

RIVER BASIN MONITORING PLAN

WATER FRAMEWORK DIRECTIVE 2ND CYCLE CLASSIFICATION SUMMARY

2015-2021

Coastal Water Body - Larne Lough South

31/05/2015



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RIVER BASIN MANAGEMENT PLAN	
 <p>Department of the Environment www.doeni.gov.uk Marine Environment Division</p>	<p>WFD COASTAL WATER BODY CLASSIFICATION Larne Lough South</p>
	<p>Version Date: 31/05/2015</p>
<p>MONITORING & ASSESSMENT TEAM</p>	

LARNE LOUGH SOUTH

Water body Information

- River Basin District: North Eastern
- Water Body: UKGBNI6NE070
- Water body type: CW8
- Water body characteristics: Euhaline, mesotidal, sheltered
- Water body area: 4.1 km²
- Heavily Modified Water Body: No
- 2021 Classification Objective: Good

2015 CLASSIFICATION	GOOD	PASS/FAIL 2021 OBJECTIVE	PASS
Notes on 2015 end of 1st cycle classification			
<p>Benthic IQI Note: Although the samples collected from this site in Larne Lough South is recorded as Poor there is sufficient concern that the site characteristics at the site shown in Figure 1 are artificially influencing the outcome. Given that there is only 1 year's data available within the rolling 6 year cycle it has been decided that the result from the adjoining water body of Larne Lough-Mid would be used instead which is seen as a much more reliable indicator of the invertebrate community of the lower Lough. During the second cycle (2015-21) a review of this site will be developed and a new location chosen within the waterbody or a decision taken to continue use the existing site within Larne Lough Mid.</p>			
<p>Annex VIII Assessment of the data for the specific pollutant Cypermethrin, a non-systematic pyrethroid insecticide with a wide range of agricultural applications reveals that the annual average concentration exceeded the current EQS of 0.1ng l⁻¹. The approach taken by NIEA and Marine Environment Division is that whilst this is a technical failure there is insufficient weight of evidence to draw down the overall classification of this waterbody from Good to Moderate. Further work will be conducted during the 2015-21 period to assess the spatial extent of cypermethrin within the NI sea loughs and transitional waters.</p>			

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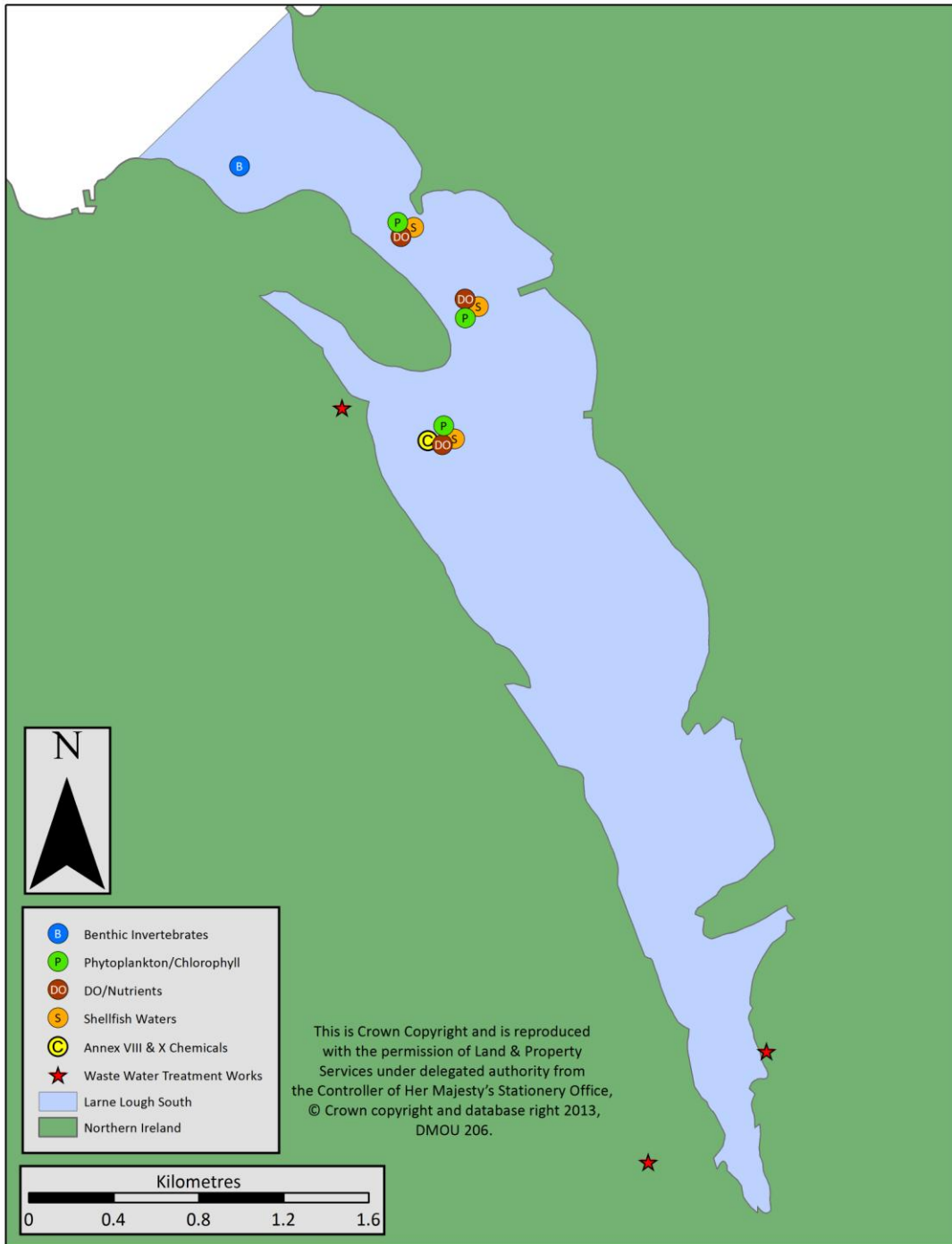


