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EU Water Framework Directive: groundwater-dependent rivers and lakes in Northern Ireland

Groundwater Systems and Water Quality Programme
Commissioned Report CR/05/070N

BRITISH GEOLOGICAL SURVEY

GROUNDWATER SYSTEMS AND WATER QUALITY PROGRAMME

COMMISSIONED REPORT CR/05/070N

EU Water Framework Directive: groundwater-dependent rivers and lakes in Northern Ireland

D M J Macdonald [1], A W Donald [2], and P J McConvey [2]

[1] British Geological Survey

[2] Geological Survey of Northern Ireland

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Owenkillew River, County Tyrone.

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British Geological Survey offices

Keyworth, Nottingham NG12 5GG

☎ 0115-936 3241 Fax 0115-936 3488
e-mail: sales@bgs.ac.uk
www.bgs.ac.uk
Shop online at: www.geologyshop.com

Murchison House, West Mains Road, Edinburgh EH9 3LA

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☎ 020-7942 5344/45 email: bgslondon@bgs.ac.uk

Forde House, Park Five Business Centre, Harrier Way, Sowton, Exeter, Devon EX2 7HU

☎ 01392-445271 Fax 01392-445371

Geological Survey of Northern Ireland, Coleby House, Stranmillis Road, Belfast BT9 5BJ

☎ 028-9038 8462 Fax 028-9038 8461

Maclean Building, Crowmarsh Gifford, Wallingford, Oxfordshire OX10 8BB

☎ 01491-838800 Fax 01491-692345

Sophia House, 28 Cathedral Road, Cardiff, CF11 9LJ

☎ 029–2066 0147 Fax 029–2066 0159

Parent Body

Natural Environment Research Council, Polaris House, North Star Avenue, Swindon, Wiltshire SN2 1EU

☎ 01793-411500 Fax 01793-411501
www.nerc.ac.uk

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Summary

The EU Water Framework Directive (WFD) requires that those rivers and lakes that are dependent on groundwater be identified and the pressures on these analysed such that the risk of not meeting their environmental objectives by 2015, as set out in Article 4, can be assessed. This report describes the methodology for identifying and carrying out risk assessments for groundwater-dependent rivers and lakes in Northern Ireland, as part of the initial characterisation process. The methodology reflects UK Technical Advisory Group (UKTAG) guidance.

The report details those river water bodies and lakes that are groundwater dependent and assesses which of these are at risk of being significantly damaged as a result of groundwater abstractions and potentially polluting point sources; diffuse pollution is addressed elsewhere.

The report does not address quantitative impacts on rivers and lakes from groundwater abstractions outside specified assessment zones; the study addressed localised impacts rather than those due to cumulative groundwater abstractions which affect the overall groundwater body water balance, and the ‘available groundwater resource’. This is reported elsewhere.

The risk assessment for lakes has been restricted to those with an area greater than 50 hectares, these being the reporting units agreed for the UK for initial characterisation. Lough Neagh and Upper and Lower Lough Erne, whilst obviously falling within this category due to their significant scale, are reported elsewhere.

Of the 673 river water bodies considered, 564 are classified as groundwater dependent. Of the 17 lakes assessed, 10 are classified as groundwater dependent.

None of the groundwater-dependent lakes are assessed as being affected by groundwater abstractions. Flows in four river water bodies are possibly at local risk due to groundwater abstractions, and one, the Breckagh Burn, is probably at risk.

All groundwater-dependent lakes have been classified as risk category 2b in relation to potentially polluting point sources. Using an approach that assesses the equivalent categories for river water bodies based on the sum of the number of sources within the surrounding assessment zones, regardless of type, 113 river water bodies were classified as risk category 2a and the remainder risk category 2b.

The report details data limitations and gaps in knowledge affecting the initial characterisation process used.

1 Introduction

The EU Water Framework Directive (WFD) requires that those rivers and lakes that are dependent on groundwater be identified and the pressures on these analysed such that the risk of not meeting the environmental objectives by 2015, as set out in Article 4, can be assessed. This report describes the methodology for identifying and carrying out risk assessments for groundwater-dependent rivers and lakes in Northern Ireland, as part of the initial characterisation process. The methodology reflects UK Technical Advisory Group (UKTAG) guidance.

The report also details those river water bodies and lakes that are groundwater dependent and assesses which of these are at risk of being significantly damaged as a result of groundwater abstractions and potentially polluting point sources; diffuse pollution is addressed elsewhere (McConvey and Donald, 2005). Those data limitations and gaps in knowledge affecting the process are detailed in Section 6.

The risk assessment for lakes has been restricted to those with an area greater than 50 hectares, these being the reporting units agreed for the UK for initial characterisation. Lough Neagh and Upper and Lower Lough Erne, whilst obviously falling within this category, due to their significant scale, are reported elsewhere (McConvey and Donald, 2005).

The full initial characterisation process and the overall risk assessment for all water bodies can be found at www.ehsni.gov.uk.

This study has been undertaken for the Environment and Heritage Service (EHS) by the British Geological Survey. EHS is the competent body for Northern Ireland responsible for meeting the requirements of the WFD.

2 WFD requirements relating to groundwater-dependent rivers and lakes

The WFD throughout recognises the potential for interaction between groundwater and surface waters. For rivers and lakes, ‘connection to groundwater bodies’ is listed as a hydromorphological element supporting the biological elements (Annex V 1.1.1 and 1.1.2). Information is required on this when assessing surface water status.

Pressures impacting on the quality of surface water bodies and their hydrological regimes may be as a result of a groundwater pathway. Identification of pressures (Annex II 1.4) and assessment of impact (Annex II 1.5) must therefore include diffuse pollution and pollution point sources discharging to the ground and groundwater abstractions which potentially reduce the baseflow to rivers and lakes.

This report does not address quantitative impacts on rivers and lakes from groundwater abstractions outside specified assessment zones or ‘buffers’ (see Section 3). The study addressed localised impacts rather than those due to cumulative groundwater abstractions which affect the overall groundwater body water balance, and the ‘available groundwater resource’ (Annex V 2.1.2). This is reported elsewhere (McConvey and Donald, 2005).

3 UKTAG guidance on identifying and assessing risk to groundwater-dependent rivers and lakes

UKTAG guidance on the identification of groundwater-dependent rivers and lakes is limited. Section 4.8 of the guidance on pollution pressures on groundwater (UKTAG 2004a), suggests groundwater interaction is determined largely on the basis of indicators, including geology of the interface between the surface water body and the groundwater body and the baseflow index.

No specific UKTAG guidance on assessing localised impact of groundwater abstractions on river flow or lake water level has been developed for the WFD. In Section 5.3.1 of the guidance on assessment of abstraction and recharge pressures (UKTAG 2004b), it is suggested that 'a more localised assessment of likely impact' be made for large groundwater abstractions in the vicinity of headwater streams. Impacts on rivers of groundwater abstractions of greater than 1000 m^3/d are assessed in Section 5.

For diffuse groundwater pollution the guidance on pollution pressures on groundwater (UKTAG 2004a) sets out an approach which includes identification of potential pollution, the susceptibility of the pathway to the receptor and the potential impact. The Scottish Environment Protection Agency (SEPA) has used this as the basis for a series of matrices (SEPA 2004) that enable potential impact to be assessed for the main diffuse pollutants (nitrate, phosphate and pesticides). These have been adopted for Northern Ireland; the results of applying these matricies are reported elsewhere (McConvey and Donald, 2005).

For potentially polluting point sources, it is assumed that surface water bodies will not be at risk from activities with discharges controlled by current legislation (UKTAG, 2004a), unless there is evidence of significant impact. It is suggested that buffer zones around the receptors are used as a screening tool to identify sources that may pose a risk. The default buffer for rivers and lakes is 1000 m. Point sources on or within a buffer of 250 m of the receptor are also identified in this study, as lower risk pollutant sources may still have an impact if located close by.

The WFD requires Member States to assess whether groundwater bodies, including their associated rivers and lakes, will be at risk of failing to achieve the environmental objectives, set out in Article 4, by December 2015. Guidance provided by the UKTAG has expanded the assessment required by the WFD, with sub-divisions for 'at risk' and 'not at risk' bodies of water, based on the degree of confidence in the risk assessment. These categories are given in Table 1. Where appropriate, river and lake bodies have been assigned individual guide risk categories for groundwater abstraction and potentially polluting point sources, in Sections 5.1 and 5.2, to assist EHS with their final classification of these water bodies and their associated groundwater bodies.

Table 1 Categories of risk of water bodies (UKTAG, 2004c)

Risk category	Risk assessment based on available information	Qualification
1a	may be at significant risk	dependent on scale and nature of the pressure
1b	probably at significant risk	partly dependent on scale and nature of the pressure - further information needed to improve confidence
2a	not at significant risk	confidence in the available information being comprehensive and reliable is low
2b	not at significant risk	confidence in the available information being comprehensive and reliable is high

4 Identification of groundwater-dependent rivers and lakes

Within the initial stage of the WFD characterisation process, the assumption has been that the dependency on groundwater of rivers, lakes and terrestrial ecosystems (TEs), is determined by the hydraulic properties of the geology lying directly beneath. At least 80% of the bedrock across Northern Ireland is overlain by superficial deposits, in particular till, which has a variable but generally low permeability. The lithology of till is not mapped in detail. There is no national survey of the degree to which rivers incise through the till to the underlying bedrock; this has only been established for a small number of locations. This is also the case for other types of superficial deposit. The assumption made for initial characterisation, given the majority of the till is relatively thick, is that where a river is mapped as flowing across till there is no contact with the underlying bedrock. This assumption is made for all other types of superficial deposit as well.

The classification of the groundwater interaction potential of superficial deposits is shown in Table 2. Where bedrock is at outcrop, the aquifer productivity classification (McConvey, 2005) is used to determine the potential for groundwater interaction (also high, moderate and low). The groundwater interaction potential map for Northern Ireland is shown in Figure 1.

In assessing the groundwater dependency of lakes (limited to those with an area of greater than 50 ha within the initial characterisation process) the assumption is made that there may be contact with the underlying bedrock even if the surrounding superficial deposits are of low groundwater interaction potential.

Table 2 Classification of superficial deposits in terms of potential to allow groundwater interaction with rivers, lakes and terrestrial ecosystems

High	Moderate	Low
Alluvium	Landslip	Peat
Blown Sand		Recent Marine Deposits
Glacial Sands and Gravels		Recent Lacustrine Deposits
Raised Beach Deposits		Glacial Lake Deposits
Glacial Outwash Sands and Gravels		Diatomite
		Till

Groundwater-dependent river water bodies are identified as those which have a significant reach on high or moderate groundwater interaction potential geology. Significance is defined as greater than 100 m of reach or 10% of the total length.

