# Monitoring (schema monitoring)

## Introduction

Article 8.1 of the WFD requires Member States to establish monitoring programmes for the assessment of the status of surface water and of groundwater in order to provide a coherent and comprehensive overview of water status within each RBD. These requirements include monitoring of Protected Areas as far as the status of surface water and groundwater is concerned. The results of monitoring play a key role in determining whether water bodies are of good status and what measures need to be included in the RBMPs in order to reach good status by 2015. Precise and reliable monitoring results are therefore a prerequisite for sound planning of investments in the Programmes of Measures (PoMs).

The WFD implementation reports required by Article 18 of the WFD should include, among other aspects, ‘a review of the status of surface water and groundwater in the Community undertaken in co-ordination with the European Environment Agency’. In the first implementation report, this review was based on both the State of the Environment (SoE) information provided by EEA Member Countries[[1]](#footnote-2) through the EIONET reporting process, and the status and pressure results reported at water body level (chapter 2 and 3 of this guidance) by Member States. Better streamlining between WFD and SoE reporting is still needed to ensure the most beneficial outcome of this two-level approach. For the second RBMPs, the review of status under Article 18 could significantly benefit from the inclusion of the WFD monitoring results on water quality data and biological data into the overall status assessment. Details could be included on the development of progress made since the first RBMPs, for example in the trends of status, pressures and impacts, and where objectives have not been fully met.

**Reporting should reflect the monitoring carried out that has informed the second RBMPs.** Given that monitoring programmes are usually dynamic and multi-annual (i.e. in the cases of quality elements with lower frequencies of monitoring), reporting should reflect, as accurately as possible, the monitoring that has informed the preparation of the second RBMPs. **Reporting is not intended to include information regarding future monitoring programmes or planned changes**.

The selection of the quality elements (QEs) and parameters to be monitored should enable the detection of all significant pressures on water bodies. This is particularly important where the pressures and impacts assessments may not have been adequate enough to identify all potential pressures and impacts in the RBD, perhaps because of the lack of information or methods, or because of unexpected, anthropogenic activities within the RBD.

The results of surveillance monitoring should ensure that the potential impacts of all pressures on water bodies in the RBDs are detected. Incomplete coverage of QEs and water bodies in surveillance monitoring could lead to the non-detection of significant pressures, the incorrect classification of water status, and inappropriate targeting of measures. Surveillance monitoring must also be able to detect long-term natural changes and those arising from anthropogenic pressures.

The selection of biological quality elements (BQEs) for operational monitoring should focus on those most sensitive to the identified pressures and impacts on water bodies. The results of operational monitoring are used (together with the results of surveillance monitoring) in the classification of water bodies and to monitor progress of implemented measures in achieving the objectives of the Directive.

The results of monitoring are used in the assessment and classification of the status of water bodies (ecological and chemical for surface waters, chemical and quantitative for groundwater). The amount of monitoring undertaken in terms of QEs, parameters, frequency and numbers of monitoring sites should be sufficient to obtain a reliable and robust assessment of the status of all water bodies in the RBDs. Insufficient monitoring leads to a low confidence in the classification of water bodies and, as a result, the (expensive) measures required to achieve objectives may be incorrectly targeted, and/or objectives such as the restoration of water bodies to good status may not be achieved.

Directive 2009/90/EC[[2]](#footnote-3) lays down technical specifications for the chemical analysis and monitoring of water status with the aim of improving the quality and comparability of monitoring results by establishing minimum performance criteria for methods of analysis to be applied by Member States when monitoring water status, sediment and biota, as well as rules for demonstrating the quality of analytical results.

### How will the European Commission and the EEA use the information reported?

The European Commission will check comparability of the monitoring programmes between Member States, and consistency with the requirements of Annex V of the WFD and the outcome of the Article 5 analysis. Moreover, the European Commission will use this information to inform the European Parliament and the public about progress in the Member States in the implementation of the WFD. Finally, some of the base data are necessary to update a reference dataset with which monitoring results can be related and exchanged between the Member States and the European institutions more easily at a later stage.

Data on water quality, including from monitoring BQEs and Priority Substances, will be used by the EEA in producing trend assessments and overviews of the status of, and pressures affecting, Europe’s surface waters and groundwater. The assessment of information reported in the second RBMPs will focus on illustrating improvement in status, and progress made in reducing pressures.

The wealth of information already reported by EEA Member Countries (including EU Member States) on water quality and BQEs via the EIONET water priority data flows (WISE-SoE) can be most effectively interpreted when streamlined with the WFD reporting. In the context of the implementation of the SEIS principles[[3]](#footnote-4), monitoring results from the EIONET water monitoring sites which are also, in the main, WFD surveillance monitoring sites, can be used in the mutual exchange of information between the SoE and WFD assessments and provide a common basis for the assessment of status and pressures. The SoE assessments would be further enhanced with monitoring results from WFD operational monitoring sites.

Statistics and information will be provided to the European Parliament at EU level. Information will be provided to the public through WISE.

