

RIVER BASIN MONITORING PLAN

WATER FRAMEWORK DIRECTIVE 1ST CYCLE CLASSIFICATION SUMMARY

2009-2015

Coastal Water Body - Larne Lough Mid

31/05/2015



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	Version Date: 31/05/2015
MONITORING & ASSESSMENT TEAM	

LARNE LOUGH MID

Water body Information

- *River Basin District:* North Eastern
- *Water Body Code:* UKGBNI6NE060
- *Water body type:* CW8
- *Water body characteristics:* Euhaline, mesotidal, sheltered
- *Water body area:* 6.5 km²
- *Heavily Modified Water Body:* No
- *2015 Classification Objective:* Good

FINAL CLASSIFICATION	MODERATE	PASS/FAIL 2015 OBJECTIVE	FAIL
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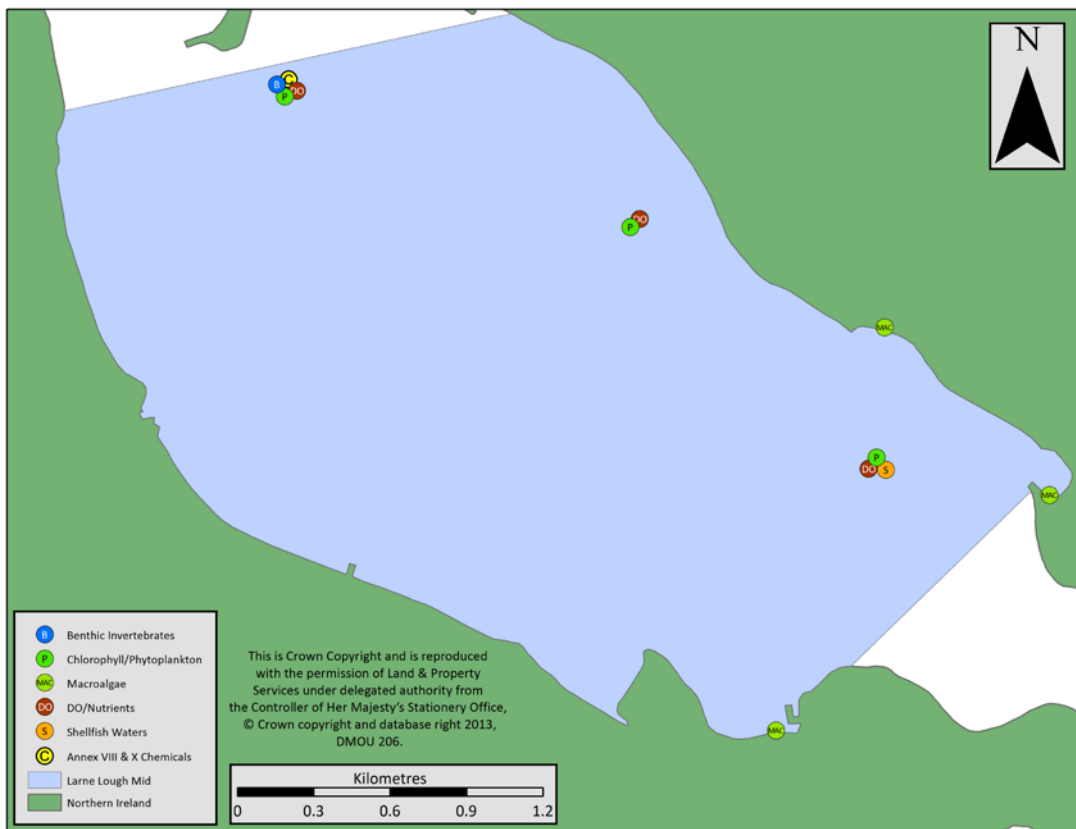


Figure 1: Waste water treatment pressures and monitoring points within Larne Lough Mid.

