Design Manual for Roads and Bridges

Sustainability & Environment
Appraisal

LA 113
Road drainage and the water environment

(formerly HD 45/09)

Revision 1

Summary
This document describes the requirements for assessment and management of the impacts that road projects can have on the water environment.

Application by Overseeing Organisations
Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
1	Mar 2020	Revision 1 (March 2020) Revision to update references only. Revision 0 (August 2019) LA 113 replaces HD 45/09. The full document has been re-written to make it compliant with the new Highways England drafting rules.

Foreword

Publishing information

This document is published by Highways England.

This document supersedes previous advice contained in HD 45/09 (Volume 11, Section 3 of the DMRB), which is withdrawn and makes provision for requirements outlined under EU Directive 2000/60/EC, hereafter referred to as the 2000/60/EC [Ref 4.N].

This document contains clear reference to other volumes, sections and parts of the DMRB that will aid the delivery of the requirements and recommendations in this document.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

This document sets out the requirements associated with the assessment and management of potential environmental impacts on the water environment from highway construction, operation, improvement and maintenance, and aligns with the requirements of the 2000/60/EC [Ref 4.N]. Drainage of the highway is considered in DMRB Volume 4.

Collaborative research was undertaken between Highways England and the Environment Agency to significantly improve the reliability and extent of existing data for pollutants and their concentrations found in road runoff from non-urban trunk roads and motorways UC 7697 [Ref 21.I], HA 3/368 [Ref 1.I], WRc UC 6037 [Ref 24.I], WRc UC 7486/1 [Ref 10.I], Hurle et al 2006 [Ref 32.I].

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 11.N] apply to this document.

Abbreviations and symbols

Abbreviations

Abbreviation	Definition
AADT	Annual Average Daily Traffic
CEMP	Construction Environmental Plan
CIRIA	Construction Industry Research and Information Association
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EQS	Environmental Quality Standard
FRA	Flood Risk Assessment
GWDTE	Groundwater Dependent Terrestrial Ecosystem
HEWRAT	Highways England Water Risk Assessment Tool
M-BAT	UKTAG Rivers and Lakes Metal Bioavailability Assessment Tool
RBMP	River Basin Management Plan
SPZ	Source Protection Zone
SSSI	Site of Specific Scientific Interest
UKTAG	UK Technical Advisory Group
WFD	Water Framework Directive

Symbols

Symbol	Definition
Q^{95}	The flow equalled or exceeded in a watercourse 95% of the time

Terms and definitions

Terms and definitions

Term	Definition
Acute impact	Occurs as a result of a severe, usually transient, event. NOTE: For road runoff, acute pollution is usually the result from a spillage of pollutants, but can result from routine runoff.
Chronic impact	The result of ongoing low levels of pollution which can result in the transport and accumulation of sediment-bound pollutants over a longer period of time (months/years).
Competent authority	An authority that is legally responsible for discharging the requirements of the 2014/52/EU [Ref 5.N] via the development consenting process.
Competent expert	Individuals who can demonstrate that they have relevant: 1) qualifications; and 2) expertise in the environmental assessment of infrastructure projects or related environmental factor(s).
Consultation body	Any body which the relevant Overseeing Organisation is required to consult in order to fulfil their duties under the 2000/60/EC [Ref 4.N].
Detailed assessment	Detailed field surveys and/or quantified modelling techniques to understand complex environmental effects.
Effect	Term used to express the consequence of an impact (expressed as the 'significance of effect').
Environmental Impact Assessment	Statutory process consisting of: 1) preparation of an Environmental Statement; 2) consultation; 3) examination by the competent authority of the information contained within the Environmental Statement; 4) the reasoned (justified or evidenced) conclusion by the competent authority on the significant effects of the project on the environment; and 5) the reasoned (justified or evidenced) decision by the competent authority to grant or refuse development consent.
Environmental Quality Standard	The maximum permissible concentration of a potentially hazardous chemical. NOTE: The Environmental Quality Standard is used to assess the risk to the health of aquatic flora and fauna.
Groundwater body	A distinct volume of groundwater within an aquifer or aquifers.
Outfall	Point of discharge into a waterbody.

Terms and definitions (continued)

Term	Definition
Protected area	Area registered under Article 6 of the 2000/60/EC [Ref 4.N].
Reach	A stretch of a river used in the assessment of river water quality.
River Basin Management Plan	A regional plan that sets out how organisations, stakeholders and communities will work together to improve the water environment and fulfil the requirements of the 2000/60/EC [Ref 4.N]
Routine runoff	The normal runoff from roads including any contaminants washed off the surface in rainfall events which can result in either acute or chronic impacts. NOTE: Routine runoff excludes the effect of spillages and major leaks which usually result in acute impacts.
Soakaway	A special pit or depression in the land surface that allows water to drain into the ground.
Scoping	The process of considering the information required for reaching a (reasoned) conclusion on the likely significant effects of a project on the environment.
Screening	The identification of likely significant effects on the environment and consequential need for an Environmental Impact Assessment.
Simple assessment	The collection and assessment of data and information that is readily available to reach an understanding of the likely environmental effects of a project. NOTE: This informs the final design or need for further 'detailed assessment.
Surface water body	A discrete and significant element of surface water. NOTE: Examples of surface water body can include a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, transitional water or a stretch of coastal water.
WFD Assessment	Assessment to identify how the project has the potential to affect each of the water body's quality/quantity elements and whether it could lead to non-compliance with the 2000/60/EC [Ref 4.N].

1. Scope

Aspects covered

1.1 The requirements and procedures set out in this document shall be applied when assessing, reporting and monitoring the effects of projects on the water environment in line with the requirements of the 2000/60/EC [Ref 4.N] and the 2014/52/EU [Ref 5.N].

1.2 The requirements in this document shall be followed in accordance with the environmental assessment requirements set out in:

1) LA 101 [Ref 10.N] Introduction to environmental assessment;
2) LA 102 [Ref 13.N] Screening projects for Environmental Impact Assessment;
3) LA 103 [Ref 12.N] Scoping projects for environmental assessment; and,
4) LA 104 [Ref 6.N] Environmental assessment and monitoring.

1.3 The assessment process shall:

1) determine compliance of the project with respect to the requirements of the 2000/60/EC [Ref 4.N];
2) determine compliance of the project with respect to UK and Devolved Administration requirements in terms of flood impacts; and
3) inform where mitigation is required in the project design.

NOTE Three principal types of impact are considered in this document:

1) impacts on surface waters:
   a) water quality (routine runoff and spillage);
   b) hydromorphology;
2) impacts on groundwater:
   a) water quality (routine runoff and spillage);
   b) groundwater levels and flows;
   c) groundwater dependent terrestrial ecosystems;
3) flood impacts.

Implementation

1.4 This document shall be implemented forthwith on all schemes involving road drainage and the water environment on the Overseeing Organisations' motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 11.N].

Use of GG 101

1.5 The requirements contained in GG 101 [Ref 11.N] shall be followed in respect of activities covered by this document.

2. Principles and purpose of environmental assessment

General

2.1 Environmental assessment, reporting and monitoring must meet the requirements of the 2014/52/EU [Ref 5.N].

2.2 To conform with the 2000/60/EC [Ref 4.N], the project must not:

1) cause deterioration to any water bodies such that their status under the WFD, or the status of any of the constituent WFD quality elements, falls by one or more classes or, where the quality element is already in the lowest class, cause any deterioration of that element;
2) contribute to, or cause, a failure of a water body to meet good overall status or, in the case of an artificial or heavily modified water body, good ecological potential and good chemical status;
3) prevent future improvements from being implemented; and
4) breach the objectives and standards of protected areas registered under Article 6 of the WFD.

2.3 Environmental assessment, reporting and monitoring shall meet the requirements of the national planning policy for each relevant Overseeing Organisation.

NOTE *The national planning policy requirements for each Overseeing Organisation are provided in the National Application Annexes.*

2.4 When assessing impacts on the water environment as part of the environmental assessment process, the principles set out in the DMRB environmental assessment documents LA 101 [Ref 10.N], LA 102 [Ref 13.N], LA 103 [Ref 12.N] and LA 104 [Ref 6.N] shall apply.

2.5 Where a project has the potential to have a significant effect on a Natura 2000 site, a Habitats Regulations Assessment (HRA) must be carried out to comply with the Conservation (Natural Habitats, &c.) Regulations 92/43/EEC [Ref 3.N], also known as 'the Habitats Directive', as detailed in LA 115 [Ref 7.N].

Surface water

2.6 In line with the 2000/60/EC [Ref 4.N], discharges from road runoff must be designed so that water quality within receiving surface waters (following mixing of the road discharge and receiving waters), does not exceed published Environmental Quality Standards (EQSs) M-BAT [Ref 15.N].

2.7 Road drainage shall not be discharged into lakes, ponds, canals or reservoirs unless a site specific risk assessment demonstrates that this would represent no or minimal risk to the water quality of the lake, pond, canal or reservoir.

2.8 The methods adopted in the site specific risk assessment of any potential impacts on lakes, ponds, canals or reservoirs shall be agreed in consultation with the relevant environmental bodies and the Overseeing Organisation.

2.8.1 Where the project alters the discharge to a lake, pond, canal or reservoir the responsible owner should be consulted.

Groundwater

2.9 Groundwater must be managed in accordance with relevant national legislation.

NOTE *Overseeing Organisation specific requirements on groundwater can be provided in the National Application Annexes.*

Flood risk

2.10 Flood risk must be managed in accordance with relevant legislation requirements of the Overseeing Organisation.

NOTE *Overseeing Organisation specific requirements on flood risk can be found in the National Application Annexes.*

2.11 Flood risk shall be managed in accordance with the national policy requirements for each Overseeing Organisation.

NOTE *Overseeing Organisation specific requirements on flood risk can be found in the National Application Annexes.*

2.12 All projects on motorways and all-purpose trunk roads shall be designed to:

1) remain operational and safe for users in times of flood;
2) result in no net loss of floodplain storage;
3) not impede water flows; and
4) not increase flood risk elsewhere.

2.13 The Flood Risk Assessment (FRA) (or equivalent) of the project must apply the latest climate change allowances in accordance with relevant national legislation requirements.

NOTE *Overseeing Organisation-specific requirements on climate change allowances can be found in the National Application Annexes.*

2.14 Environmental permits/ licences (or registered exemptions) must be obtained prior to carrying out any activity that has the potential to affect flood risk, in accordance with the relevant legislative requirements.

NOTE *Overseeing Organisation-specific requirements on flood risk can be found in the National Application Annexes.*

2.15 Where an embankment (as part of a project) has the potential to hold a large volume of floodwater such that it would be defined as a reservoir, national legislation must be followed.

NOTE *Overseeing Organisation-specific requirements on reservoirs can be found in the National Application Annexes.*

3. Assessment of impacts

Levels of assessment

3.1 The assessment requirements of LA 102 [Ref 13.N] (Screening projects for Environmental Impact Assessment) and LA 103 [Ref 12.N] (Scoping projects for environmental assessment) shall apply.

3.2 Where scoping identifies a likely significant adverse effect on the water environment, a simple assessment shall be undertaken in accordance with LA 101 [Ref 10.N] Introduction to environmental assessment and using the appropriate method shown in Table 3.2.

Table 3.2 Levels and methods of assessment

Potential Impact	Mechanism(s)	Levels and methods of assessment		
		Scoping	**Simple**	**Detailed**
Water quality (surface water)	Routine runoff (acute impacts from soluble pollutants and chronic impacts from sediment related pollutants)	Follow requirements in LA 103 [Ref 12.N] Scoping projects for Environmental Assessment	Routine runoff and surface water quality assessment (HEWRAT)	No detailed assessment method available - pass or fail at simple assessment.
	Routine runoff (annual average soluble concentrations)			Bioavailability assessment using UKTAG Rivers and Lakes Metal Bioavailability Assessment Tool (M-BAT) M-BAT [Ref 15.N].
	Spillage		Spillage assessment	No detailed assessment method available - pass or fail at simple assessment.
Water quality (groundwater)	Routine runoff		Routine runoff and groundwater quality assessment	Site specific method to be devised. Approach to be discussed and agreed with the relevant consultation body.
	Spillage		Spillage assessment	No detailed assessment method available - pass or fail at simple assessment.
Groundwater level and flow	Altered drainage regime, physical barrier, dewatering		Groundwater level and flow assessment	Increasingly sophisticated conceptual model. Approach to be discussed and agreed with the Overseeing Organisation and relevant consultation body.
Groundwater dependent terrestrial ecosystems (GWDTE)	Altered drainage regime, physical barrier, dewatering		GWDTE assessment	Site specific method to be devised. Approach to be discussed and agreed with the Overseeing Organisation and relevant consultation body.
	Routine runoff		Routine runoff and groundwater quality assessment	

Table 3.2 Levels and methods of assessment (continued)

Potential Impact	Mechanism(s)	Levels and methods of assessment		
		Scoping	**Simple**	**Detailed**
Groundwater dependent terrestrial ecosystems (GWDTE)	Spillage	Follow requirements in LA 103 [Ref 12.N] Scoping projects for environmental assessment.	Spillage assessment	No detailed assessment method available - pass or fail at simple assessment.
Hydromorphology of surface water body	Flow rate, scour		Site specific simple assessment	Site specific method to be devised. Approach to be discussed and agreed with the Overseeing Organisation and relevant consultation body.
	Construction in or alteration of bed and banks			
Flood risk (to project)	Alignment, location, drainage design		Flood risk assessment - Adhere to the requirements of the Overseeing Organisation.	
Flood risk (resulting from project)	Drainage design, impoundment, runoff rate, blockage, barrier			
Construction phase Impacts	Spillage, sediment release, scour, blockage and others		Follow guidance in CIRIA C648 [Ref 2.N]	
Cumulative impacts	Above mechanisms in combination		Follow requirements in LA 104 [Ref 6.N] Environmental assessment and monitoring.	
Contravention of WFD	Above mechanisms in isolation or combination		WFD assessment (informed by assessments above)	

NOTE *Further detail on the methods listed in Table 3.2 is given in the sections which follow the table.*

3.2.1 Where a positive response is provided to the following scoping questions (which are not exhaustive), the relevant simple assessment from Table 3.2 should be undertaken:

1) does the project have the potential to affect an existing watercourse in terms of water quality, hydromorphology or water quantity?;
2) does the project have the potential to affect a floodplain?;
3) does the project have the potential to cross an existing watercourse where upstream flooding is an existing problem or where there has been significant development in the upstream catchment since the crossing was built?;
4) does the project have the potential to change either the road drainage or natural land drainage catchments?;
5) does the project have the potential to lead to an increase in traffic flow of more than 20%?;
6) does the project have the potential to change the number or type of junctions?;
7) is any of the project located within flood zone 2, flood zone 3 or a source protection zone?;
8) can earthworks result in sediment being carried to watercourses?;
9) can earthworks alter the groundwater flow regime?;
10) does the project have the potential to allow drainage discharges to the ground?