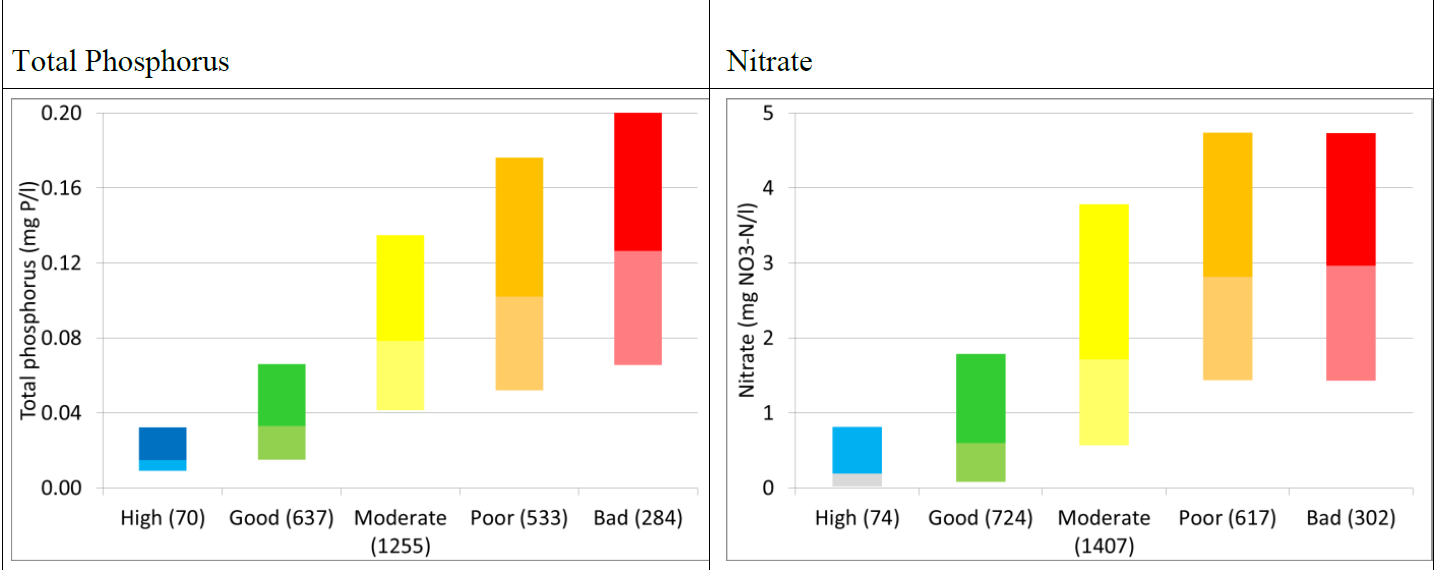
## Products from reporting

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| --- | --- | --- | --- | --- | --- | --- |
| **Nb** | **Name of product** | **Type of pro-duct** | **Scale of infor-ma-tion\*** | **Detailed information displayed** | **Source of detailed information and aggregation rule** | **Used in 2012 reports?\*** |
| 1 | Surface water monitoring sites | Map | Site | Map of surface water monitoring sites by Category. | Geographical location of monitoring sites as reported. | Yes |
| 2 | Number of surveillance, operational and total monitoring sites by water category | Table | MS | Number of surveillance, operational and total monitoring sites per surface water Category.  Number of surveillance, operational and quantitative monitoring sites for groundwater. | Aggregation on the basis of the information reported at monitoring site level. | Yes |
| 3 | Number of surveillance and operational monitoring sites per 1000 km2 | Chart | MS | Number of surveillance and operational monitoring sites per 1000 km2 | Aggregation on the basis of the information reported at monitoring site level and total surface area of the RBD. | Yes |
| 4 | Number of monitoring sites in surface waters used for monitoring the different types of quality elements | Table | MS | Number of monitoring sites in surface waters used for monitoring the different types of quality elements (biological; hydromorphological; physico-chemical including non-priority specific pollutants; Priority Substances). | Aggregation on the basis of the information reported at monitoring site level. | Yes |
| 5 | Percentage of surface water bodies included in surveillance monitoring compared to total number of surface water bodies | Chart | MS | Percentage of surface water bodies included in surveillance monitoring compared to total number of surface water bodies. | Aggregation on the basis of the water body information reported at monitoring site level. | Yes |
| 6 | Number of river water bodies included in surveillance monitoring | Chart | MS | Number of river water bodies included in surveillance monitoring, benchmarked to criteria in WFD Annex V Section 1.3.1. | Aggregation on the basis of the water body information reported at monitoring site level.  Benchmark is MS land area divided by 2500 km2. | Yes |
| 7 | Percentage of surface water bodies in surveillance monitoring in which all relevant biological quality elements are monitored | Chart | MS | Percentage of surface water bodies in surveillance monitoring in which all relevant biological quality elements are monitored. | Aggregation on the basis of the water body information reported at monitoring site level. | Yes |
| 8 | Percentage of surface water bodies included in operational monitoring compared to surface water bodies with significant pressures | Chart | MS | Percentage of surface water bodies included in operational monitoring and compared to surface water bodies with significant pressures. | Aggregation on the basis of the water body information reported at monitoring site level. | Yes |
| 9 | Percentage of surface water bodies included in operational monitoring compared to total failing good ecological status | Chart | MS | Percentage of surface water bodies included in operational monitoring compared to total number of surface water bodies failing to achieve good ecological status. | Aggregation on the basis of the water body information reported at monitoring site and at water body level. | No |
| 10 | Number of operational sites in relation to the population density of the Member State | Chart | MS | Number of operational sites in relation to the population density of the Member State; population density is used as an indicator of the amount of potential pressure from human activity. | Aggregation on the basis of the water body information reported at monitoring site level. | Yes |
| 11 | Percentage of surface water bodies included in operational monitoring in which each biological quality element is measured | Chart | MS | Percentage of surface water bodies included in operational monitoring in which phytoplankton, other aquatic flora, macroinvertebrates and fish are monitored. | Aggregation on the basis of the water body information reported at monitoring site level. | Yes |
| 12 | Percentage of surface water bodies monitored and classified (on the basis of monitoring or extrapolation) for chemical status | Chart | MS | Percentage of surface water bodies classified for chemical status compared to the percentage of water bodies monitored for Priority Substances. | Aggregation on the basis of information reported at water body and monitoring site levels. | Yes |
| 13 | Percentage of surface water bodies in which each Priority Substance is monitored | Chart | MS | Percentage of surface water bodies in which each Priority Substance is monitored. | Aggregation on the basis of information reported at water body and monitoring site levels. | It was not possible to produce (reporting of individual priority substances was optional; in addition in many cases information was not available in RBMP or background documents; generally very poor reporting of chemical status reflecting implementation gaps) |
| 14 | Number of surface water monitoring sites per Priority Substance | Chart or table | EU/MS/ RBD/SU | Number of monitoring sites per Priority Substance differentiating matrix and purpose (status and trend). | Aggregation on the basis of the water body information reported at monitoring site level. | No |
