RIVER BASIN MONITORING PLAN

WATER FRAMEWORK DIRECTIVE 2ND CYCLE CLASSIFICATION SUMMARY

2015-2021

Transitional Heavily Modified Water Body – Bann Estuary

31/05/2015

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RIVER BASIN MANAGEMENT PLAN		
Department of the Environment www.doeni.gov.uk Marine Environment Division	**WFD TRANSITIONAL WATER BODY CLASSIFICATION** Bann Estuary	
	Version Date:	31/05/2015
	MONITORING AND ASSESSMENT TEAM	

BANN ESTUARY (TRANSITIONAL WATER)

Water body Information

- River Basin District: North Eastern
- Water body type: Transitional Water 2 (TW2)
- Water body code: UKGBNI5NB10010
- Water body characteristics: Partly mixed/stratified, mesotidal, sand and mud, mesohaline
- Water body area: 2.50 km^2
- Heavily Modified Water Body: Yes
- 2021 Classification Objective: Moderate Ecological Potential

2015 CLASSIFICATION	POOR ECOLOGICAL POTENTIAL	*PASS/FAIL 2021 OBJECTIVE*	**FAIL**

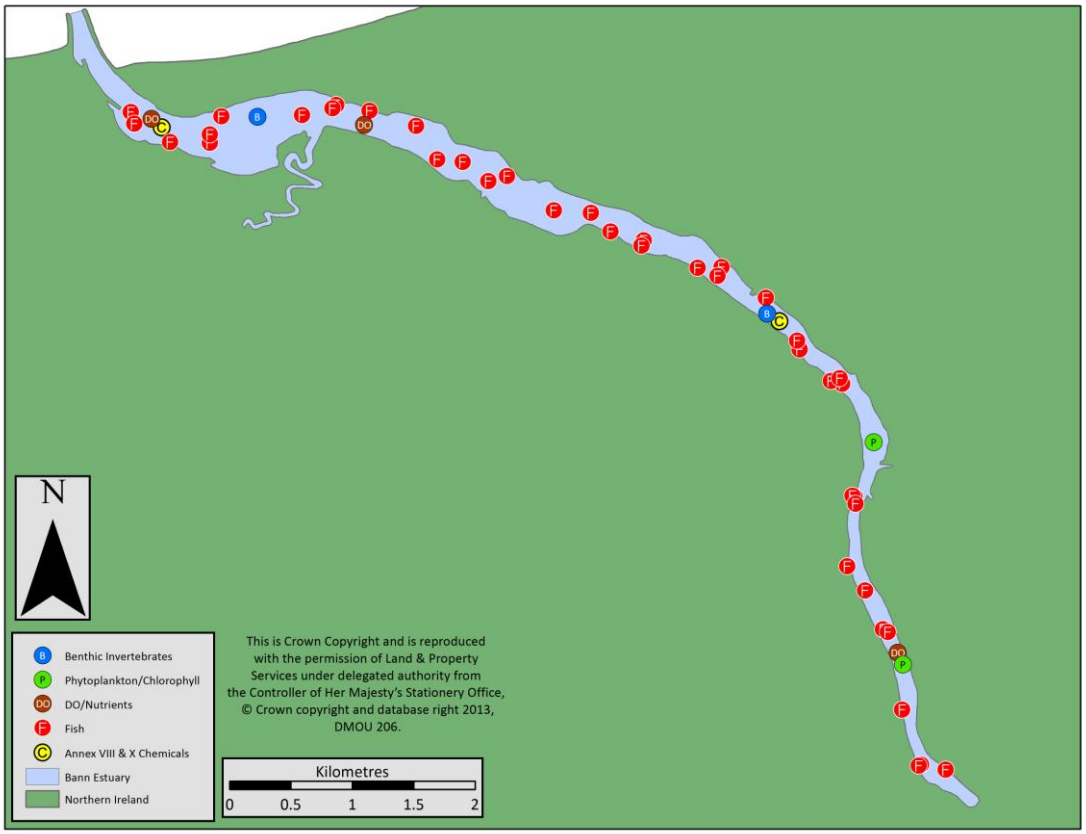

Figure 1: Waste water treatment pressures and monitoring points within Bann Estuary (Transitional Water).