It is recognised that this approach will result in river water bodies that are in contact with small pockets of permeable material being classified as groundwater dependent. This approach was judged as adequate at this stage of characterisation, given the data limitations.

The identification of groundwater-dependent river water bodies was carried out using a geographical information system (GIS). The river water body layer was obtained from EHS. Small buffers (10 m) were set around river water body reaches to account for differences in data scales and enable the geology bordering and underlying the rivers to be established. The identification codes of those river water bodies classified as groundwater dependent are listed in

Table 3. Figure 2 is a map of Northern Ireland showing the classification of all river water bodies. Of the 673 river water bodies, 564 are classified as groundwater dependent.

NB: subsequent to this analysis being carried out, certain adjacent river water bodies were combined by EHS to create larger bodies, with the overall number of river water bodies correspondingly reducing.

There are only 17 lakes greater than 50 ha in Northern Ireland (not including Lough Neagh and Upper and Lower Lough Erne). These were assessed individually. The groundwater dependence was assessed on the basis of the hydrogeological setting, taking into account the groundwater interaction potential of the surface geology mapped as bordering the lake and in the lake catchment, and on the bedrock geology underlying the lake. The lakes are listed in Table 4, which includes a commentary justifying the lake groundwater-dependency classification. Ten were identified as being groundwater dependent (Figure 3).

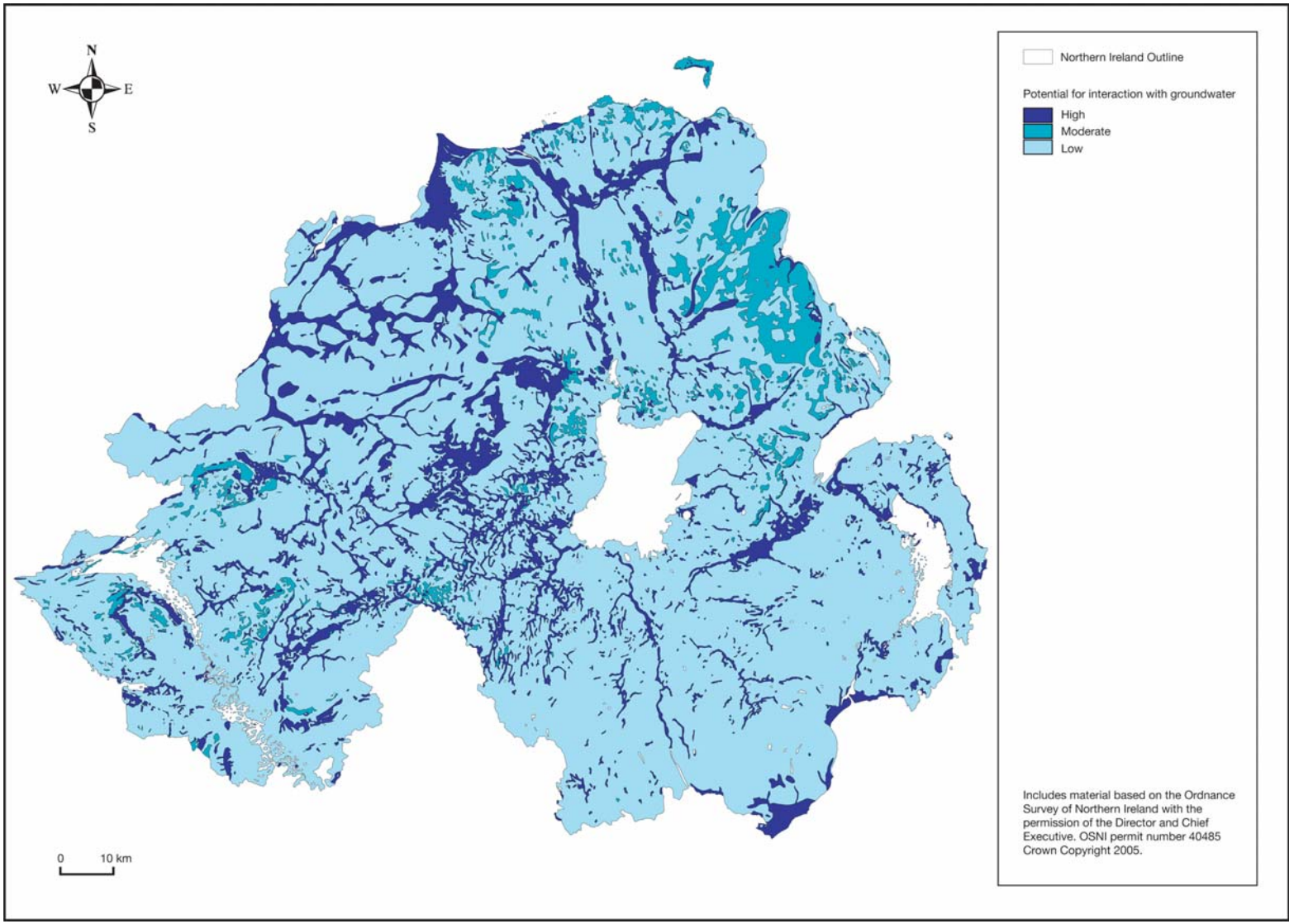

Figure 1 Potential for interaction of rivers, lakes and terrestrial ecosystems with groundwater. Based on permeability classification of surface geology, primarily superficial deposits, mapped at 1:250,000 scale

