

# Summary

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Contaminants of drinking water causing taste and odour problems can originate from natural organic and inorganic substances and biological processes, from contamination by synthetic chemicals, from corrosion or interaction with materials used for containing the water supply, or as by-products of water treatment processes. A number of major taste and odour incidents in the UK and elsewhere involving contamination of drinking water by substances released into the environment due to anthropogenic activities, has highlighted the need for awareness of potential threats to inform the development of effective risk management practices. Several authorities have established guidelines or standards for a limited number of substances in drinking water based on their taste and odour thresholds including the World Health Organisation and some national authorities. These guidelines will have been set in response to perceived risks, but at the local level the risk will depend upon the potential for contamination of source water and the effectiveness of removal of any such contaminant during water supply treatment. Therefore a priority list of substances for England and Wales should have regard for these factors.

Given the many thousands of substances in use in an industrialised country it has been necessary in this study to select only those substances considered to present a high risk based upon a process of prioritisation. Those initially selected for further consideration included all those reported as being involved in taste and odour incidents in a developed country whilst those excluded included those for which there was no evidence of UK production or import, as well as those already regulated to a limit value either lower than or close to the reported taste and odour threshold. Other prioritised substances were then categorised according to amounts used and their reported taste and odour threshold. This process gave a list of compounds from which substances formed during water treatment were excluded leaving 18 priority compounds. Added to this list were the two compounds most commonly associated with taste and odour problems arising from natural sources (geosmin and 2-MIB).

The 18 substances of anthropogenic origin associated with industrial uses were subject to investigation of usage and environmental fate characteristics based on literature searches and consultations with stakeholders. Inverse modelling was applied to these as well as geosmin and 2-MIB to estimate the sizes of sources of the prioritised substances required to be released in a water catchment to produce a taste and odour problem. Both a generic scenario (built around the assumptions embodied in the EU technical guidance document for the risk assessment of chemicals) and a specific scenario (which considers the Great Ouse to Bedford) were used for the modelling exercise.

The ranking of the resulting source strengths required to produce a taste and odour problem showed that the least amounts were for 2-EDD and 2-EMD which have been associated with major taste and odour problems in the UK and elsewhere. Furthermore, the natural compounds geosmin and 2-MIB are among the compounds requiring the lowest released amounts and they are also well recognised as causing taste and odour events. This relative risk posed by each prioritised compound principally depends on the taste and odour threshold itself; these can vary by several orders of magnitude although the extent to which the compound can be removed in water treatment is also influential. However, the actual risk of a taste and odour event also depends on the likelihood of release of the required source amount.

Of the prioritised taste and odour compounds, eleven find use as fuel additives; in particular, these include MTBE, TAME and ETBE. The modelling showed that very large amounts of fuel would need to be lost from each station within the catchments in order for there to be a risk of exceeding the taste and odour concentration thresholds. For those substances which have potential origins from home and/or personal care products (such as galaxolide, diphenyl ether and ethylene glycol butyl ether (or 2-butoxyethanol)), and may therefore become a 'down the drain' pathway through product use, it was found that much higher consumption figures would be required to exceed taste and odour thresholds.

All of the prioritised anthropogenic taste and odour compounds considered in detail in this study could potentially pass into drinking water supplies as a consequence of a spillage from a containment facility or during transport. For the generic scenario, this would result in taste and odour thresholds being exceeded for all substances considered, even if advanced water treatment is in place. In the specific scenario, there are differences depending upon flow and treatment scenarios. Similar sized spills into the sewer network would trigger taste and odour issues for somewhat fewer substances in the specific scenario under either flow conditions, although thresholds would be exceeded for all substances under the generic scenario.

For geosmin and 2-MIB, it is feasible that water could be sourced from a reservoir containing an algal bloom where there is no riverine attenuation or dilution between source and receptor. Only rather tentative information was available, but an estimate has been made of the scale of algal bloom necessary to produce sufficient amount of these compounds to produce a taste and odour incident.

The final stage of the project considered whether exposure to any of the prioritised substances at their taste and odour threshold would represent a risk to the health of consumers. This assessment found that exposure to these concentrations was not associated with significant risks of toxicity.