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			
Main Element	***Sub-Element***	***Applied***	***Comment***
Phytoplankton	Chlorophyll Biomass Index	✓	
	Elevated Taxa Count Index	✓	
Fish	Transitional Fish Classification Index	✓	
Physico-Chemical (waters)	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	✓	

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	2009-2014	6 sites 97 samples
	Elevated Taxa Count Index	2011-2014	66 samples
Fish	Transitional Fish Classification Index	2014	40 sites
Physio-chemical			
Nutrients		2011-2013	3 sites 33 samples
Dissolved Oxygen		2000-8	23 daily averages
Specific polluting substances (Annex VIII)		2010-2014	
Hydromorphology		2007	
Priority hazardous substances (Annex X)		2010-2014	

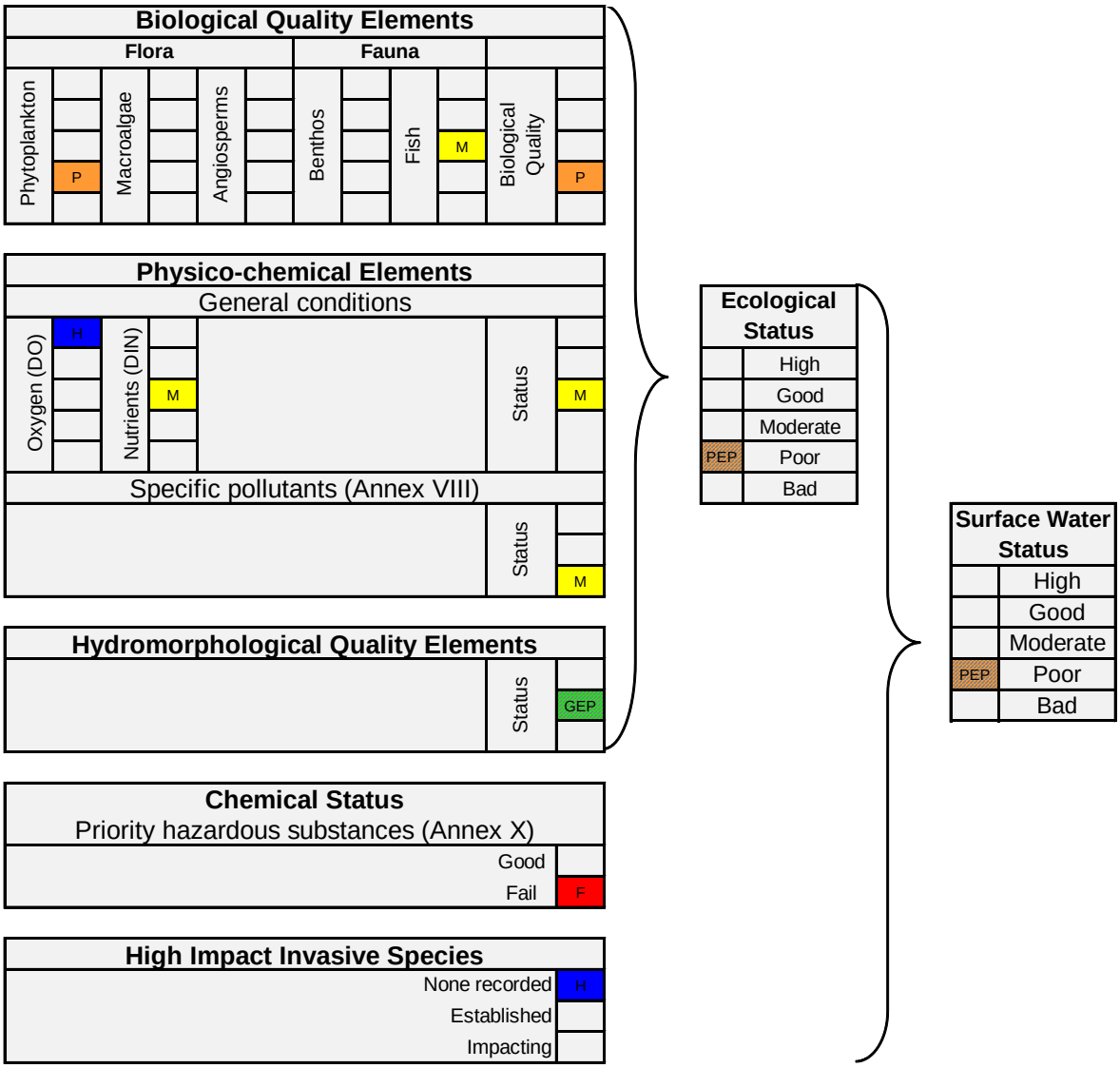

Figure 2: Overall classification of Bann Estuary (Transitional Water).

