WAT-PS-10 Assigning Groundwater Assessment Criteria for Pollutant Inputs – Draft for Consultation

Annex 4 Assessing future groundwater resource potential in superficial deposits

A4.1 Background

All groundwater within superficial deposits that have been mapped by SEPA as groundwater bodies is considered to have resource potential.

However, most superficial deposits are considered to be part of an amalgamated superficial/bedrock groundwater body. Some of these superficial deposits have low potential as a future groundwater resource. This annex sets out broad guidelines on the type of investigations that SEPA will consider acceptable for determining whether groundwater within superficial deposits that are not currently mapped by SEPA as individual groundwater bodies have future groundwater resource potential. This methodology only applies to onshore superficial deposits, located inland of the mean high water springs tidal limit.

Assessing the supply capacity of groundwater beneath the site will enable correct location of the assessment and compliance points to protect the future groundwater resource.

A4.2 Recommended approach

The methodology described below consists of three stages of increasing complexity and cost aimed at assessing whether the superficial deposits above bedrock fulfil the UK TAG criteria for a groundwater body. Those wishing to use this approach should start at Stage 1 as appropriate and continue to the next stage(s) as necessary. Those taking this route should be aware that SEPA will use the ‘weight of evidence’ from the investigation to decide the resource potential of the deposit.

SEPA will make a final decision on whether or not the stratum should be considered to have resource value based upon the following properties of the superficial deposit:

- areal extent
- average thickness
- physical properties
- permeability / productivity.

A4.2.1 Stage 1: Prior to site investigation

Assume that all saturated natural superficial strata, if more than 50m inland from the mean high water springs tidal limit, have future groundwater resources potential.

In some situations it may be more cost effective to accept this assumption. However examination of the implications of acceptance might reveal that it may be an advantage to test this assumption by progressing to Stage 2; that is, the cost of the investigation could be offset by savings elsewhere.

A4.2.2 Stage 2: Drilling/excavation to bedrock

The aim is to infer if the superficial strata can provide more than $10m^3$/day using information from site investigation and available geological mapping.

If the superficial strata are significant areal extent (>1 ha) and more than 5m thickness of continuous saturated sand or gravel (or coarser material) is found in any one excavation, then either a Stage 3 investigation should be undertaken, or the stratum should be considered to form part of a groundwater body with its limit at the top of the relevant stratum.

The determination of ‘sand or gravel strata’ should be made in one of two ways:

- Using field descriptions made by qualified personnel in accordance with British Standards (BS5930:2015 Codes of Practice for Site investigations). In samples from sand or gravel strata, the ‘“principal soil type”’ should be sand or coarser, with the material having no apparent plasticity/cohesion or being dominantly cobbles or boulders.

- Using particle size analysis. The distribution from the relevant strata should be less than 20% fines (silt and clay) in all samples, with average clay content of less than 13% clay[1].

Available geological mapping should be used to provide additional confidence to the conclusions drawn from site investigation, e.g. areal extent and connectivity of granular deposits.

Where the superficial geological sequence is complex, or where there is doubt concerning any of the Stage 2 assessments, then a Stage 3 investigation should be undertaken. An example of a complex sequence is the common situation, where numerous thin layers or lenses of permeable strata are interbedded with less permeable deposits.

A4.2.3 Stage 3: Productivity testing

Enhancing the information provided by Stage 2, the aim is to demonstrate with more confidence if the relevant stratum identified in Stage 2 can provide more than $10m^3$/day.

The saturated superficial deposits will be considered to have resource value and the top of the groundwater body set at the top of the relevant stratum unless flow within the superficial strata is demonstrated to be less than 10 m^3/day.

Flow within the superficial strata should be assessed taking into account the following factors:

- Average[2] transmissivity of the superficial strata
- Lateral extent of the permeable superficial strata perpendicular to the dominant groundwater flow direction
- Hydraulic regime within the superficial deposits, taking into account potential interactions with the underlying bedrock and with surface waters.

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[1] Based on low permeability indicator quoted in Swartz, M., Misstear, B.D.R, Daly, D. and Farrell, E.R., 2003. Assessing subsoil permeability for groundwater vulnerability. Quarterly Journal of Engineering Geology and Hydrogeology, v36, p173-184.

[2] Taking into account the relative thicknesses and hydraulic conductivities of the various lithological horizons within the saturated superficial deposits.

Depending on the degree of uncertainty, this assessment should be undertaken through representative in-situ test pumping or through a combination of in-situ testing and analytical or numerical calculations of flow based upon data representing the relevant strata as a whole. Field testing should be undertaken in accordance with British Standards (BS5930:2015 Code of Practice for Site investigations).

Note that it is the potential sustainable yield of the superficial aquifer as a whole that is to be considered in the assessment, rather than the potential yield from any individual borehole.