

HADDMS Priority Registers Priority Soakaways Verification User Guide

Date: __ May 2012

Version: 2.0a

Document Control

Document Title	HADDMS Priority Registers
Author	Mike Barker
Owner	Michael Whitehead
Distribution	Santi Santhalingam Mike Whitehead DPoE
Document Status	Draft

Revision History

Version	Date	Description	Author
0.1	22 April 2010	First Draft	M Barker
1.1	4 June 2010	Second Draft	M Barker
1.2	22 June 2010	Third Draft	M Barker
1.2a	24 June 2010	Third Draft (minor revision)	M Barker
1.3	13 July 2010	Final Draft	M Barker
2.0	March 2012	Major Revision	M Barker
2.0a	17 May 2012	Final Revised Draft	M Barker

Reviewer List

Name	Role
Will Rogers	Technical Reviewer
Tim Spink	Project Manager
Michael Whitehead	Project Sponsor

Approvals

Name	Signature	Title	Date of Issue	Version
Will Rogers				
Tim Spink				
Michael Whitehead				

The original format of this document is copyright to the Highways Agency.

Table of Contents

1	Introduction	1
2	Background	1
3	Procedure and Processes	3
3.1	Overview	3
3.2	Step 1(a) Desk Studies – Verification and Initial Assessment	6
3.3	Step 1b Desk Studies – Assessment of Treatment and Build Type	7
3.4	Step 2 Field Based Studies	12
4	Identifying Solutions	14
4.1	Step 3 Mitigation - Conceptual Design	14
4.2	Step 4 Mitigation –Detailed Design	15
5	Populating the Register	17
5.1	Making Priority Soakaway Register entries	17
5.2	Data fields	17
6	References	20
Appendices – Supporting Information		21
Appendix A	Workbook Verification Tool – Instructions for use	21
Appendix B	Assessment, Categorisation and Prioritisation	24
B1	Assessment Methods	24
B2	Prioritisation of Studies and Actions	26
Appendix C	Data Requirements and Data Sources	27
Appendix D	Verification- Additional Notes	30
Appendix E	Example Register Entries	32
Appendix F (1)	Screenshot of HADDMS showing status of soakaways	33
Appendix F (2)	Screenshot of HADDMS Soakaway Register	34

1 Introduction

This document provides guidance on the implementation of AMM 130/10 for the method of verifying risks to the water environment from highway drainage through existing soakaways on the HA's network and explains the procedure to follow to populate the Priority Soakaways Register on HADDMS (Highways Agency Drainage Data Management System).

This document:

- Provides guidance on the data required and tasks necessary to undertake the verification process (or risk assessment for newly located soakaways)
- Establishes the need to undertake a spillage risk assessment to identify the overall risk status of the soakaway
- Introduces a spreadsheet based "workbook verification tool" that is used in the verification and assessment process
- Can be used to help identify where mitigation measures may be necessary to address risks to groundwater from soakaways

2 The Priority Soakaway Register

2.1 Background

Research undertaken for the HA during 2007 and 2008 established a database of over 2000 soakaways and developed a risk assessment process (hazard ranking system - HRS) that identified risks to groundwater from routine runoff. This research project is more fully described in Investigation of Soakaways Above Sensitive Groundwaters - Stage 2. Final Project Report, Halcrow, July 2008. The output of this research project included an initial "register", derived from the HRS, which set out a list of individual soakaways, prioritised according to risk. This list, first completed in October 2008, formed the Baseline Soakaways Assessment in the HADDMS Priority Soakaways Register.

This original prioritised list was based on regional scale, generically derived information. In order that the risks may be fully defined, a verification process is required to ratify the baseline assessment and hence confirm the risk represented by routine runoff to groundwater from an individual soakaway. In addition, this guide introduces the need to undertake a spillage risk assessment for each soakaway.

A "Priority Soakaway Register" was developed to manage and update the data generated by the assessment and verification process. This formed one of a number of priority registers (that also include outfalls, culverts and flooding hotspots) that will be managed and implemented through the HA Drainage Data Management System (HADDMS).

.

2.2 Revisions and Updates

Research completed for the Highways Agency during 2010 has led to slight revisions in the risk assessment Method C in HD45, which together with Method D forms the basis of the Hazard Ranking System used in the prioritisation of soakaways. Whilst these revisions do not bring about a fundamental change, the baseline soakaways assessment (“Revised Baseline Soakaways Assessment”) has been repeated and the verification tool and this User Guide have been updated to take account of these revisions. The Revised Baseline Soakaways Assessment has been undertaken for all soakaways recorded on HADDMS (as at February 2012) – in excess of 6500 in number.

Soakaways not recorded on HADDMS at this time should also be subjected to risk assessment and hence included within the priority soakaway register following the processes described herein.

