ENVIRONMENTAL PROTECTION AGENCY

The EPA is responsible for protecting and improving the environment as a valuable asset for the people of Ireland. We are committed to protecting people and the environment from the harmful effects of radiation and pollution.

The work of the EPA can be divided into three main areas:

Regulation: *Implementing regulation and environmental compliance systems to deliver good environmental outcomes and target those who don't comply.*

Knowledge: *Providing high quality, targeted and timely environmental data, information and assessment to inform decision making.*

Advocacy: *Working with others to advocate for a clean, productive and well protected environment and for sustainable environmental practices.*

Our responsibilities include:

Licensing

- Large-scale industrial, waste and petrol storage activities;
- Urban waste water discharges;
- The contained use and controlled release of Genetically Modified Organisms;
- Sources of ionising radiation;
- Greenhouse gas emissions from industry and aviation through the EU Emissions Trading Scheme.

National Environmental Enforcement

- Audit and inspection of EPA licensed facilities;
- Drive the implementation of best practice in regulated activities and facilities;
- Oversee local authority responsibilities for environmental protection;
- Regulate the quality of public drinking water and enforce urban waste water discharge authorisations;
- Assess and report on public and private drinking water quality;
- Coordinate a network of public service organisations to support action against environmental crime;
- Prosecute those who flout environmental law and damage the environment.

Waste Management and Chemicals in the Environment

- Implement and enforce waste regulations including national enforcement issues;
- Prepare and publish national waste statistics and the National Hazardous Waste Management Plan;
- Develop and implement the National Waste Prevention Programme;
- Implement and report on legislation on the control of chemicals in the environment.

Water Management

- Engage with national and regional governance and operational structures to implement the Water Framework Directive;
- Monitor, assess and report on the quality of rivers, lakes, transitional and coastal waters, bathing waters and groundwaters, and measurement of water levels and river flows.

Climate Science & Climate Change

- Publish Ireland's greenhouse gas emission inventories and projections;
- Provide the Secretariat to the Climate Change Advisory Council and support to the National Dialogue on Climate Action;
- Support National, EU and UN Climate Science and Policy development activities.

Environmental Monitoring & Assessment

- Design and implement national environmental monitoring systems: technology, data management, analysis and forecasting;
- Produce the State of Ireland's Environment and Indicator Reports;
- Monitor air quality and implement the EU Clean Air for Europe Directive, the Convention on Long Range Transboundary Air Pollution, and the National Emissions Ceiling Directive;
- Oversee the implementation of the Environmental Noise Directive;
- Assess the impact of proposed plans and programmes on the Irish environment.
- Environmental Research and Development
- Coordinate and fund national environmental research activity to identify pressures, inform policy and provide solutions;
- Collaborate with national and EU environmental research activity.

Radiological Protection

- Monitoring radiation levels and assess public exposure to ionising radiation and electromagnetic fields;
- Assist in developing national plans for emergencies arising from nuclear accidents;
- Monitor developments abroad relating to nuclear installations and radiological safety;
- Provide, or oversee the provision of, specialist radiation protection services.

Guidance, Awareness Raising, and Accessible Information

- Provide independent evidence-based reporting, advice and guidance to Government, industry and the public on environmental and radiological protection topics;
- Promote the link between health and wellbeing, the economy and a clean environment;
- Promote environmental awareness including supporting behaviours for resource efficiency and climate transition;
- Promote radon testing in homes and workplaces and encourage remediation where necessary.

Partnership and networking

- Work with international and national agencies, regional and local authorities, non-governmental organisations, representative bodies and government departments to deliver environmental and radiological protection, research coordination and science-based decision making.

Management and structure of the EPA

The EPA is managed by a full time Board, consisting of a Director General and five Directors. The work is carried out across five Offices:

- Office of Environmental Sustainability
- Office of Environmental Enforcement
- Office of Evidence and Assessment
- Office of Radiation Protection and Environmental Monitoring
- Office of Communications and Corporate Services

The EPA is assisted by advisory committees who meet regularly to discuss issues of concern and provide advice to the Board.

Assigning Ecological Status to Unmonitored Water Bodies in 2016-2021

A technical report outlining the methodologies used in surface waters and groundwaters

ENVIRONMENTAL PROTECTION AGENCY
An Ghníomhaireacht um Chaomhnú Comhshaoil
PO Box 3000, Johnstown Castle, Co. Wexford, Ireland
Telephone: +353 53 916 0600 Fax: +353 53 916 0699
Email: info@epa.ie Website: www.epa.ie

ISBN: 978-1-80009-191-7

Contents

1 Introduction

The EU Water Framework Directive (WFD) is the main piece of legislation aiming to protect and restore the quality of surface waters (rivers, lakes, estuaries, and coastal waters) and groundwaters across the European Union. The Directive sets key environmental objectives for each body of water. The status of each water body is assessed periodically to determine if the objectives have been met.

In Ireland, almost 60 per cent of identified Water Framework Directive (WFD) water bodies[1] are monitored. The current ecological status assigned to these waterbodies is based on the results of the 2019-2021 national water quality monitoring programme (EPA, 2021). The status for those water bodies that are not monitored must be assigned by other means. The purpose of this technical paper is to outline how status is assigned to the remaining unmonitored surface waters and groundwaters.

2 Background

The WFD requires that all European Union Member States assess the status of their water bodies. The evaluation of status is used to determine if the environmental objectives set for a water body have been achieved.

