the waterbodies within the NBIRBD has resulted in 10 transitional waterbodies (falling into two types) and 5 coastal waterbodies (falling into three types). There are 3 cross-border coastal waterbodies (falling into three types) in the NBIRBD. There are no transitional cross-border waterbodies.

## **2.2 Groundwaters**

The island of Ireland has a diverse, complex bedrock and subsoil geology. Consequently, the groundwater flow regime varies from intergranular flow in subsoils to fissure flow in bedrock and conduit flow in karst limestones. Groundwater body typology is based on the flow regime of the aquifer. Boundaries between different waterbodies are delineated where there is little or no flow across them. The same system was used in both NI and the Rol. There were four groundwater body types identified, based on flow regime, namely karstic, productive fissured bedrock, gravel and poorly productive bedrock. This work was carried out jointly by the Geological Survey, Ireland (GSI) and the Geological Survey, Northern Ireland (GSNI).

This resulted in the delineation of 37 groundwater bodies in the NBIRBD, 5 of these are cross border bodies. Ongoing delineation and characterisation of these border groundwater bodies may result in some redefining of waterbody boundaries.

### **2.2.1 Groundwater Dependent Terrestrial Eco-Systems**

Traditionally, study and management of water resources has largely focused on surface water or groundwater as if they were separate entities. However almost all surface water features (streams, lakes, wetlands and estuaries) interact with and are hydraulically connected to groundwater (Ref 3). While many aquatic eco-systems depend on the quality of groundwater bodies, many terrestrial eco-systems depend on them also. Examples include turloughs, fens and dune slacks whereby groundwater either discharges to the surface or to the rooting zone of vegetation. Consequently, the ecological potential of the eco-system is determined by the

associated groundwater body. For the purposes of the River Basin projects, the consideration of terrestrial ecosystems dependent on groundwater has been carried out on sites within European designations, i.e. SACs and SPAs as these areas, by their designation, have been classed as high value. Further characterisation activities in Northern Ireland will assess other nationally and locally important sites within Northern Ireland (Ref 1).

### 3.0 Register of Protected Areas

Protected areas are defined as those requiring special protection of their surface water or groundwater or for the conservation of habitats and species directly depending on those waters. Protected areas are being captured under the WFD in order to bring all water related EC legislation under one umbrella. Article 6 of the WFD requires each Member State to establish a register of protected areas. Environment and Heritage Service, Northern Ireland (EHS) and the Environment Protection Agency (EPA) have established registers for the waters within the NBIRBD<sup>1</sup>. The protected areas are divided into six main categories as follows.

#### **Areas designated for the abstraction of water intended for human consumption**

Currently rivers and lakes providing water supply intended for human consumption are protected under the Surface Water Abstraction Directive. Protected areas were also identified in relation to groundwater abstraction; in fact all groundwater bodies were included because they are all potentially drinking water supplies.

#### **Areas designated for the protection of economically significant aquatic species**

These protected areas are previously designated under EC directives aimed at protecting shellfish and freshwater fish. These areas are currently under review. They include the EHS recommendations for Salmonid species in Northern Irish waters.

#### **Areas designated as recreational & bathing waters**

These are bathing waters which have been designated under the Bathing Waters Directive.

#### **Nutrient Sensitive Areas**

Nutrient sensitive areas have been designated under the Urban Waste Water Treatment Directive (UWWT). Within Northern Ireland, Nitrate Vulnerable Zones have been designated under the Nitrates Directive, whilst in the Republic of Ireland a Nitrates Action Programme has been prepared in accordance with Article 5 of the Nitrates Directive and is to be applied to the state as a whole.

#### **Areas designated for the protection of habitats (including birds)**

These are areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection. These include Salmonid waters (RoI only), Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). SACs are strictly protected sites designated under the EC Habitats Directive. The objective of such designation is to protect some of the most seriously threatened habitats and species across Europe. SPAs are designated under the European Commission Directive on the Conservation of Wild Birds (The Birds Directive). All European Community Member States are

<sup>1</sup> <http://www.ehssi.gov.uk/environment/waterManage/wfd/register/RegProtArea.shtml>

required to identify internationally important areas for breeding, over-wintering and migrating birds and designate them as SPAs.

Table 3.1 summarises the existing Protected Areas throughout the RBD. Work is currently being progressed on harmonising the registers to facilitate the maintenance of the Article 6 register.

**Table 3.1 Areas designated under the Register of Protected Areas in the NBIRBD**

Protected Area	River Water Bodies	Lake Water Bodies	Transitional Water Bodies	Coastal Water Bodies	Ground water Bodies	Number of Designated Areas
<b>Drinking Waters</b>	28	19			51	198
<b>Economically Significant Aquatic Species</b>	189 (Salmonid sp. EHS)	12 (Salmonid sp. EHS)		1		203
<b>Recreational and Bathing Waters</b>				7		7
<b>Nutrient Sensitive Waters</b>	205	3	1	1		210
<b>Protection of Habitats</b>	6 (Salmonid sp Rol)	1 (Salmonid Sp, Rol)				7
<b>Water Dependent Special Areas of Conservation (SAC)</b>						20
<b>Water Dependent Special Areas of Protection (SPA)</b>						5

## 4.0 Risk Assessment

### 4.1 Introduction

The WFD required each Member State to complete an analysis of Pressures and Impact (P & I) by December 2004 and report on the findings by March 2005. The competent authorities within both jurisdictions of the NBIRBD achieved these deadlines. The analysis results are presented in the corresponding national characterisation reports and synthesis reports which were submitted to Europe. The relevant national documents are available, to those who want to explore technical detail on Ireland's WFD website (Ref 2) ([www.wfdireland.ie](http://www.wfdireland.ie)) and the Environment and Heritage Service's website (Ref 1) ([www.ehsni.gov.uk](http://www.ehsni.gov.uk)).

The NS Share Project undertook a comparison of the P & I analysis applied in each jurisdiction. The agencies involved carried out the analysis independently and communicated to ensure, where possible, that the work would be consistent when joined together. Despite best efforts, there were slight differences in approach, dataset available and interpretations. Consequently, the reflection of this in the P & I analysis results will be continuously reviewed and addressed through the River Basin Management Planning Process. This section of the NBIRBD summary report aims to extract the key findings of the P & I analysis and to highlight what issues need to be focussed on to prepare a River Basin Management Plan for the district.

The P & I analysis considered water status issues from the top down (looking at drivers which cause **pressures** on waters) and from the bottom up (looking at what we know today about **impacts** on water status). The pressure analysis uses predictive techniques and available information on the extent of human activities, e.g. land use mapping to identify water bodies experiencing significant pressures and therefore with a water quality status that is potentially at the greatest degree of risk of failing to achieve the objectives of the WFD. The impacts analysis incorporates knowledge from provided by existing monitoring activities and identifies any water bodies that exhibit what is currently considered as deteriorated water status.

Four categories have been used to describe the P & I analysis results (Table 4.1). The analysis is a risk based assessment, which means that it deals with the likelihood that a waterbody will meet its WFD status objectives. This framework coincides with that used by the competent authorities in both the UK and Ireland as a whole. For example the waterbodies experiencing the greatest degree of a pressure are least likely to achieve the target of at least good status and likewise any waterbody already impacted (that is failing existing environmental targets) is unlikely to achieve good status in WFD terms. The P & I analysis identifies areas where additional information or investigation is needed to improve confidence in the risk assessment.

**Table 4.1 Risk Categories**

<b>Reporting Risk Categories</b>	
<b>(1a) Waterbodies at significant risk – “At Risk”</b>	<b>Action:</b> Identifies waterbodies for which consideration of appropriate measures to improve status can start as soon as practical
<b>(1b) Waterbodies probably at significant risk</b> but for which further information will be needed to confirm that this view is correct – <b>“Probably at Risk”</b>	<b>Action:</b> Focus for more detailed risk assessments (including, where necessary, further characterisation) aimed at determining whether or not the waterbodies in this category are at significant risk in time for the publication of the interim overview of significant water management issues in 2007
<b>(2a) Waterbodies probably not at significant risk</b> on the basis of available information for which confidence in the available information being comprehensive and reliable is lower – <b>“Probably not at Risk”</b>	<b>Action:</b> Focus for more detailed risk assessments aimed at improving the quality of information and determining whether or not the waterbodies in this category are not at significant risk in time for the publication of the draft River Basin Management Plan due to be completed in 2008.
<b>(2b) Waterbodies not at significant risk</b> on the basis of available information for which confidence in the available information being comprehensive and reliable is high – <b>“Not at Risk”</b>	<b>Action:</b> Consideration of appropriate measures to ensure no deterioration in status can start as soon as practical

Member States must investigate a variety of pressures ranging from familiar point and diffuse pollution issues to abstraction, flow regulation and morphology (together known as hydromorphology) pressures which might impact on the flow or physical regime of the waterbody and consequently affect the natural flora and fauna. The range of pressures considered in the P & I analysis covers all those identified by the European WFD implementation guidance.

Within the NBIRBD the collation of data detailing which pressures and where these pressures exist in the district has been carried out by the Environment and Heritage Service (EHS) for the portion of the RBD within NI and by the project team of the NS Share Project for RoI portion of the RBD. During the data collection process it was necessary to collaborate with many Agencies to collect, or where necessary, generate this information and to assemble it into a geographical database. This means that there is comprehensive data throughout the district and that pressures such as physical alterations to waters are being systematically addressed for the first time.

Risk assessment methods were developed and applied to all groundwaters, rivers, lakes, transitional (estuaries) and coastal waterbodies within the study area. The purpose of applying risk assessments was to assess the degree or significance of pressure on a waterbody. It was important that all assessments were applied in a consistent way throughout the shared waters within the NBIRBD. Consequently in

an effort to harmonise the P & I approach, the methodologies developed by the UK Technical Advisory Group and applied by EHS to Northern Ireland's waterbodies were adapted and applied throughout the Republic of Ireland portion of the NBIRBD. The detail behind the risk assessment methodologies is contained in background documents which support the respective national characterisation reports. The results of the P & I risk assessments applied in the NBIRBD are contained in the following sections of this chapter.

It is important to note that significant WFD related work is still ongoing to establish exactly how pressures are linked to impacts and also what the definition of good water quality status is in the context of the WFD. However, the P & I analysis that has been undertaken makes use of the best information available to identify what issues we need to know more about and to prioritise the key issues for water management. For the most part the analysis is based on today's situation, further studies will be undertaken to look at how changes in drivers and pressures could affect water management issues. The P & I assessment is an iterative procedure (forming part of a management cycle). The first analysis presented in this NBIRBD Summary Report must be thought of as an "initial characterisation" which provides an appropriate basis to develop the next phase of the river basin management planning process.

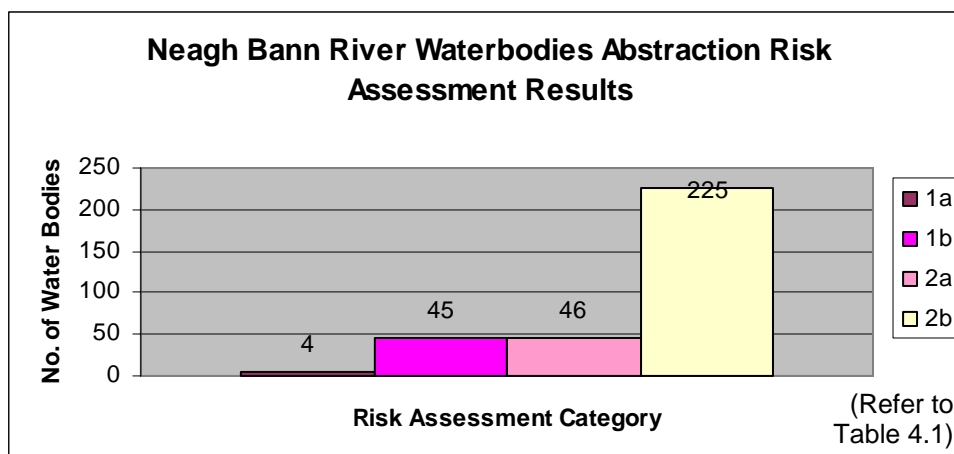
## **4.2 Rivers Risk Assessment**

The purpose of the risk assessment is to identify water bodies at risk of failing to achieve good ecological or chemical status due to the effect of human activities. The river risk assessment involved identification and assessment of the significance of pressures from water abstractions, water flow regulations, morphological alterations, point sources and diffuse sources. Known impacts as indicated by available monitoring data were also incorporated into the analysis.

### **4.2.1 Significant Abstraction and Flow Regulation Pressures**

The abstraction risk assessment methodology is based on water balance, with nett abstraction compared to natural low flow characteristics. The presence of significant flow regulations was also considered in the assessment in both jurisdictions.

Figure 4.1 presents the abstractions and flow regulation risk assessment results for the 320 river waterbodies in the NBIRBD. As indicated, significant abstraction and flow regulation pressures are not widespread within the NBIRBD. Of those waterbodies that are considered to be "at risk" or "probably at risk" the predominant pressure is abstraction for public water supply with both domestic and commercial users generating a demand.

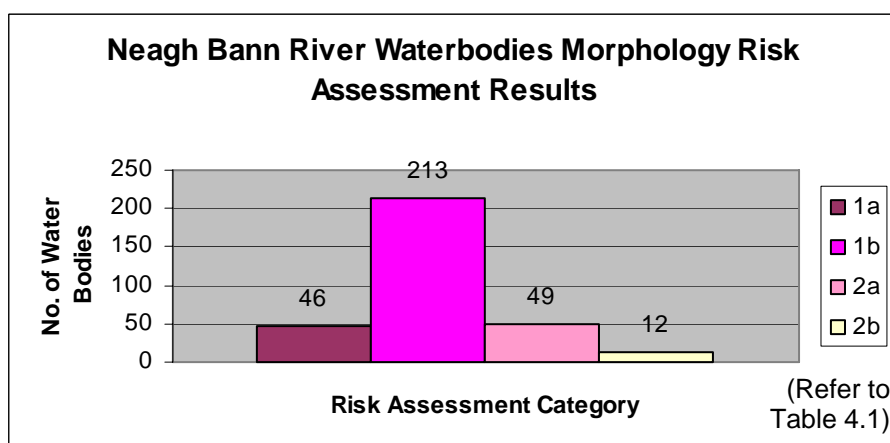


**Figure 4.1 Flow regulation and water abstraction risk assessment for NBIRBD rivers**

#### 4.2.2 Significant Morphological Pressures Assessment

The significant morphological pressures assessment addresses physical alterations made on rivers to support human activities such as navigation, urban development or agriculture. The morphological assessment for rivers includes: channelisation and dredging, river straightening, flood protection and embankments, impoundments, water regulation and intensive land use.

