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DISCUSSION PAPER

Proposed framework structure of the Directive establishing strategies to prevent and control pollution of groundwater (GWD)

0. OVERVIEW

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1. BACKGROUND

On 23 October 2000 the European Parliament and the Council adopted the Directive 2000/60/EC, hereafter referred to as the WFD, establishing a framework for Community action in the field of water policy. This Directive forms the basic legislation for the protection of the European aquatic environment.

The debates during the conciliation often showed an insufficient conceptual basis for the various problems of groundwater protection. Consequently, the WFD included a provision, in Article 17, stipulating that the European Parliament and the Council should adopt specific measures to prevent and control groundwater pollution. These measures should be designed to achieve the objective of good groundwater chemical status in accordance with Article 4(1)(b) of the WFD, acting on the proposal (of a new Directive) presented by the Commission in accordance with the procedures laid down in the Treaty.

An issue paper was prepared on 6 November 2001 to stimulate a first orientation debate of the Water Directors on the future proposal of Groundwater Directive, hereafter referred to as GWD, according to Article 17 of the WFD. This paper has been largely built on the provisions set out in the WFD and the discussions during the conciliation process. The issue paper corresponded, therefore, to the starting point of an open discussion on different conceptual approaches based on a first analysis of groundwater pollution in Europe.

Built on this issue paper, results of expert drafting groups were integrated to prepare a synthesis paper describing different conceptual approaches based on the analysis of the different pollution problems occurring in European groundwater. This paper was finalised on 20 March 2002 and discussed at the second meeting of the Expert Advisory Forum (EAF) on

Groundwater on 25-26 March 2002. The defined orientations enabled to propose first elements of a legislative proposal of a Groundwater Directive at the third EAF Groundwater meeting on 25 June 2002, and the main draft outline of the GWD was presented at the fourth EAF Groundwater meeting on 8 October 2002.

The proposed GWD will complement the WFD, while integrating the requirements of Council Directive 80/68/EEC, in order to ensure continuity after its repeal (end of 2013), and ensure coherence with other relevant environmental legislation (e.g. the Landfill Directive, the Drinking Water Directive, the Nitrates Directive, etc.). It is a separate, independent piece of legislation, which is built on articles 4, 7, 11, 17 and related annexes of the WFD, whilst avoiding duplication.

In other words, the GWD will not repeat groundwater features that are already covered by the WFD. In particular, derogation clauses (and preconditions) of Article 4 of WFD apply to surface water as well as to groundwater bodies; therefore, no elements of (further) derogation are foreseen. All other provisions of the WFD regarding groundwater will fully apply to this directive, namely:

- Co-ordination of administrative arrangements within river basin districts (Article 3);
- Environmental objectives, in particular the no-deterioration clause (Article 4);
- Requirements for analysing the characteristics of the river basin district, review of the environmental impact of human activity and economic analysis of water use (Article 5);
- Establishment of a register of protected areas (Article 6);
- Identification of waters for the abstraction of drinking water and the establishment of safeguard zones for those bodies of water (Article 7);
- Monitoring requirements (Article 8);
- Principle of recovery of the costs of water services, including environmental and resource costs (Article 9);
- Establishment of a programme of measures (Article 11);
- Issues which can not be dealt with at Member State level (Article 12);
- Establishment of a river basin management plan for each river basin district (Article 13);
- Requirements for public information and consultation (Article 14);
- Reporting requirements (Articles 15 and 18);
- Technical adaptations following scientific and technical progress (Article 20);
- Plans for future Community measures to the Regulatory Committee (Article 21);
- Repealing clauses and transitional provisions (Article 22); and
- Provisions for penalties (Article 23).