Figure 1: Waste water treatment pressures and monitoring points within Larne Lough South (Coastal Water).

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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	Biomass	✓	
	Elevated Taxa Count Index	✓	
Macroalgae (Seaweed)	Opportunistic Macroalgae	✓	
	Reduced Species List	☒	Tool not applicable
Angiosperms	Seagrass	☒	No data available
	Saltmarsh	☒	
Benthic Invertebrates	Infaunal Quality Index	✓	
	Imposex	☒	Tool Not Applicable
Physico-chemical	-Dissolved Oxygen	✓	
	-Nutrients	✓	
	Specific Pollutants (Annex VIII substances)	✓	
Hydromorphological Quality Elements	SEPA Rapid Designation	✓	
	TraC MIMAS	✓	
Chemical Status			
Priority Hazardous Substances	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
Biological			
Phytoplankton	Chlorophyll Biomass Index	2009-2014	5 sites 53 samples
	Elevated Taxa Count Index	2009-2014	5 sites 54 samples
Macroalgae (Seaweed)	MBT	2009, 2014	n/a
Benthic Invertebrates	Infaunal Quality Index	2012	1 site 3 samples
Physico-chemical			
Nutrients		2010-2015	55 samples 8 sites
Dissolved Oxygen (DO)		2010-2015	97 daily averages
Other polluting substances (Annex VIII)		2010-2014	
Hydromorphology		2007	
Water chemistry			
(Annex X)		2010-2014	

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Biological Quality Elements															
Flora					Fauna										
Phytoplankton	H		H		Benthos	G		Fish	Biological Quality	G					
Macroalgae					Benthos			Fish	Biological Quality						
Angiosperms					Benthos			Fish	Biological Quality						
Physico-chemical Elements															
General conditions															
Oxygen (DO)	H				Specific pollutants (Annex VIII)				Status	H					
Nutrients (DIN)	H				Specific pollutants (Annex VIII)				Status	H					
Specific pollutants (Annex VIII)															
									Status	G					
Hydromorphological Quality Elements															
									Status	G					
Chemical Status															
Priority hazardous substances (Annex X)															
									Good	P					
									Fail						
High Impact Invasive Species															
									None recorded						
									Established	G					
									Impacting						

Ecological Status	
	High
G	Good
	Moderate
	Poor
	Bad

Surface Water Status	
	High
G	Good
	Moderate
	Poor
	Bad

Figure 2: Overall classification of Larne Lough South (Coastal Water). Note1 Benthic IQI result based on Larne Lough Mid result. See Benthic IQI sheet for explanation. Note 2 There is a technical failure of Cypermethrin an Annexe VIII chemical which in the absence of supporting biological evidence is not sufficient to draw down overall status from Good to Moderate.