3.3 Where the simple assessment identifies a likely significant adverse effect on the water environment, and mitigation is not incorporated to prevent the adverse effect, a detailed assessment shall be undertaken in accordance with LA 101 [Ref 10.N] Introduction to environmental assessment and using the appropriate method shown in Table 3.2.

3.3.1 Detailed assessment methodologies are not available for all potential effects, and where this is the case, appropriate methods should be agreed with the Overseeing Organisation or relevant statutory consultation body.

3.4 Where a simple or detailed assessment identifies a likely significant effect, the design to mitigate this effect shall be agreed with the Overseeing Organisation and relevant statutory consultation body.

3.5 A change management process shall be implemented throughout the project lifecycle to record and assess design changes in accordance with the requirements of LA 104 [Ref 6.N] Environmental assessment and monitoring.

Methods of assessment

Routine runoff and surface water quality

3.6 Where scoping identifies the potential for likely significant effect on surface water quality from routine runoff, simple assessment shall be undertaken using the Highways England Water Risk Assessment Tool (HEWRAT) to determine whether the risk is acceptable.

NOTE 1 *Where Annual Average Daily Traffic (AADT) is less than 10,000, further information about the applicability of HEWRAT can be provided in the National Application Annexes.*

NOTE 2 *HEWRAT is a Microsoft Excel application which can be downloaded from Highways England's online drainage asset data management system (HADDMS) and is applicable to all Overseeing Organisations.*

NOTE 3 *HEWRAT is a publically accessible tool available from the downloads link on the landing page of HADDMS HADDMS [Ref 9.N].*

NOTE 4 *Further detail on the method of assessment for routine runoff and surface water quality and a description of the parameters used, is given in the HEWRAT Help Guide which is accessed from within the HEWRAT tool by clicking on the 'HELP GUIDE' button.*

NOTE 5 *HEWRAT can produce the following outcomes:*

1) a pass or fail result for acute impacts from soluble pollutants;

2) a pass or fail result for chronic impacts due to sediment related pollutants;

3) compliance with EQSs annual average concentrations of soluble pollutants.

3.7 The latest version of HEWRAT shall be used for the simple assessment.

3.8 Where the discharge fails the HEWRAT simple assessment for annual average concentrations of soluble pollutants, and proportionate mitigation cannot be readily incorporated, a detailed assessment shall be carried out using the UKTAG Rivers and Lakes Metal Bioavailability Assessment Tool (M-BAT) M-BAT [Ref 15.N].

NOTE While M-BAT provides a more detailed assessment for annual average concentrations of soluble pollutants, it does not provide a more detailed method for assessing the acute impact of soluble pollutants nor the chronic impact of sediment related pollutants.

3.9 The annual average concentrations predicted by HEWRAT or M-BAT must be lower than the EQSs to achieve compliance with the 2000/60/EC [Ref 4.N].

3.10 The default EQS values for dissolved copper and dissolved zinc within HEWRAT shall be manually adjusted where they are no longer current.

NOTE The UK Technical Advisory Group (UKTAG) has derived UK-specific EQSs, including copper and zinc, to be utilised in the implementation of WFD river basin management planning.

3.11 For assessment of impacts associated with soluble pollutants, outfalls within 1km (measured along the watercourse) shall be aggregated for purposes of cumulative assessment.

3.12 For assessment of impacts associated with sediment related pollutants, outfalls within 100m (measured along the watercourse) shall be aggregated for purposes of cumulative assessment.

NOTE To aggregate the outfalls for assessment in HEWRAT, the drained areas are added together.

3.13 The geographical location for the surface water quality assessment shall be clearly identified.

3.13.1 The geographical location for cumulative assessment of water quality should be clearly identified and be at or downstream of the last outfall in the reach.

3.13.2 The geographical location of the water quality assessment should not be within a highway drain or ditch.

3.13.3 Where a discharge is into a ditch or drain (owned by the Overseeing Organisation) that discharges into a natural (or heavily modified) watercourse after a short distance, the assessment should focus on the watercourse and not the ditch or drain.

3.14 Table 3.14 defines all outcome combinations for the routine runoff and surface water quality assessment and the action shall be applied to the relevant scenario.

Table 3.14 Assessment outcomes and actions

Acute-soluble and chronic-sediment impacts	Annual average concentrations (compliance with EQSs)	Action
Pass	Pass	1) No further action
Fail	Pass	1) Factor in effects of proposed mitigation and reassess. 2) Determine implications of redesign and reassess. 3) Weigh up benefits over whole project. 4) Discuss with Overseeing Organisation and EPA and agree action.
Pass	Fail	1) Factor in effects of proposed mitigation and reassess. 2) Check sensitivity of modelling to input 0pt parameters e.g. Q95. 3) Discuss with Overseeing Organisation and EPA and agree action.
Fail	Fail	1) Factor in effects of proposed mitigation and reassess. 2) Redesign and reassess. 3) Discuss with Overseeing Organisation and EPA and agree action.

NOTE 1 *A 'pass' is only achieved if both the acute-soluble and the chronic-sediment assessments pass.*

NOTE 2 *An EQS 'pass' is only achieved if both the dissolved zinc and the dissolved copper assessments pass.*

Groundwater level and flow

3.15 Where scoping identifies the potential for likely significant effect on groundwater level and flow, a simple assessment shall be undertaken following the procedure set out in Appendix A.

3.16 A groundwater level and flow detailed assessment shall be carried out if the conceptual model developed for the simple assessment cannot rule out the potential for significant impacts for groundwater levels and flow.

3.16.1 For a groundwater level and flow detailed assessment, the sophistication of the conceptual model may need to be increased.

3.17 The approach and level of detail of a groundwater level and flow detailed assessment shall be agreed with the Overseeing Organisation and relevant consultation body.

NOTE *The following references provide useful advice for carrying out the groundwater level and flow assessment:*

1) *Environment Agency, 2007, Hydrogeological Impact Appraisal for Groundwater Abstractions Science Report SC040020/SR2 [Ref 20.I].*
2) *Environment Agency, 2007, Hydrogeological Impact Appraisal for Dewatering Abstractions SC040020/SR1 [Ref 19.I].*
3) *Scottish Environmental Protection Agency, 2013, Regulatory Method (WAT-RM-16), Hydrogeologist Input to Groundwater Abstraction Assessment WAT-RM-16 [Ref 26.I].*
4) *Environment Agency, 2002. Groundwater Resources Modelling: Guidance Notes and Template Project Brief (Version 1). Strategic Review of Groundwater Modelling Guidance Notes W213 [Ref 14.I].*
5) *Defra/Environment Agency, 2003, Guidebook of Applied Fluvial Geomorphology FD1914 [Ref 17.I].*
6) *Defra/Environment Agency. Groundwater risk assessment for your environmental permit. Groundwater risk assessment [Ref 15.I].*

Groundwater dependent terrestrial ecosystems (GWDTE)

3.18 GWDTE that are statutory (Natura 2000 and SSSI), non-statutory (UK Biodiversity Action Plan) priority habitats or local nature reserves shall be included in scoping.

3.19 Where scoping concludes the potential for likely significant effect on GWDTE, a simple assessment shall be undertaken.

NOTE The Natura 2000 site details and the SSSI citation provide information on whether the identified site(s) relate to water dependent communities and habitats that have the potential to be impacted.

3.20 The GWDTE simple assessment shall follow the procedure set out in Appendix B.

3.21 The GWDTE detailed assessment shall be carried out if the result of the simple assessment procedure set out in Appendix B concludes the potential for likely significant effect.

3.22 The requirements for the detailed assessment of impacts to GWDTE shall be agreed with the Overseeing Organisation and the relevant consultation body.

3.23 In addition to the assessment requirements set out above, where there is potential for direct physical loss (partial or whole) of a GWDTE, the impact shall be assessed using the methods set out in LA 108 [Ref 1.N].

Groundwater quality and routine runoff

3.24 Where scoping identifies the potential for likely significant effects on groundwater quality from routine runoff, a simple assessment shall be undertaken using the method described in Appendix C.

3.24.1 HEWRAT provides the facility to perform the groundwater quality and routine runoff simple assessment though manual calculation may be used if preferred.

NOTE The manual calculations, and a description of the parameters used in a groundwater quality and routine runoff simple assessment, are given in Appendix C.

3.25 Notwithstanding the findings of the scoping assessment, a simple assessment shall be undertaken where:

1) infiltration of routine runoff to ground is proposed as part of the project;
2) unlined road drainage is proposed;
3) road drainage discharges to a watercourse that dries up in most years; or
4) the Q95 flow of the watercourse is one litre per second or less.

NOTE A simple assessment output indicates the level of risk; either low, medium or high.

3.25.1 Where the risk indicated in a groundwater quality and routine runoff simple assessment is low, the design of the discharge may be selected to most effectively meet the hydraulic requirements of the road drainage.

3.26 Where the risk indicated in a groundwater quality and routine runoff simple assessment is medium or high, a detailed assessment shall be completed by a competent expert with the degree of detail being appropriate to the medium or high result.

3.27 The approach for detailed assessment of and groundwater quality and routine runoff shall be agreed with the relevant consultation body.

3.27.1 The detailed assessment for groundwater quality and routine runoff should involve the collection of further information, the nature and scale of which is to be determined by the competent expert.

3.28 The need for, and nature of, measures to mitigate the effects of routine runoff on groundwater quality shall be informed by the detailed assessment.

3.29 Discharge to ground within a SPZ 1 shall be subject to a detailed assessment.

3.29.1 Discharge to ground within a SPZ 1 should be avoided.

3.30 Where there is potential for infiltration to by-pass the unsaturated zone, for example in extensively fractured ground, a detailed assessment shall be undertaken.

3.31 Discharge to ground via deep, point-type soakaways such as deep shafts or boreholes shall be subject to a detailed assessment.

3.31.1 Discharge to ground via deep, point-type soakaways should be avoided.

3.31.2 A minimum depth of one metre to groundwater should be maintained by any infiltration device.

Spillage and water quality

3.32 Where scoping identifies the potential for likely significant effects on either surface water quality or groundwater quality from spillage, a spillage assessment shall be undertaken using the method provided in Appendix D.

3.32.1 When completing a spillage assessment, the assessor should gain familiarity with the manual calculations.

NOTE *HEWRAT provides an automated facility to perform a spillage assessment.*

3.33 Using the spillage assessment method, for the risk of a serious pollution incident to be acceptable the calculated annual probability of such an incident shall not be greater than 1%.

3.34 Using the spillage assessment method, for the risk of a serious pollution incident to be acceptable the calculated annual probability shall not be greater than 0.5% where spillage has the potential to affect a:

1) SSSI;
2) SPZ;
3) protected area;
4) drinking water supply; or
5) commercial activity abstracting from the watercourse.

3.35 The relevant consultation body shall be consulted if there is an abstraction less than 1 km downstream of the highway outfall.

3.36 Where more than one outfall discharges to the same reach of a watercourse, the combined risk from the outfalls shall be assessed.

3.37 Where the highway outfalls are deemed to discharge to different reaches, justification shall be given.

3.38 Where more than one soakaway discharges to the same groundwater body, the combined risk from the soakaways shall be assessed.

Hydromorphological assessment

3.39 Where scoping identifies the potential for likely significant effect on hydromorphology, a simple assessment shall be undertaken to determine whether the degree of hydromorphological change is acceptable.

3.40 The appropriate method of assessment to measure hydromorphological change shall be determined by a competent expert on a site specific basis.

NOTE *There are no prescriptive methods for hydromorphological assessment.*

3.40.1 The guidance on hydromorphological assessments in Appendix E should be followed.

3.40.2 The simple assessment of hydromorphological change should be desk-based.

3.40.3 The simple assessment of hydromorphological change may include a site visit to make basic observations.

3.40.4 The simple assessment should identify the hydromorphological characteristics of the water bodies that have the potential to be affected by the road project.

3.40.5 The simple assessment should assess how the proposed changes can affect the hydromorphological elements which support the biological elements of those water bodies.

3.41 The simple assessment shall conclude whether, the degree of hydromorphological change resulting from the project is compliant with the requirements of the 2000/60/EC [Ref 4.N].

3.42 Where the potential degree of hydromorphological change is not compliant with 2000/60/EC [Ref 4.N], a detailed assessment shall be undertaken.

3.43 For a watercourses not within the 2000/60/EC [Ref 4.N] reporting network, where the simple assessment identifies likely significant adverse effects a detailed assessment shall be undertaken.

3.44 Before progressing to a detailed assessment the approach shall be agreed with the relevant consultation body and the Overseeing Organisation.

NOTE *A detailed assessment is likely to require the collection of empirical data from the site.*

3.45 The hydromorphological assessments (simple and detailed) have elements of subjectivity and shall be carried out by a competent expert.

Flood risk

3.46 Where scoping identifies likely significant effect on flood risk, a FRA (or equivalent) shall be carried out in accordance with the requirements of the Overseeing Organisation.

NOTE *Overseeing Organisation-specific requirements on flood risk can be provided in the National Application Annexes.*

3.47 The FRA (or equivalent) shall use the latest climate change allowances published by the relevant authority.

Construction phase impacts

3.48 An assessment of construction phase impacts shall be undertaken.

3.48.1 Construction phase effects should use the baseline year to represent the conditions prior to construction starting, as required by LA 104 [Ref 6.N] Environmental assessment and monitoring.

3.48.2 An assessment of construction phase impacts should use the advice given in CIRIA C648 [Ref 2.N] on potential impacts arising during the construction phase and the assessment and mitigation of these risks.

Cumulative assessment

3.49 Where scoping identifies likely significant effects from road drainage on the water environment through a combination of mechanisms, the assessment of these cumulative impacts and their significance shall be undertaken in accordance with LA 104 [Ref 6.N] Environmental assessment and monitoring.

WFD assessment

3.50 All water bodies (both surface water and groundwater) designated under the 2000/60/EC [Ref 4.N] that have the potential to be affected by a road project shall be identified and included when scoping the WFD assessment.

3.51 The WFD assessment shall identify which of the quality elements (and in the case of groundwater, quantity elements) are potentially at risk of impact from a project.

3.52 Where the quality or quantity elements of a water body are potentially at risk of impact from a project, the current WFD status and target WFD status of the water body shall be described.

3.53 For water bodies and quality/quantity elements which are scoped out of further assessment, justification shall be provided.

3.54 The baseline data and water body classifications shall be based on the WFD cycle in place at the time of the assessment.

NOTE *Details of the current WFD status and WFD objectives of water bodies and protected areas are available online WFD Status & Objectives [Ref 8.N].*

3.55 The WFD quality and quantity elements identified through scoping as being at potential risk of impact from a project shall be assessed in a WFD assessment.

3.56 A WFD assessment shall identify how the road project has the potential to affect each of the water body's quality/quantity elements and whether it could lead to non-compliance with the WFD.

3.56.1 The results of the other assessments in this document may be used to inform the WFD assessment.

3.56.2 Realistic opportunities for enhancing water quality as part of road projects should be sought.

3.57 For water bodies that have the potential to be impacted by the project, the effect of the project on any mitigation measures identified within the relevant River Basin Management Plan (RBMP) shall be assessed.