3 Procedure and Processes

3.1 Overview

As summarised on Figure 1 below, the assessment includes the following processes:

- Verify or determine the routine runoff risk category [A,B,C,D]
- Determine the spillage risk status [Pass, Fail]
- Identify whether the existing drainage includes facilities that already address the risk from routine runoff and spillage including influence of build type
- Determine overall risk status
- Where necessary, establish a potential, generic, solution (and its cost) to mitigate the risks
- Record the actual solution put in place and its cost

The assessment and verification of risks from routine runoff (based on the hazard ranking system) and spillage (based upon DMRB Vol 11 Section 3 Part 10 - HD45¹ - Method D) is undertaken through use of the workbook verification tool. Once these actions are complete, and existing measures and soakaway build have been taken into account, the soakaways are assigned an overall risk status (used to populate the priority risk register) which in turn identifies whether mitigating actions are required.

Appendix A provides instructions for using the workbook verification tool, which must be used in conjunction with this guide.

The priority register is used to record the current stage (and status) of the verification / assessment process, whether (mitigation) action is required, and if so whether that action has been completed. If, at any stage, the overall risk status is recorded as “X – Risk Addressed”, the process is complete.

Further details of the individual process steps are summarised on Figures 2 to 4.

More information on assessment and risk categorisation is given in Appendix B.

Limitations

Although this user guide and accompanying workbook provide guidance for the different steps of the assessment and verification process, it cannot cover all permutations of risk to groundwater from road drainage. Appropriate engineering and environmental solutions must be adopted based on site specific information. Further clarification can be provided by the HA if required.

Where there is good documented knowledge of the drainage system it may be possible to complete assessment, verification and final risk categorisation from desk study alone, however, in many cases, it is likely that a full set of information cannot be obtained and field studies will be required.

¹ Subsequent references to this document refer simply to HD45. Other HA Standards and Advice notes are also referred to in this format, with full references provided at the end of this document