| 15 | Number of Priority Substances reliably monitored in surveillance and/or operational monitoring | Chart | MS | Number of Priority Substances monitored in accordance with QA/QC Directive performance requirements in surveillance and/or operational monitoring. | Aggregation of information reported at RBD level. | It was not possible to produce (necessary information on QA/QC Directive implementation was not included in reporting requirements because not yet implemented) |
| 16 | Priority Substances subjected to trend monitoring in sediment | Table | MS | Priority substances subjected to trend monitoring in sediment. | Aggregation of information reported at water body level. | It was not possible to produce (necessary information was not included in reporting requirements) |
| 17 | Priority Substances subjected to trend monitoring in biota | Table | MS | Priority Substances subjected to trend monitoring in biota (by MS) | Aggregation of information reported at water body level. | It was not possible to produce (necessary information was not included in reporting requirements) |
| 18 | Priority Substances showing upward trend in biota or sediment | Table | MS | Priority Substances showing upward trend in biota or sediment, with matrix | Aggregation of information reported at water body level. | It was not possible to produce (necessary information was not included in reporting requirements) |
| 19 | Groundwater monitoring sites | Map | Site | Map of groundwater monitoring sites for quantitative and chemical monitoring. | Geographical location of monitoring sites as reported. | Yes |
| 20 | Number of monitoring sites for quantitative and chemical groundwater monitoring | Chart | MS | Number of monitoring sites for quantitative and chemical groundwater monitoring. | Aggregation on the basis of the water body information reported at monitoring site level. | Yes |
| 21 | Density of groundwater monitoring sites for quantitative and chemical monitoring | Chart | MS | Number of groundwater monitoring sites per 1000km2 of groundwater area for quantitative and chemical monitoring. | Aggregation on the basis of the information reported at monitoring site level and total surface area of the RBD. | Yes |
| 22 | Percentage of groundwater bodies in quantitative monitoring | Chart | MS | Percentage of groundwater bodies included in quantitative monitoring. | Aggregation on the basis of the water body information reported at monitoring site level. | Yes |
| 23 | Number of monitoring sites per groundwater body for quantitative monitoring | Chart | EU | Number of groundwater bodies with 0, 1, 2-5, 6-10, and 11 and more monitoring sites for quantitative monitoring. | Aggregation on the basis of the water body information reported at monitoring site level. | Yes |
| 24 | Percentage of groundwater bodies in chemical surveillance monitoring | Chart | MS | Percentage of groundwater bodies in chemical surveillance monitoring. | Aggregation on the basis of the water body information reported at monitoring site level. | Yes |
| 25 | Groundwater bodies included in chemical surveillance monitoring where all core parameters are monitored | Chart | MS | Percentage of groundwater bodies included in chemical surveillance monitoring where all core parameters are monitored. | Aggregation on the basis of the information reported at monitoring site level. | Yes |
| 26 | Percentage of groundwater bodies in chemical operational monitoring | Chart | MS | Percentage of groundwater bodies in chemical operational monitoring. | Aggregation on the basis of the water body information reported at monitoring site level. | Yes |
| 27 | Relative number of groundwater bodies included in operational monitoring and those with significant pressures | Chart | MS | Relative number of groundwater bodies included in operational monitoring and those with significant pressures. | Aggregation on the basis of the water body information reported at monitoring site level. | Yes |
| 28 | Number of monitoring sites per groundwater body for chemical monitoring | Chart | EU | Number of groundwater bodies with 0, 1, 2-5, 6-10, and 11 and more monitoring sites for chemical monitoring. | Aggregation on the basis of the water body information reported at monitoring site level. | Yes |
| 29 | Trend in median (a) total ammonium, (b) total phosphorus and (c) nitrate concentration of river water bodies, grouped by ecological status/poten-tial class | Chart | EU | WFD water body information linked with WISE-SoE long time series data on water quality in rivers for (a) total ammonium, (b) total phosphorus and (c) nitrate concentration. The trend in water quality is presented for each ecological class and extrapolated to 2027 to illustrate if water bodies of moderate to poor ecological status will approach high or good ecological status. | Aggregation on the basis of the information reported at water body level combined with information on river water quality from the WISE-SoE database. | Yes |

**Notes:** \* Scale of information: EU = European; MS = National, Member State; RBD = River Basin District; SU = Sub-unit; WB = water body; Site = monitoring site

Example of combining water quality results with information on ecological status and potential – more examples are available in ETC/ICM 2012[[4]](#footnote-5).