NOTE *Further advice on how to complete a WFD assessment is available from the environmental consultation body and other relevant national authorities.*

Consultation

3.58 Consultation shall be undertaken in accordance with DMRB environmental assessment documents LA 101 [Ref 10.N], LA 102 [Ref 13.N], LA 103 [Ref 12.N] and LA 104 [Ref 6.N].

3.59 Where projects have the potential to result in discharges of road runoff and affect protected areas, consultation shall be undertaken with the relevant consultation body.

3.60 Where projects have the potential to result in discharges of road runoff and affect sites of specific scientific interest (SSSIs) and/or groundwater source protection zones (SPZs) zones 1 or 2, consultation shall be undertaken with the relevant consultation body.

3.61 Where a response from a consultation body includes requirements in relation to design, implementation shall be agreed with the Overseeing Organisation and/or competent authority.

Design and mitigation

3.62 Environmental assessment and design shall incorporate mitigation measures using the hierarchical system as required by LA 104 [Ref 6.N] Environmental assessment and monitoring.

3.63 New mitigation measures shall not compromise any existing or planned mitigation measures identified separately by the relevant consultation body.

NOTE 1 CG 501 [Ref 5.I]is a useful source of information on treatment systems and their effectiveness at removing pollutants.

NOTE 2 For mitigation of risk to groundwater from routine runoff, research Jeffries et all [Ref 30.I] Byrns & Brewin 2010 [Ref 12.I] has established that, given the right ground conditions, it is possible for significant pollutant attenuation to occur within soils and the unsaturated zone.

Mitigation for groundwater level and flow and GWDTE

3.64 Where the environmental assessment identifies likely significant effects on groundwater level and flow or GWDTE, effective mitigation shall be incorporated.

3.64.1 The following generic mitigation measures may be used for the physical protection of receptors:

1) replacement or alteration of water supply by connection to new sources or construction of new wells out of the impact zone;
2) installation of low permeability cut-off walls around engineering works or particular receptors to reduce groundwater level and flow impacts;
3) installation of temporary low-permeability cut-off walls that can be removed or degrade over time to prevent long term level or flow alterations;
4) relocation or modification works to protect underground structures against any imposed changes;
5) limits to the scale, depth and time of temporary dewatering or abstractions by change of method or by division of works to reduce the zone of influence of dewatering;
6) reduction in the use of damaging construction methods to aquifer physical properties such as blasting or over consolidating;
7) avoidance of sensitive aquifers or aquifer boundaries such as confining layers.

3.64.2 The following generic mitigation measures may be used for the management of water balance:

1) provision of (compensatory) discharges to GWDTEs to support water level and flows where these may be reduced;
2) provision of (compensatory) discharges to surface water bodies that are groundwater fed or feeding to support water level and flows and groundwater recharge;
3) provision of discharges to groundwater using infiltration to maintain level and flows for abstraction and to protect against settlement;
4) abstraction of groundwater to prevent increases in levels and flows that may lead to damage or flooding;
5) provision of monitoring of water levels in nearby wells or surface water to enable/ identify further mitigation measures when needed.

Spillage mitigation

3.65 Where the environmental assessment identifies likely significant effects from spillage, effective mitigation shall be incorporated.

3.65.1 Where a number of outfalls (or soakaways) combine to give a likely significant effect, the outfall (or soakaway) which contributes the highest risk should be the focus for mitigation measures.

3.65.2 Where two forms of mitigation measures are necessary, they should be complementary and not rely on the same mechanisms for their effect.

3.65.3 Where two forms of mitigation measures are necessary, at least one should be a passive system that does not require an operator.

NOTE Automated control of spillage containment systems is unlikely to be practical, reliable or cost effective in the rare event that the systems are required to contain a spillage.

Hydromorphological mitigation

3.66 Where the environmental assessment of hydromorphology identifies likely significant effects, effective mitigation shall be incorporated.

3.66.1 Hydromorphological mitigation options may include:

1) bridges - design of piers/abutments to minimise impacts on channel flows;
2) diversions and realignments - replication of natural channel characteristics in order to minimise changes in flow dynamics and sediment transport;
3) culverts – minimising the use of culverts, but where needed adapting their design to match flow dynamics and erosion of neighbouring watercourse;
4) structures – avoiding the use of structures, but where needed use of softer options such as timber piling or coir matting in order to reduce interruption of the continuity of the natural hydraulic and sediment regimes;
5) outfalls - using sustainable drainage systems to control outflow rates and water quality and minimise in-channel erosion.

NOTE Further advice on mitigation measures is available from sources such as the European Centre for River Restoration ECRR [Ref 11.I] and The River Restoration Centre The River Restoration Centre [Ref 36.I].

Flood mitigation

3.67 Where the environmental assessment of flood risk identifies likely significant effects, effective mitigation shall be incorporated.

3.67.1 To assess the impact of flood mitigation measures, an unsteady hydraulic model should be developed to simulate the changes in water levels both upstream and downstream.

3.68 Mitigation measures shall not result in an increase in flood levels elsewhere in the catchment nor have an adverse effect on the road project under other flow conditions.

3.68.1 Flood mitigation measures may include:

1) amendment of the road geometry;
2) flood relief culverts;
3) replacement flood storage areas;
4) flood walls;
5) flood protection embankments, levees or berms;
6) local embankments to protect isolated features; and
7) changing the resistance of the floodplain to flood flow by:
    a) removal of existing obstructions, including vegetation;
    b) ground lowering; or
    c) creating new openings in existing embankments (to increase conveyance).

3.68.2 The design of flood walls and embankments should allow for the discharge of local drainage during a flood.

NOTE 1 Mitigation measures such as large-scale straightening or deepening of rivers is not acceptable unless these options offer demonstrable improvements to flood risk management and the natural environment.

NOTE 2 Channel alteration works have implications for river maintenance as the river will try to recover its original shape unless regular maintenance is undertaken.

NOTE 3 Berms and floodplain lowering have the potential to result in waterlogging, with consequent land use and maintenance problems.

NOTE 4 Berms have the potential to prevent access to the river for maintenance or public enjoyment.

NOTE 5 Further advice on the control of flood risk is provided in CG 501 [Ref 5.I].

NOTE 6 Additional sources of information on the control of pollution, mitigation of flood risk and mitigation of hydromorphological impacts are:

1) *CIRIA C532 [Ref 3.I] - Control of Water Pollution from Construction Sites;*
2) *CIRIA R742 [Ref 25.I] - Manual on Scour at Bridges and other Hydraulic Structures, second edition;*
3) *CIRIA C648 [Ref 2.N] - Control of Water Pollution from Linear Construction Projects;*
4) *CIRIA C689 [Ref 4.I] - Culvert Design and Operation Guide;*
5) *CIRIA C753 [Ref 33.I] - The SuDS Manual;*
6) *CD 532 [Ref 34.I] Vegetated Drainage Systems for Highway Runoff;*
7) *CD 522 [Ref 9.I] Drainage of Runoff from Natural Catchments;*
8) *CD 529 [Ref 6.I] Design of Outfall and Culvert Details;*
9) *CD 530 [Ref 7.I] Design of Soakaways;*
10) *CD 521 [Ref 18.I] Hydraulic design of road edge surface water channels and outlets;*
11) *SEPA website [Ref 28.I] and SNH [Ref 29.I] (a range of guidance documents for planning mitigation measures for road projects and hydromorphology); and*
12) *Water Framework Directive Mitigation Measures Online Manual WFD Manual [Ref 35.I];*
13) *European Centre for River Restoration ECRR [Ref 11.I]; and*
14) *The River Restoration Centre The River Restoration Centre [Ref 36.I].*

Assessment of significance

3.69 For each of the relevant water attributes listed in Table 3.69 the significance of the potential impacts shall be reported.

Table 3.69 Water features: attributes and indicators of quality

Feature	Attribute	Indicator of quality	Possible measure
River/stream	Water supply/quality	Amount used for water supply (potable) Amount used for water supply (industrial/agricultural) Chemical water quality	Location and number of abstraction points Volume abstracted daily WFD chemical status
	Dilution and removal of waste products.	Presence of surface water discharges Effluent discharges	Daily volume of discharge (treated/untreated)
	Recreation	Access to river Use of river for recreation	Length of river used for recreation (fishing, water sports) Number of clubs
	Value to economy	Value of use of river	Length of river used for recreation commercially. Number of people employed Length of river bank developed Length of river fished commercially
	Conveyance of flow	Presence of watercourses	Number and size of watercourses, natural, artificial or heavily modified water body Number of watercourses artificially managed to control flow/levels
	Biodiversity	Biological water quality	Fisheries quality
		Fisheries quality	Fish status, as defined in the 2000/60/EC [Ref 4.N]
Floodplain	Conveyance of flow	Presence of floodplain Flood flows	Developed area within extent of floodplain affected, as determined from hydraulic modelling Flood risk Mean annual flood
Groundwater	Water supply/quality	Amount used for water supply Amount used for water supply (industrial/agricultural)	WFD groundwater quantitative and chemical status Catchment abstraction management Strategy (CAMS) status Location and number of abstraction points Volume abstracted daily and use (potable most important) Location and grade of SPZ

Table 3.69 Water features: attributes and indicators of quality (continued)

Feature	Attribute	Indicator of quality	Possible measure
Groundwater	Soakaway	Presence of soakaways or other discharges to the ground	Location, type and number of discharge points. Daily volume discharged
	Vulnerability	Groundwater vulnerability	Classification of aquifer vulnerability
	Economic value	Extent of use for abstractions	Number of people employed, cost of alternatives
	Conveyance of flow	Presence of groundwater supported watercourses. Potential for groundwater flooding Groundwater interception by road structures or drainage	Changes to groundwater recharge, levels or flows Number and size of watercourses fed by baseflow
	Biodiversity	Presence of GWDTE	Changes to groundwater recharge, levels or flows. Status or classification of wetland including GWDTE under WFD
Estuaries and coastal waters	Water quality	Chemical water quality	WFD chemical status
	Dilution and removal of waste products	Presence of surface water discharges Effluent discharges	Daily volume of discharge (treated/ untreated).
	Recreation	Access to river/coast Use of river/coast for recreation	Length of river used for recreation (fishing, water sports) Number of clubs
	Value to economy	Extent of employment	Number of people employed
	Biodiversity	Biological water quality	WFD ecological status
		Fisheries quality Wading birds or over-wintering birds Estuarine/marine features	Fish status, as defined in the 2000/60/EC [Ref 4.N] Assemblages of wading bird species or numbers of over-wintering birds Meeting site conservation objectives

Table 3.69 Water features: attributes and indicators of quality (continued)

Feature	Attribute	Indicator of quality	Possible measure
Lakes, ponds and reservoirs	Recreation	Access Use for recreation	Area used for recreation (fishing, water sports) Number of clubs
	Water supply/quality	Amount used for water supply (potable) Amount used for water supply (industrial/agricultural) Chemical water quality	Volume abstracted daily WFD chemical status
	Dilution and removal of waste products	Presence of surface water discharges Effluent discharges	Daily volume of discharge (treated/ untreated)
	Value to economy	Extent of employment	Number of people employed
	Biodiversity	Biological water quality	WFD ecological status
		Fisheries quality Populations of birds	Fish status, as defined in the 2000/60/EC [Ref 4.N] Assemblages or number of species of UK biodiversity Action plan or birds of conservation concern
Canals	Water supply/quality	Amount used for water supply (potable) Amount used for water supply (industrial/ agricultural) Chemical water quality	Location and number of abstraction points Volume abstracted daily WFD chemical status
	Recreation	Access to canal. Use of canal for recreation.	Length used for recreation (fishing, boating) Number of clubs/marinas
	Value to economy	Extent of employment	Number of people employed
	Dilution and removal of waste products	Presence of surface water discharges. Effluent discharges.	Daily volume of discharge (treated/ untreated)
	Biodiversity	Biological water quality	WFD ecological status
		Fisheries quality Populations of birds	Fish status, as defined in the 2000/60/EC [Ref 4.N] Assemblages or number of species of UK biodiversity Action plan or birds of conservation concern

3.70 The importance of the attribute shall be assigned based on the quality indicators and measures in Table 3.70 and the criteria in Table 3.70 (using the typical examples as a gauge).

Table 3.70 Estimating the importance of water environment attributes

Importance	Typical criteria	Typical examples	
Very high	Nationally significant attribute of high importance	Surface water:	Watercourse having a WFD classification shown in a RBMP and $Q_{95} \geq 1.0$ m^3/s. Site protected/designated under EC or UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/Species protected by EC legislation LA 108 [Ref 1.N].
		Groundwater:	Principal aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation LA 108 [Ref 1.N]. Groundwater locally supports GWDTE SPZ1
		Flood risk:	Essential infrastructure or highly vulnerable development
High	Locally significant attribute of high importance	Surface water:	Watercourse having a WFD classification shown in a RBMP and Q_{95} $<1.0m^3/s$. Species protected under EC or UK legislation LA 108 [Ref 1.N].
		Groundwater:	Principal aquifer providing locally important resource or supporting a river ecosystem. Groundwater supports a GWDTE SPZ2
		Flood risk:	More vulnerable development
Medium	Of moderate quality and rarity	Surface water:	Watercourses not having a WFD classification shown in a RBMP and Q_{95} $>0.001m^3/s$.
		Groundwater:	Aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ3
		Flood risk:	Less vulnerable development
Low	Lower quality	Surface water:	Watercourses not having a WFD classification shown in a RBMP and Q_{95} $\leq 0.001m^3/s$.
		Groundwater:	Unproductive strata
		Flood risk:	Water compatible development

NOTE *Vulnerable development, less vulnerable development and water compatible development are defined in the Flood Risk section of the Technical Guidance to the NPPF NPPF 2012 [Ref 14.N].*

3.71 The magnitude of the impact shall be assigned based on the criteria in Table 3.71 using the typical examples as a gauge.

Table 3.71 Estimating the magnitude of an impact on an attribute

Magnitude	Criteria	Typical example	
Major adverse	Results in loss of attribute and/or quality and integrity of the attribute	Surface water:	Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT and compliance failure with EQS values. Calculated risk of pollution from a spillage ≥2% annually (spillage assessment). Loss or extensive change to a fishery. Loss of regionally important public water supply. Loss or extensive change to a designated nature conservation site. Reduction in water body WFD classification.
		Groundwater:	Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Potential high risk of pollution to groundwater from routine runoff - risk score >250 (Groundwater quality and runoff assessment). Calculated risk of pollution from spillages ≥2% annually (Spillage assessment). Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. Reduction in water body WFD classification. Loss or significant damage to major structures through subsidence or similar effects.
		Flood risk:	Increase in peak flood level (> 100mm).

