

RIVER BASIN MONITORING PLAN

WATER FRAMEWORK DIRECTIVE 1ST CYCLE CLASSIFICATION SUMMARY

2009-2015

Coastal Water Body – Strangford Lough
South

31/05/2015

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STRANGFORD LOUGH SOUTH

Water body Information

- River Basin District: North Eastern
- Water body type: CW8
- Water body code : UKGBNI6NE130
- Water body characteristics: Euhaline, mesotidal, sheltered
- Water body area: 86.33 km²
- Heavily Modified Water Body: No
- 2015 Classification Objective: Moderate

<i>FINAL CLASSIFICATION</i>	MODERATE	<i>PASS/FAIL 2015 OBJECTIVE</i>	PASS
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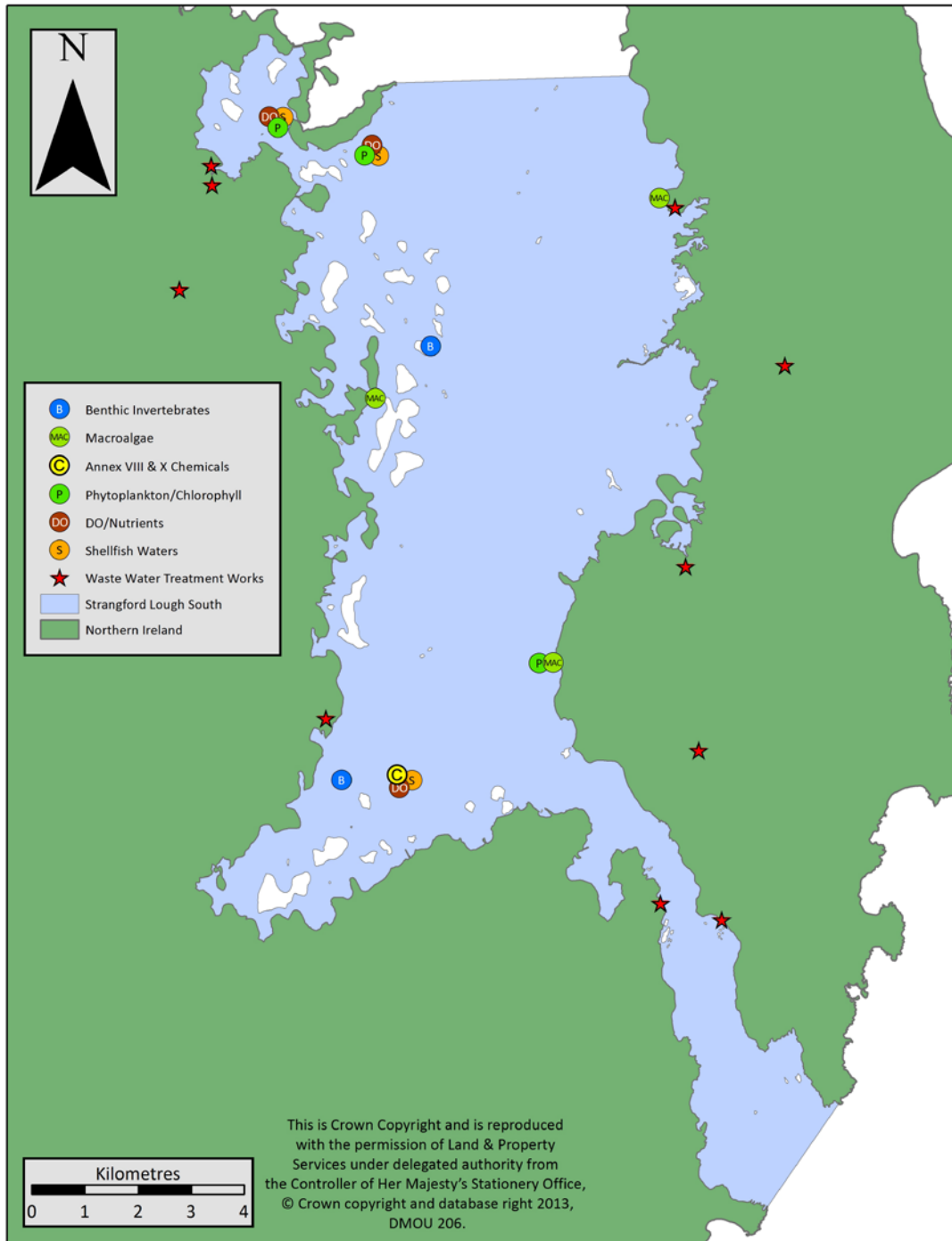


Figure 1: Waste water treatment pressures and monitoring points within Strangford Lough South (Coastal Water).