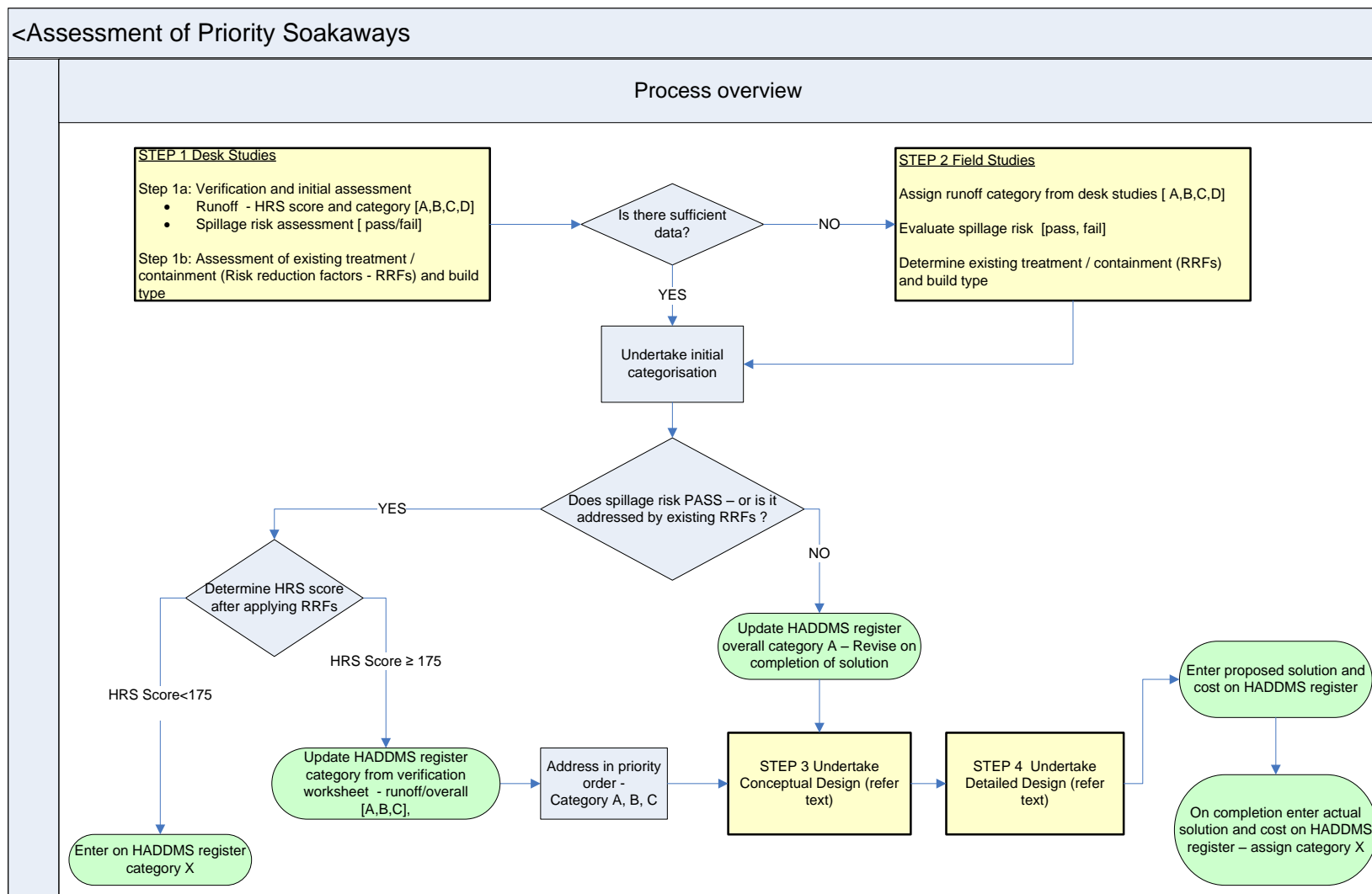
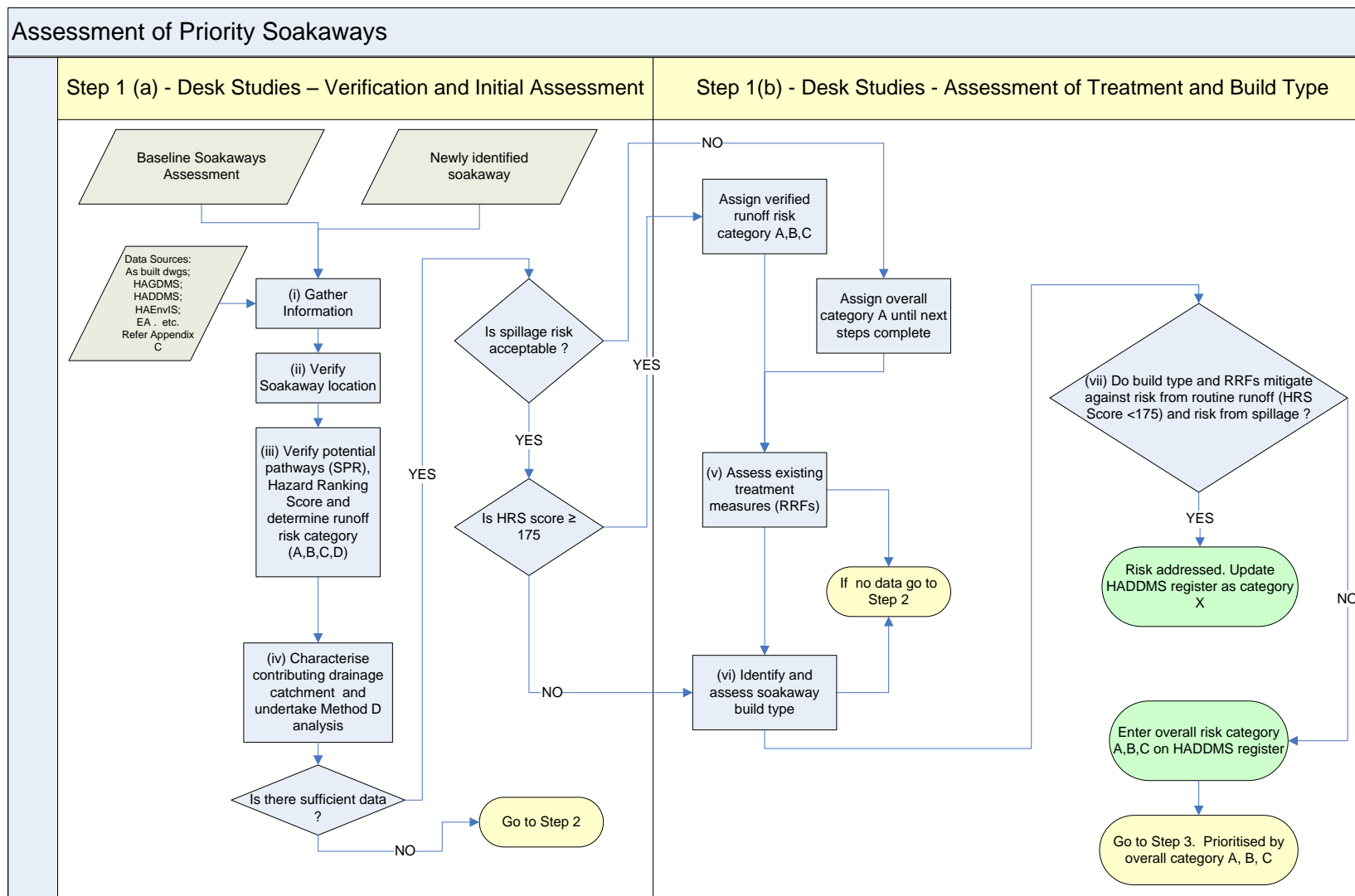
Figure 1 – Verification Process Overview