ANNEX A: Classification of Biological Quality Elements

QE: Phytoplankton

QE Phytoplankton assessment (+data confidence):	POOR (92.9%)	

Classification metrics:

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

1. Chlorophyll Biomass Index

Data store (classification): ..\transitional data\TRANSITIONAL CHLOROPHYLL BANN Copy.xls
M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015 Elevated Count Classification Update (08-13 data)\Transitionals\BANN classification 2015 - Copy.XLS

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

Thresholds:

				EA Proposed Transitional Boundaries		
		High	Good	Moderate	Poor	Bad
10 (5 submetrics for each zone) (2 salinity zones present) 1-25psu & >25-35psu	Face Value (passes)	9	7	5	3	<2
	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
0.4	**Moderate**	2009-2014	6	97	10.6%

Data confidence:
Data analysed for Confidence of Class using CUTLASS
M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015TW_Phytoplankton_CofC_tool_CUTLASS_v1.8_UKTAG.xls

Data Confidence low for moderate – 10.6% but 81.5% for poor.

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 (% Exceedance)

I_1	I_2	EQR	Status	Data Years	No. of Julian months	No. of phytoplankton samples	Data confidence
59.7%	44.8%	0.270	Poor	2011-2014	23	66	95.4%

3. Combined Chlorophyll and Elevated Count Tool for Waterbody

Poor (92.9%)

4. Presence of High impact Species.

None

QE: Macroalgae – tool not applicable/ tool under development

QE Angiosperms – tool not applicable

QE: Benthic Invertebrates

QE Benthic Invertebrate assessment (+data confidence):	TUD (Low)	

Classification tools: 1. Infaunal Quality Index (IQI)

1. IQI (UKTAG v01 20140228)

Water body IQI assessment: **Poor TUD (Low)**

WFD surveillance monitoring:

- **Data store:..\Bann River\bann river water body 08-13 0_5mm fauna data.xlsx**
- **Benthic invertebrates** UNICORN (NMMT) Database
- **Supporting Parameters** Water Quality Data Set
- **Digital images** AMAP Project folder
- **Data Availability (classification):** 1 sites, 5 reps, 4 years, Day Grab, 0.5 mm sieve, n=20.

Boundaries (Intercalibrated NEAGIG):

Class	Bad	Poor	Moderate	Good	High
IQI	>0.0 ≤0.24	≥0.24 <0.44	≥0.44 <0.64	≥0.64 <0.75	≥0.75

Results:

Year	Survey	Station	n	Annual Mean	Annual ± S.D	Status
2010	MM-Benthos	BR3 (5)	5	0.33	0.03	Poor
2011	MM-Benthos	BR3 (5)	5	0.33	0.05	Poor
2012	MM-Benthos	BR3 (5)	5	0.30	0.05	Poor
2013	MM-Benthos	BR3 (5)	5	0.39	0.04	Poor
2014	MM-Benthos	BR3 (5)	-	-	-	-
2015	MM-Benthos	BR3 (5)	-	-	-	-
Overall 6 year waterbody means			**5.0**	**0.34 (0.30*)**	**0.04**	**Poor (TUD)**

TUD – Tool Under development: IQI not signed off for transitional waters therefore benthic classification does not contribute to overall ecological classification.

* IQI derived from data averaged minus Standard Deviation (see issues with tools paper). This figure is used for classification.