For surface water, these objectives are the achievement of at least good status, or good ecological potential[2], and the prevention of deterioration in status (Article 4(1)(a) of the WFD). Responsibility for determining surface water status was assigned to the EPA in SI 272 of 2009 (European Communities Environmental Objectives (Surface Waters) Regulations).

For groundwater, these objectives are the achievement of good chemical and quantitative status. Responsibility for determining groundwater status was assigned to the EPA in SI 9 of 2010 (European Communities Environmental Objectives (Groundwater) Regulations).

The WFD sets out in detail how status should be assigned for each identified water body type[1] by monitoring various biological and physicochemical elements. The elements to be monitored are prescribed in the Directive and monitoring results are compared against type-specific reference conditions to determine the status of water bodies. While the Directive requires that all water bodies are assigned a status it does not require that all water bodies are monitored. It is widely recognised that monitoring all water bodies is not economically or logistically feasible and therefore it is necessary to group similar water bodies together for the purpose of assigning status. This is allowed for by the Directive as long as sufficient water bodies are monitored within a group to provide an accurate assessment of status of that group (Common Implementation Strategy Guidance Document No. 7). This grouping can be based on similar hydrological, geomorphological or geographical conditions or on similar land-uses or catchment impacts. Statistical analysis can also be used to group water bodies with similar characteristics. In all cases grouping must be technically or scientifically justifiable.

As indicated, approximately 60 per cent of the surface and groundwater bodies are currently monitored in the national water quality monitoring programme. This means that water status for those water bodies that are not monitored must be assigned by other means. This can either involve grouping of similar water bodies together for the purpose of assigning status or by the use of expert judgement where grouping is not possible.

The approach taken for assigning status to unmonitored water bodies for the 2013-2018 period was published and is available here. The methodologies for assigning status to unmonitored rivers and lakes were subsequently updated to improve the overall confidence in the results. This report outlines

[1] Water bodies are the basic unit of reporting used in the WFD. Member states must identify the location and boundaries of water bodies, the water category to which they belong (i.e. river, lake, transitional water, coastal water and groundwater) and their physical type within this category.

[2] Heavily Modified Water Bodies are classified with ecological potential rather than ecological status.

the methods applied to assign status to unmonitored rivers, lakes, transitional and coastal and groundwater water bodies for the 2016-2021 period. Each water category will be dealt with under a separate heading.

The 2016-2021 ecological status assessment results for all water bodies based on all assessment techniques are available to download from the EPA website (https://gis.epa.ie/GetData/Download).

3 Rivers

The EPA commissioned a study to further develop the method to assign status to unmonitored rivers for the 2016-2021 status assessment period (Appendix A). The study developed regression models using data from monitored river sites to predict the status of two quality elements - macroinvertebrates (Q value) and Molybdate Reactive Phosphorus (MRP) for unmonitored river water bodies. The outputs of the study were reviewed by EPA and modified where appropriate when assigning status to the unmonitored river water bodies. A total of 2,397 of the 3,192 WFD river water bodies (RWBs) were assigned an ecological status in the 2016-2021 status assessment using monitored data. The majority of the remaining 795 unmonitored RWBs were assigned ecological status using the updated methodology.

3.1 Data Used

A range of physical attributes, pressure data (including risk characterisation[3]), status data, and data from the EPA Source Load Apportionment Model (SLAM - Mockler *et al*. 2016, 2017) was collated at the river water body (RWB) level and considered for the modelling assessment.

The following variables were used in the Phosphate status model:

- Local urban phosphorus loading
- Upstream urban phosphorus loading
- Local rural phosphorus loading/local percentage of poorly draining soils
- Flow
- Slope
- Eastings and northings

The following variables were used in the Macroinvertebrate status model:

- MRP concentration
- Dissolved oxygen saturation
- Flow
- Slope
- Local % poorly draining soils
- Local % urban land use
- Heavily modified water body
- MQI score
- Easting and northing

3.2 Statistical Method Applied

Regression models were developed using data from monitored river sites to predict the WFD status class of two quality elements - macroinvertebrates (Q value) and MRP for unmonitored river water bodies (Appendix A). For both quality elements, spatial variation among monitored RWBs was analysed using specialised regression models. A standard Gaussian error distribution was used to model MRP concentration while the macroinvertebrate model focused on predicting Q value status

[3] Risk of not achieving the WFD objectives set for that water body.

classes which have a natural order (high, good, moderate, poor, and bad) and so an ordered categorical (ocat) model was used instead.

The biological macroinvertebrate status predictions were used to assign the extrapolated ecological status in the majority of these unmonitored river water bodies. This differs from the study in Appendix A which used the worst case of either MRP or macroinvertebrates to assign status. This decision was taken because in a monitored river water body, ecological status is only assigned when a biological element's status is available (macroinvertebrates combined with macrophytes, phytobenthos, and fish, if available). Also, General Physico-Chemical (GPC) status assessment requires data for several parameters (pH, dissolved oxygen, biochemical oxygen demand (BOD), orthophosphate, total ammonia and total oxidised nitrogen). Under the current rules applied to assess GPC and ecological status, orthophosphate cannot determine status on its own.

3.2.1 Expert Judgement

The modelled status results were then reviewed. Any available supplementary information about the unmonitored RWBs was used to validate the outputs of the regression modelling analysis. Where the supplementary information was not in agreement with the outputs of the analysis, expert judgement was used to assign status based on an evaluation of the available supplementary data. Expert judgement focussed on categorising water bodies as being "good or better" or "moderate or worse". For reporting purposes, the status of these water bodies was reported as either 'good' or 'moderate', respectively.