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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	Biomass	✓	
	Elevated Taxa Count Index	✓	
Macroalgae (Seaweeds)	Opportunistic Macroalgae	☒	Tool Not Applicable
	Reduced Species List	✓	
Angiosperms	Saltmarsh	☒	Tool Not Applicable
	Seagrass	☒	Tool Not Applicable
Benthic Invertebrates	Infaunal Quality Index	✓	
	Imposex	☒	
Physico-Chemical (Water)	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 ELEMENT		Data years contributing to classification	No. of sites/samples
Biological			
Phytoplankton		2009-2014	10 sites 53 samples
Macroalgae (Seaweed)	Reduced Species List	2009, 2014	3 sites 6 surveys
Benthic Invertebrates	Infaunal Quality Index	2010-2013	1 site 20 samples
Physico-chemical			
Nutrients		2011-2015	8 sites 45 samples
Dissolved Oxygen		2010-2015	96 daily averages
Specific polluting substances (Annex VIII)		2010-2014	3
Hydromorphology		2007	
Water chemistry			
(Annex X)		2010-2014	3

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ANNEX A: Classification of Biological Quality Elements

QE: Phytoplankton

QE Phytoplankton assessment (+data confidence):	HIGH (100%)	
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Classification metrics:

1. Chlorophyll biomass index (90%ile)
2. Elevated taxa count index:
3. Seasonal succession: Not applied, insufficient data.

1. Chlorophyll Biomass Index

Data store: <M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\Coastal data\LARNE MID 2015.XLS>

<M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\Coastal data\Larne 90th Percentile.xls>

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

Thresholds:


Water Ref. Area		Status				
		High	Good	Moderate	Poor	Bad
North/Irish Sea	Chl $\mu\text{g l}^{-1}$	<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:

90%ile	Status	EQR	Data Years	No. of Sites	No. of Samples	Data Confidence
4.02	HIGH	0.84	2009-2014	10	53	92.3%

Data confidence: High 92.3%

Data analysed using <M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015CW Phytoplankton CoC tool v107 UKTAG.xls>

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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 (excl. Phaeocystis) (%)	500,000 (cells l ⁻¹)	
I ₂ - Total Taxa Count (%)	10 ⁷ (cells l ⁻¹)	
I ₃ - Elevated Biomass Count (%)	>10 (µg l ⁻¹)	>5 (µg 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	I ₃	Elevated Count EQR	Status	Data Years	No. of phytoplankton samples	Data confidence
7.4%	0	0%	0.951	HIGH	2009-2014	54	99.4%


Data confidence: 85.7%

.Data analysed using [M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\2015CW Phytoplankton CoC tool v107 UKTAG.xls](#)

Presence of alien/ nuisance species: *none*

Overall Waterbody Status

HIGH (100%)

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QE: Macroalgae

QE macroalgal assessment (+ data confidence):	HIGH (50.7%)	
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Classification tools:

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

RSL assessment:


- WFD surveillance monitoring: 2009 & 2014
- Data Availability (classification): 3 sites 2009, 3 sites 2014
- Data Store: [M:\Projects_14Phycology_2014\MM14-12 Intertidal Rocky Shore\FSL-RSL Classification update 2015 \(09-14\)\Datasheet.xls](M:\Projects_14Phycology_2014\MM14-12 Intertidal Rocky Shore\FSL-RSL Classification update 2015 (09-14)\Datasheet.xls)

Boundaries:

Parameters	Quality Status	Bad	Poor	Moderate	Good	High
	Sub-metric quality status	0.0 – 0.2	0.21 – 0.4	0.41 – 0.6	0.61 – 0.8	0.81 – 1.0
Species richness (adj. for shore)		0 – 3	3 – 10	10 – 20	20 – 34	34 – 68
Proportion of Chlorophyta (% G)		80 – 100	45 – 80	30 – 45	20 – 30	0 – 20
Proportion of Rhodophyta (% R)		0 – 10	10 – 25	25 – 35	35 – 45	45 – 100
Ecological Status Group ratio (ESG)		0.0 – 0.2	0.2 – 0.4	0.4 – 0.6	0.6 – 0.8	0.8 – 1.2
Proportion of opportunists (% opp)		50 – 100	35 – 50	25 – 35	15 – 25	0 – 15

