

RIVER BASIN MONITORING PLAN

WATER FRAMEWORK DIRECTIVE 1ST CYCLE CLASSIFICATION SUMMARY

2009-2015

Transitional Water Body– Roe Estuary

31/05/2015

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ROE ESTUARY TRANSITIONAL WATER

Water body Information

- River Basin District: North Western
- Water body type: Transitional Water 2 (TW2)
- Water body Code: UKGBNI5NW/250020
- Water body characteristics: Partly mixed/stratified, mesotidal, sand and mud, mesohaline
- Water body area: 2.56 km²
- Heavily Modified Water Body: No
- 2015 Classification Objective: Good

FINAL CLASSIFICATION	MODERATE	PASS/FAIL 2015 OBJECTIVE	FAIL
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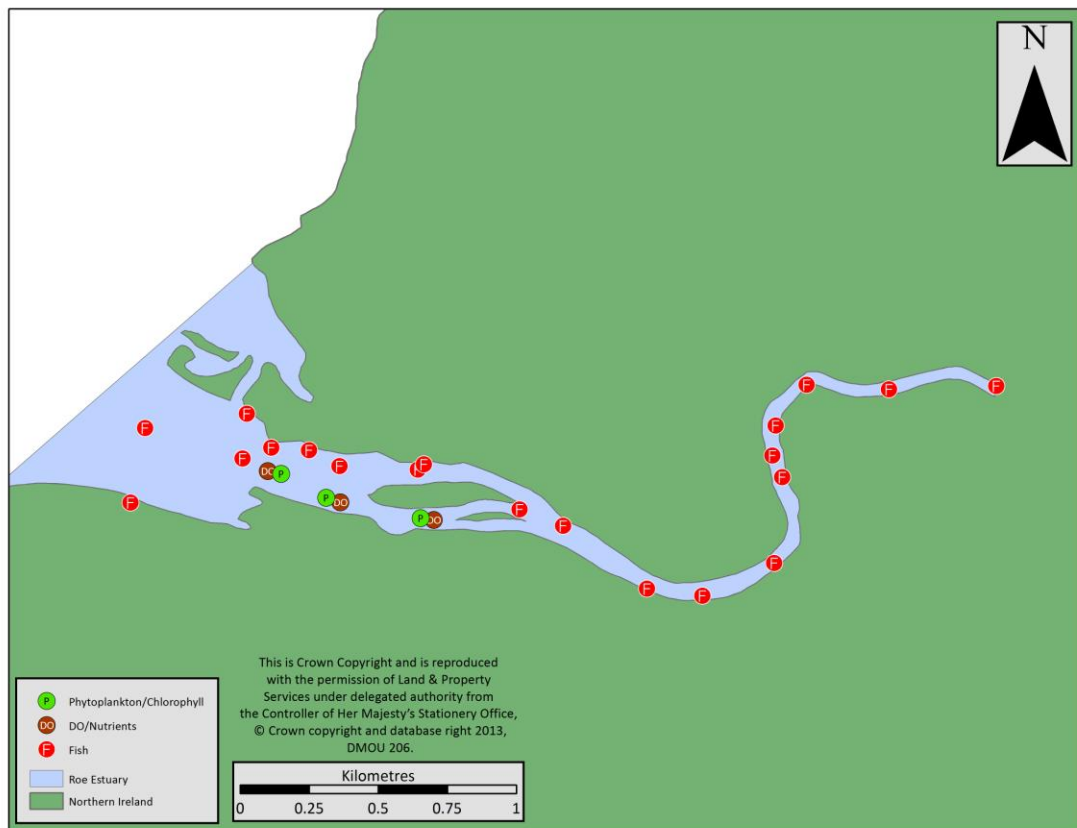


Figure 1 Map of water quality pressures and monitoring sites within the River Roe (Transitional Water).

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Table 1: Parameters for which classification systems are available and have been used in this round of classification. Some biological assessment tools are not suitable for all water bodies due to habitat type.