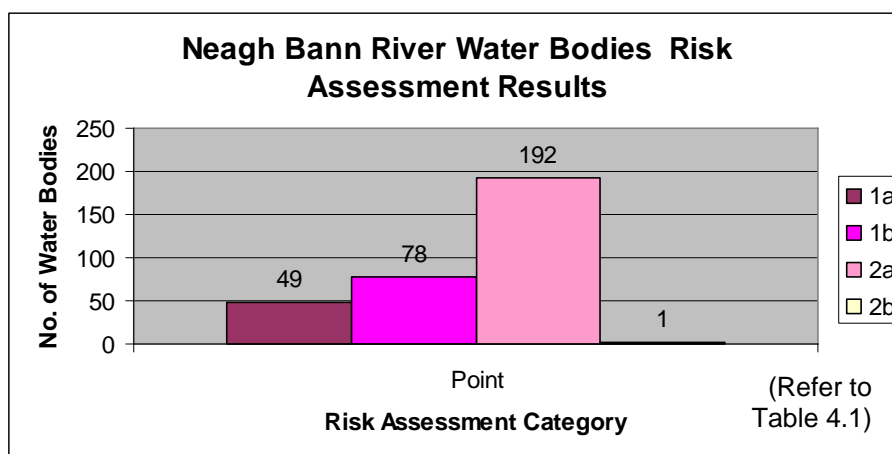
The results for the morphological risk assessment for river waterbodies within the NBIRBD are illustrated in Figure 4.2. 80% of the rivers assessed in the NBIRBD are “at risk” or “probably at risk” due to morphology pressures. The main activities that river waterbodies are subjected to are land drainage pressures associated with agriculture, intensive land use and channelisation works.



**Figure 4.2 Morphological pressures risk assessment for NBIRBD rivers**

### 4.2.3 Significant Point Source Pressures

The significant point source pressures addressed in the river risk assessment include discharges from Urban Wastewater Treatment Plants (UWWT), storm overflows, sludge treatment plants and industries. Other point source pressures including landfills, quarries and mines were also addressed where they were considered significant at an (I)RBD level.



**Figure 4.3 Point source pressures risk assessment for NBIRBD rivers**

The results for the point source risk assessment of river waterbodies within the NBIRBD are presented in Figure 4.3. Point source pressures place approximately 40% of river waterbodies in the “at risk” or “probably at risk” categories. The main sectors affecting those waterbodies are waste water treatment plant and combined storm overflows and industrial discharges. The assessment highlights that point source discharges, for the most part, are clustered around more densely populated areas. This is consistent with the assessments in other (I)RBDs and reflects the challenges required to regulate facilities through out the island of Ireland.

### 4.2.4 Significant Diffuse Source Pressures

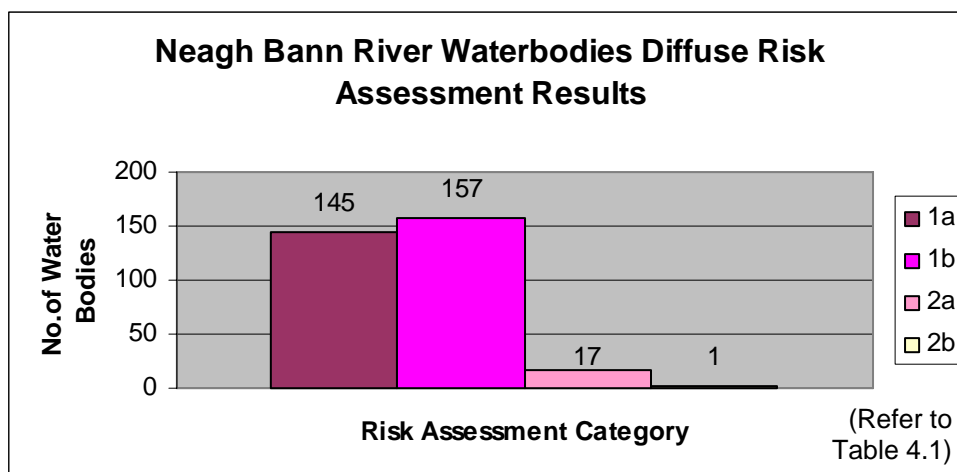
Diffuse pollution pressures arise from widespread rural and urban land use activities. The diffuse pollution risk assessment considers a range of activities which potentially give rise to various pollutants to aquatic systems. These include agriculture, non-sewered population, urban land use, transport, some industrial activities and other major land uses which in the NBIRBD including, peat exploitation and forestry activities.

The diffuse source risk assessment used impact data collected by monitoring programmes in both jurisdictions in the NBIRBD. Impact data was supplemented by expert knowledge and a modelling approach which was used to provide a predictive assessment of the diffuse pollution pressures in the absence of known impact status.

The pressure datasets used in the predictive diffuse assessments included land management practices, infrastructure details, forestry inventories, in addition to

physical attributes such as soil and sub-soil coverage, digital terrain model, extent of urbanised areas and agricultural statistics.

The results for the diffuse source risk assessment of river waterbodies within the NBIRBD are illustrated in Figure 4.4. The assessment highlights the significance of diffuse pressures, with 94% of the river waterbodies in the NBIRBD “at risk” or “probably at risk” due to diffuse source pollution. Agriculture and forestry are the general industry sectors in the NBIRBD found to be the largest contributors to diffuse source pollution pressures.



**Figure 3.4 Diffuse source pressures risk assessment for NBIRBD rivers**

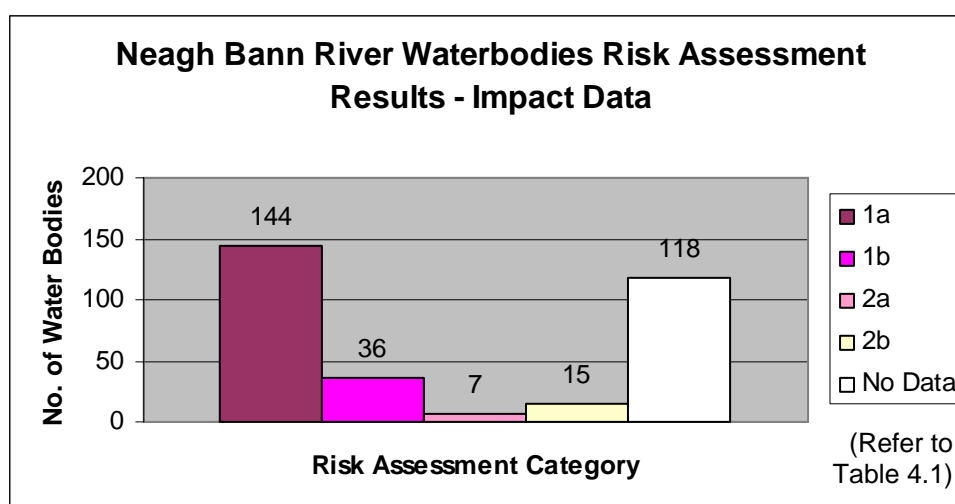
#### 4.2.5 River Impact Assessment

Impact data was obtained from monitoring programmes carried out by EPA and EHS on an ongoing basis throughout the study area. The Q system and the distribution of the freshwater pearl mussel *Margaritifera margaritifera* were used in the RoI portion of the NBIRBD. The Q system is implemented by EPA, which is a monitoring programme that occurs on a three year cycle. Q Values indicating water quality are assigned to more than 1000 river sites each year. Assessments of the status of individual rivers are given and the causes of pollution are indicated. In each three-year cycle approximately 13,200 km of river channel is surveyed at 3200 different locations.

In NI, chemical and biological monitoring is carried out under the General Quality Assessment (GQA) by EHS. This assessment, in conjunction with trophic status surveys, is used to determine river water quality. The Biological GQA is based on comparison of the macro-invertebrate fauna found at a sampling site with the expected condition in the absence of pollution. The chemical grade of the GQA scheme is defined by standards for the concentrations of BOD, ammonia and dissolved oxygen. These have been selected as indicators of the extent to which waters are affected by wastewater discharges and rural land use run-off containing organic, biodegradable material.

This monitoring data indicates where pressures are impacting water quality, regardless of the source of the pressure. These monitoring datasets are supplemented by various monitoring programmes established to assess specific legislative requirements.

The results of the river impact data risk assessment for the NBIRBD are illustrated in Figure 4.5. The results indicate that of the 202 river waterbodies that have available impact data, 180 are considered “at risk” or “probably at risk”.



**Figure 4.5 Impact risk assessment for NBIRBD rivers.**

#### 4.2.6 River Waterbodies Risk Assessment Summary

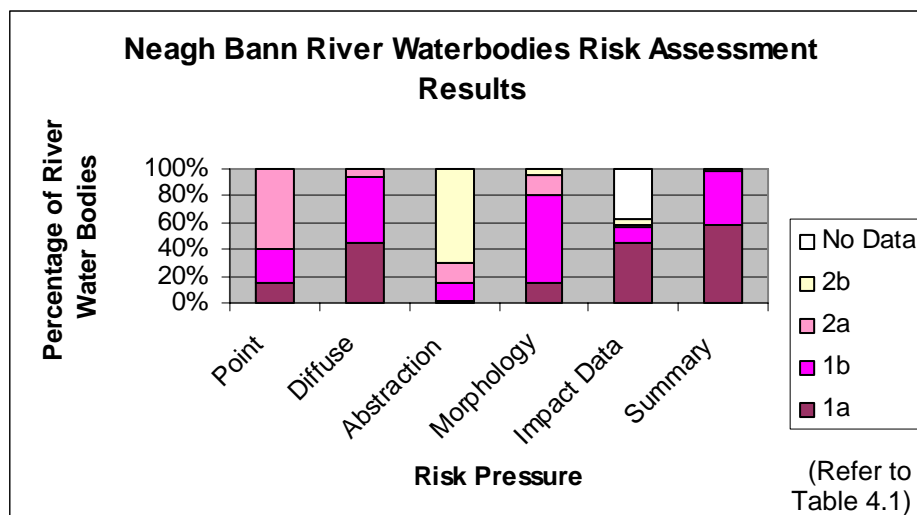
The overall risk assessment process is precautionary in that a single pressure can cause a waterbody to be classified at risk. Where a waterbody has more than one pressure associated with it, the worst case will be used to classify the overall risk assessment results for the waterbody.

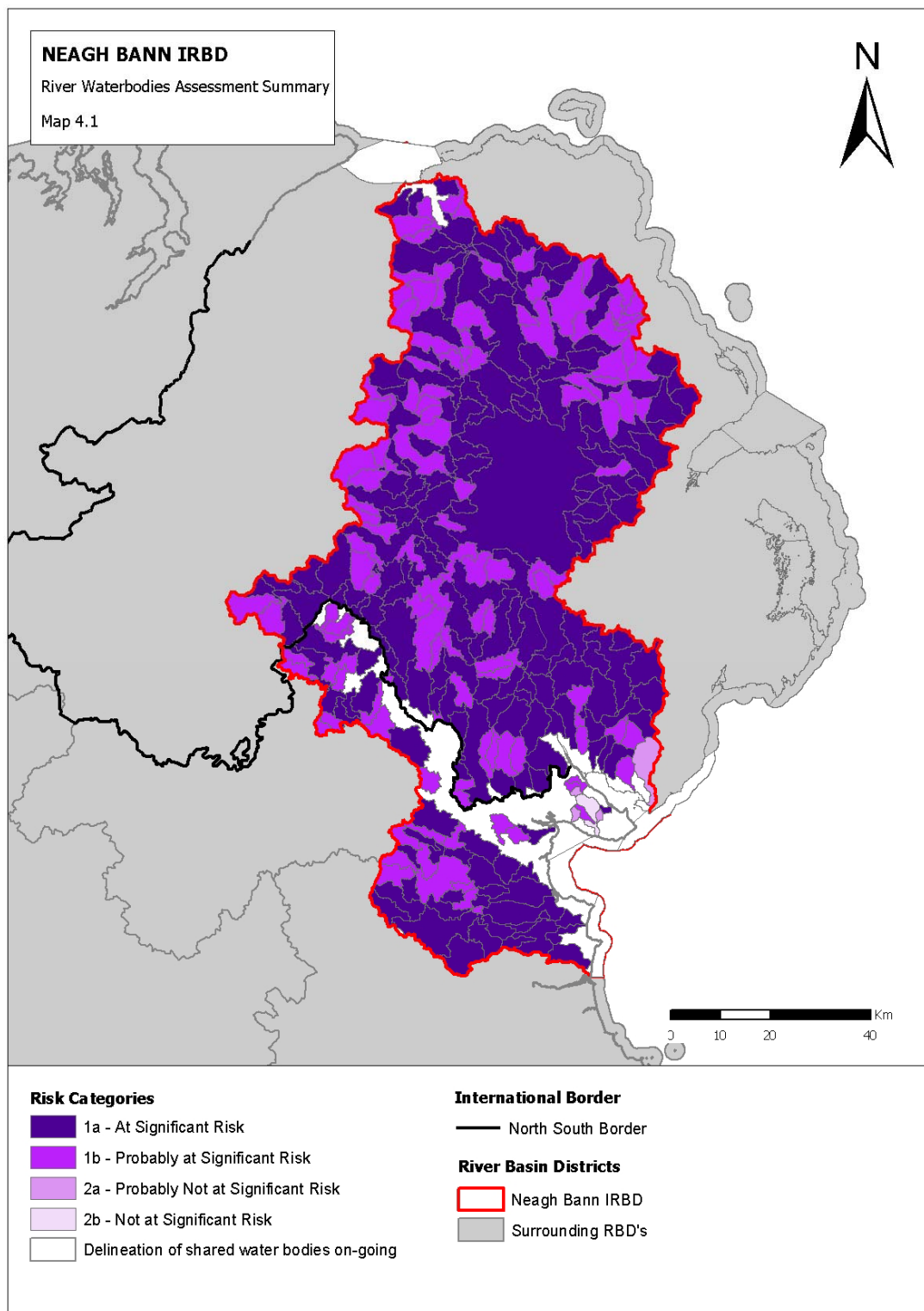
Map 4.1 illustrates the combined risk category associated with the NBIRBD river waterbodies. The waterbodies at risk tend to be located in areas where land use is intensive, such as urban areas and fertile agricultural areas such as the lower Bann river valley.

Table 4.2 and Figure 4.6 summarise the risk assessment combined results. Table 4.2 indicates that of the 320 waterbodies assessed in the NBIRBD almost 99% are considered to be at risk of not achieving good status or their environmental objectives under the WFD by 2015. Figure 4.6 demonstrates that the main sources of human pressures in relation to those river waterbodies at risk are from diffuse and morphological pressures.