Table 3.71 Estimating the magnitude of an impact on an attribute (continued)

Magnitude	Criteria	Typical example	
Moderate adverse	Results in effect on integrity of attribute, or loss of part of attribute	Surface water:	Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values. Calculated risk of pollution from spillages ≥1% annually and <2 % annually. Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. Contribution to reduction in water body WFD classification.
		Groundwater:	Partial loss or change to an aquifer. Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies. Potential medium risk of pollution to groundwater from routine runoff - risk score 150-250. Calculated risk of pollution from spillages ≥1% annually and <2 % annually. Partial loss of the integrity of GWDTE. Contribution to reduction in water body WFD classification. Damage to major structures through subsidence or similar effects or loss of minor structures.
		Flood risk:	Increase in peak flood level (> 50mm).
Minor adverse	Results in some measurable change in attributes, quality or vulnerability	Surface water:	Failure of either acute soluble or chronic sediment related pollutants in HEWRAT. Calculated risk of pollution from spillages ≥0.5% annually and < 1% annually. Minor effects on water supplies.
		Groundwater:	Potential low risk of pollution to groundwater from routine runoff - risk score <150 Calculated risk of pollution from spillages ≥0.5% annually and <1% annuallyMinor effects on an aquifer, GWDTEs, abstractions and structures
		Flood risk:	Increase in peak flood level (> 10mm)

Table 3.71 Estimating the magnitude of an impact on an attribute (continued)

Magnitude	Criteria	Typical example	
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	The proposed project is unlikely to affect the integrity of the water environment.	
		Surface water:	No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). Risk of pollution from spillages <0.5%.
		Groundwater:	No measurable impact upon an aquifer and/or groundwater receptors and risk of pollution from spillages <0.5%.
		Flood risk:	Negligible change to peak flood level (≤ +/- 10mm).
Minor beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Surface water:	HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually).
		Groundwater:	Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk <1% annually). Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding.
		Flood risk:	Creation of flood storage and decrease in peak flood level (> 1 0mm).
Moderate beneficial	Results in moderate improvement of attribute quality	Surface water:	HEWRAT assessment of both acute-soluble and chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. Calculated reduction in existing spillage by 50% or more (when existing spillage risk >1% annually). Contribution to improvement in water body WFD classification.
		Groundwater:	Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is >1% annually). Contribution to improvement in water body WFD classification. Improvement in water body catchment abstraction management Strategy (CAMS) (or equivalent) classification. Support to significant improvements in damaged GWDTE.
		Flood risk:	Creation of flood storage and decrease in peak flood level1 (> 50mm).

Table 3.71 Estimating the magnitude of an impact on an attribute (continued)

Magnitude	Criteria	Typical example	
Major beneficial	Results in major improvement of attribute quality	Surface water:	Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse. Improvement in water body WFD classification.
		Groundwater:	Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification.
		Flood risk:	Creation of flood storage and decrease in peak flood level (> 1 00mm).
No change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.	

NOTE *All references to peak flood level in Table 3.71 are for a 1% annual probability event, including climate change. Where access or egress routes are affected, the magnitude of the impact is defined by the change in the Flood Hazard Rating as defined by Defra and the EA (Flood Risk Assessment Guidance for New Development Phase 2) FD2320 [Ref 13.I].*

3.72 Once the importance of each attribute and the magnitude of the potential impact upon it are established, the significance of the potential impact shall be determined in accordance with LA 104 [Ref 6.N] Environmental assessment and monitoring.

3.73 The assessment of the significance of potential impacts before or after mitigation shall be in accordance with the requirements of the Overseeing Organisation as detailed in the relevant NAA.

4. Reporting

4.1 The reporting requirements in LA 101 [Ref 10.N] Introduction to environmental assessment, LA 102 [Ref 13.N] Screening and LA 103 [Ref 12.N] Scoping and LA 104 [Ref 6.N] Environmental assessment and monitoring shall be followed.

4.2 The mitigation required shall be recorded in the Environmental Management Plan (EMP) and subsequently the Construction Environmental Management Plan (CEMP).

4.3 Where erosion or sediment release has been identified as a potential risk, a management plan shall be included within the EMP and/or CEMP.

4.4 The significance of the impact upon each attribute of the water environment shall be reported in line with the specific national requirements and general guidance in LA 104 [Ref 6.N].

4.5 The report shall conclude whether the project is in compliance with the WFD or not.

5. Monitoring

5.1 The requirements for monitoring of significant adverse effects as set out in LA 104 [Ref 6.N] Environmental assessment and monitoring shall be followed.

6. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	Highways England. LA 108, 'Biodiversity'
Ref 2.N	CIRIA, 2006. Murname, E., Heap, A. and Swain, A.. CIRIA C648, 'Control of Water Pollution from Linear Construction Sites (Technical Guidance)'
Ref 3.N	92/43/EEC, 'Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.'
Ref 4.N	2000/60/EC, 'Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy'
Ref 5.N	2014/52/EU, 'Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment'
Ref 6.N	Highways England. LA 104, 'Environmental assessment and monitoring'
Ref 7.N	Highways England. LA 115, 'Habitats Regulations assessment'
Ref 8.N	WFD Status & Objectives , 'http://environment.data.gov.uk/catchment-planning'
Ref 9.N	http://www.hagdms.co.uk. HADDMS, 'http://www.hagdms.co.uk'
Ref 10.N	Highways England. LA 101, 'Introduction to environmental assessment'
Ref 11.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 12.N	Highways England. LA 103, 'Scoping projects for environmental assessment'
Ref 13.N	Highways England. LA 102, 'Screening projects for Environmental Impact Assessment'
Ref 14.N	Department for Local Communities and Local Government, 2012. NPPF 2012, 'Technical Guidance to the National Planning Policy Framework'
Ref 15.N	UKTAG, 2014. M-BAT, 'UKTAG River and Lake Assessment Method Specific Pollutants (Metals): Metal Bioavailability Assessment Tool (M-BAT), UK Technical Advisory Group on the Water Framework Directive.'

7. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	Highways Agency, 2008. Gaskell, P., Maltby, L. and Guymer, I. . HA 3/368, 'Accumulation and Dispersal of Suspended Solids in Watercourses, ECUS, University of Sheffield, University of Warwick, Report No: HA3/368'
Ref 2.I	Environment Agency . EA CLR11, 'Contaminated Land Report 11: Model Procedures for the Management of Contaminated Land'
Ref 3.I	CIRIA. Masters-Williams, H.. CIRIA C532, 'Control of water pollution from construction sites, Guidance for consultants and contractors'
Ref 4.I	CIRIA, 2010. Balkem et al. CIRIA C689, 'Culvert design and operation guide'
Ref 5.I	Highways England. CG 501, 'Design of highway drainage systems'
Ref 6.I	Highways England. CD 529, 'Design of outfall and culvert details'
Ref 7.I	Highways England. CD 530, 'Design of soakaways'
Ref 8.I	Highways England. CD 535, 'Drainage asset data and risk management'
Ref 9.I	Highways England. CD 522, 'Drainage of runoff from natural catchments'
Ref 10.I	Highways Agency, 2007. Johnson, I. and Crabtree, R.W.. WRc UC 7486/1, 'Effects of Soluble Pollutants on the Ecology of Receiving Waters, WRc Plc, Report No: UC 7486/1 '
Ref 11.I	ECRR, 'European Centre for River Restoration www.ecrr.org'
Ref 12.I	Highways Agency. Byrns, G and Brewin, L. 2010. Byrns & Brewin 2010, 'Fate of Highway Contaminants in the Unsaturated Zone – Final Synthesis Report, March 2010'
Ref 13.I	Defra/Environment Agency, 2005. FD2320, 'Flood Risk Assessment Guidance for New Development Phase 2: Framework and Guidance for Assessing and Managing Flood Risk for New Development – Full Documentation and Tools, R&D Technical Report FD2320/TR2'
Ref 14.I	Environment Agency, 2002. Guidance Notes W213, 'Groundwater Resources Modelling: Guidance Notes and Template Project Brief (Version 1). Strategic Review of Groundwater Modelling. R&D Guidance Notes W213. Bristol, Environment Agency'
Ref 15.I	Defra/Environment Agency, 2003. Groundwater risk assessment, 'Groundwater risk assessment for your environmental permit'
Ref 16.I	UKTAG, 2004 - updated 2009. UKTAG 2009, 'Guidance on the Identification and Risk Assessment of Groundwater Dependent Terrestrial Ecosystems'
Ref 17.I	Defra/Environment Agency, 2003. FD1914, 'Guidebook of Applied Fluvial Geomorphology, R & D Technical Report FD1914'
Ref 18.I	Highways England. CD 521, 'Hydraulic design of road edge surface water channels and outlets'
Ref 19.I	Environment Agency, 2007. SC040020/SR1, 'Hydrogeological Impact Appraisal for Dewatering Abstractions. Science Report SC040020/SR1'
Ref 20.I	Environment Agency, 2007. Science Report SC040020/SR2, 'Hydrogeological Impact Appraisal for Groundwater Abstractions. Science Report SC040020/SR2'

Ref 21.I	Highways Agency, 2008. Crabtree, R.W., Dempsey, P., Moy, F., Brown, C. and Song, M. . UC 7697, 'Improved Determination of Pollutants in Highway Runoff - Phase 2: Final Report, Wrc Plc, Report: UC 7697'
Ref 22.I	Environment Agency, 2011. CICS 4/01, 'Incidents and their classification: the Common Incident Classification Scheme (CICS), Operational Instruction 04_01 '
Ref 23.I	www.jncc.defra.gov.uk. JNCC, 'Joint Nature Conservation Committee (JNCC) '
Ref 24.I	Highways Agency, 2002, . Moy, F., Crabtree, R.W. and Simms, T.. WRc UC 6037, 'Long Term Monitoring of Pollution from Road Runoff: Final Report, WRc Plc, Report No: UC 6037 '
Ref 25.I	Department for Transport. Kirby, Roca, Kitchen, etal. CIRIA R742, 'Manual on scour at bridges and other hydraulic structures'
Ref 26.I	Scottish Environmental Protection Agency, 2013. WAT-RM-16, 'Regulatory Method (WAT-RM-16), Hydrogeologist Input to Groundwater Abstraction Assessment'
Ref 27.I	Haycock Associates, 2005. Turner, Dr. K. and Thorne, Professor C. Turner & Thorne 2005, 'Review of Impact Assessment Tools and Post Project Monitoring Guidance'
Ref 28.I	https://www.sepa.org.uk/. SEPA website, 'Scottish Environmental Protection Agency'
Ref 29.I	https://www.nature.scot/. SNH, 'Scottish Natural Heritage'
Ref 30.I	Jeffries C, Napier F, Fogg P, Nicholson F. Jeffries et all, 'Source Control Pollution in Sustainable Drainage. SNIFFER Project UEUW01. Final Report, February 2008'
Ref 31.I	UKTAG, 2014. GWDTE, 'Technical Report on Groundwater Dependent Terrestrial Ecosystem (GWDTE) Threshold Values'
Ref 32.I	Highways Agency, 2006. Hurle, R.E., Bark, A.W., Bury, N.R. and Caswell, B.. Hurle et al 2006, 'The Effects of Soluble Pollutants on the Ecology of Receiving Waters. Kings College London, Final Report on Highways Agency Project No. 00Y91924 '
Ref 33.I	Construction Industry Research and Information Association. London. Woods-Ballard,B., Wilson,S., Udale Clark,H., Illman,S., Scott,T., Ashley,R., Kellagher,R. CIRIA C753, 'The SuDS Manual'
Ref 34.I	Highways England. CD 532, 'Vegetated drainage systems for highway runoff'
Ref 35.I	The Environment Agency. WFD Manual, 'WFD Mitigation Measures Online Manual'
Ref 36.I	The River Restoration Centre , 'www.therrc.co.uk'

Appendix A. Groundwater levels and flow

A1 Introduction

This methodology constitutes a simple assessment approach. It is based upon FD1914 [Ref 17.I] and Groundwater risk assessment [Ref 15.I] but has been modified to accommodate the range of impacts related to road construction and operation and to fit the overall assessment process for roads and the water environment. A summary of the assessment process for groundwater levels and flows is provided in Table A.1 and this section provides further information on each step.

Table A.1 Groundwater levels and flows assessment

Step 1	Establish regional groundwater body status.
Step 2	Develop a conceptual model for the surrounding area.
Step 3	Based on the conceptual model, identify all potential features which are susceptible to groundwater level and flow impacts.

A2 Step 1 - Establish regional groundwater body status

Determine the status of all regional groundwater bodies within the vicinity of the planned project.

A3 Step 2 - Develop a conceptual model for the surrounding area

Develop a conceptual model to express the current understanding of the characteristics and processes inherent in the groundwater regime and how this influences the behaviour of groundwater, including its interaction with surface water.

The purpose of the model is to understand groundwater flow directions, depth to groundwater, aquifer layering, water quality, interaction with surface water and dependent ecosystems, overall water balance etc. all of which will assist with assessing the risks to groundwater. For simple assessment, the conceptual model should be developed from information and data that are readily available from published sources, such as the EA, SEPA, the BGS, and the Centre for Ecology and Hydrology (CEH) or any available monitoring data.

Conceptual models can be developed at different scales and to different levels of detail depending on the specific task they are designed for. The minimum recommended information can be summarised as:

1) a definition, based on the regional geology and hydrogeology, of the extent of the study area (including defining the WFD water body and its status and the groundwater management unit) and its subdivision into appropriate zones (vertically and horizontally);
2) a description of the hydrogeological conditions and flows at the boundaries of the unit (including vertical boundaries, where the adjoining strata should be identified as aquitards, aquicludes, leaky aquifers etc.);
3) an estimate of the plausible range of aquifer parameters in the unit, and a description of the likely groundwater flow paths or flow patterns;
4) identification of water dependent features of the area such as rivers, ponds, wetlands, springs, seepages, estuaries etc;
5) identification of the major water resources and water quality pressures on the unit (such as other abstractions, and point sources of pollution);
6) a description of the likely mechanisms and locations of interaction between groundwater and surface water features;
7) interpretation of available water quality data; and
8) a description of the limitations of the current conceptual understanding, and the major sources of uncertainty.

The conceptual model should also establish the propensity for the groundwater body to contribute to groundwater flood risk, groundwater emergence and water logging and potential effects on the geotechnical properties of the impacted area.

A4 Step 3 - Identify all potential features which are susceptible to groundwater level and flow impacts

This step focusses on which water features are likely to be affected by the proposed works. The assessment will only progress to this step if a sensitive groundwater receptor is present.

The identification of all the potential water features that are susceptible to groundwater level and flow impacts is part of this step. This may include, for example, rivers, and some lakes or wetlands, groundwater abstractions, underground structures and aquifer flow regimes. Deciding how far afield to look for potential water features is a matter of professional judgement. Further information is provided in FD1914 [Ref 17.I].

Following completion of step 3, the conceptual model should be revisited to determine any remaining uncertainties (if any), where the greatest of these may lie and where efforts to reduce uncertainty would best be focussed.

Appendix B. Groundwater dependent terrestrial ecosystems

B1 Introduction

Assessment of impacts on groundwater dependent terrestrial ecosystems (GWDTE) should be undertaken following a stepped, risk based approach which depends upon establishing linkages between potential impacts from the road development on the hydrological and hydrogeological regime and a GWDTE.