Figure 3 Rivers: Concentration range (1st quartile, median and 3rd quartile) of annual average nutrient concentrations in river water bodies in different classes of ecological status or potential (high to bad)



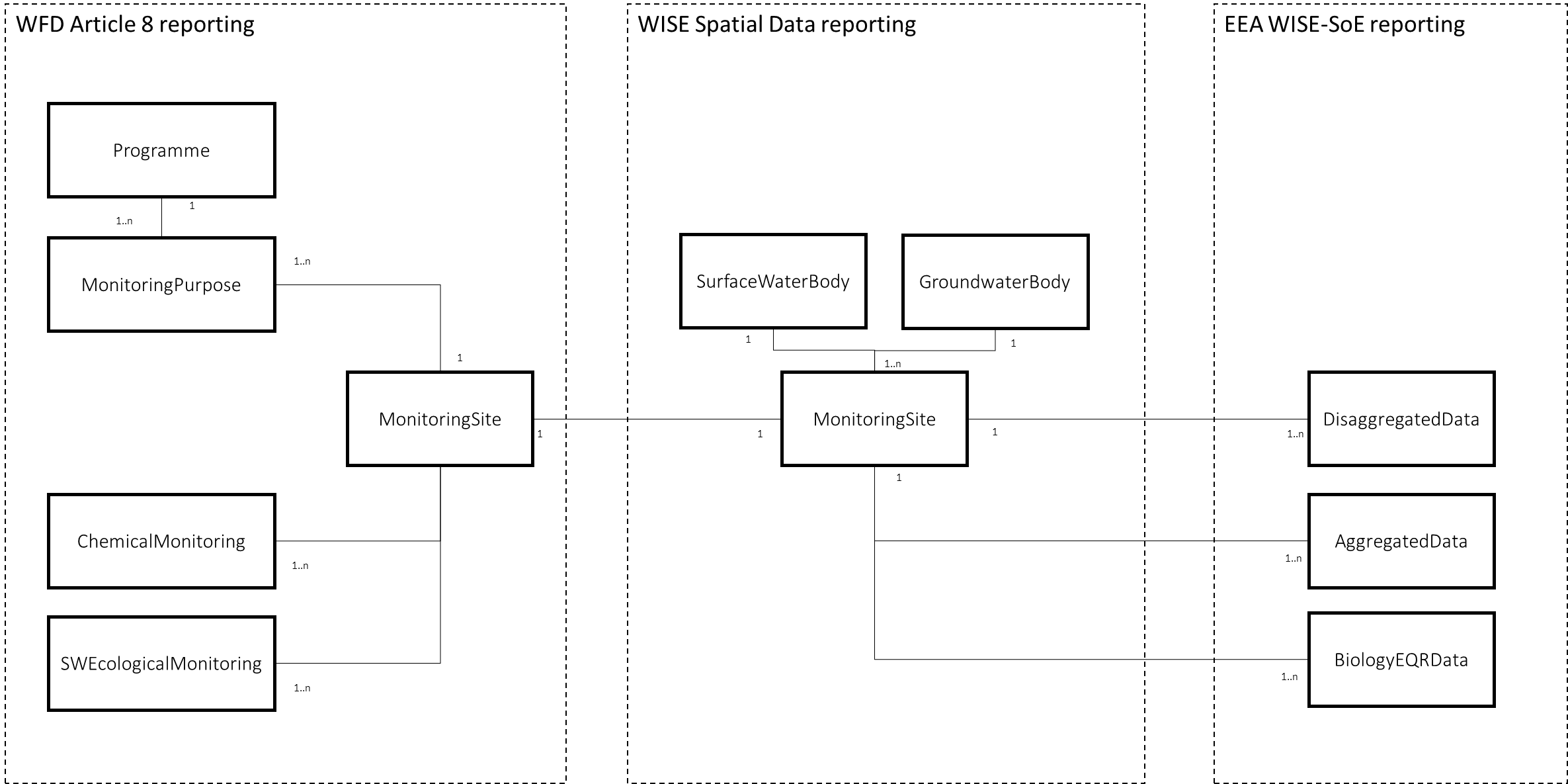
**Notes:** Average of mean annual water quality concentration values over the years 2005-2010. Based on results from 3368 WISE-SoE river monitoring sites in 16 Member States, dominated by river monitoring sites in France (1416 sites) and the UK (555 sites).

## Contents of the 2016 reporting

The data and information on monitoring to be reported under Article 8 of the WFD include a description of the monitoring sites, a specification of the different QEs and chemical substances monitored at each site, and information relating to the associated monitoring programmes.

Figure 4 presents a conceptual overview of the monitoring data reported under the WFD and the monitoring results reported to the EEA (WISE-SoE). In both reporting streams, the monitoring sites have a unique site code, which allows the information to be joined with the spatial data and additional information reported in the common WISE Spatial Data reporting flow.

Figure 4: Conceptual overview of reporting of WFD monitoring metadata (Article 8) and reporting monitoring results to EEA WISE SoE



**Member States are expected to report to EEA WISE SoE:**

* Water quality results including Priority Substances and River Basin Specific Pollutants to EEAs Waterbases on groundwater, rivers, lakes, transitional waters and coastal waters
* Results from monitoring Biological Quality Elements to EEAs Waterbases on rivers, lakes, transitional waters and coastal waters

The reporting requirements are further described in the Reporting Obligations Database (ROD)[[5]](#footnote-6)

The information reported under the WISE Spatial Data flow provides the common reference spatial data sets for monitoring sites and water bodies. This information is shered across thematic data to ensure consistency between the different water related directives (WFD, NiD, UWWT, Bathing Water) and WISE-SoE.

### Schema sketch

See Annex 10.4.

### Data and information to be reported using the schemas

Information regarding monitoring programmes should be reported at RBD level.