**Table 4.2 River waterbodies risk assessment summary**

Reporting Category	Number of Waterbodies	% of Number	Km Affected	% area of RBD river wb's
1a at risk	187	58.5	4648.7	67.9
1b probably at risk	128	40.0	2131.6	31.1
2a probably not a risk	3	0.9	61.8	0.9
2b not at risk	2	0.6	9.7	0.1
<b>Total at risk</b>	<b>315</b>	<b>98.5</b>	<b>7850.5</b>	<b>99.0</b>

**Figure 4.6 Overall risk assessment results for NBIRBD rivers**



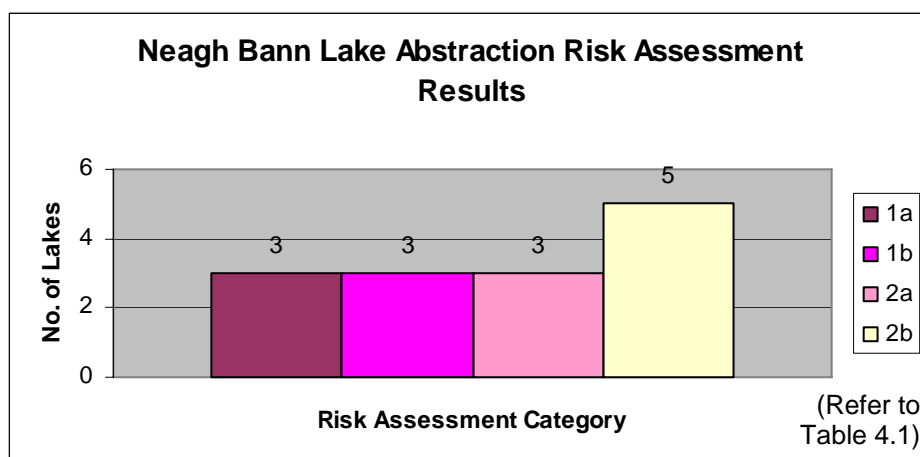
**Map 4.1 River Combined Risk Assessment – NBIRBD**

### 4.3 Lakes Risk Assessment

The lake risk assessment closely parallels the analysis applied to rivers, involving both predictive pressures and impact assessments. The lake analyses includes abstraction; flow regulation; morphology; point and diffuse source pressures and also incorporates impact data from lake monitoring datasets. The European threshold for reporting lakes is a surface area greater than 0.5 km. In Northern Ireland only those lakes that meet this size threshold are reported on, whilst in the RoI all lakes above the reporting threshold and some small lakes associated with drinking water supplies and some associated with protected areas, i.e. Special Areas of Conservation, were included in the risk assessment.

#### 4.3.1 Significant Abstraction and Flow Regulation Pressures

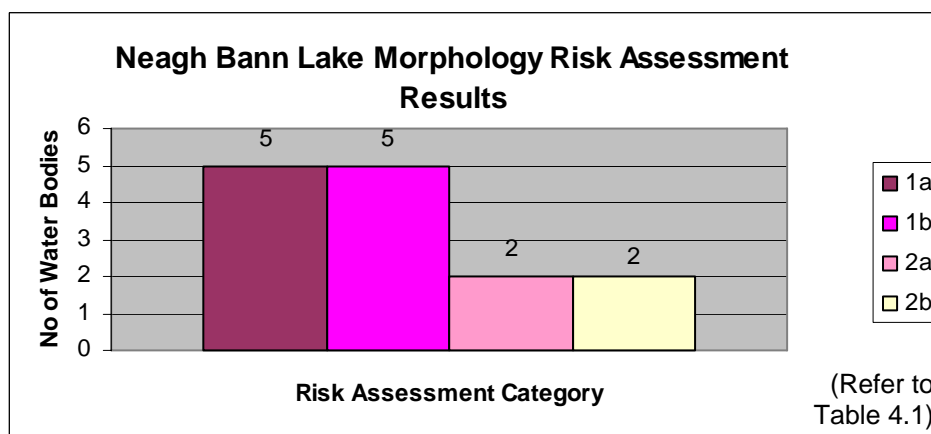
The risk assessment of abstraction pressures and flow regulations mirrored the river waterbody assessment process (presented in section 4.2.1). The results of the assessment are presented in Figure 4.7. Of the 14 lake waterbodies in the NBIRBD, six are considered “at risk” or “probably at risk” due to abstraction and flow regulation. Public water supply to both the domestic and commercial markets is the main abstraction activity that potentially impacts upon lake waterbodies in the NBIRBD.



**Figure 4.7 Flow regulation and water abstraction pressures risk assessment for NBIRBD lakes**

#### 4.3.2 Significant Morphological Pressures Assessment

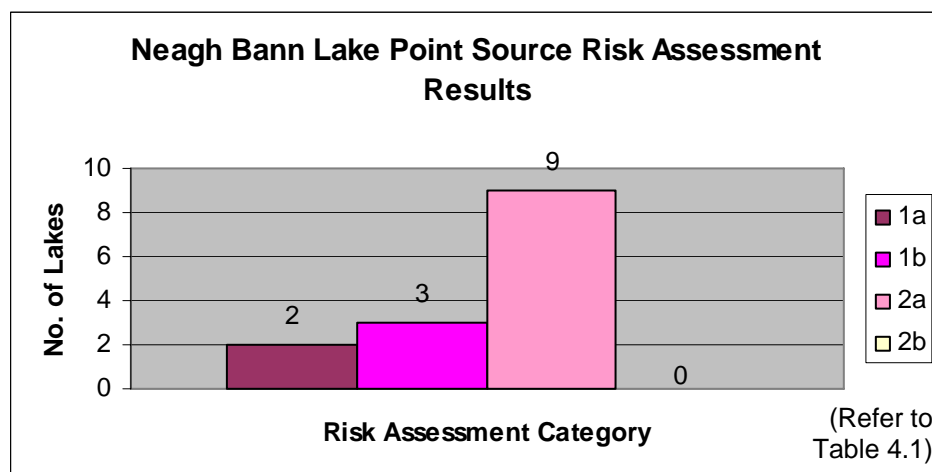
The morphological pressures assessment was undertaken by determining the extent of various know significant alterations within each lake waterbody, similar to the river morphological risk assessment (presented in section 4.2.2). Figure 4.8 summarises the findings of the morphological pressures risk assessment. It is indicated that approximately 70% of lake waterbodies are “at risk” or “probably at risk” due to morphological pressures in the NBIRBD. The main morphological pressures acting on lakes are from intensive land use practices.



**Figure 4.8 Morphological pressures risk assessment for NBIRBD lakes**

#### 4.3.3 Significant Point Source Pressures

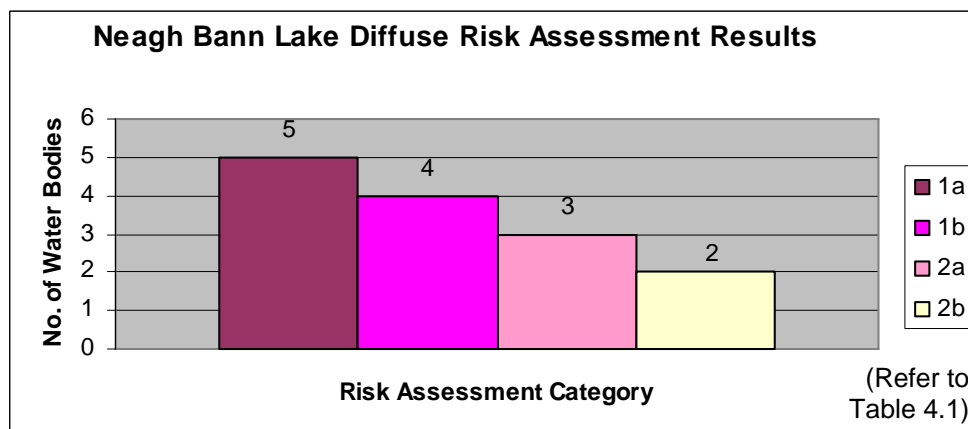
The significant point source pressures methodology applied in the lakes risk assessment considered facilities such as Urban Waste Water Treatment (UWWT) & sludge treatment plants; storm overflows; industries with licensed discharges. Figure 4.9 illustrates the results of the point source pressures analysis for lakes within the NBIRBD. Five of the lakes assessed in the NBIRBD are “at risk” or “probably at risk” from point source pollution. The main source of point source pressures in the NBIRBD is associated with waste water and water treatment plants.



**Figure 4.9 Point source pressures risk assessment for NBIRBD lakes**

#### 4.3.4 Significant Diffuse Source Pressures

The significant diffuse pressures assessment of lakes was based on the predictive and impact assessments carried out on the rivers inflowing into the lake. Impact data, derived from monitoring data from national lake surveys, was used to supplement the predictive modelling of pressures associated with diffuse source pollution for lakes. Figure 4.10 summarises the results of the diffuse source pollution risk assessment for lake waterbodies. The main sources of diffuse source pollution to lakes are again associated with intensive land use practices predominantly intensive agriculture.

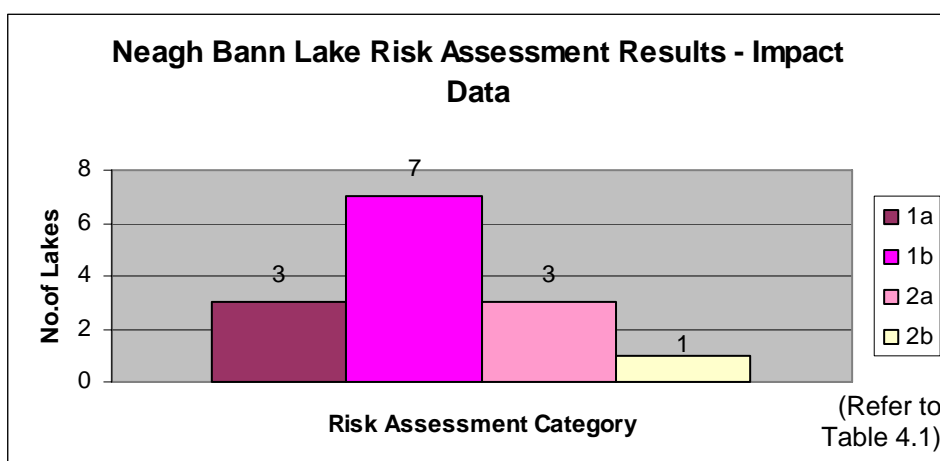


**Figure 4.10 Diffuse source pressures risk assessment for NBIRBD lakes**

#### 4.3.5 Lake Impact Assessment

The lake impact assessment is similar to the river impact assessment in that the results are based in national monitoring data. The impact data used relates predominantly to the identification of eutrophication pressures including phosphorus concentrations and mean and maximum Chlorophyll *a* values. Expert judgement was used to refine the risk category.

Figure 4.11 illustrates the NBIRBD lake risk assessment results. Impact data is available for all of the lakes in the NBIRBD. The results indicate that three of the lake waterbodies are considered to be “at risk” and seven lake waterbodies are considered to be “probably at risk” based on the impact data available. Diffuse pressures are the predominant source of the risk in the NBIRBD lakes.



**Figure 4.11 Lake impact risk assessment for NBIRBD**

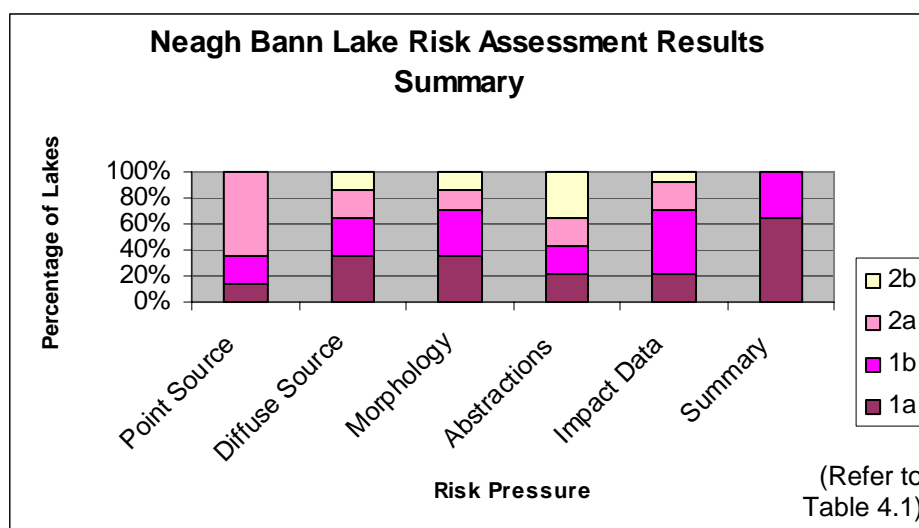
### 4.3.6 Lake Risk Assessment Summary

As is the case with all waterbodies the process employed is precautionary in that a single pressure can cause a waterbody to be classified at risk. The component elements for the lakes risk assessment (point, diffuse, morphology, abstraction and impact data) are considered and the worst case scenario is selected again adopting a precautionary principal.

