

Supporting document

Groundwater Draft Classification Methodology: GWDTE Test 2020/2021



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Groundwater Draft Classification Methodology: Groundwater Dependant Terrestrial Ecosystems (GWDTE) Test

Introduction

All groundwater bodies in Northern Ireland (NI) were classified in 2020 to establish whether they are at 'good' or 'poor' status utilising monitoring data from the past six years (January 2014 – December 2019). Status is divided into qualitative and quantitative status and a number of tests were carried out for each, see Figure 1.

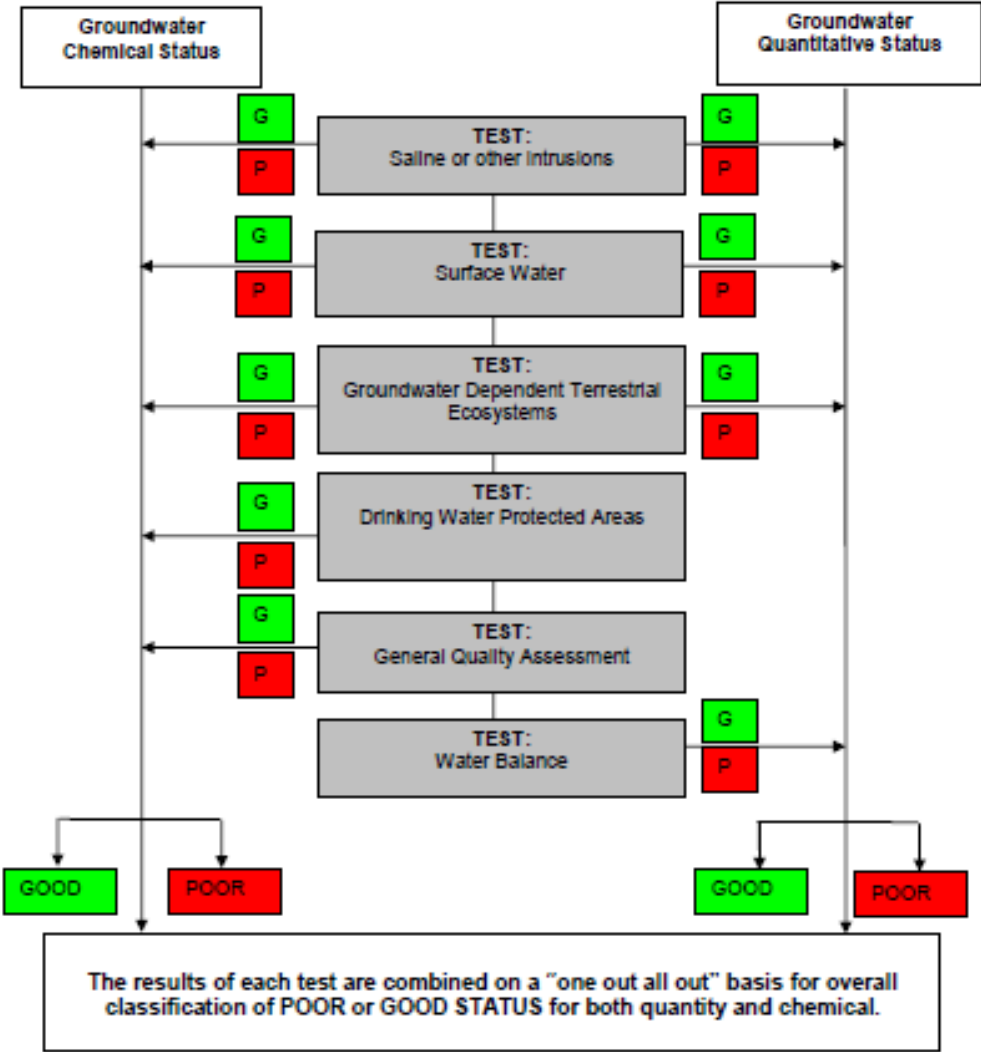
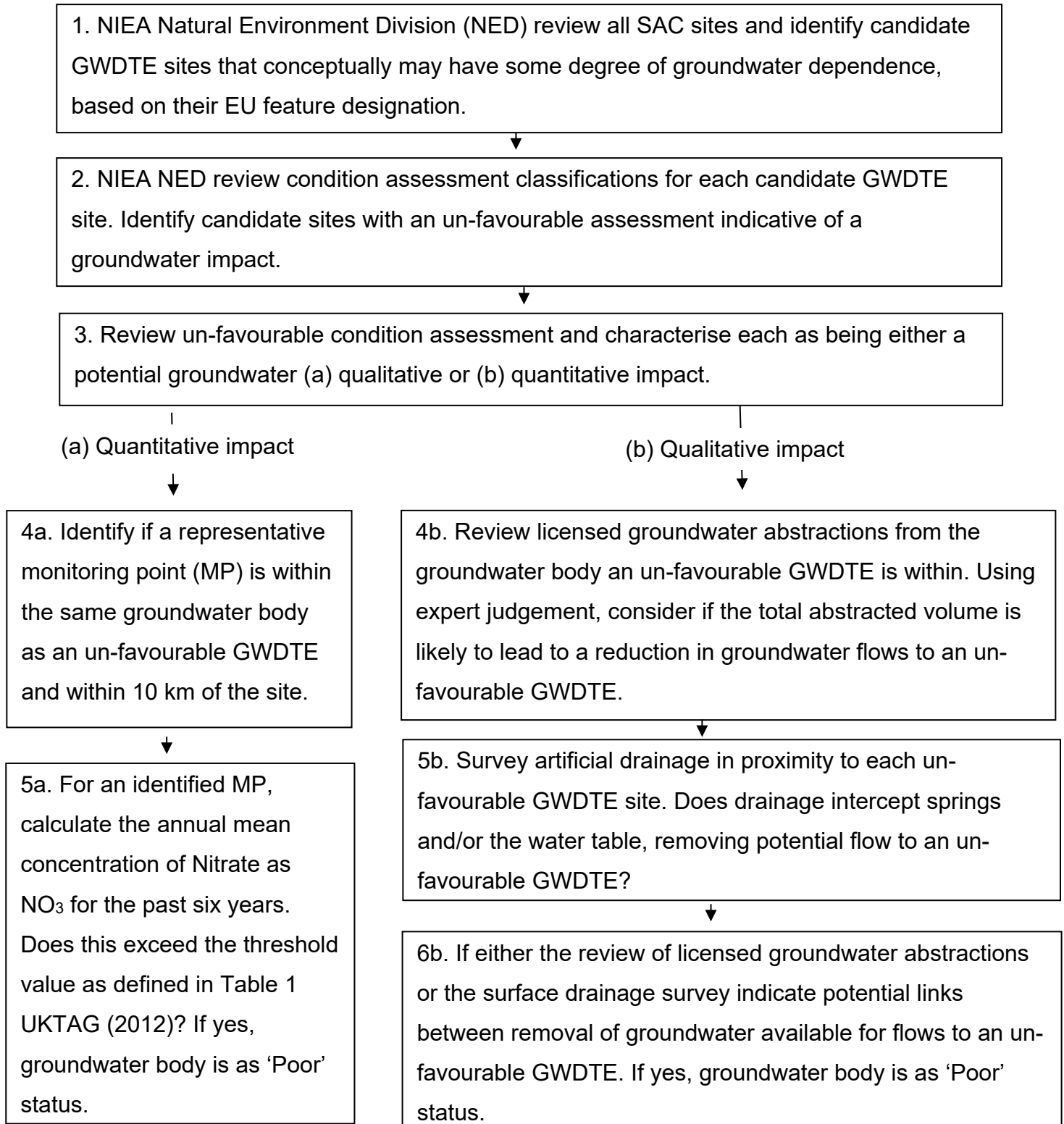


