#

**List of Groundwater Standards**

Version 1.0, December 2024

# Purpose and scope

This document sets out the groundwater standards to be applied when:

* Assessing inputs of substances hazardous to groundwater
* Assessing risks to future groundwater resources using threshold values.

Further detail on how to use these standards is provided in WAT-PS-10-02

This document presents the numerical standards for selected substances that are commonly assessed for regulatory purposes in Scotland. It is not feasible to provide numerical standards for every possible substance. If the substance you are assessing is not included in this document, you can apply the approach outlined in the Scottish Government Directions 2024 to derive an appropriate standard.

The standards derived from health criteria value (HCV) were based on the information available to SEPA at the time. Applicants or operators may propose alternative values for SEPA’s consideration, provided these are derived in accordance with the WHO methodology and the relevant supporting justification is provided.

For radioactive substances, refer to separate relevant SEPA policy and guidance.

# Groundwater standards for substances hazardous to groundwater

**Table 1: Groundwater standards for substances hazardous to groundwater**

| **The CAS**  | **Substance Name** | **Input standard >50m from surface water****(µg/L)** | **Basis for standard** | **Input standard ≤50m from surface water****(µg/L)** | **Basis for standard** | **Threshold value** **(µg/L)** | **Basis for value** | **Comment** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 93-76-5 | (2,4,5-trichlorophenoxy)acetic acid | 0.05 | Pesticide | 0.05 | Pesticide | 0.075 | Pesticide | - |
| 93-72-1  | (2,4,5-trichlorophenoxy) propionic acid (2,4,5-TP) (Silvex)  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 630-20-6  | 1,1,2,2-tetrachloroethane  | 17.4 | HCV-derived  | 17.4 | HCV-derived  | 26.1 | HCV-derived  | - |
| 76-13-1  | 1,1,2-trichlorotrifluoroethane  | 90000 | HCV-derived  | 90000 | HCV-derived  | 135000 | HCV-derived  | - |
| 634-66-2  | 1,2,3,4-tetrachlorobenzene  | 30 | HCV-derived  | 30 | HCV-derived  | 45 | HCV-derived  | - |
| 634-90-2  | 1,2,3,5-tetrachlorobenzene  | 3 | HCV-derived  | 3 | HCV-derived  | 4.5 | HCV-derived  | - |
| 95-94-3  | 1,2,4,5-tetrachlorobenzene  | 0.3 | HCV-derived  | 0.3 | HCV-derived  | 0.45 | HCV-derived  | - |
| 120-82-1  | 1,2,4-trichlorobenzene  | 35  | DWS  | 35  | DWS | 52.5 | DWS  | - |
| 95-63-6  | 1,2,4-trimethylbenzene  | 30 | HCV-derived  | 30 | HCV-derived  | 45 | HCV-derived  | - |
| 106-93-4  | 1,2-dibromoethane  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 3209-22-1  | 1,2-dichloro-3-nitrobenzene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 95-50-1  | 1,2-dichlorobenzene  | 500 | DWS  | 500 | DWS  | 750 | DWS  | - |
| 78-87-5  | 1,2-dichloropropane  | 20 | DWS  | 20 | DWS  | 30 | DWS  | - |
| 96-23-1  | 1,3-dichloro-2-propanol  | 0.99 | HCV-derived  | 0.99 | HCV-derived  | 1.485 | HCV-derived  | - |
| 541-73-1  | 1,3-dichlorobenzene  | 60 | HCV-derived  | 60 | HCV-derived  | 90 | HCV-derived  | - |
| 542-75-6  | 1,3-dichloropropene  | 10 | DWS  | 10 | DWS  | 15 | DWS  | - |
| 89-61-2  | 1,4-dichloro-2-nitrobenzene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 106-46-7  | 1,4-dichlorobenzene  | 150 | DWS  | 150 | DWS  | 225 | DWS  | - |
| 2163-00-0  | 1,6-dichlorohexane  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 106-94-5  | 1-bromopropane  | 600 | HCV-derived  | 600 | HCV-derived  | 900 | HCV-derived  | - |
| 544-10-5  | 1-chlorohexane  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 1195-45-5  | 1-fluoro-4-isocyanatobenzene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 75-99-0  | 2,2-dichloropropanoic acid (Dalapon)  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 576-24-9  | 2,3-dichlorophenol  | 9 | HCV-derived  | 9 | HCV-derived  | 13.5 | HCV-derived  | - |
| 78-88-6  | 2,3-dichloropropene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 95-95-4  | 2,4,5-trichlorophenol  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 108-77-0  | 2,4,6-trichloro-1,3,5-triazine  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 88-06-2  | 2,4,6-trichlorophenol  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | Consider also taste/odour when assessing risks to potable abstractions (see WHO guidance).  |
| 120-83-2  | 2,4-dichlorophenol (2,4-DP)  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | Consider also taste/odour when assessing risks to potable abstractions (see WHO guidance).  |
| 14861-17-7  | 2,4-dichlorophenoxy-4-aniline (aminofen)  | 0.1 | detection limit  | 0.1  | detection limit  | 0.1 | detection limit  | - |
| 94-82-6  | 2,4-dichlorophenoxybutyric acid (2,4-DB)  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 87-65-0  | 2,6-dichlorophenol  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 95-85-2  | 2-amino-4-chlorophenol  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 120-32-1  | 2-benzyl-4-chlorophenol  | 0.005 | pesticide  | 0.005 | pesticide  | 0.0075 | pesticide  | - |
| 126-99-8  | 2-chloro-1,3-butadiene  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 95-51-2  | 2-chloroaniline  | 10 | HCV-derived  | 10 | HCV-derived  | 15 | HCV-derived  | - |
| 131-09-9  | 2-chloroanthraquinone  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 107-07-3  | 2-chloroethanol  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 95-57-8  | 2-chlorophenol  | 150 | DWS  | 150 | DWS  | 225 | DWS  | Consider also taste/odour when assessing risks to potable abstractions (see WHO guidance).  |
| 95-49-8  | 2-chlorotoluene  | 70 | DWS  | 70 | DWS  | 105 | DWS  | - |
| 95-76-1  | 3,4-dichloroaniline  | 0.01 | detection limit  | 0.01 | detection limit  | 0.01 | detection limit  | - |
| 99-54-7  | 3,4-dichloronitrobenzene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 108-42-9  | 3-chloroaniline  | 156 | HCV-derived  | 156 | HCV-derived  | 234 | HCV-derived  | - |
| 108-43-0  | 3-chlorophenol  | 9 | HCV-derived  | 9 | HCV-derived  | 13.5 | HCV-derived  | - |
| 107-05-1  | 3-chloropropene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 100-44-7  | 3-chlorotoluene (alphachlorotoluene)  | 1 | DWS  | 1 | DWS  | 1.5 | DWS  | - |
| 55406-53-6  | 3-Iodo-2-propynyl n-butyl carbamate (IPBC)  | 600 | HCV-derived  | 600 | HCV-derived  | 900 | HCV-derived  | - |
| 94-81-5  | 4-(4-chloro-2-methylphenoxy) butyric acid  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1570-64-5  | 4-chloro-2-methylphenol  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 89-63-4  | 4-chloro-2-nitroaniline  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 59-50-7  | 4-chloro-3-methylphenol  | 300 | HCV-derived  | 300 | HCV-derived  | 450 | HCV-derived  | - |