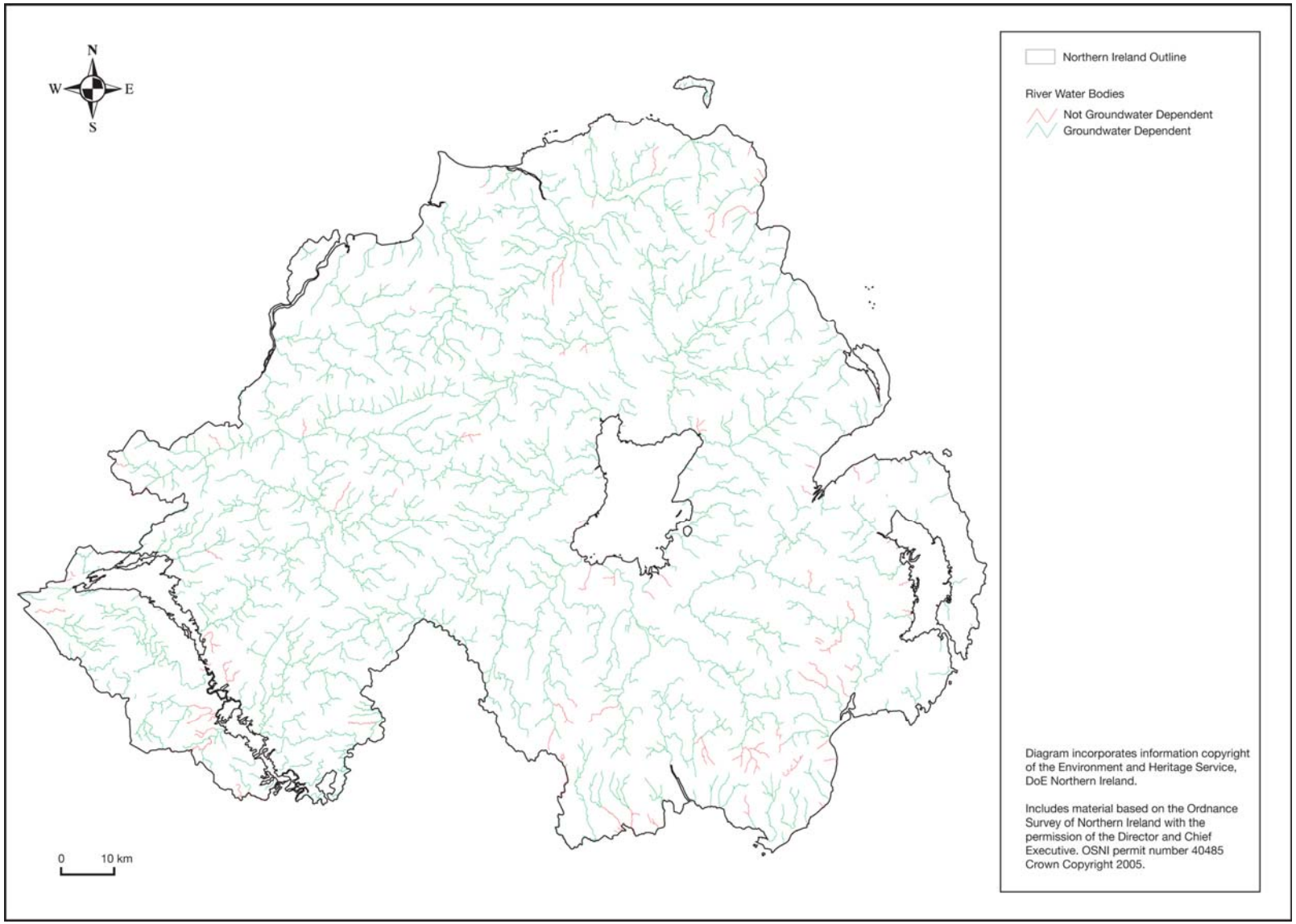

Figure 2 River water bodies classified as groundwater dependent

Table 3 Identification codes of groundwater-dependent river water bodies

GBNI1NB03030																			
1064	1065	1066	1067	1068	1069	1070	1071	1073	1074	1075	1076	1077	1078	1079	1081	1146	1147	1149	1152
1153	1163	1166	1169	1211	1213	1214	1215	1216	1218	1219	1220	1221	1222	1223	1224	1225	1230	2010	2011
2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2123	2148	2150	2156	2157	2158	2159
2160	2161	2164	2165	2168	2199	2200	2201	2212	2229	2231	2232	2233	2234	2235	2236	2237	3002	3003	3004
3005	3006	3007	3008	3009	3139	3143	3144	3154	3167	3209	3210	3226	3227	3228	3241	4053	4054	4055	4056
4057	4058	4059	4060	4061	4062	4063	4097	4133	4134	4135	4136	4137	4138	4176	4177	4178	4179	4181	4240
5001	5121	5122	5124	5128	5202	5203	5204	5205	5206	5207	6082	6083	6084	6085	6087	6125	6126	6127	6130
6131	6141	6151	6190	6191	6193	6194	6195	6198	6208	7025	7026	7027	7028	7029	7030	7031	7032	7033	7034
7035	7036	7037	7038	7039	7040	7041	7042	7043	7044	7045	7046	7047	7048	7049	7050	7051	7052	7095	7096
7099	7106	7108	7109	7112	7129	7132	7145	7173	7175	7180	7182	7196	7238	7239	7242	7243	8090	8091	8092
8093	8094	8100	8103	8104	8107	8110	8113	8114	8115	8117	8118	8119	8184	8186	8187	8188	8189	8197	
GBNI1NB06060																			
1003	1005	1006	1007	1019	1020	1021	1022	1023	1024	1025	1044	2001	2002	2029	2035	2036	2039	3028	3032
4011	4040	4041	4042	4043	4045														
GBNI1NE04040																			
1044	2043	2056	3011	3012	3014	3015	3016	3017	3018	3019	3023	3026	3027	3028	3031	3033	3034	3039	3045
3048	3059	3060	3061	3062	3063	3064	4001	4002	4003	4004	4035	4036	4038	4040	4042	4049	4050	4051	4053
4054	4058	5029	5046	5047															
GBNI1NE05050																			
1004	1076	1077	1082	1116	1118	1120	2083	2084	2091	3001	3002	3003	3046	3047	3048	3070	3087	3088	3096
3098	3101	3102	3103	3104	3105	3106	3107	3108	3117	3119	4007	4008	4009	4010	4011	4012	4019	4020	4021
4022	4023	4050	4051	4055	4056	4057	4058	4064	4072	4074	4080	4081	4085	4086	4093	5034	5035	5036	5037
5044	5045	5061	5062	5063	5068	5069	5073	5097	5099	5109	5110	5111	5113	5114					
GBNI1NW01010																			
1045	1069	1070	1071	1072	1075	1076	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2014	2016
2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
2037	2038	2039	2040	2041	2043	2046	2047	2048	2049	2050	2051	2052	2053	2054	2056	2063	2064	2066	2067
2073	2074	2075	2077	2080	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	3061
GBNI1NW02020																			
1041	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2018	2019	2022	2023	2024	2032	2037	2039
2040	2043	2044	2045	2046	2047	2048	2049	3027	3028	3029	3030	3036	4002	4003	4017	4025	4026	4031	4033
4034	4035	4038																	
GBNI1NW35350																			
1007	2001	2002	2003	2004	2005														
GBNI1NW36360																			
1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1033	1036	1037	1041	1042	1044	1045
1046	1048	1049	1053	1055	1056	1057	1058	1059	1060	1071	1073	1074	1076	1078	1079	1080	1084	2014	2016
2017	2018	2019	2020	2021	2022	2023	2024	2025	2028	2029	2030	2035	2043	2050	2054	2061	2062	2063	2064
2066	2068	2069	2070	2081	2082	2083	2085	2086											
GBNI1NW39390																			
1001																			

Table 4 Groundwater dependency of lakes with an area greater than 50 hectares (not including Lough Neagh and Upper and Lower Lough Erne). Analysis only takes into account the geology in Northern Ireland

Lakes	Size of lake (ha)	Size of lake catchment (ha)	Estimated percentage of lake across border	Estimated percentage of lake catchment across border	Commentary[1]	Groundwater dependent?
Castlehume Lough	56	904	0	0	Lough underlain by high permeability Ballyshannon Limestone some of which is at outcrop	yes
Clea Lakes	61	1275	0	0	Catchment all low GWI geology (various). Underlying bedrock has low permeability	no
Island Reavy Reservoir	99	1277	0	0	Catchment all low GWI geology (various). Underlying bedrock has low permeability	no
Lough Beg	473	494648	0	0	Lough surrounded by low GWI lacustrine deposits. ~20% of catchment is sands & gravels. However, underlying bedrock is moderate permeability Lower Basalt	yes
Lough Cam	73	933	0	0	Catchment all low GWI geology (various). Underlying bedrock has low permeability	no
Lough Fea	54	424	0	0	Lough sits within an extensive outcrop of sands and gravels	yes
Lough Gullion	97	251	0	0	Catchment all low GWI geology (peat and till). Underlying bedrock has low permeability	no
Lough Melvin	2223	20116	80	50	Lough mainly surrounded by low GWI till, however, underlying bedrock is moderate permeability Mullaghamore Sandstone.	yes
Lough Mourne	53	537	0	0	Lough surrounded mainly by low GWI till, however, underlying bedrock is moderate permeability Lower Basalt	yes
Lough Portmore	185	6278	0	0	Lough almost surrounded by alluvium but not that extensive – vast majority of the catchment is till	yes
Lough Scolban	66	1390	0	30	Lough borders outcrop of high permeability Ballyshannon Limestone	yes
Macnean Lower Lough	462	18263	10	10	Only small part of lough shore is bordered by high GWI alluvium. However, underlying bedrock is high permeability Knockmore Limestone	yes
Macnean Upper Lough	978	15028	50	70	Very small part of the lough shore bordered by high GWI alluvium, remainder till. However, underlain by moderate and high permeability bedrock	yes
Ross Lough Monaghan	86	17711	20	80	Lough surrounded by till. Majority of catchment low GWI geology (various) with very small amount of alluvium. Underlying bedrock has low permeability	no
Silent Valley Reservoir	88	2264	0	0	Catchment all low GWI geology (various). Underlying bedrock has low permeability	no
Spelga Dam	55	746	0	0	Catchment all low GWI geology (various). Underlying bedrock has low permeability	no
Stoneyford Reservoir	60	618	0	0	Very small part of the lough shore bordered by high GWI alluvium, remainder till. However, underlying bedrock is moderate permeability Lower Basalt	yes

[1] GWI – groundwater interaction

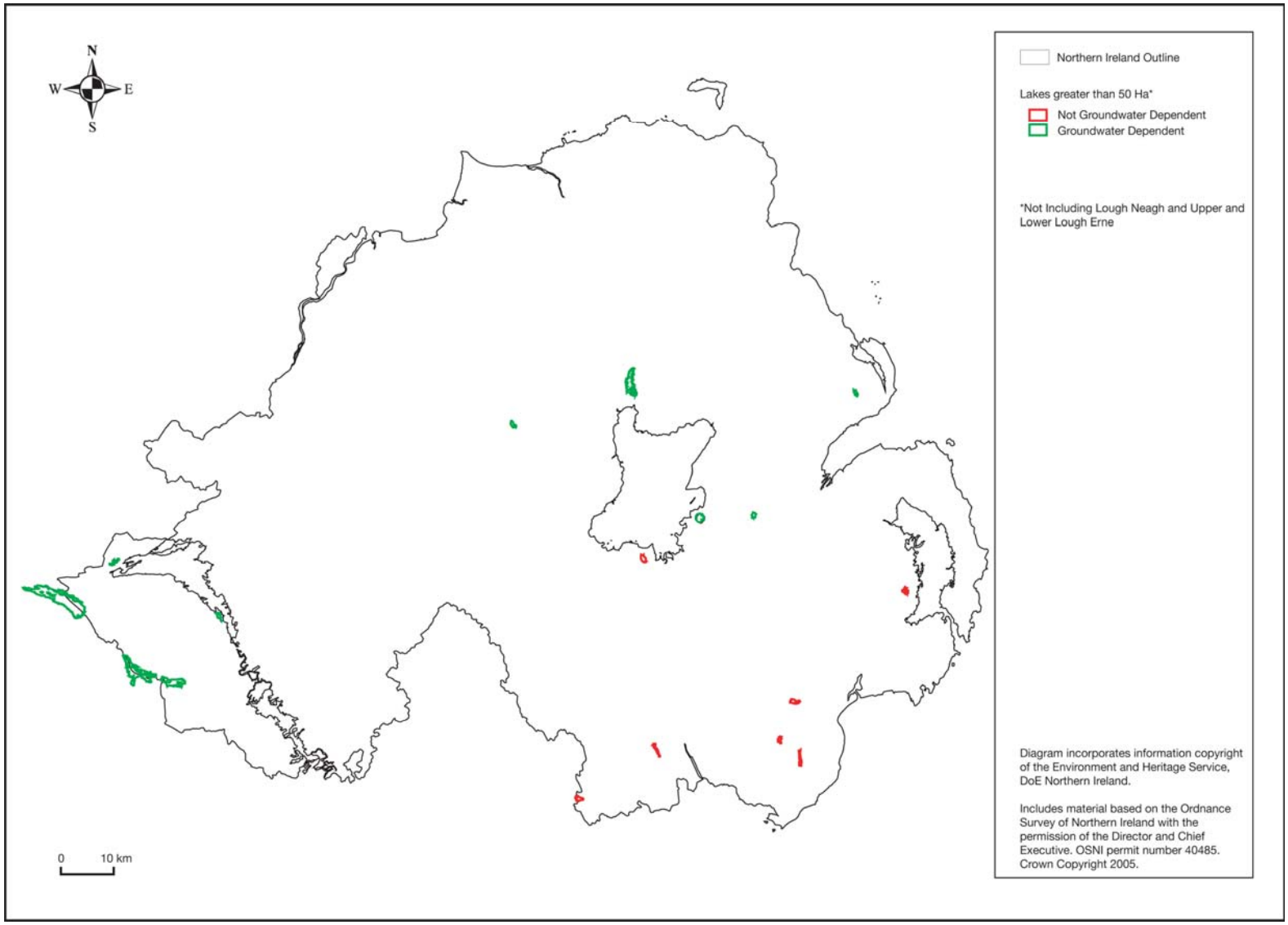

Figure 3 Lakes with an area greater than 50 ha, classified as groundwater dependent (not including Lough Neagh and Upper and Lower Lough Erne)

5 Assessment of risk to groundwater-dependent rivers and lakes

5.1 RISK TO RIVERS AND LAKES FROM LOCAL GROUNDWATER ABSTRACTIONS

Northern Ireland does not presently have a system in place for regulating groundwater abstractions. However, a preliminary database of groundwater abstractions has been established by EHS for WFD assessment work, using a variety of data sources. In the absence of knowledge of actual abstraction volumes, estimates have been used based upon the recorded purpose of the abstraction source (farm, industrial, etc.). The data set has not been verified and can only be considered to be a first estimate of the locations and yields of groundwater abstractions. Nevertheless, it is considered by EHS that most of the larger abstractions, for example public water supply boreholes, will have been captured. The vast majority of small abstractions (20 m^3/d or less) are located on farms. All but one of the large abstractions (greater than 1000 m^3/d) are public water supplies. Medium-sized abstractions are used for a range of activities, including food processing, light industry and smaller public water supplies. Groundwater abstractions were categorised to help with their display within the GIS and with the pressure analysis. The number of abstractions within each category is shown in Table 5.

Table 5 Categories and numbers of groundwater abstractions

Abstraction (m^3/d)	Number
≤20	1577
21-100	35
101-1000	55
1001-2000	17
2001-5000	8
>5000	2

The assessment of risk to lakes from local groundwater abstractions considered the number and size of abstractions located within a 5 km buffer. Nine of the ten groundwater-dependent lakes have no known groundwater abstractions within this buffer; Stonyford Reservoir has three but these are small and greater than 1 km from the lake and therefore do not present a risk to lake water levels.

