CHEMICAL PARAMETERS

PARAMETER	UK DRINKING WATER STANDARD	REASON FOR STANDARD	POSSIBLE SOURCES TREATMENT SOLUTIONS
Aluminium	200 µg/l	At high concentrations there is evidence linking aluminium to effects on the nervous system, with possible connections to several diseases.	Natural leaching from rock and soil into groundwater; leaching of aluminium into water increases when the pH of water is lower (more acidic). Reverse osmosis, blending with water source lower in aluminium concentration.
Ammonium	0.5 mg/l	No proposed health implications for humans but can be an indication of faecal contamination-important to consider the source when assessing the implications to health. Toxic for aquatic life. Can reduce the effectiveness of chlorination systems.	Occurs naturally in ground and surface water, leaching from concrete water pipes, waste, and fertiliser. Carbon filter, water conditioning techniques.
Arsenic	10 µg/l	Toxic in high concentrations and in its inorganic form. Long-term exposure through contaminated drinking water can cause chronic arsenic poisoning, cancer and skin lesions. It has also been associated with cardiovascular disease and diabetes. Standard is health-related and has a large safety factor built in.	Natural leaching from rock into ground water, pollution from waste of industrial sites or waste disposal plants. Reverse osmosis, ultra-filtration, distillation, ion exchange.
Boron	1 mg/l	Boric acid can be lethal at high concentrations in drinking water- symptoms of ingestion include gastrointestinal tract distress, vomiting, abdominal pain, diarrhoea, and nausea.	Natural leaching from rock and soil into groundwater in the form of boron-containing minerals e.g. Boric acid, pollution from industrial wastewater and municipal sewage. Reverse osmosis, ion exchange, distillation. Conventional water treatment (coagulation, sedimentation, filtration) does not significantly remove boron.
Cadmium	5 µg/l	Short-term exposure to high concentrations can cause nausea, vomiting, diarrhoea, and other severe symptoms. Long-term exposure can cause kidney, liver, bone and blood damage. Standard is health-related and has a large safety factor built in.	Natural leaching from rock can cause cadmium to enter groundwater at low concentrations (<0.2µg/l). Higher concentrations can occur by corrosion of galvanized pipes or discharge from metal refineries. Coagulation, filtration, ion exchange, softening, reverse osmosis, distillation.
Calcium	non regulatory no standard	Calcium contributes to the total hardness of water, see Total Hardness.	Natural leaching from rock into ground water. Water softening treatment.

Chloride	250 mg/l	Increases corrosion potential and makes water salty to taste. Standard is not health-related.	Surface run-off containing road de-icing salts, inorganic fertilizers, animal feeds, industrial effluents, irrigation drainage, and seawater intrusion in coastal areas. Reverse osmosis.
Chromium	50 µg/l	Some forms of chromium can cause cancer and organ damage. Exposure can be fatal. Standard is health-related and has a large safety factor built in. Standard is set to a low value assuming all forms of chromium detected are harmful to health.	May enter water in low concentrations from the natural environment but rarely found in drinking water. High concentrations are due to sources of pollution. Ion exchange resin.
Copper	2 mg/l	Can cause severe symptoms in high concentrations. May cause blue/green staining on sanitary fittings and makes water metallic to taste.	Leaching from copper pipes and fittings in households. Water which is hard and acidic (low pH) is more corrosive and can increase leaching of copper pipes. Ion exchange, reverse osmosis.
Cyanide	50 µg/l	Exposure to small amounts of cyanide can be deadly, causing harm to the brain and heart and can even causing coma and death. The standards are health-related and have a large safety factor built in.	May enter water in low concentrations from the natural environment but rarely found in drinking water. High concentrations may occur from discharge of industrial processes. Ion exchange, reverse osmosis, alkaline chlorination.
Fluoride	1.5 mg/l	Chronic high-level exposure to fluoride can lead to skeletal fluorosis.	Occurs naturally in ground water at various concentrations by leaching from rock. Fluoride may be added to water with lower concentrations for dental health measures (as required by local authorities). Blending with water source lower in fluoride concentration.
Iron	200 µg/l	Causes brown/orange discolouration of water and unpleasant taste. Water with iron concentrations can also cause staining to surfaces and materials. The standard for iron has been set for aesthetic rather than health reasons.	Occurs naturally in ground and surface water. Corrosion of old iron water mains is a common source in drinking water. Aeration, precipitation, filter beds, membrane filtration.
Lead	10 µg/l	Lead is harmful to health and can accumulate in the body leading to problems over time.	Leaching from lead pipe work. Replacing lead pipe work, dosing with phosphate to prevent pipe corrosion, adjust pH and hardness of water to make it less corrosive to pipes.