| 106-47-8  | 4-chloroaniline  | 6 | HCV-derived  | 6 | HCV-derived  | 9 | HCV-derived  | - |
| 106-48-9  | 4-chlorophenol  | 9 | HCV-derived  | 9 | HCV-derived  | 13.5 | HCV-derived  | - |
| 106-43-4  | 4-chlorotoluene  | 2.5 | DWS  | 2.5 | DWS  | 3.75 | DWS  | - |
| 26172-55-4  | 5-chloro-2-methyl-4-isothiazolin-3-one  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 83-32-9  | acenaphthene  | 180 | HCV-derived  | 180 | HCV-derived  | 270 | HCV-derived  | - |
| 79-06-1  | acrylamide  | 0.05 | DWS  | 0.05 | DWS  | 0.075 | DWS  | - |
| 15972-60-8  | alachlor  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 309-00-2  | aldrin  | 0.015 | DWS  | 0.02  | Surface Water ES  | 0.0225 | DWS  | The pesticides aldrin, dieldrin, endrin & isodrin are assessed together against the surface water ES  |
| 85422-92-0; 63449-398 | alkanes, C=>18, chloro  | 300 | HCV-derived  | 300 | HCV-derived  | 450 | HCV-derived  | - |
| 85535-84-8 | alkanes, C10-13, chloro  | 105 | HCV-derived  | 0.8 | Surface Water ES  | 157.5 | HCV-derived  | - |
| 85535-85-9  | alkanes, C14-17, chloro  | 69000 | HCV-derived  | 69000 | HCV-derived  | 103500 | HCV-derived  | - |
| 98-87-3  | alpha,alpha-dichlorotoluene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 67375-30-8  | alpha-cypermethrin  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 959-98-8  | alpha-endosulfan  | 0.05 | pesticide  | 0.01 | Surface Water ES  | 0.075 | pesticide  | - |
| 384-22-5  | alpha-trifluoro-2-nitrotoluene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 121-17-5  | alpha-trifluoro-3-nitro-4-chloro-toluene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 98-46-4  | alpha-trifluoro-3-nitrotoluene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 402-54-0  | alpha-trifluoro-4-nitrotoluene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 61-82-5  | amitrole  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 101-05-3  | anilazine  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 120-12-7  | anthracene  | 0.05 | DWS  | 0.05 | DWS  | 0.075 | DWS  | - |
| n/a | arsenic (inorganic III and V)  | 5 | DWS  | 5 | DWS  | 7.5 | DWS  | - |
| 1912-24-9  | atrazine  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 2642-71-9  | azinphos ethyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 86-50-0  | azinphos methyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 3813-05-6 | benazolin  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 15310-01-7  | benodanil  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 17804-35-2  | benomyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 71-43-2  | benzene  | 0.5 | DWS  | 0.5 | DWS  | 0.75 | DWS  | - |
| 50-32-8  | benzo(a)pyrene  | 0.005 | DWS  | 0.00034 | Surface Water ES  | 0.0075 | DWS  | - |
| 205-99-2  | benzo(b)fluoroanthene  | 0.05 | DWS  | 0.05 | DWS  | 0.075 | DWS  | Benzo(a)pyrene is used as a marker compound in surface waters; assessment of generic PAHs should refer to benzo(a)pyrene  |
| 191-24-2  | benzo(g,h,i)perylene  | 0.05 | DWS  | 0.05 | DWS  | 0.075 | DWS  | Benzo(a)pyrene is used as a marker compound in surface waters; assessment of generic PAHs should refer to benzo(a)pyrene  |
| 207-08-9  | benzo(k)fluoranthene  | 0.05 | DWS  | 0.05 | DWS  | 0.075 | DWS  | Benzo(a)pyrene is used as a marker compound in surface waters; assessment of generic PAHs should refer to benzo(a)pyrene  |
| 42576-02-3  | bifenox  | 0.05 | pesticide  | 0.024 | Surface Water ES  | 0.075 | pesticide  | - |
| 82657-04-3  | bifenthrin  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 108-60-1  | bis(2-chloroisopropyl) ether  | 100 | DWS  | 100 | DWS  | 150 | DWS  | - |
| n/a - mixture  | bitumen  | - | - | - | - | - | - | Assess on basis of CAS 8002-05-9, Petroleum oil, based on aliphatic and aromatic hydrocarbon components  |
| 314-40-9  | bromacil  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| group  | brominated diphenylether (penta-, octa-, deca-)  | 0.3 | HCV-derived  | 0.3 | HCV-derived  | 0.45 | HCV-derived  | - |
| 1689-84-5  | bromoxynil (as Bromoxynilphenol)  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1689-99-2  | bromoxynil octanoate  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 133-06-2  | captan  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 10605-21-7  | carbendazim  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 56-23-5  | carbon tetrachloride (tetrachloromethane)  | 1.5 | DWS  | 1.5 | DWS  | 2.25 | DWS  | - |
| 1967-16-4  | chlorbufam  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 57-74-9  | chlordane  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 470-90-6  | chlorfenvinphos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1698-60-8  | chloridazon  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 97-00-7  | chloro-2,4-dinitrobenzene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 88-73-3  | chloro-2-nitrobenzene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 121-73-3  | chloro-3-nitrobenzene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 100-00-5  | chloro-4-nitrobenzene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 79-11-8  | chloroacetic acid  | 10 | DWS  | 10 | DWS  | 15 | DWS  | See also threshold value for HAAs as group |
| group  | chloroaminotoluene  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | Main substance in group is 4-chloroorth-toluidine, breakdown product of the pesticide chlordimeform. As such this "lead" substance is representative of the parent so follows pesticide value selection  |
| 108-90-7  | chlorobenzene  | 5 | DWS  | 5 | DWS  | 7.5 | DWS  | - |
| 67-66-3  | chloroform  | 50 | DWS  | 5 | Surface Water ES  | 75 | DWS  | - |
| 90-13-1  | chloronaphthalene  | 240 | HCV-derived  | 240 | HCV-derived  | 360 | HCV-derived  | - |
| 25567-68-4  | chloronitrotoluene  | 0.1 | detection limit | 0.1 | detection limit  | 0.1 | detection limit | - |
| 76-06-2  | chloropicrin  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1897-45-6  | chlorothalonil  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 15545-48-9  | chlorotoluron  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1982-47-4  | chloroxuron  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 101-21-3  | chlorpropham  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 2921-88-2  | chlorpyrifos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1861-32-1  | chlorthal-dimethyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 18540-29-9  | chromium VI  | 25 | DWS  | 6.8 | Surface Water ES  | 37.5 | DWS  | DWS is for all forms of Cr.  |