Figure 2 – Desk Studies

3.2 Step 1(a) Desk Studies – Verification and Initial Assessment

Step 1 a (i) Gathering Information

For each soakaway location, all data pertinent to risk assessment with respect to both routine runoff and accidental spillage should be collected and collated. This includes details of the soakaway itself (e.g. location, build type), its environment (such as depth to water) and the details of the system that drains the road catchment discharging into the soakaway.

Appendix C provides data requirements and potential data sources for the desk studies.

Step 1 a (ii) Verification of soakaway location.

This is essential for all other activities. If this cannot be confirmed by desk study, it must be confirmed during field studies. No verified risk category can be recorded unless the location is first verified. A suggested methodology is provided in a Guidance Note on outfall and soakaway surveys which can be downloaded from HADDMS.

Step 1 a (iii) Verification of Hazard Ranking System (HRS) scoring components.

There are a number of circumstances whereby the generic data used to generate the Revised Baseline Soakaways Assessment may be inaccurate and all data contributing to HRS scores and runoff risk categorisation must be verified by matching to site specific details.

Verifying the depth to groundwater is particularly important as this is one of the key components in determining risk to groundwater and the information used in the Revised Baseline Soakaways Assessment is based on generic national data and is not very robust (see also Appendix D) .

The existence (or absence) of a source-pathway-receptor pollutant linkage must also be determined. Within the HRS, potential pathways include those to Source Protection Zones (SPZ) and designated sites.

Appendix B provides additional information on assessment using the HRS and Appendix D provides supporting notes.

Once this data has been verified it is possible to re-evaluate the HRS score and routine runoff risk categorisation. Completion of this step finalises the initial verification of the risk due to routine runoff, and a risk category [A,B,C,D] is generated by the workbook verification tool. However this should not yet be recorded on the priority soakaway register until the effects of existing treatments/containment and the soakaway build type are considered (see Step 1(b)).

Step 1a (iv) introduces spillage risk assessment – the risk to groundwater cannot be fully assessed until this process is completed. This step must be undertaken for all soakaways as assessment of risk from accidental spillage was not carried out as part of the Baseline Soakaways Assessment.

Step 1 a (iv) Characterise drainage catchment and carry out spillage risk assessment.

Data gathered during Step 1 a (i) should have included all necessary data to carry out a spillage risk assessment in accordance with HD45 Method D. This assessment may be carried out within the workbook verification tool.

In accordance with HD45, the risk of a serious (groundwater) pollution incident should not normally exceed a 1% annual probability (1 in 100 year) although in exceptional circumstances, for example, if discharges to groundwater could affect protected wetlands or designated sites, a higher level protection may be required. Where doubt exists advice should be sought from the HA.

The spillage risk assessment output as provided in the workbook is simply pass or fail. The workbook allows for reduction of risk through existing treatment or containment measures (risk reduction factors - RRFs). These RRFs are based on the guidance provided in HD 45, Table 8.1.

Once complete, the spillage risk status on the HADDMS priority soakaways register must be updated (see Section 5).

Further information is provided in Appendix D with respect to discharges to groups or clusters of soakaways.

The risk of flooding from the soakaway drainage should also be assessed at this point in accordance with HA118.

On the completion of Step 1 a (iv) it will be possible to make a preliminary evaluation of the overall risk to groundwater, however this cannot be assigned to the priority register until the impact of existing treatment measures and build type have been assessed. In particular the build type must be determined to ensure this does not constitute a threat to groundwater (e.g. a soakaway with a deep borehole).

3.3 Step 1b Desk Studies – Assessment of Treatment and Build Type

Step 1 b (v) Assess existing treatment and containment measures

At this point, even though the soakaway may have been identified as being in a very high or high risk category, the effects of existing treatment or containment measures (prior to discharge into the soakaway) must be taken into account, as these may already address the risk. A worksheet included in the workbook verification tool may be used to assess the impact of such existing measures (see box below).

With respect to spillage, risk reduction factors (RRFs) may alter the risk from Fail to Pass – i.e. this risk has been addressed. With respect to routine runoff risk, the workbook verification tool applies RRFs to the verified HRS score (derived from Step 1 a (iii)). If this score is reduced to <175, category D should be assigned and it is deemed that the routine runoff risk has been addressed. However, these cannot be reported on HADDMS until build type has been assessed.

Where risk reduction measures fail to address spillage risk, new solutions must be identified (see Section 4).