Magnesium	non-regulatory no standard	Magnesium contributes to the total hardness of water, see Total Hardness.	Natural leaching from rock into ground water. Water softening treatment.
Manganese	50 µg/l	Manganese solids can form staining and coatings on water pipes that may later slough off as a black precipitate that give water an unpleasant appearance or taste and can support the growth of bacteria. Standard is set for aesthetic reasons.	Occurs naturally in groundwater by leaching from rock and is also present in natural food sources e.g. leafy vegetables, nuts, grains, animal products and tea. Water sources may be contaminated with manganese from industrial effluent, acid-mine drainage, sewage etc. Treated by ion exchange, reverse osmosis, lime softening
Nitrate	50 mg/l	In the body nitrates are converted to nitrites-consuming too much can affect how blood carries oxygen in humans and can cause methemoglobinemia in infants which may be fatal. Long term exposure to elevated nitrate/nitrite levels can also cause diuresis, increased starchy deposits and haemorrhaging of the spleen.	Found naturally in the environment as part of the nitrogen cycle. High levels can occur from inorganic fertilisers from agricultural runoff, landfill runoff, waste water treatment, septic systems, urban drainage. Ion exchange, reverse osmosis, blending with water source lower in nitrate concentration.
Nitrite	0.50 mg/l	In the body nitrates are converted to nitrites-consuming too much can affect how blood carries oxygen in humans and can cause methemoglobinemia in infants which may be fatal. Long term exposure to elevated nitrate/nitrite levels can also cause diuresis, increased starchy deposits and haemorrhaging of the spleen.	Can be formed in water chemically in distribution pipes by Nitrosomonas bacteria during stagnation of nitrate-containing and oxygen-poor drinking-water in galvanized steel pipes. Sometimes produced as a by-product when chloramine is used as a disinfectant-process should be controlled to reduce nitrite concentrations from increasing.
Phosphate	non-regulatory no standard	Safe to consume as reasonable levels. High levels of phosphates can promote the growth of organisms in water sources. Long term exposure to excess phosphate is associated with chronic kidney disease and possible toxic effects on the cardiovascular system.	Occurs naturally in water but can also be added as treatment to prevent leaching of metals from pipe work. Can also come from agricultural run-off containing fertilisers and pollution from septic systems.
Potassium	non-regulatory no standard	Potassium is essential for dietary requirements but can be harmful in high doses of its salt compounds to vulnerable individuals e.g. infants, those with kidney disease etc.	Occurs naturally in water as salt compounds. High concentrations in ground water be sourced from farmyard runoff, land spreading and sewage sources. Reverse osmosis, softening treatment.
Sodium	200 mg/l	A relationship between elevated sodium intake and hypertension/ blood pressure may exist. It is not recommended to drink water which has been through a softening treatment as it may contain elevated levels of sodium.	Occurs naturally in groundwater by leaching from rock and naturally brackish ground water. Can also come from saline intrusion, mineral deposits, seawater spray, sewage effluents, and run-ff containing salt used in road de-icing. Water softening treatment also results in higher sodium levels. Reverse osmosis, electro-dialysis, distillation techniques or ion exchange.

Sulphate	250 mg/l	Drinking water with high levels of sulphate compounds can cause dehydration and have laxative effects. High levels of sulphates in drinking water can make it 'bitter' or 'medicinal' to taste.	Occurs naturally in groundwater in low concentrations by leaching from rock. Sulphates and sulphuric acid are used in the production of fertilizers, chemicals, dyes, glass, paper, soaps etc. And can enter water through pollution from many anthropogenic sources. Reverse osmosis (RO), distillation, ion exchange.