| 74115-24-5  | clofentezine  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1702-17-6  | clopyralid  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 56-72-4  | coumaphos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 26444-49-5  | cresyldiphenyl-phosphate  | 60 | HCV-derived  | 60 | HCV-derived  | 90 | HCV-derived  | - |
| 21725-46-2  | cyanazine  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 52315-07-8  | cypermethrin  | 0.05 | pesticide  | 0.00016 | Surface Water ES  | 0.075 | pesticide  | - |
| 94361-06-5  | cyproconazole  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 50-29-3  | DDT  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 52918-63-5  | deltamethrin  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 8000-97-3  | demeton  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 17040-19-6  | demeton-S-methyl sulphone  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 333-41-5  | diazinon  | 0.05 | pesticide  | 0.02 | Surface Water ES  | 0.075 | pesticide  | - |
| 77-58-7  | dibutyl bis(oxylauroyl)tin  | 9 | HCV-derived  | 9 | HCV-derived  | 13.5 | HCV-derived  | - |
| n/a | dibutyltin cation  | 0.3 | HCV-derived  | 0.3 | HCV-derived  | 0.45 | HCV-derived  | - |
| 818-08-6  | dibutyltin oxide  | 0.3 | HCV-derived  | 0.3 | HCV-derived  | 0.45 | HCV-derived  | - |
| 1194-65-6  | dichlobenil  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1085-98-9  | dichlofluanid  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 91-94-1  | dichlorobenzidine  | 0.4 | DWS  | 0.4 | DWS  | 0.6 | DWS  | - |
| group  | dichloronitrobenzene (all isomers)  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 97-23-4  | dichlorophen  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 120-36-5  | dichlorprop  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 62-73-7  | dichlorvos  | 0.05 | pesticide  | 0.0012 | Surface Water ES  | 0.075 | pesticide  | - |
| 75736-33-3  | diclobutrazol  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 51338-27-3  | diclofop-methyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 99-30-9  | dicloran  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 115-32-2  | dicofol  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 60-57-1  | dieldrin  | 0.05 | pesticide  | 0.02 | Surface Water ES  | 0.075 | pesticide  | The pesticides aldrin, dieldrin, endrin & isodrin are assessed together against the surface water ES  |
| 2227-17-0  | dienochlor  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 119446-68-3 | difenoconazole  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 35367-38-5  | diflubenzuron  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 83164-33-4  | diflufenican  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 60-51-5  | dimethoate  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 110488-70-5 | dimethomorph  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| group  | dioxins  | 0.015 | DWS  | 0.015 | DWS  | 0.0225 | DWS  | - |
| 712-48-1  | diphenyl chloroarsine  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 298-04-4  | disulfoton  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 330-54-1  | diuron  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 123-01-3  | dodecyl benzene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 51450-97-6  | drazoxolon  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 115-29-7  | endosulfan  | 0.05 | pesticide  | 0.01 | Surface Water ES  | 0.075 | pesticide  | - |
| 72-20-8  | endrin  | 0.015 | DWS  | 0.02 | Surface Water ES  | 0.0225 | DWS  | The pesticides aldrin, dieldrin, endrin & isodrin are assessed together against the surface water ES  |
| 106-89-8  | epichlorohydrin  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 135319-73- 2 or 133855-98- 8 | epoxiconazole  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 66230-04-4 | esfenvalerate  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 13194-48-4  | ethoprophos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 598-14-1  | ethyl dichloroarsine  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 100-41-4  | ethylbenzene  | 150 | DWS  | 150 | DWS  | 225 | DWS  | - |
| 2593-15-9  | etridiazole  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 60168-88-9  | fenarimol  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 13356-08-6  | fenbutatin oxide  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 299-84-3  | fenchlorphos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 122-14-5  | fenitrothion  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 82110-72-3  | fenoxaprop-ethyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 71283-80-2  | fenoxaprop-P-ethyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 74738-17-3  | fenpiclonil  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 55-38-9  | fenthion  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 900-95-8  | fentin acetate  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 51630-58-1  | fenvalerate  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 52756-22-6  | flamprop-M-isopropyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 79622-59-6  | fluazinam  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 70124-77-5  | flucythrinate  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 69770-45-2 | flumethrin  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 206-44-0  | fluoranthene  | 37.5 | HCV-derived  | 0.0126 | Surface Water ES  | 56.25 | HCV-derived  | - |
| 77501-90-7  | fluroglycofen-ethyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 69377-81-7  | fluroxypyr  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 85509-19-9  | flusilazole  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 76674-21-0  | flutriafol  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 72178-02-0  | fomesafen  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 944-22-9  | fonofos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 76-44-8  | heptachlor  | 0.015 | DWS  | 0.0000004 | Surface Water ES  | 0.0225 | DWS  | - |
| 34783-40-9  | heptenophos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 25637-99-4  | hexabromocyclododecane (HBCDD)  | 4.5 | HCV-derived  | 0.0032 | Surface Water ES  | 6.75 | HCV-derived  | - |
| 118-74-1  | hexachlorobenzene (HCB)  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 87-68-3  | hexachlorobutadiene (HCBD)  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 608-73-1  | hexachlorocyclohexane  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 58-89-9  | hexachlorocyclohexane (lindane) (gamma-HCH)  | 0.05 | pesticide  | 0.04 | Surface Water ES  | 0.075 | pesticide  | - |