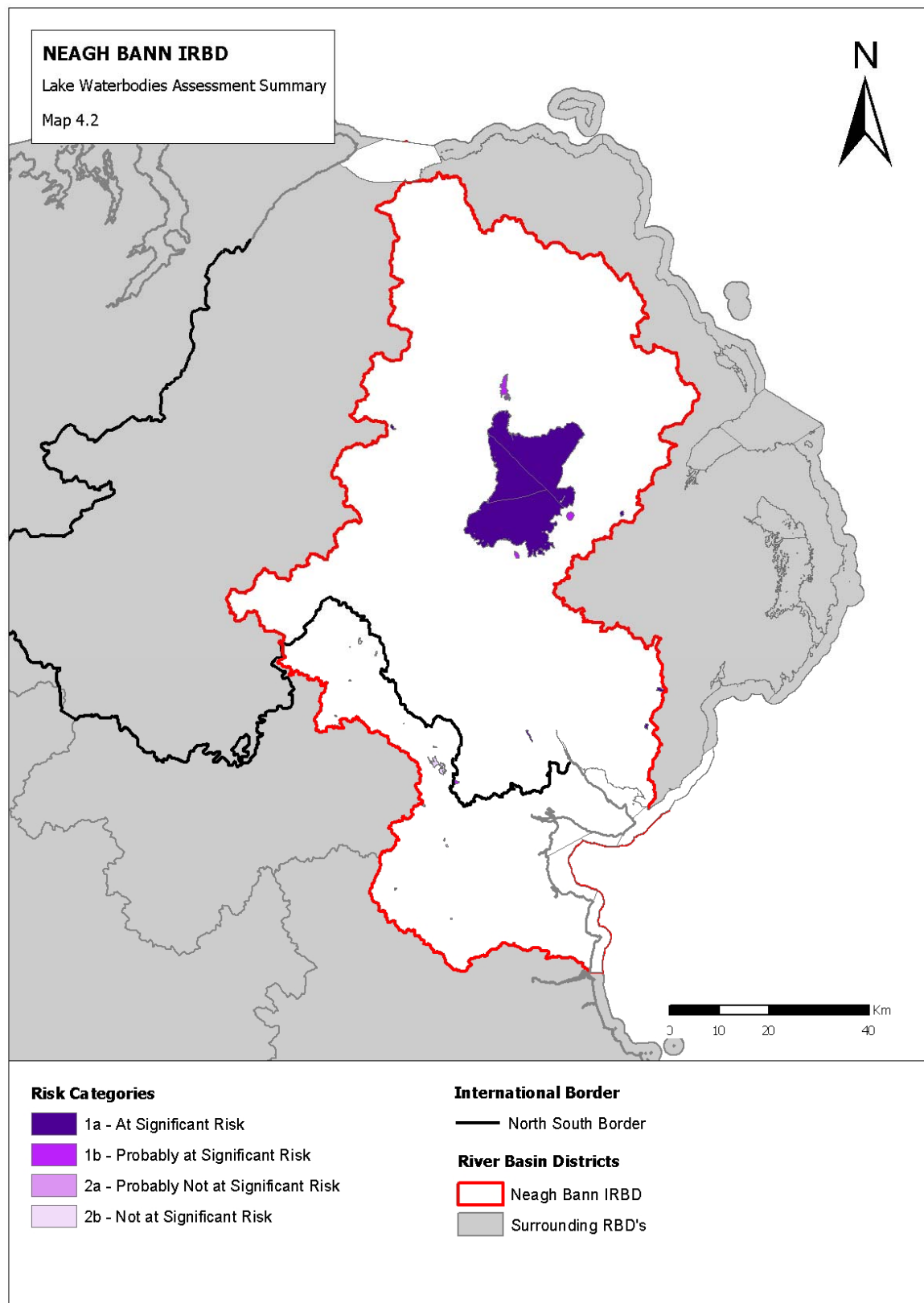
Map 4.2 illustrates the combined lake risk assessment summary results. Table 4.3 and Figure 4.12 summarise the NBIRBD lake waterbodies assessment results. The lake risk assessment has established that diffuse source pollution and morphological pressures are the most significant pressures in relation to the lake waterbodies contained within the NBIRBD with water abstraction also contributing to those lakes considered at risk. Intensive land use practices and public water supply are the main activities potentially impacting lakes in the study area

**Table 4.3 Lake waterbodies risk assessment summary**

Reporting Category	Number of Waterbodies	% of Number	% area of RBD lakes
1a at risk	9	64.3	97.7
1b probably at risk	5	35.7	2.3
2a probably not a risk	0	0	0
2b not at risk	0	0	0
<b>Total at risk (1a + 1b)</b>	<b>14</b>	<b>100</b>	<b>100</b>



**Figure 4.12 Overall risk assessment results for NBIRBD lakes**



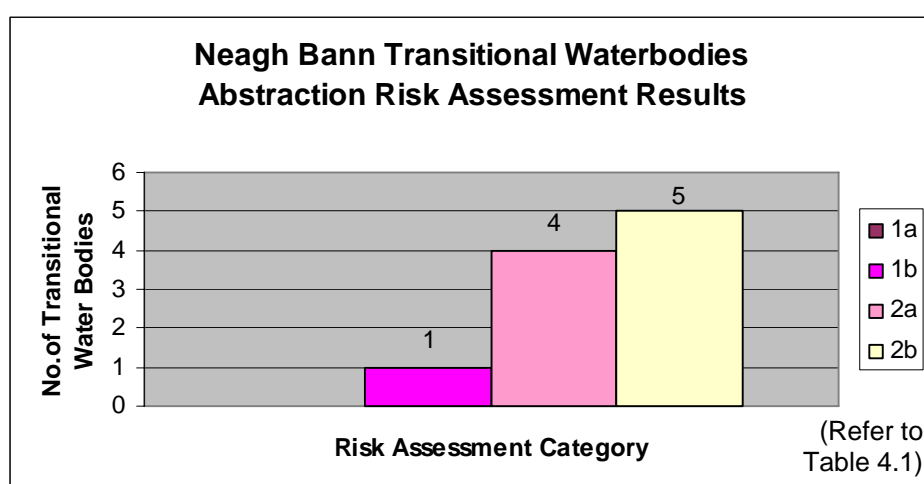
**Map 4.2 Lake Combined Risk Assessment – NBIRBD**

## 4.4 Transitional Waterbodies Risk Assessment

The risk assessment for transitional waterbodies incorporates abstraction and flow regulation, morphological and direct point pressures. The assessment also includes marine monitoring impact data to address indirect pollution from both diffuse and point sources in the upstream catchment of the estuary.

### 4.4.1 Significant Flow Regulation and Abstraction Pressures

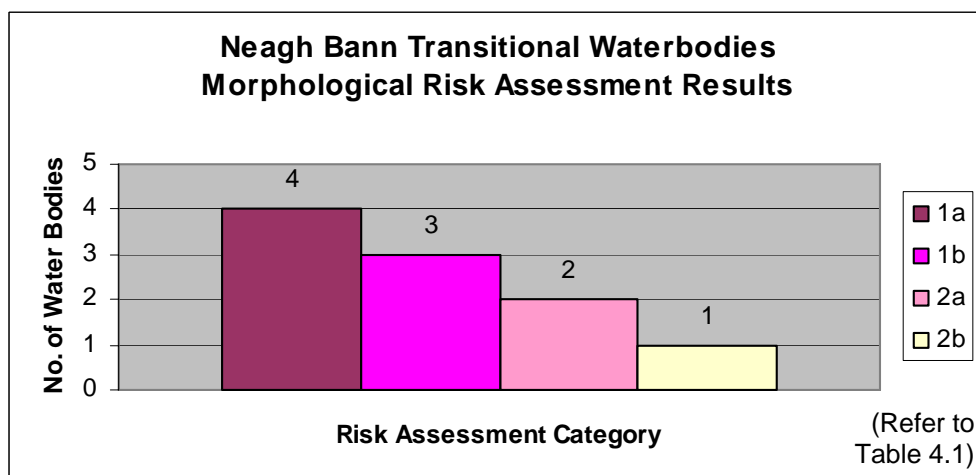
The risk assessment of significant abstraction pressures on transitional waterbodies considered water balance in a similar manner to the rivers and lakes assessments. There are no major flow regulation structures present in transitional waters in the NBIRBD. Figure 4.13 presents the risk assessment results for the 10 transitional waterbodies in the NBIRBD. Only one transitional waterbody, the Bann Estuary, is identified as “probably at risk” due to water abstraction.



**Figure 4.13 Flow regulation and water abstraction pressures in the NBIRBD transitional waterbodies**

### 4.4.2 Significant Morphological Pressures

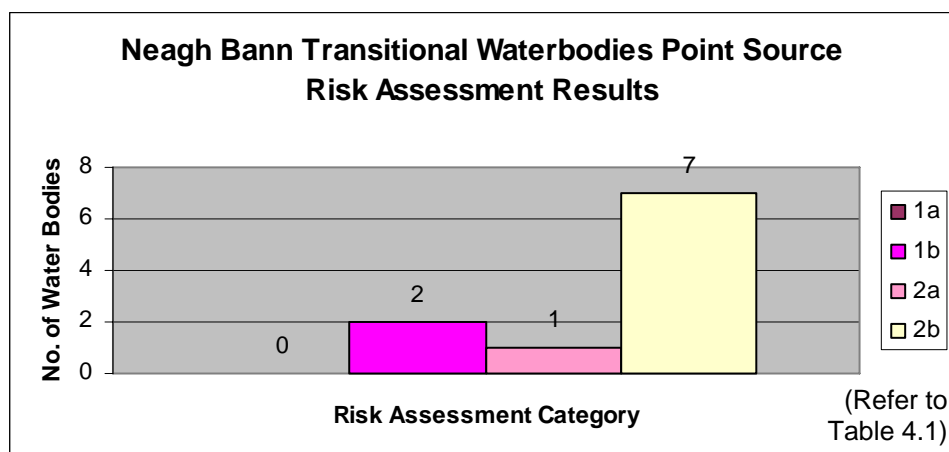
This assessment addressed significant alterations to the waterbody including channelisation, dredging and disposal of dredged spoil, flood protection, embankments, land reclamation, morphological barriers, fishing activities and built development on the shoreline. Figure 4.14 shows the results for the morphological risk assessment for transitional waterbodies. 70% of the transitional waterbodies within the NBIRBD are considered to be “at risk” or “probably at risk” due to morphological pressures. The analysis indicates that coastal defences and shoreline reinforcement are the greatest pressure to transitional waterbodies in the NBIRBD. Intensive land use practices are also a potential impact.



**Figure 4.14 Morphological pressures risk assessment in NBIRBD transitional waters**

#### 4.4.3 Significant Point Source Pressures

The point source assessment is similar to the lake and river point source assessment as it considers discharges to the marine environment from waste water treatment plants and licensed industries and their compliance history. Combined Sewer Overflows (CSOs) and expert opinion were used to supplement the assessment. Figure 4.15 presents the pollution assessment results. Two transitional waterbodies are considered “probably at risk”. The main point source causing NBIRBD transitional waterbodies to fall within this category is effluent discharge from waste water treatment plants.



**Figure 4.15 Point Source pressure risk assessment in NBIRBD transitional waters**

#### 4.4.4 Transitional Waterbodies Marine Impact Assessment

The marine impact assessment comprised of two elements, nutrient / organic enrichment and hazardous substances. Available monitoring datasets were obtained from the relevant competent authorities to identify impacted marine waterbodies.

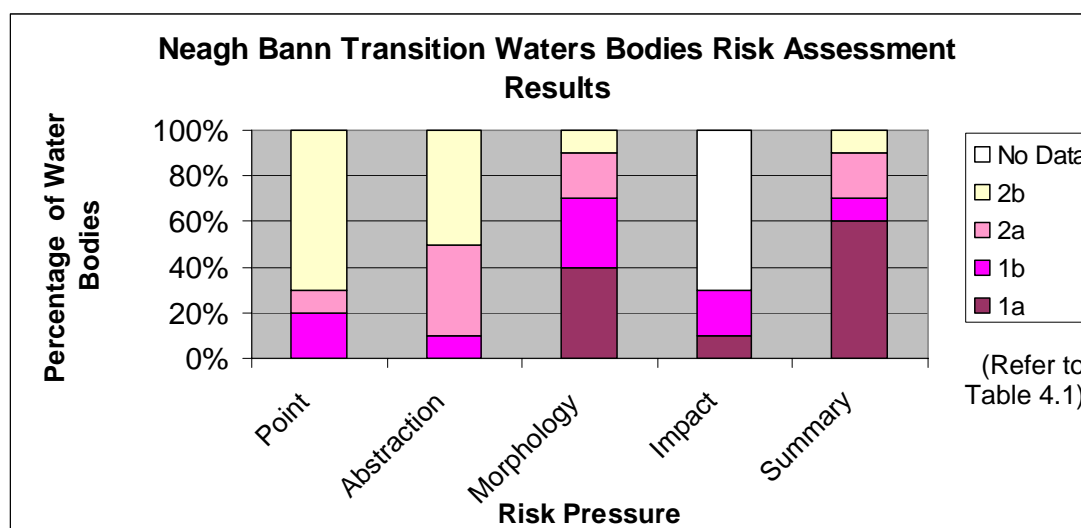
The outcome of this assessment revealed that there is limited marine impact data available for the NBIRBD transitional waterbodies. The Castletown, Newry and Bann Estuaries are the only transitional waterbodies within the NBIRBD where impact data is available. The Castletown and Bann Estuaries are also considered “at risk” (1a) due to Urban Waste Water Treatment Directive (UWWTD) designations and hazardous substances respectively. The Newry Estuary is also considered “probably at risk” (1b) due to hazardous substances.

#### 4.4.5 Transitional Waterbodies Summary

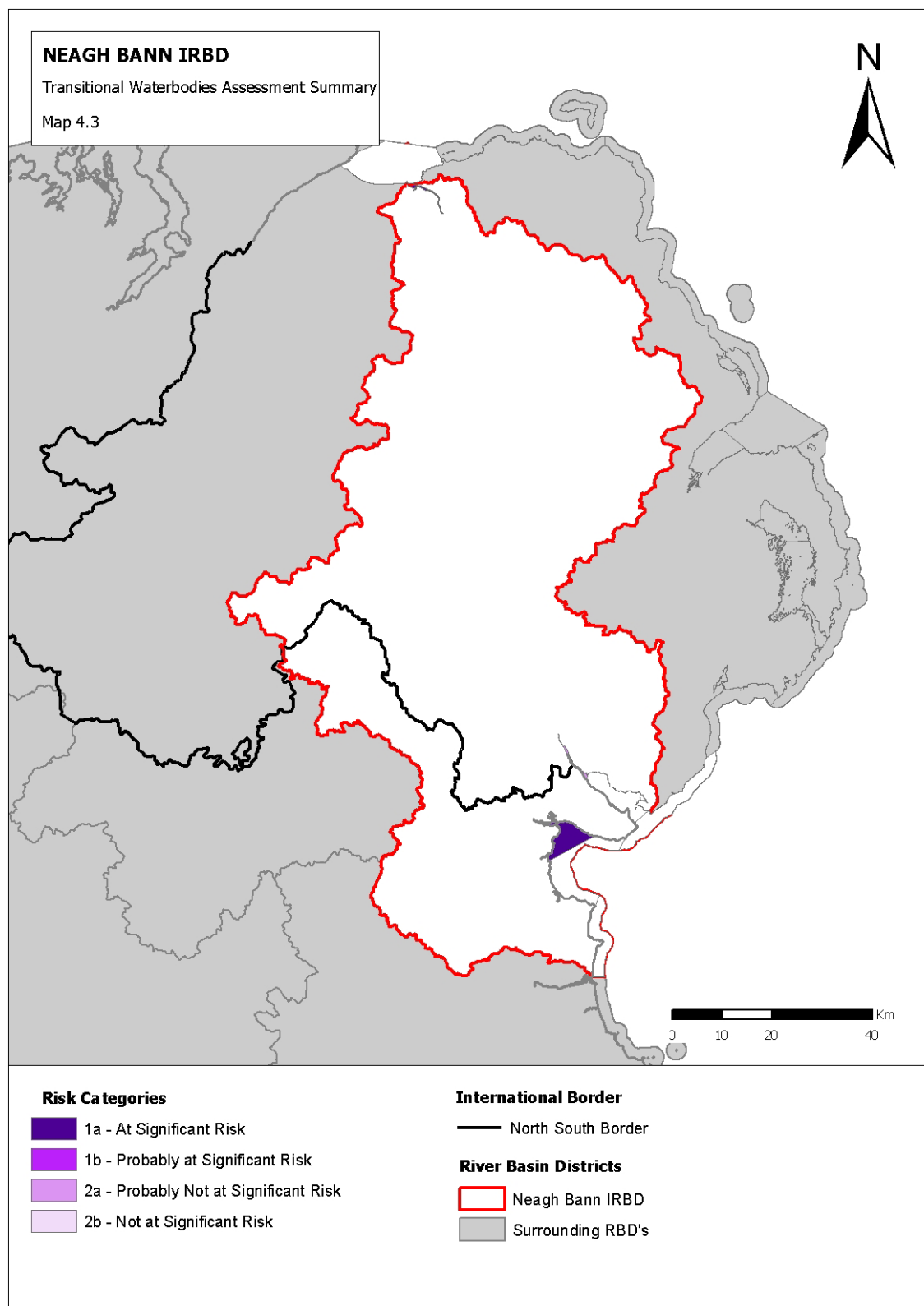
The overall risk category was obtained by taking the worst case risk category for the abstraction and flow regulation, morphology, impact and other assessment for each of the 10 transitional waterbodies. Table 4.4 and Figure 4.16 summarise the combined risk assessment results for the NBIRBD. 70% of the transitional waterbodies are considered at risk. Closer analysis of the assessment reveals that morphological pressures are the main pressure source. Dredging (channelisation) is the human activity that is posing the greatest morphological threat to transitional waters.