Results

Shore	Sub-Metric EQR							RSL EQR	Status
	Shore desc.	Sp. richness	Adj. Sp. Richness	% G	% R	ESG	% Opp		
Blue Circle Boatdub 2009	10	28	38.08	21.43	39.29	0.65	17.86	0.694	GOOD
Millbay 2009	10	45	61.2	15.56	46.67	0.88	11.11	0.841	HIGH
Ballydown 2009	7	37	50.32	13.51	45.95	1.18	5.41	0.889	HIGH
Millbay 2014	10	39	53.04	12.82	46.15	1.05	15.38	0.821	HIGH
Ballydown 2014	12	44	53.24	18.18	43.18	1	18.18	0.786	GOOD
Blue Circle Boatdub 2014	12	34	41.14	17.65	44.12	0.89	20.59	0.756	GOOD
Mean								0.801 ±0.07	HIGH

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Macroalgae (cont'd)

Confidence of Classification: **HIGH (50.7%)**

- On classification boundary **HIGH 50.7%** and **GOOD 49.3%**.
- Data analysed for Confidence of Class using PIRATES (V04) [M:\Projects 14\Phycology 2014\MM14-12 Intertidal Rocky Shore\PIRATES_v04 - Class update 2015 \(09-14\) for UKTAG.xls](#)
- Standard Deviation (\pm) is included with the mean EQR.
- Data QA (expert team).
- WFD specific data (Reduced species list completed; Full species list not yet carried out, tool not yet completed).
- Three shores (good spatial coverage) over two years (moderate temporal trend assessment).

Alien taxa: *Sargassum muticum*

QE: Angiosperms – tool not applicable

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QE: Benthic Invertebrates

QE benthic invertebrate assessment (+ Data confidence):	GOOD (L)	
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Classification tools:

1. Infaunal Quality Index (IQI)
2. Imposex tool (VDSI) –Not applied

1. IQI (UKTAG v01 20140228)

Water body IQI assessment:

Good (Low)

WFD surveillance monitoring:

- **Data store:** [..\Larne Lough Mid water body\Larne Lough Mid water body 08-13 fauna data 1mm.xlsx](#)
- **Benthic invertebrates** UNICORN (NMMT) Database
- **Supporting Parameters** Water Quality Data Set
- **Digital images** AMAP Project folder
- **Data Availability (classification):** 1 site, 5 reps, 4 years, Day Grab, 1 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	LL4 (5)	5	0.73	0.02	Good
2011	MM-Benthos	LL4 (5)	5	0.73	0.03	Good
2012	MM-Benthos	LL4 (5)	5	0.70	0.02	Good
2013	MM-Benthos	LL4 (5)	5	0.73	0.04	Good
2014	MM-Benthos	LL4 (5)	-	-	-	-
2015	MM-Benthos	LL4 (5)	-	-	-	-
Overall 6 year waterbody means			5.0	0.72 (0.69*)	0.03	Good

* 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)

Alien taxa present: *Styela clava*

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

QE: Dissolved Oxygen

Dissolved oxygen (+ data confidence):	HIGH (100%)	
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Classification tools: Comparison of 5% ile against reference standards

- Data Availability: 2010-15
- Data Store: [..\DO Classification 2012\Shortcut to DO FIELD VALUES 2006 -2010.Ink](#)
- 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*)
7.76	HIGH	2010-15	**	96	

* Proportion of possible months for which data are available

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QE: Nutrients – N regulation

QE N regulation assessment (+ Data confidence):	HIGH (100%)	
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- **Data store:** [..\Coastal WB inc AFBI 15.xls](#)
- **Data Availability:** 2011-2015
DIN & salinity (Nov to Feb)
- **Data Source (spot & continuous samples):** spot

Thresholds:


Area	Salinity range	DIN (uM) Winter mean H	DIN (uM) Winter mean G	DIN (uM) Winter mean M
Coastal (at salinity 32)	30-34.5	>12	12-18	18 +

Results:

Mean Winter DIN (uM) (Avg DIN)*	Winter DIN Daily average (n)	No. of samples (n)	No. of sites	Data Years	Data Quality	Status
8.61		45	8	2011- 2015	Database not yet QA'd	HIGH

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

Data confidence source: [..\CofCDINth.xlsx](#)

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

Specific pollutants assessment (+data confidence)	MODERATE	
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Classification tools: Comparison with EQS levels.