Data confidence: **Low**

- Sample analysis QA'd through NMBAQC (Good)
- Database QA'd (Good)
- No specific WFD data (single point with reps)

QE: Transitional Fish

QE transitional fish assessment (+ Data confidence):	**MODERATE (57%)**	

Classification tools: Estuarine Multi-metric Fish Index (EMFI)
Data store:

- **Fish**: ..\..\..\..\FISH\DATA\WFDClassification\EMFIclass\EMFIii2014TH\EMFI 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	<0.10	≥0.10; < 0.35	≥0.35; <0.65	≥0.66; < 0.92	≥0.92

Results:
Estuarine Multi-metric Fish Index (EMFI) – 2014 data

Metric Number	Metric	Score
1	Species richness	5
2	Number of introduced species	3
3	Species composition	5
4	Species abundance	3
5	Dominance	3
6	Number of diadromous species	3
7	Estuarine species richness	4
8	Marine migrant species richness	4
9	Estuarine species abundance	4
10	Marine migrant species abundance	3
11	Zoobenthivore species richness	5
12	Piscivore species richness	3
13	Zoobenthivore abundance	3
14	Piscivore abundance	2
	EMFI	50
	EQR	0.64

Fish cont'd

Percent Confidence of Class (bias corrected bootstrap method)

Bad	Poor	Moderate	Good	High
0.0	0.0	56.7	43.3	0.0

Data confidence: High

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

ANNEX B: Classification of physico-chemical Quality Elements: General

QE: Dissolved Oxygen

QE Dissolved oxygen (+ data confidence):	HIGH (M)	

Classification tools: Comparison of 5% ile against reference standards

- **Data Store:** ..\..\DO Classification 2012\Shortcut to DO FIELD VALUES 2006 -2010.lnk
- **Data Availability:** 2006 – 2015.
- **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*)
7.11	HIGH	2006-15 #	**		

***** Proportion of possible months for which data are available

2006 data retained as very limited data available for 2009

QE: Nutrients – N regulation

QE N regulation assessment (+ Data confidence):	**MODERATE (88%)**	

- **Data Store:** ..\Transitional DIN 2015-2021.xls
- **Data Availability:** 2011 to 2013
  DIN (Nov to Feb)
- **Data Source (spot & continuous samples):** spot

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
43.08*	6	33	3	2011 - 2013	Database not yet QA'd	MODERATE

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

ANNEX C: Classification of physico-chemical quality elements: Specific Pollutants (Annex VIII)

Specific pollutants assessment (+data confidence)	MODERATE	

Classification tools: Comparison with EQS levels.

Data assessed for 2013 Update:

Specific Pollutants

Suite	Parameter	Data Availability
Trace Metals	Chromium	CSEG 2012
Trace Metals	Iron	CSEG 2012
Trace Metals	Copper	CSEG 2012
Trace Metals	Zinc	CSEG 2012
Trace Metals	Arsenic	CSEG 2012
Trace Organics (OPONS)	Dimethoate	SEP 2010 – JUNE 2011
Trace Organics (OPONS)	Diazinon	SEP 2010 – JUNE 2011
Trace Organics (OPONS)	Fenitrothion	SEP 2010 – JUNE 2011
Urea Herbicides	Linuron	OCT 2011 – JUNE2012
Nutrients (Winter Nutrients)	Unionised Ammonia (at pH8)	WIN NUTS 2012-2013
Candidate Specific pollutant	Glyphosate	NOV 2012 – APR 2013

Other Pollutants – DSD list 2 (with existing EQS)

Suite	Parameter	Data Availability
Trace Metals (DSD list 2)	Vanadium	CSEG 2012
Trace Organics (OPONS)	Mevinphos	SEP 2010 – JUNE 2011
Trace Organics (OPONS)	Triazaphos*	SEP 2010 – JUNE 2011
Trace Organics (OPONS)	Dichlorvos	SEP 2010 – JUNE 2011

Triazaphos* LOD above the EQS.

Link to Data, Assessment and EQSs

G:\MARINE\Water Framework Directive\WFD ANNUAL CLASSIFCATION UPDATE 2013\Chemistry

Data assessed for 2014 Update:

Suite	Parameter	Data Availability
Trace Metals	Chromium	CSEG 2013
Trace Metals	Iron	CSEG 2013
Trace Metals	Copper	CSEG 2013
Trace Metals	Zinc	CSEG 2013
Trace Metals	Arsenic	CSEG 2013

Other Pollutants – DSD list 2 (with existing EQS)

Suite	Parameter	Data Availability
Trace Metals (DSD list 2)	Vanadium	CSEG 2013
Trace Metals (DSD list 2)	Boron	CSEG 2013

