

River Basin Management Plans (2015 - 2021)

Groundwater Classification Methodology

Saline Intrusion

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Introduction

All groundwater bodies in Northern Ireland were classified in 2014-2015 to establish whether they are at good or poor status utilising monitoring data from the past six years (2009 to 2014). Status is divided in to qualitative and quantitative status and a number of tests were carried out for each, see Figure 1.

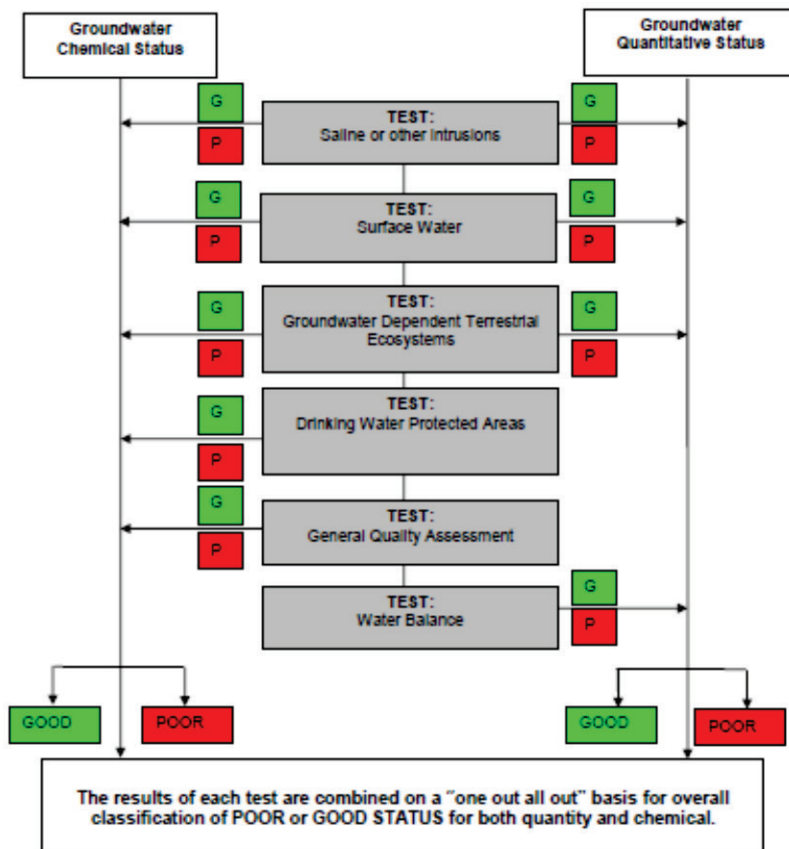


Figure 1: Overview of classification tests [from UK Technical Advisory Group paper 11b(i)].

