RIVER BASIN MONITORING PLAN

WATER FRAMEWORK DIRECTIVE 1ST CYCLE CLASSIFICATION SUMMARY

2009-2015

Transitional Heavily Modified Water Body – Connswater Estuary

31/05/2015

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CONNSWATER ESTUARY (TRANSITIONAL WATER)

Water body Information

- River Basin District: North Eastern
- Water body type: Transitional Water 2 (TW2)
- Water body code: UKGBNI5NE10020
- Water body characteristics: Partly mixed/stratified, mesotidal, sand and mud, mesohaline
- Water body area: 0.07 km^2
- Heavily Modified Water Body: Yes
- 2015 Classification Objective: Moderate Ecological Potential

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

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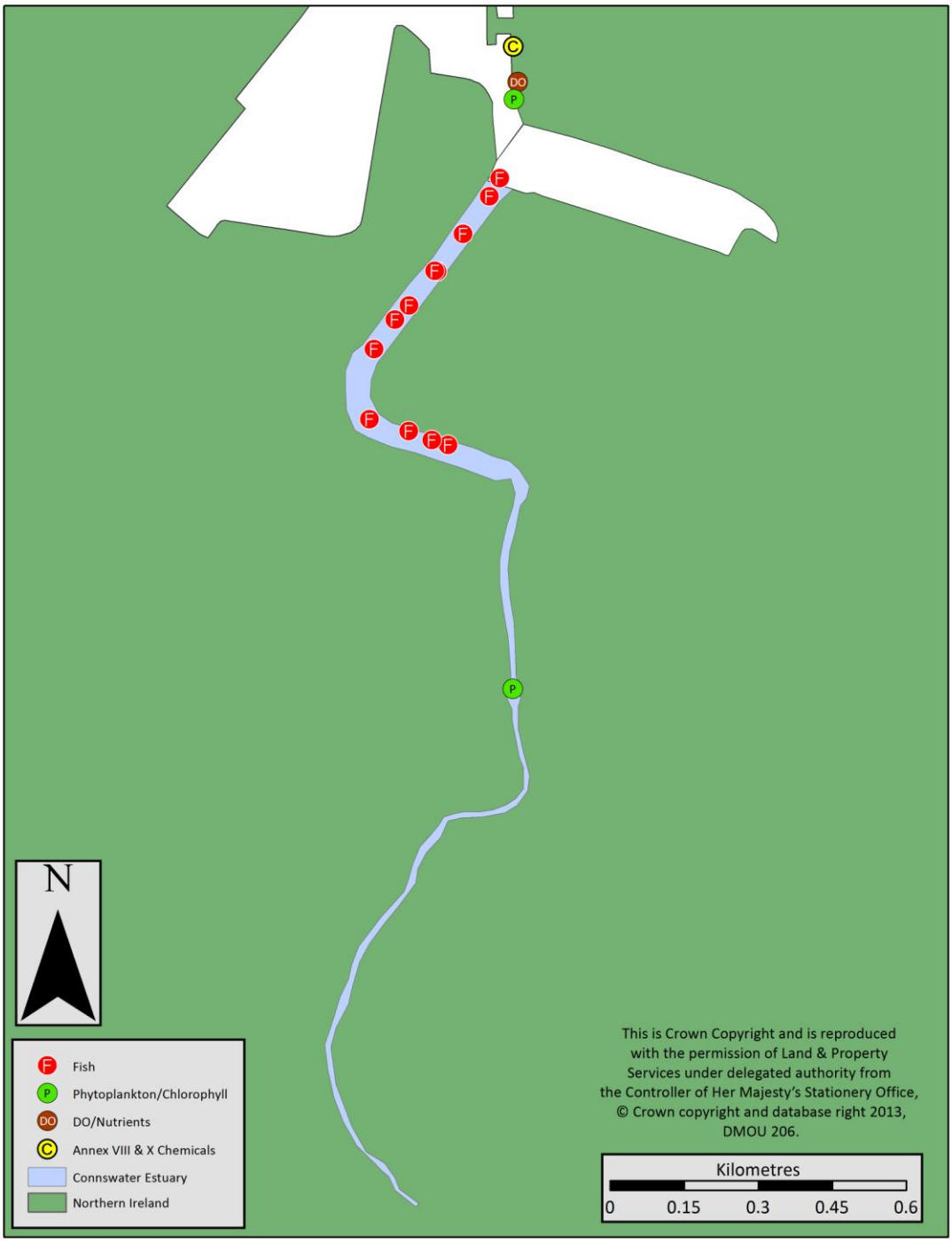