Only those groundwater abstractions greater than 1000 m^3/d were assessed for potential local impact on rivers (Table 6); rates less than this were judged to be generally insignificant in comparison with river flows. The assessment took into account the size of the groundwater abstraction, its distance from the river and the potential for interaction between the river and groundwater in the formation from which the borehole is thought to be abstracting. It also took into account the likely low summer flow in the river, estimated using information from the nearest river gauging station (NERC 2003). This included the baseflow index (BFI), the 95 percentile river flow (Q95) and the factors affecting runoff (NERC 2003).

Table 6 The potential for large groundwater abstractions (> 1000 m^3/d) to have significant impact on river flow in their locality (n.b. impact on available groundwater resources for supporting river flow due to the combined groundwater abstraction addressed elsewhere)

Name[a]	Northing	Easting	Estimated abstraction rate	ID of nearest river water body	Location of borehole in relation to river	Closest gauging station to nearest point of river	BFI [b]	Q95[c] (m3/s)	FAR[d]	Aquifer[e]	Superficial deposits[f]	Commentary	At risk?
Alcrossagh	307700	432600	2650	391	150 m from Well Water	~ 30 km upstream of the Bush at Seneiri Bridge	0.43	0.98	SPG	Bedrock	Alluvium, sands & gravels and till	FAR indicates groundwater abstractions may be affecting the Bush at Seneiri Bridge. May be a hydraulic connection between bedrock and sands and gravels. Groundwater abstraction rate may be significant as flow in these headwaters will be much lower than the Bush at Seneiri Bridge	possibly
Barbour No1	328300	368000	2000	546	150 m from River Lagan	~ 10 km upstream from Lagan at Newforge	0.45	1.00	GEI	Bedrock	Alluvium and till	Although located close to the river, the degree of connection between bedrock aquifer and river likely to be poor	none
Barbour No2	328300	368000	2000	546	150 m from River Lagan	~ 10 km upstream from Lagan at Newforge	0.45	1.00	GEI	Bedrock	Alluvium and till	Although located close to the river, the degree of connection between bedrock aquifer and river likely to be poor	none
Ballycullen 1 + 2	347510	363970	7640	543	1.5 km from River Blackwater	None	-	-	-	Bedrock	till	Distant from the river, likely to be in poor hydraulic connection with river	none
Balmoral	331100	370400	1180	580	800 m from Blackstaff River	~ 2 km upstream from gauging point (not in National Water Archive	-	-	-	Bedrock	Alluvium and till	Not clear what connection between bedrock aquifer and river but likely to be poor	none
Bellaghy no.3			2000	319	650 m from River Main	~ 8 km upstream from Main at Dunminning Lw	.51	0.86	SR	?	Alluvium, sands & gravels and till	Distant from river. Abstraction unlikely to be significant compared with river flow	none
Belsize	327000	367300	3990	546	800 m west of source of tributary of River Lagan	~ 11 km upstream from Lagan at Newforge	0.45	1.00	GEI	Bedrock	Alluvium, sands & gravels and till	Distant from the river and likely to be poor hydraulic connection with river	none
Buckna	320400	408400	2240	825	Beside the Braid River	~15 km upstream of Braid at Ballee	0.48	0.75	E	Sands & gravels	Alluvium, sands & gravels and some till	Potential for river to be affected by groundwater abstraction. Not enough information to tell if groundwater abstraction is significant relative to river flow	possibly

Name[a]	Northing	Easting	Estimated abstraction rate	ID of nearest river water body	Location of borehole in relation to river	Closest gauging station to nearest point of river	BFI [b]	Q95[c] (m3/s)	FAR[d]	Aquifer[e]	Superficial deposits[f]	Commentary	At risk?
Buckna (Kanes Hill)	326800	408900	2040	329	1 km from Owencloghy Water	none	-	-	-	Bedrock	Till	Distant from the river and likely to be poor hydraulic connection with river	none
Derryaghy	328000	368100	2000	546	100 m from River Lagan	~ 10 km upstream from Lagan at Newforge	0.45	1.00	GEI	Bedrock	Alluvium and till	Although located close to the river, the degree of connection between bedrock aquifer and river likely to be poor	none
Drumabest	302680	424340	3270	345	Beside the Breckagh Burn	No station in National Water Archive, Rivers Agency will have more	-	-	-	Sands & gravels	Sands & gravels, peat and till	Relatively large abstraction located close to headwaters in sands & gravels. Likely there will be an impact in the locality	probably
Gilliland's	348210	371670	1450	coastal	2.2 km from Comber River	2.5 km upstream of Enler at Comber	0.46	0.09	N	bedrock	Alluvium, sands & gravels and till	Although Q95 is relatively small, abstraction distant from the river and connection may be poor. May impact on flow when combined with others in the area	possibly
Glanbia Cheese	313500	358700	1100	50	250 m from River Lagan	Next to Lagan at banoge	0.22	0.04	-	Bedrock?	Alluvium and till	Unlikely to be connection between the underlying Sherwood Sandstone and the river locally	none
Glarryford	305240	413730	1123	319	200 m from River Main	~ 4 km upstream from Main at Dunminning Lw	.51	0.86	SR	Sands & gravels	Alluvium, sands & gravels and till	Although abstraction from sands & gravels in connection with river, the rate is unlikely to be significant compared with river flow	none
Glenburn 1	329800	368300	1700	545	Beside Collin River	~ 8 km upstream from Lagan at Newforge	0.45	1.00	GEI	Bedrock	Alluvium, sands & gravels and till	Although located close to the river, the degree of connection between bedrock aquifer likely to be poor and abstraction probably small compared to river flow	none
Glenburn 2	329800	368300	1850	545	Beside Collin River	~ 8 km upstream from Lagan at Newforge	0.45	1.00	GEI	Bedrock	Alluvium, sands & gravels and till	Although located close to the river, the degree of connection between bedrock aquifer likely to be poor and abstraction probably small compared to river flow	none
Gortlenaghan	271300	362200	1285	267	Beside Oonawater	~ 15 km upstream of	-	0.09	RPI	Bedrock	Alluvium and till	Flow in Oonawater downstream is relatively small but not sufficient	possibly

Name[a]	Northing	Easting	Estimated abstraction rate	ID of nearest river water body	Location of borehole in relation to river	Closest gauging station to nearest point of river	BFI [b]	Q95[c] (m3/s)	FAR[d]	Aquifer[e]	Superficial deposits[f]	Commentary	At risk?
						Oonawater at Shanmoy						known to make confident assessment	
IDB (Comber)	348000	373500	2000	coastal	600 m from Cullys Burn	none	-	-	-	Bedrock	Sands & gravels and till	Abstraction distant from the river and connection likely to be poor	none
Killynether	347047	372571	2000	coastal	1.5 km from Comber River	2.5 km upstream of Enler at Comber	0.46	0.09	N	Bedrock	Alluvium, sands & gravels and till	Although Q95 is relatively small, abstraction distant from the river and connection may be poor. May impact on flow when combined with others in the area	possibly
Lagan Valley	335200	370300	6340	747	1 km from River Lagan	3 km downstream from Lagan at Newforge	0.45	1.00	GEI	Bedrock	Alluvium, sands & gravels and till	Distant from the river, likely to be in poor hydraulic connection with river and, although a large abstraction, relatively small compared with river flow	none
Lagan Valley/Poleglass	329700	372800	2000	580	2 km from Blackstaff River	~ 2 km upstream from gauging point (not in National Water Archive	-	-	-	Bedrock	till	Distant from the river and likely to be poor hydraulic connection with river	none
Larkfield	329530	369930	2000	580	600m from Collin River	~ 10 km upstream from Lagan at Newforge	0.45	1.00	GEI	Bedrock	Alluvium, sands & gravels and till	Abstraction distant from the river and connection likely to be poor	none
McAlpines 1	347950	371110	2650	coastal	1.7 km from Comber River	2.5 km upstream of Enler at Comber	0.46	0.09	N	Bedrock	Alluvium, sands & gravels and till	Although Q95 is relatively small, abstraction distant from the river and connection may be poor. May impact on flow when combined with others in the area	possibly
McAlpines 2	347870	370790	2000	coastal	1.7 km from Comber River	2.5 km upstream of Enler at Comber	0.46	0.09	N	Bedrock	Alluvium, sands & gravels and till	Although Q95 is relatively small, abstraction distant from the river and connection may be poor. May impact on flow when combined with others in the area	possibly
Newforge Lane	332600	369600	2000	747	200 m from River Lagan	Next to Lagan at Newforge	0.45	1.00	GEI	Bedrock	Alluvium, sands & gravels and till	Although located close to the river, the degree of connection between bedrock aquifer and river likely to be poor. River flow here is significantly greater	none

Name[a]	Northing	Easting	Estimated abstraction rate	ID of nearest river water body	Location of borehole in relation to river	Closest gauging station to nearest point of river	BFI [b]	Q95[c] (m3/s)	FAR[d]	Aquifer[e]	Superficial deposits[f]	Commentary	At risk?
												than this groundwater abstraction	
Newtownstewart	241133	386515	1233	499	confluence of Glenknock and Owenkillew Rivers	Next to Owenkillew at Crosh	0.39	2.72	N	Bedrock	Alluvium and till	Abstraction rate very small compared with river flow (~0.5%) and unlikely that significant proportion of this will come from river + river has 'natural' flow	none
Shanmoy 1	278100	356200	2410	273	Beside Oonawater	Next to Oonawater at Shanmoy	-	0.09	RPI	Sands & gravels	Alluvium, sands & gravels and till	Potential for river to be affected by groundwater abstractions – abstractions equivalent to ~50% of Q95	possibly
Shanmoy 5 BW[a]	278100	356000	2060	273	Beside Oonawater	Next to Oonawater at Shanmoy	-	0.09	RPI	Sands & gravels	Alluvium, sands & gravels and till	Potential for river to be affected by groundwater abstractions – abstractions equivalent to ~50% of Q95	possibly

a all boreholes are public water supplies apart from Glanbia Cheese

b BFI – baseflow index, measure of the proportion of the river runoff derived from stored sources

c Q95 - river flow exceeded for 95 per cent of the flow record, typically 25 years

d FAR – factors affecting runoff, an indication of abstractions from, and discharges to, the river operating within the catchment which alter the natural flow. Codes used in this table (see NERC (2003) for full description): N – natural; S – storage or impounding reservoir; R – regulated river; P – public water supplies; G – groundwater abstractions; E – effluent return; I – industrial and agricultural abstractions

e type of aquifer from which it is reported groundwater is abstracted

f superficial deposits underlying the river and the location of the borehole in the vicinity of the borehole

The assessment for potential local impact on rivers provides hydrologists with information that will help in the classification of the overall risk category for river water bodies. The categories of 'potential impact' assigned to the nearest river water body to each abstraction are 'none', 'possibly' and 'probably' (Table 6). Of the 14 river water bodies (Figure 4), four were assessed as possibly at risk of having their summer low flows significantly affected by local groundwater abstractions, and one, the Breckagh Burn, as probably at risk. Five of the groundwater abstractions are located near to rivers which are tidal and therefore not classified as river water bodies. (N.b. some river water bodies have more than one groundwater abstraction of greater than 1000 m^3/d near to them.)