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| **Schema: Monitoring** |
| ***Class: Programme***  ***Properties****: maxOccurs = unbounded minOccurs = 1* |
| **Schema element**:euProgrammeCode  **Field type / facets:** FeatureUniqueEUCodeType  **Properties:** maxOccurs = 1 minOccurs = 1  **Guidance on completion of schema element**: Required. Unique EU code of the monitoring programme. Prefix the monitoring programme’s national, unique code with the Member State’s 2-alpha character ISO country code. The same code reported in 2007 and 2010 should be used for monitoring programmes still in existence.  **Quality checks**: Element check: First 2 characters must be the Member State’s 2-alpha character ISO country code.  Within-schema check: euProgrammeCode must be unique. |
| **Schema element**:programmeName  **Field type / facets:** String250Type  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Readily understandable name of the monitoring programme in English that is meaningful outside of the RBD or Member State. It should reflect its purpose, such as surveillance, operational, investigative or drinking water monitoring programme, and the water categories in which it is undertaken. |
| **Schema element**:programmeCategoryRW  **Field type / facets:** YesNoCode\_Enum: Yes, No  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Indicate if this monitoring programme is used for rivers. |
| **Schema element**:programmeCategoryLW  **Field type / facets:** YesNoCode\_Enum: Yes, No  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Indicate if this monitoring programme is used for lakes. |
| **Schema element**:programmeCategoryTW  **Field type / facets:** YesNoCode\_Enum: Yes, No  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Indicate if this monitoring programme is used for transitional waters. |
| **Schema element**:programmeCategoryCW  **Field type / facets:** YesNoCode\_Enum: Yes, No  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Indicate if this monitoring programme is used for coastal waters. |
| **Schema element**:programmeCategoryTeW  **Field type / facets:** YesNoCode\_Enum: Yes, No  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Indicate if this monitoring programme is used for territorial waters. |
| **Schema element**:programmeCategoryGW  **Field type / facets:** YesNoCode\_Enum: Yes, No  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Indicate if this monitoring programme is used for groundwater. |
| **Schema element:** programmeReference  **Field type / facets:** ReferenceType (see Annex 9)  **Properties**: maxOccurs = unbounded minOccurs = 1  **Guidance on completion of schema element:** Required. Provide references or hyperlinks to the documents and sections where relevant information relating to the monitoring programmes can be found. Guidance on what should be included in this document is provided in Section 4.3.4. |

The following class is used to provide information on the surface and groundwater monitoring sites.

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| **Schema: Monitoring (continued)** |
| ***Class: MonitoringSite***  ***Properties****: maxOccurs = unbounded minOccurs = 1* |
| **Schema element**:euMonitoringSiteCode  **Field type / facets:** FeatureUniqueEUCodeType  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Unique EU code of the surface water monitoring site. Prefix the surface water monitoring site’s national, unique code with the Member State’s 2-alpha character ISO country code[[6]](#footnote-7).  **Quality checks**:  Element check: First 2 characters must be the Member State’s 2-alpha character ISO country code.  Within-schema check: euMonitoringSiteCode must be unique. |
| **Schema element**:euMonitoringSiteName  **Field type / facets:** String250Type  **Properties:** maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Readily understandable name of the monitoring site in English that is meaningful outside of the RBD or Member State. |
| **Schema element**:euWaterBodyCode  **Field type / facets:** FeatureUniqueEUCodeType  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Unique EU code of the surface or groundwater body as reported in the SWB or GWB schemas in which the monitoring site is physically located in or near (in the rare cases where the monitoring site is not physically located in the water body).  **Quality checks**: Cross-schema check: The water body code must be included in SWB/SurfaceWaterBody/euSurfaceWaterBodyCode or in GWB/GroundWaterBody/euGroundWaterBodyCode. |
| **Schema element**:waterCategory  **Field type / facets:** WaterCategory\_Enum: RW, LW, TW, CW, TeW, GW  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Report the water category of the water body that is monitored (where the site is physically located in or near).  **Quality checks**: if ‘waterCategory’ is ‘GW’ then ‘euWaterBodyCode’ should be included in GWB/GroundWaterBody/euGroundWaterBodyCode. |
| **Schema element**:ecologicalMonitoring  **Field type / facets:** YesNoNotApplicable\_Union\_Enum: Yes, No, Not applicable  **Properties:** maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Indicate whether the monitoring site is used for ecological monitoring. For groundwater monitoring sites report ‘Not applicable’  **Quality checks**: Within-schema check: ‘Not applicable’ must be selected if ‘waterCategory’ is ‘GW’. |
| **Schema element**: chemicalMonitoring  **Field type / facets:** YesNoCode\_Enum: Yes, No  **Properties:** maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Indicate whether the surface or groundwater monitoring site is used for chemical monitoring. |
| **Schema element**:quantitativeMonitoring  **Field type / facets:** YesNoNotApplicable\_Union\_Enum: Yes, No, Not applicable  **Properties:** maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Indicate whether the groundwater monitoring site is used for quantitative monitoring. For surface water monitoring sites report ‘Not applicable’  **Quality checks**: Within-schema check: ‘Not applicable’ must be selected if ‘waterCategory’ is not ‘GW’. |
| **Schema element**:quantitativeFrequency  **Field type / facets:** nonNegativeInteger  **Properties:** maxOccurs =1 minOccurs = 0  **Guidance on completion of schema element**: Conditional. If the groundwater monitoring site is used for quantitative monitoring, report the frequency of monitoring.  Further guidance on what should be reported is provided in the glossary in section 4.3.5.  **Quality checks**: Conditional check: Report if ‘quantitativeMonitoring’ is ‘Yes’. |
| **Schema element**:quantitativeCycle  **Field type / facets:** nonNegativeInteger  **Properties**: maxOccurs =1 minOccurs = 0  **Guidance on completion of schema element**: Conditional. If the groundwater monitoring site is used for quantitative monitoring, report the cycle of monitoring.  Further guidance on what should be reported is provided in the glossary in section 4.3.5.  **Quality checks**: Conditional check: Report if ‘quantitativeMonitoring’ is ‘Yes’. |
| **Schema element:** quantitativeLastMonitored  **Field type / facets:** YearRangeType  **Properties:** maxOccurs =1 minOccurs = 0  **Guidance on completion of schema element**: Conditional. If the groundwater monitoring site is used for quantitative monitoring, report the most recent year in the format YYYY that was monitored. Enter 9999 if parameter has yet to be measured.  **Quality checks**: Conditional check: Report if ‘quantitativeMonitoring’ is ‘Yes’. |
| **Schema element**:wellSpring  **Field type / facets:** WellSpring\_Enum:Well, Spring, Other  **Properties:** maxOccurs =1 minOccurs = 0  **Guidance on completion of schema element**: Conditional. For groundwater sites, indicate whether the groundwater monitoring site is a well, spring or other.  **Quality checks**: Conditional check: report it ‘waterCategory’ is ‘GW’ |
| **Schema element**:depth  **Field type / facets:** MonitoringDepth\_Enum:Upper, Medium, Lower, Mixed  **Properties**: maxOccurs =1 minOccurs = 0  **Guidance on completion of schema element**: Conditional. For groundwater monitoring sites, indicate the groundwater layer within the groundwater body in which sampling occurs. Please see visualization of multi-layered GWBs in sections 1.3 and 2.3 of Annex 4.  **Quality checks**: Conditional check: report it ‘waterCategory’ is ‘GW’ |