| 67-72-1  | hexachloroethane  | 4.5 | DWS  | 4.5 | DWS  | 6.75 | DWS  | - |
| 1335-87-1  | hexachloronaphthalene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 3389-71-7 and 2868044-6  | hexachloronorbornadiene  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 79983-71-4  | hexaconazole  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 35554-44-0  | imazalil  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 138261-41-3 | imidacloprid  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 193-39-5  | indeno(1,2,3-cd)pyrene  | 0.05 | DWS  | 0.05 | DWS  | 0.075 | DWS  | Benzo(a)pyrene is used as a marker compound in surface waters; assessment of generic PAHs should refer to benzo(a)pyrene  |
| 1689-83-4  | ioxynil  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 36734-19-7 | iprodione  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 465-73-6  | isodrin  | 0.015 | DWS  | 0.02 | Surface Water ES  | 0.0225 | DWS  | The pesticides aldrin, dieldrin, endrin & isodrin are assessed together against the surface water ES  |
| 91465-08-6  | lambda-cyhalothrin  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| n/a | lead (total)  | 5 | DWS  | 2.4 | Surface Water ES (see comment)  | 7.5 | DWS  | Surface water ES is worst case bioavailable concentration  |
| 330-55-2  | linuron  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 569-64-2  | malachite Green  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 121-75-5  | malathion  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 950-10-7 | mephosfolan  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 21908-53-2  | mercuric oxide  | 0.5 | DWS  | 0.5 | DWS  | 0.75 | DWS  | - |
| n/a | mercury compounds (inorganic total)  | 0.5 | DWS  | 0.5 | DWS  | 0.75 | DWS  | - |
| 67129-08-2  | metazachlor  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 10265-92-6  | methamidophos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 950-37-8  | methidathion  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 19937-59-8  | metoxuron  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 7786-34-7  | mevinphos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 8012-95-1  | mineral oil  | - | - | - | - | - | - | Assess on basis of CAS 8002-05-9, Petroleum oil, based on aliphatic and aromatic hydrocarbon components  |
| 1746-81-2  | monolinuron  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 88671-89-0  | myclobutanil  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 33855-47-9  | N-(4-bromophenyl) methyl-1,2-ethanediamine  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 63284-71-9  | nuarimol  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 58810-48-3  | ofurace  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1113-02-6  | omethoate  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 19666-30-9  | oxadiazon  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 301-12-2  | oxydemeton-methyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 76738-62-0  | paclobutrazol  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 56-38-2  | parathion  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 298-00-0  | parathion-methyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 66246-88-6  | penconazole  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 608-93-5  | pentachlorobenzene  | 2 | HCV-derived  | 0.014 | Surface Water ES  | 3 | HCV-derived  | - |
| 76-01-7  | pentachloroethane  | 0.01 | detection limit  | 0.01 | detection limit  | 0.01 | detection limit  | - |
| 87-86-5  | pentachlorophenol (PCP)  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 2307-68-8  | pentanochlor  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1763-23-1  | perfluorooctane sulfonic acid and its salts (PFOS)  | 0.05 | DWS  | 0.0013 | Surface Water ES  | 1.5 | DWS  | See also potable standard for Sum of PFAS  |
| 52645-53-1  | permethrin  | 0.05 | pesticide  | 0.002 | Surface Water ES  | 0.075 | pesticide  | - |
| 8002-05-9 | petroleum oil TPH Aliphatic EC 5-6 | 7500 | DWS  | 7500 | DWS  | 11250 | DWS  | Consider also taste and odour when assessing risks to potable abstractions |
| 8002-05-9 | petroleum oil TPH Aliphatic EC >6-8 | 2700 | Solubility criteria | 2700 | Solubility criteria | 4050 | Solubility criteria | May be modified to account for effective solubility if present in mixture of fractionsConsider also taste and odour when assessing risks to potable abstractions |
| 8002-05-9 | petroleum oil TPH Aliphatic EC >8-10  | 150 | DWS  | 150 | DWS  | 225 | DWS  | May be modified to account for effective solubility if present in mixture of fractionsConsider also taste and odour when assessing risks to potable abstractions |
| 8002-05-9 | petroleum oil TPH Aliphatic EC >8-10  | 150 | DWS  | 150 | DWS  | 225 | DWS  | May be modified to account for effective solubility if present in mixture of fractionsConsider also taste and odour when assessing risks to potable abstractions |
| 8002-05-9 | petroleum oil TPH Aliphatic EC >10-12  | 17 | Solubility criteria | 17 | Solubility criteria | 25.5 | Solubility criteria | May be modified to account for effective solubility if present in mixture of fractionsConsider also taste and odour when assessing risks to potable abstractions |
| 8002-05-9 | petroleum oil TPH Aliphatic EC >12-16  | 0.38 | Solubility criteria | 0.38 | Solubility criteria | 0.57 | Solubility criteria | May be modified to account for effective solubility if present in mixture of fractionsConsider also taste and odour when assessing risks to potable abstractions |
| 8002-05-9 | petroleum oil TPH Aliphatic EC >16-35  | 0.0015 | Solubility criteria | 0.0015 | Solubility criteria | 0.00225 | Solubility criteria | May be modified to account for effective solubility if present in mixture of fractionsConsider also taste and odour when assessing risks to potable abstractions |
| 8002-05-9 | petroleum oil TPH Aromatic EC 5-7 | n/a  | n/a  | n/a  | n/a  | See comment  |   | Refer to CAS 71-43-2 benzene |
| 8002-05-9 | petroleum oil TPH Aromatic EC >7-8 | n/a  | n/a  | n/a  | n/a  | See comment  |   | Refer to CAS 108-88-3 toluene |
| 8002-05-9 | petroleum oil TPH Aromatic EC >8-10  | n/a  | n/a  | n/a  | n/a  | See comment  |   | Refer to CAS 100-41-4 ethylbenzene |
| 8002-05-9 | petroleum oil TPH Aromatic EC >10-12  | 45 | DWS  | 45 | DWS  | 67.5 | DWS  | Consider also taste and odour when assessing risks to potable abstractions |
| 8002-05-9 | petroleum oil TPH Aromatic EC >12-16  | 45 | DWS  | 45 | DWS  | 67.5 | DWS  | Consider also taste and odour when assessing risks to potable abstractions |