The simple assessment determines whether there is a hydrogeological link with the GWDTE, the importance of the GWDTE, the magnitude of any potential impact on the GWDTE and thereby the overall significance of risk to the GWDTE.

B2 Step 1 - Identify potential linkages

A site specific conceptual hydrogeological model should be developed to provide an overview of the interactions between groundwater, surface water and to identify potential linkages between potential impacts from the road (during construction or operation) and GWDTE.

Groundwater flow paths, groundwater levels and the proximity of the GWDTE should be taken into account in the conceptual hydrogeological model.

If a site specific conceptual hydrogeological model has been developed for the assessment of impacts on groundwater level and flow then this model may be adapted for use to assess impacts on GWDTE.

If the conceptual model demonstrates there is no linkage between the potential impacts from the road and the GWDTE then there is negligible risk and no further assessment is required.

If there is a linkage between the potential impacts from the road and the GWDTE, or a linkage cannot be ruled out, the assessment should proceed to step 2.

B3 Step 2 - Assess GWDTE importance

The UKTAG wetland task team (WTT) provide guidance on using the national vegetation classification (NVC) to determine groundwater dependency of vegetation UKTAG 2009 [Ref 16.I]. Plant communities that are dependent on groundwater are listed using the NVC and are assigned associated groundwater dependency scores. The NVC score, indicating dependence on groundwater, is separated into three groups (3 = low, 2 = moderate, 1 = high) UKTAG 2009 [Ref 16.I].

The importance of the GWDTE is assessed on a three point scale that mirrors the NVC groundwater dependency levels (Table B.1). The importance of the GWDTE is taken as the highest of the 'flora and fauna' and 'habitat' receptors.

Table B.1 Classification and Importance of GWDTE

Receptor	Low	Moderate	High
Flora and fauna	Species are not protected or listed. They are abundant / common and not critical for GWDTE functions, such as predator/prey species or important host flora for protected or listed species. NVC dependency level on groundwater 3.	Species are not globally common species that are rare in UK, or important to GWDTE functioning, such as predator/prey species, or a species that is under threat or the population is declining. NVC dependency level on groundwater 2.	Regionally significant populations of globally threatened or endangered species. Species important to GWDTE functioning, such as predator or prey species. NVC dependency level on groundwater 1.
NVC plant communities			

Table B.1 Classification and Importance of GWDTE (continued)

Receptor	Low	Moderate	High
Habitat As per International Natura 2000 codes Annex I and II and National SSSI. Eleven broad categories grouped by the UKTAG WTT: 1) Quaking bog. 2) Wet dune. 3) Fen (mesotrophic) and fen meadow. 4) Fen (oligotrophic) and wetlands at tufa forming springs. 5) Wet grassland. 6) Wet heath. 7) Peat bog and woodland on peat bog. 8) Wetland directly irrigated by spring or seepage. 9) Swamp (mesotrophic) and reed bed. 10) Swamp (oligotrophic). 11) Wet woodland.	Sites of local biodiversity value but not intact, fragile or unique. Habitats that recover quickly following disturbance (i.e. habitats comprising marine species that readily recolonise disturbed areas).	Habitats that are suffering significant decline at a national or regional level. Habitats of high species number or habitat diversity or 'naturalness'. Habitats that are capable of unassisted recovery to natural conditions following disturbance, although this can require several years (habitats where growing conditions are favourable).	Sites designated for protection at national (SSSI) or international level (Natura 2000). Broad categories grouped by the UKTAG WTT. Habitats recognised as intact or unique or areas recognised by non-governmental organisations as having high environmental value. Habitats that are unlikely to return to natural conditions without some intervention, but which are capable of assisted recovery.

Note 1. NVC Communities are defined in UKTAG 2009 UKTAG 2009 [Ref 16.I].

Note 2. The JNCC website provides listings of NVC communities and sub-communities JNCC [Ref 23.I].

Note 3. Dependency on Groundwater of species is defined in UKTAG 2009 UKTAG 2009 [Ref 16.I].

Note 4. UKTAG Wetland Task Team, UKTAG 2014 GWDTE [Ref 31.I].

B4 Step 3 - Assess potential impacts

Table B.2 identifies typical potential impacts and the general means for their assessment which (at this simple assessment level) should be qualitative, based on the conceptual model.

Table B.2 Potential impacts from groundwater on GWDTE

Impact type		Potential impact	Assessment method
Ground-water quantity	Groundwater flow/ flux	Change in discharge of groundwater via springs and seepages. Change in groundwater flow/ flux through GWDTE.	Qualitative identification of relative change in volume/flow of groundwater discharge to/ through the GWDTE.
	Groundwater level	Change in water level beneath the GWDTE. Change in upward hydraulic gradient and/or flow from a deeper groundwater body to the near surface deposits.	Qualitative identification of change in relative elevations of groundwater within the groundwater body and the GWDTE. Qualitative determination of potential change in soil hydraulic properties and saturation related to groundwater level and flow.
	Soil saturation/ soil moisture		
Ground-water quality	Nutrients (Nitrate/ Phosphate)	Change in nutrient loading to GWDTE.	Qualitative determination of potential change in nutrient loading.
	Metalloid and organic compounds	Change in quantities of potentially toxic chemicals derived from road runoff and drainage.	Refer to routine runoff and surface water quality, routine runoff and groundwater quality and spillage assessment methodologies.

Based on the results of the assessments, the magnitude of the potential change in the groundwater regime at the GWDTE is determined using Table B.3.

Table B.3 Magnitude of impact on a GWDTE

Magnitude	Example
Major adverse	Total or partial loss of groundwater flow or changes in groundwater quality such that the GWDTE is no longer supported or is prevented it from reaching favourable condition. Reduction in classification under the WFD.
Moderate adverse	Partial loss of groundwater flow, or change in groundwater level or quality at the GWDTE such that there are measurable effects on the habitat or flora and fauna of the GWDTE but which are insufficient to lead to a change in its status or classification under the WFD or prevent it from reaching favourable condition.
Minor adverse	Minor changes in groundwater levels, flow or quality at the GWDTE which have no measurable effect on the habitat or flora and fauna of the GWDTE.
Negligible	No measurable change in groundwater levels, flow or quality at the GWDTE.

There may be some circumstances under which the road and its drainage may potentially contribute to and provide some beneficial support to a GWDTE. Where this is the case it should be taken into account in the overall assessment.

B5 Step 4 - Establish risk to GWDTE

To establish the risk to GWDTE the importance (step 2) is combined with the magnitude of the potential impact magnitude determined (step 3) using the matrix in Table B.4.

Table B.4 Risk matrix for GWDTE

		Magnitude			
		Major	**Moderate**	**Minor**	**Negligible**
Importance	**High**	Significant risk	Significant risk	Moderate risk	Negligible risk
	Moderate	Significant risk	Moderate risk	Moderate risk	Negligible risk
	Low	Moderate risk	Negligible risk	Negligible risk	Negligible risk

B6 Step 5 - Assessment outcomes and actions

If the simple assessment identifies that there is a significant risk to GWDTE from the project then, unless there is mitigation incorporated to address the risk, a more detailed assessment and characterisation of the GWDTE will be necessary. In turn this may be used to develop more appropriate and robust mitigation measures.

If the simple assessment identifies that there is a moderate risk to GWDTE from the project then, the need for a more detailed assessment will depend upon the nature of the impact from the change in groundwater regime, the proximity of the GWDTE to the development and the sensitivity of the GWDTE. Where this risk can be addressed by suitable mitigation, no further detailed assessment will be necessary.

The aim of the more detailed assessment is to establish a more precise assessment of the significance of such risk and aid the identification and design of any mitigation measures.

No guidance is provided here for detailed characterisation and assessment as this can only be carried out on a site by site basis, however in broad terms the approach should be similar to that set out in Table B.2 but replacing the qualitative analysis with a more quantitative analysis.

With respect to groundwater quantity this should quantify the departure from the required environmental supporting conditions within the GWDTE.

With respect to groundwater quality this may require the quantification of any departure from defined GWDTE threshold values established by UKTAG JNCC [Ref 23.l].

Appendix C. Groundwater quality and run off

C1 Introduction

This appendix describes the parameters and manual calculations used in a simple assessment for determining the risk of impact on groundwater quality from routine runoff.

The method is based on the 'source-pathway-receptor' pollutant linkage principle which is widely used and explained in Model Procedures for the Management of Contaminated Land (EA/Defra, 2004) EA CLR11 [Ref 2.I]. In the context of road drainage, the source is the road runoff with any pollutants it contains. The pathways are the processes which may modify the pollutants during transmission through the discharge system and unsaturated zone. The receptor is the groundwater.

The key factors affecting the persistence and movement of pollutants within the pathway to groundwater are illustrated in Figure C.1. From these factors the risk matrix shown in Table C.1 was developed. The matrix is used to carry out the groundwater quality and runoff simple assessment.

C2 Using the groundwater risk assessment matrix

To use the matrix (Table C.1) first establish the risk level (low, medium or high) for each parameter and the relevant risk factor (1, 2, 3 respectively). This is then multiplied by the weighting factor for that parameter to provide a score. For example, if the runoff is from a road with a traffic flow of 70,000 AADT the risk for this parameter would be medium or '2' and this is then multiplied by the weighting factor for this parameter of 10, giving a score for traffic flow of 20.

This process is repeated for all parameters and the scores are then summed to provide an overall risk score. The lowest possible overall score is 100 and the highest is 300. The higher the score the greater the risk to groundwater. The overall score determines whether the risk is low, medium or high as follows:

1) <150 low risk
2) 150-250 medium risk
3) >250 high risk

The risk category determines what actions are then taken and the need for further assessment as detailed in Section 3.

The process of working through the matrix will help to identify which parameters are associated with the greatest risk and therefore where more detailed assessment would be most usefully targeted. Similarly, working through the matrix will give an indication as to how best to mitigate the risk to break the source-pathway-receptor linkage.

HEWRAT contains an automated version of the matrix in Table C.1, though manual calculation may be used if preferred.

C2.1 Matrix Parameters

Many of the parameters in the matrix are self-explanatory. For those which are not, further information is given below.

C2.1.1 Drainage area ratio

The ratio is determined as 'drainage area of road'/'active surface area of infiltration device', where the active surface area is that part of the device through which the majority of downward discharge will occur.

C2.1.2 Infiltration method

Whether the form of the infiltration system is 'continuous', 'region' or 'point'. The terms 'continuous', 'region' and 'point' are specific asset definitions from CD 535 [Ref 8.I].

C2.1.3 Unsaturated zone

The minimum depth of the unsaturated zone accounting for seasonal variations in groundwater level.

C2.1.4 Flow type

This parameter incorporates the type of flow through the ground and the effective grain size.

1) dominantly intergranular flow occurs in, for example, non-fractured consolidated deposits or unconsolidated deposits of fine-medium sand or finer;
2) mixed fracture and intergranular flow occurs in, for example, consolidated deposits or unconsolidated deposits of medium – coarse sand;
3) flow dominated by fractures/fissures occurs in, for example, well consolidated sedimentary deposits, igneous and metamorphic rocks or unconsolidated deposits of very coarse sand or coarser.

Figure C.1 Schematic of source, transport and fate of road runoff

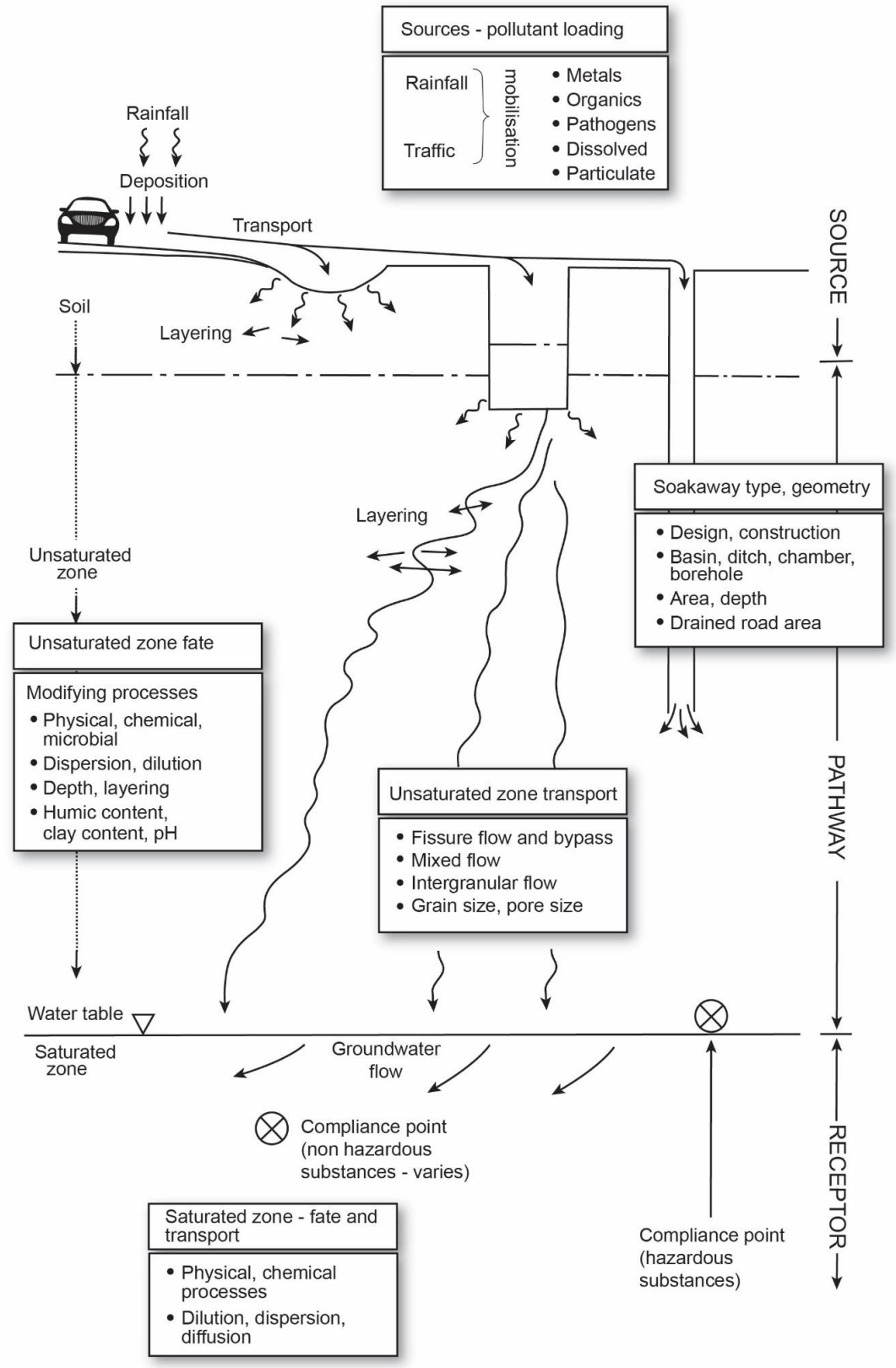

Table C.1 Groundwater quality and runoff risk assessment matrix

	Parameter	Weighting factor	Low risk (Score 1)	Medium risk (Score 2)	High risk (Score 3)
Source	Traffic flow	10	≤50,000 AADT	>50,000 AADT to <100,000 AADT	≥100,000 AADT
	Rainfall depth (annual averages)	10	≤740 mm	>740 mm to <1060 mm	≥1060 mm
	Drainage area ratio	10	≤50	>50 to <150	≥150
Pathway	Infiltration method	15	"Continuous" shallow linear (e.g. unlined ditch, swale, grassed channel)	"Region", shallow infiltration systems, (e.g. infiltration basin).	"Point" systems (e.g. chamber soakaways, deep shafts) 2
	Unsaturated zone	20	Depth to water table ≥15 m or unproductive strata	Depth to water table <15 m and >5 m	Depth to water table ≤5 m
	Flow type	20	Dominantly intergranular flow	Mixed fracture and intergranular flow	Flow dominated by fractures/ fissures
	Unsaturated zone clay content	5	≥15 % clay minerals	<15 % to >1 % clay minerals	≤1 % clay minerals
	Organic carbon	5	≥15 % Soil organic matter	<15% to >1% soil organic matter	≤1 % Soil organic matter
	Unsaturated zone soil pH	5	pH ≥8	pH <8 to >5	pH ≤5

Appendix D. Spillage assessment

D1 Introduction

This appendix describes the parameters and manual calculations used in a spillage assessment for determining the risk of a pollution incident occurring as the result of a spillage.