Data assessed for 2013 Update:

Specific Pollutants:

Suite	Parameter	Data Availability
Trace Metals	Chromium	CSEG 2012 / SWMP 2012
Trace Metals	Iron	CSEG 2012 / SWMP 2012
Trace Metals	Copper	CSEG 2012 / SWMP 2012
Trace Metals	Zinc	CSEG 2012 / SWMP 2012
Trace Metals	Arsenic	CSEG 2012 / SWMP 2012
Trace Organics (OPONS)	Dimethoate	NOV10 - MAY11
Trace Organics (OPONS)	Diazinon	NOV10 - MAY11
Trace Organics (OPONS)	Fenitrothion	NOV10 - MAY11
Urea Herbicides	Linuron	OCT 2011 – JUL 2012
Nutrients (Winter Nutrients)	Unionised Ammonia (at pH8)	WIN NUTS 2012-2013
Candidate Specific pollutant	Glyphosate	NOV 2012 – MAR 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	NOV10 - MAY11
Trace Organics (OPONS)	Triazaphos*	NOV10 - MAY11
Trace Organics (OPONS)	Dichlorvos	NOV10 - MAY11

Triazaphos* LOD above the EQS.

Link to Data, Assessment and EQSs:

[G:\MARINE\Water Framework Directive\WFD ANNUAL CLASSIFICATION UPDATE 2013\Chemistry](#)

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Data assessed for 2014 Update:

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

No 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	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

EQS failures:

Cypermethrin

Link to Data, Assessment and EQSs:

[G:\MARINEWater Framework Directive\WFD ANNUAL CLASSIFICATION UPDATE 2015\2015 QE sheets](#)


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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)	FAIL	
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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 / SWMP 2012
Trace Metals	Cadmium	CSEG / SWMP 2012
Trace Metals	Lead	CSEG / SWMP 2012
Trace Metals	Mercury	CSEG / SWMP 2012
Trace Organics (OPONS)	Atrazine	NOV 2010 – MAY 2011
Trace Organics (OPONS)	Chlorfenvinphos	NOV 2010 – MAY 2011
Trace Organics (OPONS)	Chlorpyrifos	NOV 2010 – MAY 2011
Trace Organics (OPONS)	Simazine	NOV 2010 – MAY 2011
Urea Herbicides	Isoproturon	OCT 2011 – JUL 2012
Urea Herbicides	Diuron	OCT 2011 – JUL 2012
PAH	Anthracene	NOV 2010 – JUN 2011
PAH	Fluoranthene	NOV 2010 – JUN 2011
PAH	Naphthalene	NOV 2010 – JUN 2011
PAH	Benzo (a) pyrene	NOV 2010 – JUN 2011
PAH	*Benzo(b)fluoranthene	NOV 2010 – JUN 2011
PAH	*Benzo(k)fluoranthene	NOV 2010 – JUN 2011
PAH	*Benzo(g,h,i)perylene	NOV 2010 – JUN 2011
PAH	*Indeno(1,2,3 cd) pyrene	NOV 2010 – JUN 2011

*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)

EQS Failures:

No failures

Link to Data, Assessment and EQSs:

[G:\MARINEWater Framework Directive\WFD ANNUAL CLASSIFICATION UPDATE 2013\Chemistry](#)

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Data Assessed for 2014 Update:

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

[G:\MARINEWater Framework Directive\WFD ANNUAL CLASSIFICATION UPDATE 2015\2015 QE sheets](#)