The following supplementary information, when available, was considered in assigning the status category and was applied hierarchically:

- Information in supplementary reports (e.g. Local Catchment Assessment Reports).
- Information on nutrient concentrations.
- Information on the status of water bodies upstream and downstream of an unmonitored water body.

3.4 Cross-border River Water Bodies

In the case of the cross-border river water bodies that are monitored only by the Northern Ireland Environment Agency (NIEA), the ecological status results for the period (based on data up to 2021) from NIEA were used where available. This provided ecological status for an additional 27 RWBs.

In RWBs where both the EPA and NIEA monitor the RWB, the status assessment outcomes were combined and the 'one-out all-out' approach[4] was used to assign final ecological status to the water body.

One RWB was defined as poor ecological status by NIEA based on expert judgement and a further three cross-border river water bodies were classified using the methodology set out here.

3.5 Results

A total of 3,189 river water bodies (99.9% of 3,192) were assigned an ecological status for the 2016-2021 period of which 2,397 RWBs had status assigned using available monitoring data (EPA & NIEA); 756 RWBs were assigned status using modelling (Table 3.1) and 36 RWBs were assigned status using expert judgement. Table 3.2 outlines the final status result using all assessment techniques.

[4] The lowest status class determines the overall status.

Table 3.1 Breakdown of Method of assessment used across all 3,192 RWB's.

Assessment Method	No. RWBs	% RWBs
Monitored (EPA)	2363	
Monitored (EPA, NIEA)	7	
Monitored (NIEA)	27	
Monitored (total)	2397	75.1
Modelling*	756	23.7
Expert Judgement*	36	1.1
Unassigned	3	0.09
Total	3192	100

*Status assignments derived using modelling or expert judgement will be reported as low confidence.

Table 3.2 The assignment of 2016-2021 ecological status for all RWBs

Ecological status assigned	No. RWBs	% RWBs
High	257	8.1
Good	1345	42.1
Moderate	1028	32.2
Poor	554	17.4
Bad	5	0.16
Unassigned	3	0.09
Total	**3192**	**100.0**
Total assigned	**3189**	**99.9**

4 Lakes

A total of 224 of the 812 WFD identified lake water bodies (LWBs) were assigned an ecological status in the 2016-2021 status assessment using monitored data. The remaining 588 lake water bodies were assigned status by modelling or expert judgement.

As with the river waterbodies, the EPA commissioned a study to further develop the methodology for assigning status to unmonitored lake water bodies (Appendix B). This resulted in the development of a new methodology for assigning status to unmonitored lakes.

The current methodology developed models using data from monitored lakes to predict the status of three quality elements for unmonitored lakes; Total Phosphorus (TP), chlorophyll *a* and macrophytes. The outputs of the study were reviewed and modified where appropriate using expert judgment when assigning status to unmonitored lakes.

4.1 Data Used

A range of physical and hydrological attributes, pressure data, status data and data from the EPA Source Load Apportionment Model (SLAM - Mockler *et al*. 2016, 2017) was collated at a lake catchment level and considered for the modelling assessment.

The following variables were used in the TP status model:

- modelled influent TP concentration
- residence time
- modelled influent TP concentration x residence time interaction; and
- easting/northing

The following variables were used in the chlorophyll *a* status model:

- TP concentration
- alkalinity
- TP concentration-alkalinity interaction
- colour

The following variables were used in the macrophytes status model:

- TP concentration
- colour
- alkalinity
- easting/northing

4.2 Statistical Method Applied

Initially a conceptual framework based on the source-pathway-receptor approach was built on the known mechanisms of lake eutrophication. This aided decisions on what data were most appropriate for the model. A typology of each lake was also determined to account for any natural variation that may influence ecological conditions.

The analysis focussed on predicting the status classes of the three quality elements using regression modelling techniques. The conceptual model was used to guide the selection of candidate data from monitored lakes as well as the most suitable regression model to use. The final models predicted the total phosphorus concentration as well as the EQRs[5] for chlorophyll *a* and macrophytes. The EQRs were then converted to WFD status classes and combined using the 'one-out all-out' approach. The report of this study is available in Appendix B and fully outlines the approach taken.

4.2.1 Expert judgement

Outputs of the extrapolation exercise were reviewed using expert judgement, verification of land use with orthophotography, and with reference to the outputs of the Wynne and Donohue (2016) study.

4.3 Results

The results obtained from modelling and expert judgement is presented in Table 4.1 along with the results based on monitoring.

[5] Ecological Quality Ratio. A number scale between zero and one. A value of one represents the best 'reference' quality and zero is the worst quality.

Table 4.1 The assignment of 2016-2021 status for all lake water bodies.

2016-2018 Status	High	Good	Moderate	Poor	Bad	Unassigned	Grand Total
Monitored	17	90	81	28	8	0	224
Modelled	121	208	85	48	0	0	462
Expert Judgement	113	8	2	3	0	0	126
Grand Total	**251**	**306**	**168**	**79**	**8**	**0**	**812**

5 Transitional and Coastal Waters

For WFD assessment purposes, the saline waters of Ireland have been split into 110 coastal water bodies and 196 transitional (estuarine) water bodies. A subset of these water bodies are monitored having been chosen in a way that allows the information gathered in these areas to be used to provide a national picture of WFD status. The following approach was used to assign a status to the unmonitored water bodies and is unchanged from the method used in 2013-2018.