Similarly, if there is inadequate reduction in runoff risk, or no risk reduction measures are in place (i.e. HRS scores remain ≥ 175), the runoff risk categories derived in Steps 1a (iii) and 1a (iv) should be retained unchanged until the risk is addressed.

Note that if risk reduction measures cannot be identified by desk studies alone, Field Study will be required, unless both spillage and runoff risk can be verified as being acceptable with no risk reduction in place.

Applying Risk Reduction

Where there are existing treatment systems in place, the workbook verification tool uses and generates risk reduction factors (RRFs) which are applied to the hazard ranking score (for routine runoff) and to the assessment of spillage risk (using HD45 - Method D). These factors have been applied based on guidance provided in HD45 (Table 8.1) and in HD33 (Table 8.1). If such treatment systems are present in the drainage system (upstream of the soakaway), the workbook calculates an adjustment of the hazard ranking system score and pass/fail status.

For RRFs applied to routine runoff, currently only those systems that have been demonstrated to remove dissolved metals (refer Table 8.1 HD 33, which does not include hydrocarbons) have been included in the workbook. In all the treatment systems described in HD33, removal of suspended solids is more significant than that of metals. Although sediments may contain contaminants that accumulate in the base of the soakaway and could threaten groundwater quality in the long term, they do not represent a direct potential hazard as is the case with discharges to surface water. Removal of entrapped sediments should be considered as part of regular maintenance procedures.

Other treatment systems may be identified and a RRF applied, though this must be justified in the text box found in the workbook.

A judgement must be made on whether the overall level of risk reduction is justified. The routine runoff risk category to be reported on HADDMS may be recorded on the workbook summary sheet, but is not generated automatically. There may be other factors that also need to be taken into consideration. It is possible that risk reduction factors that apply to routine runoff also apply to containment (of accidental spillage) although this will not always be the case.

Step 1 b (vi) Evaluate build type.

The type of soakaway may lead to the by-passing of attenuation processes prevalent in the unsaturated zone (which are used as a basis of the hazard ranking system) - indeed some build types may increase the risk if they provide a direct pathway to groundwater.

Soakaways with boreholes

Although regulatory authorities have no specific policy regarding the depth of soakaways, those soakaways that are >5m deep must be referred directly to the HA.

Conversely, shallow soakaways (particularly infiltration basins) may provide a level of treatment that may be considered as reducing the level of risk. This “soakaway build” risk reduction factor is integrated into the workbook. Currently in the workbook these are applied in addition to the risk reduction factors assigned for any upstream treatments, but different treatment types and build types (effectively treatment trains) may have different cumulative effects on different potential pollutants. As above, the level of risk reduction, if at all, requires a professional judgment to be made. Further guidance is available in HD45 and HD33 on the attenuation potential of shallow soakaway systems.

If information on soakaway build type cannot be determined from desk study alone, field studies will be needed.

Step 1b (vii) Evaluate need for mitigation.

On completion of the steps above, the risk from routine runoff and spillage risk will have been established. Recording these on HADDMS generates the overall risk category (see box below and also Appendix B). The effects of existing risk reduction measures and build type will also have been taken into account.