**Table 4.4 Transitional waterbodies risk assessment summary**

Reporting Category	Number of Waterbodies	% of Number	% area of RBD trans wb's
1a at risk	6	60	90.9
1b probably at risk	1	10	2.1
2a probably not a risk	2	20	6.9
2b not at risk	1	10	0.1
<b>Total at risk (1a + 1b)</b>	<b>7</b>	<b>70</b>	<b>93</b>



**Figure 4.16 Overall risk assessment results for NBIRBD transitional waters**



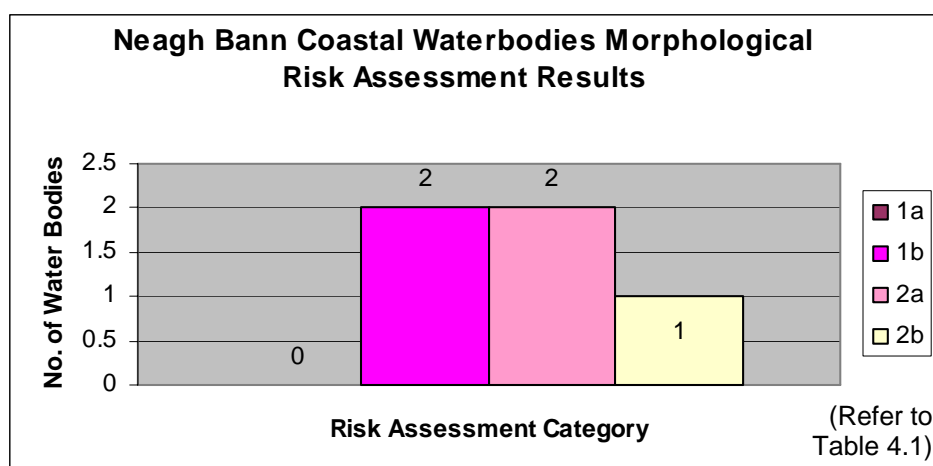
**Map 4.3 Transitional Waterbodies Combined Risk Assessment – NBIRBD**

## 4.5 Coastal Waterbodies Risk Assessment

The risk assessment for coastal waterbodies addresses morphological pressures, point and diffuse pollution pressures and marine impact data.

### 4.5.1 Significant Morphological Pressures

The significant morphological pressures for coastal waterbodies include coastal defences; dredging activities; intensive land use and built development on the coastline. In Northern Ireland the assessment also included the impact from fisheries and aquaculture activities. Figure 4.17 presents the results of the morphological pressure assessments. There are 5 coastal waterbodies in the NBIRBD and morphological pressures place three waterbodies in the “probably at risk” category. The morphological pressured which place coastal waterbodies at risk are due to fished areas along the Mourne Coast and coastal defences or shoreline development, in Carlingford Lough and Outer Dundalk Bay.



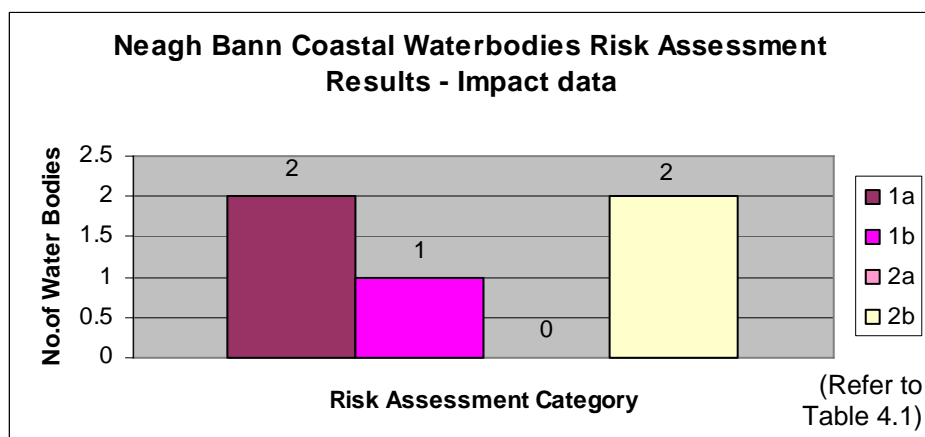
**Figure 4.17 Morphological pressures risk assessment for NBIRBD coastal waters**

### 4.5.2 Significant Point Source Pressures

Point source discharges for coastal waterbodies in the NBIRBD were assessed using the compliance history for industrial and wastewater treatment work discharges and supplemented by expert opinion. There are two coastal water bodies considered to the “at risk” due to non-compliant point source discharges. These are the Mourne Coast and Portstewart Bay whilst Carlingford Lough is considered to be “probably at risk” due to this pressure.

### 4.5.3 Coastal Waterbodies Marine Impact Assessment

The marine impact assessment for coastal waterbodies is similar to the transitional water assessment as it also comprised of two elements, nutrient / organic enrichment and hazardous substances. Monitoring datasets were obtained from the relevant competent authorities to identify impacted marine waterbodies. Figure 4.19 presents the results of the marine impact risk assessment. Three coastal waterbodies in the NBIRBD are considered “at risk” or “probably at risk” based on available impact data.



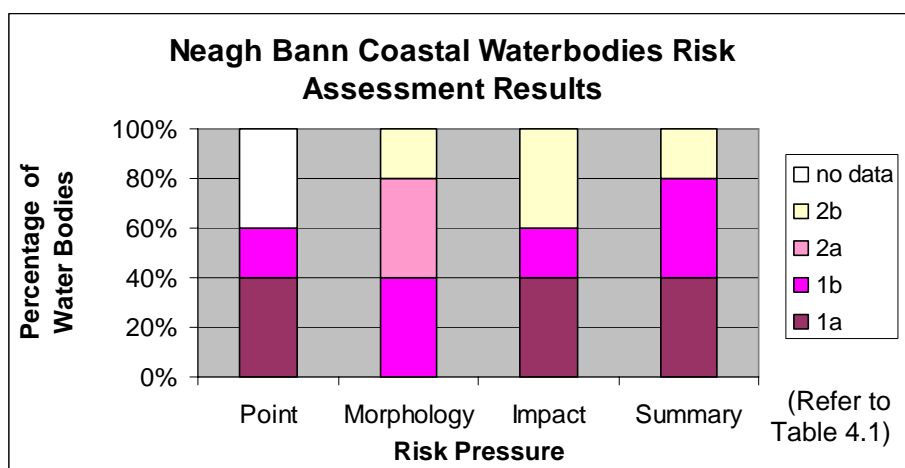
**Figure 4.19 Pollution pressures risk assessment for NBIRBD coastal waters**

#### 4.5.4 Coastal Waterbodies Summary

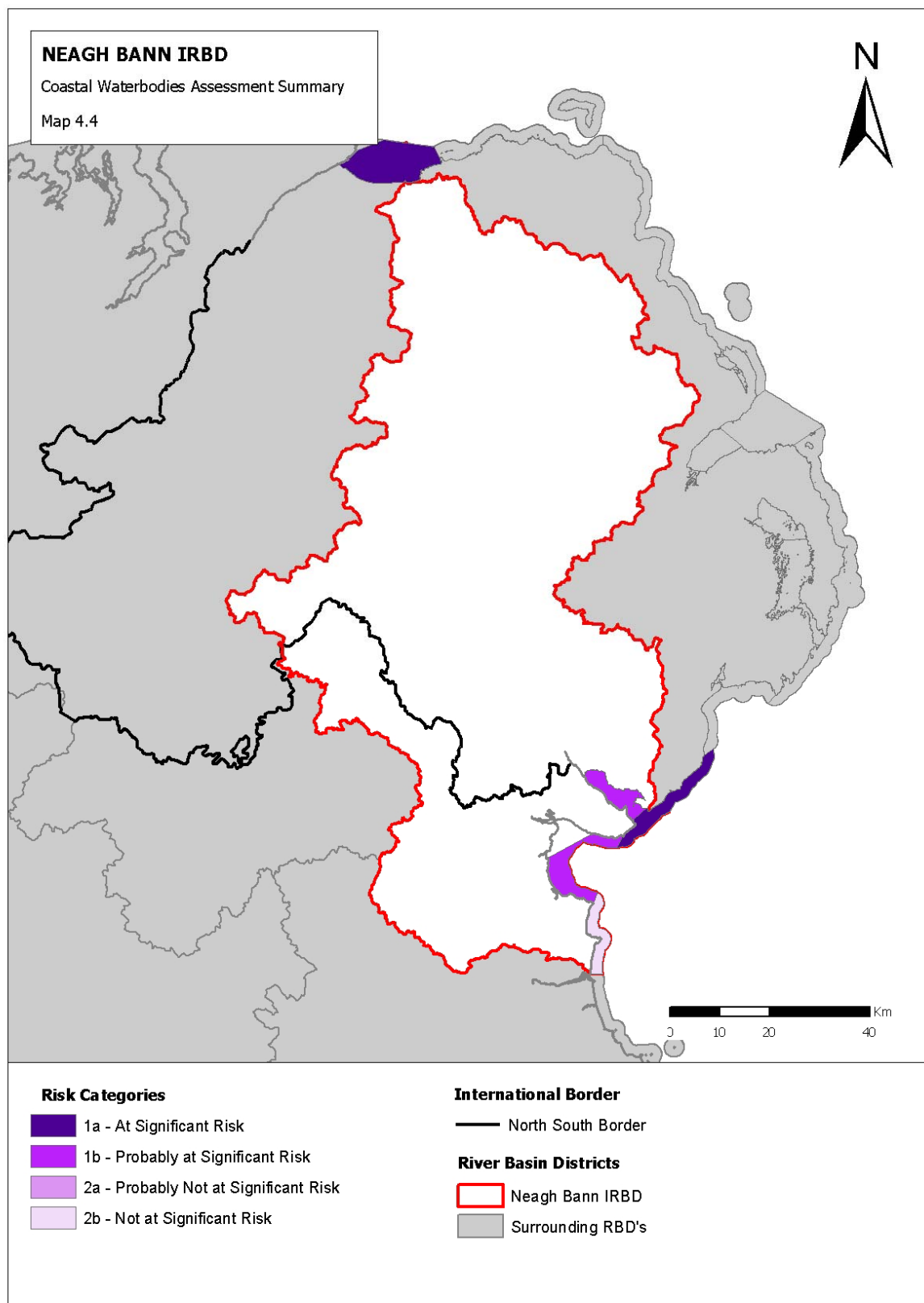
The overall risk category was obtained by taking the worst case risk category from those assessments carried out in relation to coastal waterbodies. Table 4.5 and Figure 4.120 summarise the results of the risk assessments of the coastal waterbodies. Most of the coastal waterbodies, 80%, are “at risk”. The marine impact assessment (pollution from diffuse and point sources) and morphological pressures due to fishing and shoreline development are the main pressures acting on the coastal waterbodies in the NBIRBD that are at risk of failing the environmental objectives of the WFD.

**Table 4.5 Coastal waterbodies risk assessment summary**

Reporting Category	Number of Waterbodies	% of Number	% area of RBD coastal wb's
1a at risk	2	40.0	55.7
1b probably at risk	2	40.0	32.7
2a probably not a risk	0	0	0
2b not at risk	1	20.0	11.6
<b>Total at risk (1a + 1b)</b>	<b>4</b>	<b>80.0</b>	<b>88.4</b>



**Figure 4.20 Overall risk assessment results for NBIRBD coastal waters**



**Map 4.4 Coastal Waterbodies Combined Risk Assessment – NBIRBD**

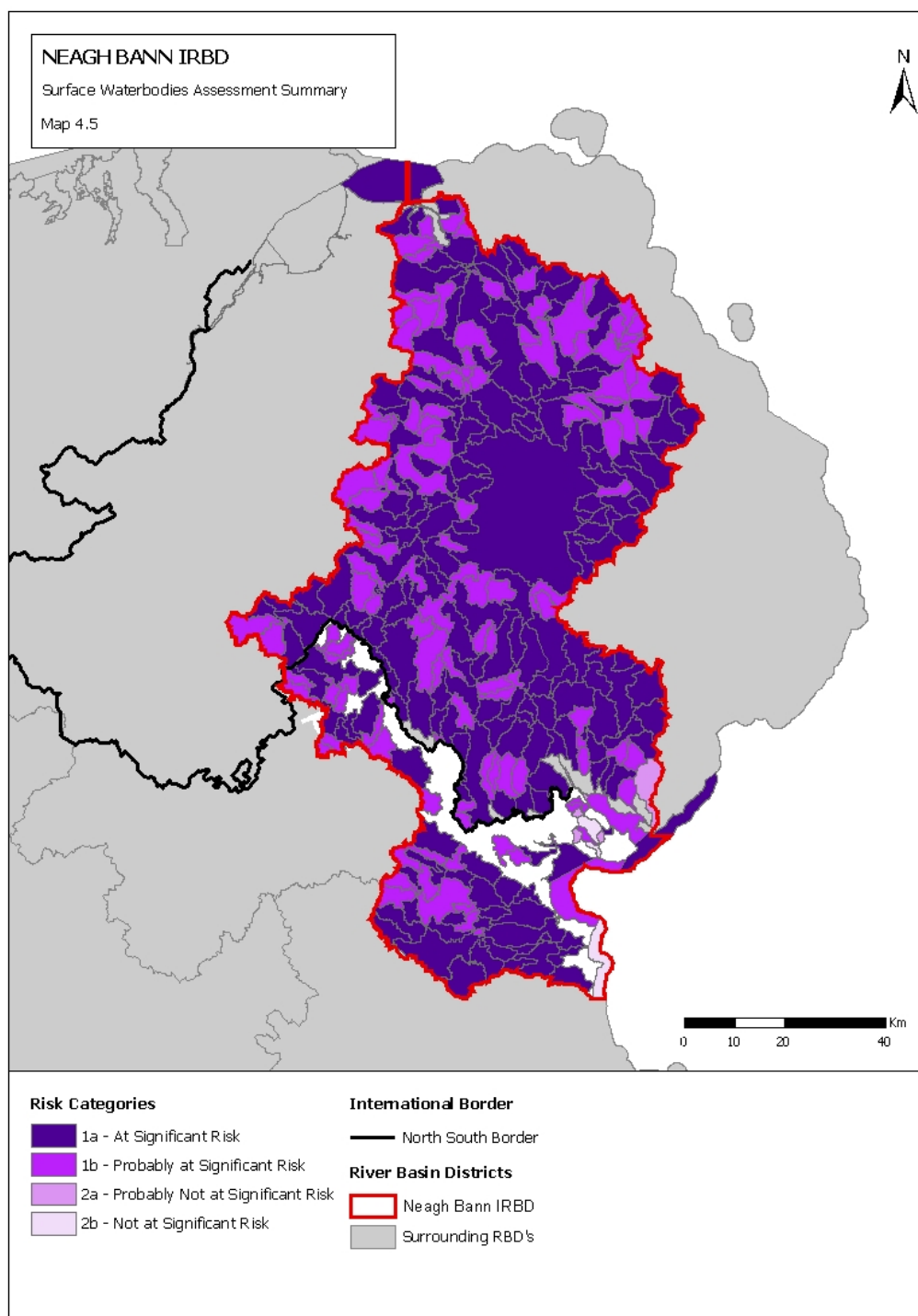
## 4.6 Other Surface Water Risk Assessments

Pressures referred to as “other pressures” have also been included in the assessment.