5.1 Data Used

Water bodies were delineated into groups with similar pressures and characteristics with each group containing monitored water bodies. The grouping was undertaken at a regional level, similar to the River Basin Districts (RBDs) used in previous River Basin Management Plans (RBMPs). The data used were based on characterisation outputs, updated catchment parameters from the SLAM model (Mockler *et al*. 2016, 2017) and available pressure data.

The set of parameters used to group the water bodies were:

Coastal:

- Typology of the water body (based on physical characteristic such as depth, exposure etc.)
- Average nitrogen export rate into each water body (weighted average)
- Average phosphorus export rate into each water body (weighted average)

Transitional

- Area of water body
- Size of the largest catchment discharging to water body
- Average nitrogen export rate into each water body
- Average phosphorus export rate into each water body

Lagoons (types CW10 and TW6[6]) which correspond to transitional and coastal lagoon water bodies were analysed separately with additional physical information on salinity regime and depth included in the analyses.

5.2 Statistical Method Applied

The grouping exercise consisted of a statistical analysis of all the water bodies in the region to cluster the areas according to their similarity. The similarity of each water body was calculated using a set of parameters based on their physical attributes and the pressures acting on them. A hierarchical cluster analysis was undertaken and then a similarity profile (SIMPROF) test was used to test for evidence of structure in the cluster analysis and to identify significant groups within the dataset. Figures 5.1 and 5.2 give examples of the outputs of the cluster analyses.

[6] WFD types for transitional and coastal waters.

The ecological status from the monitored areas in these groups were then applied to the non-monitored areas to give an overall picture of the national status of all transitional and coastal water bodies. Each group had at least one monitored water body in it and the status assessment for this area was applied to the other water bodies.

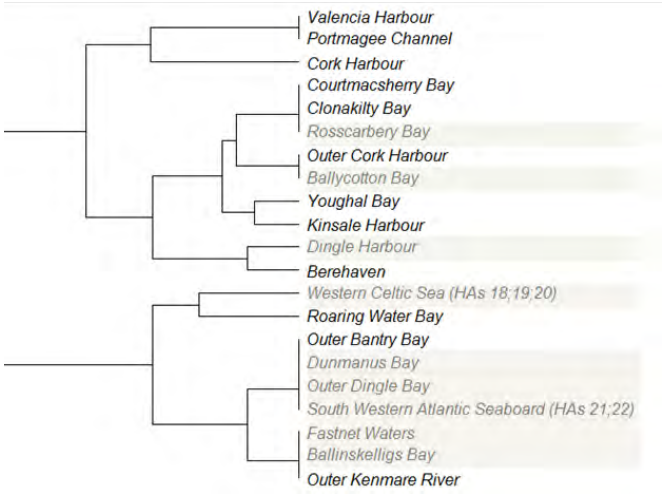

Figure 5.1 Example of a cluster analysis tree with groups of similar water bodies. Unmonitored water bodies in grey.

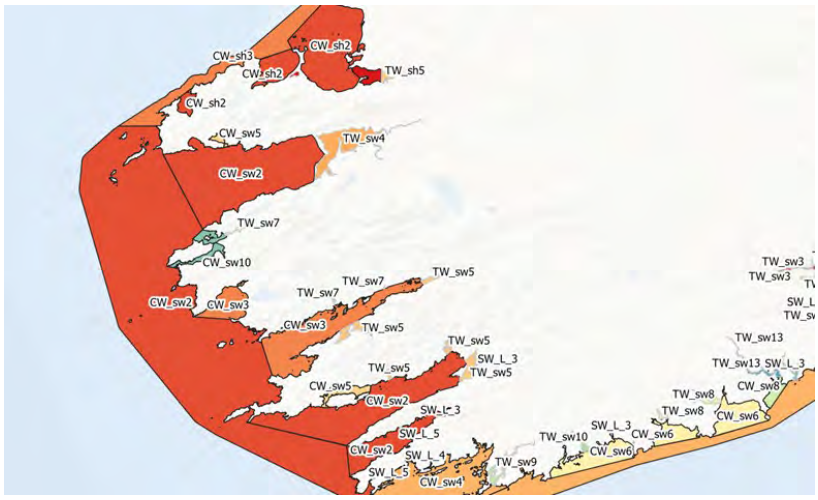

Figure 5.2 Example of cluster groups in the southwest of Ireland.

Only the physico-chemical and biological elements responding to diffuse pressures were used for the grouping. Issues due to localised or point sources are not included in the analysis as these are unique to the water body affected. Where monitored status was less than good a 'moderate' status was assigned to grouped water bodies.

5.2.1 Expert Judgement

Validation of grouped status was undertaken where additional data were available. For example, if winter nutrient data was available to assess the EQS (Environmental Quality Standard) for available parameters this was compared to grouped status. In selected cases information from in situ monitoring buoys was used for additional validation.

5.3 Results

The final 2016-2021 status assessment of monitored and unmonitored transitional and coastal water bodies is presented in Table 5.1.

Table 5.1 The assignment of 2016-2021 status for all transitional and coastal water bodies using all methods.

2016-2021 Ecological Status	No. Transitional WBs	No. Coastal WBs
High	28	44
Good	30	35
Moderate	79	16
Poor	18	1
Bad	4	1
Total Assigned	159	97
Total no. Water Bodies	196	110
% Assigned*	81	88

*The majority of unassigned water bodies are small lagoons that were not grouped.