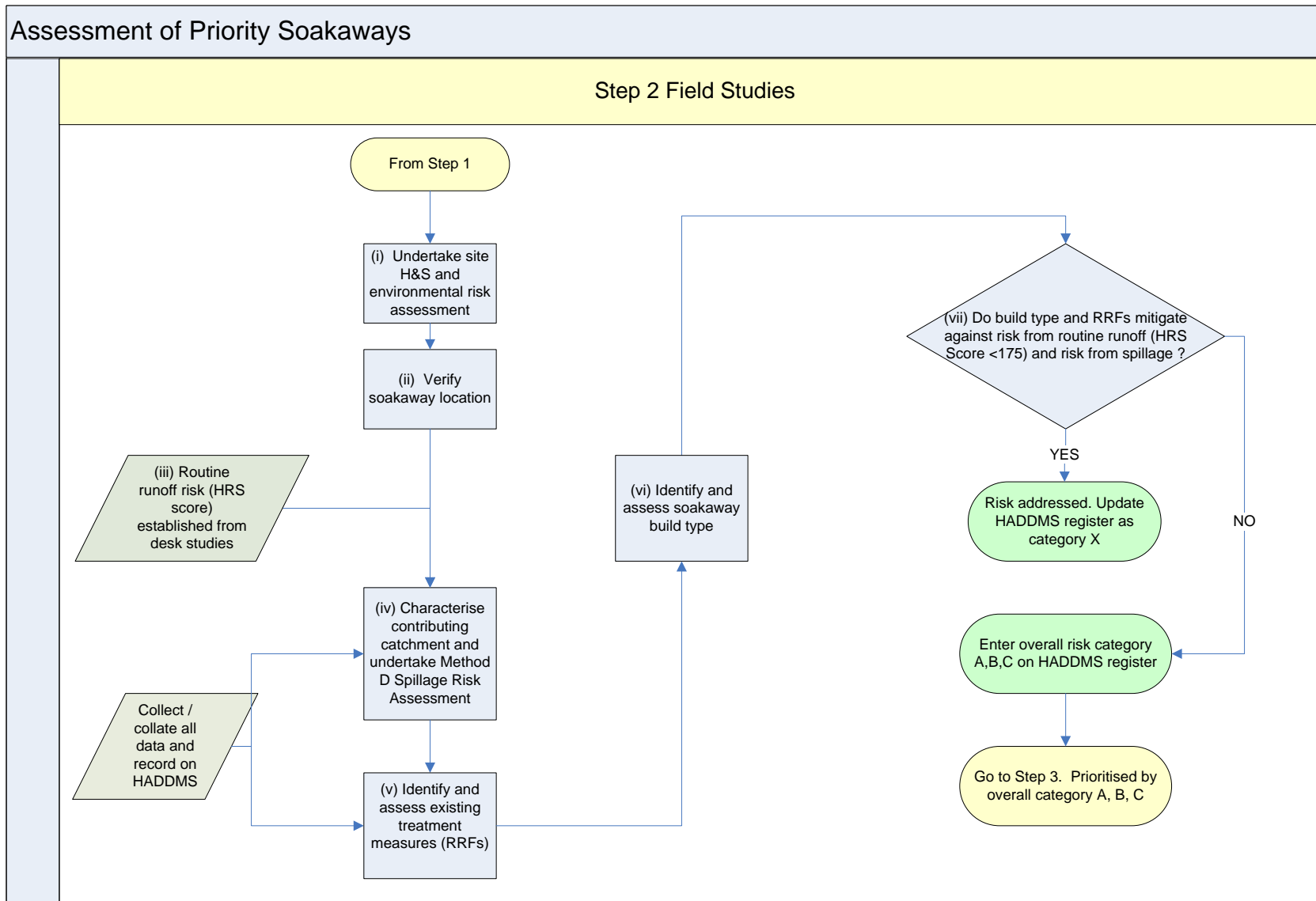
On completion of the assessment the routine runoff risk status and the spillage risk status should be manually entered against the appropriate soakaway in the HADDMS Priority Soakaways Register. The verification status must be changed to "Desk study complete - no field study required" or "Desk study complete - field study required" and the action status must be changed to "Not required" or "Required not done or not completed". The overall risk status will then be automatically calculated by HADDMS. A PDF version of the completed workbook verification tool spreadsheet must be uploaded as an attached document to the soakaway asset inventory.

Once overall risk status is determined, the requirement for mitigation measures is as set out in the table below:

		Routine runoff risk category (status)			
		A	B	C	D
Spillage risk status	Pass	Overall Very High Risk (A) <i>Mitigation measures required</i>	Overall High Risk (B) (see note below)	Overall Moderate Risk (C) (see note below)	Overall Low Risk. May be assigned category X (risk addressed) in risk register
	Fail	Overall Very High Risk (A) <i>Mitigation measures required</i>			

Note: Irrespective of the routine runoff category, if spillage risk is “Fail,” the overall risk status is A, Very High Risk and mitigation measures will be required. Where mitigation measures are required, the next step is to go to conceptual design on a prioritised basis – to first address overall risk category A. Risk category B and C sites will not be allocated for mitigation measures until category A sites have been addressed.

Where the overall risk has been verified as being low (Category D routine runoff, HRS score<175; Method D spillage risk “Pass”) this warrants no further action and Category X (risk addressed) is assigned.

Figure 3 Field Studies

3.4 Step 2 Field Based Studies

These will be needed where desk based studies do not provide sufficient information to inform Steps 1a (iv) – b (vi) or where soakaway location (Step 1 a (ii)) needs to be verified. The risk from routine runoff is determined from desk study alone.

Prioritisation of Field Studies

Prior to proceeding to Field Study, the verification status “field study required” of the assessment should be recorded on the soakaway register and any such studies prioritised (see Appendix B)