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ANNEX A: Classification of Biological Quality Elements

QE: Phytoplankton

QE Phytoplankton assessment (+ data confidence):	HIGH (99.8%)	
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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 SOUTH 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 (2009-2014) AFBINI & 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
4.97	HIGH	0.80	2009-2014	5	53	62.2%

Data confidence: 62.2%

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 % Exceedance:

I ₁	I ₂	I ₃	Elevated Count EQR	Status	Data Years	No. of phytoplankton samples	Data confidence
1.89%	0	0%	0.988	HIGH	2009-2014	54	95.5%

Data confidence: 95.5%

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 (99.8%)

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QE: Macroalgae Larne Lough south

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).

2. MBT assessment:

- WFD surveillance monitoring: 2009, 2014
- Data Availability (classification): 2009, 2014.
- Data Store: [..\..\..\Algae\algae images\Macrophytes\Survey Site Images\OGA site photos\Larne South: ..\..\MM14-15 Intertidal Seagrass Assessment\Larne Seagrass Visual Assessment](#)

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%						
2014	<5%						
					Mean		

Data Confidence: Medium

- 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, 2009 & 2014.
- Satellite imagery or aerial photography may need to be considered to improve data confidence.

Alien taxa: No data

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QE: Angiosperms – Larne South - GOOD (ND)

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QE: Benthic Invertebrates SEE NOTE BELOW – STATUS BASED ON IQI RESULT FOR LL MID – RECORDED AS GOOD – SEE FIGURE 2 FOR REPORTED VALUE.

QE benthic invertebrate assessment (+ Data confidence):	POOR (L)	
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Classification tools: 1. Infaunal Quality Index (IQI)
2. Imposex tool (VDSI) -Tool not applicable

1. IQI (UKTAG v01 20140228)

Water body IQI assessment:

Poor (Low)

WFD surveillance monitoring:

- Data store: [..\Larne Lough South water body\Larne Lough South 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 sites, 3 reps, 1 years, Day Grab, 1 mm sieve, n=3.

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	-	-	-	-	-	-
2011	-	-	-	-	-	-
2012	MM-Benthos	LLS (3)	3	0.43	0.05	Poor
2013	MM-Benthos	LLS (3)	-	-	-	-
2014	MM-Benthos	LLS (3)	-	-	-	-
2015	MM-Benthos	LLS (3)	-	-	-	-
Overall 6 year waterbody means			3	0.43 (*0.38)	0.05	Poor

* IQI derived from data averaged minus Standard Deviation (see issues with tools paper). This figure is used for classification. **Note:** Although the samples collected from this site in Larne Lough South is recorded as **Poor** there is sufficient concern that the site characteristics at the site shown in Figure 1 are artificially influencing the outcome. Given that there is only 1 years data available within the rolling 6 year cycle it has been decided that the result from Larne Lough Mid would be used which is seen as a much more reliable indicator of the invertebrate community of the lower lough.

Data confidence:

Low

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

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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: 2010-2015
- 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*)
7.81	HIGH	2010-15	**	97	

* Proportion of possible months for which data are available

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QE: Nutrients – N regulation

QE N regulation assessment (+ Data confidence):	HIGH (88%)	
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- **Data store:** [..\Coastal WB inc AFBI 15.xls](#)
- **Data Availability:** 2010-15
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
11.54		55	8	2010- 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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NOTE: Assessment of the data for the specific pollutant Cypermethrin, a non-systematic pyrethroid insecticide with a wide range of agricultural applications reveals that the annual average concentration exceeded the current EQS of 0.1ng l^{-1} . The approach taken by NIEA and Marine Environment Division is that whilst this is a technical failure there is insufficient weight of evidence to draw down the overall classification of this water body from Good to Moderate.

Classification tools: Comparison with EQS levels.

Data assessed for 2013 Update:

Specific Pollutants

Suite	Parameter	Data Availability
Trace Metals	Chromium	SWMP 2012
Trace Metals	Iron	SWMP 2012
Trace Metals	Copper	SWMP 2012
Trace Metals	Zinc	SWMP 2012
Trace Metals	Arsenic	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 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

<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	SWMP 2013
Trace Metals	Copper	SWMP 2013
Trace Metals	Zinc	SWMP 2013
Trace Metals	Arsenic	SWMP 2013

No EQS failures

Link to Data, Assessment

[..\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:\MARINE\Water 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)	GOOD	
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Classification tools: Comparison with EQS levels.