Ecological Quality Element			
<i>Main Element</i>	<i>Sub-Element</i>	<i>Applied</i>	<i>Comment</i>
Phytoplankton	Chlorophyll Biomass Index	✓	
	Elevated Taxa Count Index	✓	
Macroalgae	Opportunistic Macroalgae	✓	Visual Inspection confirmed <5% coverage; default to HIGH classification
Benthic Invertebrates	Infaunal Quality Index	☒	Tool Under Development: not signed off for transitional waters
Fish	Transitional Fish Classification Index	✓	
Physico-Chemical	General Conditions		
	-Dissolved Oxygen	✓	
	-Nutrients	✓	
	Specific Pollutants (Annex VIII subs)	☒	
Hydromorphological Quality Elements	SEPA Rapid Designation	✓	
	TraC MIMAS	✓	
Chemical Status			
Priority Hazardous Substances (Annex X)	Annex X Substances	☒	

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Table 2: Sampling frequency for each quality element.

Monitoring Level: *Surveillance*

Quality Elements		Data years contributing to classification	No. of sites/samples
Phytoplankton	Chlorophyll Biomass Index	2010-2014	3 sites 62 samples
	Elevated Taxa Count Index	2011-2014	3 sites 64 samples
Fish	Transitional Fish Classification Index	2014	20 samples
Physio-chemical			
Nutrients		2010-2015	3 sites 49 samples
Dissolved Oxygen		2010, 2012-2015	84 daily averages
Specific polluting substances (Annex VIII)		n/a	
Hydromorphology		2007	
Water chemistry (Annex X)			
Priority hazardous substances		n/a	

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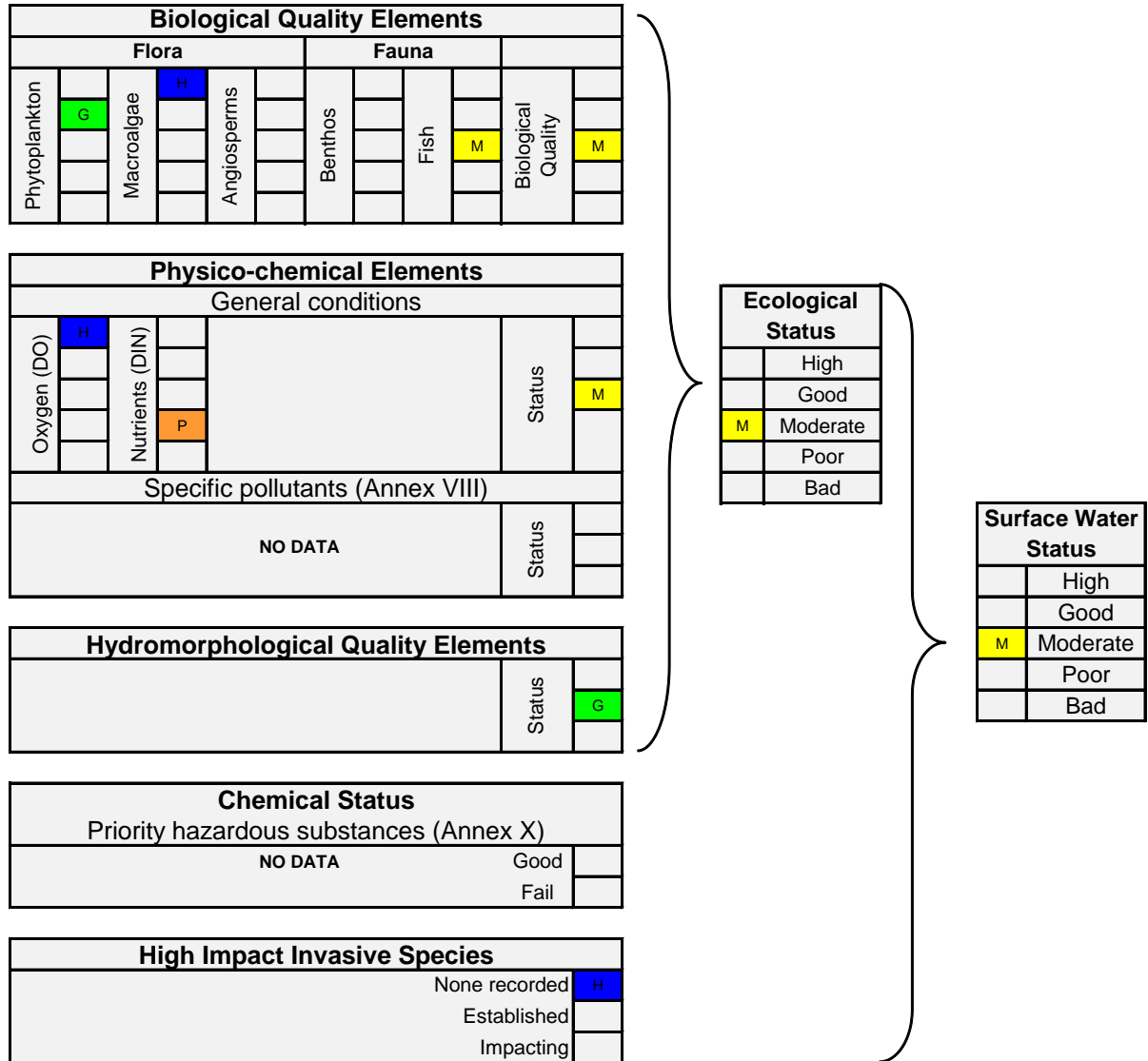