5.2 RISK FROM POINT SOURCE POLLUTION PRESSURES

The risk from point source pollution pressures was assessed initially by looking at the occurrence of known potential sources within buffers of 250 m and 250 m to 1 km (see Section 3). EHS datasets used within the assessment are listed in Table 7.

Table 7 Datasets used to assess risk to rivers and lakes from potentially polluting point sources

Dataset	Comments
Flooded or discharging abandoned mines	location only
Groundwater Directive Part IIa consented discharges	Land parcel areas rather than points
Industrial Discharge Consents - discharging to ground	two classes available, < 5 and 5-100 m^3/d
Industrial Pollution Controls (IPC)	may include uncontrolled discharges
Oil depots	location only
Potentially polluting activities, e.g. petrol stations	location and risk category - only high risk activities used

Apart from the abandoned mines and possibly the sites covered by IPCs, none of the datasets include uncontrolled discharges. The vast majority of IPCs will be irrelevant as they are direct pressures on surface waters; details are not available of those that are likely to discharge to the ground.

The UKTAG guidance (UKTAG 2004a) states that controlled discharges are not relevant if there is no evidence of significant impacts. No such evidence is available for impacts on rivers and lakes from point source pollution via the groundwater pathway, however limited knowledge is presently available upon which to base this judgement.

Given these factors, it was considered inappropriate to classify any of the rivers or lakes as 'at risk', and to assign the associated groundwater bodies as also 'at risk'. However, it is appropriate to highlight where a significant number of sources from the EHS datasets in Table 7 are concentrated within the buffers. This information is used to determine whether the surface water bodies are classified as in risk category 2a or 2b and is relevant to the design of groundwater quality monitoring networks in the future. The number and type of the sources from the datasets in Table 7 were tallied for the two zones.

These are listed in Table 8 for lakes (N.B. the totals were tallied for all lakes although the assessment is only relevant for groundwater-dependent lakes, in bold). There are very few sources in the vicinity of the groundwater dependent lakes. Only in the case of Macnean Lough Lower are there a potentially significant number of Part IIa consents. However, it was judged, given the size of the lake and therefore the large dilution factor, that it should still have a risk category 2b. All lakes therefore are risk category 2b in relation to potentially polluting point sources.

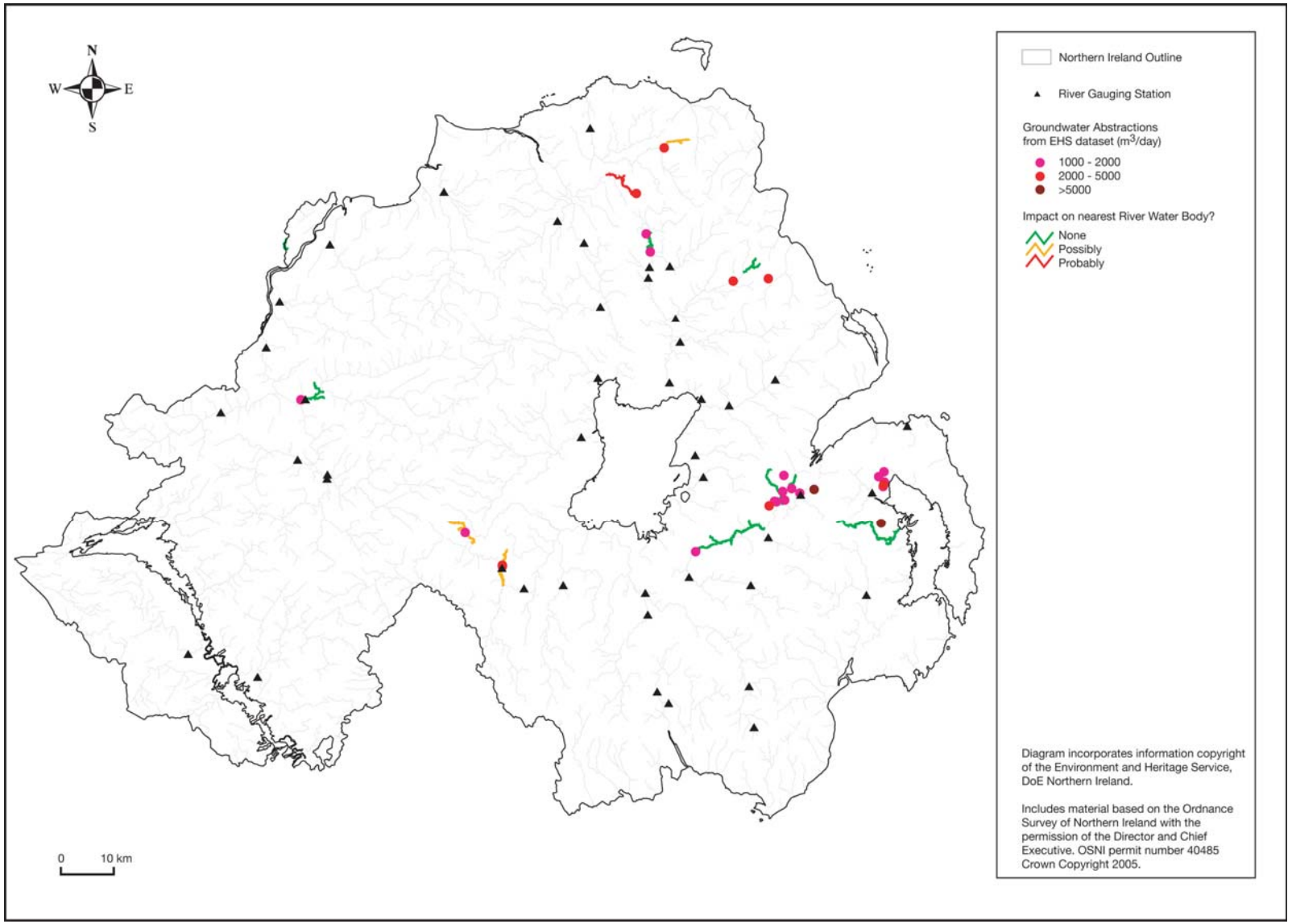

Figure 4 River water bodies likely to have localised impact on low flows due to groundwater abstractions

Table 8 Assessment of risk to lakes from potentially polluting point sources

Lakes[1]	Abandoned mines		Industrial Discharge Consents				Oil depots		Industrial Pollution Controls		High risk potentially polluting activities		Part IIa consents		Commentary	Risk category
			< 5 m^3/d		5 –100 m^3/d											
Zones (km)	≤0.25	0.25 – 1	≤0.25	0.25 – 1	≤0.25	0.25 – 1	≤0.25	0.25 – 1	≤0.25	0.25 – 1	≤0.25	0.25 – 1	≤0.25	0.25 – 1		
Castlehume Lough															Number/type of sources not significant	2b
Clea Lakes														1	Number/type of sources not significant	2b
Island Reavy Reservoir												1			Number/type of sources not significant	2b
Lough Beg															Number/type of sources not significant	2b
Lough Cam															Number/type of sources not significant	2b
Lough Fea															Number/type of sources not significant	2b
Lough Gullion															Number/type of sources not significant	2b
Lough Melvin												1			Number/type of sources not significant	2b
Lough Mourne				1						1					Number/type of sources not significant	2b
Lough Portmore				2											Number/type of sources not significant	2b
Lough Scolban												1			Number/type of sources not significant	2b
Macnean Lower Lough										1			3	1	Likely to be sufficient dilution	2b
Macnean Upper Lough															Number/type of sources not significant	2b
Ross Lough Monaghan															Number/type of sources not significant	2b
Silent Valley Reservoir									1						Number/type of sources not significant	2b
Spelga Dam															Number/type of sources not significant	2b
Stoneyford Reservoir															Number/type of sources not significant	2b

[1] No entry means zero sources, names in **BOLD** denote groundwater dependent lakes

The number and type of potentially polluting point sources tallied for river water bodies are reported in Table A1 in the Appendix. For river water bodies, the sources in the outer buffer (250 m to 1 km) have been separated into those where there is continuous high groundwater interaction potential geology from river water body to point source, and the remainder. There are in total 673 river water bodies in Northern Ireland. Given the time available it was not feasible to assess individually the risk from point sources. The approach taken was to set the risk category based on the sum of the number of sources within the buffers, regardless of type. Given that the lengths of river water body reaches vary greatly, from less than 1 km to more than 50 km, a scaling factor was employed to normalise the data - this was the average river water body length, 10,596 m. The basis for categorising risk is detailed in Table 9 along with the resulting number of river water bodies in each risk category. These are shown in Figure 5.

Table 9 Approach to categorising risk to river water bodies from potentially polluting point sources, and the numbers in each Risk Category

Buffers	**Risk category criteria**		**No. of river water bodies within each risk category**	
within 250 m + within 250 m to 1 km, where continuous high groundwater interaction potential geology from river water body to point source	risk category 2a risk category 2b	≥ 5 sources < 5 sources	risk category 2a risk category 2b	- 92 - 581
within 250 m to 1 km, where there is not continuous high groundwater interaction potential geology from river water body to point source	risk category 2a risk category 2b	≥ 10 sources < 10 sources	risk category 2a risk category 2b	- 102 - 571
Combined total where either criterion is met			**risk category 2a** **risk ategory 2b**	**- 113** **- 550**

The criteria are based on a judgement of the number of sources that may cause significant damage, with no reference to their type or nature and volume of discharge, if any. There is clearly an element of arbitrariness in the numbers used. This represents an initial screening tool only and further investigation would be necessary where otherwise unexplained impacts on rivers and lakes are detected.

