TGN7 - CATCHMENT PROTECTION

Introduction

Application of a multiple-barrier approach to water treatment recognises that the failure of one barrier might be compensated by the effective operation of the remaining barriers. This approach reduces the likelihood of contaminants passing through the entire treatment system and/or being present in sufficient concentrations to pose a potential risk to the health of consumers.

By minimising contamination of the source water through application of effective and appropriate catchment management measures, the challenge to treatment processes, and degree of treatment required can be reduced with a beneficial effect on water quality risk and operational costs. This follows the principle of "prevention is better than cure".

The Water Framework Directive (2000/60/EC) (WFD) came in to force in 2003. The primary objectives of the WFD directly concerned with catchment management are:

- reduce pollution of water, especially by 'priority' and 'priority hazardous' substances and;
- ensure progressive reduction of groundwater pollution

Further, the introduction of the WFD brought about the need for increased analytical monitoring and a requirement to report raw water data to the DWI. This is enshrined in the Water Supply (Water Quality) Regulations 2016 and their equivalents in the devolved administrations. These Regulations require water undertakers to carry out "source to tap" risk assessments of all the hazards in the catchment and where necessary to implement a sampling regime to monitor their potential impact on water supplies.

This TGN presents examples of potential hazards in the catchment and suggests strategies to help reduce or mitigate these. It does not provide comprehensive guidance on risk assessment methodology, nor does it identify all potential risks to surface and ground waters.

The following Good Practice guidance is provided:

Good Practice

In developing their own policies, codes of practice and operating procedures for the management of catchments, companies should consider the following points:-

1. It is important to understand the influence of the characteristics of a catchment on water quality and how this may vary temporally and spatially. Such changes may influence the requirements for treatment, its efficiency, efficacy and ultimately the potential of the final treated water to pose a potential risk to human health.

2. Where a number of water sources are available, there may be flexibility in the selection of water for treatment and supply. For example, it may be possible to avoid taking water from rivers and streams when water quality is poor (e.g., following heavy rainfall or a known contamination event) in order to reduce risk and prevent potential problems in subsequent treatment processes.

3. In addition to maintaining continuous availability of water for treatment, retention in raw water reservoirs can reduce the number of faecal microorganisms through settling and die-off either by senescence or predation and solar inactivation. If well designed, such

structures will also “peak lop” or buffer any fluctuations in raw water quality providing more consistent water for treatment.

4. Raw water quality may be influenced by both natural and human factors. Important natural factors include wildlife, climate, topography, geology and vegetation. Human factors include accidental or deliberate point source pollution, diffuse source pollution and the influence of animal husbandry practices. These factors can present significant microbiological and chemical hazards continuously or during a pollution event. Examples of risks and control measures are provided below (11-13).

5. It is recognised that not all catchments (in part or entirety) are owned by the water undertaker. Whilst catchment ownership clearly allows for more direct management of any potential hazards, third party ownership should not impede a responsible and prudent approach to catchment risk management.

6. Scenarios that could lead to water pollution should be identified and managed (either directly or via stakeholder management). Despite economic drivers and the need for increased development in catchments, introducing good practice in containment of hazards is often possible without substantially restricting activities or increasing cost.

7. Collaboration between stakeholders is a powerful tool to reduce pollution without reducing beneficial development. Where catchment management is beyond the direct control of the water undertaker, the planning and implementation of mitigation measures will require coordination with other agencies. These may include:
   - Land owners and their agents,
   - Local planning authorities,
   - The Environment Agency (and equivalents in Scotland and Northern Ireland),
   - Natural England (and equivalent in Wales, Scotland and Northern Ireland),
   - Highway authorities,
   - Agricultural umbrella organisations (e.g.: NFU)
   - Industrial and trade organisations

8. The multi-agency approach to the management of certain pesticides (e.g.: metaldehyde) is a good example of indirect catchment management.

9. Groundwater from deep and confined aquifers is usually of good microbiological quality, chemically stable and less easily influenced by direct contamination. However, shallow or unconfined aquifers can be subject to the same contamination risks as surface water as well as by gradual permeation of pollutants. The contamination of groundwater is at its greatest where the hazard occurs close to or within Source Protection Zone 1 as defined by the Environment Agency (a theoretical boundary where the transmission from surface to aquifer may be less than 50 days).

10. The disposal of all wastes produced on groundwater sites (e.g.: sewage) should be managed to prevent pollution of the source.

11. Specific control measures for the protection of the well / borehole head from contamination (e.g.: from local flooding) should be in place. Assessment of the physical integrity of the borehole casing and headworks structures should be carried out periodically.

12. Hazards and hazardous events that may have a deleterious impact on catchments, abstraction systems and raw water storage reservoirs include:
    - Municipal and industrial wastewater discharges;
    - Septic tanks and cess pits;
    - Chemical use in catchment areas (e.g., use of fertilizers and agricultural pesticides);
    - Major chemical spills (including relationship to public roads and transport routes), both accidental and deliberate;
    - Land use (e.g., agriculture, forestry, mining, waste disposal, industrial area) and changes thereof;
    - Active or closed mining or waste disposal sites / contaminated sites / hazardous wastes;
    - Human access (e.g., recreational activity);
    - Number, type and concentration of wildlife and livestock;
    - Inadequate buffer zones and vegetation, soil erosion and failure of sediment traps;
    - Storm water flows and discharges;
    - Geology (naturally occurring chemicals);
    - Unconfined and shallow aquifer (including groundwater under direct influence of surface water) especially those within a flood plain
    - Proliferation of algal and cyanobacterial blooms within, or stratification of, the raw water storage

13. Effective resource and source protection management measures may include the development and implementation of a catchment management plan. This is a useful method of identifying and recording control measures to protect raw water sources. This should consider:
    - The impact of climatic and seasonal variations (e.g.: heavy rainfall events, droughts, flooding).
    - Procedures to identify planning applications that may pose risks to source water quality.
    - Promotion and awareness in the community of the impact of human activity on water quality.

14. Control measures for effective protection of source water, catchments, raw water storage and abstractions systems include:
    - Implementation of a catchment management plan;
    - Control of wastewater effluents;
    - Regular inspections of catchments;
    - Appropriate location, security measures, and protection of intake;
    - Designated and restricted access to catchments, or areas of a catchment and where appropriate prevention of unauthorized access;
    - Management of human activities (including commercial and domestic developments) within catchment boundaries;
    - Management of animal husbandry practices and livestock populations within catchments and, where appropriate restricted access by animals;
    - Registration of chemicals used in catchments and, specific protective requirements (e.g.: containment) for chemical industry or fuel storage;
    - Control of storm water flows and where appropriate runoff interception;

- Use of available water storage during and after periods of heavy rainfall;
- Appropriate choice of off-take depth from reservoirs;
- Proper well construction, including casing, sealing and wellhead security.