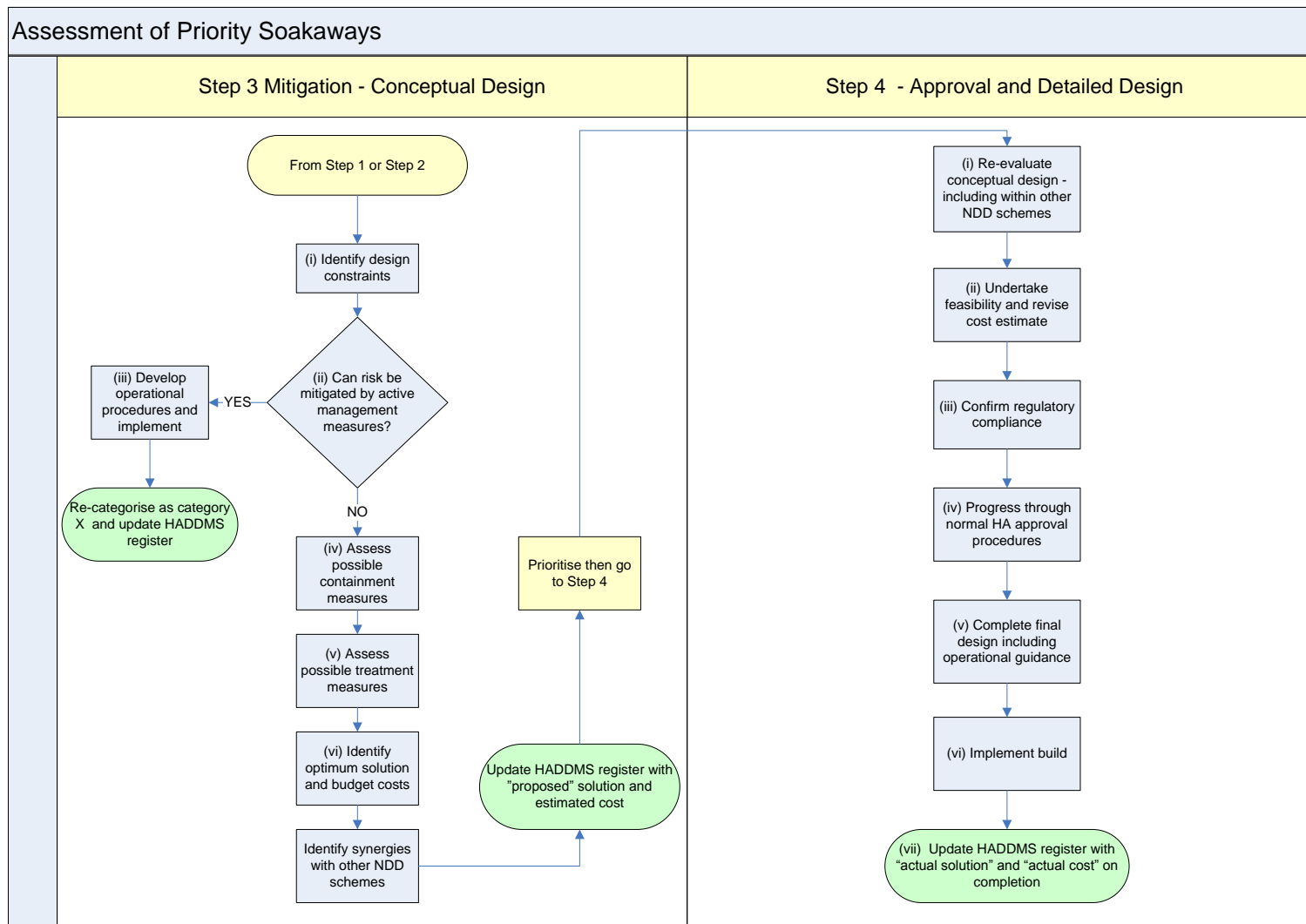
Step 2 (i) H&S and environmental risk assessment

Prior to undertaking any field works, Health and Safety and environmental risk assessments must be undertaken. These should be based on all available information although safe access, confined spaces working and protected species must be key considerations.

Once field data is obtained, Steps 1a (iv) – 1 b (vi) are carried out as described for the desk study and as shown on the accompanying flow chart, to determine the overall risk status. Once these steps are complete, the need for mitigation may be identified as in Step 1 b (vii) above.

On completion of the field assessment the routine runoff risk status and the spillage risk status should be manually updated against the appropriate soakaway in the HADDMS Priority Soakaways Register. The verification status must be changed to “Field study complete” and the action status must be changed to “Not required” or “Required not done or not completed”. The overall risk status will then be automatically calculated by HADDMS. A PDF version of the completed workbook verification tool spreadsheet must be uploaded as an attached document to the soakaway asset inventory.

Experience suggests the level of information that may be gathered on soakaway build type from field surveys may be limited. If the field studies do not reveal build type a decision will be needed based on the potential risk. If the weight of evidence is that the risk is relatively low (e.g. there are RRFs in place, other soakaways in the vicinity are of an acceptable type etc.), the overall risk of the site may be categorised in accordance with the overall risk category (status) derived during the verification process. If evidence suggests the site remains at high risk, further RRFs may be required or an option to replace the soakaway may need consideration.