6 Groundwaters

There are 514 groundwater bodies delineated nationally in Ireland, and many of these have similar hydrogeological characteristics and pressures. The origins of the groundwater monitoring network are described in EPA, 2006 and Craig *et al*., 2006. There are 253 groundwater monitoring points where groundwater quality is assessed. There are 128 groundwater level and 24 spring flow monitoring sites in the current groundwater quantitative monitoring programme.

126 of the 514 groundwater bodies have at least one associated groundwater monitoring point that is monitored by the EPA as part of the national groundwater monitoring programme. Additional monitoring data by way of investigative monitoring from EPA licensed activities, GSI, NPWS or local authority monitoring is available, and these data are used in the assessment of status for an additional 103 groundwater bodies. In the status assessments for cross-border groundwater bodies, the status classifications in both jurisdictions are considered to determine status. A groundwater classification methodology was developed and published for Ireland in 2010.

In accordance with European guidance on groundwater body delineation, groundwater monitoring and groundwater status assessments; "*groundwater bodies may be grouped for monitoring purposes provided that the monitoring information obtained provides a reliable assessment of the status of each body in the group*".

Groundwater body grouping has been used in the assessment of groundwater **chemical status**, where the pressures are widespread and diffuse in nature e.g. nutrient loss from agricultural activities.

For the assessment of groundwater **chemical status** where the pressures are from point sources and/or are unique to a groundwater body e.g. from historic industrial contamination, chemical status has been determined using monitoring data for those individual groundwater bodies i.e., groundwater body grouping has not been used.

For the assessment of groundwater **quantitative status**, groundwater body grouping was not required because the data were available to complete the assessment for the specific groundwater bodies i.e., the impact of abstractions is localised to a specific groundwater body and associated receptors.

6.1 Principles of Groundwater Body Grouping

Groundwater body grouping has been used in the assessment of groundwater chemical status where the pressures are widespread and diffuse in nature. Groundwater chemistry varies spatially across an aquifer because of natural variations in hydrogeology and land use between recharge and discharge areas. It is unlikely that the hydrogeological characteristics of, and pressures impacting on, a single groundwater monitoring point will account for spatial variation in hydrogeology and range of diffuse pressures that exist across an entire groundwater body.

Therefore, to ensure status assessments and associated water quality measures are representative , groundwater body groups with similar hydrogeological characteristics and pressures have been grouped. The aggregated water quality data from groundwater monitoring points within the group of groundwater bodies has been used to determine the groundwater body status for the collective group of groundwater bodies.

Grouping of groundwater bodies is based on representativity and risk. Grouping takes account of:

- Pressures (diffuse)
- Pathway (hydrogeology)
- Risk (of failing to meet WFD objectives)
- Monitoring data (informing and validating the grouping)

A representative monitoring network group for diffuse/widespread pressures is achieved when the monitoring network adequately represents the variation in hydrogeology and land use pressures

across a group of groundwater bodies. The monitoring data validate the grouping i.e. if high groundwater nitrate concentrations are expected and the monitoring data indicate high concentrations, then the group of monitoring points is representative of the pressures and pathways in the group of groundwater bodies.

The average concentrations from the group of groundwater monitoring points are compared against the groundwater threshold values to determine status. If the average group concentration exceeds the threshold value, then all groundwater bodies in the group are classified as at poor status.

Pressure, pathway and risk data has been taken from the PIP maps generated using the Catchment Characterisation Tool and the modelled loadings per hectare via the groundwater pathway from the SLAM model (Mockler *et al*. 2016, 2017).

6.2 Groundwater Body Grouping Method

In total, there 39 groundwater body groups have been established. These reflect the different hydrogeological, pressure risk characterisation variations across Ireland. All 514 groundwater bodies are assigned to a group for the chemical status assessment relating to diffuse and/or widespread groundwater body pressures.

Where a groundwater body is associated with a significant point source pressure, the groundwater status is determined using groundwater body specific monitoring data e.g. compliance monitoring for an industrial facility. This groundwater body and associated monitoring data are considered unrepresentative of the group of groundwater bodies for diffuse and/or widespread groundwater body pressures and they are excluded from the group/grouping assessment.

Groundwater groups for diffuse and/or widespread groundwater body pressures consider:

a) **Aquifer category / flow regime** – the dominant aquifer/flow regime was determined for each groundwater body and for each contributing area (zone of contribution) to each monitoring point. The aquifer/flow regime data was determined using the national bedrock aquifer map and sand and gravel aquifer map as produced by the Geological Survey of Ireland (GSI, 2014).

b) **Groundwater Body Status & Risk Characterisation** – the status and risk characterisation outputs were used to avoid grouping groundwater bodies that were at poor status with groundwater bodies at good status and to avoid grouping 'not at risk' groundwater bodies with 'at risk' groundwater bodies.

c) **Nitrate impact potential** used the nitrate Pollution Impact Potential (PIP) maps generated using the Catchment Characterisation Tool and the modelled loadings per hectare via the groundwater pathway from the SLAM model (Mockler *et al*. 2016, 2017). From this the relative nutrient losses (kg/ha) via groundwater for each groundwater body and each monitoring point zone of contribution was determined. The PIP was categorised (in relative terms and for the purposes of this assessment only) as follows:

    i. PIP Category 1-2 was considered High Impact Potential

    ii. PIP Category 3-5 was considered Mid Impact Potential

    iii. PIP Category 6-7 was considered Low Impact Potential

d) **Phosphate impact potential** used the phosphate PIP maps generated from the Catchment Characterisation Tool and the modelled loadings per hectare via the groundwater pathway from the SLAM model as described above for the nitrate impact potential.