- A catalogue of recordings of *alien species* has been generated. These alien species are non-indigenous invasive flora and fauna which threaten the NBIRBD’s native ecology by competing for habitats and or food. The EPA has identified the eight species of main concern in Ireland while the EHS have identified 7 species of main concern in the UK. Four of these are now present in the NBIRBD in particular the Australian Swan has been found on Lough Neagh, Lough Beg, Lough Island Reavy and the Gosford River. Common Cord Grass and Japanese weed have been found in the coastal waters of Carlingford Lough. Water Fern has been found in Lough Neagh and the River Bann together with Water Pennywort in Sixmilewater River. Future management plans will have to take account of the presence of these alien species.
- *Fishery activities* have also been addressed. Amongst the freshwater fish species, salmon (and trout) are subjected to the greatest fishing /angling pressures in Ireland. The Scientific Committee of the Salmon Commission is developing models which allow salmon conservation limits to be set for Irish rivers. The Fisheries Conservancy Board is also preparing datasets on fisheries pressures in inland waters in NI. In marine waters, the extent of commercial activities has been mapped nationally in the RoI for the first time and this work will be further developed to identify the activity level of pressures. In NI marine fisheries pressures have been considered in the morphological risk assessment however further work is required and will be implemented through the North South Shared Aquatic Resource Project (NS Share). In the NBIRBD commercial aquaculture activities are located in Carlingford Lough and Inner Dundalk Bay. Further offshore, in Outer Dundalk Bay, Hydraulic Dredging takes place and Otter Trawling is also undertaken in Portstewart Bay. Management plans will have to consider how best to control these important economic activities.
- An assessment of compliance with existing water quality standards for designated Bathing Waters was undertaken. In the NBIRBD there is one compliance breach detected at Portstewart Bay and the reasons for this impact will have to be investigated and addressed in the management plan.

## 4.7 Summary of Surface Waterbodies Affected by All Pressures

Map 4.5 provides an overview of those surface waterbodies affected by all pressures in the NBIRBD. The majority of surface waterbodies are considered to be “at risk” or “probably at risk” of failing to achieve the WFD environmental objectives by 2015 with diffuse and morphological pressures exerting the greatest influence. It should be noted that the delineation of shared and small waterbodies is an ongoing process.



**Map 4.5 Surface Waterbodies affected by all Pressures - NBIRBD**

## 4.8 Artificial & Heavily Modified Waterbodies

Surface waterbodies that are unlikely to achieve good status because of physical alterations to facilitate human activities including navigation, water abstraction and regulation, flood protection and land drainage have been identified for special consideration under the WFD. The Directive recognises that there are cases where the benefits of such uses need to be retained and permits identification and designation of Artificial Waterbodies (AWB) and Heavily Modified Waterbodies (HMWB).

- A **HMWB** is a waterbody which, as a result of significant physical alterations by human activity, is substantially changed in character.
- An **AWB** is a waterbody created by human activity.

Designation does not mean that mitigation measures will not be required. The procedure merely enables appropriate objectives to be set that allow the benefits of the use to be maintained but ensures that other pressures can be managed and where possible mitigated. A step by step process for the identification of these waterbodies was applied in both jurisdictions. The selection process to date has identified 'provisional' cases (pAWB and pHMWB) these waterbodies will be subjected to more detailed examination during further characterisation.

### 4.8.1 AWB and HMWB designation in the RoI portion of the NBIRBD

Table 4.6 summarises the hydrological and morphological pressures leading to HMWB preliminary identification for river and lake waterbodies in RoI.

**Table 4.6 Pressures on River and Lake Waterbodies**

Hydrological & Morphological Pressures	Does the pressure 'substantially change' WB character and warrant further pHMWB consideration?
Channelisation & Dredging	No
Flood Protection & Embankments	Yes - If substrate is artificial
Impounding (dams)	Yes - If ecological effects observed
Water Regulation (Locks & Weirs)	No
Intensive Land Use	No (Derogation for peat lands)
Abstractions	Yes - If ecological effects observed

In marine waters the combined affect of activities including dredging, dumping of dredge spoil, coastal defence and embankments, built structures (ports, industrial intakes), intensive land use and abstractions were considered for preliminary HMWB designation on a case by case basis.

Waterbodies at risk and probably at risk due to abstraction, flow regulation and morphology pressures were all considered as candidates for designation however expert review and consideration of water quality data screened out the majority of

the candidate waterbodies. Table 4.7 summarises the pHMWBs in the NBIRBD. There are no pHMWBs in the Republic of Ireland portion of the NBIRBD

**Table 4.7 pHMWB and pAWB in the NBIRBD**

Jurisdiction	pHMWB River Waterbodies	pHMWB Lake Waterbodies	pHMWB Transitional Waterbodies	pHMWB Coastal Waterbodies	pAWB
Republic of Ireland portion	-	-	-	-	1
Northern Ireland portion	82	9	2	2	1

#### **4.8.2 AWB and HMWB designation in Northern Ireland**

In Northern Ireland, the “at risk” or “probably at risk” waterbodies resulting from the abstraction, flow regulation and morphology assessment were again identified as pHMWB and pAWB. The number of candidate waterbodies in each category is summarised in Table 4.7. Screening based on expert judgement was not undertaken during initial characterisation within Northern Ireland, however a tailored in-field investigation has already commenced as part of further characterisation to verify the extent of pressures and impacts which will allow review of the list of candidates.

Final designation of AWB and HMWB is not required until finalisation of the RBMP. Further work is required in both jurisdictions entailing designation tests: known as ‘restoration’ and ‘alternative means’ tests, and establishing appropriate quality targets. Harmonisation of the process and development of the actual lists of AWB and HMWB in both jurisdictions will be progressed through the NS Share Project.

## 4.9 Groundwater Risk Assessment

The methodologies applied in the groundwater risk assessment were developed by Geological Survey of Ireland (GSI) for the RoI portion of the NBIRBD supported through the Groundwater Working Group (GWWG) which had representation from the Geological Survey Northern Ireland (GSNI). The methodologies applied by the GSNI/EHS in NI were consistent with the guidance developed by the UK WFD Groundwater Task Team and Scottish Environmental Protection Agency (SEPA) (Ref 4).

The WFD sets objectives of good quantitative and chemical status for groundwaters. Risk assessments based on the pressure, source, pathway and receptor model were used to determine the degree of risk associated with a groundwater body for a given pressure. Impact information was then used, where available, to verify the risk assessment.

Groundwaters feed surface freshwater systems such as rivers, lakes, fens and turloughs which eventually flow into transitional and coastal waters. To take account of these links between groundwater and surface waters, the environmental objectives for groundwater also considered the risk to these downstream receptors as well as to the groundwater bodies themselves. As groundwater is also an important source of drinking water supply, the risk assessment also considered human health standards.

Many chemicals from various diffuse and point sources can potentially put groundwater at risk. For the purposes of the risk assessments chemical pollutants were grouped into four categories according to similarities in behaviour as they move through groundwater pathways. The grouping also takes account of whether the substance decays or is conservative (organic or inorganic, respectively) and whether the substance is adsorbed within the structure of the soils, subsoils and aquifer (mobile or less mobile).

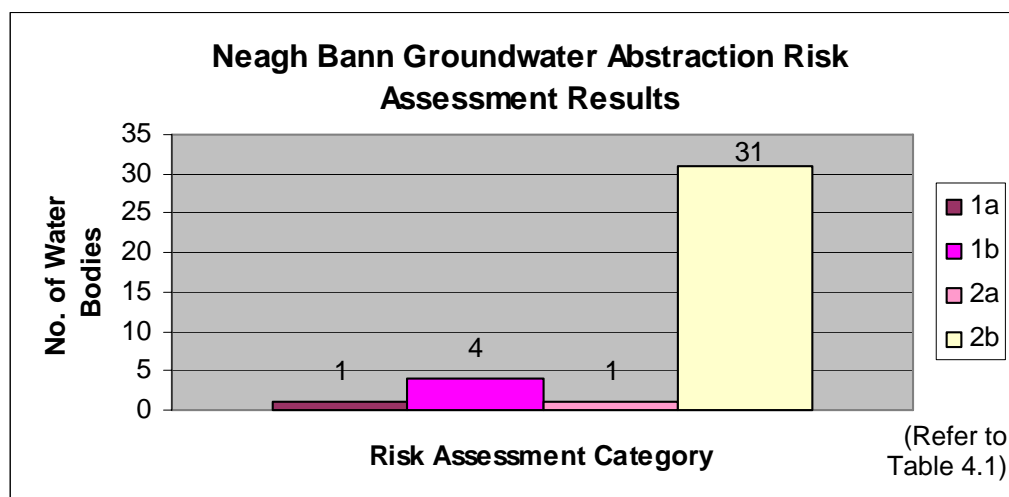
There was a series of separate groundwater risk assessments applied dealing with all receptors and pollutants. These were broadly categorised into three different pressure types:

- groundwater abstractions/water balance;
- diffuse source pollution and;
- point source pollution.

### 4.9.1 Quantitative Risk Assessment - Significant Abstraction Pressure

This assessment considered the overall water balance assessment for the groundwater body (i.e. is the level of water abstraction able to be met by the amount of water recharging the groundwater body without impacting on the water requirements of dependent systems, such as rivers and lakes and Ground Water Dependent Terrestrial Ecosystems (GWDTE), e.g., fens and turloughs). For saline intrusion groundwater bodies were assessed in localised areas where it was considered there may be a potential impact.

There are a total of 37 groundwater bodies in the NBIRBD. Figure 4.21 presents the results of the abstraction risk assessment. Approximately 14% of NBIRBD groundwater bodies are considered to be “at risk” or “probably at risk” due to abstraction pressures and saline intrusion. Water supply for the public and private sector is the industry affecting 1a and 1b groundwater bodies.



**Figure 4.21 Abstraction pressures risk assessment for NBIRBD groundwater bodies**

#### 4.9.2 Chemical Risk Assessment

The groundwater chemical risk assessment integrates pressures and impacts with the physical characterisation, using the pressure-pathway-receptor approach, i.e. the likelihood of pollutants being transmitted to a receptor. The chemical pollutants from diffuse and point sources have been grouped into four sectors:

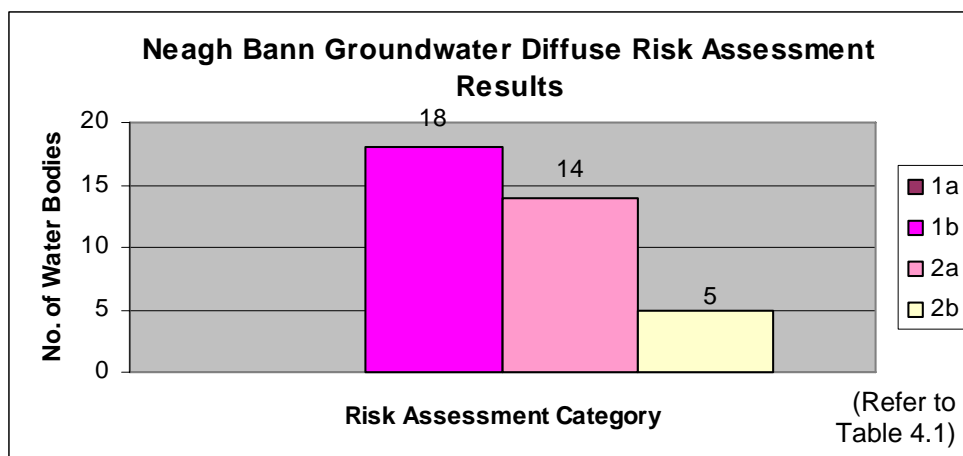
- Mobile nutrients e.g. Nitrates
- Certain agrochemical
- Certain pesticides
- Less mobile organic substances e.g. agrochemicals which bind to soil

#### 4.9.3 Diffuse Risk Assessment

This assessment consisted of the examination and assessment of agricultural activities, unsewered human populations and usage of dangerous substances from all land use sectors. The assessment included identifying areas within water bodies with significant potential impact (zones where high pressures coincide with vulnerable pathways). The risk category was assigned to each water body depending on the proportion of the area identified as having significant impact potential.