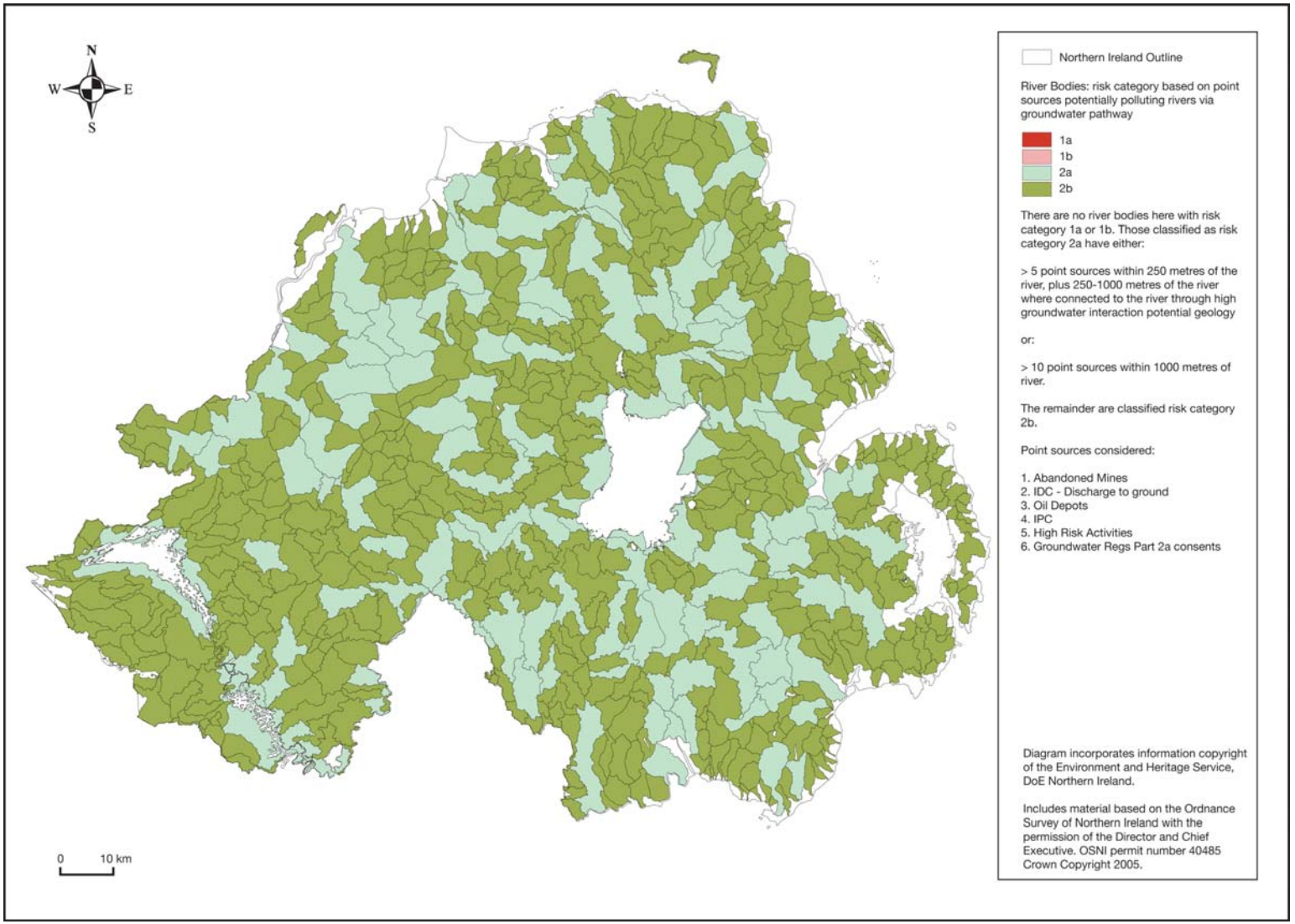

Figure 5 Risk categories for river water bodies in relation to potentially polluting point sources. River water body catchments are coloured according to river body risk category

6 Improvements to the methodology

In applying the methodology for identification and assessment of risk to rivers and lakes, a number of aspects have been highlighted that could be improved. These are listed below. Whilst the points identify where improvements are possible, the context of the work done to date should be remembered. This was to undertake a first-pass screening exercise to identify where pressures exist and impacts may occur, and prioritise where further assessment would be beneficial. It is considered that this objective has been achieved, albeit with more work required to better understand the rivers and lakes assessed and the pressures on them.

i) There would appear to be some misalignment between 1:250,000 scale geological digital data and other spatial data, of up to 300 m in places; this has been identified during other WFD-related work. Hydrogeological assessments for helping to identify groundwater-dependent rivers have relied solely on spatial data. The misalignment of geological data and rivers may have introduced some errors to the identification process. This also has implications for the pressure analysis as the hydraulic connection between the location of the pressure (groundwater abstraction and potentially polluting point source) and the river is important. (N.b. this is not an issue for lakes as the geological maps show the lake boundaries.) It is noted that 1:50,000 scale digital geological maps should be available shortly; these are recommended for use in further characterisation.

ii) Assumptions have been made when undertaking the identification of rivers and lakes (and also TEs) that are dependent on groundwater. The scheme for classifying the groundwater dependency is based on the underlying geology, not taking into account its extent or its hydrogeological setting. Much of the river network in Northern Ireland is underlain by alluvium and is defined as groundwater dependent as a result. Where underlain by superficial deposits classified as generally having low permeability, for example till or peat, the assumption is made that the river does not incise through to the underlying formation, which may be bedrock or sands and gravels respectively. The spatial variability in the lithology of the till, and therefore the degree to which it forms a hydraulic barrier between receptors and the underlying bedrock, is not well known. The extent of the sands and gravels where they are overlain by other superficial deposits such as peat and alluvium is not clear.

    Further work would be required to improve the understanding of these hydrogeological controls.

iii) Further, there has not been sufficient time to develop, to any significant degree, conceptual models of groundwater flow to and from surface receptors. The assessments in this report would benefit from such models, however it recognised that limited data are currently available to do this. Development of models for representative catchments would allow application to much of the country. However, even with these models, there is a knowledge gap in terms of what is the flux of pollutants into rivers and lakes and the impact they have on the ecosystems supported. Understanding of these processes within the UK is being improved by ongoing research, particularly as part of the NERC Thematic Programme, LOCAR (Lowland Catchment Research).

iv) The pressures data used in the analysis could be improved. Groundwater abstraction rates are presently estimated and it cannot be confirmed conclusively that all large abstractions have been identified.

    In addition, there is a lack of monitoring data to assess trends in groundwater levels and quality. This would help assess the impacts of these pressures on surface receptors and could be extrapolated to similar hydrogeological/ecological/pressure settings. This should be considered when developing the monitoring network required by the WFD.

Glossary

EHS	Environment and Heritage Service, Northern Ireland
GIS	geographical information system
GWDTE	groundwater-dependent terrestrial ecosystem
IDC	Industrial Discharge Consent
IPC	Industrial Pollution Control
TE	terrestrial ecosystem
UKTAG	UK Technical Advisory Group
WFD	Water Framework Directive

References

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UKTAG 2004b. Guidance on the assessment of abstraction and recharge pressures on bodies of groundwater. UK Technical Advisory Group on the Water Framework Directive, www.wfduk.org/TAG_Guidance.

UKTAG 2004c. Guidance on general principals for pressures and impacts analysis (final). UK Technical Advisory Group on the Water Framework Directive, http://www.wfduk.org/TAG_Guidance.

Appendix: Table A1

Table A1 Assessment of risk to river water bodies from potentially polluting point sources (see Section 5.2 for description of method)

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NB030301064	7334													1						2a
GBNI1NB030301066	10316													4					1	2b
GBNI1NB030301068	16823									1				1		2	1			2b
GBNI1NB030301069	24107													1			2		12	2a
GBNI1NB030301070	7392															1			1	2b
GBNI1NB030301072	15905												1							2b
GBNI1NB030301073	12541												1	1						2b
GBNI1NB030301074	2404												2	1						2b
GBNI1NB030301075	14602								1					5		1			1	2a
GBNI1NB030301076	5357																1	1	1	2b
GBNI1NB030301078	9902															1				2b
GBNI1NB030301079	2892																		1	2b
GBNI1NB030301080	3197															1				2b
GBNI1NB030301146	8670										1			1			2		4	2b
GBNI1NB030301147	14983													1		1	3		3	2a
GBNI1NB030301149	49272				2				1					2	2	11			4	2a
GBNI1NB030301152	4829															1			1	2b
GBNI1NB030301153	4371																		1	2b
GBNI1NB030301155	2194																		2	2b
GBNI1NB030301163	5154															1				2b
GBNI1NB030301166	12382															2				2b
GBNI1NB030301169	12855									1				2		4				2b
GBNI1NB030301213	33607													7			5		5	2a
GBNI1NB030301214	15718													2			3	3		2a
GBNI1NB030301219	3515													1						2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NB030301220	15751									1	1			5	5	1				2a
GBNI1NB030301221	9311													1		1				2b
GBNI1NB030301222	5258															1				2b
GBNI1NB030301223	8192							3	1					8		3	2		2	2a
GBNI1NB030301224	10059															1	1		1	2b
GBNI1NB030301225	9973												1	2	1				3	2b
GBNI1NB030301230	14405															1	9		6	2a
GBNI1NB030302010	12025				1											1				2b
GBNI1NB030302011	30024							1		1				3		1	1		2	2a
GBNI1NB030302013	7535															1				2b
GBNI1NB030302014	15928							1						3						2a
GBNI1NB030302015	2886																1		1	2b
GBNI1NB030302016	5221																2			2b
GBNI1NB030302017	16357							1			1			5						2a
GBNI1NB030302018	12264							2						7		7				2a
GBNI1NB030302020	14499													1		1	3			2a
GBNI1NB030302021	10572				1					1					1		5	2	3	2a
GBNI1NB030302022	8566													4			2		2	2b
GBNI1NB030302024	5858														1					2b
GBNI1NB030302148	4761																	1		2b
GBNI1NB030302150	15964													2		4			2	2a
GBNI1NB030302156	7350					1								1		1				2b
GBNI1NB030302157	4009															1				2b
GBNI1NB030302158	19316													6		2				2a
GBNI1NB030302160	12853													2		1		1	2	2b
GBNI1NB030302161	15957				1									1			2		7	2a
GBNI1NB030302164	6269													1					1	2b
GBNI1NB030302168	8482													2						2b
GBNI1NB030302200	4603																1			2b
GBNI1NB030302201	10815												2			1			3	2b
GBNI1NB030302212	13868				1								1			3				2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NB030302232	6189							1									2		2	2b
GBNI1NB030302233	13226	1		3	1									3		6	10		10	2a
GBNI1NB030302234	13858													1					1	2b
GBNI1NB030302237	7017	2		4										2		5	4		4	2a
GBNI1NB030303002	9207													1						2b
GBNI1NB030303004	3752					1													1	2b
GBNI1NB030303006	8049													1	1	1				2b
GBNI1NB030303007	6210													1						2b
GBNI1NB030303139	7179													1	1			1		2b
GBNI1NB030303143	4960																		4	2b
GBNI1NB030303144	9742				2					2				2		2				2b
GBNI1NB030303154	16200															2				2b
GBNI1NB030303167	6273									1								1		2b
GBNI1NB030303209	9199																3		1	2b
GBNI1NB030303226	8623															1				2b
GBNI1NB030303227	20028													3			5	1	3	2a
GBNI1NB030303228	19734														2	1			4	2a
GBNI1NB030303241	16883																3	2	1	2a
GBNI1NB030304054	10829					1								1						2b
GBNI1NB030304055	4648				1												1		2	2b
GBNI1NB030304056	5937															1	1		2	2b
GBNI1NB030304057	10560									1						1	4	1	3	2b
GBNI1NB030304058	7033													1				1		2b
GBNI1NB030304060	8436				1									4		8				2a
GBNI1NB030304061	8921													2	1					2b
GBNI1NB030304062	8699				1							1					2			2b
GBNI1NB030304063	8005															1				2b
GBNI1NB030304097	6668					1														2b
GBNI1NB030304133	12847											1	1				1		1	2b
GBNI1NB030304134	6072									1					1	2				2b
GBNI1NB030304135	19807													5		5		1	2	2a