e) **Nitrate and phosphate water quality data** from the groundwater monitoring programme were used to further inform and validate the grouping and the representativity. The following were used for the 2016-2021 period:

i. Average concentration per monitoring point

ii. Average concentration per GWB

iii. Average concentration per GWB Group

f) **Representative groups** of groundwater bodies and associated monitoring point groups were achieved when the impact potential from the collective zone of contributions was comparable to that of the collective group of groundwater bodies, and when the water quality from the collective group validated the impact potential.

g) **Groundwater body chemical status** was determined by comparing the aggregated average concentration in each group of groundwater bodies against the groundwater threshold value**.** If the aggregated average concentration for the group exceeded the threshold value, every groundwater body in the group was assigned poor status.

h) **Individual average concentration exceedances** of the threshold value at monitoring points within a group were further investigated to determine if the zone of contribution to that monitoring point represented more than 20% of the overall groundwater body group area. This would have potentially led to the groundwater bodies being assigned poor status. In this assessment no monitoring point zones of contribution were greater than 20% of the groundwater body group area.

6.3 Groundwater Body Status Results

Table 6.1 shows the status breakdown for groundwater bodies for each assessment element for 2016-2021. Groundwater body grouping has been used in the assessment of groundwater body chemical status for the surface water body, GWDTE (groundwater dependent terrestrial ecosystems) and general chemical tests[7], as each may be impacted by diffuse and/or widespread pressures. Groundwater body grouping has not been used for any of the other groundwater body test elements.

[7] Industrial and point source pressures impacting on a single groundwater body are also assessed under each of these tests and it is these individual groundwater body specific pressures that account for most of the poor status groundwater bodies.

Table 6.1 The assignment of groundwater status for all groundwater bodies

Groundwater Assessment Element	**2016-2021**	
	514 water bodies	
	Good Status	Poor Status
Surface Water Quality Test	510	4
GWDTE Chemical Test	512	2
Drinking Water Test	507	7
General Chemical Test	482	32
Intrusions Test	514	0
Surface Water Quantity Test	514	0
GWDTE Quantity Test	513	1
Water Balance Test	513	1
Overall Chemical Status	*472*	*42*
Overall Quantitative Status	*512*	*2*
Final Status Classification	**470**	**44**

7 WFD Status 2016-2021 -All Methods

Table 7.1 presents a breakdown of the WFD status of monitored and unmonitored surface and groundwaters for the 2016-2021 period.

Table 7.1 WFD Status 2016-2021 for monitored and unmonitored surface and groundwaters

	High	Good	Moderate	Poor	Bad	Unassigned	Total
Rivers							
Monitored	232	1002	716	442	5	0	**2397**
Unmonitored	25	343	312	112	0	0	**792**
Unassigned	0	0	0	0	0	3	**3**
Total	**257**	**1345**	**1028**	**554**	**5**	**3**	**3192**
Lakes							
Monitored	17	90	81	28	8	0	**224**
Unmonitored	234	216	87	51	0	0	**588**
Unassigned	0	0	0	0	0	0	**0**
Total	**251**	**306**	**168**	**79**	**8**	**0**	**812**
Transitional							
Monitored	6	10	41	18	4	0	**79**
Unmonitored	22	20	38	0	0	0	**80**
Unassigned	0	0	0	0	0	37	**37**
Total	**28**	**30**	**79**	**18**	**4**	**37**	**196**
Coastal							
Monitored	20	21	13	1	1	0	**56**
Unmonitored	24	14	3	0	0	0	**41**
Unassigned	0	0	0	0	0	13	**13**
Total	**44**	**35**	**16**	**1**	**1**	**13**	**110**
Groundwater							
Monitored	n/a	120	n/a	9[8]	n/a	0	**129**
Investigative Monitoring[9]	n/a	68	n/a	35	n/a	0	**103**
Unmonitored	n/a	282	n/a	0	n/a	0	**282**
Unassigned	n/a	0	n/a	0	n/a	0	**0**
Total	**n/a**	**470**	**n/a**	**44**	**n/a**	**0**	**514**

[8] Three of these groundwater bodies are cross border bodies, where the status outcome has been determined by monitoring data gathered and assessment completed by the NIEA.

[9] Investigative monitoring includes the assessment of compliance monitoring from IED, IPC and Waste licences. It also includes monitoring and assessments undertaken by other state bodies such as NPWS, GSI and the local authorities.

8 References

Craig *et al*. (2006). Screening Methodology for The Water Framework Directive Groundwater Quality Monitoring Network; Matthew Craig, Natalya Hunter Williams, Henning Moe. Proceedings of the 26th Annual IAH Conference: "It doesn't just go away, you know…" SUDS and Groundwater Monitoring. 25-26 April 2006, Tullamore Court Hotel, Co. Offaly.

EPA (2006). *Water Framework Directive Monitoring Programme*. Environmental Protection Agency, Wexford, Ireland. 140 pages.

EPA (2010). *Methodology for Establishing Threshold Values, and the Assessment of Groundwater Status and Pollution Trends*. Environmental Protection Agency, Wexford, Ireland. 57 pages.

EPA (2021). Ireland's National Water Framework Directive Monitoring Programme 2019-2021. Environmental Protection Agency, Wexford, Ireland. 56 pages.

EPA (2022). Assigning WFD Status to Unmonitored Water Bodies in 2013-2018. A technical report outlining the methodologies used in surface waters and groundwaters. Environmental Protection Agency, Wexford, Ireland. 23 pages.