Figure 1: Waste water treatment pressures and monitoring points within Connswater Estuary (Transitional Water).

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***
Macroalgae	**Opportunistic Macroalgae**	✓	Visual inspection of water body resulting in default classification (see QE for details)
Phytoplankton	**Chlorophyll Biomass Index**	✓	
	Elevated Taxa Count Index	✓	
Benthic Invertebrates	**Infaunal Quality Index**	☒	Tool under development; not signed off for transitional waters
Fish	**Transitional Fish Classification Index**	✓	
Physico-Chemical (water)	**General Conditions**		
	-Dissolved Oxygen	✓	
	-Nutrients	✓	
	Specific Pollutant (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

Ecological		**Data years contributing to classification**	**No. of sites/samples**
Phytoplankton - 90%ile		2010-2014	2 sites 49 samples
Fish	Transitional Fish Classification Index	2014	12 samples
Physio-chemical			
Nutrients		2008-2013	3 sites 35 samples
Dissolved Oxygen		2010-2015	132 daily averages
Specific pollutants (Annex VIII)		2013-2014	
Hydromorphology		2007	
Water chemistry (Annex X)			
Priority hazardous substances		2013-2014	

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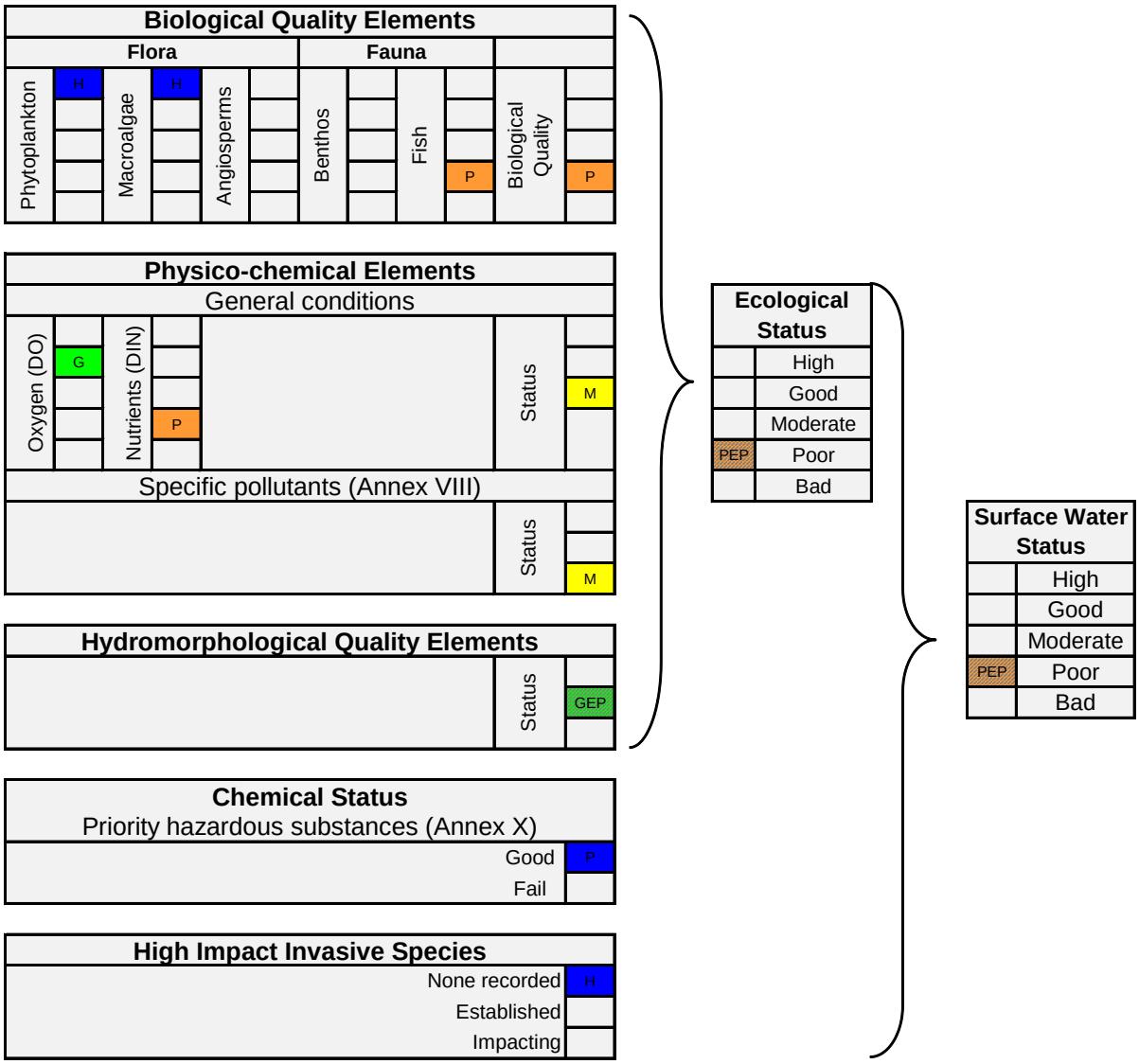