The following class (child of MonitoringSite) is used to report each QE monitored at the surface water monitoring site:

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| --- |
| **Schema: Monitoring (continued)** |
| ***Class SWEcologicalMonitoring***  ***Properties:*** *maxOccurs = unbounded minOccurs = 0*  *Conditional check: report at least 1 if ecologicalMonitoring is ‘Yes’* |
| **Schema element**:qeCode  **Field type / facets:** QualityElement\_Enum (see Annex 8h)  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required[[7]](#footnote-8). Select all the quality elements (QEs) monitored at this surface water monitoring site from the enumeration list. |
| **Schema element**:qeDescription  **Field type / facets:** String100Type  **Properties:** maxOccurs =1 minOccurs = 0  **Guidance on completion of schema element**: Conditional. If ‘QE1-5 - Other species’ has been selected from the enumeration list and reported under qualityElementCode, provide the name of the other QE(s) monitored at this surface water monitoring site  **Quality checks**: Conditional check: Report if ‘QE1-5 - Other species’ is selected from the enumeration list under qualityElementCode. |
| **Schema element**:qeFrequency  **Field type / facets:** nonNegativeInteger  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Report the frequency at which each QE is monitored at this surface water monitoring site.  Further guidance on what should be reported is provided in the glossary in section 4.3.5. |
| **Schema element**:qeCycle  **Field type / facets:** nonNegativeInteger  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Report the monitoring cycle relating to each QE monitored at this surface water monitoring site.  Further guidance on what should be reported is provided in the glossary in section 4.3.5. |
| **Schema element**:qeLastMonitored  **Field type / facets:** YearRangeType  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Report the most recent year in the format YYYY that each QE was monitored at this surface water monitoring site. Enter 9999 if the QE has yet to be measured. |

The following class (child of MonitoringSite) is used to report each chemical substance monitored at the surface or groundwater monitoring site:

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| **Schema: Monitoring (continued)** |
| ***Class ChemicalMonitoring***  ***Properties:*** *maxOccurs = unbounded minOccurs = 0*  *Conditional check: report at least 1 if ‘chemicalMonitoring’ is ‘Yes’* |
| **Schema element**: chemicalSubstanceCode  **Field type / facets:** ChemicalSubstances\_Union\_Enum (see Annex 8e)  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Report each chemical substance or parameter which is monitored at this site.  Please note that, as regards surface waters and according to the WFD, Priority Substances are included in the assessment of chemical status and non-priority River Basin Specific Pollutants are included in the assessment of ecological status. However, for the sake of simplicity in the reporting of monitoring data, they are required to be reported together.Please note that the following pollutants and parameters are only valid for groundwater (for surface waters most of them are included in ecological status or, in the case of pesticides, can be reported individually): Hardness, Water temperature, Dissolved oxygen, CODMn, Total organic carbon (TOC), Chloride, Sulphate, Electrical conductivity, pH, Hydrogen carbonate (bicarbonate) HCO3, Acid capacity to pH 4.5, Nitrate, Total phosphorus, Pesticides (active substances in pesticides, including their relevant metabolites, degradation and reaction products) – Total. |
| **Schema element**: chemicalSubstanceOther  **Field type / facets:** String100Type  **Properties**: maxOccurs =1 minOccurs = 0  **Guidance on completion of schema element**: Conditional. If ‘chemicalSubstanceCode’ is ‘Other’ please indicate in this field the CAS number (if relevant) and the name of the chemical substance.  **Quality checks**: Conditional check: report if ‘chemicalSubstanceCode’ is ‘EEA\_00-00-0 – Other chemical parameter’. |
| **Schema element**:chemicalMatrix  **Field type / facets:** Matrix\_Enum:  Water  Biota  Biota - fish  Biota - other  Sediment  Sediment - suspended sediment  Sediment - settled sediment  **Properties**: maxOccurs = 1 minOccurs = 1  **Guidance on completion of schema element**: Required. Report the matrix in which each chemical substance is monitored. For groundwater monitoring sites report ‘Water’. |
| **Schema element**:chemicalPurpose  **Field type / facets:** ChemicalPurpose\_Enum: Status, Trend, Both  **Properties**: maxOccurs = 1 minOccurs = 1  **Guidance on completion of schema element**: Required. Report if the chemical monitoring is used for status assessment, trend assessment or both. |
| **Schema element**: chemicalFrequency  **Field type / facets:** nonNegativeInteger  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Report the frequency at which each chemical substance is monitored at this monitoring site.  Further guidance on what should be reported is provided in the glossary in section 4.3.5. |
| **Schema element**:chemicalCycle  **Field type / facets:** nonNegativeInteger  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Report the monitoring cycle relating to each chemical substance monitored at this monitoring site.  Further guidance on what should be reported is provided in the glossary in section 4.3.5. |
| **Schema element**: chemicalLastMonitored  **Field type / facets:** YearRangeType  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Report the most recent year in the format YYYY that each chemical substance was monitored at this monitoring site. Enter 9999 if the chemical substance has yet to be measured. |