The method initially estimates the risk that there will be an incident causing the spillage of a potentially polluting substance somewhere on the length of road being assessed. It then calculates the risk, assuming a spillage has occurred, that the pollutant will reach and impact on the receiving watercourse or groundwater. The pollution impacts considered are those that fall into either Category 1 or 2 incidents, as defined by the Environment Agency in their Common Incident Classification System (CICS) CICS 4/01 [Ref 22.I], hereafter described as 'serious pollution incidents'.

The risks are expressed as annual probabilities of such an event occurring, allowing objective decisions to be made as to their acceptability, or whether measures are needed to reduce the risk.

D2 Calculating the risk of a serious pollution incident

HEWRAT incorporates a spreadsheet which automates the calculation of the risk of a serious pollution incident. Before using HEWRAT to calculate spillage risk the assessor should gain familiarity with the manual calculations.

To perform the risk calculation the following data for each outfall or soakaway is used:

a) the length of road in each of the categories in Table D.1 which drains to the outfall or soakaway;

b) the AADT two way flow for each section of road, other than slip roads, identified above (for new roads, use the design year traffic flow);

c) the percentage of the AADT flow that comprises HGVs. Where roads are known to carry an unusually high proportion of hazardous materials, for example to an oil refinery or creamery, a higher factor may be appropriate.

Table D.1 Serious spillage rates in billion HGV km/year

	Motorways	Rural trunk roads	Urban trunk roads
No junction	0.36	0.29	0.31
Slip road	0.43	0.83	0.36
Roundabout	3.09	3.09	5.35
Crossroad	n/a	0.88	1.46
Side road	n/a	0.93	1.81

An urban all-purpose trunk road is defined as a road within a built-up area having a speed limit of 40 mph or less if single carriageway, or 60 mph or less if dual carriageway.

The spillage rate from Table D.1 applies to all road lengths within 100 m of these junction types. For example, for a side road joining an urban trunk road the factor is 1.81 for 100 m of the side road and for a 200 m length of the trunk road, centred on the junction.

Using these data, the annual probability of a spillage for each section of road is calculated using this formula:

PSPL = RL x SS x (AADT x 365 x 10-9) x (%HGV/100)

Where:

PSPL = annual probability of a spillage with the potential to cause a serious pollution incident

RL = road length in kilometres

SS = spillage rates from Table D.1

AADT = annual average daily traffic (use design year AADT for new roads)

%HGV = percentage of heavy goods vehicles

The result (PSPL) is then used in the calculation of the predicted annual probability of a serious pollution incident for each section of road, using this formula:

PINC = PSPL x PPOL

Where:

PINC = the probability of a spillage with an associated risk of a serious pollution incident occurring

PPOL = the probability, given a spillage, that a serious pollution incident will result. An appropriate value for this is selected from Table D.2. This will depend on the sensitivity of the watercourse and how soon it can be reached by the emergency services.

Table D.2 Probability of a serious pollution incident occurring as a result of a serious spillage

Receiving water body	Urban (response time to site <20 minutes)	Rural (response time to site <1 hour)	Remote (response time to site >1 hour)
Surface watercourse	0.45	0.6	0.75
Groundwater	0.45	0.6	0.75

Where more than one outfall discharges into a reach (or more than one soakaway drains into the same groundwater body), the annual probabilities for each section of road are added to get the combined risk.

As stated in Section 3, the risk of a serious pollutant incident is deemed acceptable if the annual probability is less than 1%. Where the spillage could affect sensitive areas or activities (defined in Section 3) the risk of a serious pollutant incident is deemed acceptable if the annual probability is less than 0.5%.

Mitigation systems which reduce the likelihood of a spillage leading to a pollution incident are listed in CG 501 [Ref 5.I] along with their optimum risk reduction factors (RRF). The RFFs listed in CG 501 [Ref 5.I] may be used in the spillage assessment calculations.

The RRF is multiplied by the PINC to establish the mitigated annual probability.

Appendix E. Hydromorphological assessment

E1 Introduction

The hydromorphological assessment should identify the natural river processes that would have operated before any development had affected the river or catchment, and then assess the impacts of the project in terms of deviations from natural conditions.

E2 Hydromorphological assessment

A simple assessment is a desk-based survey which should be tailored to the nature of proposed project and potentially affected watercourses. It should include, where relevant, details of:

1) flow processes;
2) sediment movement;
3) boundary conditions (channel bed and banks);
4) riparian zones;
5) floodplains;
6) downstream and catchment-channel connectivity;
7) the general form and function of the channel and near-channel zones; and
8) the setting of the watercourse within the wider catchment.

The assessment should determine how the above characteristics are likely to be affected by the project and what impacts these changes might have on the hydromorphological characteristics of, or the ecology within, that watercourse and downstream water bodies.

A detailed assessment takes the assessment a stage further and should include site surveys and may include modelling. Documents such as that by Haycock Associates Turner & Thorne 2005 [Ref 27.I] are available to guide the scope and appropriate methods of such surveys.

Sustainability & Environment
Appraisal

LA 113
England National Application Annex to LA 113 Road drainage and the water environment

(formerly HD 45/09)

Revision 0

Summary
This National Application Annex sets out the Highways England specific requirements on assessment and management of the impacts that road projects can have on the water environment.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Aug 2019	Highways England National Application Annex to LA 113.

Foreword

Publishing information

This document is published by Highways England.

This document supersedes HD 45/09, which is withdrawn.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

This National Application Annex gives the Highways England specific requirements related to the assessment and management of the impacts that road projects can have on the water environment.

This National Application Annex defines the Highways England specific requirements related to the environmental assessment and monitoring of projects under Directive 2011/92/EU as amended by 2014/52/EU (hereafter referred to as the EIA Directive) 2014/52/EU [Ref 2.N].

Exemption from Environmental Permit to discharge road runoff

Under Section 12(1) of the Environmental Permitting (England and Wales) Regulations 2016 (EPR) SI 2016/1154 [Ref 3.N] it is not permitted to cause or knowingly permit a water discharge activity or groundwater activity, except under and to the extent authorised by an environmental permit. The full definitions of 'water discharge activity' and 'groundwater activity' are given in Schedules 21 and 22 of the EPR respectively though they are essentially the discharge of pollutants directly or indirectly into surface waters or groundwater. However, road authorities in England and Wales are exempt from the need to apply for an environmental permit to discharge road runoff by virtue of the Highways Act 1980 Highways Act 1980 [Ref 6.N]and the Groundwater (England and Wales) Regulations 2009 Groundwater 2009 [Ref 13.N]. If pollution is occurring, the relevant Environmental Protection Agency can serve a notice for the requirement of an environmental permit or serve an enforcement notice under Section 36 of the EPR.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 7.N] apply to this document.

Abbreviations

Abbreviations

Abbreviation	Definition
EPR	Environmental Permitting Regulations
EQS	Environmental Quality Standard
FRA	Flood Risk Assessment
HADDMS	Highway Agency Drainage Data Management System
HEWRAT	Highways England Water Risk Assessment Tool
IDB	Internal Drainage Board
M-BAT	UKTAG Rivers and Lakes Metal Bioavailability Assessment Tool
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance
WFD	Water Framework Directive

Terms and definitions

Terms and definitions

Term	Definition
Environment Agency	A non-departmental public body, sponsored by Department for Environment, Food and Rural Affairs (DEFRA), with responsibilities relating to the protection and enhancement of the environment in England.
Flood risk assessment	An assessment to show how flood risk to the project, or elsewhere as a result of proposed changes to the project location, can be managed as part of the project and identify flood mitigation measures.
Lead local flood authorities	Organisations that have a statutory responsibility for managing flood and coastal erosion risk.
Major planning applications	Defined in the Town and Country Planning (Development Management Procedure) (England) Order 2015 TCP(DMP)E [Ref 3.I] and includes "development carried out on a site having an area of 1 hectare or more".
Nationally significant infrastructure projects	A project of a type and scale defined under the Planning Act 2008 Planning Act 2008 [Ref 8.N].

E/1. Methods of assessment

E/1.1 The WFD, as translated into English and Welsh law through The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 as amended SI 2003/3242 [Ref 14.N] must not be contravened.

Implementation for priority assets

E/1.2 Where priority outfalls, priority soakaways and priority culverts are being further assessed under the priority assets programme, the requirements of this document shall be applied.

Water quality

E/1.3 To comply with The Water Environment (WFD) (England and Wales) (Amendment) Regulations WFD 2015 [Ref 15.N] the annual average concentrations predicted by HEWRAT or M-BAT must be lower than the Environmental Quality Standards (EQS) given in The Water Framework Directive (Standards and Classification) Directions (England and Wales) WFD(E) 2015 [Ref 16.N].

NOTE *The Environment Agency has approved the method of assessment used by HEWRAT and has agreed that the outputs from the tool can be used when undertaking an assessment of potential impacts of surface water quality.*

Flood risk (Clause 3.46, LA 113)

E/1.4 Road projects must be compliant with:

1) Flood Risk Regulations 2009 Flood Risk (E&W) [Ref 12.N];
2) Flood and Water Management Act 2010 FWMA 2010 [Ref 4.N];
3) National Planning Policy Framework (NPPF) NPPF 2012 [Ref 11.N];
4) Planning Practice Guidance (PPG) on Flood Risk and Coastal Change PPG Flood risk [Ref 9.N].

NOTE *EU Directive 2007/60/EC (Assessment and Management of Flood Risks Directive (Floods Directive)) 2007/60/EC [Ref 1.N], which established a framework for the assessment and management of flood risks throughout the European Union, was translated into English and Welsh law through the Flood Risk Regulations 2009 Flood Risk (E&W) [Ref 12.N] and the Flood and Water Management Act 2010 FWMA 2010 [Ref 4.N].*

E/1.5 A Flood Risk Assessment (FRA) shall be carried out in accordance with the National Policy Planning Framework (NPPF) NPPF 2012 [Ref 11.N] and associated Planning Practice Guidance (PPG) on Flood Risk and Coastal Change PPG Flood risk [Ref 9.N].

NOTE 1 *The NPPF and PPG on flood risk and coastal change set out the criteria for when a FRA is needed and how to carry out the FRA.*

NOTE 2 *The NPPF sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow.*

NOTE 3 *Where NPPF tests are not met, national policy is clear that new development ought not to be allowed.*

NOTE 4 *The NPPF requires that sustainable drainage is a material consideration for all major' planning applications and for development to protect people and property from flooding.*

E/1.6 In accordance with PPG on flood risk and coastal change PPG Flood risk [Ref 9.N], sustainable drainage systems shall be provided for 'major development' unless demonstrated to be inappropriate.

E/1.7 In accordance with the NPPF, lead local flood authorities (generally falling under the stewardship of county councils and unitary authorities) shall be consulted for all major planning applications.

E/1.8 In accordance with the Environmental Permitting Regulations (EPRs) SI 2016/1154 [Ref 3.N] an environmental permit (or registered exemption) must be obtained before carrying out any flood risk activity.

NOTE *Further advice regarding environmental permits for flood risk activities, including when an environmental permit or registered exemption is required from the EA, is given on www.gov.uk.*

E/1.9 Where works are not on or near a main river but on or near an ordinary watercourse the Internal Drainage Board (IDB) (if applicable) or lead local flood authority shall be consulted to determine whether land drainage consent is required.

E/1.10 In accordance with the Reservoirs Act 1975 and various Reservoirs Act (Amendment) Regulations Reservoirs Act (1975) [Ref 10.N], no work to a large raised reservoir must be carried out unless supervised by a suitably qualified civil engineer, as defined in that act.

NOTE 1 *Where the retaining embankment holds a volume greater than 25,000 m3 above the natural level of any part of the adjacent land it is deemed to be a large raised reservoir regulated under the Reservoirs Act 1975 and various Reservoirs Act (Amendment) Regulations Reservoirs Act (1975) [Ref 10.N] (which places requirements upon the designer, owner and operator of reservoirs.*

NOTE 2 *Further details on reservoirs are given on the Defra website Reservoirs (O&O Requirements) [Ref 1.I].*

Climate change allowances for flood risk assessment

E/1.11 The FRA of the scheme shall apply the latest climate change allowances published by the Environment Agency; Flood risk assessments: climate change allowances FRA CCA [Ref 5.N] .

E/1.11.1 The appropriate allowance should be selected for the river basin district in which the scheme is located.

E/1.11.2 The appropriate allowance should be applied to the flows for any watercourse crossed by the scheme to ensure that the structure carrying the road will have sufficient hydraulic capacity.

E/1.11.3 The central allowance for the design life of the scheme should be used, with a sensitivity check made using the upper end allowance.

E/1.12 If there is robust local evidence of how climate change has the potential to affect flood risk, agreement to use this evidence shall be obtained from the Environment Agency and the evidence incorporated into the assessment.

WFD assessment

E/1.13 WFD assessments on Nationally Significant Infrastructure Projects (NSIPs) shall use Advice Note Eighteen: The Water Framework Directive published by The Planning Inspectorate Advice Note 18 [Ref 2.I].

NOTE 1 *Advice Note Eighteen advises a staged approach of screening, scoping then impact assessment in consultation with the relevant environment bodies, commencing early in the pre-application stage.*

NOTE 2 *Further advice on how to complete a WFD assessment for a flood risk activity is available from the Environment Agency WFD Assessment 2016 [Ref 4.I].*

E/2. Reporting and recording results

E/2.1 The level of significance of potential impacts on attributes shall be assigned after the review of any proposed mitigation.