Figure 4.22 presents the number of NBIRBD groundwater bodies impacted by diffuse source pollution. The assessment demonstrates that almost 50% of GWBs are “probably at risk” due do diffuse pressures. This is a result of the mobile organic

substances assessment, e.g. pesticides. The remaining groundwater bodies are “not at risk” or “probably not at risk”



**Figure 4.22 Diffuse pressures risk assessment for NBIRBD groundwater bodies**

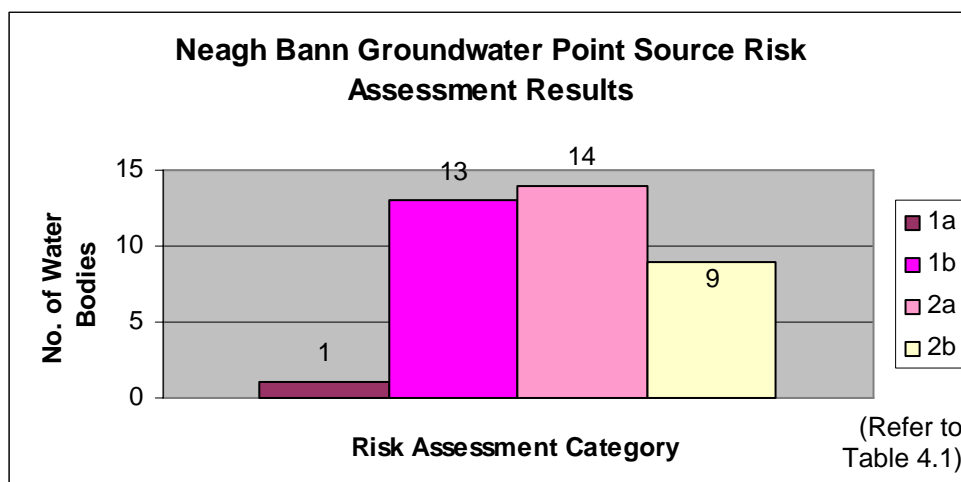
#### 4.9.4 Significant Point Source Pressures

This assessment addressed the risk associated with point source pressures such as mines, quarries, contaminated land, landfills, oil industry infrastructure, licensed trade effluent and wastewater discharges.

In Republic of Ireland point influences were considered unlikely to exert a significant influence on an entire groundwater body, as waterbodies are relatively large units (generally over fifty square kilometres). Consequently, small waterbodies were delineated around each point pressure assigned at risk or probably at risk category to better represent the likely zone of influence of the pressure.

In Northern Ireland a more precautionary analysis of point source pressures was undertaken, at this initial characterisation stage, due to time and resource pressures and this assessment will be reviewed during further characterisation. Presence/absence of potential point sources within buffer zones of ‘groundwater-dependent’ rivers was used to define risk to rivers with most assessments coming out as probably not at risk.

Figure 4.23 shows the results of the point source risk assessment. The risk assessment results indicate that 38% of groundwater bodies are “at risk” or “probably at risk” from point source pressures predominantly due to the presence of landfills but also as a result of contaminated land and the presence of major towns above the groundwater body.



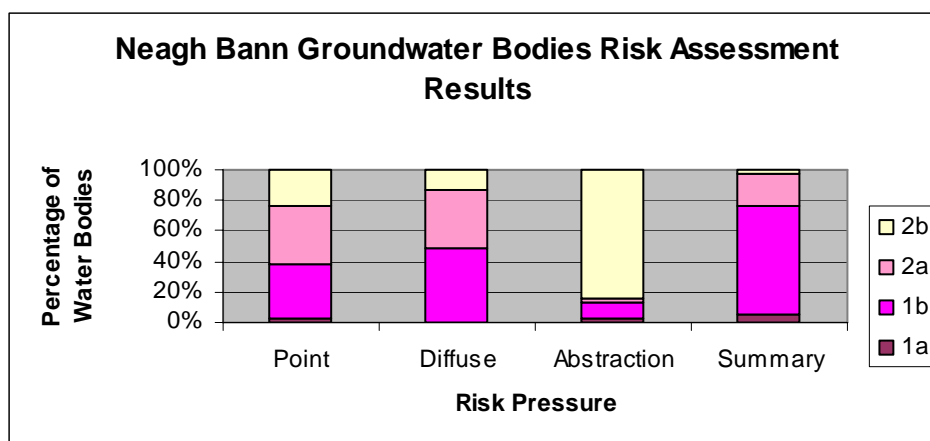
**Figure 4.23 Point source pressures risk assessment for NBIRBD groundwater bodies**

#### 4.9.5 Groundwater Bodies Summary

The overall risk category was obtained by combining the various risk assessments and taking the worst case risk category. Table 4.5 and Figure 4.24 summarise the findings of the risk assessments carried out for groundwater bodies. Of groundwater bodies in the NBIRBD 76% are considered to be at risk of failing to meet the environmental objectives of the WFD. The main pressures on groundwater bodies are chemical pollutants from both point and diffuse source pollution, particularly mobile organic substances, e.g. nitrate. Map 4.5 illustrates the groundwater bodies risk assessment across the NBIRBD.

**Table 4.5 Groundwater risk assessment summary**

Reporting Category	Number of Waterbodies	% of Number	% area of RBD GWBs
1a at risk	2	5.4	0.9
1b probably at risk	26	70.3	54.9
2a probably not a risk	8	21.6	43.5
2b not at risk	1	2.7	0.7
<b>Total at risk (1a + 1b)</b>	<b>28</b>	<b>75.7</b>	<b>55.8</b>

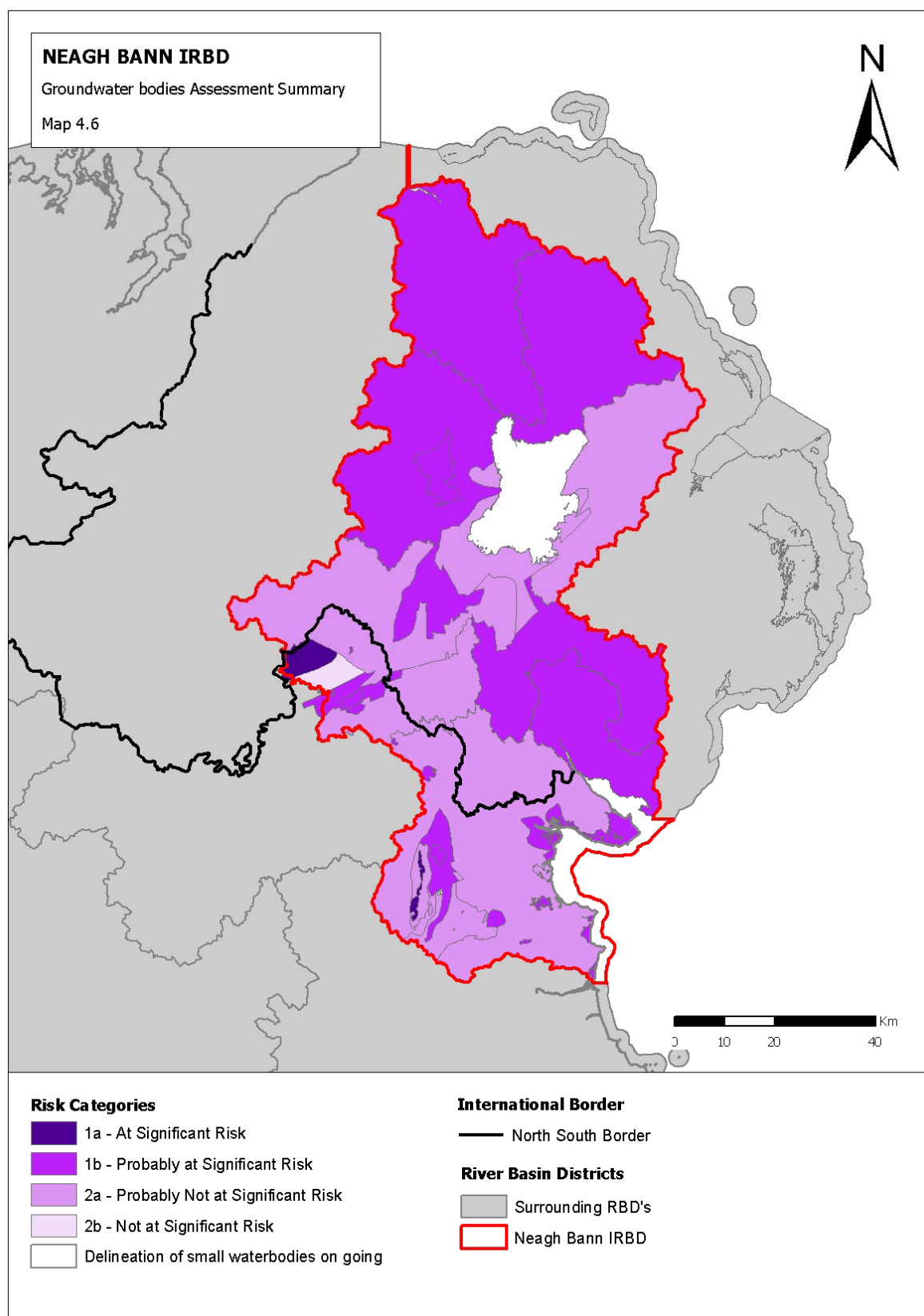


**Figure 4.24 Overall risk assessment results for NBIRBD groundwater bodies**

#### 4.10 Groundwater Bodies with Less Stringent Objectives

The WFD requires groundwater bodies for which less stringent environmental objectives are to be specified to be listed in the Characterisation Report. These objectives may be set in cases where a body of water is so affected by human activity that it may be unfeasible or unreasonably expensive to achieve good chemical status within two further river basin planning cycles (i.e. by 2027). Based upon guidance developed by United Kingdom Technical Advisory Group (UKTAG) (NI) and a review by experts from the Groundwater Working Group (RoI) likely candidates for which Less Stringent Objectives (LSOs) might apply were established.

In the NBIRBD Kingscourt gypsum mines in County Cavan was the only location designated for LSOs. The identification of such groundwater bodies should be regarded as preliminary. It is based on the best available information at the present time. Further characterisation will provide more information about groundwater characteristics and pressures and impacts.



**Map 4.6 Groundwater bodies Combined Risk Assessment – NBIRBD**

## 5.0 Economics Baseline

Water is precious for life, but its relative abundance and apparent free supply has in the past caused many to undervalue it. The growing recognition of the damage that some uses can cause to our water resource along with a realisation that conservation and protection have a high cost, has placed the economics of water use at the centre of the Water Framework Directive.

The WFD requires economic analysis to be applied in three main phases:

- The overall economic characterisation of water use (2004);
- The economic analysis to compare potential programmes of measures for achieving good water status (2008);
- The assessment of cost recovery alternatives, including analysis of water services pricing policies (2010).

This summary report provides an overview of the economic characterisation (or baseline) of the NBIRBD. The baseline has been established at national level by both jurisdictions in the NBIRBD. The analysis has been carried out in accordance with EU guidance documents but is based on available datasets which differ in each jurisdiction. The baseline is a preliminary stepping stone for future analysis of the programme of measures and cost recovery assessment.

The economic characterisation is extracted from the following sources:

- The Northern Ireland Water Framework Directive Article 5 Economic Analysis of Water Use” (Ref 5)  
<http://www.ehsni.gov.uk/pubs/publications/article5ecoreport.pdf>
- “Economic Analysis of Water Use in Ireland – which provides findings both on a national and individual Irish RBD basis (Ref 6).

### 5.1 Who Uses Water, What For, How Much and With What Consequence?

The largest single use of water in the NBIRBD is likely to be public water supply for domestic use. Population in the NBIRBD is estimated as 670,000 in Northern Ireland and 116,300 in the Republic of Ireland based on Census estimates for the districts that lie wholly or partly within it.

Agriculture in the NBIRBD includes the focus of apple production in Northern Ireland, and valuable coarse fisheries in the Upper Bann.

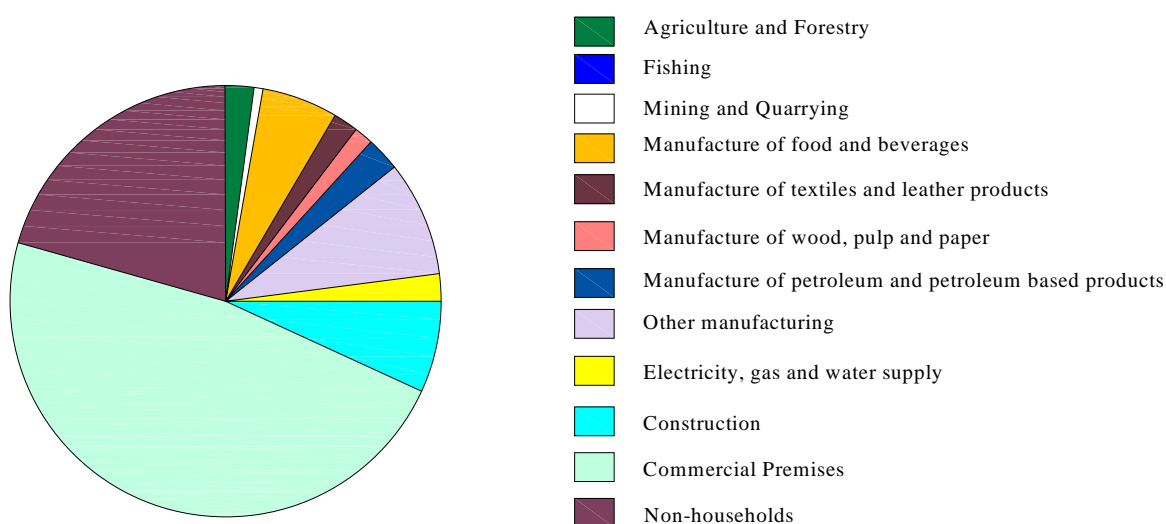
Industry uses water in a number of ways; from cooling to directly within a process (e.g. washing) or as a raw material. There is some mineral and quarrying extraction, across a range of stone types, and the dominant food producer of NI is located in the NBIRBD, i.e. Moy Park Limited. There is also some mineral water production. The

NBIRBD was the traditional important home of linen manufacture. It has no power generation. The key water using industrial sub-sectors are, food products and beverages manufacturing, chemical and chemical products manufacturing, and electrical and optical equipment manufacturing.

There is a range of water dependent activities available in the NBIRBD. Activities and visitor attractions include cruiser hire; water dependent recreation on Lough Neagh, Exploris Aquarium, and Giants Causeway Visitor Centre. The premier water environment interpretative centre in NI - Oxford Island Nature Reserve – is located at the foot of Lough Neagh in the centre of the NBIRBD. The preliminary results indicate that the total annual value of good water quality in NI is between £6.3 million and £10.0 million. In the RoI portion of the NBIRBD the estimated annual value of water based leisure totals almost £8.5 million (€12 million).

## 5.2 What is Our Water Worth?

In order to assess the significance of this water use, the value of these processes was considered in terms of monetary value added to the economy.



**Figure 5.1 – Gross value by sector in Northern Ireland, (Ref 7)**

The Gross Value Added (GVA) represents that part of production which is the actual contribution of an enterprise to the economy. Value added is calculated by deducting total value of input from the total value of output during preference period. In NI the overall GVA during 2003 was estimated at almost £19 billion (over €31 billion). The main process users of water are manufacturing, industry and agriculture (Figure 5.1). The national GVA for the RoI is estimated at nearly €122 billion, with the NBIRBD portion estimated at €1.7 billion. The industrial sector's GVA is 19 times that of the agriculture sector.