Figure 1: Overview of classification tests [from UK Technical Advisory Group paper 11b(i)].

Groundwater Dependant Terrestrial Ecosystems (GWDTE) classification

The process and explanation of classifying GWDTE, is laid out below, with specific detail given to the origin and processing of data required for the implementation of the method. This has been applied to GWDTEs which are designated at Special Areas of Conservation (SACs).



Threshold values

New threshold values for classification were introduced by UK Technical Advisory Group who consulted on them in 2012. Threshold values used for classification can also be found in the Groundwater (Amendment) Regulations (Northern Ireland) 2014.

Review of Special Areas of Conservation (SAC) Candidate GWDTEs

In collaboration with Natural Environment Division (NED) within the NIEA, a review was carried out of all SACs to determine if they are likely candidate GWDTEs.

A study was undertaken by MacDonald and McConvey (2005) in the first River Basin Planning (RBP) cycle to identify candidate GWDTE. This study involved an ArcGIS exercise to review the percentage of superficial deposits within the surrounding areas of each SACs. If an SAC was surrounded by a significant percentage of high permeability superficial deposits it was considered to be GWDTE. This method proposed 22 SACs as being likely GWDTE sites.

As an extension and an improvement to this method, ecologists from NED considered all SAC sites based on their own field experience of undertaking condition assessment surveys whilst being provided hydrogeological support from The Geological Survey of Northern Ireland (GSNI). This review considers the designated species that have been identified and the geological context of each SAC feature. For example, if a designated species has been identified at an SAC that is known to be dependent upon wet conditions only achievable by a groundwater flow, then it is likely that the SAC is to a greater or lesser extent dependent upon a flow of water from a groundwater source.