The GWD will set out criteria for the assessment of the chemical status of groundwater, which shall be based on basic criteria defined in Annex V.2.3 of the WFD, and on the establishment of a core list EU Groundwater Quality Standards to be used as common (screening) indicators for the definition of groundwater chemical status. In addition, complementary standards shall be identified by Member States, taking into account (new and historical) point and diffuse sources of pollution, groundwater use, and interactions of groundwater with surface water and terrestrial ecosystems. The assessment shall also consider natural background concentrations, either issued from modelling or measured.

This Directive intends to make operational measures to prevent or limit pollution of groundwater (taking into account of the 80/68/EEC Directive requirements), and prevent further deterioration of groundwater status, by linking them to identified pressures and impacts from point and diffuse sources of pollution.

2. SCOPE OF THE GWD

As explained in section 1 above, many of the issues related to groundwater are already addressed in the WFD itself. The linkages between the GWD and the WFD will be explained in the “whereas” clauses of the groundwater proposal. In addition, we will need to indicate what the scope of the GWD is, namely that it:

1. Reinforces the protection, enhancement and restoration measures with the aim of achieving good groundwater status by the end of 2015; article 17(1) WFD;
2. Sets up the criteria for assessing good groundwater chemical status; article 17(2)(a) WFD;
3. Sets up the criteria for the identification of significant and sustained upward trends and for the definition of starting points for trend reversals; article 17(2)(b) WFD;
4. Implements the measures necessary to prevent or limit the input of pollutants into groundwater and to prevent the further deterioration of status of all bodies of groundwater, subject to the applications of the WFD concerning protected areas and abstraction of drinking water, and the derogation clauses specified in the same Directive; article 17(3) WFD;
5. Implements the measures necessary to identify and reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity in order progressively to reduce pollution of groundwater; articles 17(4) and 17(5) WFD.

3. DEFINITIONS

An essential element of the Directive will be the definition of key terms. The following is a non-exhaustive list with our initial thoughts for wording:

1. **‘Deterioration’** refers to any statistically verified increase in the concentration of pollutants, event if it occurs within the good status class.
2. **‘Unpolluted groundwater’** means groundwater in its natural state and/or largely unaffected by human activity.
3. **‘status quo’** refers to the assessment of the composition of groundwater, as evaluated in the recharge zone, at the start of the monitoring programme (Annex V.2.4 of the WFD).
4. **‘Safeguard zones’** refer to protected areas designated for the abstraction of water intended for human consumption under Article 7 of the WFD.
5. **‘Conservation areas’** refer to protected areas designated as (1) nutrient-sensitive areas, including areas designated as vulnerable zones under Directive 91/676/EEC and areas designated as sensitive areas under Directive 91/271/EEC, and (2) areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including Natura 2000 sites designated under Directive 92/43/EEC and Directive 79/409/EEC.

6. **‘Risk zones’** refer to a group of point sources of pollution or geographically defined diffuse sources of pollution, including historical polluted sites, which together make a significant flux of pollution that may affect one or several receptors within a specific area.
7. **‘Point source of pollution’** refers to an identifiable and localised area, structure or facility, the direct or indirect discharges of which can cause pollution of groundwater.
8. **‘Diffuse source of pollution’** refers to direct or indirect discharges of liquid or solid substances, or atmospheric depositions, which can cause pollution of groundwater over large geographic surfaces.
9. **‘Direct discharge’** means: the introduction into groundwater of substances in the “prevent list” or any substances identified by Member States as being of potential risk to groundwater without percolation through the ground or subsoil.
10. **‘Indirect discharge’** means: the introduction into groundwater of substances in the “prevent list” or any substances identified by Member States as being of potential risk to groundwater after percolation through the ground or subsoil.
11. **‘Significant trend’** is related to the detection of an increase of concentration of a given substance in relation to the groundwater *status quo* (concentration measured at the start of the monitoring programme), which may result in pollution, i.e. would cause or has already caused harm to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems, damage to material property (e.g. by corroding pipes etc.) or impairment or interference with amenities (e.g. spas, other bathing waters) and other legitimate uses of the environment. The criteria will be detailed in a separate annex, with a cross-reference in the definition.
12. **‘Sustained trend’** is related to the increase rate of pollutant concentrations, which is demonstrated over a period of five years. The criteria will be detailed in a separate annex, with a cross-reference in the definition.
13. **‘Trend reversal’** is linked to the identification of significant and sustained upward trend of pollutant concentrations. Where relevant, trend reversal is defined in relation to starting points. The criteria will be detailed in a separate annex, with a cross-reference in the definition.
14. **‘Starting points’** for trend reversal corresponds to 50% of EU Groundwater Quality Standards or other standards set out by Member States. The criteria will be detailed in a separate annex, with a cross-reference in the definition.