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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			
Main Element	Sub-Element	Applied	Comment
Phytoplankton	Chlorophyll Biomass	✓	
	Elevated Taxa Count Index	✓	
Macroalgae (seaweed)	Opportunistic Macroalgae	☒	No data available
	Reduced Species List	✓	
Angiosperms	Seagrass	☒	No data available
	Saltmarsh	☒	
Benthic Invertebrates	Infaunal Quality Index	✓	
	Imposex	☒	No suitable sites
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 Elements		Data years contributing to classification	No. of sites/samples
Biological			
Phytoplankton	Chlorophyll Biomass	2009-2014	7 sites 57 samples
	Elevated Taxa Count Index	2009-2014	7 sites 58 samples
Macroalgae	Reduced Species List	2011-2012	3 sites 4 surveys
Benthic Invertebrates	Infaunal Quality Index	2010-2013	48 sites, 94 replicates
Physico-chemical			
Nutrients		2010-2013	22 sites 58 samples
Dissolved Oxygen (DO)		2010-2015	115 daily averages
Other polluting substances (Annex VIII)		2010-2014	
Hydromorphology		2007	
Water chemistry			
(Annex X)		2010-2014	

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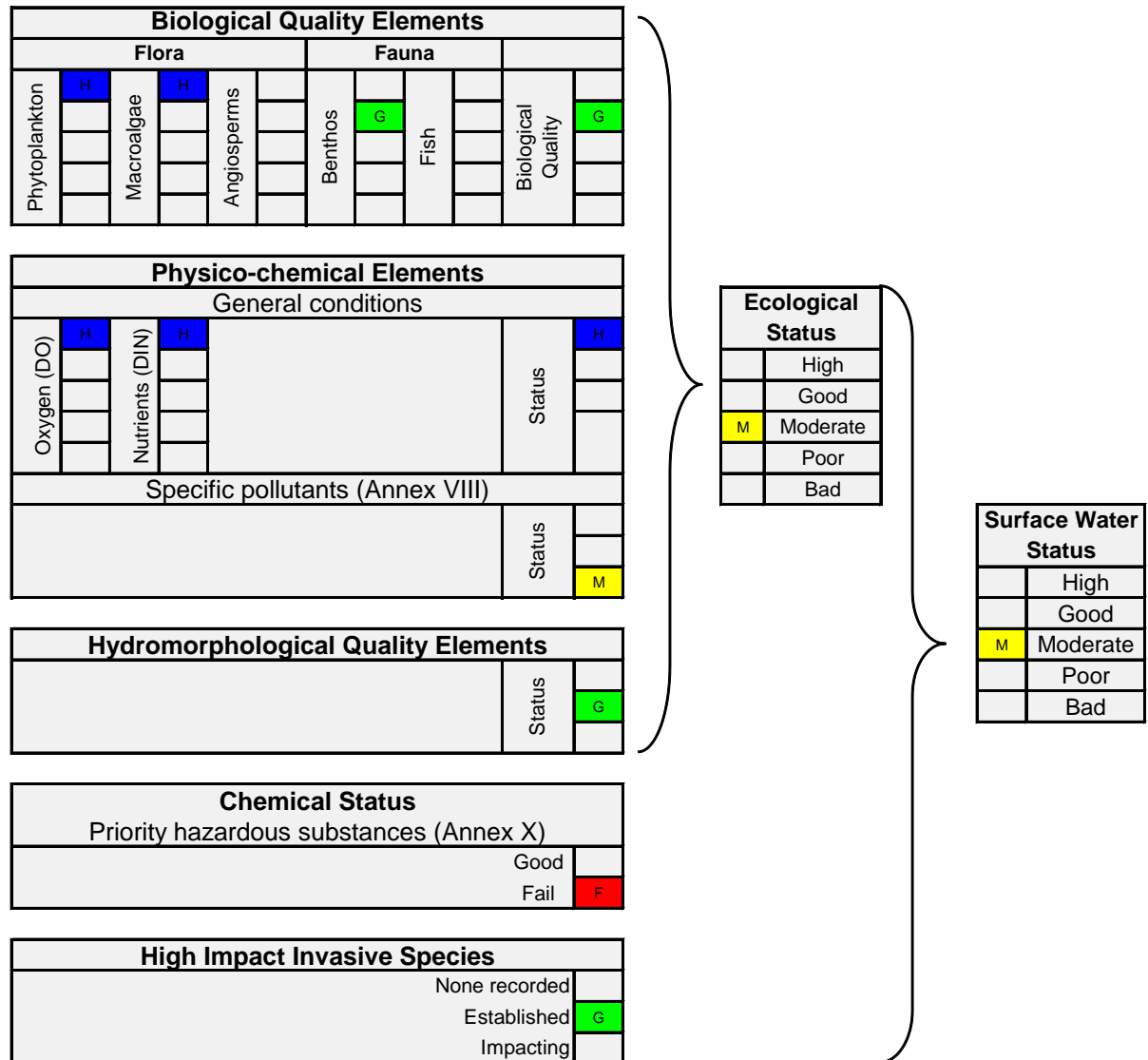