EQS failures

Link to Data, Assessment and EQSs

..\..\Data

Data assessed for 2015 Update:

Suite	Parameter	Data Availability
Trace Organics	Permethrin	June 2013 – June 2014
Trace Organics	Cypermethrin	June 2013 – June 2014
Trace Organics	Toluene	Nov 2013 – Sept 2014
Trace Organics	Xylene	Nov 2013 – Sept 2014
Trace Metals	Chromium	Sept 2014 – Dec 2014
Trace Metals	Iron	Sept 2014 – Dec 2014
Trace Metals	Copper	Sept 2014 – Dec 2014
Trace Metals	Zinc	Sept 2014 – Dec 2014
Trace Metals	Arsenic	Sept 2014 – Dec 2014

Other Pollutants – DSD list 2 (with existing EQS)

Suite	Parameter	Data Availability
Trace Metals (DSD list 2)	Vanadium	Sept 2014 – Dec 2014

EQS failures

Cypermethrin

Link to Data, Assessment and EQSs

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ANNEX D: Hydromorphological quality elements

Overall hydromorphology assessment	**HMWB-GEP**	

Classification tools:

1. TRaC Hydromorphology metrics
2. MIMAS

Alternative approach assessment (CIS guidance 2006): Good Ecological Potential

ANNEX E: Chemical Status – Annex X Chemicals

Priority Hazardous substances assessment (+data confidence)	**FAIL**	

Classification tools: Comparison with EQS levels.

Annex X: Overall Compliance	**Fail**
Annex X: Pass/Fail	**Fail**

Data Assessed for 2013 Update:

Suite	Parameter	Data Availability
Trace Metals	Nickel	CSEG 2012
Trace Metals	Cadmium	CSEG 2012
Trace Metals	Lead	CSEG 2012
Trace Metals	Mercury	CSEG 2012
Trace Organics (OPONS	Atrazine	SEP 2010 – JUNE 2011
Trace Organics (OPONS)	Chlorfenvinphos	SEP 2010 – JUNE 2011
Trace Organics (OPONS)	Chlorpyrifos	SEP 2010 – JUNE 2011
Trace Organics (OPONS)	Simazine	SEP 2010 – JUNE 2011
Urea Herbicides	Isoproturon	OCT 2011 – JUN 2012
Urea Herbicides	Diuron	OCT 2011 – JUN 2012
PAH	Anthracene	SEP 10 – JUN 11
PAH	Fluoranthene	SEP 10 – JUN 11
PAH	Naphthalene	SEP 10 – JUN 11
PAH	Benzo (a) pyrene	SEP 10 – JUN 11
PAH	*Benzo(b)fluoranthene	SEP 10 – JUN 11
PAH	*Benzo(k)fluoranthene	SEP 10 – JUN 11
PAH	*Benzo(g,h,i)perylene	SEP 10 – JUN 11
PAH	*Indeno(1,2,3 cd) pyrene	SEP 10 – JUN 11

*AA - EQS = Sum of Benzo(b)fluoranthene and Benzo(k)fluoranthene = 0.03ug/l (No Marine MAC – EQS)

*AA - EQS = Sum of Benzo(g,h,i)perylene and Indeno(1,2,3 cd) pyrene = 0.002ug/l (No Marine MAC – EQS)

Link to Data, Assessment and EQSs

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Data Assessed for 2014 Update:

Suite	Parameter	Data Availability
Trace Metals	Nickel	CSEG 2013
Trace Metals	Cadmium	CSEG 2013
Trace Metals	Lead	CSEG 2013
Trace Metals	Mercury	CSEG 2013

No EQS failures

Link to Data, Assessment and EQSs

..\..\Data

Data Assessed for 2015 Update:

Suite	Parameter	Data Availability
Trace Metals	Nickel	Sep 2014 – Dec 2014
Trace Metals	Cadmium	Sep 2014 – Dec 2014
Trace Metals	Lead	Sep 2014 – Dec 2014
Trace Metals	Mercury	Sep 2014 – Dec 2014
Trace Organics	Benzene	Nov 2013 – Sept 2014
Trace Organics	Nonylphenol	April 2014 – Dec 2014
Trace Organics	Octylphenol	April 2014 – Dec 2014
Pesticides	Pentachlorobenzene	April 2014 – Dec 2014
Pesticides	Trifluralin	April 2014 – Dec 2014
Pesticides	HCH	April 2014 – Dec 2014
Pesticides	Hexachlorobenzene	April 2014 – Dec 2014
Pesticides	Alachlor	April 2014 – Dec 2014
Pesticides	Cyclodienes	April 2014 – Dec 2014
Pesticides	Endosuphan	April 2014 – Dec 2014
Pesticides	DDT	April 2014 – Dec 2014
Pesticides	pp DDT	April 2014 – Dec 2014