Figure 3: Overall classification of Connswater Estuary (Transitional Water)

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ANNEX A: Classification of Biological Quality Elements

QE: Phytoplankton

QE phytoplankton assessment *(+ Data confidence)*:	HIGH *(84.7%)*	

ANNEX A: Classification of Biological Quality Elements

Classification tools:

1. Chlorophyll biomass index (Transitional Waters)
2. Elevated Taxa Count Index -

- **Data store (classification):** M:\Projects 12\Phycology 2012\Chlorophyll a\WFD Updates\Phytoplankton Updates 2012 data sheets\Transitionals to 2012\Connswater 90th Percentile.xls
- M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015 Elevated Count Classification Update (08-13 data)\Transitionals\CONNSWATER classification - Copy.XLS

- **Data Availability (spot & continuous samples):**

Chl = spot (*2010-2014) NIEA/MD*

1. Chlorophyll Biomass Index - (Chl μg l^{-1})

Waterbody Chl. biomass assessment **High (*34.3%*)**

Thresholds:

Water Ref. Area		Status				
		High	Good	Moderate	Poor	Bad
North/Irish Sea	Chl μg l^{-1}	<5	5-10	10-15	15-20	>20
	EQR	0 -1.0	1.0-0.8	0.8-0.6	0.6-0.4	0.4-0.2

Results:

EQR	Status	Data Years	No. of Sites	No. of Samples	Data Confidence
1.0	HIGH	2010-2014	2	49	34.3%

Data confidence: Data analysed using CUTLASSV1.8 UKTAG

M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015TW_Phytoplankton_CofC_tool_CUTLASS_v1.8_UKTAG.xls
Data confidence is low for high Status (34.3%) but 61.4% for Good.

Data Quality temporally is good but spatially low due to the lack of available sites.