Figure 3: Overall classification of Strangford Lough South (Coastal Water)

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ANNEX A: Classification of Biological Quality Elements

QE: Phytoplankton

QE Phytoplankton assessment (+ data confidence):	HIGH (96.4%)	
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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\STRANGFORD SOUTH 2015.XLS>

<M:\Projects 14\Phycology 2014\MM14-14 Phytoplankton and Chlorophyll\classification 15\Coastal data\Strangford 90th Percentile 2011.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
4.47	HIGH	0.82	2009-2014	7	57	83.4%

Data confidence:

Data analysed for Confidence of Classification 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
10.3%	0%	1.72%	0.922	HIGH	2009-2014	58	99.2%


Data confidence: 99.2%

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 (96.4%)

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QE: Macroalgae

QE macroalgal assessment (+ data confidence):	HIGH (99.7%)	
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Classification tools:

Reduced species list (RSL)
Macroalgae Blooming Tool –Not applied

1. *Reduced Species List (RSL)*

- **WFD surveillance monitoring:** 2011 & 2012
- **Data Availability (classification):** 2011 - 3 sites & 2012 – 1 site
- **Data Store:** [M:\Projects 14\Phycology 2014MM14-12 Intertidal Rocky Shore\FSL-RSL Classification update 2015 \(09-14\)\Datasheet.xls](M:\Projects 14\Phycology 2014MM14-12 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		
Kircubbin 2011	10	49	66.64	12.24	51.02	1.04	12.24	0.864	HIGH
Ringhaddy Rapids 2011	10	41	55.76	17.07	46.34	0.95	12.20	0.830	HIGH
Marfield 2011	13	57	64.98	17.54	49.12	0.90	12.28	0.836	HIGH
Ringhaddy Rapids 2012	9	45	64.8	15.56	48.89	0.96	11.11	0.855	HIGH
Mean								0.846 ±0.016	HIGH


Confidence of Classification: High (99.7%)

- Data analysed for Confidence of Class using [M:\Projects 14\Phycology 2014MM14-12 Intertidal Rocky Shore\PIRATES_v04 - Class update 2015 \(09-14\) for UKTAG.xls](M:\Projects 14\Phycology 2014MM14-12 Intertidal Rocky Shore\PIRATES_v04 - Class update 2015 (09-14) for UKTAG.xls)
- Standard Deviation (±) is included with the mean EQR.
- Data QA (expert team).
- WFD specific data (reduced species list completed; full species list not yet carried out).

Alien taxa present: *Sargassum muticum*, *Heterosiphonia japonica*

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QE: Angiosperms – No Data

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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)

1. IQI (UKTAG v01 20140228)

Water body IQI assessment:

Good (Low)

WFD surveillance monitoring:

- **Data store:** [..\Strangford Lough South water body\Strangford Lough Water Body 08-13 fauna data 1mm.xlsx](#)
- **Benthic invertebrates**
- **Supporting Parameters**
- **Digital images**
- **Data Availability (classification):**

UNICORN (NMMT) Database
Water Quality Data Set
AMAP Project folder
48 sites, 5, 3 & 1 reps, 4 years, Day Grab, 1 mm sieve, n=94.

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 & CSEG	SL4 (3), GIP (5)	8	0.66	0.03	Good
2011	MM- Benthos & CSEG	SL4 (5), GIP (5)	10	0.78	0.02	High
2012	MM- Benthos, CSEG, BSSP12	SL4 (5), GIP (5), SSp12-57	66	0.78	0.08	High
2013	MM- Benthos & CSEG	SL4 (5), GIP (5)	10	0.80	0.03	High
2014	MM- Benthos & CSEG (not analysed)	SL4 (5), GIP (5)	-	-	-	-
2015	MM- Benthos & CSEG (no resources)	SL4 (5), GIP (5)	-	-	-	-
Overall 6 year waterbody means			23.5	0.76 (0.72*)	0.04	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 (2 single points with reps and additional spatial coverage in 2012 with 46 sites)

Aliens species present: *Crassostrea gigas*.