Figure 2 Overall classification of Roe Estuary (Transitional Waterbody)

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ANNEX A: Classification of Biological Quality Elements

QE: Phytoplankton

Waterbody Phytoplankton Classification (data confidence):	Good (92.0%)	
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Classification metrics:

1. Chlorophyll biomass index , Transitional Waters.
2. Elevated taxa count index:

1. Chlorophyll Biomass Index

Data store (classification): [M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015 Elevated Count Classification Update \(08-13 data\)\Transitionals\ROE classification 2015.XLS](M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015 Elevated Count Classification Update (08-13 data)\Transitionals\ROE classification 2015.XLS)

<M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\transitional data\TRANSITIONAL CHLOROPHYLL ROE.xls>

Data Availability (spot & continuous samples): Spot samples –2009-2014 NIEA/MD

Thresholds:

		High	Good	<i>EA Proposed Transitional Boundaries</i> Moderate	Poor	Bad
10 (5 submetrics for each zone) (2 salinity zones present) 1-25psu & >25-35psu	Face Value (passes)	9	7	5	3	<3
	EQR	0.9	0.7	0.5	0.3	0
5 (only 1salinity zone present)	Face Value (passes)	4	3	2	1	0
	EQR	0.8	0.6	0.4	0.2	0

Results:

EQR	Status	Data Years	No. of Sites	No. of Samples	Data Confidence
0.8	HIGH	2010-2014	3	62	High (50.8%)

Data confidence:

Data analysed for Confidence of Class using CUTLASSV1.8
<M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015TW Phytoplankton CofC tool CUTLASS v1.8 UKTAG.xls>

Data confidence for High: 50.8%, but 48.0% for Good.

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2. Elevated Taxa Count Index

Waterbody Elevated Taxa Assessment

Thresholds:

Tool	Thresholds	
	North/Irish Sea	Atlantic
I ₁ - Individual Species Count%	500,000 (cells l ⁻¹)	
I ₂ - Total Taxa Count%	10 ⁶ (cells l ⁻¹)	

EQR Boundaries:

% exceedances (Face value range)	Metric range (0-1)	Class
0 - <10	≥0.8 - 1.0	High
≥10 - < 20	≥0.6 - < 0.8	Good
≥20 - < 40	≥0.4 - < 0.6	Moderate
≥40 - <60	≥0.2 - < 0.4	Poor
≥60 - 100	≥0 - < 0.2	Bad

Results (% Exceedence)

I ₁	I ₂	EQR	Status	Data Years	No. of Julian months	No. of phytoplankton samples	Data confidence
32.8%	23.4%	0.52	Moderate	2011-2014	21	64	98.8%

3. Combined Chlorophyll and Elevated Count Tool for Waterbody

Good (92%)

4. Presence of High impact Species.

Karenia mikimotoi

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QE: Macroalgae

QE macroalgal assessment (+ data confidence):	HIGH (L)	
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Classification tools:

1. Reduced species list (RSL) Not applicable.
2. Macroalgal Blooming Tool (MBT).

MBT assessment: HIGH (Low)

- WFD surveillance monitoring: 2009
- Data Store: <..\..\..\Algae\algae images\Macrophytes\Survey Site Images\OGA site photos\Roe Estuary>
- Data Availability Visual Inspection