GSI (2009) *Classification of Groundwater Bodies: General Chemistry Test for Mines*, Geological Survey of Ireland, 2009.

GSI (2014). National Bedrock Aquifer Map and Sand and Gravel Aquifer Map, Geological Survey of Ireland, 2014. https://www.gsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx

Mockler *et al*. (2016). Nutrient load apportionment to support the identification of appropriate water framework directive measures. Mockler, Eva M., Deakin, Jenny, Archbold, Marie A., Daly, Donal, Bruen, Michael. Biology and Environment: Proceedings of the Royal Irish Academy Vol. 116B, No. 3 (2016), pp. 245-263.

Mockler *et al*. (2017). Sources of nitrogen and phosphorus emissions to Irish rivers and coastal waters: Estimates from a nutrient load apportionment framework. Mockler, Eva M., Deakin, Jenny, Archbold, Marie A., Gill, Laurence, Daly, Donal, Bruen, Michael. Science of the Total Environment 601–602 (2017) 326–339.

UKTAG (2012). UKTAG Task 11(b)(i) *Groundwater Chemical Classification for the purposes of the Water Framework Directive and the Groundwater Directive*, UK Technical Advice Guidance.

UKTAG (2012). UKTAG Task 11(b)(ii) *Groundwater Quantitative Classification for the purposes of the Water Framework Directive*, UK Technical Advice Guidance.

WFD CIS Guidance Document No2 (2003). Identification of Water Bodies, Common Implementation Strategy for the Water Framework Directive (2000/60/EC), Published by the Directorate General Environment of the European Commission, Brussels.

WFD CIS Guidance Document No7 (2003). Groundwater Monitoring Under the Water Framework Directive, Common Implementation Strategy for the Water Framework Directive (2000/60/EC), Published by the Directorate General Environment of the European Commission, Brussels.

WFD CIS Guidance Document No15 (2007). Groundwater Monitoring Under the Water Framework Directive, Common Implementation Strategy for the Water Framework Directive (2000/60/EC), Published by the Directorate General Environment of the European Commission, Brussels.

WFD CIS Guidance Document No18 (2009). Guidance on Groundwater Status and Trend Assessment, Common Implementation Strategy for the Water Framework Directive (2000/60/EC), Published by the Directorate General Environment of the European Commission, Brussels.

Wynne and Donohue (2016), Predicting ecological status in unmonitored lakes using catchment land use and hydromorphological characteristics. EPA Research Report No. 181 (https://www.epa.ie/publications/research/water/EPA-RR-181-final-web-2.pdf)

AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL

Tá an GCC freagrach as an gcomhshaol a chosaint agus a fheabhsú, mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ar thionchar díobhálach na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialáil: *Rialáil agus córais chomhlíonta comhshaoil éifeachtacha a chur i bhfeidhm, chun dea-thorthaí comhshaoil a bhaint amach agus díriú orthu siúd nach mbíonn ag cloí leo.*

Eolas: *Sonraí, eolas agus measúnú ardchaighdeáin, spriocdhírithe agus tráthúil a chur ar fáil i leith an chomhshaoil chun bonn eolais a chur faoin gcinnteoireacht.*

Abhcóideacht: *Ag obair le daoine eile ar son timpeallachta glaine, táirgiúla agus dea-chosanta agus ar son cleachtas inbhuanaithe i dtaobh an chomhshaoil.*

I measc ár gcuid freagrachtaí tá:

Ceadúnú

- Gníomhaíochtaí tionscail, dramhaíola agus stórála peitril ar scála mór;
- Sceitheadh fuíolluisce uirbigh;
- Úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe;
- Foinsí radaíochta ianúcháin;
- Astaíochtaí gás ceaptha teasa ó thionscal agus ón eitlíocht trí Scéim an AE um Thrádáil Astaíochtaí.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil

- Iniúchadh agus cigireacht ar shaoráidí a bhfuil ceadúnas acu ón GCC;
- Cur i bhfeidhm an dea-chleachtais a stiúradh i ngníomhaíochtaí agus i saoráidí rialáilte;
- Maoirseacht a dhéanamh ar fhreagrachtaí an údaráis áitiúil as cosaint an chomhshaoil;
- Caighdeán an uisce óil phoiblí a rialáil agus údaruithe um sceitheadh fuíolluisce uirbigh a fhorfheidhmiú
- Caighdeán an uisce óil phoiblí agus phríobháidigh a mheasúnú agus tuairisciú air;
- Comhordú a dhéanamh ar líonra d'eagraíochtaí seirbhíse poiblí chun tacú le gníomhú i gcoinne coireachta comhshaoil;
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Dramhaíola agus Ceimiceáin sa Chomhshaol

- Rialacháin dramhaíola a chur i bhfeidhm agus a fhorfheidhmiú lena n-áirítear saincheisteanna forfheidhmithe náisiúnta;
- Staitisticí dramhaíola náisiúnta a ullmhú agus a fhoilsiú chomh maith leis an bPlean Náisiúnta um Bainistíocht Dramhaíola Guaisí;
- An Clár Náisiúnta um Chosc Dramhaíola a fhorbairt agus a chur i bhfeidhm;
- Reachtaíocht ar rialú ceimiceán sa timpeallacht a chur i bhfeidhm agus tuairisciú ar an reachtaíocht sin.

