A European framework for water quality

Key features and potential impacts on the downstream oil industry

In October 2000 the European Commission published an all-encompassing Directive for water. Five years on from the first concept, the Water Framework Directive (WFD) was intended to replace a patchwork of other legislation, often overlapping and even contradictory, on various aspects of water management and quality. It has been hailed as one of the most far-reaching and comprehensive pieces of water legislation in the world. Issues covered include surface and groundwater quality (both chemical and 'ecological'), water resource management, costs of water and minimum standards required. The Directive introduced two concepts new to most European countries: firstly, the notion of water bodies within river basins as the basic building block of water management; and secondly, the dual approach to standards, i.e. discharge limits combined with environmental quality objectives and standards. The WFD covers inland surface water, transitional water, coastal water and groundwater, and will cause repeal of seven earlier Directives (and various amendments) over the next 15 years.

The WFD sets out to manage water principally by defining quality requirements which, in turn, also have a secondary effect upon availability and supply. The basic building block of the Directive is a series of water bodies within each Member State, a water body being defined as 'a discrete and significant element of surface water such as a lake, reservoir, stream, river or canal, part of a stream, river or canal, a transitional water or coastal water' and 'a distinct volume of groundwater within an aquifer or aquifers'. Overlying these water bodies is a set of river basins, which are further combined into River Basin Districts, and are used as the basic management tool by Member States. The Directive itself includes a series of broad quality definitions (see Table 1) covering both the chemical and ecological properties of water within each water body. Using a prescribed monitoring regime, each water body is required to attain 'good status' or better 15 years after the date of entry into force of the Directive (i.e. by 2015). Measures also need to be in place to prevent deterioration of status. Further detail on values will be developed in associated guidance documents and by the Member States themselves.

> ***Is water special?***
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> *Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such.*

Under certain circumstances, where a water body has been so modified by human activity, or its natural condition is such that it is not feasible or is unreasonably costly to achieve good status, lower standards may be set. All practicable steps should still be taken to avoid further deterioration. Such a case might, for example, arise where a river has been canalised to facilitate river traffic. In such a situation, only chemical quality standards will be set for the water body, but will be set so as to ensure that it achieves the best possible water quality. Hence the definitions for such heavily modified water bodies are in terms of 'ecological potential' rather than actual ecological status. In all cases achieving a quality capable of sustaining a broad ecology is the goal for all water bodies covered.

What does this mean in practice for refineries?

There are a number of aspects of the WFD which are especially relevant to downstream oil operations and their discharges to controlled waters.

Article 10 of the Directive refers to the combined approach of emission controls and environmental quality standards (EQS). This specifically requires the use of BAT for emission controls (e.g. as defined in the IPPC or Urban Waste Water Directives). If, however, the use of

Table 1 Status definitions

Status level	General definition	Chemistry definition
High	No, or very minor, variation by anthropogenic influence from undisturbed state	Close to zero or less than detection limits for synthetic substances; undisturbed (i.e. background levels) for non-synthetic substances
Good	Low level of variation by anthropogenic influence from undisturbed state	Below EQS for both synthetic and non-synthetic substances
Moderate	Moderate variation by anthropogenic influence from undisturbed state	No specific description
Poor	No specific description—worse than moderate	No specific description
Bad	No specific description—worse than poor	No specific description
Chemical parameters for surface water	**Ecological parameters for surface water**	**Parameters for groundwater**
Thermal condition Oxygenation levels Salinity Acidification state Nutrient state Pollution by PS Pollution by other synthetic substances discharged in significant quantity	Composition and abundance of aquatic flora Composition and abundance of benthic invertebrates Composition, abundance and age structure of fish fauna	Oxygenation level pH Conductivity Nitrate Ammonia
	Additionally for transitional and coastal waters composition, abundance and biomass of phytoplankton	
	Heavily modified water bodies are classified according to max/good/moderate ecological potential	

BAT does not achieve compliance with EQS, then more stringent emission controls shall be set. This could enable a regulator to require a refinery to go beyond the BAT descriptions in the relevant BREF to obtain good status in a particular receiving water.

What is zero?

One of the requirements of Article 16 is the cessation of emissions, releases and losses of all priority hazardous substances. There is considerable debate as to what this means in practice—below detection limits; some de minimis *value; a threshold below which there is no discernable increase in concentration in the receiving water; no discharge at all, i.e. in effect cessation of use. All could be argued to be in the spirit of the WFD. A debate to watch closely.*

Article 16 of the WFD deals with specific measures to be adopted against individual substances, or groups of substances, considered to pose a significant risk to the aquatic environment. A selection process has taken place to identify priority (PS) and priority hazardous (PHS) substances. Table 2 lists those currently selected. A number of substances are listed as PSR. This means they are priority substances under review as possible priority hazardous substances. The list of PS and PHS is to be reviewed every four years from entry into force of the Directive. This means it should have been reviewed for the first time by now. In practice this process is just beginning.