4. ASSESSMENT OF GROUNDWATER CHEMICAL STATUS

Specifications for the assessment of the chemical status of groundwater will be set out in an annex of the GWD, subject to the extension, application, and derogation clauses established in the WFD. In addition to the basic criteria mentioned in section 4.1, the assessment of the groundwater chemical status is proposed to be based on (1) a general assessment of status linked to EU Groundwater Quality Standards used as common (screening) indicators, (2) criteria related to groundwater uses, (3) criteria related to interactions of groundwater with

associated surface water and terrestrial ecosystems, and (4) complementary standards set up by Member States, following a risk-based approach. **The boundary between good and poor groundwater chemical status will be defined by the most stringent of the criteria defining good status.**

4.1. Basic requirements

The assessment of groundwater chemical status should take account of basic requirements and criteria defined in Annexes II.2.1 and V.2.3 of the WFD. They concern:

- (a) The initial characterisation (by the end of 2004) of all groundwater bodies to assess their uses and the degree to which they are at risk of failing to meet objectives for each groundwater body (Annex II.2.1 of WFD);
- (b) The further characterisation of groundwater bodies identified as being at risk (Annex II.2.2 of WFD); and
- (c) The basic criteria for the assessment of groundwater chemical status (conductivity, concentrations of pollutants), Annex V.2.3 of WFD.

4.2. EU Groundwater Quality Standards as common indicators

A core list of EU Groundwater Quality Standards is proposed as (Table 1) to establish general boundaries between poor and good chemical status. This list takes account of the need to set up common (screening) indicators for a general assessment of status of groundwater bodies, or groups of bodies. **This list should be opened to periodic reviews.**

Note: The establishment of EU Groundwater Quality Standards is a tool to compare the status of European groundwater bodies along common criteria. These standards are not meant to be restoration targets, nor should they be seen as a possibility of “topping up” of concentrations (which is anyway not allowed under the no-deterioration clause).

Aluminium is an element of the first being washed out upon soil acidification and is hence a good indicator in this respect. **Ammonia** is a good indicator of urban areas and agricultural activities (in the case of reducing conditions, a higher quality targets should be set). **Cadmium** is a significant heavy metal from a human toxicological perspective, which can enter into the environment via sulphate fertilisers, in particular. **Chlorides** may be indicative of leaks in the sewerage systems as well as of traffic-related emissions (road salts) or intrusion of salt waters. **Nitrates** are regulated in groundwater (91/676/EEC Directive). **Phosphates** does not play a role from a human health perspective or for the protection of the groundwater itself, but this substance may be linked to eutrophication risks of sensitive associated surface waters and wetlands. **Pesticides** are regulated in groundwater (91/414/EEC Directive). **Sulphate** leaches out from construction site rubble and slag heaps and may be a principal indicator of nitrate depletion if content levels rise. **Tetrachloroethylene** and **trichloroethylene** are indicators of pressures from housing areas and industrial activities. **Conductivity** is an indicator of saline intrusion.