| 8002-05-9 | petroleum oil TPH Aromatic EC >16-21  | 45 | DWS  | 45 | DWS  | 67.5 | DWS  | Consider also taste and odour when assessing risks to potable abstractions |
| 8002-05-9 | petroleum oil TPH Aromatic EC >21-35  | 3.3 | Solubility criteria | 3.3 | Solubility criteria | 4.95 | Solubility criteria | May be modified to account for effective solubility if present in mixture of fractionsConsider also taste and odour when assessing risks to potable abstractions |
| 62-38-4  | phenylmercury acetate  | 0.15 | HCV-derived  | 0.15 | HCV-derived  | 0.225 | HCV-derived  | - |
| 298-02-2  | phorate  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 2310-17-0  | phosalone  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 29232-93-7  | pirimiphos-methyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1336-36-3 (category)  | polychlorinated biphenyls (PCBs)  | n/a  | n/a  | n/a  | n/a  | See comment  |   | Refer to dioxins to cover risk from dioxins & dioxine-like PCBs |
| 67747-09-5  | prochloraz  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1918-16-7  | propachlor  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 709-98-8  | propanil  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 111479-05-1 | propaquizafop  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 31218-83-4 | propetamphos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 60207-90-1  | propiconazole  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 23950-58-5  | propyzamide  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 94125-34-5  | prosulfuron  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 13457-18-6  | pyrazophos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 55512-33-9  | pyridate  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 88283-41-4  | pyrifenox  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 13593-03-8  | quinalphos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 82-68-8  | quintozene  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 76578-14-8  | quizalofop-ethyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 122-34-9  | simazine  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 100-42-5  | styrene  | 10 | DWS  | 10 | DWS  | 15 | DWS  | - |
| 8001-58-9  | tar oil  | See comment  |   | See comment  |   | See comment  |   | Assess on basis of CAS 8002-05-9, Petroleum oil, based on aliphatic and aromatic hydrocarbon components  |
| 107534-96-3 | tebuconazole  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 83121-18-0  | teflubenzuron  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 79538-32-2  | tefluthrin  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 5902-51-2  | terbacil  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 5915-41-3  | terbuthylazine  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 79-27-6  | tetrabromoethane  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 1461-25-2  | tetrabutyltin  | 0.05 | detection limit  | 0.05 | detection limit  | 0.05 | detection limit  | - |
| 12408-10-5  | tetrachlorobenzene (all isomers)  | 0.3 | HCV-derived  | 0.3 | HCV-derived  | See comment  |   | Assess on basis of CAS 95-94-3, 1,2,4,5-tetrachlorobenzene, if analysis does not identify substituent patterns of components  |
| 22248-79-9  | tetrachlorvinphos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 116-29-0  | tetradifon  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 640-15-3  | thiometon  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 23564-05-8  | thiophanate-methyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 137-26-8  | thiram  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 57018-04-9  | tolclofos-methyl  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 108-88-3  | toluene  | 350 | DWS  | 148 | Surface Water ES  | 933 | DWS | Consider also taste/odour when assessing risks to potable abstractions (see WHO guidance) |
| 43121-43-3  | triadimefon  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 55219-65-3  | triadimenol  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 2303-17-5  | triallate  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 82097-50-5  | triasulfuron  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 24017-47-8  | triazophos  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 72459-58-6  | triazoxide  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 126-73-8  | tributyl-phosphate  | 240 | HCV-derived  | 240 | HCV-derived  | 360 | HCV-derived  | - |
| 56-35-9  | tributyltin oxide (TBTO)  | 1 | DWS  | 0.0004 | Surface Water ES  | 1.5 | DWS  | - |
| 52-68-6  | trichlorfon  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 76-03-9  | trichloroacetic acid  | 30 | DWS  | 30 | DWS  | 45 | DWS  | See also threshold value for HAAs as group |
| 75-87-6  | trichloroethanal  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 25323-89-1 | trichloroethane | 2.5 | DWS | 2.5 | DWS | 3.75 | DWS | Assess on basis of CAS 79-00-5: 1,1,2-trichloroethane  |
| 79-01-6  | trichloroethylene  | 5 | DWS  | 5 | DWS  | 7.5 | DWS  | - |
| 25167-82-2  | trichlorophenol (all isomers)  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | Two out of three isomers have majority pesticide use  |
| 55335-06-3  | triclopyr  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1330-78-5  | tricresyl-phosphate  | 105 | HCV-derived  | 105 | HCV-derived  | 157.5 | HCV-derived  | - |
| 1912-26-1  | trietazine  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 1582-09-8  | trifluralin  | 0.05 | pesticide  | 0.06 | Surface Water ES  | 0.075 | pesticide  | - |
| 26644-46-2  | triforine  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 25103-12-2 or 78-42-2  | trioctyl-phosphate  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | HCV not reliable  |
| 115-86-6  | triphenyl-phosphate  | 350 | HCV-derived  | 350 | HCV-derived  | 525 | HCV-derived  | - |
| 1262-21-1  | triphenyltin oxide (TPTO)  | 1 | HCV-derived  | 1 | HCV-derived  | 1.5 | HCV-derived  | - |
| 126-72-7  | tris(2,3-bromo-1-propyl)phosphate  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 25155-23-1  | trixylenyl-phosphate  | 0.1 | detection limit  | 0.1 | detection limit  | 0.1 | detection limit  | - |
| 2275-23-2  | vamidothion  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
| 50471-44-8  | vinclozolin  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |
|  75-01-4  | vinyl chloride  | 0.25 | DWS  | 0.25 | DWS  | 0.375 | DWS  | - |
| 1330-20-7  | xylene  | 250 | DWS  | 60 | Surface Water ES  | 375 | DWS | Consider also taste/odour when assessing risks to potable abstractions (see WHO guidance).  |
| 137-30-4  | ziram  | 0.05 | pesticide  | 0.05 | pesticide  | 0.075 | pesticide  | - |