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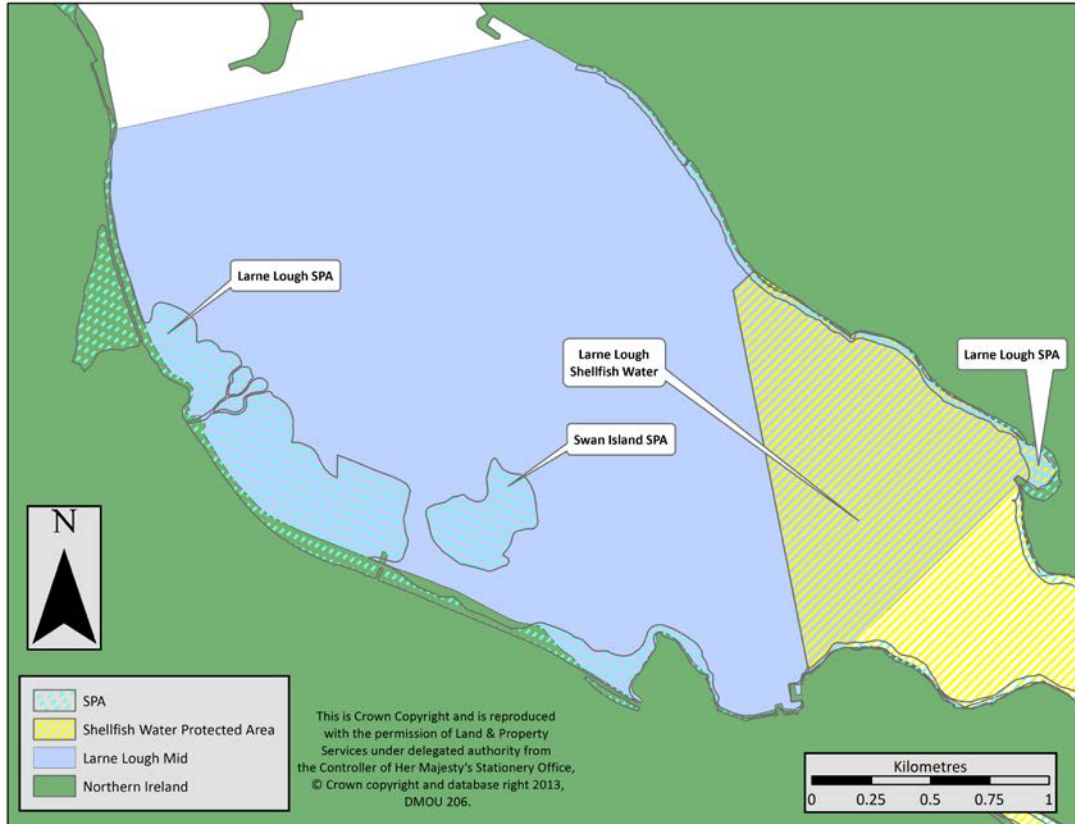
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ANNEX F: Protected Areas



Protected areas within Larne Lough Mid.

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The following Protected Areas are situated either wholly or partly within the Larne Lough Mid 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
Larne Lough SPA	Favourable	Common Tern; Roseate Tern; Sandwich Tern; Light Bellied Brent Goose	None	n/a
Swan Island SPA	Favourable	Common Tern; Roseate Tern; Sandwich Tern; Light-bellied Brent Goose	None	n/a

Shellfish Water Protected Areas:

Shellfish Water Protected Area	Met Guideline Microbiological Standard* in 2014
Larne Lough	No (n=34)

*75% of samples contain ≤ 230 *E. coli*/100ml of shellfish flesh and intervalvular liquid

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ANNEX G: High Impact Invasive Species

QE High Impact Invasive Species assessment	GOOD
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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>		Y		W
Crustacea	<i>Eriocheir sinensis</i>				
Mollusca	<i>Crassostrea gigas</i>				
Mollusca	<i>Crepidula fornicata</i>				
Phaeophyceae	<i>Sargassum muticum</i>		Y		W
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