Article 16 is spawning a Daughter Directive of its own to deal with the controls on PS and PHS, and the standards required. An important aspect here is that emissions of PHS should cease by 2015 (see box on left) and that emissions of PS shall have adequate controls placed upon them in the same timescale. As Table 2 indicates, a number of substances relevant to downstream oil operations are included as PHS (for example cadmium, PAHs (list of 5),

mercury, etc.) and PS (for example benzene, nickel, fluoranthene, etc.). The initial indications from the Commission on the Article 16 Daughter Directive suggested significant extensions to the current requirements of the WFD and other related Directives. This is an area still under review and further public consultation is awaited. CONCAWE is working with other industry bodies to ensure sound science and effective management tools are applied in this Directive.

Table 2 Priority and Priority Hazardous substances

Substance	Classification	Notes
Alachlor	PS	
Anthracene	PSR	Under review as possible PHS
Atrazine	PSR	Under review as possible PHS
Benzene	PS	
Brominated diphenyl ethers	PHS	
Cadmium and its compounds	PHS	
C10-13 chloroalkanes	PHS	
Chlorphenviphos	PS	
Chlorpyriphos	PSR	Under review as possible PHS
1,2-dichloroethane	PS	
Dichloromethane	PS	
DEHP	PSR	Under review as possible PHS
Diuron	PSR	Under review as possible PHS
Endosulphan	PSR	Under review as possible PHS
Fluoranthene	PS	Indicator of other PAHs
Hexachlorobenzene	PHS	
Hexachlorobutadiene	PHS	
Hexachlorocyclohexane	PHS	
Isoproturon	PSR	Under review as possible PHS
Lead and its compounds	PSR	Under review as possible PHS
Mercury and its compounds	PHS	
Naphthalene	PSR	Under review as possible PHS
Nickel and its compounds	PS	
Nonylphenols	PHS	
Octylphenols	PSR	Under review as possible PHS
Pentachlorobenzene	PHS	
Pentachlorophenol	PSR	Under review as possible PHS
PAHs (list of 5)	PHS	benzo(a)pyrene, benzo(b)fluoranthene benzo(ghi)perylene benzo(k)fluoranthene indeno(1,2,3-cd)pyrene
Simazine	PSR	Under review as possible PHS
Tributyl tin compounds	PHS	
Trichlorobenzenes	PSR	Under review as possible PHS
Trichloromethane	PS	
Trifuralin	PSR	Under review as possible PHS

PS = priority substance; PSR = priority substance under review; PHS = priority hazardous substance

A further aspect of relevance to our industry is Article 7 which deals with waters used for the abstraction of drinking water. This short article has provisions for water quality to ensure the appropriate drinking water standards can be achieved, and furthermore that these be achieved with a reduced level of treatment (interpreted by some as a low or minimum level of treatment). The requirements under Article 7 have been extensively discussed and proposals have been made which, in effect, require all surface (and potentially ground) waters likely to be used for drinking water to meet drinking water standards for all PS and PHS. CONCAWE, with other industry bodies, has been active in development of a technical argument to support a less stringent requirement, allowing for reduction of substance levels by treatment within the drinking water purification plant and only applying the quality standards at the point of abstraction for water actually used for drinking water production. This is still under debate but is being widely supported as a practicable way forward.

Where are we now, and what is the CONCAWE response?

The WFD is a complex piece of legislation which will require major changes in the way water quality is controlled in most Member States. Guidance is being developed by the Commission for many aspects of the Directive. In an attempt to simplify the implementation process for Member States and to encourage a common approach the Commission has put in place a Common Implementation Strategy for the WFD. As part of this process a Pilot River Basin Project has been initiated to work through the various aspects of implementation of the WFD. This is currently under way in 15 river basins across the EU (see Table 3). Feedback from this project so far indicates the WFD can be implemented but that a number of practical problems will have to be addressed. Many of these relate to how the various water bodies are to be classified and controlled in a cost-effective and protective manner. The outcomes from this project will also be used to modify the guidance documents based on real practical experience of implementation.