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

Data Assessed for 2013 Update:

Suite	Parameter	Data Availability
Trace Metals	Nickel	SWMP 2012
Trace Metals	Cadmium	SWMP 2012
Trace Metals	Lead	SWMP 2012
Trace Metals	Mercury	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)

No EQS 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	SWMP 2013
Trace Metals	Cadmium	SWMP 2013
Trace Metals	Lead	SWMP 2013
Trace Metals	Mercury	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

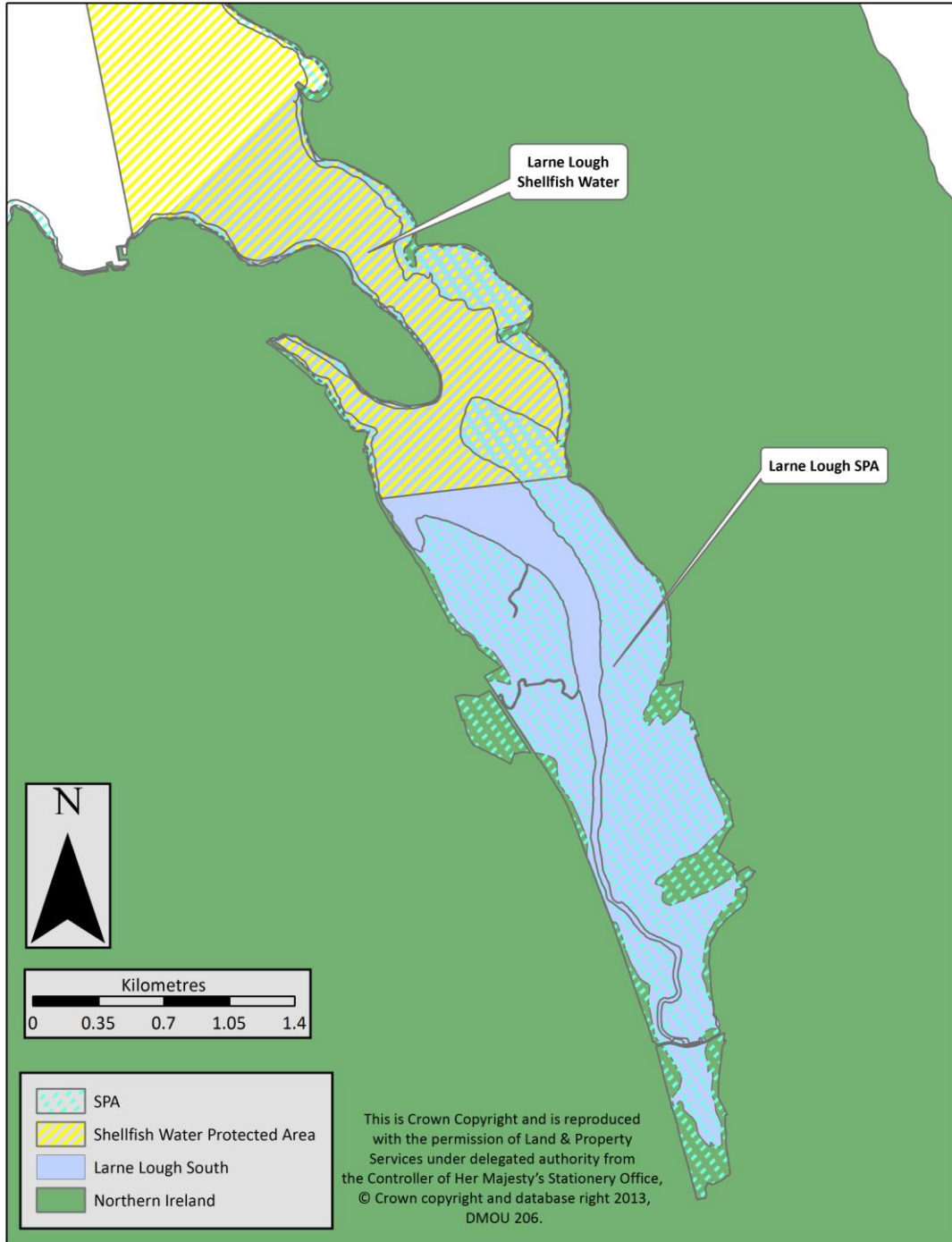
No EQS failures

Link to Data, Assessment and EQSs:

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

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ANNEX F: Protected Areas



Protected areas within Larne Lough South (Coastal Water).

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The following Protected Areas are situated either wholly or partly within the Larne Lough South 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

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>				
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.

RIVER BASIN MANAGEMENT PLAN

 <p>Department of the Environment www.doeni.gov.uk Marine Environment Division</p>	WFD COASTAL WATER BODY CLASSIFICATION Larne Lough South	
	Version Date:	31/05/2015
	MONITORING & ASSESSMENT TEAM	

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