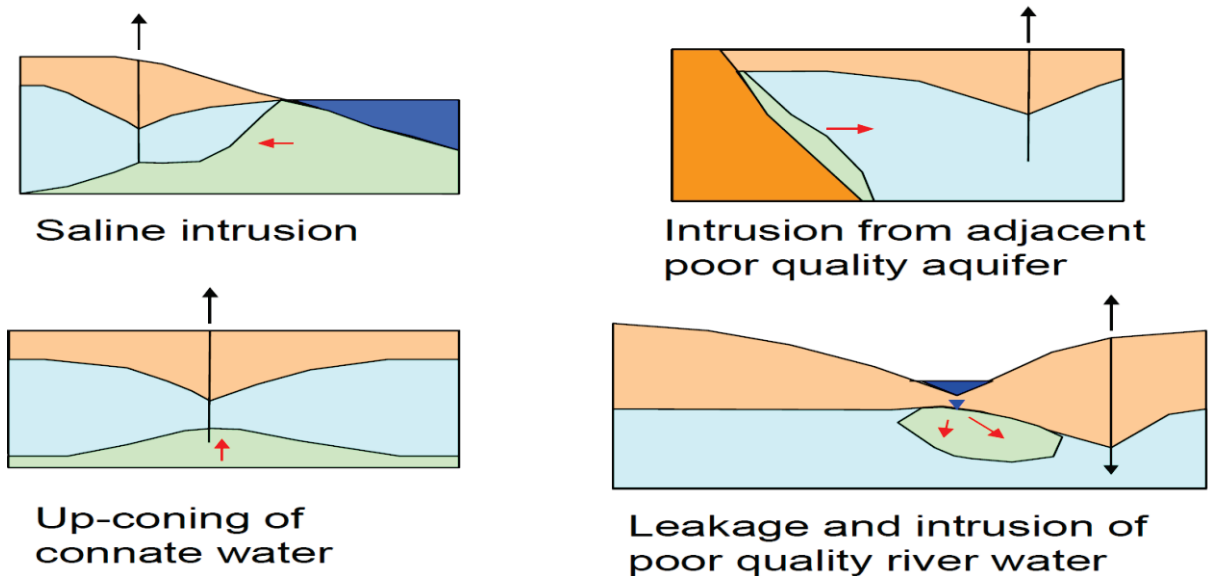
Saline Intrusion classification

The saline intrusion test assesses if an abstraction of groundwater or set of abstractions are likely leading to the intrusion of poorer quality water into a water body.

Saline intrusion can be considered as both a chemical and quantitative pressure. It is the abstraction of groundwater that can then lead to deterioration in the quality of groundwater. Assessing the likelihood that saline intrusion is occurring within a groundwater body is a case of assessing both the scale of abstraction in relation to freshwater recharge and analysis of chemical monitoring data from the groundwater abstractions. However, it is the latter that provides more reliable evidence that saline intrusion is occurring and greater emphasis should be placed on it when undertaking this assessment.

There are four key types of anthropogenic induced intrusion that can be considered. These are demonstrated in Figure 2 below.