# Groundwater threshold values for selected other substances

**Table 2: Groundwater threshold values for selected other substances**

| **CAS Reference** | **Substance Name** | **Threshold value** **(µg/L)** | **Basis for value** | **Comment** |
| --- | --- | --- | --- | --- |
| 120-23-0 | (2-naphthyloxy)acetic acid  | 0.075 | Pesticide |  |
| 71-55-6  | 1,1,1-trichloroethane  | 1500 | DWS  |  |
| 79-00-5  | 1,1,2-trichloroethane  | 3.75 | DWS  |  |
| 75-34-3  | 1,1-dichloroethane  | 3.75 | DWS  |  |
| 75-35-4  | 1,1-dichloroethene  | 105 | DWS  |  |
| 107-06-2  | 1,2-dichloroethane  | 2.25 | DWS  |  |
| 540-59-0 | 1,2-dichloroethene  | 37.5 | DWS  |  |
| 86-87-3  | 1-naphthylacetic acid  | 0.075 | pesticide  | Used to promote growth but covered by plant protection products regulation  |
| 133-32-4  | 4-indol-3-butyric acid  | 0.075 | detection limit  |  |
| 116-06-3  | aldicarb  | 0.075 | pesticide  |  |
| 593-81-7  | alkylaryl trimethylammonium chloride  | 0.075 | detection limit  | CAS refers to trimethylamine hydrochloride; alkylaryl substituent is non-specific therefore healthbased standards assessment not possible  |
| group  | alkyl benzalkonium chloride  | 0.075 | detection limit  | Group of substances with no definition of chain length, therefore health-based standards assessment not possible  |
| 55635-13-7  | alloxydim-sodium  | 0.075 | pesticide  |  |
| n/a | aluminium | 150 | DWS | Not assessed by JAGDAG |
| 7784-26-1  | aluminium ammonium sulphate  | 0.075 | pesticide  |  |
| 10043-01-3  | aluminium sulphate  | 0.075 | pesticide  |  |
| 120923-37-7 | amidosulfuron  | 0.075 | pesticide  |  |
| 33089-61-1 | amitraz  | 0.075 | pesticide  |  |
| 7664-41-7  | ammonia  | 375 | DWS  | For ammonium ions and ammonia. Whilst odour thresholds for ammonia have been documented, these values are higher than the UK DWS for ammonia and ammonium ions combined. Based on the interconversion of the ion and ammonia depending on water chemistry, we recommend using the UK DWS standard.  |
| 506-87-6  | ammonium carbonate  | 375 | DWS  | As per ammonium ions and ammonia  |
| 84-65-1  | anthraquinone  | 0.075 | pesticide  |  |
| 7440-36-0 and 1309-64-4 | antimony (V and III)  | 3.75 | DWS  |  |
| 3337-71-7  | asulam  | 0.075 | pesticide  |  |
| 4658-28-0  | aziprotryne  | 0.075 | pesticide  |  |
| n/a | barium  | 975 | DWS  | Not determined by JAGDAG  |
| 71626-11-4  | benalaxyl  | 0.075 | pesticide  |  |
| 22781-23-3  | bendiocarb  | 0.075 | pesticide  |  |
| 82560-54-1  | benfuracarb  | 0.075 | pesticide  |  |
| 25057-89-0  | bentazone  | 0.075 | pesticide  |  |
| n/a | beryllium  | 9 | DWS  | Not determined by JAGDAG. Not a formal recommendation by WHO, since beryllium is rarely found in drinking water  |
| 80-05-7 | bisphenol A | 1.875 | DWS | Not determined by JAGDAG  |
| 55179-31-2  | bitertanol  | 0.075 | pesticide  |  |
| n/a | boron (as boron III)  | 750 | DWS  |  |
| 15541-45-4 | bromate | 7.5 | DWS |  |
| 41483-43-6  | bupirimate  | 0.075 | pesticide  |  |
| 7440-43-9  | cadmium  | 3.75 | DWS  |  |
| n/a | calcium  | See comment  |  | There is no standard for calcium because there is no UK or WHO potable standard plus it does not routinely cause pollution by itself and is normally found in combination with other, more problematic, pollutants.  |
| 63-25-2  | carbaryl  | 0.075 | pesticide  |  |
| 16118-49-3  | carbetamide  | 0.075 | pesticide  |  |
| 1563-66-2  | carbofuran  | 0.075 | pesticide  |  |
| 75-15-0  | carbon disulfide  | 450 | HCV-derived  |  |
| 55285-14-8  | carbosulfan  | 0.075 | pesticide  |  |
| 5234-68-4  | carboxin  | 0.075 | pesticide  |  |
| 57-09-0  | cetrimide  | 0.075 | detection limit  |  |
| 14866-68-3 | chlorate | 0.1875 | DWS | Not determined by JAGDAG  |
| n/a | chloride  | 187500 | DWS  | Not determined by JAGDAG  |
| 7782-50-5  | chlorine  | 3750 | DWS  |  |
| 14998-27-7 | chlorite | 0.1875 | DWS | Not determined by JAGDAG  |
| 16065-83-1  | chromium III  | 37.5 | DWS  | Based on DWS for total Cr |
| n/a | cobalt (based on cobalt II using carbonate & sulphate salt data)  | 103.5 | HCV-derived  |  |
| group  | copper (soluble compounds)  | 1500 | DWS  |  |
| 95-48-7  | cresylic acid (o-, m- and p-cresol)  | 225 | HCV-derived  |  |
| 11096-18-9  | cufraneb  | 0.075 | pesticide  |  |
| 33113-08-5  | cupric ammonium carbonate  | 0.075 | pesticide  |  |
| 57-12-5  | cyanide  | 37.5 | DWS  | Consider also taste/odour when assessing risks to potable abstractions (see WHO guidance) |
| 101205-02-1 | cycloxydim  | 0.075 | pesticide  |  |
| 57966-95-7  | cymoxanil  | 0.075 | pesticide  |  |
| 1596-84-5  | daminozide  | 0.075 | pesticide  |  |
| 533-74-4  | dazomet  | 0.075 | pesticide  |  |
| 13684-56-5  | desmedipham  | 0.075 | pesticide  |  |
| 1014-69-3  | desmetryn  | 0.075 | pesticide  |  |
| 117-81-7  | di(2-ethylhexyl) phthalate  | 6 | DWS  |  |
| 84-74-2  | dibutyl phthalate  | 15 | DWS  |  |
| 75-09-2  | dichloromethane  | 15 | DWS  |  |
| 49866-87-7 | difenzoquat  | 0.075 | pesticide  |  |
| 18467-77-1  | dikegulac  | 0.075 | pesticide  |  |
| 39300-45-3 | dinocap  | 0.075 | pesticide  |  |
| 957-51-7  | diphenamid  | 0.075 | pesticide  |  |
| 122-39-4  | diphenyl amine  | 0.075 | pesticide  |  |
| 2764-72-9  | diquat  | 0.075 | pesticide  |  |
| 3347-22-6  | dithianon  | 0.075 | pesticide  |  |
| 1593-77-7  | dodemorph  | 0.075 | pesticide  |  |
| 2439-10-3 | dodine  | 0.075 | pesticide  |  |
| 23947-60-6  | ethirimol  | 0.075 | pesticide  |  |
| 26225-79-6  | ethofumesate  | 0.075 | pesticide  |  |
| 107-21-1  | ethylene glycol  | 225 | HCV-derived  |  |
| 39515-41-8  | fenpropathrin  | 0.075 | pesticide  |  |
| 67306-00-7  | fenpropidin  | 0.075 | pesticide  |  |
| 67306-03-0  | fenpropimorph  | 0.075 | pesticide  |  |
| 101-42-8  | fenuron  | 0.075 | pesticide  |  |
| 14484-64-1  | ferbam  | 0.075 | pesticide  |  |
| 142459-58-3 | flufenacet  | 0.075 | pesticide  |  |
| 7681-49-4  | fluoride  | 1125 | DWS  | Not determined by JAGDAG  |
| 50-00-0  | formaldehyde  | 1950 | DWS  |  |
| 39148-24-8  | fosetyl-aluminium  | 0.075 | pesticide  |  |
| 3878-19-1  | fuberidazole  | 0.075 | pesticide  |  |
| 57646-30-7  | furalaxyl  | 0.075 | pesticide  |  |
| 77-06-5  | gibberellic acid  | 0.075 | pesticide  | Naturally occurring plant growth hormone but covered by EU plant protection products regulation  |
| group | gibberellins  | 0.075 | pesticide  | Naturally occurring plant growth hormone but covered by EU plant protection products regulation  |