2. *Elevated Taxa Count Index*

Waterbody Elevated Taxa Assessment

Thresholds:

Tool	Thresholds	
	North/Irish Sea	Atlantic
I_1 - Individual Species Count%	250,000 (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
14.3%	11.4%	0.74	GOOD	2011-2014	31	35	71.5%

3. *Combined Chlorophyll and Elevated Count Tool for Waterbody*

HIGH (84.7%)

4. *Presence of High impact Species.*

Phaeocystis sp.

QE: Macroalgae

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

Classification tools:

1. Reduced species list (RSL): Not applicable.
2. Macroalgal Blooming Tool (MBT): 2009

2. *MBT assessment: HIGH (Low)*

- WFD surveillance monitoring: 2009
- Data Store: ..\..\..\..\..\Algae\Fucoid Extent\Trans Waters\Connswater
- Data Availability: Visual Inspection

Boundaries:

Parameters	Quality Status	High	Good	Moderate	Poor	Bad
	Sub-metric EQR	***≥0.8 – 1.0***	***≥0.6 – 0.8***	***≥0.4 – 0.6***	***≥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.

Alien taxa: No data

QE Angiosperms – tool not applicable
QE: Benthic Invertebrates – tool under development for transitional waters

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QE: Transitional Fish

QE transitional fish assessment (+ Data confidence):	**POOR (100%)**	

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	1
3	Species relative abundance	3
4	No. of taxa making up 90% of the abundance	3
5	No. of estuarine resident taxa	2
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	1
10	Feeding guild composition	3
	TFCI	24
	EQR	0.35

Fish cont'd

Percent Confidence of Class (bias corrected bootstrap method)

Bad	Poor	Moderate	Good	High
0.0	100.0	0.0	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: General

QE: Dissolved Oxygen

Dissolved oxygen (+ data confidence):	**GOOD (69%)**	

Classification tools: Comparison of 5% ile against reference standards.

- **Data Store:** ..\..\DO Classification 2012\Shortcut to DO FIELD VALUES 2006 -2010.lnk
- **Data Availability:** 2010-2015.
- **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*)
5.56	GOOD	2010-15	**	132	

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

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QE: Nutrients – N regulation

QE N regulation assessment (+ Data confidence):	**POOR (99%)**	

- **Data store:** ..\Transitional WB inc AFBI 15.xls
- **Data Availability:** 2008 to 2013 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
58.79*		35	3	2008 to 2013	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: Specific Pollutants (Annex VIII)

Specific pollutants assessment (+data confidence)	MODERATE	

Classification tools: Comparison with EQS levels.

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

Other Pollutants – DSD list 2 (with existing EQS):

Suite	Parameter	Data Availability

EQS failures:

Cypermethrin

Link to Data, Assessment and EQSs:

G:\MARINE\Water Framework Directive\WFD ANNUAL CLASSIFICATION UPDATE 2015\2015 QE sheets

ANNEX D: Hydromorphological quality elements

Overall hydromorphology assessment	HMWB-GEP	

Classification tools:

1. TRaC Hydromorphology metrics
2. MIMAS

ANNEX E: Chemical Status - Annex X Chemicals

Priority hazardous substances (+data confidence)	GOOD	

Classification tools: Comparison with EQS levels.

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

Data Assessed for 2015 Update:

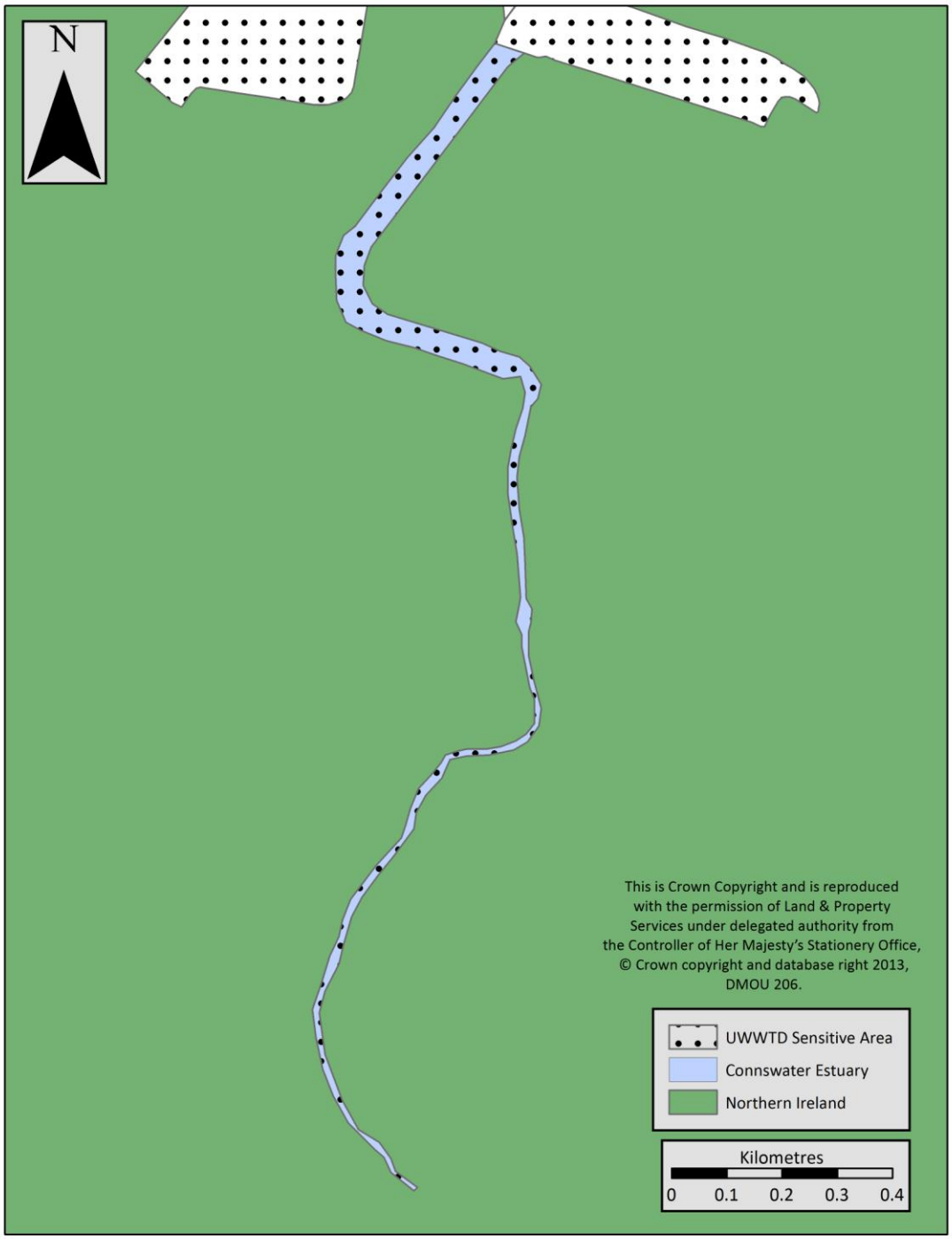
Suite	Parameter	Data Availability
Trace Organics	Benzene	Nov 2013 – Sept 2014
Trace Organics	Nonylphenol	April 2014 – Dec 2014
Trace Organics	Octylphenol	April 2014 – Dec 2014
Pesticides	Pentachlorobenzene	April 2014 – Dec 2014
Pesticides	Trifluralin	April 2014 – Dec 2014
Pesticides	HCH	April 2014 – 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:

None

Link to Data, Assessment and EQSs:
G:\MARINE\Water Framework Directive\WFD ANNUAL CLASSIFICATION UPDATE 2015\2015 QE sheets

ANNEX F: Protected Areas



Protected areas within Connswater Estuary (Transitional Water).

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

Nitrates Directive/ Urban Waste Water Treatment Directive Sensitive Areas:

- Inner Belfast Lough UWWTD Sensitive Area

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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
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