TABLE 1. EU Groundwater Quality Standards	Parametric values setting the boundary between poor and good chemical status (general standards)
Aluminium	0.2 mg/l
Ammonium	0.5 mg/l
Cadmium	5 µg/l
Chloride	240 mg/l
Nitrates	50 mg/l
Phosphates ¹	50 µg/l
Pesticides ²	0.1 µg/l
Pesticides – Total ³	0.5 µg/l
Sulphate	250 mg/l
Tetrachloroethylene	10 µg/l
Trichloroethylene	10 µg/l
Conductivity	2500 µS cm ⁻¹ at 20°C

This general assessment forms a part of the status evaluation of a groundwater body, or group of bodies. The good chemical status is attained when the average concentrations (according to the monitoring specifications described in section 8), excluding data from risk zones for which compliance requirements are defined in section 4.5, are equal or below the EU Groundwater Quality Standards within the confidence interval of the monitoring measurements. If the concentrations are higher than the standards, the reason of the pollution has to be surveyed and measures have to be taken to avoid further pollution as set out in section 7. If necessary, and if the costs are not disproportionate, remediation measures are required. Compliance to EU Groundwater Quality Standards does not apply to groundwater, which contains high concentrations of substances in its natural state (including groundwater in contact with seawater with respect to sodium chloride contents), nor does it apply to risk zones.

With respect to synthetic substances, monitoring should only be performed if the risk analysis (initial characterisation) has identified the likelihood of the occurrence of these substances in the groundwater body, or group of bodies.

4.3. Groundwater uses

In the context of this directive, and pursuant to Article 7.2 of the WFD, Member States shall ensure that under the water treatment regime applied, and in accordance with Community legislation, the resulting abstracted groundwater for use as drinking water will meet the

¹ Sum of total organic and dissolved phosphorus (concentrations given as µg/l of P)

² Individual pesticides. Only those pesticides which are likely to be present in a given supply need to be monitored

³ Sum of all identified and quantified pesticides

requirements of Directive 80/778/EEC as amended by Directive 98/83/EEC. In the case of an overall groundwater body, or groups of bodies, concerned by drinking water abstraction, the good chemical status is attained when the above requirements are met (i.e. drinking water standards apply to the overall groundwater body, or groups of bodies). In the case of a limited zone (safeguard zone) within a groundwater body, or group of bodies, the drinking water quality standards only apply to the abstracted groundwater.

With respect to other uses (industrial, irrigation, animal watering), the general assessment of chemical status should be carried on the basis of requirements set up in section 4.1, and Member States shall establish standards appropriate to local situations and risks, taking into account the provisions of sections 4.4 and 4.5.

4.4. Groundwater interactions

The chemical composition of the groundwater body should not be such that it would result in failure to achieve the good chemical or ecological status in associated surface waters nor any significant damage to terrestrial ecosystems depending on the groundwater body. Alternatively, interactions with surface water should not result in failure to achieve good chemical status for associated groundwater bodies. In this context, Member States shall identify within each river basin district (and each groundwater body) the zones where groundwater interactions are likely to occur.

Member States shall verify that these interactions do not yield to:

- Deterioration of groundwater body status due to surface water flow or modifications of surface water conditions, as measured by the measurement of EU Groundwater Quality Standards in groundwater at the interface between the groundwater body and the surface water;
- Deterioration of surface water body status as measured by chemical and ecological standards relevant to the WFD in surface water at the interface of the surface water body and the groundwater;
- Adverse effects to terrestrial ecosystems as evaluated by ecological criteria (no significant damage should be detected).

4.5. Risk-based complementary standards

Complementary standards (substances with maximum concentration values) shall be identified by the Member States, following a risk-based approach with the aim to control sources of groundwater pollution. These standards shall be locally-derived (set at the level of specific risk zones) and based on the identification of point and diffuse sources of pollution.

The establishment of values of the identified substances shall take into account their natural (derived) background concentrations, the identified risks of polluting substances, taking into account their persistence, toxicity and potential to accumulate in terrestrial ecosystem dependent on groundwater, the vulnerability of the groundwater body to the identified pollution, the use of groundwater (for abstraction as drinking water or other use) and the interactions of groundwater with surface water and terrestrial ecosystems.