### 5.3 Costs: Who Pays For What and How?

Across the NBIRBD domestic users are currently not directly charged for water, although the regional component of Household Rates in Northern Ireland (an element of a domestic property tax) raises revenue which contributes in part to a range of public expenditure, including water. This is being changed with a direct charge to households for water being introduced in 2007. Details remain to be confirmed but it is anticipated that there will be a reduction in the charge for those on low incomes.

Agriculture, industry and commercial users pay on a metered basis, with farmers receiving an allowance to reflect their expected domestic use within the farmhouse. All industrial and commercial generators of trade effluent pay a related charge. Recreation uses are largely uncharged for their water use, in many cases reflecting their light impact.

The WFD requires a number of principles to be embodied in water charges. These are as follows:

- incentive pricing, which seeks to encourage reduced and improved use by charges;
- cost-recovery where users pay for water and ;
- the 'polluter-pays' principle.

Metering achieves incentivisation by directly relating consumption to cost and can effect cost-recovery if set at the appropriate level.

Measuring the cost-effectiveness of potential changes to the way water is managed is not yet possible as while information is good in some areas it is limited elsewhere. There are no workable definitions yet of 'good ecological status' or 'potential', which are necessary to gauge the gap between the current position and the goal. There is also little information on the cost and effectiveness of the measures that might be needed. This information shortfall is being addressed (see subsection below).

### 5.4 The Future: What Will Change and with What Effect?

While the future is uncertain there are a number of clear trends with importance for the use of water.

Firstly there is an increasing acceptance of the importance of water, and hence of seeking 'good ecological status' as part of a growing trend towards environmental awareness. This should encourage both a reduction in wasting or degrading water, and a positive emphasis on conservation and protection of water sources.

Rising prosperity will increase water use though the major rise associated with the introduction of washing machines and other appliances is largely complete, with greater operating efficiency offsetting most of the further growth in appliance ownership. However while the population over the next decade is expected to grow

steadily in the NBIRBD, the effect of changing social norms, in part associated with growing wealth, is to bring about a much faster growth in households. Evidence shows that households with fewer members use proportionately more water. Thus significant growth in domestic demand is expected.

Agricultural use is likely to be influenced by sector specific EU Directives, making this difficult to predict, though reduced fertiliser use and likely rising costs of water will act to depress consumption.

Industrial use will be subject to the competing forces of greater output, which would raise the demand for water, and a shift towards the knowledge or weightless economy and greater efficiency in resource uses which will lower the use of water per unit of GDP. The small scale of individual sectors makes prediction unreliable at any more disaggregated level.

A great unknown is climate change though current studies suggest that in the short to medium term weather changes will have limited impact on the overall demand for water.

The level of water charges, where supply is metered, will affect demand.

Other policy changes will also be important, for example any change in planning policy towards for example rural dwellings, will have a direct consequence for waste water connections, changes in company taxation will affect industrial development and so forth.

## **5.5 Analysis: What Do We Need to Know and How?**

Much work needs to be carried out in this area to examine in detail how water is used from its source, some of which comes from unrecorded sources such as private boreholes, to its discharge, where there are also measurement difficulties as these are monitored by more than one body.

This work must be consistent, to allow results to be aggregated across (I)RBDs. The priorities for this work are to identify and illustrate all issues, determine how to assess costs and impacts in an even handed manner, develop approaches for handling unusual cases and main gaps in knowledge, clearly specify environmental dangers, develop and refine ways of assessing benefits, environmental and otherwise, and measuring demand.

There is also a general need to relate data, which has been gathered under a different boundary, to the area covered by the NBIRBD. This would assist all analysis including that concerned with the assessment of any impact on equality or disadvantage.

## 6.0 Summary of the Way Forward

### 6.1 Overview of the Characterisation Process

The initial characterisation process is the most comprehensive and systematic assessment of the surface and groundwater bodies undertaken yet in the NBIRBD. The process has identified surface water and groundwater bodies which are the basic management unit in reporting and assessing compliance under the WFD. An assessment of the human impacts on each water body has also been carried out to prioritise the activities and pressures within the NBIRBD that have potential to cause water bodies to fail in achieving the objectives of the WFD by 2015. This risk assessment has helped to identify and prioritise issues in relation to water quality management. The initial characterisation process represents the first phase of the River Basin District Planning cycle and will establish the best way forward in relation to monitoring programmes and the development of a programme of measures to address the main water management issues identified.

Water bodies have been classified based on natural factors such as altitude, geology or size. This system of classifying waters according to meaningful types is called typology. Surface and groundwater bodies have been typed in Northern Ireland and Republic of Ireland separately however harmonisation of the typology systems is ongoing.

There are 71 and 249 river waterbodies in the RoI and NI portions of the NBIRBD respectively. Approximately half of these are calcareous (hard water) types covering a range of channel slope conditions. There are also shared waterbodies which are currently undergoing delineation and characterisation.

There are two lake waterbodies above the WFD threshold for reporting (50 hectares) in the RoI portion of the NBIRBD. There are 12 lakes in the NI portion of the NBIRBD. Most of the lake waterbodies can be described as low altitude, calcareous, non peat lakes.

A common typology system was applied to all transitional and coastal waterbodies in both NI and the RoI. The typology scheme uses the factors of tidal range, salinity and exposure with special categories for coastal and transitional lagoons. Applying the typology factors to the waterbodies within the NBIRBD has resulted in 11 transitional waterbodies (falling into two types) and 5 coastal waterbodies (falling into three types). Three coastal waterbodies are cross-border.

There were four groundwater body types identified, based on flow regime, namely karstic, productive fissured bedrock, gravel and poorly productive bedrock. This resulted in the delineation of 37 groundwater bodies in the NBIRBD, 5 of these are cross border groundwater bodies. Ongoing delineation and characterisation of these border groundwater bodies may result in some redefining of waterbody boundaries.

The key pressures on waters in the NBIRBD are:

### **Rivers**

The risk assessment for rivers identified that of the 320 waterbodies assessed in the NBIRBD almost 99% are considered to be at risk of not achieving good status or their environmental objectives under the WFD by 2015. The main sources of human pressures acting on rivers are from diffuse sources such as agriculture and unsewered populations and morphological pressures including channelisation and intensive land use.

### **Lakes**

The lake risk assessment has established that all the lakes considered in the assessment are “at risk” or “probably at risk”. Diffuse source pollution and morphological pressures are the most significant pressures in relation to the lake waterbodies contained within the NBIRBD with water abstraction also contributing to those lakes considered at risk.

### **Transitional and Coastal Waters**

There is 70% of the transitional waterbodies considered at risk in the NBIRBD. Closer analysis of the assessment reveals that morphological pressures are the main pressure source with dredging (channelisation) representing the human activity that is posing the greatest morphological threat to transitional waters.

The marine impact assessment (pollution from diffuse and point sources) and morphological pressures due to fishing and shoreline development are the main pressures acting on the coastal waterbodies in the NBIRBD that are at risk of failing the environmental objectives of the WFD.

### **Alien Species**

Four alien species are now present in the NBIRBD in particular the Australian Swan has been found on Lough Neagh, Lough Beg, Lough Island Reavy and the Gosford River. Common Cord Grass and Japanese weed have been found in the coastal waters of Carlingford Lough. Water Fern has been found in Lough Neagh and the River Bann together with Water Pennywort in Sixmilewater River.

### **Fisheries Activities**

In the NBIRBD commercial aquaculture activities are located in Carlingford Lough and Inner Dundalk Bay. Further offshore, in Outer Dundalk Bay, Hydraulic Dredging takes place and Otter Trawling is also undertaken in Portstewart Bay.

### **Bathing Waters**

An assessment of compliance with existing water quality standards for designated *Bathing Waters* was undertaken. In the NBIRBD there is one compliance breach detected at Portstewart Bay.

**Heavily Modified Water Bodies (HMWB) and Artificial Water Bodies (AWB)**

The NBIRBD has identified 95 pHMWBs; 82 river, 9 lakes, 2 transitional and 2 coastal. There are 2 pAWBs.

**Groundwaters**

Of the groundwater bodies in the NBIRBD 76% are considered to be at risk or probably at risk of failing to meet the environmental objectives of the WFD. The main pressures on groundwater bodies are chemical pollutants from both point and diffuse source pollution, particularly mobile organic substances, e.g. nitrate.

**6.2 Further Characterisation and the Development of a Programme of Measures**

The next activity of the WFD, further characterisation, will involve collection of additional datasets to fill data gaps and additional monitoring and use of modelling techniques in order to improve confidence in the risk assessment process. However, the next phase is to deliver decision making tools to support the implementation of the WFD. Targeted studies (e.g. fieldwork and modelling exercises) will be undertaken to verify the linkages between pressures and impacts, to enable environmental objectives to be set and to establish a rigorous basis for the development of programmes of measures. The scope of these studies will be directed by the results of the risk assessments. The NS Share project will facilitate this process in the NBIRBD through the collection of new data sets and the development of catchment models to allow a better understanding of the water quality issues.

Monitoring programmes must be established by December 2006 for surface waters, groundwaters and protected areas. The objectives of the monitoring programmes are to determine the status of waterbodies by validating and supplementing the initial risk assessments; assess the effectiveness of measures and to contribute to the development of programmes of measures within RBMPs. The design of these monitoring programmes will be assisted by the output of the characterisation process. The intention is that further characterisation will have addressed many of the uncertainties identified by the initial characterisation by the end of 2006 before WFD monitoring programmes are designed and implemented. The outputs of the monitoring programmes will direct the development of a programme of measures aimed at achieving the WFD's objective of at least good status.

Identified water management issues represent a challenge for WFD implementation. Pressures that have been identified as posing significant risk to the attainment of WFD objectives are in many cases, the result of established human activity and practices. Proposed mitigation measures aimed at achieving "good status" for water quality may instigate changes to these practices and as a result raise social, economic and technical issues. Therefore, all mitigation proposals should be thoroughly reviewed with respect to their feasibility and implications.

Basic measures are the minimum requirements to be complied with and consist mainly of measures required to implement EU legislation in relation to the protection of water. In addition to the basic measures, supplementary measures will be designed and implemented in order to achieve the objectives of the WFD. Most importantly the further characterisation process will involve rigorous detailed studies which will verify the linkages between pressures and impacts. The subsequent activity will deliver decision making tools to support regulators with the implementation of the WFD.

The NS SHARE project will seek to improve inter-regional capacity for environmental monitoring and management at the river basin district level through a technical review of the existing monitoring programmes/arrangements and ecological classification tools.

The involvement of all stakeholders in the river basin management process is also critical to the overall success of the project and the full implementation of the WFD. It is essential that a common integrated approach to a programme of participation with interested parties is developed throughout the entire NBIRBD. This will be achieved by communication of the significant water management issues within the study area through various media including the internet, reports and local meetings aimed at raising the awareness of the project and the WFD.

This summary report has attempted to make the findings of the characterisation process available to all parties within the NBIRBD. Public participation is a cornerstone of the WFD and the next deliverables are geared towards strengthening this role. The next major reporting deadline under the WFD is the publication of a “significant water issues report” in 2007. The report will further inform the public of the water management priorities in the NBIRBD. The first River Basin Management Plan (RBMP) for the NBIRBD will be drafted during 2008 and finalised after a year’s consultation in 2009.

## 7.0 References

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## 8.0 Abbreviations & Glossary of Terms

<b>Aquifer</b>	Water-bearing sand, gravel, or rock layer yielding usable water quantities
<b>AOD</b>	<b>Above Ordnance Datum - Measurement of land level above base level at Malin Head or Poolbeg</b>
<b>AWB</b>	Artificial Water Body (pAWB indicates provisional AWB)
<b>Calcareous</b>	Geological term for rocks containing calcium carbonate
<b>Carboniferous</b>	A major geological time period between 300 – 360 million years ago producing or containing carbon or coal
<b>CSO</b>	Combined Storm Overflow
<b>Devonian</b>	Of or belonging to the geologic time, system of rocks, or sedimentary deposits of the fourth period of the Paleozoic Era, characterized by the development of lobe-finned fishes, the appearance of amphibians and insects, and the first forests.
<b>EHS</b>	Environment and Heritage Service
<b>EU</b>	European Union
<b>EU INTERREG IIIA</b>	A €182 million programme which addresses the economic and social disadvantages that can result from the existence of a border. It does this by promoting the creation of cross border networks involving, and benefiting local communities. The Ireland/Northern Ireland INTERREG IIIA Programme covers all of Northern Ireland and the six border counties of Ireland. The NS SHARE project is funded by EU INTERREG IIIA. (Website reference <a href="http://www.seupb.org">http://www.seupb.org</a> )
<b>GVA</b>	Gross Value Added
<b>GWWG</b>	Groundwater Working Group
<b>HMWB</b>	Heavily Modified Water Body (pHMWB indicates provisional HMWB)
<b>Karstic</b>	Heavily eroded & channelled outcropping limestone rocks (Origin: Kras, Slovenian limestone plateau region)
<b>Mesozoic</b>	Period of geological time 245–65 million years ago
<b>NS Share</b>	North South Shared Aquatic Resources
<b>NBIRBD</b>	Neagh-Bann International River Basin District
<b>Ordovician</b>	Period of geological time 510–439 million years ago
<b>Palaeogene</b>	Palaeogene period is a unit of geologic time that began 65 and ended 23 million years ago.
<b>P&amp;I</b>	Pressures and Impacts
<b>RBD</b>	River Basin District
<b>RBMP</b>	River Basin Management Plan
<b>RPA</b>	Register of Protected Areas
<b>SAC</b>	Special Area of Conservation
<b>SPA</b>	Special Protection Area
<b>Siliceous</b>	Geological term for rocks containing a large percentage of silica

<b>Triassic</b>	Of or belonging to the geologic time of 200 to 251 million years ago; system of rocks, or sedimentary deposits of the first period of the Mesozoic Era, characterized by the diversification of land life, the rise of dinosaurs, and the appearance of the earliest mammals.
<b>Transitional</b>	Term referring to estuarine waters (Water Framework Directive)
<b>Trophic</b>	Of or involving the feeding habits or food relationship of different organisms in a food chain.
<b>Typology</b>	Differentiation of surface waters into types based on predefined descriptor specified in the WFD
<b>UWWTD</b>	European Urban Waste Water Treatment Directive
<b>Waterbody</b>	The basic compliance, reporting and management unit for the Water Framework Directive into which all rivers, lakes, ground, transitional and coastal waters are divided.
<b>WFD</b>	Water Framework Directive
<b>WTP</b>	Water Treatment Plant
<b>WWTP</b>	Waste Water Treatment Plant