

**APPENDIX 9/2  
RISK ASSESSMENT METHODOLOGY**

## Introduction

DEFRA’s GL III [Ref. A] contains generic guidelines for the assessment and management of environmental risks. GL III outlines a staged approach to risk assessment and the document is intended to guide regulatory staff in Government and its agencies, as well as those carrying out assessments, to reach a decision on managing environmental risk.

A hydrogeological risk assessment for proposed development has been carried out in accordance with the Source-Pathway-Receptor (S-P-R) approach described in GL III [Ref. A] and the methodology in the Environment Agency’s H1 Environmental Risk Assessment framework – Annex J (Groundwater) [Ref. B]. Where S-P-R linkages have been identified, the sensitivity of the receptor, magnitude of impact and significance of effect has been considered in order to assess potential risks.

Ref. B describes a tiered approach to risk assessment, starting at Tier 1 and progressing to Tier 3. Tier 1 is essentially a qualitative approach and Tier 3 is highly quantitative approach. The choice of approach should be based on how complicated the system is, how high the risks are, and how easily and fully the risks can be mitigated. As such the selection process is iterative, and in complex systems there may be a mixture of approaches where simple, low risk sub-systems are assessed with a Tier 1 approach and more complex aspects with risks that cannot be fully mitigated may need a complex quantitative approach. The methodology described in this Appendix is for a Tier 1 assessment.

## Receptor Sensitivity

The sensitivity of water resource receptors is based on their status and considered resource value, as described in Table A.

**Table A: Receptor Sensitivity**

Receptor Sensitivity	Description	Examples
Very High	Water resource with an importance and rarity at an international level with limited potential for substitution.	A water resource making up a vital component of an SAC or SPA under the EC Habitats Directive A water body achieving a status of ‘High status or potential’ under the WFD Principal aquifer providing potable water to a large population EC designated Salmonid fishery
High	Water resource with a high quality and rarity at a national or regional level and limited potential for substitution.	A water resource designated or directly linked to a SSSI. Principal aquifer providing potable water to a small population A river designated as being of Good status or with a target of Good status or potential under the WFD A water body used for national sporting events such as regattas or sailing events EC designated Cyprinid fishery

Receptor Sensitivity	Description	Examples
Medium	Water resource with a high quality and rarity at a local scale; or Water resource with a medium quality and rarity at a regional or national scale.	Secondary aquifer providing potable water to a small population An aquifer providing abstraction water for agricultural and industrial use
Low	Water resource with a low quality and rarity at a local scale.	A non 'main' river or stream or other water body without significant ecological habitat

Magnitude of Impact

The magnitude of a potential impact on a receptor depends on the nature and extent of the proposed development, and is independent of the sensitivity of the water resource, as described in Table B.

**Table B: Magnitude of Impact**

Magnitude of Impact	Description	Examples
High	Results in a major change to attributes.	Loss of EU designated Salmonid fishery Change in WFD classification of a water body. Compromise employment source Loss of flood storage/increased flood risk Pollution of potable source of abstraction
Medium	Results in impact on integrity of attribute or loss of part of attribute.	Loss / gain in productivity of a fishery. Contribution / reduction of a significant proportion of the effluent in a receiving river, but insufficient to change its WFD classification Reduction / increase in the economic value of the feature
Low	Results in minor impact to attributes.	Measurable changes in attribute, but of limited size and/or proportion
Very Low	Results in an impact on attribute but of insignificant magnitude to affect use and/or integrity.	Physical impact to a water resource, but no significant reduction/increase in quality, productivity, or biodiversity No significant impact on the economic value of the feature No increase in flood risk

Significance of Effect

The significance of the potential effect is derived by combining the assessments of both the sensitivity of the water resource and the magnitude of the impact in a simple matrix, as presented in Table C. Effects which are assessed to be major or moderate are considered to be significant, whilst those that are minor or negligible are not significant.

**Table C: Significance of Effect**

Receptor Sensitivity	Magnitude of Impact			
	High	Medium	Low	Very Low
Very High	Major	Major	Moderate	Moderate
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible

Qualitative Likelihood

**Table D: Qualitative Likelihood of Occurrence**

Qualitative Likelihood of Occurrence	Description	Examples
Highly Likely	High probability of occurrence	Spillage at a poorly maintained and operated facility Uncontrolled activity in or on an aquifer, close to surface water Uncontrolled known discharge
Likely	On balance could occur	Controlled but un-mitigated activity Complex process where failure of a part is likely to lead to release Large area where 100% sealing cannot reasonably be expected
Moderate	Equally likely/unlikely	Unmitigated, low risk Controllable activity Partially contained site
Unlikely	On balance would not occur	Mitigated higher risk Simple, controllable activity Underlain by poorly permeable strata Existing contained site
Very Unlikely	Very low probability of occurrence	Essentially no risk Extreme set of circumstances required to generate low probability Fully mitigated low or medium risk

Qualitative Risk Analysis

The residual qualitative risk is derived by combining the likelihood of occurrence and the significance of effect of a potential impact on a receptor in a simple matrix, as presented in Table E. Risks which are assessed to be very high, high, or medium are considered to be significant, whilst those that are low, very low or none are not significant.

**Table E: Qualitative Risk Analysis**

Qualitative Likelihood of Occurrence	Significance of Effect			
	Major	Moderate	Minor	Negligible
Highly Likely	Very High	High	Medium	Low
Likely	High	Medium	Low	Very Low
Moderate	Medium	Low	Very Low	None
Unlikely	Low	Very Low	None	None
Very Unlikely	Very Low	None	None	None

References

- Ref. A: Green Leaves III - Guidelines for Environmental Risk Assessment and Management: Green Leaves III. Revised Departmental Guidance Prepared by Defra and the Collaborative Centre of Excellence in Understanding and Managing Natural and Environmental Risks, Cranfield University, November 2011.
- Ref. B: H1 Environmental Risk Assessment framework – Annex J (Groundwater). Environment Agency, 2010.