The following class (child of MonitoringSite) is used to report the purpose and the programme that is linked to it:

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| **Schema: Monitoring (continued)** |
| ***Class MonitoringPurpose***  ***Properties:*** *maxOccurs = unbounded minOccurs = 1* |
| **Schema element**: monitoringPurpose  **Field type / facets:** MonitoringPurpose\_Enum (see Annex 8i)  **Properties**: maxOccurs =1 minOccurs = 1  **Guidance on completion of schema element**: Required. Report each monitoring purpose of each monitoring site. |
| **Schema element**:euProgrammeCode  **Field type / facets:** FeatureUniqueEUCodeType  **Properties**: maxOccurs = 1 minOccurs = 1  **Guidance on completion of schema element**: Required. Report the EU monitoring programme code under which the relevant purpose is implemented in this site.  **Quality check**: Element check: First 2 characters must be the Member State’s 2-alpha character ISO country code.  Within-schema check: the code must be included in *Monitoring/Programme/euProgrammeCode* |

### GIS information

The location of monitoring sites needs to be reported separately as GML files (see Annex 5 GIS guidance for further information).

### Guidance on contents of RBMPs and background documents

The following provides guidance on the aspects that the European Commission expects to find in the relevant chapters on monitoring in the RBMPs or in background documents. This guidance is not intended to be comprehensive in terms of what the Member States have to include in their RBMPs or background documents, rather to provide certain concrete elements of information that the European Commission expects to find.

The RBMPs or background documents should include:

* Summaries of the significant changes in the monitoring programmes undertaken since the first reporting exercise in 2007, the first RBMPs in 2010, those used to inform the development of the second RBMPs up to 2015, and those planned to be undertaken up to 2021.
* Detailed information on the design of each type of monitoring programme, including the objectives of monitoring, QEs selected, the rationale for the number and location of monitoring sites chosen, the level of confidence and precision, etc.

*Surface Waters*

* Which of the requirements and objectives laid down in Annex V 1.3.1 of the WFD are incorporated into the design of the surveillance monitoring programme for surface waters? To provide information for:
* supplementing and validating the impact assessment procedure detailed in Annex II,
* the efficient and effective design of future monitoring programmes,
* the assessment of long-term changes in natural conditions,
* the assessment of long-term changes resulting from widespread anthropogenic activity,
* an assessment of the overall surface water status within each catchment or sub-catchments within the RBD.
* Surveillance monitoring requires that parameters indicative of all BQEs, all hydromorphological QEs, all general physicochemical QEs, and (conditionally) priority list pollutants which are discharged into the river basin or sub-basin, and (conditionally) other pollutants discharged in significant quantities in the river basin or sub-basin, are monitored. How have water bodies and QEs been selected for surveillance monitoring (e.g. in relation to all potential pressures, on the basis of emissions inventories)?
* The reasons for the exclusion of any QEs that are not monitored in water bodies included in surveillance monitoring (e.g. lack of suitable method, practical considerations, scientific justification).
* The operational monitoring programme should respond to the significant pressures identified in the pressures and impacts analysis required under Article 5 of the WFD. Which BQEs are selected in the operational monitoring programme to respond to different pressures and impacts? Please present a table similar to the following:

*Biological Quality Elements used in operational monitoring (indicate in each cell the relevant BQEs from the enumeration list in Annex 8h)*:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Impact | Rivers | Lakes | Transitional waters | Coastal waters |
| Nutrient pollution |  |  |  |  |
| Organic pollution |  |  |  |  |
| Chemical contamination of water |  |  |  |  |
| Chemical contamination of sediment |  |  |  |  |
| Saline pollution |  |  |  |  |
| Acidification |  |  |  |  |
| Elevated temperatures |  |  |  |  |
| Altered habitats as a result of hydrological and morphololgical alterations |  |  |  |  |
| Other impacts |  |  |  |  |