| 111-30-8  | gluteraldehyde  | 450 | HCV-derived  |  |
| 108173-90-6 | guazatine  | 0.075 | pesticide  |  |
| group | halo acetic acids (HAA) | 45 | DWS | Assessed as summed total of monochloro-, dichloro-, trichloro-acetic acid and mono- and dibromo-acetic acid. For 79-11-8 chloroacetic acid and 76-03-9 trichloroacetic acid see also relevant hazardous input standards.  |
| 1024-57-3 | heptachlor epoxide | 0.0225 | DWS |  |
| 51235-04-2  | hexazinone  | 0.075 | pesticide  |  |
| 10004-44-1  | hymexazol  | 0.075 | pesticide  |  |
| 81405-85-8  | imazamethabenz-methyl  | 0.075 | pesticide  |  |
| 81335-37-7  | imazaquin  | 0.075 | pesticide  |  |
| 7553-56-2  | iodine  | 76.5 | HCV-derived  |  |
| n/a | iron  | 150 | DWS  | Not determined by JAGDAG |
| 34123-59-6  | isoproturon  | 0.075 | pesticide  |  |
| 82558-50-7  | isoxaben  | 0.075 | pesticide  |  |
| 2164-08-1 | lenacil  | 0.075 | pesticide  |  |
| n/a | magnesium  | See comment |  | Not determined by JAGDAG. There is no standard for magnesium because there is no UK or WHO potable standard plus it does not routinely cause pollution by itself and is normally found in combination with other, more problematic, pollutants.  |
| 123-33-1  | maleic hydrazide  | 0.075 | pesticide  |  |
| 8018-01-7 | mancozeb  | 0.075 | pesticide  |  |
| 12427-38-2  | maneb  | 0.075 | pesticide  |  |
| n/a | manganese  | 37.5 | DWS  | Not determined by JAGDAG  |
| 7085-19-0 | mecoprop  | 0.03 | DWS  |  |
| 24307-26-4  | mepiquat  | 0.075 | pesticide  |  |
| 57837-19-1  | metalaxyl  | 0.075 | pesticide  |  |
| 9002-91-9  | metaldehyde  | 0.075 | pesticide  |  |
| 41394-05-2  | metamitron  | 0.075 | pesticide  |  |
| 137-42-8  | metam-sodium  | 0.075 | pesticide  |  |
| 18691-97-9  | methabenzthiazuron  | 0.075 | pesticide  |  |
| 2032-65-7  | methiocarb  | 0.075 | pesticide  |  |
| 1634-04-4  | methyl tertiary butyl ether (MTBE) | 1350 | HCV-derived  | Consider also taste/odour when assessing risks to potable abstractions (see WHO guidance) |
| 21087-64-9  | metribuzin  | 0.075 | pesticide  |  |
| 74223-64-6  | metsulfuron-methyl  | 0.075 | pesticide  |  |
| n/a | molybdenum  | 52.5 | DWS  |  |
| 142-59-6  | nabam  | 0.075 | pesticide  |  |
| 91-20-3  | naphthalene  | 90 | HCV-derived  |  |
| 15299-99-7  | napropamide  | 0.075 | pesticide  |  |
| n/a | nickel (as nickel II)  | 15 | DWS  |  |
| 54-11-5  | nicotine  | 3.6 | HCV-derived  |  |
| 14797-55-8  | nitrate  | 37500 | DWS  | Not determined by JAGDAG  |
| 14797-65-0  | nitrites  | 375 | DWS  | Not determined by JAGDAG  |
| 10552-74-6  | nitrothal-isopropyl  | 0.075 | pesticide  |  |
| 25154-52-3 | Nonylphenol | 0.3 | SW ES | Not determined by JAGDAG |
| 26530-20-1  | octhilinone  | 0.075 | pesticide  |  |
| 19044-88-3  | oryzalin  | 0.075 | pesticide  |  |
| 77732-09-3  | oxadixyl  | 0.075 | pesticide  |  |
| 23135-22-0  | oxamyl  | 0.075 | pesticide  |  |
| 10380-28-6  | oxine-copper  | 0.075 | pesticide  |  |
| 5259-88-1  | oxycarboxin  | 0.075 | pesticide  |  |
| 4685-14-7  | paraquat  | 0.075 | pesticide  |  |
| 40487-42-1  | pendimethalin  | 0.075 | pesticide  |  |
| group | perfluoralkyl and polyfluoralkyl substances (PFAS) | 0.075 | DWS | The potable standard is assessed as the sum of 20 PFAS For PFOS see relevant hazardous substance input standard.  |
| 79-21-0  | peroxyacetic acid  | 0.075 | pesticide  |  |
| 13684-63-4  | phenmedipham  | 0.075 | pesticide  |  |
| 108-95-2  | phenol  | 2250 | HCV-derived  |  |
| 7664-38-2  | phosphoric acid  | See comment  |   | There is no standard for phosphoric acid, or phosphate, because there is no UK or WHO potable standard plus it does not routinely cause groundwater pollution by itself and is normally found in combination with other, more problematic, pollutants.  |
| 23103-98-2  | pirimicarb  | 0.075 | pesticide  |  |
| 9003-05-8 | polyacrylamide (anionic)  | 0.075 | detection limit  | No data to assign a health derived value  |
| 7440-09-7 | potassium  | See comment  |   | Not determined by JAGDAG. There is no standard for potassium because there is no UK or WHO potable standard plus it does not routinely cause pollution by itself and is normally found in combination with other, more problematic, pollutants.  |
| 7287-19-6  | prometryn  | 0.075 | pesticide  |  |
| 25606-41-1  | propamocarb hydrochloride  | 0.075 | pesticide  |  |
| 122-42-9  | propham  | 0.075 | pesticide  |  |
| 114-26-1  | propoxur  | 0.075 | pesticide  |  |
| 57-55-6  | propylene glycol  | 5250 | DWS  |  |
| 8003-34-7  | pyrethrins  | 0.075 | pesticide  |  |
| 2439-01-2 | quinomethionate  | 0.075 | pesticide  |  |
| 10453-86-8  | resmethrin  | 0.075 | pesticide  |  |
| 83-79-4  | rotenone  | 0.075 | pesticide  |  |
| 7782-49-2  | selenium  | 7.5 | DWS  |  |
| 74051-80-2  | sethoxydim  | 0.075 | pesticide  |  |
| n/a | sodium (as sodium I)  | 150000 | DWS  | Not determined by JAGDAG  |
| 7775-09-9 | sodium chlorate  | 0.075 | pesticide  |  |
| 10022-70-5 and 768152-9  | sodium hypochlorite  | 0.075 | pesticide  |  |
| 3926-62-3  | sodium monochloroacetate  | 0.075 | pesticide  |  |
| 1330-43-4  | sodium tetraborate  | 0.075 | pesticide  |  |
| n/a | sulphate  | 187500 | DWS  | Not determined by JAGDAG  |
| 35256-85-0 | tebutam  | 0.075 | pesticide  |  |
| 886-50-0  | terbutryn  | 0.075 | pesticide  |  |
| 127-18-4  | tetrachloroethylene  | 7.5 | DWS  |  |
| n/a | thallium (as thallium I)  | 1.5 | DWS  |  |
| 148-79-8  | thiabendazole  | 0.075 | pesticide  |  |
| 79277-27-3  | thifensulfuron-methyl  | 0.075 | pesticide  |  |
| 59669-26-0  | thiodicarb  | 0.075 | pesticide  |  |
| 87820-88-0  | tralkoxydim  | 0.075 | pesticide  |  |
| 101200-48-0 | tribenuron-methyl  | 0.075 | pesticide  |  |
| 12002-48-1  | trichlorobenzene  | See comment  |   | Assess on basis of CAS 120-82-1: 1,2,4-trichlorobenzene  |
| group | trihalomethanes | 75 | DWS | Assessed as the summed total of chloroform, bromoform, dibromochloromethane, and bromodichloromethane.For 67-66-3 chloroform see also relevant hazardous substance input standard |
| n/a | uranium  | 22.5 | DWS | Not determined by JAGDAG |
| n/a | vanadium  | 11.25 | detection limit  | Not determined by JAGDAG  |
| 7440-66-6  | zinc  | 3750 | DWS  | Consider also taste/odour when assessing risks to potable abstractions (see WHO guidance).  |
| 12122-67-7  | zineb  | 0.075 | pesticide  |  |
| 9006-42-2  | zineb-ethylenethiuram disulphide  | 0.075 | pesticide  |  |