Figure 2 – Types of intrusion

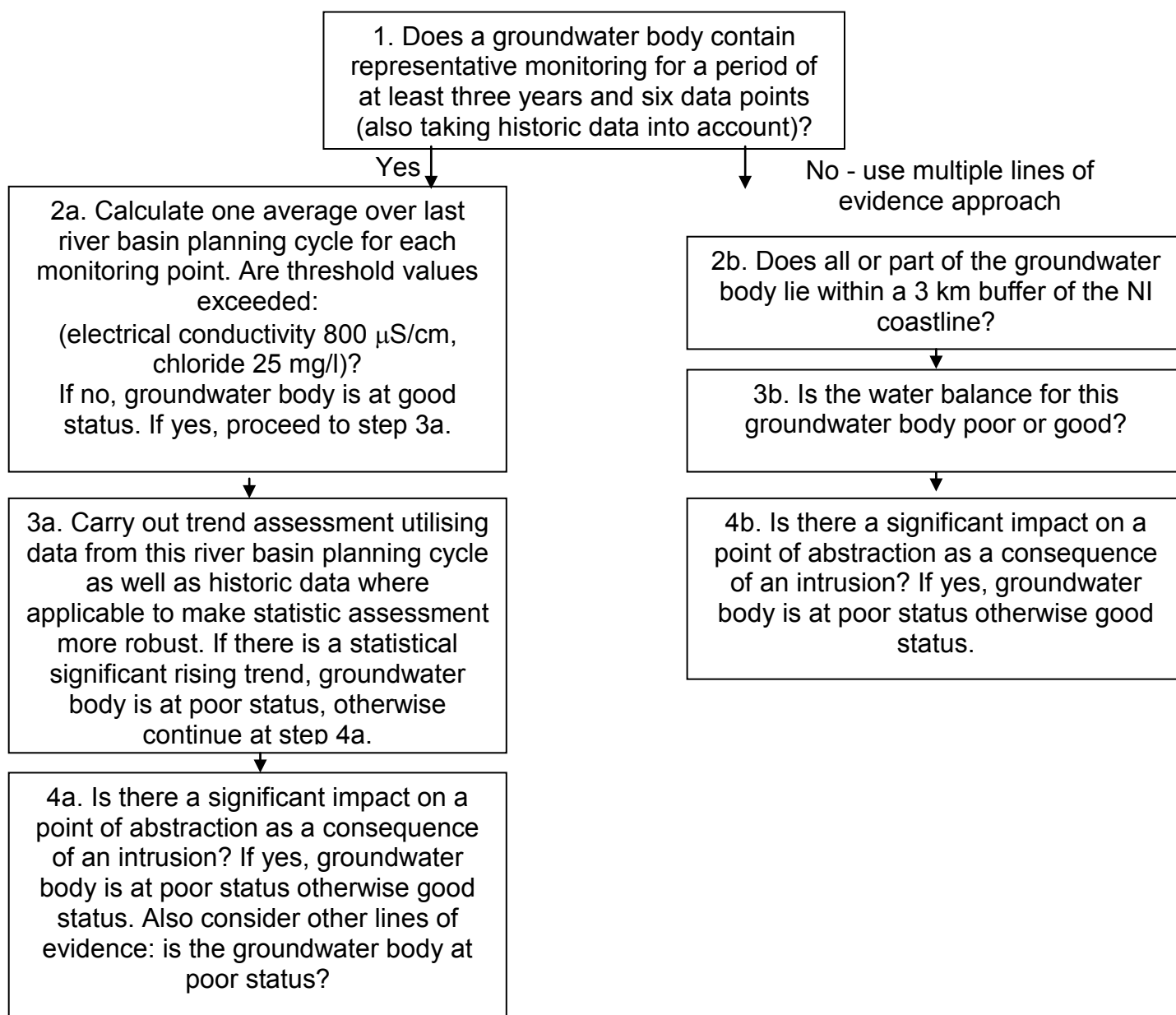


The primary potential for impact from 'intrusion' in Northern Ireland is along coastal areas and adjacent to tidal rivers. The related potential for intrusion will be dependent upon the nature of the aquifer, overlying deposits and the abstraction pressures operating close to these areas.

Due mainly to the dominant fractured bedrock hydrogeology of Northern Ireland, abstraction of groundwater is limited. Conceptually therefore the potential for intrusion is expected to be limited.

The process of assessing the status of the Saline Intrusion test for a groundwater body, as defined above, is laid out below.

This method is derived from the UKTAG guidance for classification, updated for the second River Basin Planning (RBP) cycle (UKTAG, 2012a).



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](#).

Test	threshold value
	Recommended threshold values for saline intrusion into groundwater bodies
Electrical conductivity	800 $\mu\text{S}/\text{cm}$
Chloride	25 mg/l

Groundwater Abstractions

The licensing of abstractions was introduced in Northern Ireland in 2007 and the current abstraction licensing database was queried for all groundwater abstractions. This excluded spring or spring fed abstractions. The total annual volume of abstraction was calculated for each groundwater body.

Monitoring Data

Groundwater quality in Northern Ireland is measured through the collection of water samples from boreholes and springs that are mostly owned and operated by third parties. Hence NIEA rely on the co-operation of land/ property owners to continue sampling from their groundwater sources for the chemical monitoring. This means that the network can change due to businesses closing or changing their groundwater usage and datasets for trend assessments are often small. The network consists mainly of industrial boreholes where groundwater is utilised for manufacturing or food/ drinks production. A small number of springs or boreholes purpose-installed by NIEA, which are purged prior to sampling, are also monitored. Regional monitoring of groundwater across Northern Ireland began in 2000. The location of the stations can be viewed on the River Basin Plan Map Viewer. The monitoring frequency and selection of determinands follows [UKTAG guidance](#). Each station monitored was analysed twice a year for chloride and electrical conductivity.

Trend Assessment

Identifying significant and sustained upward trends of certain parameters is important for ensuring that objective IV of the WFD is met. An upward trend is indicative of an anthropogenic pressure on a groundwater body. Analysing monitoring data for a significant and sustained upward trend is therefore important.

The Northern Ireland Environment Agency commissioned the British Geological Survey to review methods of trend assessment applicable to small datasets. The recommendation made by the review was to combine several methods like Sen and Man-Kendall to increase confidence in the trend assessment. The trend assessment has been carried out using the inbuilt function of the AquaChem software package. This was designed by Schlumberger Water Services in conjunction with the Environment Agency of England specifically to assess trends within groundwater monitoring data collected for the purposes of WFD classification and characterisation. The software also includes a forward projection capability to predict concentration levels for the next river basin planning cycle.

Further information on the trend assessment method can be found in Stuart (2012).

References

Stuart, M.E. (2012). *Trend analysis and prediction for small groundwater quality datasets from Northern Ireland*. British Geological Survey Commissioned Report, CR/12/037. 38pp

UKTAG Paper 11b(i), (2012a). *Groundwater Chemical Classification for the purposes of the Water Framework Directive and the Groundwater Directive*. www.wfduk.org

UKTAG Paper 11b(ii), (2012b). *Groundwater Quantitative Classification for the purposes of the Water Framework Directive*. www.wfduk.org