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NB030304136	11977				1					1				2						2b
GBNI1NB030304138	11272														1			2		2b
GBNI1NB030304176	6308																	1	2	2b
GBNI1NB030304177	19006								1					1	1		1	1	1	2a
GBNI1NB030304178	7450				1				2						2					2b
GBNI1NB030304181	11365							1		1					1					2b
GBNI1NB030304240	22847				1								1	2	1	1		1	1	2a
GBNI1NB030305001	5840				1				1					1						2b
GBNI1NB030305121	8746				1															2b
GBNI1NB030305122	19105									1				9		4	3	2		2a
GBNI1NB030305124	13317													3					1	2b
GBNI1NB030305128	9193													2		1	1		2	2b
GBNI1NB030305162	6500													1		3			1	2b
GBNI1NB030305202	3369													1						2b
GBNI1NB030305203	9372			2										1						2b
GBNI1NB030305204	15720			2										9		4				2a
GBNI1NB030305205	4725				4											2				2b
GBNI1NB030305206	15481				1			1		3	2		3	12		18				2a
GBNI1NB030305207	15049				1											2			1	2b
GBNI1NB030306084	9011					1														2b
GBNI1NB030306086	3956							1								11				2b
GBNI1NB030306087	7339								1	1				2	2	1				2b
GBNI1NB030306125	5838				1											1				2b
GBNI1NB030306126	9937				1															2b
GBNI1NB030306127	9556				1											1	1		2	2b
GBNI1NB030306140	1247															1				2b
GBNI1NB030306141	11124										1									2b
GBNI1NB030306142	6412															2				2b
GBNI1NB030306190	2208				1						1									2b
GBNI1NB030306191	2742				1					1										2b
GBNI1NB030306193	11861									1						1				2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NB030306194	6641														1					2b
GBNI1NB030306195	4884															10				2b
GBNI1NB030306208	17329									1	1		1	2	1	5				2a
GBNI1NB030307025	7729								1		1		1	2	4	3				2a
GBNI1NB030307026	17916										1					2	1		1	2a
GBNI1NB030307027	9287							1								1				2b
GBNI1NB030307028	5896								1							5				2b
GBNI1NB030307029	2820							1												2b
GBNI1NB030307030	2870													1						2b
GBNI1NB030307031	704							1					1							2b
GBNI1NB030307033	10068													3			2	1	2	2a
GBNI1NB030307034	11980													1	1	1		1	1	2b
GBNI1NB030307036	9520					2				2						5				2b
GBNI1NB030307037	3743													1						2b
GBNI1NB030307039	10350																			2b
GBNI1NB030307040	29116										1					2			1	2a
GBNI1NB030307041	6811													4						2b
GBNI1NB030307042	7935				1														1	2b
GBNI1NB030307043	7375															1			2	2b
GBNI1NB030307044	9715													7					1	2a
GBNI1NB030307045	15820									1							1		2	2a
GBNI1NB030307046	5126																			2b
GBNI1NB030307048	10446									1			2							2b
GBNI1NB030307049	4234									1				4		3	2		2	2b
GBNI1NB030307050	7606								1					2						2b
GBNI1NB030307095	21004				1			1						1		1	1		1	2a
GBNI1NB030307096	5645																		1	2b
GBNI1NB030307098	2629							1												2b
GBNI1NB030307106	3407																		1	2b
GBNI1NB030307108	7244													1		2				2b
GBNI1NB030307109	6171													1		1				2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NB030307112	7533																		2	2b
GBNI1NB030307116	2617												2							2b
GBNI1NB030307129	21324							1									1		1	2b
GBNI1NB030307132	13008													1		1				2b
GBNI1NB030307145	16649			1	1					1				4	4	2				2a
GBNI1NB030307170	4341													1						2b
GBNI1NB030307173	25939												1	3	2		2	1		2a
GBNI1NB030307175	22086									1				3						2a
GBNI1NB030307180	11102													1		1	1		1	2b
GBNI1NB030307182	51471													2		1				2a
GBNI1NB030307196	16053													2	1	1	2		2	2a
GBNI1NB030307238	16244															2				2b
GBNI1NB030307239	10934																		1	2b
GBNI1NB030307242	5931													1		1				2b
GBNI1NB030308088	1453													1		1				2b
GBNI1NB030308091	5497			1				1		1				1		9		1	3	2b
GBNI1NB030308093	12055																2	1	6	2a
GBNI1NB030308094	3208							1											7	2b
GBNI1NB030308100	12282												2				4		13	2a
GBNI1NB030308101	9712													1						2b
GBNI1NB030308102	6212																		2	2b
GBNI1NB030308103	17223									2	1		2	6	1	15				2a
GBNI1NB030308107	18139				1					1			2	3		4	8		8	2a
GBNI1NB030308110	20750				1					2				6		4	1		3	2a
GBNI1NB030308113	9266																1			2b
GBNI1NB030308114	13209				1					1						2	1			2b
GBNI1NB030308117	7539							1											2	2b
GBNI1NB030308118	4976													1			1		1	2b
GBNI1NB030308119	8414									2				1			3		1	2b
GBNI1NB030308120	8915												2							2b
GBNI1NB030308183	3610	1															2		5	2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NB030308184	32692													9		2	14	2	9	2a
GBNI1NB030308186	6634															1				2b
GBNI1NB030308187	15934													2		2			3	2a
GBNI1NB030308188	14564									1				1		1	1		5	2a
GBNI1NB030308189	17497							1		3				12		1				2a
GBNI1NB030308197	6816							2						11		7			1	2a
GBNI1NB060601003	7272													1						2b
GBNI1NB060601004	2649													1						2b
GBNI1NB060601005	2847							1											2	2b
GBNI1NB060601007	7371							3		1				9		5				2a
GBNI1NB060601018	10579													1		1			1	2b
GBNI1NB060601019	9721				2			1						7	1	4				2a
GBNI1NB060601020	3837																		1	2b
GBNI1NB060601021	16322															1	2		3	2b
GBNI1NB060601022	8991				1	1								1			2	1	2	2a
GBNI1NB060601024	18863													1		3	2		2	2a
GBNI1NB060601025	7053													1					5	2b
GBNI1NB060601044	13041							1						2			3	1	10	2a
GBNI1NB060602029	35502										1					1	1		2	2a
GBNI1NB060602033	925																		1	2b
GBNI1NB060602035	13221																		1	2b
GBNI1NB060602037	7874												1							2b
GBNI1NB060602038	4429															1				2b
GBNI1NB060602039	15161									1						3			3	2a
GBNI1NB060603030	742													1						2b
GBNI1NB060604009	7154																		1	2b
GBNI1NB060604011	2886																2			2b
GBNI1NB060604016	2886									1										2b
GBNI1NB060604040	7319																1		1	2b
GBNI1NB060604041	8912													1			2		3	2b
GBNI1NB060604042	7675																4		5	2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NB060604043	2519													1					2	2b
GBNI1NB060604045	27087					2								1			1	2	1	2a
GBNI1NE040402043	1306													1		1				2b
GBNI1NE040402056	438															1				2b
GBNI1NE040402057	438														1					2b
GBNI1NE040403011	4023				1															2b
GBNI1NE040403012	6716												1							2b
GBNI1NE040403014	1238													1						2b
GBNI1NE040403015	21074													1			1		8	2a
GBNI1NE040403016	12911																3		6	2a
GBNI1NE040403017	7159																1		3	2b
GBNI1NE040403018	4101														1					2b
GBNI1NE040403019	295																		2	2b
GBNI1NE040403020	2286																1		1	2b
GBNI1NE040403024	8406			1													1		2	2b
GBNI1NE040403026	8326			1															1	2b
GBNI1NE040403027	7382				2												1	1	2	2b
GBNI1NE040403028	1796			1																2b
GBNI1NE040403033	7075							1			1			2		2			1	2b
GBNI1NE040403034	2412															1	1		1	2b
GBNI1NE040403039	21352																	1		2b
GBNI1NE040403048	11824															1				2b
GBNI1NE040403060	6062	1																		2b
GBNI1NE040403061	10072	3			1												2		3	2a
GBNI1NE040403062	5657			3												1	1		1	2b
GBNI1NE040403064	2417	2		1																2b
GBNI1NE040404001	7738													1	1			1		2b
GBNI1NE040404003	3975				1															2b
GBNI1NE040404004	8147													1						2b
GBNI1NE040404035	14558													1			1		2	2b
GBNI1NE040404037	6739																2		1	2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NE040404038	6818													1			3			2b
GBNI1NE040404040	3989																	1		2b
GBNI1NE040404042	21952													1		1	1		3	2a
GBNI1NE040404049	24561													1			7	2	3	2a
GBNI1NE040404050	11592							1		1				1		2	1		1	2b
GBNI1NE040404051	13275													1			1	1	1	2b
GBNI1NE040404053	8800													1					1	2b
GBNI1NE040404055	2346									1										2b
GBNI1NE040405029	3829				1									2		1				2b
GBNI1NE040405046	10317																1		2	2b
GBNI1NE040405047	15546				4			1			1	1		9		5				2a
GBNI1NE050501004	3187				1						2									2b
GBNI1NE050501115	2084													2		3				2b
GBNI1NE050501118	6326									1				4		5				2b
GBNI1NE050501120	7426				2					1				1		2				2b
GBNI1NE050502032	3169															1				2b
GBNI1NE050502033	901									1										2b
GBNI1NE050502083	5871				1									2			1		1	2b
GBNI1NE050502084	6381													1						2b
GBNI1NE050502094	600										1									2b
GBNI1NE050503001	5877							1		2				2						2b
GBNI1NE050503002	2965							1		3			1	22	1	13				2a
GBNI1NE050503003	2617									1			1	2	2	10				2b
GBNI1NE050503046	7887										1			1						2b
GBNI1NE050503047	16404				2									1		1	1		3	2a
GBNI1NE050503048	7617													1		1	1		1	2b
GBNI1NE050503049	858															1			1	2b
GBNI1NE050503070	5951					1							1							2b
GBNI1NE050503071	4398										1									2b
GBNI1NE050503087	8296							1	2	3	1			9	4	13				2a
GBNI1NE050503088	7790				1					1				8	1	4				2a