This clause implies that natural background concentrations of groundwater bodies should be assessed (either by measurement or derived from modelling) and a conceptual understanding of each groundwater body should be established to determine the degree of interactions with

surface, transitional and coastal waters and terrestrial ecosystems. This assessment should be obtained at the latest at the end of 2006.

The requirement for assessment of natural background concentrations is based on the reasoning that only in this way it is possible to develop an understanding on the possible changes and influences caused by human activities, to assess the associated risks and to expediently evaluate monitoring results. However, there is no need to specify background levels for those substances that are irrelevant owing to prevailing geological circumstances.

4.6. Compliance regime related to groundwater chemical status

On the basis of the above paragraphs, several levels should be considered when defining groundwater chemical status in relation to quality standards, namely: (1) general EU Groundwater Quality Standards used as common indicators, (2) drinking water standards applied to groundwater abstracted, or intended to be used, for human consumption, and other standards set up by Member States regarding other groundwater uses, (3) relevant standards applied to either groundwater or surface water in zones or terrestrial ecosystems in zones which are concerned by such interactions, (4) standards set up by Member States on a case-by-case basis, e.g. for the purpose of prevention/control of diffuse and point sources of pollution. In all cases, the boundary between good and poor groundwater chemical status will be defined by the most stringent of the standards and/or criteria defining good status.

5. THE NO-DETERIORATION CLAUSE

The Article 4(1)(b)(i) of the WFD makes it clear that measures should be implemented to prevent deterioration of status of all groundwater bodies, subject to the provisions set out in this article. The GWD will not repeat this clause and will only clarify the required measures.

5.1. No-deterioration of groundwater body status

The no-deterioration clause applies to the status of all groundwater bodies i.e. preventative measures should make sure that groundwater bodies, or groups of bodies, in good chemical status will not be deteriorated to poor chemical status.

5.2. No-deterioration of unpolluted groundwater

Unpolluted groundwater has to be retained in its natural state. In this clause, the no-deterioration clause applies to the groundwater *status quo*, which implies the assessment of the composition of unpolluted groundwater (natural background concentrations) at the start of the monitoring programme and a conceptual understanding of each groundwater body as stipulated in the paragraph 4.5. **These requirements are not explicitly specified in the WFD and should hence be covered by the GWD as additional requirements.** They concern in particular **conservation areas**.

Note: The assessment of natural background concentrations of groundwater bodies (feasibility, expected difficulties) will be discussed at a workshop organised jointly by the DG RDT and the DG ENV on the BASELINE project. This meeting will be held in Brussels on the 27th January 2003.

The no-deterioration clause implies that natural background concentrations should not be exceeded by a factor of two, taking into account natural trends and variability. For

anthropogenic substances, the lower limit of the application range of European analytical standards (detection limits) should be used instead of background values.

5.3. No-deterioration of groundwater abstracted for drinking water

Pursuant to Article 7.3 of the WFD, Member States shall ensure the necessary protection of the bodies of water identified with the aim of avoiding deterioration in their quality in order to reduce the level of purification treatment in the production of drinking water. In this context, **safeguard zones** may be established for those bodies of groundwater.

6. IDENTIFICATION AND REVERSAL OF SIGNIFICANT AND SUSTAINED UPWARD TRENDS

The identification of significant and sustained upward trends and the definition of starting points for trend reversal shall be based on the following criteria:

1. The **establishment of the *status quo*** of groundwater should be carried out at the start of the monitoring programme (end of 2006).