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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*)
7.58	HIGH	2010-2015	**	115	

* 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 DIN 2015-2021.xls](#)
- **Data Availability:** 2010 to 2013
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
9.86		58	22	2010 to 2013	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	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	NOV 2010 – APR 2011
Trace Organics (OPONS)	Diazinon	NOV 2010 – APR 2011
Trace Organics (OPONS)	Fenitrothion	NOV 2010 – APR 2011
Urea Herbicides	Linuron	OCT 2011 – MAY 2012
Nutrients (Winter Nutrients)	Unionised Ammonia (at pH8)	WIN NUTS 2012-2013
Candidate Specific pollutant	Glyphosate	NOV 2012 – FEB 2013

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

Suite	Parameter	Data Availability
Trace Organics (OPONS)	Mevinphos	NOV 2010 – APR 2011
Trace Organics (OPONS)	Triazaphos*	NOV 2010 – APR 2011
Trace Organics (OPONS)	Dichlorvos	NOV 2010 – APR 2011

Triazaphos* LOD above the EQS.

*Further data is available but cannot be used for classification until the assessment of 2011 Killyleagh WWTW trace organics monitoring data is completed.

Link to Data, Assessment and EQSs:

<G:\MARINEWater Framework Directive\WFD ANNUAL CLASSIFICATION UPDATE 2013\Chemistry>


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 and EQSs:

<..\Data>

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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 (L)	
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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	SWMP 2012
Trace Metals	Cadmium	SWMP 2012
Trace Metals	Lead	SWMP 2012
Trace Metals	Mercury	SWMP 2012
Trace Organics (OPONS)	Atrazine	NOV 10 – APR 11
Trace Organics (OPONS)	Chlorfenvinphos	NOV 10 – APR 11
Trace Organics (OPONS)	Chlorpyrifos	NOV 10 – APR 11
Trace Organics (OPONS)	Simazine	NOV 10 – APR 11
Urea Herbicides	Isoproturon	OCT 11 – MAY 12
Urea Herbicides	Diuron	OCT 11 – MAY 12
PAH	Anthracene	NOV 10 – JUN 11
PAH	Fluoranthene	NOV 10 – JUN 11
PAH	Naphthalene	NOV 10 – JUN 11
PAH	Benzo (a) pyrene	NOV 10 – JUN 11
PAH	*Benzo(b)fluoranthene	NOV 10 – JUN 11
PAH	*Benzo(k)fluoranthene	NOV 10 – JUN 11
PAH	*Benzo(g,h,i)perylene	NOV 10 – JUN 11
PAH	*Indeno(1,2,3 cd) pyrene	NOV 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)

EQS Failures:

AA – EQS failure for the sum of Benzo(g,h,i)perylene and Indeno(1,2,3 cd) pyrene.

Calculated mean = 0.0659 ug/l

AA – EQS failure for the sum of Benzo(b)fluoranthene and Benzo(k)fluoranthene.


Calculated mean = 0.05020 ug/l

There is low confidence as the EQS is an annual average and the mean is calculated with only 4 months of monitoring data (Nov 10, Jan 11, Apr 11 and Jun 11).

There is no marine maximum allowable concentration (MAC) for comparison.

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 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