Boundaries:

Parameters	Quality Status	High	Good	Moderate	Poor	Bad
	Sub-metric EQR	$\geq 0.8 - 1.0$	$\geq 0.6 - 0.8$	$\geq 0.4 - 0.6$	$\geq 0.2 - 0.4$	$0.0 - 0.2$
Available Intertidal Habitat (AIH) %		0 – 5	5 – 15	15 – 25	25 – 75	75 – 100
Affected Area (ha)		0 – 10	10 – 50	50 – 100	100 – 1000	1000 – 2000
Biomass of AIH (g m ²)		0 – 100	100 – 500	500 – 1000	1000 – 3000	3000 - 6000
Biomass of affected area (g m ²)		0 – 100	100 – 500	500 – 1000	1000 – 3000	3000 - 6000
Presence of entrained algae (% of quadrats)		0 – 1	1 – 5	5 – 20	20 – 50	50 – 100

Results:

Year	Sub-metric EQR					Mean EQR	Status
	% cover of AIH	Affected Area	Biomass of AIH	Biomass of affected area	Entrained algae		
2009	<5%						HIGH
					Mean		

Data Confidence:

Low

- On classification boundary.
- Visual assessment carried out over intertidal area, if less than 5% cover no further survey required and shore classified as HIGH.
- Intertidal area assessed over two years.
- Satellite imagery or aerial photography may need to be considered to improve data confidence.

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QE: Transitional Fish

QE: Transitional fish assessment (+ Data confidence):	MODERATE (93%)	
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Classification tools: Transitional Fish Classification Index (TFCI)

Data store:

- **Fish:** <..\..\FISH\DATA\WFDClassification\TFCI\TFCI 2014\TFCI 2014 Analysis.xlsx>
- **Supporting Parameters:** [Chemistry](#)

Data Availability:

- WFD surveillance monitoring 2005-2014; one survey in 2005, two surveys per annum from 2006 to 2011, one (autumn) survey in 2012, 2013 and 2014. Sampling methods include seine net, fyke net, and beam trawl.

EQR boundaries:

	Bad	Poor	Moderate	Good	High
EQR	<0.2	≥0.2; < 0.4	≥0.4; <0.6	≥0.6; < 0.8	≥0.8

Results:

Transitional Fish Classification Index (TFCI) – 2014 data

Metric Number	Metric	Score
1	Species composition	3
2	Presence of Indicator species	2
3	Species relative abundance	3
4	No. of taxa making up 90% of the abundance	3
5	No. of estuarine resident taxa	3
6	No. of estuarine-dependent marine taxa	2
7	Functional guild composition	4
8	No. of benthic invertebrate feeding taxa	2
9	No. of piscivorous taxa	3
10	Feeding guild composition	4
	TFCI	29
	EQR	0.48

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Fish cont'd

Percent Confidence of Class (bias corrected bootstrap method)

Bad	Poor	Moderate	Good	High
0.0	7.1	92.9	0.0	0.0

Data confidence: High

- Survey methodologies and protocols (High)
- Realistic type-specific reference conditions (Medium)
- Data QA (High)
- Statistical testing and intercalibration (High)

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ANNEX B: Classification of physico-chemical quality elements

QE: Dissolved Oxygen

QE Dissolved oxygen (+ data confidence):	HIGH (99%)	
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Classification tools: Comparison of 5% ile against reference standards

- Data Store: [...\.DO Classification 2012\Shortcut to DO FIELD VALUES 2006 - 2010.lnk](#)
- Data Availability: 2010, 2012-15
- Data Availability (spot & continuous samples): Spot

Thresholds:

WFD Status	Marine 5%ile	Objectives
HIGH	≥5.7 mg/L	All life stages of salmonids and transitional fish
GOOD	≥4.0 <5.7 mg/L	Presence of salmonids and transitional fish
MODERATE	≥2.4 <4.0 mg/L	Most life stages of non-salmonid adults
POOR	≥1.6 <2.4 mg/L	Presence of non-salmonids, poor survival of salmonids
BAD	<1.6 mg/L	No salmonids present, marginal survival of resident species

Results:

5% ile DO (mg/L)	Status	Data years	Data Quality	No. of daily averages	Data Coverage (proportion of possible months with data*)
7.80	HIGH	2010,2012-15	**	84	

* Proportion of possible months for which data are available

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QE: Nutrients - N regulation

QE N regulation assessment (+ Data confidence):	POOR (54%)	
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- Data store: [..\Transitional WB inc AFBI 15.xls](#)
- Data Availability: 2010-15
DIN & salinity (Nov to Feb)
- Data Availability (spot & continuous samples): spot

N regulation thresholds:

Area	Salinity range	DIN (uM) Winter mean H/G	DIN (uM) Winter mean G/M	DIN (uM) Winter mean M/P
Transitional (at salinity 25)	5-25	20-30	30-45	45-67.5

Results:

Mean Winter DIN (uM) (normalised to salinity 25)	Winter DIN Daily average (n)	No. of samples (n)	No. of sites	Data Years	Data Quality	Status
57.02*		49	3	2010-15	Database not yet QA'd	POOR

* Average DIN used as r^2 value of regression model is less than 0.75


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**ANNEX C: Classification of physico-chemical quality elements: Other specific
Pollutants**

Specific pollutants assessment (+data confidence)	NO DATA	
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Classification tools: Comparison with EQS levels.

Data availability: No Data

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ANNEX D: Hydromorphological quality elements

Overall hydromorphology assessment	gH	
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Classification tools:

1. TRaC Hydromorphology metrics
2. MIMAS

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ANNEX E: Chemical Status – Annex X Chemicals

Priority hazardous substances (+data confidence)	NO DATA	
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Classification tools: Comparison with EQS levels.