* How are Priority Substances monitored in sediments and/or biota to assess long-term trends of Priority Substances? Article 3.3 of Directive 2008/105/EC[[8]](#footnote-9) (Article 3.6 in the current version as amended by Directive 2013/39/EU[[9]](#footnote-10)) states that ‘Member States shall determine the frequency of monitoring in sediment and/or biota so as to provide sufficient data for a reliable long-term trend analysis. As a guideline, monitoring should take place every three years, unless technical knowledge and expert judgment justify another interval.’ Indicate the Priority Substances for which the monitoring of long-term trends is undertaken and in how many stations, with the matrices used and frequencies applied.
* The WFD allows the grouping of water bodies for monitoring and assessment. Only similar types of water bodies can be grouped, for example, where the ecological conditions are similar, or almost similar, and in terms of the magnitude and type of pressure or combination of pressures on the water bodies. In all cases, grouping must be technically or scientifically justifiable. Also, the monitoring of sufficient indicative or representative water bodies in the sub-groups of surface water or groundwater bodies would have to provide for an acceptable level of confidence and precision in the results of monitoring, and in particular the classification of water body status. Explain and justify the basis for grouping, the categories of water bodies to which grouping has been applied and the extent of the application. Explain any differences in methodology between water categories.
* A summary of how the requirements associated with surface water and groundwater Drinking Water Protected Areas have been incorporated into the monitoring programmes for the WFD.
* A summary of transboundary monitoring networks for surface water and groundwater bodies, including transboundary countries that are not part of the EU.

*Groundwater*

* For surveillance monitoring, Annex V of the WFD requires Member States to monitor a set of core parameters in all groundwater bodies and parameters indicative of pressures in groundwater bodies identified as being at risk. In the case of operational monitoring, Member States should monitor only those parameters which are indicative of the pressures to which the body is subject.How have the parameters in groundwater monitoring programmes been selected to respond to different pressures and impacts?
* How are groundwater chemical status monitoring programmes designed in order to detect significant and sustained upward trends in pollutants? Indicate which of the following aspects were incorporated into the monitoring programmes, and how:
  + Trend assessment only carried out in groundwater bodies at risk of not meeting WFD Environmental Objectives,
  + Trend assessment on groundwater bodies not currently at risk in order to distinguish long-term trends both as a result of changes in natural conditions and through anthropogenic activity.
  + Trend assessment based on surveillance and operational monitoring data from individual monitoring sites.
  + Statistical method for assessing trends at each monitoring site (statistical method adapted to initial conditions such as regression analysis for normal distributions and non-parametric tests for non-normal distributed time series).
  + Individual parameter concentrations (or values) below the Limit of Quantification (LOQ) replaced by half of the value of the highest LOQ occurring in the time series being analysed.
  + How were upward trends identified in sufficient time to allow measures to be implemented?
  + Length of time series considered to be appropriate to detect significant trends.
  + How were baseline levels for substances which occur both naturally and from anthropogenic sources considered?
  + How was it ensured that upward trends can be distinguished from natural variation with an adequate level of confidence and precision?
  + What was considered to be an acceptable level of confidence in the trend assessment?

### Glossary: clarification of terms and reporting requirements

The Frequency and Cycle elements are used together to describe the frequency at which the QEs or chemical substances at surface water monitoring sites, or chemical parameters at groundwater monitoring sites, are monitored.

Frequency is the number of determination or sampling events made in a year when monitoring is undertaken. For example, ‘12’ equates to approximately 12 monthly determinations, ‘4’ equates to determinations approximately every 3 months, ‘2’ equates to determinations approximately every 6 months or twice a year, and ‘1’ equates to 1 determination in the year.

Cycle is the period (years) between the years when monitoring is undertaken within the 6 year planning cycle. For example, ‘1’ indicates that the element will be monitored every year in the 6 year cycle, ’2’ is once every 2 years (i.e. 3 times in the cycle), and ’3’ is once every 3 years (i.e. twice in the cycle). ’0’ should be used to indicate that the monitoring programme will be implemented once per cycle and, depending on the results, future monitoring will be decided.

Some QEs (e.g. QE2-1 Hydrological regime: rivers) or parameters (e.g. groundwater level) are measured continuously. In these cases, enter ‘365’ in the Frequency element and ‘1’ in the Cycle element.

Some examples are given below.

|  |  |  |
| --- | --- | --- |
| **Frequency** | **Cycle** | **Description** |
| 12 | 1 | The element is determined monthly every year |
| 1 | 2 | The element is determined once every two years |
| 12 | 0 | The element is determined monthly for one year only (i.e. the cycle is not repeated) |
| 365 | 1 | The element is determined daily every year or continuously (e.g. water table level or river flow) |

1. <http://bookshop.europa.eu/en/technical-report-on-groundwater-dep> [↑](#footnote-ref-2)
2. <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1411979700659&uri=CELEX:32009L0090> [↑](#footnote-ref-3)
3. SEIS – shared environmental information systems – collect once use multiple times [↑](#footnote-ref-4)
4. <http://icm.eionet.europa.eu/ETC_Reports/EcoChemStatusPressInEurWaters_201211/Ecological_and_chemical_status_and_pressures_ETC_13112012_Published.pdf> [↑](#footnote-ref-5)
5. http://rod.eionet.europa.eu/. [↑](#footnote-ref-6)
6. Member State’s 2-alpha character ISO country code: <http://publications.europa.eu/code/en/en-370100.htm> (Note: for Greece use ‘EL’ and United Kingdom use ‘UK’) [↑](#footnote-ref-7)
7. Please note that the multiplicity of the Class SWEcologicalMonitoring is 0 to many. Therefore, if there are no quality elements monitored at this site this whole class does not need to be reported. [↑](#footnote-ref-8)
8. [Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council](http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1410784732488&uri=CELEX:02008L0105-20130913) [↑](#footnote-ref-9)
9. [Directive 2013/39/EU of the European Parliament and of the Council of 12 August 2013 amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy](http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1410784774193&uri=CELEX:32013L0039) [↑](#footnote-ref-10)