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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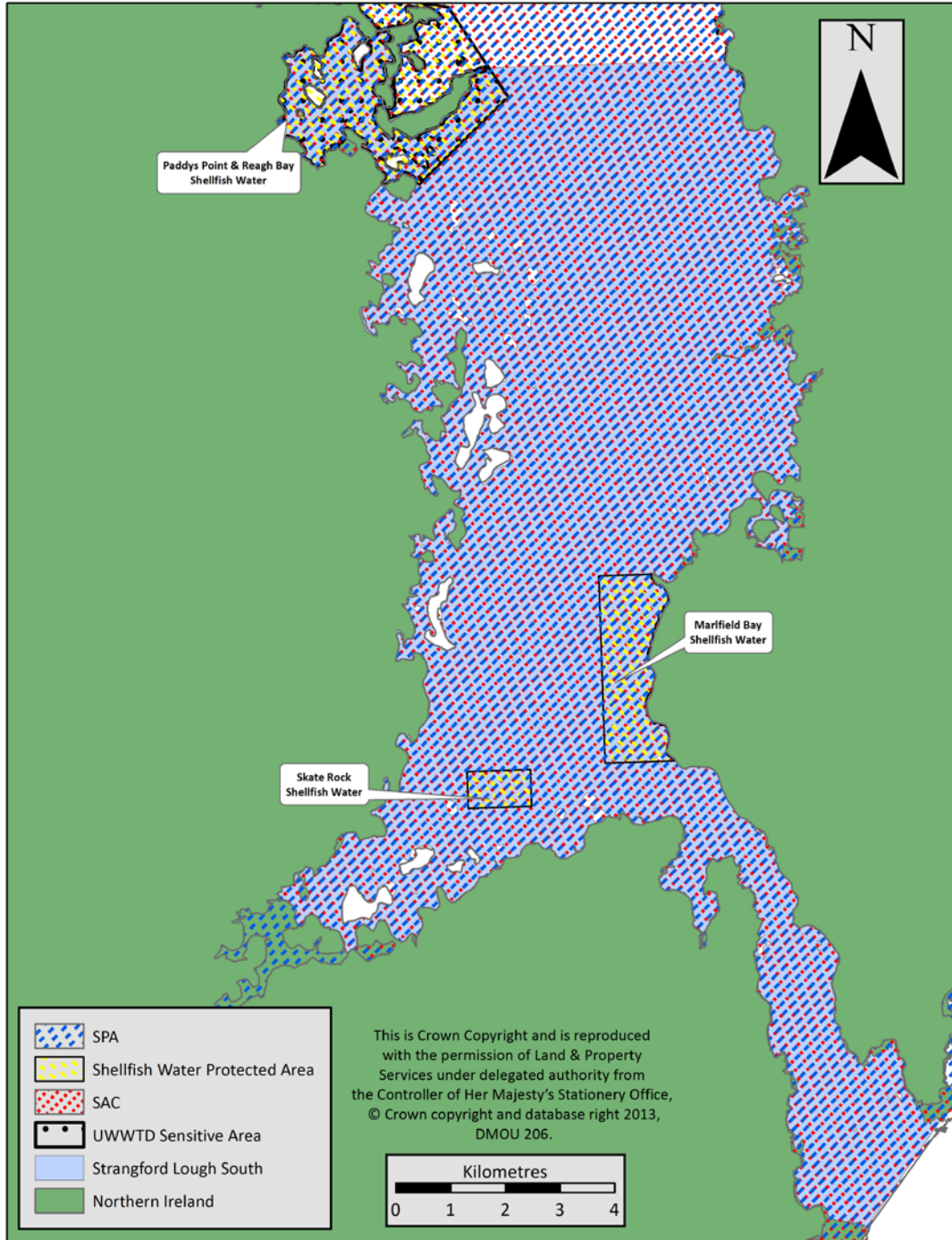
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ANNEX F: Protected Areas



Protected areas within Strangford South (Coastal Water).

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The following Protected Areas are situated either wholly or partly within the Strangford 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
Strangford Lough SAC	Unfavourable	Coastal lagoons; Large shallow inlets and bays; Annual vegetation of driftlines; Atlantic salt meadows (<i>Glaucopiccinellietalia maritimae</i>); Mudflats and sandflats not covered by seawater at low tide; Perennial vegetation of stony banks; Reefs; <i>Salicornia</i> and other annuals colonising mud and sand; <i>Phoca vitulina</i>	Atlantic salt meadows (<i>Glaucopiccinellietalia maritimae</i>); <i>Salicornia</i> and other annuals colonising mud and sand; Reefs; Perennial vegetation of stony banks; Large shallow inlets and bays; Coastal lagoons	Invasive species <i>Spartina anglica</i> Invasive species <i>Spartina anglica</i> Non marine water quality related Agricultural operations (Ploughing, fertiliser, pesticides) Non marine water quality related Increased siltation and non native species
Strangford Lough SPA	Favourable	Sandwich tern; Common tern; Arctic tern; Knot; Light bellied brent goose; Redshank; water bird assemblage	None	n/a


Shellfish Water Protected Areas:

Shellfish Water Protected Area	Met Guideline Microbiological Standard* in 2014
Paddy's Point/Reagh Bay	Yes (n=24)
Skate Rock	Yes (n=13)
Marfield Bay	No (n=0) NO DATA

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

Nitrates Directive/ Urban Waste Water Treatment Directive Sensitive Areas:

- Ardmillan Shellfish Water UWWTD Sensitive Area

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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.		Y		PO
Chordata	<i>Styela clava</i>				
Crustacea	<i>Eriocheir sinensis</i>				
Mollusca	<i>Crassostrea gigas</i>		Y		W
Mollusca	<i>Crepidula fornicata</i>				
Phaeophyceae	<i>Sargassum muticum</i>		Y		W
Angiosperms	<i>Spartina anglica</i>		Y		W

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 Strangford 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
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