E/2.2 Assessment results for existing outfalls or soakaways shall be recorded on HADDMS if assessments have been made of any of the following:

1) the risk to surface waters from routine runoff;
2) the risk to groundwater from routine runoff; or
3) the likelihood of a pollution incident arising from a spillage.

E/2.3 Where assessments have been made of proposed new or modified outfalls or soakaways, the results shall not be uploaded to HADDMS until the scheme is built or the modification complete.

E/2.4 The results uploaded to HADDMS shall reflect the as-built scheme.

E/3. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	2007/60/EC, 'Assessment and Management of Flood Risks Directive'
Ref 2.N	2014/52/EU, 'Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment'
Ref 3.N	SI 2016/1154, 'Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154)'
Ref 4.N	legislation.gov.uk. FWMA 2010, 'Flood and Water Management Act 2010'
Ref 5.N	Gov.UK. Environment Agency. FRA CCA, 'Flood risk assessments: climate change allowances'
Ref 6.N	The National Archives. legislation.gov.uk. Highways Act 1980, 'Highways Act 1980'
Ref 7.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 8.N	Planning Act 2008, 'Planning Act 2008 (as amended)'
Ref 9.N	PPG Flood risk, 'Planning Practice Guidance: Flood Risk and Coastal Change, Department for Communities and Local Government (available online)'
Ref 10.N	Reservoirs Act (1975), 'Reservoirs Act 1975 and various Reservoirs Act (Amendment) Regulations'
Ref 11.N	Department for Local Communities and Local Government, 2012. NPPF 2012, 'Technical Guidance to the National Planning Policy Framework'
Ref 12.N	Flood Risk (E&W), 'The Flood Risk (England and Wales) Regulations 2009 (SI 2009 No 3042)'
Ref 13.N	Groundwater 2009, 'The Groundwater (England and Wales) Regulations 2009'
Ref 14.N	SI 2003/3242, 'The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (S.I. 2003/3242) as amended'
Ref 15.N	WFD 2015, 'The Water Environment (WFD) (England and Wales) (Amendment) Regulations 2015'
Ref 16.N	WFD(E) 2015, 'The Water Framework Directive (Standards and Classification) Directions (England and Wales), 2015'

E/4. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	Gov.uk. Department for Environment, Food & Rural Affairs and Environment Agency. Reservoirs (O&O Requirements), 'Reservoirs: owner and operator requirements'
Ref 2.I	Advice Note 18, 'The Planning Inspectorate, Advice Note Eighteen: The Water Framework Directive'
Ref 3.I	TCP(DMP)E, 'The Town and Country Planning (Development Management Procedure) (England) Order 2015'
Ref 4.I	Environment Agency,. WFD Assessment 2016, 'Water Framework Directive risk assessment, How to assess the risk of your activity, 2016'

Department for Infrastructure
An Roinn Bonneagair

Sustainability & Environment
Appraisal

LA 113
Northern Ireland National Application Annex to LA 113 Road drainage and the water environment

(formerly HD 45/09)

Revision 0

Summary
This National Application Annex sets out the Department for Infrastructure Northern Ireland specific requirements for the assessment and management of the impacts that road projects can have on the water environment.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated team in the Department for Infrastructure, Northern Ireland. The email address for all enquiries and feedback is: dcu@infrastructure-ni.gov.uk

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Aug 2019	Department for Infrastructure Northern Ireland National Application Annex to LA 113.

Foreword

Publishing information

This document is published by Highways England on behalf of Department for Infrastructure, Northern Ireland.

This document supersedes HD 45/09, which is withdrawn.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

This National Application Annex outlines the Department for Infrastructure, Northern Ireland-specific requirements related to the assessment and management of the impacts that road projects can have on the water environment.

This National Application Annex defines the Department for Infrastructure, Northern Ireland-specific related to the environmental assessment and monitoring of projects under Directive 2011/92/EU as amended by 2014/52/EU (hereafter referred to as the EIA Directive) 2011/92/EU [Ref 2.N].

Exemption from requirement for 'Consent to Discharge' for road runoff

Under Article 7 of the Water Order (NI) 1999 W(NI)O 1999 [Ref 11.N] it is an offence to discharge any poisonous, noxious or polluting matter into a waterway or underground stratum, without the consent of the department. However, the road authority in Northern Ireland are exempt from the need to apply for this consent to discharge road runoff by virtue of the Roads Order (NI) 1993 R(NI)O 1993 [Ref 10.N]. If pollution is occurring, the Environment Protection Agency can serve a notice on the offending party requiring remedial action under Article 17 of the Water Order (NI) 1999 W(NI)O 1999 [Ref 11.N].

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 5.N] apply to this document.

Abbreviations and symbols

Abbreviations

Abbreviation	Definition
DfI	Department for Infrastructure
EQS	Environmental Quality Standard
FRA	Flood Risk Assessment
PPS	Planning Policy Statement
RBMP	River Basin Management Plan
SPPS	Strategic Planning Policy Statement

Symbols

Symbol	Definition
Q_{95}	The flow equalled or exceeded in a watercourse 95% of the time

Terms and definitions

Terms

Term	Definition
Department for Infrastructure - Rivers	DfI Rivers is a departmental unit which aims to reduce the risk to life and damage to property from flooding from rivers and the sea and to undertake watercourse and coastal flood management is a sustainable manner.
Flood risk assessment	An assessment to show how flood risk to the project, or elsewhere as a result of proposed changes to the project location, can be managed as part of the project and identify flood mitigation measures.
Northern Ireland Environment Agency	An Executive Agency within the Department of Agriculture, Environment and Rural Affairs, with objectives to create prosperity and well being through effective environment and heritage management and regulation in Northern Ireland.

NI/1. Methods of assessment

NI/1.1 The WFD, as translated through The Water Environment (Water Framework Directive) (Northern Ireland) Regulations 2017 WFR(NI) 2017 [Ref 12.N] must not be contravened.

Water quality

NI/1.2 To comply with The Water Environment (WFD) (Northern Ireland) (Amendment) Regulations WFR(NI) 2017 [Ref 12.N] the annual average concentrations predicted by HEWRAT or M-BAT must be lower than the Environmental Quality Standards (ESQ) given in The Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015 WFD(NI) 2015 [Ref 13.N].

NOTE *The accepted method of assessment using the HEWRAT permits the outputs from the tool can be used when undertaking an assessment of potential impacts of surface water quality.*

Flood risk

NI/1.3 Trunk-road projects must be compliant with:

1) The Water Environment (Floods Directive) (Northern Ireland) WFR(NI) 2017 [Ref 12.N];
2) The Roads (Northern Ireland) Order R(NI)O 1993 [Ref 10.N];
3) Strategic Planning Policy Statement for Northern Ireland Strategic Planning (NI) [Ref 7.N];
4) Planning Policy Statement 15 (PPS15) PPS 15 [Ref 6.N].

NOTE *EU Directive 2007/60/EC (Assessment and Management of Flood Risks Directive (Floods Directive)) 2007/60/EC [Ref 1.N], which established a framework for the assessment and management of flood risks throughout the European Union, was translated into Northern Ireland law through the Flood Risk Regulations 2009 Flood Risk (NI) [Ref 9.N] and the Flood and Water Management Act 2010 FWMA 2010 [Ref 3.N].*

NI/1.4 A flood risk assessment (FRA) shall be carried out in accordance SPPS/PPS 15 PPS 15 [Ref 6.N].

NOTE 1 *PPS 15 on flood risk sets out the criteria for when a FRA is needed and how to carry out the FRA.*

NOTE 2 *The PPS 15 sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow.*

NOTE 3 *Where PPS 15 tests are not met, the policy is clear that new development ought not to be allowed.*

NOTE 4 *SPPS encourages consideration of sustainable drainage for all development or redevelopment to protect people and property from flooding.*

NI/1.5 In accordance with the PPS 15 PPS 15 [Ref 6.N], in Northern Ireland, DfI Rivers is the statutory drainage and flood defence authority and the Northern Ireland Environment Agency (NIEA) seeks to safeguard the quality of water bodies, and both bodies shall be consulted for all 'major' planning applications.

NOTE *Where the retaining embankment holds a volume greater than 10,000 m3 it is regulated under the Reservoirs Act (Northern Ireland) 2015 Reservoirs (NI) 2015 [Ref 1.I] which places requirements upon the designer, owner and operator of reservoirs.*

NI/1.6 The FRA of the scheme shall apply the latest climate change allowances published by the Department for Infrastructure Water and Drainage Policy Section; Technical Flood Risk Guidance in relation to Allowances for Climate Change in Northern Ireland Flood Risk Guidance (NI) [Ref 8.N].

NI/1.7 For the purposes of selecting the appropriate climate change allowances, all motorways and all-purpose trunk roads shall be assessed as 'essential infrastructure'.

NI/1.8 If there is robust local evidence of how climate change has the potential to affect flood risk, agreement to use this evidence shall be obtained from the DfI Rivers and the evidence incorporated into the assessment.

WFD assessment

NI/1.9 WFD assessments shall be conducted to address the requirements contained within the Guidance note on carrying out a Water Framework Directive assessment on Environmental Impact Assessment developments, published by Northern Ireland Environment Agency, Water Management Unit WFD Assessment [Ref 4.N].

NI/2. Reporting and recording results

NI/2.1 The level of significance of potential impacts on water environment receptors and their component attributes shall be assigned after review of any proposed mitigation.

NI/3. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	2007/60/EC, 'Assessment and Management of Flood Risks Directive'
Ref 2.N	2011/92/EU, 'Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014'
Ref 3.N	legislation.gov.uk. FWMA 2010, 'Flood and Water Management Act 2010'
Ref 4.N	Department of Agriculture, Environment and Rural Affairs. WFD Assessment, 'Guidance note on carrying out a Water Framework Directive assessment on Environmental Impact Assessment developments'
Ref 5.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 6.N	www.planningni.gov.uk. PPS 15, 'PPS 15 (Revised): Planning and Flood Risk'
Ref 7.N	Department of the Environment. Strategic Planning (NI), 'Strategic Planning Policy Statement for Northern Ireland'
Ref 8.N	Department for Infrastructure. Flood Risk Guidance (NI), 'Technical Flood Risk Guidance in relation to Allowances for Climate Change in Northern Ireland'
Ref 9.N	legislation.gov.uk. Flood Risk (NI), 'The Flood Risk Regulations 2009'
Ref 10.N	legislation.gov.uk. R(NI)O 1993, 'The Roads (Northern Ireland) Order 1993'
Ref 11.N	legislation.gov.uk. W(NI)O 1999, 'The Water (Northern Ireland) Order 1999'
Ref 12.N	legislation.gov.uk. WFR(NI) 2017, 'The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017'
Ref 13.N	legislation.gov.uk. WFD(NI) 2015, 'The Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015'

NI/4. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	legislation.gov.uk. Reservoirs (NI) 2015, 'Reservoirs Act (Northern Ireland) 2015'

Sustainability & Environment
Appraisal

LA 113
Scotland National Application Annex to LA 113 Road drainage and the water environment

(formerly HD 45/09)

Revision 0

Summary
This National Application Annex sets out the Transport Scotland specific requirements for the assessment and management of the impacts that road projects can have on the water environment.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Transport Scotland team. The email address for all enquiries and feedback is: TSStandardsBranch@transport.gov.scot

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Aug 2019	Tramsport Scotland National Application Annex to LA 113.

Foreword

Publishing information

This document is published by Highways England on behalf of Transport Scotland.

This document supersedes HD 45/09, which is withdrawn.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

This National Application Annex defines Transport Scotland-specific requirements related to the assessment and management of impacts on the water environment, under Directive 2011/92/EU as amended by 2014/52/EU (hereafter referred to as the EIA Directive) 2014/52/EU [Ref 5.N] and transposed by The Roads (Scotland) Act 1984, as amended Roads(S) 1984 [Ref 10.N] .

Environmental permitting of road drainage and the water activities in Scotland

The Water Environment (Controlled Activities) (Scotland) Regulations 2011 WE(CA)(S) Regs 2011 [Ref 18.N] (more commonly known as the Controlled Activity Regulations (CAR)) and their further amendments apply regulatory controls over activities which may affect Scotland's water environment.

This legislation arose from the European Community (EC) 2000/60/EC [Ref 4.N], becoming law in Scotland as the Water Environment and Water Services (Scotland) Act 2003 (WEWS Act) WEWS (S) 2003 [Ref 11.N].

The regulations cover rivers, lochs, transitional waters (estuaries), coastal waters groundwater, and groundwater dependant wetlands. Detailed information can be found in the CAR practical guide WE(CA)(S) Regs 2011 Guide [Ref 19.N].

The following activities are included within the scope of CAR:

1) discharges;
2) diffuse pollution;
3) abstractions;
4) engineering works in inland waters;
5) groundwater.

Under CAR, Scottish Environment Protection Agency (SEPA) risk assess proposed activities before granting, if appropriate, an authorisation. There are three levels of authorisation defined under the CAR, based on the type and scale of the proposed activity.

These include:

1) general binding rules (GBR) – these are applied to low risk activities which do not need to be notified to SEPA;
2) registrations – these are applied to medium risk activities where SEPA can monitor cumulative impacts and set additional conditions if required;
3) licence (simple and complex) – these are applied to high risk activities which contain site specific conditions and identification of a responsible person to ensure compliance of required conditions. 'simple' and 'complex' licences vary depending upon activity size and risk.

When an activity complies with the relevant GBR, although there is no statutory requirement to consult with SEPA, they should be contacted to confirm if there is any need to upgrade to a registration or licence application for the activity.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 7.N] apply to this document.

Abbreviations

Abbreviations

Abbreviation	Definition
CAR	Controlled Activities Regulations
CIRIA	Construction Industry Research and Information Association
EQS	Environmental Quality Standard
FRA	Flood Risk Assessment
GBR	General Binding Rules
HEWRAT	Highways England Water Risk Assessment Tool
LMA	Land Made Available
M-BAT	UKTAG Rivers and Lakes Metal Bioavailability Assessment Tool
MCL	Morphological Condition Limits
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SIA	Simple Index Approach
SPP	Scottish Planning Policy (2014)
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
SuDs	Sustainable Drainage Systems
WFD	Water Framework Directive

Terms and definitions

Terms

Term	Definition
Flood risk assessment	An assessment to show how flood risk to the project, or elsewhere as a result of proposed changes to the project location, can be managed as part of the project and identify flood mitigation measures.
Local authorities	Organisations that have a statutory responsibility for managing flood and coastal erosion risk in addition to SEPA.
Scottish Environment Protection Agency (SEPA)	The Scottish Environment Protection Agency (SEPA; Scottish Gaelic: Buidheann Dìon Àrainneachd nah-Alba) is Scotland's environmental regulator and national flood forecasting, flood warning and strategic flood risk management authority. Its main role is to protect and improve Scotland's environment.
Scottish Natural Heritage (SNH)	Scottish Natural Heritage (SNH; Scottish Gaelic: Dualchas Nàdair na h-Alba) is the Scottish public body responsible for the country's natural heritage, especially its natural, genetic and scenic diversity.