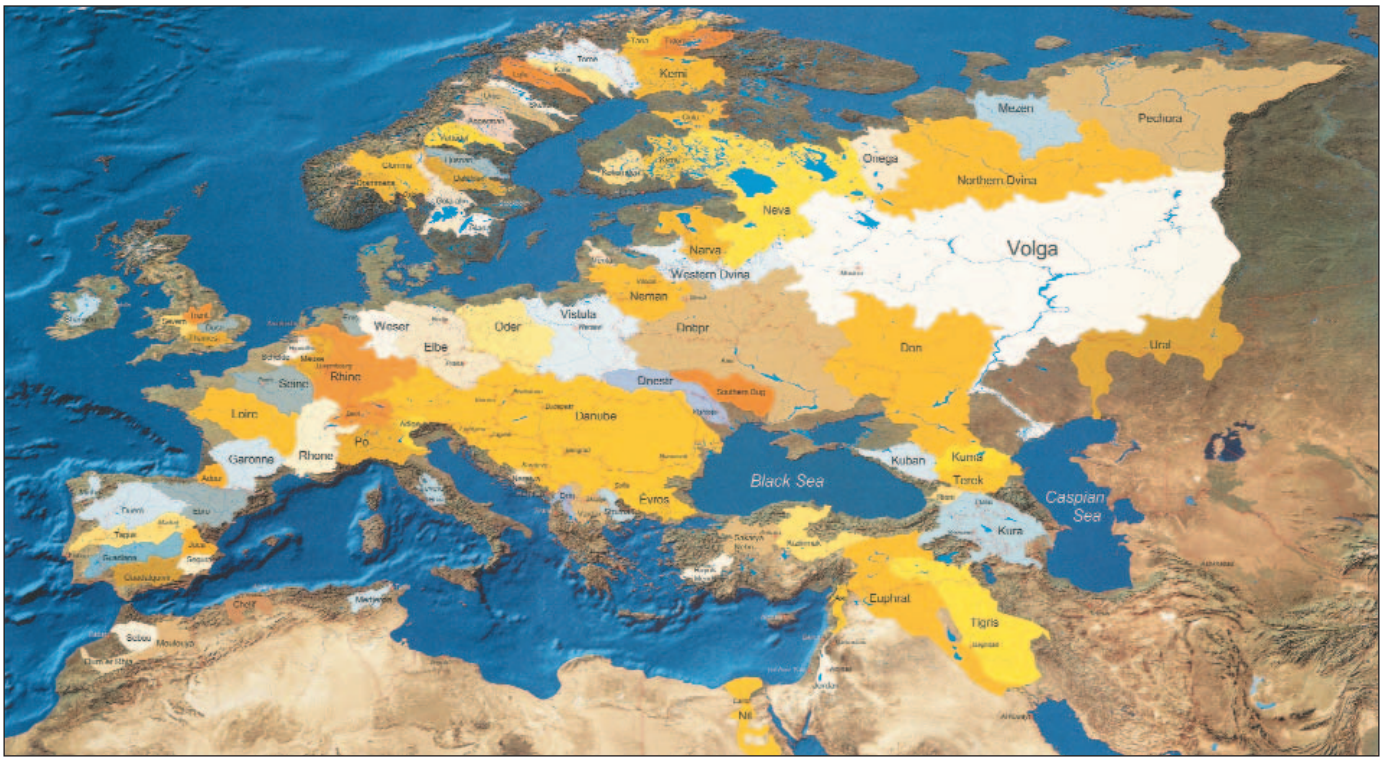
The timelines for the full implementation of the WFD may seem long but, given the ramifications for industry, work has already commenced in an effort to fully understand all factors involved. Some of the activities, for example in relation to water quality standards, have been mentioned above. Additionally, CONCAWE's Water Quality Management Group has formed two Special Task Forces to gather data on discharges and receiving water quality. This data will help in identifying further actions required to ensure the downstream oil industry continues to minimise its effect upon surface and ground waters.

Further information can be obtained at the DG Environment website: http://europa.eu.int/comm/environment/water/water-framework/index_en.html and through the CIRCA portal: http://forum.europa.eu.int/Public/irc/env/wfd/library.

Table 3 Pilot river basins

Country/countries	River basin	Transboundary?
Belgium/France/The Netherlands	Scheldt	Yes
Denmark	Odense	No
Finland	Oulujoki	No
France/Germany/Luxembourg	Sarre-Moselle	Yes
France	Marne	No
Germany/Poland/Czech Rep	Neisse	Yes
Greece	Pinios	No
Ireland	Shannon	No
Italy	Cecina and Tevere	No
Norway	Suldalsvassdraget	No
Portugal	Guadiana	No (only Portuguese side)
Romania/Hungary	Somos	Yes
Spain	Júcar	No
United Kingdom	Ribble	No

Figure 1 European inland waters and river basins



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