River Basin Management Plans – Groundwater Classification

Mineral Workings

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1.0 Purpose

This paper describes the approach taken to assess the Water Framework Directive (WFD) chemical status of groundwater bodies with respect to impact from mineral workings (quarries).

2.0 Background

The WFD requires that groundwater bodies must be classified as good or poor for both chemical status (in relation to a large range of pollution pressures) and quantitative status (in relation to groundwater abstraction pressures).

Potential impacts from mineral workings (quarries) have been considered in the context of two of the four tests that were developed for groundwater body quantitative classification. These tests are based on WFD requirements and guidance provided at an EC and UK level[1]. The four tests consider the impacts of groundwater abstraction on the groundwater body itself, and on any ecological receptors which depend on it. The worst result from all four tests is taken as the overall quantitative status result for each groundwater body.

Potential impacts from mineral workings (quarries) have also been considered in the context of one of the five tests developed for groundwater body chemical classification, based on WFD requirements and guidance provided at an EC and UK level[2]. The five tests consider groundwater chemical composition with respect to impacts on the groundwater body (including significant potable supplies), and also on the ecological receptors which depend on it. The worst result from all five tests is taken as the overall chemical status result for each groundwater body.

There are approximately 200 operating quarries within Northern Ireland extracting a variety of bedrock types (shales, gritstones, basalt and limestone) as well as sand and gravel. Operation of the quarries is controlled under planning legislation. Quarries operating under permissions issued more than 15-20 years ago may potentially pose a greater threat to the water environment compared to more recently permitted quarries and quarry extensions which generally will have undergone a relatively thorough environmental impact assessment review in the course of obtaining planning permission.

Risks from quarries with respect to the water environment fall into three main categories:

i) lowering of surrounding water table due to dewatering;
ii) discharge of water from quarry with high suspended solids or modified pH; and
iii) local pollution from accidental spillages of hydrocarbons or discharge from office septic tanks.

[1] UK Technical Advisory Group on the Water Framework Directive. Paper 11b(ii): Groundwater Quantitative Classification for the purposes of the Water Framework Directive. This paper can be downloaded from the www.wfduk.org web site.
[2] UK Technical Advisory Group on the Water Framework Directive. Paper 11b(i): Groundwater Chemical Classification for the purposes of the Water Framework Directive. This paper can be downloaded from the www.wfduk.org web site.

A variety of factors will influence whether or not an individual site poses a particular risk to the water environment. These include: size and depth of the site, the local hydrogeological setting and proximity to sensitive receptors.

There is generally little information available with respect to dewatering, whether a quarry is operating below the water table or the quantity of groundwater being abstracted. Some of this information will however become available as quarries comply with the Water Abstraction and Impoundment (Licensing) Regulations (NI) 2006.

Risks associated with dewatering due to quarrying include:

i) lowering of water levels/reduction of discharge at nearby groundwater dependent terrestrial ecosystems (GWDTEs);
ii) lowering of water levels affecting yields from nearby wells, springs and boreholes; and
iii) modification to natural groundwater flow causing saline intrusion, particularly in coastal areas.

Discharges from quarries to surface waters are normally consented under the Water (Northern Ireland) Order 1999. As this is not a groundwater pathway issue this has not been considered relevant for groundwater classification.

Given the nature and scale of operations at most quarry sites significant 'accidental' pollution of groundwater would be expected to be minimal. Most sites only have a small number of personnel and store only relatively small volumes of hazardous substances such as hydrocarbons.

3.0 Classification

This assessment has been undertaken to support the following elements of classification:

Quantitative Classification

- No significant diminution of surface water chemistry and ecology
- Impact on Groundwater Dependent Terrestrial Ecosystems (GWDTEs)

Chemical Classification

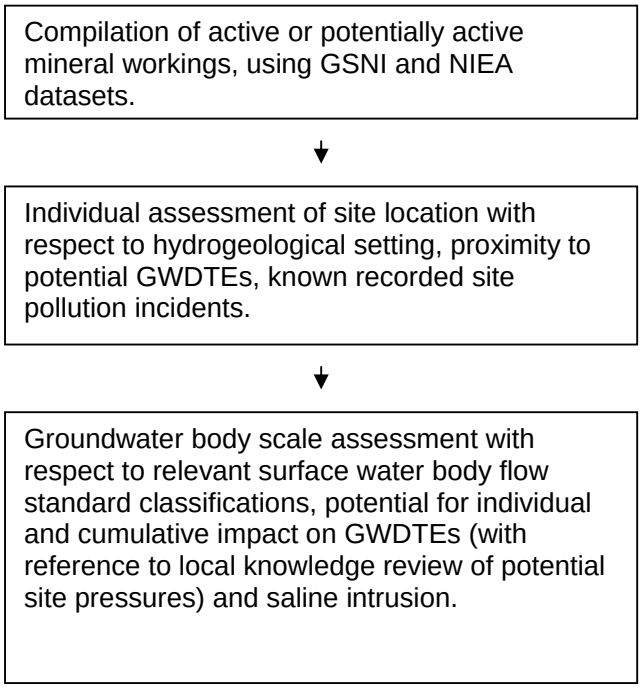
- Potential for causing saline intrusion

A check was also made to see whether or not there has been any reported/recorded groundwater pollution incidents which may have significance for nearby dependent surface water features. However the significance of pollution events would be expected to be relatively minimal and temporary, given the nature of quarries in Northern Ireland (NB: most quarry-related 'pollution' events involve suspended solids run-off or consented discharge breaches. This is not considered to be relevant for groundwater classification).

4.0 Assessment Process

The following assessment process was undertaken, managed within a GIS-based project.

It should be noted that for potential GWDTEs (SPA, SAC, ASSIs and NNRs) there is presently limited knowledge available regarding their groundwater dependency and sensitivity to water level/flow changes. Where a mineral working site is identified in close proximity to potential GWDTEs, an opinion on potential for impact has been made by reference to the hydrogeological setting and information available from NIEA ecologists familiar with the sites.



This assessment has sought to identify all active mineral workings and consider their significance (based upon location) with respect primarily to nearby surface water bodies and potential GWDTEs (SAC, SPA, ASSIs and NNRs). Using local knowledge of hydrogeological settings, surface water flow classification and condition of GWDTEs, a determination has been made as to whether a groundwater body should be classed as being of “good” or “poor” status with respect to the risk from this point source pressure.

5.0 Outcome

Based upon the above assessment no groundwater body has been classified as being at “poor status” as a result of local impacts for this point source pressure. There is no available definite evidence that mineral workings have contributed to a surface water body or GWDTE failing its environmental objectives or caused saline intrusion.

Because of the limited data relating to actual dewatering volumes, local groundwater level variation and groundwater conductivity (EC), the assessment is primarily qualitative and a low confidence has been assigned except where no quarries have been identified within a groundwater body where a high confidence is assigned.

6.0 River Basin Planning Cycle

The introduction of the Water Abstraction and Impoundment (Licensing) Regulations (NI) 2006, which any significant dewatering from mineral workings will be regulated under, may contribute to an improved understanding of the volumes of water being abstracted from quarries. Over the period of the River Basin Management Plan this will inform the review of risks from this type of pressure especially with respect to nearby surface waters, GWDTEs and saline intrusion.

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