Bainistíocht Uisce

- Plé le struchtúir náisiúnta agus réigiúnacha rialachais agus oibriúcháin chun an Chreat-treoir Uisce a chur i bhfeidhm;
- Monatóireacht, measúnú agus tuairisciú a dhéanamh ar chaighdeán aibhneacha, lochanna, uiscí idirchreasa agus cósta, uiscí snámha agus screamhuisce chomh maith le tomhas ar leibhéil uisce agus sreabhadh abhann.

Eolaíocht Aeráide & Athrú Aeráide

- Fardail agus réamh-mheastacháin a fhoilsiú um astaíochtaí gás ceaptha teasa na hÉireann;
- Rúnaíocht a chur ar fáil don Chomhairle Chomhairleach ar Athrú Aeráide agus tacaíocht a thabhairt don Idirphlé Náisiúnta ar Ghníomhú ar son na hAeráide;
- Tacú le gníomhaíochtaí forbartha Náisiúnta, AE agus NA um Eolaíocht agus Beartas Aeráide.

Monatóireacht & Measúnú ar an gComhshaol

- Córais náisiúnta um monatóireacht an chomhshaoil a cheapadh agus a chur i bhfeidhm: teicneolaíocht, bainistíocht sonraí, anailís agus réamhaisnéisiú;
- Tuairiscí ar Staid Thimpeallacht na hÉireann agus ar Tháscairí a chur ar fáil;
- Monatóireacht a dhéanamh ar chaighdeán an aeir agus Treoir an AE i leith Aeir Ghlain don Eoraip a chur i bhfeidhm chomh maith leis an gCoinbhinsiún ar Aerthruailliú Fadraoin Trasteorann, agus an Treoir i leith na Teorann Náisiúnta Astaíochtaí;
- Maoirseacht a dhéanamh ar chur i bhfeidhm na Treorach i leith Torainn Timpeallachta;
- Measúnú a dhéanamh ar thionchar pleananna agus clár beartaithe ar chomhshaol na hÉireann.
- Taighde agus Forbairt Comhshaoil
- Comhordú a dhéanamh ar ghníomhaíochtaí taighde comhshaoil agus iad a mhaoiniú chun brú a aithint, bonn eolais a chur faoin mbeartas agus réitigh a chur ar fáil;
- Comhoibriú le gníomhaíocht náisiúnta agus AE um thaighde comhshaoil.

Cosaint Raideolaíoch

- Monatóireacht a dhéanamh ar leibhéil radaíochta agus nochtadh an phobail do radaíocht ianúcháin agus do réimsí leictreamaighnéadacha a mheas;
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha;
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta;
- Sainseirbhísí um chosaint ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Ardú Feasachta agus Faisnéis Inrochtana

- Tuairisciú, comhairle agus treoir neamhspleách, fianaise-bhunaithe a chur ar fáil don Rialtas, don tionscal agus don phobal ar ábhair maidir le cosaint comhshaoil agus raideolaíoch;
- An nasc idir sláinte agus folláine, an geilleagar agus timpeallacht ghlan a chur chun cinn;
- Feasacht comhshaoil a chur chun cinn lena n-áirítear tacú le hiompraíocht um éifeachtúlacht acmhainní agus aistriú aeráide;
- Tástáil radóin a chur chun cinn i dtithe agus in ionaid oibre agus feabhsúchán a mholadh áit is gá.

Comhpháirtíocht agus líonrú

- Oibriú le gníomhaireachtaí idirnáisiúnta agus náisiúnta, údaráis réigiúnacha agus áitiúla, eagraíochtaí neamhrialtais, comhlachtaí ionadaíocha agus ranna rialtais chun cosaint chomhshaoil agus raideolaíoch a chur ar fáil, chomh maith le taighde, comhordú agus cinnteoireacht bunaithe ar an eolaíocht.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil

Tá an GCC á bhainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóir. Déantar an obair ar fud cúig cinn d'Oifigí:

- An Oifig um Inbhuanaitheacht i leith Cúrsaí Comhshaoil
- An Oifig Forfheidhmithe i leith Cúrsaí Comhshaoil
- An Oifig um Fhianaise agus Measúnú
- An Oifig um Chosaint ar Radaíocht agus Monatóireacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tugann coistí comhairleacha cabhair don Ghníomhaireacht agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Headquarters

PO Box 3000,
Johnstown Castle Estate
County Wexford, Ireland

T: +353 53 916 0600
F: +353 53 916 0699
E: info@epa.ie
W:
LoCall: 1890 33 55 99

Regional Inspectorate
McCumiskey House,
Richview, Clonskeagh Road,
Dublin 14, Ireland

T: +353 1 268 0100
F: +353 1 268 0199

Regional Inspectorate
Inniscarra, County Cork,
Ireland

T: +353 21 487 5540
F: +353 21 487 5545

Regional Inspectorate
Seville Lodge, Callan Road,
Kilkenny, Ireland

T +353 56 779 6700
F +353 56 779 6798

Regional Inspectorate
John Moore Road, Castlebar

County Mayo, Ireland

T +353 94 904 8400
F +353 94 902 1934

Regional Inspectorate
The Glen, Monaghan, Ireland

T +353 47 77600
F +353 47 84987

Regional Offices

The Civic Centre
Church St., Athlone
Co. Westmeath, Ireland
T +353 906 475722

Room 3, Raheen Conference Centre,
Pearse House, Pearse Road
Raheen Business Park, Limerick,
Ireland
T +353 61 224764

Printed on environmentally friendly paper stock