This assessment should take into account the analysis of pressures and impacts, the delineation of groundwater bodies and the identification of restricted areas (protected areas and risk zones related to geographically-defined diffuse and point sources of pollution). The establishment of the *status quo* should be based on an aggregation of data (average concentrations) collected in groundwater bodies, or group of bodies, or groundwater not included in a given groundwater body, and restricted areas within groundwater bodies, using the statistical tool provided by the WG 2.8 Guidance Document. Arithmetic means and their confidence intervals should be reported for each of the following cases:

- Groundwater bodies, or group of bodies, excluding data from risk zones;
 - Protected areas, separated into conservation areas and safeguard zones for drinking water abstraction;
 - Risk zones related to geographically-defined diffuse and point sources of pollution;
 - Other groundwaters (not covered by the above categories).
2. Identification of significant and sustained upward trends based on a given increase of concentrations of pollutants identified as posing a potential risk of groundwater pollution over a minimum of five consecutive years as set out below. The algorithm used should be based on the WG 2.8 Guidance Document or equivalent.
 3. Every significant and sustained trend should be reversed. Starting points for trend reversal should be equal to 50% of selected standards (both concerning the EU Groundwater Quality Standards and parameters selected following a risk-based approach).
 4. Graduated measures for limiting and reversing a trend should be taken, depending on the concentration when the trend is identified. The more the trend is significant and

the closer it comes to reaching or ever exceeding the quality goal, the far more reaching and binding these measures should be.

7. COMBINED APPROACH FOR DIFFUSE AND POINT SOURCES OF POLLUTION

In addition to the measures identified in Article 11 of the WFD, a combined approach to prevent or limit groundwater pollution from diffuse and point sources shall be followed. These measures are meant to ensure a continuity of the protection regime of the 80/68/EEC Directive. To comply with this requirement, Member States shall:

- Prevent at source, as far as technically and economically feasible, the introduction into groundwater of substances in the “prevent list” by prohibiting all direct discharge, including from soil pollution;
- Subject to prior investigation any disposal or tipping for the purpose of disposal of substances in the “prevent list”, which might lead to indirect discharge. In the light of that investigation, Member States shall prohibit such activity or shall grant authorisation, provided that all the technical precautions necessary to prevent such discharge are observed;
- Take all appropriate measures they deem necessary to prevent any indirect discharge of substances in the “prevent list” due to activities on or in the ground other than those mentioned in the second indent;

TABLE 2. Prevent list
<p>Organohalogen compounds and substances which may form such compounds in the aquatic environment</p> <p style="text-align: center;">Organophosphorus compounds</p> <p style="text-align: center;">Triorganotin compounds</p> <p>Substances which possess carcinogenic, mutagenic, or teratogenic properties in or via the aquatic environment</p> <p style="text-align: center;">Total mercury and methylmercury compounds</p> <p style="text-align: center;">Mineral oils and (polyaromatic and chlorinated) hydrocarbons</p> <p style="text-align: center;">Cyanides</p> <p style="text-align: center;">MTBE</p>

- Subject to prior investigation all direct discharge of substances identified as being of potential risk to groundwater (all pressures identified at the initial characterisation stage), including emission controls based on best available techniques as defined in the IPPC Directive, so as to limit such discharges, and the disposal or tipping for the purpose of disposal of these substances, which might lead to indirect discharge. In the light of that investigation, Member States shall grant authorisation, provided that all the technical precautions for preventing groundwater pollution by these substances are observed;
- Take all appropriate measures they deem necessary, including emission controls based on best available techniques, to limit any indirect discharge of substances

identified as being of potential risk to groundwater (all pressures identified at the initial characterisation stage) due to activities on or in the ground other than those mentioned in the fifth indent;

- In the case of point source of pollution, limit, as far as technically and economically feasible, the extension of the contaminated plume beyond a defined restricted risk zone in order to avoid deterioration of the status of the groundwater body, or group of bodies;
- In the case of diffuse source of pollution, controls including, as appropriate, best environmental practices. When measures based on a ban of specific substances have proven their effectiveness as demonstrated by downward trends, short-term measures should focus on controlling that the trend is continuing to decrease. In the case of steady polluted state, restoration measures should be undertaken, proportionate to the level of pollution, the local conditions and the associated risks;
- Restrict the use of the site and of the groundwater to avoid the degradation of the water resources;
- Inform the potential users of the site of the potential risks of groundwater degradation.