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NE050503096	9520				1									1		1	2		2	2b
GBNI1NE050503098	16028													1		2			4	2a
GBNI1NE050503101	18770	1			1			2						8		2	1		1	2a
GBNI1NE050503102	5661										1									2b
GBNI1NE050503103	23979					2		1	1	4	1		1	2	3	5		1	3	2a
GBNI1NE050503104	2774										1			2						2b
GBNI1NE050503105	10617												1	1		1			3	2b
GBNI1NE050503106	4253				1									1						2b
GBNI1NE050503107	4835													3						2b
GBNI1NE050503108	22986				1				2	1				9	6	1				2a
GBNI1NE050503117	8771									1	1			3		2				2b
GBNI1NE050503119	5706													8		3				2b
GBNI1NE050503121	3223									3				9		7				2b
GBNI1NE050504009	8091													2		1				2b
GBNI1NE050504011	10300													4		1				2b
GBNI1NE050504020	4873				1				1		1			2	1	1				2b
GBNI1NE050504023	7262									1										2b
GBNI1NE050504050	23142													1		1	2	2		2a
GBNI1NE050504051	3262															4				2b
GBNI1NE050504053	3334										1									2b
GBNI1NE050504054	6															1				2b
GBNI1NE050504056	23949				3			1		2			1	2		7				2a
GBNI1NE050504057	21984				1					1			1	2		4	3		5	2a
GBNI1NE050504058	5435														2	1		2		2b
GBNI1NE050504064	6260													1		2				2b
GBNI1NE050504066	8994													5		1			1	2b
GBNI1NE050504074	7316							1												2b
GBNI1NE050504080	9223				1			1	1		1			7						2a
GBNI1NE050504081	9204				1						1					2				2b
GBNI1NE050504085	2915							2		1	1			7	1	3			1	2b
GBNI1NE050504086	3492													1		1				2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NE050505036	5332																		1	2b
GBNI1NE050505038	1077																		1	2b
GBNI1NE050505044	5586																1		5	2b
GBNI1NE050505052	3440												1			1			2	2b
GBNI1NE050505059	7561															1				2b
GBNI1NE050505060	5415																1		3	2b
GBNI1NE050505061	10913																1		1	2b
GBNI1NE050505063	7712				1															2b
GBNI1NE050505067	6911																3		1	2b
GBNI1NE050505068	6293																6		4	2b
GBNI1NE050505069	5716																			2b
GBNI1NE050505097	6849			1					1				1		2					2b
GBNI1NE050505099	2276				1	1														2b
GBNI1NE050505110	15756													1		1	3		1	2a
GBNI1NE050505111	10539									1						2			2	2b
GBNI1NE050505113	20704				2									2		5	3		9	2a
GBNI1NE050505114	11254													1	1			4	2	2a
GBNI1NW010101045	9523				1									2		1			1	2b
GBNI1NW010101069	14032					1								1			1	2	14	2a
GBNI1NW010101070	15925				1											1			1	2b
GBNI1NW010101071	19056										1						4	1	6	2a
GBNI1NW010101075	15825													6					1	2a
GBNI1NW010101076	5435																1	1	2	2b
GBNI1NW010101079	3034																		1	2b
GBNI1NW010102001	7282																		2	2b
GBNI1NW010102002	13908																1	1	1	2b
GBNI1NW010102005	3766				1									1						2b
GBNI1NW010102006	9852				1									3						2b
GBNI1NW010102007	4009																		2	2b
GBNI1NW010102008	12778				1			1						2					1	2b
GBNI1NW010102011	7476																1		2	2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NW010102013	1559				1									1						2b
GBNI1NW010102016	5758													1						2b
GBNI1NW010102018	18198																	1	2	2b
GBNI1NW010102019	8982													2		1				2b
GBNI1NW010102020	32903				1					1				2	1	1	5		4	2a
GBNI1NW010102021	11461													3						2b
GBNI1NW010102022	6875														1	1			1	2b
GBNI1NW010102024	8368																1		1	2b
GBNI1NW010102026	3222																4		2	2b
GBNI1NW010102027	16834													2	2		3	2	1	2a
GBNI1NW010102028	10729				1												1	2		2b
GBNI1NW010102029	7666													1			1	1		2b
GBNI1NW010102030	7178													1						2b
GBNI1NW010102031	1944														1					2b
GBNI1NW010102032	12249									1			1			1				2b
GBNI1NW010102033	27259							1						1		1	8	3	4	2a
GBNI1NW010102035	15560				1									1		1			1	2b
GBNI1NW010102036	5166																		1	2b
GBNI1NW010102039	12285					1										1				2b
GBNI1NW010102041	28903														1	1			2	2a
GBNI1NW010102043	6123																		1	2b
GBNI1NW010102044	2780													1						2b
GBNI1NW010102048	26972													1			4	2	10	2a
GBNI1NW010102050	15686															1	3		4	2a
GBNI1NW010102052	12328											1		2				1		2b
GBNI1NW010102053	11644															2				2b
GBNI1NW010102054	19760													2						2b
GBNI1NW010102056	6924																1		3	2b
GBNI1NW010102063	32096							2		1				4		6	2	1	9	2a
GBNI1NW010102065	4109																		2	2b
GBNI1NW010102066	21660																1		1	2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NW010102067	19228																1			2b
GBNI1NW010102073	39696												1	2			2		5	2a
GBNI1NW010102074	26520				1			3				1		4	4	3	1	1	1	2a
GBNI1NW010102075	14215																1		1	2b
GBNI1NW010102080	14702															1		2		2b
GBNI1NW010102081	7231																		1	2b
GBNI1NW010102082	13221																1	1	1	2b
GBNI1NW010102083	18447																2		2	2b
GBNI1NW010102085	12141																2		2	2b
GBNI1NW010102086	31222													1					4	2a
GBNI1NW010102088	8266																3		4	2b
GBNI1NW010102089	13402										1									2b
GBNI1NW010102090	15906													2			2		1	2a
GBNI1NW010102091	16004															1			1	2b
GBNI1NW010102092	11730														2		1	1	2	2b
GBNI1NW010102093	7234							2		1				8		5				2a
GBNI1NW010102094	17385													1		1	1		5	2a
GBNI1NW010102095	8486																1		5	2b
GBNI1NW010103061	8626									1				1		1				2b
GBNI1NW020201041	4927				1											2	2		4	2b
GBNI1NW020202010	11406														1			2		2b
GBNI1NW020202014	1757													1						2b
GBNI1NW020202015	10721																1	8	-1	2a
GBNI1NW020202018	25956													2		1	6	7	6	2a
GBNI1NW020202022	3209																1		1	2b
GBNI1NW020202023	23190				1	1								3	1		2	1		2a
GBNI1NW020202024	11256				2	2								1	1			2	3	2a
GBNI1NW020202032	7918																3	1	4	2b
GBNI1NW020202039	10261																		2	2b
GBNI1NW020202043	8199				1						1						1	1		2b
GBNI1NW020202044	10786																		2	2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NW020202045	19014				1									2		1	5	1	7	2a
GBNI1NW020202049	17490				1									1			2		6	2a
GBNI1NW020203027	6853													2		1		1		2b
GBNI1NW020203028	9986																1			2b
GBNI1NW020203030	13211																		2	2b
GBNI1NW020204002	1488							1						1						2b
GBNI1NW020204003	4525																1	1	1	2b
GBNI1NW020204016	1622													1			1		1	2b
GBNI1NW020204026	9824																	2	4	2b
GBNI1NW020204031	31572				9	3				1	2		1	5	2	2			8	2a
GBNI1NW020204033	32363					1								2			4	6	4	2a
GBNI1NW020204034	7622				2											1	1		1	2b
GBNI1NW020204038	17194												1				3	10	1	2a
GBNI1NW363601001	13599																	1	1	2b
GBNI1NW363601002	7919													1		1	1		1	2b
GBNI1NW363601005	7155				1									1		1				2b
GBNI1NW363601008	4696								1											2b
GBNI1NW363601009	13633																1		1	2b
GBNI1NW363601032	8156										1									2b
GBNI1NW363601033	4919																		1	2b
GBNI1NW363601036	12466																		1	2b
GBNI1NW363601037	8278												1						1	2b
GBNI1NW363601040	15448															1				2b
GBNI1NW363601041	12096									2						1	4		7	2a
GBNI1NW363601042	17079									1				2						2b
GBNI1NW363601045	14630															1	3	1	6	2a
GBNI1NW363601046	14933													1						2b
GBNI1NW363601047	5143												1							2b
GBNI1NW363601048	7815									1				1	1	1				2b
GBNI1NW363601049	12173													2						2b
GBNI1NW363601053	10514												1							2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NW363601057	6855					1														2b
GBNI1NW363601058	33273																		2	2b
GBNI1NW363601059	14431				1															2b
GBNI1NW363601060	16187																1		1	2b
GBNI1NW363601071	9241									1										2b
GBNI1NW363601072	1516													2	1					2b
GBNI1NW363601077	3760															1				2b
GBNI1NW363601078	14067																1	1		2b
GBNI1NW363602016	8746																		1	2b
GBNI1NW363602017	6350													1		1				2b
GBNI1NW363602018	35753													3		1			1	2a
GBNI1NW363602019	5278													1						2b
GBNI1NW363602022	13023													2						2b
GBNI1NW363602024	19615										1									2b
GBNI1NW363602028	9830																		1	2b
GBNI1NW363602035	5339									2										2b
GBNI1NW363602038	11417															3	1		1	2b
GBNI1NW363602039	7311									3				1		2				2b
GBNI1NW363602051	7665				1												2		1	2b
GBNI1NW363602052	7192																		1	2b
GBNI1NW363602061	11638																1		1	2b
GBNI1NW363602063	29960													1		3			2	2a
GBNI1NW363602066	28374													1		1				2b
GBNI1NW363602067	14056												4							2b
GBNI1NW363602068	7116										1									2b
GBNI1NW363602069	36670				1			1						1						2a
GBNI1NW363602082	11639													1						2b
GBNI1NW363602083	7575												1							2b
GBNI1NW363602085	20311													2		1				2b
GBNI1NW363602086	15838													1						2b
GBNI1NW393901001	7716									1				2		1			2	2b

River water body ID	River length (m)	Abandoned mines			Industrial Discharge Consents			Oil depots			Industrial Pollution Controls			High risk potentially polluting activities			Part IIa consents			Risk Category
Zones (km)[1]		≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	≤0.25	0.25 – 1 high	0.25 – 1 not high	
GBNI1NW404001001	1016													1						2b

[1] *0.25-1 high* identifies those point sources within the 0.25 to 1 km buffer for which there is continuous high potential groundwater interaction geology between river and point source

0.25-1 not high identifies those point sources within the 0.25 to 1 km buffer for which there is not continuous high potential groundwater interaction geology between river and point source