PHYSICAL PARAMETERS

PARAMETER	UK DRINKING WATER STANDARD	FURTHER INFORMATION
Alkalinity	non-regulatory no standard	Acts as a buffer in water to keep the pH stable and neutral. Alkalinity is normally due to bicarbonate salts of calcium and magnesium. Sometimes referred to as 'temporary hardness' and can be removed by boiling water.
Colour (true)	20 mg/l Pt/Co	Water should be clear and bright, but natural organic matter and contaminants can cause water to have a coloured tint. It can be removed by water treatment. The standard is set for aesthetic reasons.
Conductivity	2500 µS/cm	The electrical conductivity is a measure of the mineral salts dissolved in the water and is related to the total dissolved solids. High conductivity may indicate high levels of ions in the water such as chloride and sulphate.
Hardness (total)	non-regulatory no standard	Hardness is due to calcium and magnesium salts dissolved in the water. Hard water can require more soap to lather. Almost all water supplies in Eastern England are hard due to the natural geology. Softeners can be used to reduce water hardness by replacing calcium and magnesium with sodium. Therefore softened water may not be recommended for drinking, particularly by individuals with high blood pressure.
Odour (qualitative)	No abnormal changes	Drinking water is usually odourless. Odours can be due to some treatments or can indicate contamination of the water which may need investigating.
pH	6.5-9.5	Measure of the hydrogen ion content and indicates if the water is more acidic or alkaline. Water should preferably be slightly alkaline as this makes it less corrosive to metallic fittings and pipe work.
Turbidity	4 NTU	This is due to fine particles suspended in the water. High turbidity can cause the water to appear cloudy and is often related to other chemical parameters. Air bubbles can give water a cloudy appearance but on standing for a few minutes these should clear from the bottom of the glass upwards.

MICROBIOLOGICAL PARAMETERS

PARAMETER	UK DRINKING WATER STANDARD	FURTHER INFORMATION
Total coliforms	0 cfu/100ml	Total coliforms are a group of relatively harmless bacteria commonly found in the environment, for example in soil or vegetation, as well as the intestines of mammals, including humans. Coliform bacteria are not likely to cause illness and are usually non-faecal in origin, but their presence indicates that a water supply may be vulnerable to contamination by more harmful microbe's e.g. *E. coli*. Poor borehole construction or maintenance can increase the risk of groundwater contamination from these pathogens.
Colony Counts	No abnormal changes	The colony count is a measure of the presence of microorganisms within a sample. The counts are made after 48 hours at 37 degrees centigrade and after 72 hours at 22 degrees centigrade. The counts are not in themselves an indication of potential harm to health, however they are a very important means by which the effectiveness of treatment systems can be assessed, to judge the extent to which a water source is effected by bacteria and in conjunction with other indicators can be used to assess the risk to consumers.
E. coli	0 cfu/100ml	E. coli are type of coliform bacteria found in all mammal guts and faeces. Detection of them is a sure sign that the water has been contaminated by faecal waste. *E. coli* is not able to survive long in the environment so presence in water indicates a relatively recent and possibly local source of pollution. *E. coli* is potentially very harmful to human health, and contaminated water should not be consumed before treatment. They can be removed by UV light disinfection and basic filtration.
Enterococci spp.	0 cfu/100ml	Detection of *Enterococci* can indicate that a water supply is contaminated with faecal waste from humans or other warm-blooded animals but they can also originate from soils absent of faecal contamination. Ingestion of water containing *Enterococci* may cause short-term health effects, such as diarrhoea, cramps, nausea, headaches, or other symptoms. They can be removed from water by chlorine disinfection, UV light disinfection and filtration.
Pseudomonas spp.	non-regulatory no standard	*Pseudomonas aeruginosa* is unlikely to cause negative health effects but can under certain conditions and may cause problems with the taste and odour of drinking water. The biofilms that *Pseudomonas spp*. form could harbour more dangerous bacteria, such as *E. coli*. They can be removed by UV light disinfection.

UNITS OF MEASUREMENT:

µg/l = micrograms per litre

mg/l = milligrams per litre

Pt/Co = Platinum-Cobalt Scale unit

µS/cm = microsiemans per centimetre

NTU = Nephelometric Turbidity Units

cfu/100ml – colony forming units per 100 millilitres