Annex X: Overall Compliance	No Data
Annex X: Pass/Fail	No Data

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ANNEX F: Protected Areas

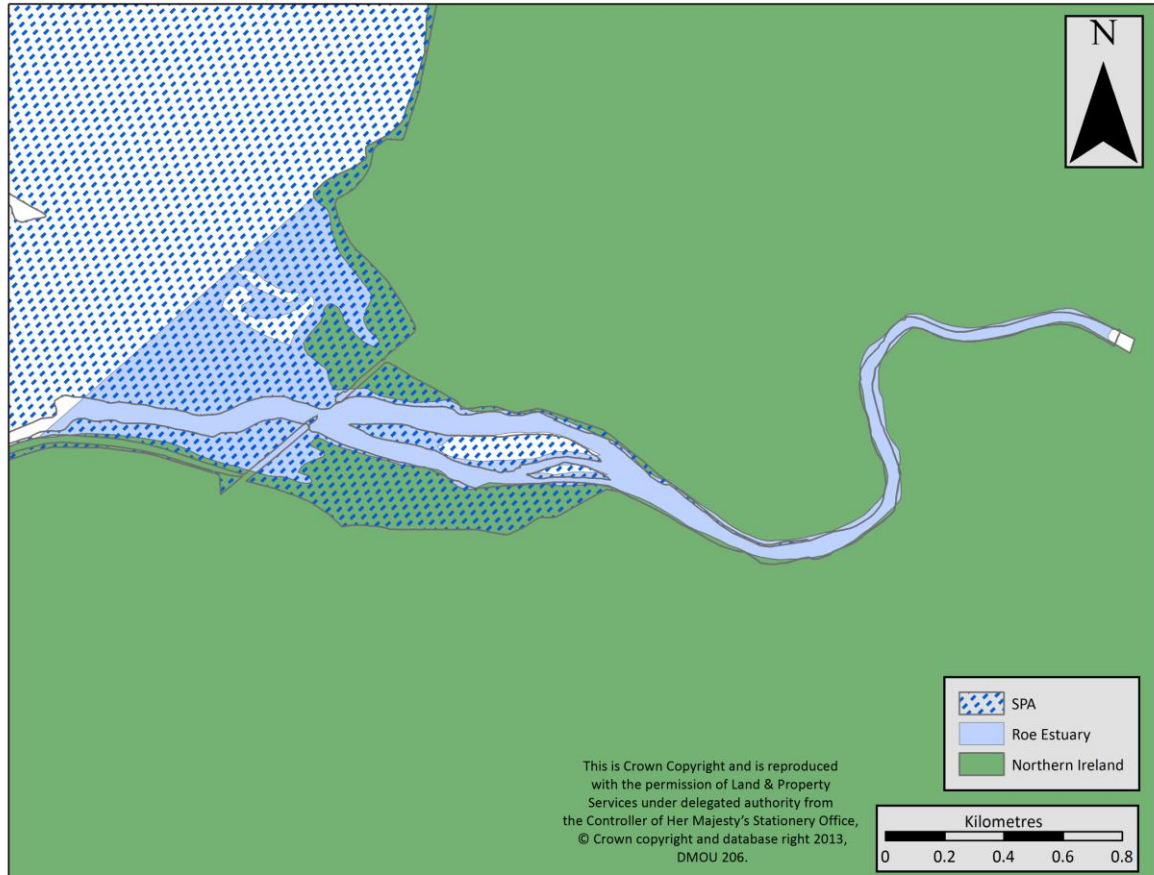


Figure 3 Map of Protected Areas within River Roe (Transitional Water).

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The following Protected Areas are situated either wholly or partly within the Roe Estuary transitional water body:

Natura 2000 sites (Habitats Directive and Birds Directive):

Site Name	2014 Condition Status	Designated Water Dependant habitat/species	Feature(s) not meeting objective	Reason for not meeting objective
Lough Foyle SPA	Favourable	Bar tailed godwit; Bewick's swan; Golden plover; Light bellied brent goose; water bird assemblage	None	n/a

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ANNEX G: High Impact Invasive Species

QE High Impact Invasive Species assessment	HIGH
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Ecoregion 17 Marine High Impact Invasive Species List

Phylum	Species	P	E	I	Record
Chordata	<i>Didemnum</i> spp.				
Chordata	<i>Styela clava</i>				
Crustacea	<i>Eriocheir sinensis</i>				
Mollusca	<i>Crassostrea gigas</i>				
Mollusca	<i>Crepidula fornicata</i>				
Phaeophyceae	<i>Sargassum muticum</i>				
Angiosperms	<i>Spartina anglica</i>				

P= Present; E= Established; I= Impacting

NB Established populations of high impact species automatically downgrade overall surface water classification from 'high' to 'good'.

Record should be inputted as follows. PO= personal observation outside of surveys; W= WFD survey; M= museum / institute records.

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GLOSSARY

AFBI	Agri-Food and Biosciences Institute (under contract to NIEA)
AMBI	AZTI Marine Biotic Index
Annex X	Annex 10 Priority Hazardous Substances
Annex VIII	Annex 8 Specific Pollutants
Article 5	Characterisation, typology, pressures and impacts analysis
ASSI	Area of Special Scientific Interest
DIN	Dissolved Inorganic Nitrogen
DO	Dissolved Oxygen
EQR	Ecological Quality Ratio
EQS	Ecological Quality Status
EUNIS	European Nature Information System
FSL	Full Species List
GEP	Good Ecological Potential
gH	Good/High status
H/G/M/P/B	High/Good/Moderate/Poor/Bad (Classification Status)
H/M/L	High/Medium/Low (Confidence)
HMWB	Heavily Modified Water Body
IQI	Infaunal Quality Index
IRBD	International River Basin District
LOD	Limit of Detection
MBT	Macroalgal Blooming Tool
MEP	Moderate Ecological Potential
NB	Neagh Bann
ND	No data
NE	North Eastern
NEAGIG	North Eastern Atlantic Geographical Intercalibration Group
NIEA	Northern Ireland Environment Agency
N-regs	Nitrogen Regulation
NVZ	Nitrate Vulnerable Zone
NW	North Western
Physico-chem	Physical and chemical monitoring
RSL	Reduced Species List
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SPA	Special Protected Area
TNA	Tool Not Applicable
TraC MImAS	Transitional and Coastal Morphology Impact Assessment System
TUD	Tool Under Development
UKAS	United Kingdom Accreditation Service
UKTAG	United Kingdom Technical Advisory Group for Water Framework Directive
UNICORN	Database for marine organisms.
UWWTD	Urban Waste Water Treatment Directive (91/271/EEC)
VDSI	Vas Deferens Sequence Index
WFD	Water Framework Directive
WWTW	Waste water treatment works