S/1. Methods of assessment

S/1.1 The WFD, as transposed into Scottish law through the Water Environment and Water Services (Scotland) Act 2003 (WEWS Act) WEWS (S) 2003 [Ref 11.N], and its specific regulatory controls as set out in the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) WE(CA)(S) Regs 2011 [Ref 18.N], as amended must not be contravened.

Water quality

S/1.2 To comply with The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) WE(CA)(S) Regs 2011 [Ref 18.N] for qualifying projects, the annual average concentrations predicted by Highways England Water Risk Assessment Tool (HEWRAT) or Metal Bioavailability Assessment Tool (M-BAT) M-BAT [Ref 20.N] must be lower than the Environmental Quality Standards (EQSs) defined in SEPA supporting guidance (WAT-SG-53) Environmental Quality Standards and Standards for Discharges to Surface Waters SEPA WAT-SG-53 [Ref 14.N].

NOTE *SEPA has acknowledged the method of assessment used by HEWRAT and has agreed that the outputs from the tool can be used when undertaking an assessment of potential impacts of surface water quality in Scotland.*

S/1.2.1 It is generally considered that two levels of sustainable drainage systems (SuDs) are expected by SEPA prior to discharge, and three levels may be required for particularly sensitive receptors.

NOTE *Refer to guidance provided in the CIRIA SuDS Manual CIRIA C753 [Ref 11.I], SCOTS SuDS for Roads SSWP 2010 [Ref 10.I] and SEPA Regulatory Method WAT-RM-08 SEPA WAT-RM-08 [Ref 9.I].*

S/1.3 SEPA shall always be consulted at an early stage to allow the development of innovative, multi-benefit features.

NOTE *The Simple Index Approach (SIA) tool, as described in the CIRIA SuDS Manual CIRIA C753 [Ref 11.I] was developed on behalf of SEPA and provides a broader and more conservative assessment method than HEWRAT.*

S/1.3.1 The SIA tool may also be used to supplement HEWRAT assessments in determining whether proposed SuDS provide adequate mitigation for the pollution hazard from the development, as defined in SEPA Regulator Method WAT-RM-08 SEPA WAT-RM-08 [Ref 9.I].

NOTE *In Scotland lining of drainage systems is not usually required.*

S/1.3.2 SEPA should always be consulted, particularly where HEWRAT predicts a potential failure to groundwater receptors.

S/1.4 Scottish Natural Heritage (SNH) shall also be consulted where discharges are made to designated sites such as SSSIs , SPAs and SACs.

S/1.5 Assessment of low traffic density roads routine runoff shall also be undertaken qualitatively on a case-by-case basis, through assessing site specific conditions, and with reference to the guidance provided in the CIRIA SuDS Manual CIRIA C753 [Ref 11.I], SCOTS SuDS for Roads SSWP 2010 [Ref 10.I] and SEPA WAT-RM-08 SEPA WAT-RM-08 [Ref 9.I].

NOTE *Generally, two levels of SuDs are expected by SEPA before discharge, unless the roads are remote rural roads or access roads.*

S/1.5.1 SEPA should always be consulted on levels of treatment.

Flood risk

S/1.6 Trunk-road projects in Scotland must be compliant with:

1) Flood Risk Management (Scotland) Act 2009 Flood Risk (S) [Ref 6.N];
2) Scottish Planning Policy (SPP) 2014 SPP 2014 [Ref 12.N];
3) Planning Advice Note 61: Planning & SuDS PAN 61 [Ref 8.N];

4) Technical Flood Risk Guidance for Stakeholders (SS-NFR-P-002) SEPA, June 2015 SEPA Flood Risk Guidance [Ref 15.N];
5) Climate Change (Scotland) Act 2009 CCA(S) 2009 [Ref 3.N].

NOTE *EU Directive 2007/60/EC (Assessment and Management of Flood Risks Directive (Floods Directive)) 2007/60/EC [Ref 1.N], which established a framework for the assessment and management of flood risks throughout the European Union, was translated into Scottish law through the Flood Risk Management (Scotland) Act 2009 Flood Risk (S) [Ref 6.N].*

S/1.7 A flood risk assessment (FRA) shall be carried out in accordance with Scottish Planning Policy 2014 SPP 2014 [Ref 12.N] and associated Planning Advice Note 61 on flooding PAN 61 [Ref 8.N].

NOTE 1 *The SPP sets out the criteria for when a FRA is needed and how to carry out the FRA is further documented in the Technical Flood Risk Guidance for Stakeholders SEPA Flood Risk Guidance [Ref 15.N].*

NOTE 2 *The SPP sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow.*

NOTE 3 *Where SPP tests are not met, national policy is clear that new development ought not to be allowed.*

S/1.7.1 The SPP requires that the development should have adequate sustainable drainage to protect people and property from flooding and appropriate long-term maintenance arrangements are put in place.

S/1.8 In accordance with the SPP, local authorities and SEPA shall be consulted on planning applications as statutory consultees.

S/1.8.1 In accordance with The Water Environment (Controlled Activities) (Scotland) Regulations 2011 WE(CA)(S) Regs 2011 [Ref 18.N], a licence or registration may need to be obtained before carrying out any flood risk activity.

NOTE *Further advice regarding licences for flood risk activities, including when a licence is required from SEPA and CAR guidance is given on www.sepa.org.uk.*

S/1.9 Where the retaining embankment holds a volume greater than 25,000 m3 it must be regulated under the Reservoirs (Scotland) Act 2011 Reservoirs (S) 2011 [Ref 9.N], which places requirements upon the designer, owner and operator of reservoirs.

NOTE *Further details on reservoirs are given on www.sepa.org.uk/reservoirs.*

Climate change allowances for flood risk assessment

S/1.10 The FRA of the project shall apply the latest climate change allowances published by SEPA in their Flood Risk Management and Climate Change document which is a summary of the findings of the CEH Report, An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change CEH (2011) [Ref 2.N].

S/1.11 For the purposes of selecting the appropriate climate change allowances, all motorways and all-purpose trunk roads shall be assessed as 'essential infrastructure'.

S/1.12 If there is robust local evidence of how climate change has the potential to affect flood risk, agreement to use this evidence shall be obtained from SEPA and the evidence incorporated into the assessment.

Hydromorphology

S/1.13 Hydromorphological assessment of proposals which affect watercourses shall be undertaken to ensure the requirements of the Water Environment (Controlled Activities) (Scotland) Regulations 2011 WE(CA)(S) Regs 2011 [Ref 18.N] are embedded during the EIA process.

NOTE *The DMRB does not outline a specific methodology or guidance on the evaluation of hydromorphological impacts.*

S/1.13.1 Sensitivity and impact magnitude criteria may be developed based on guidance provided in the Defra/EA R&D Report FD1914 Guide Book of Applied Fluvial Geomorphology FD1914 [Ref 1.I].

NOTE *SEPA uses morphological condition limits (MCL) to define permissible levels of morphological impact on available capacity within river water bodies.*

S/1.14 Hydromorphological sensitivity and impact magnitude criteria for watercourses affected by proposed activities shall be cognisant of baseline morphological condition and MCL as identified by SEPA.

NOTE *MCLs are used by SEPA to determine whether a proposed activity will result in deterioration in morphological quality and WFD status. The test is undertaken by SEPA using an impact assessment tool; MImAS (Morphological Impact Assessment System). Further information is provided in SEPA guidance document WAT-SG-21: Environmental Standards for River Morphology SEPA WAT-SG-21 [Ref 6.I] .*

S/1.15 Sufficient design detail shall be progressed during the EIA stage to identify land made available (LMA) so as not to adversely constrain hydromorphological requirements at detailed design.

S/1.16 The design approach shall minimise effects upon fluvial geomorphology and natural river function, demonstrating good practice with specific reference to the guidance series developed by SEPA for engineering in the water environment, including but not limited to WAT-SG-23 Good Practice Guide – Bank Protection SEPA WAT-SG-23 [Ref 2.I], WAT-SG-25 Good Practice Guide – river crossings SEPA WAT-SG-25 [Ref 4.I], WAT-SG-26: Good Practice Guide - Sediment Management SEPA WAT-SG-26 [Ref 5.I], WAT-SG-28: Good Practice Guide - Intakes and Outfalls SEPA WAT-SG-28 [Ref 3.I], WAT-PS-06-02: Culverting of Watercourses SEPA WAT-PS-06-02 [Ref 8.I].

Groundwater and groundwater dependent terrestrial ecosystems (GWDTE)

S/1.17 Impacts on groundwater receptors and GWDTE shall be assessed with reference to the SEPA Land Use and Planning System (LUPS) Guidance Note 31 SEPA GN 31 [Ref 13.N].

NOTE *This guidance cannot be used to assess deep excavations where dewatering will be required (for example from deep cuttings).*

S/1.17.1 For this category of development (dewatering volumes above 10m3 per day) the principles outlined in SEPAs Regulatory Method WAT-RM-11 SEPA WAT-RM-11 [Ref 16.N] should be applied.

S/1.18 In order to assess potential risk to GWDTEs, a phase 1 habitat survey shall be provided using the guidance SNIFFER WFD 95: A Functional Wetland Typology for Scotland (Scotland & Northern Ireland Forum for Environmental Research) WFD95 [Ref 17.N], to identify types of wetland both within and outwith the site boundary, within certain distances of the development as a minimum.

NOTE *SEPA recommend surveys within a 100m radius from excavations less than 1m deep and within a 250m radius of all excavations deeper than 1m.*

S/1.19 Impacts on groundwater quality from pollution inputs shall be assessed, with reference to HEWRAT (see Water Quality section above) and the SEPA Position Statement WAT-PS-10-01 SEPA WAT-PS-10-01 [Ref 7.I].

S/1.19.1 This document assigns groundwater assessment criteria for pollutant inputs, describing how the prevent and limit requirements of the WFD should be applied.

S/2. Reporting and recording results

S/2.1 The level of significance of potential impacts on water environment receptors and their component attributes shall be assigned after review of any proposed mitigation.

NOTE *In Scotland, project-level WFD compliance assessment reporting is not required. WFD objectives are assumed to be embedded in the environmental assessment process and safeguarded through The Water Environment (Controlled Activities) (Scotland) Regulations 2011 WE(CA)(S) Regs 2011 [Ref 18.N] for project activities.*

S/3. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	2007/60/EC, 'Assessment and Management of Flood Risks Directive'
Ref 2.N	CEH (2011), 'CEH (2011), An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change.'
Ref 3.N	CCA(S) 2009, 'Climate Change (Scotland) Act 2009'
Ref 4.N	2000/60/EC, 'Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy'
Ref 5.N	2014/52/EU, 'Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment'
Ref 6.N	Flood Risk (S), 'Flood Risk Management (Scotland) Act 2009 '
Ref 7.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 8.N	PAN 61, 'Planning Advice Note 61: Planning & SuDS'
Ref 9.N	Reservoirs (S) 2011, 'Reservoirs (Scotland) Act 2011'
Ref 10.N	The Stationery Office. Roads(S) 1984, 'Roads (Scotland) Act 1984'
Ref 11.N	WEWS (S) 2003, 'Scotland as the Water Environment and Water Services (Scotland) Act 2003'
Ref 12.N	SPP 2014, 'Scottish Planning Policy (SPP) 2014'
Ref 13.N	SEPA GN 31, 'SEPA (2014) Land Use Planning System Guidance Note 31 '
Ref 14.N	SEPA WAT-SG-53, 'SEPA (2015) Supporting Guidance (WAT-SG-53) Environmental Quality Standards and Standards for Discharges to Surface Waters'
Ref 15.N	SEPA Flood Risk Guidance, 'SEPA (2015) Technical Flood Risk Guidance for Stakeholders'
Ref 16.N	SEPA WAT-RM-11, 'SEPA (2017) Regulatory Method (WAT-RM-11) Licensing Groundwater Abstractions including Dewatering'
Ref 17.N	WFD95 , 'SNIFFER (2009) WFD95 A Functional Wetland Typology for Scotland Field Report'
Ref 18.N	WE(CA)(S) Regs 2011, 'The Water Environment (Controlled Activities) (Scotland) Regulations 2011'
Ref 19.N	WE(CA)(S) Regs 2011 Guide, 'The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) - A Practical Guide.'
Ref 20.N	UKTAG, 2014. M-BAT, 'UKTAG River and Lake Assessment Method Specific Pollutants (Metals): Metal Bioavailability Assessment Tool (M-BAT), UK Technical Advisory Group on the Water Framework Directive.'

S/4. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	Defra/Environment Agency, 2003. FD1914, 'Guidebook of Applied Fluvial Geomorphology, R & D Technical Report FD1914'
Ref 2.I	SEPA WAT-SG-23, 'SEPA (2008); Engineering in the environment: good practice guide – Bank Protection Rivers and Lochs (WAT-SG-23).'
Ref 3.I	SEPA WAT-SG-28, 'SEPA (2008); Engineering in the environment: good practice guide – Intakes and outfalls (WAT-SG-28).'
Ref 4.I	SEPA WAT-SG-25, 'SEPA (2010); Engineering in the environment: good practice guide – River crossings (WAT-SG-25).'
Ref 5.I	SEPA WAT-SG-26, 'SEPA (2010); Engineering in the environment: good practice guide – Sediment management (WAT-SG-26).'
Ref 6.I	SEPA WAT-SG-21, 'SEPA (2012); Environmental Standards for River Morphology (WAT-SG-21)'
Ref 7.I	SEPA WAT-PS-10-01, 'SEPA (2014) Position Statement (WAT-PS-10-01) Assigning Groundwater Assessment Criteria for Pollutant Inputs'
Ref 8.I	SEPA WAT-PS-06-02, 'SEPA (2015) WAT-PS-06-02: Culverting of Watercourses - Position Statement and Supporting Guidance'
Ref 9.I	SEPA WAT-RM-08, 'SEPA (2017) Regulatory Method (WAT-RM-08) Sustainable Urban Drainage Systems (SUDS or SUD Systems)'
Ref 10.I	SSWP 2010, 'SSWP (2010), SuDS for Roads'
Ref 11.I	Construction Industry Research and Information Association. London. Woods-Ballard,B., Wilson,S., Udale Clark,H., Illman,S., Scott,T., Ashley,R., Kellagher,R. CIRIA C753, 'The SuDS Manual'

Llywodraeth Cymru
Welsh Government

Sustainability & Environment
Appraisal

LA 113
Wales National Application Annex to LA 113 Road drainage and the water environment

(formerly HD 45/09)

Revision 0

Summary
Please contact Welsh Government for the application of LA 113. The email address is: Standards_Feedback_and_Enquiries@gov.wales

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Welsh Government team. The email address for all enquiries and feedback is: Standards_Feedback_and_Enquiries@gov.wales

This is a controlled document.

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Release notes

Version	Date	Details of amendments
0	Aug 2019	Welsh Government National Application Annex to LA 113.