# Supporting notes

For radioactive substances, the groundwater standards are dose based and assessed by the risk to members of the public and non-human organisms and their habitats. Refer to the relevant SEPA policy and guidance on assessing radioactive substances.

For metals and cationic or anionic substances, in many cases no CAS number is given because a CAS number does not exist for the substance as assessed (ie the dissolved ion)

"DWS" means the standard was derived based on a drinking water standard or guideline set by the Scottish Government, the World Health Organisation or if not available another international toxicology-based or national drinking water value. Where the current Scottish DWS for public and private water supplies do not align, SEPA have adopted the lower value.

"HCV-derived" means the standard was derived based on a peer reviewed Regulatory Health Criteria value that was used to calculate a water concentration threshold according to WHO methodology.

"MRV derived" means the standard was derived based on minimum reporting values, which in turn are based on limits of quantification

For PAHs there is only an annual average EQS for benzo(a)pyrene as this substance is used as a marker for PAHs, so when assessing close to surface waters this substance should be used to indicate risk.

"pesticide" means a value based on the potable limits for pesticides set out Scottish potable standards. As well as a potable standard for individual pesticides, note the potable standards also include a Total Pesticides limit of 0.5µg/l. Both the individual and cumulative risks should be considered. Note also for Aldrin, Dieldrin, Endrin & Isodrin that the surface water Environmental Standard is based on summed concentrations which means that analysis of all four substances is required to judge compliance.

“Sum of PFAS” is as set out in the Scottish potable standards and comprises the arithmetic sum of perfluorobutanoic acid, perfluoropentanoic acid, perfluorohexanoic acid, perfluoroheptanoic acid, perfluorooctanoic acid, perfluorononanoic acid, perfluorodecanoic acid, perfluoroundecanoic acid, perfluorododecanoic acid, perfluorotridecanoic acid, perfluorobutane sulfonic acid, perfluoropentane sulfonic acid, perfluorohexane sulfonic acid, perfluoroheptane sulfonic acid, perfluorooctane sulfonic acid, perfluorononane sulfonic acid, perfluorodecane sulfonic acid, perfluoroundecane sulfonic acid, perfluorododecane sulfonic acid, and perfluorotridecane sulfonic acid. There is no current potable standard for other PFAS substances.

"Taste/odour criteria" means the threshold concentration at which the substance has detrimental effects for taste and odour in water is lower than the toxicologically-based value

Although a recent hazardous determination has been made for CrVI, the standard is still based on total chromium (dissolved). This is because to date no accepted standard for CrVI has been established, unlike total chromium for which a value is available under (ii) above, and because of practical issues with speciated analysis. When comparing laboratory data with the assessment criteria, SEPA recommend that dissolved or filtered chromium data is assumed to be CrVI unless proven otherwise. If no dissolved or filtered data available, SEPA recommend professional judgement be applied as to likely speciation based on the hydrogeological setting.

# Glossary

| **Term** | **Interpretation**  |
| --- | --- |
| Biota ES | The published Environmental Standard is set in biota with no equivalent Environmental Standard in water. |
| CAR | Water Environment (Controlled Activities) (Scotland) Regulations |
| DWS | Drinking Water StandardsStandards used by SEPA to define when water is fit for human consumption. Refer to hierarchy of potable standards in the 2024 Directions. |
| Environmental Standards | Standards adopted by the Scottish Government and used by SEPA to protect the water environment and define water body classification for status purposes. These are published in The Scotland River Basin District (Standards) Directions 2024 (also referred to in this document as the ‘2024 Directions’). |
| Groundwater | Water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil (defined in the GWD and the WFD). |
| Groundwater Standards | Standards used by SEPA to protect the water environment. These standards vary according to the nature of the contaminant and the relevant receptor being assessed. |
| GWD | Groundwater DirectiveEuropean directive regarding groundwater that is transposed into Scottish Law via WEWS and CAR. |
| Hazardous substances | Substances or groups of substances that are toxic, persistent, and liable to bio-accumulate, and other substances which give rise to an equivalent level of concern (defined in the WFD). |
| HCV-derived | Value derived from a published Health Criteria Value (HCV) following WHO guidance. |
| JAGDAG | Joint Agency Groundwater Directive Advisory GroupA partnership of UK and Ireland environment agencies and other stakeholders set up to interpret and support the implementation of the GWD. |
| LoD | Limit of detection The output signal or concentration value above which it can be affirmed, with a stated level of confidence that a sample is different from a blank sample that does not contain the substance of interest. |
| LoQ | Limit of quantification The output signal or concentration value above a substance can not only be detected but predefined goals for bias and precision are also met. |
| NAPL | Non-Aqueous Phase LiquidAn organic liquid which does not readily dissolve in or mix with water.There are two types: Light (LNAPL), which are less dense than fresh water and tend to float; and Dense (DNAPL), which are more dense than fresh water and tend to sink. |
| PFAS | Perfluoroalkyl and polyfluoralkyl substances |
| PAH | Polycyclic aromatic hydrocarbons |
| Surface waters | Surface water means inland waters (other than groundwater), transitional waters, and coastal waters (defined in the WFD). In this context SEPA regards springs as surface waters. |
| Threshold Values | Standards based upon risk to human health and used to maintain a minimum level of groundwater quality with respect to potable use. |
| TPH | Total petroleum hydrocarbons |
| UK TAG | The United Kingdom Technical Advisory GroupA partnership of UK and Ireland environment and conservation agencies set up to interpret and support the implementation of the WFD. |
| WEWS | Water Environment and Water Services (Scotland) Act |
| WFD | Water Framework Directive. European directive regarding the water environment that is transposed into Scottish Law via WEWS and CAR. |
| WHO | World Health Organisation |

# References

* [Groundwater Daughter Directive 2006/118/EC](https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:372:0019:0031:EN:PDF)(CELEX: 32006L0118)
* [Groundwater Dependent Terrestrial Ecosystem Threshold Values](http://www.wfduk.org)[,](http://stir-app-qpl01/QPulseDocumentService/Documents.svc/documents/active/attachment) UKTAG July 2014
* [The Public Water Supplies (Scotland) Amendment Regulations 2022](https://www.legislation.gov.uk/ssi/2022/387/contents/made)
* The Scotland River Basin District (Standards) Directions 2024
* [The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017](https://www.legislation.gov.uk/ssi/2017/282/contents/made)
* [UK TAG Paper 11b(i) Groundwater Chemical Classification for the purposes](https://www.wfduk.org/resources%20/defining-and-reporting-groundwater-bodies)[of the Water Framework Directive and the Groundwater Directive, 2019.](http://www.wfduk.org)
* [Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR)](https://www.legislation.gov.uk/ssi/2011/209/contents)and further amendments in 2013, 2017 and 2021
* [Water Environment and Water Services (Scotland) Act 2003 (WEWS)](https://www.legislation.gov.uk/asp/2003/3/contents)
* [Water Framework Directive 2000/60/EC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060)(CELEX: 32000L0060)
* [WAT-SG-53: Environmental Quality Standards for Discharges to Surface](https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/) [Waters](http://www.wfduk.org/?number=wat-sg-53)
* [WHO Guidelines for Drinking Water Quality](https://www.who.int/publications/i/item/9789241549950)[,](http://www.wfduk.org/sites/default/files/UKTAG%20Paper%2011b%28i%29%20Guidance%20on%20Groundwater%20Chemical%20Classification%20-FINAL%2020190402%20-%20amended%2020191001.pdf) 4th ED., Vol. 1

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