EQS Failures:

HCH

Link to Data, Assessment and EQSs

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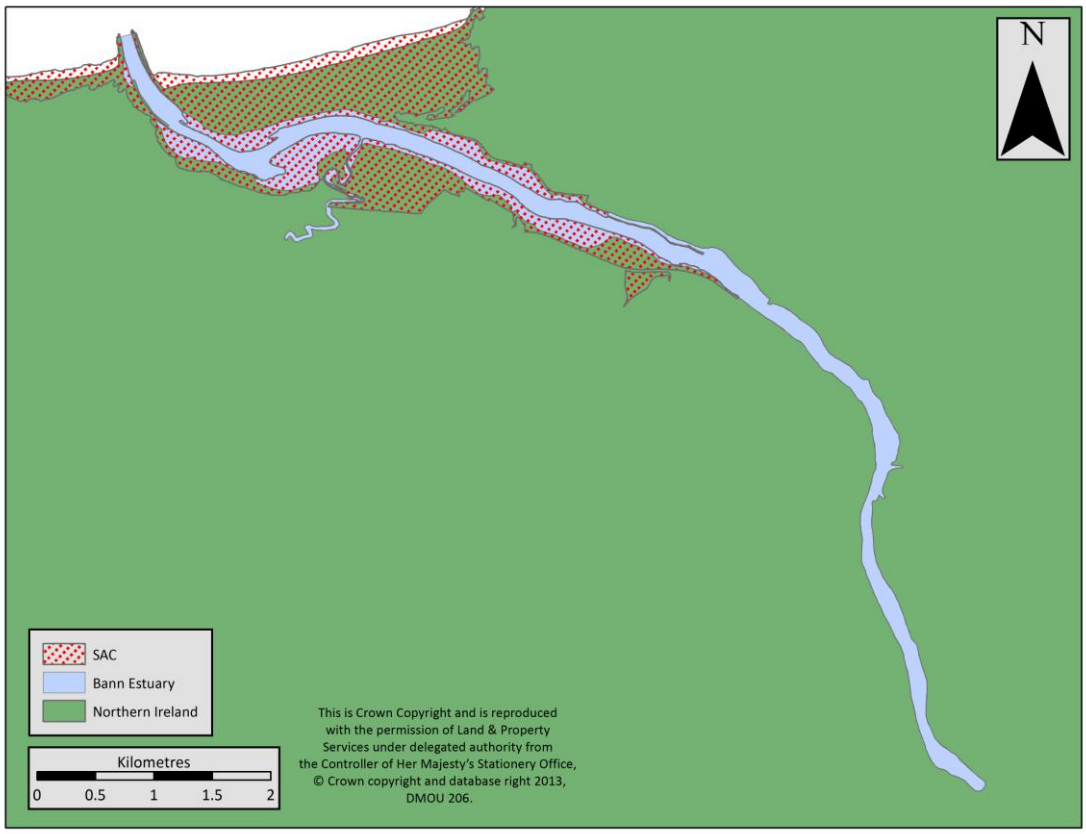
ANNEX F: Protected Area Objectives



Protected areas within Bann Estuary (Transitional Water).

The following Protected Areas are situated either wholly or partly within the Bann 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
Bann Estuary SAC	Unfavourable	Fixed dunes with herbaceous vegetation (‘grey dunes’); Atlantic salt meadows (*Glauco-Piccinellietalia maritimae*); Embryonic shifting dunes; Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")	All features	Non marine water quality related

ANNEX G: High Impact Invasive Species

QE High Impact Invasive Species assessment		**HIGH**

Ecoregion 17 Marine High Impact Invasive Species List

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

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.

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
CIS	Common Implementation Strategy
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
$_{G}$H	Good/High
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