The prior investigations shall include examination of the hydrogeological conditions of the area concerned, the possible purifying power of the soil and sub-soil and the risk of pollution and alteration of the quality of the groundwater from the discharge, and all other requirements defined in Annex II.2.2 of the WFD.

Where a quality objective or quality standard, whether established pursuant to this Directive, or pursuant to any other Community legislation, requires stricter conditions than those which would result in the application of paragraph 2, more stringent emission controls shall be set accordingly.

Note: A distinction should be made between new and historical contamination. New point sources of pollution are subject to pollution prevention and must be dealt with in any case and as swift as possible after detection. Whether historical point sources (resulting from activities that took place before the entry into force of the GWD) must be remediated or not must follow from a site-specific risk-based decision, taking into account all possible receptors. Appropriate measures have to be required in order to avoid further pollution (in the context of the GWD, the “plume behaviour” should be assessed, not accepting expanding plumes over a given time-frame).

8. MONITORING SPECIFICATIONS AND REPORTING

1. Monitoring requirements of Article 8 of the WFD apply to the GWD. In addition, details are given in the monitoring guidance document (CIS Working Group 2.7) that will not be repeated in the GWD. This section only provides further specifications that are not covered by the guidance document.
2. Groundwater monitoring should be performed in the upper (recharge zone) and lower layers to identify possible rapid changes (e.g. linked to a new pollution) and/or long-term changes. Evidence should be given that the measurement points are distributed

throughout the groundwater body in such a way that they cover the risks and faithfully reflect the status of the groundwater body;

3. Surveillance monitoring should be ensured with a frequency adapted to local conditions and should be sufficient to enable Member States to be adequately confident that the bodies are at good status and that there no significant and sustained upward trends in the concentration of any pollutant;
4. Specific monitoring requirements shall be established for risk zones, with a frequency adapted to local conditions, in order to assess their impact on existing or identified future receptors (such as drinking water supply, surface water or vulnerable terrestrial ecosystem);
5. Following the specifications described in section 4, the assessment of the groundwater chemical status shall be set out as follows:
 - (a) Results of individual monitoring points shall be aggregated and reported as weighted arithmetic mean for each groundwater body, or group of bodies (following recommendations of the WG 2.8 Guidance Document) to demonstrate compliance with good groundwater chemical status;
 - (b) For risk zones, a synthetic report per groundwater body, or group of bodies, should be provided, indicating whether or not these zones affected the status of the groundwater bodies, or group of bodies. If relevant, the report should provide a summary of restoration measures;
 - (c) For protected areas as defined in Articles 6 and 7 of WFD, a synthetic report per groundwater body, or group of bodies, should be provided, indicating whether or not fixed objectives for protected areas have been respected;
 - (d) In addition to the specifications given in Annex V.2.5 of the WFD with respect to groundwater chemical status, a distinction shall be made in the colour-coded map as indicated below:
 - Good chemical status: green
 - Good chemical status for groundwater bodies in natural state but with background levels exceeding the levels of good chemical status due to natural factors: green and light grey stripes
 - Risk zones within good chemical status bodies: red dots – Alternatively, a list of identified sites may be provided instead of plotting all individual risk zones on the maps;
 - Poor chemical status due to anthropogenic impact: red
7. River Basin Authorities shall keep an inventory of the authorisations referred to in the section 7 regarding direct and indirect discharges, and shall monitor compliance with the conditions laid down in these authorisations and the effects of discharges on groundwater quality. Reporting on the granted authorisations shall be carried out in each River Basin Management Plan, including (a) the results of the prior investigations referred to in the section 7; (b) details of the authorisations granted; and (c) the results of the monitoring and inspections carried out.