Many of the SACs are large sites that include many different protected features. An example of this is the West Fermanagh Scarplands. This is designated for various features including tufa forming springs but also many features that are not relevant to GWDTE characterisation. The ecologists from NED split out the relevant habitat features associated with each SAC site that are likely to be groundwater dependant so that better attention and focus can be applied to them.

Likely groundwater dependant habitat features were considered as candidate GWDTEs.

Condition Assessments

A condition assessment is undertaken on each SAC to assess if the habitat and species interests of a designated site are meeting the objectives for which the site was declared. These condition assessments involve a detailed survey of each site involving significant resource and expertise. A survey is performed on each site once every six years. A site can be assessed on a range of different habitats and species interests. For wetland SACs, some of these are water related.

NED will review the most recent condition assessment results for the candidate GWDTEs to identify any that have an unfavourable condition assessment. Each of these assessments will be reviewed to identify if they are relevant to the water environment. For example, depending on the relevant unfavourable condition assessment for each GWDTE, it will be determined if this is possibly due to an impact from a deterioration in the quantity or quality of groundwater.

Groundwater Quality Assessment

For all GWDTEs with an unfavourable condition assessment, possibly due to an impact from deterioration in the quality of groundwater, an assessment will be made to determine if there is further evidence to support the claim that groundwater could be a contributing factor.

It is worth noting that only reliable further evidence will be used. In the absence of any such evidence no further assessment will be undertaken.

The groundwater body within which each GWDTE is located was identified. Monitoring points associated with that groundwater body or group of groundwater bodies were identified and any that are located within 10 km of a GWDTE were assessed to determine if it is a reliable monitoring point.

By combining information on the geology, land use and monitoring point structure (borehole design) an assessment will be made to determine if the monitoring point is representative of groundwater that could be a supporting water source for the GWDTE.

If a monitoring point is deemed to be representative, the average mean concentration of nitrate as NO_3 from the past six years of data will be compared to the threshold values relevant to the GWDTE type and altitude. If this exceeds the threshold value, groundwater is likely to be a contributing factor in the unfavourable condition of that GWDTE. The groundwater body within which the GWDTE is located will be characterised as at risk.

Nitrate is the only chemical parameter to be considered in this assessment for three reasons:

- It is the only parameter that has so far been found to have a direct influence on the condition of GWDTE sites (UKTAG, 2012a);
- Nutrient enrichment is known to be the major cause of unfavourable conditions of SAC sites in NI;
- All candidate GWDTE sites lie within rural settings where diffuse pressures are dominant.

Groundwater Abstractions

The licensing of abstractions was introduced in NI in 2007 and the current NIEA abstraction licensing database was queried for all groundwater abstractions. This excluded spring or spring fed abstractions.

Drainage

It is common around and in wetlands for artificial drainage channels or buried drainage networks to be constructed so that water can be redirected away from the wetland so that land can be used for farming or other uses. This however is not good for the wetland. For GWDTEs, the drainage channels may be constructed below the groundwater level or intercept springs before they can reach a wetland. In effect, drainage is a groundwater abstraction and it can serve to lower the groundwater levels in a GWDTE. Since many sites are sensitive to even small reductions in groundwater levels, drainage can have a significant impact on GWDTEs.

Drainage may also include underground works that have taken place which have led to an interception in groundwater flow prior to discharge at a GWDTE. This may include a quarry that was operational before Environmental Impact Assessments (EIA) were required for quarry development applications. If such un-restored quarries contain groundwater seepages that can discharge to surface waters by gravity, then they may be having a detrimental impact on a GWDTE down gradient of the quarry.

A site visit, survey of site drainage and review of existing data was not conducted on relevant sites due to Covid-19 restrictions. This is relevant to 'Magilligan Sands' and 'Enniskillen' groundwater bodies. NIEA will aim to complete site visits and surveys, where required, prior to final classification of groundwater bodies and update status accordingly.

Other lines of Evidence

To support the results, other lines of evidence can be used. These can include:

- Groundwater level monitoring data – is there a sustained downward trend in groundwater levels that cannot be accounted for by normal climatic effects;
- Site specific hydrogeological study reports – it is known that some GWDTE sites have had targeted investigations performed on them;
- Modelling results – if groundwater flow or nutrient models exist specific to a given unfavourable GWDTE, then the outputs from these should be used to inform the CSMs and therefore influence the risk assessment; and
- Future development potential – if there is awareness that there may be significant development that would lead to an increase in the volume of water being abstracted from groundwater within a groundwater body, projections of likely volumes should be included with the total volume of abstractions.

References

UKTAG Paper (2012a). *Technical report on groundwater dependant terrestrial ecosystems (GWDTE) threshold values*. www.wfdu



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