Figure 4 Steps in Solution Design

4 Identifying Solutions

4.1 Step 3 Mitigation - Conceptual Design

Where it is established mitigation measures are required, a conceptual (pre feasibility) design for treatment and /or containment should be developed. **Designers should ensure, and seek to demonstrate, that proposals are consistent with the principles of sustainability.** As a general rule designers should ensure the following are a material consideration within the design process;

- the principles of sustainable drainage systems (SuDS) are, wherever technically possible, incorporated within the conceptual design and that the solution is proportionate to the level of identified risk;
- future maintenance regimes and whole life costs are considered as well as capital costs;
- mitigation works can be incorporated with other planned works;
- low technology solutions within the existing highway boundary; and
- use of recycled materials and/or low carbon technology

Mitigation measures (solutions) adopted may typically be as defined below:

Proposed Mitigation Measure / Solution	Definition	Example
New build	Addition of a new asset where nothing was available previously	Addition of a sediment pond upstream of a soakaway where none previously present
Retrofit	Addition of a new asset or attribute to an existing asset	Adding a penstock to a sediment pond upstream of a soakaway
Rebuild	Rebuilding an existing asset that had deteriorated such that it was no longer functional	Rebuilding of a collapsed chamber soakaway
Substitute	Substitution of an existing asset with an alternative form of asset	Backfilling and replacing a soakaway borehole with an infiltration basin
Active Management	Non built, behavioural solutions	Enhanced signage, regular inspection with quick response measures such as sand bags for spillage containment

HA design guidance particularly that provided in **HDXX**, HD33, HA103 and HA118, should be taken into account during the conceptual design process.

The steps through conceptual design, summarised on the flow chart, include:

- 3 (i) Identify design constraints based on individual sites, including sensitivity of receiving groundwater², space, access, landscape etc.
- 3 (ii) Identify and assess possible active management measures - i.e. can revised operational procedures provide the appropriate level of mitigation? (e.g. enhanced response to spillage, such as use of sandbags).

² Some sites may be so sensitive that discharge to groundwater may no longer be appropriate – in this case the HA must be consulted before alternative drainage solutions are sought

- 3 (iii) If these measures can be implemented, develop and seek approval for procedures and re-categorise the soakaway on the register as Category X – risk addressed.
- 3 (iv) Identify and assess possible containment measures if there is a need to address spillage risk (i.e. if Method D identifies this is required).
- 3 (v) Identify possible treatments for routine runoff and combined treatments to address both routine runoff and spillage risk.
- 3 (vi) Identify optimum treatment/containment solution and determine budget costs. Solutions should consider at minimum: groundwater sensitivity and depth; catchment size; flood risk; space constraints; access and H&S; landscape/ecological constraints; relative costs. Relevant HA design guidance should be used to determine appropriate measures.

Those soakaways requiring mitigation measures should be prioritised by carrying out a benefit cost analysis. This could be an assessment against other “soakaway” appraisals (e.g. one high risk site needing a costly solution vs. five lower risk sites at the same cost) or could be a cost benefit analysis for different solutions at the same site. The Service Provider should also assess the opportunity for combining the mitigation measures with other planned works.

4.2 Step 4 Mitigation – Detailed Design

Once the conceptual design and costs are agreed, the following will be required to progress through to final design:

- 4 (i) Re-evaluate conceptual design - This comprises a review of the chosen option to ensure it will meet treatment and containment objectives.
- 4 (ii) Undertake feasibility and cost estimate to determine construction costs, access, H&S, on going operational /maintenance requirements and costs, initiate CDM.
- 4 (iii) Confirm “regulatory” compliance
- 4 (iv) Seek scheme and budget approval for design and construction through the normal HA procedures.

The proposed solution and its estimated cost must be entered on the HADDMS Priority Soakaways Register.

- 4 (v) Complete final design including setting out operational guidance
- 4 (vi) Once budget approval is granted and resources identified, the measures may be implemented.

Once measures are complete, the solution adopted and its actual cost must be recorded on the HADDMS priority soakaway register and the action status changed to "Required complete" All design details etc. must be entered on HADDMS.

5 Populating the Register

5.1 Making Priority Soakaway Register entries

Service Providers should access the Priority Soakaway Register through HADDMS. The register is a subsection of the asset inventory. The relevant soakaway can be found from the HADDMS map. Screenshots of HADDMS showing soakaway status and the soakaway register are given in Appendix F.

5.2 Data fields

An example of data entries into the register is included in Appendix E. These are based on soakaways identified in the baseline – all post verification data entries are fictional, although they might represent typical outcomes.

The data fields in the register are as follows:

Baseline information:

(These fields are primarily populated from information in the Revised Baseline Soakaways Assessment)

- Baseline assessment ID
 - Retained as reference to the original Baseline Soakaways Assessment Report. *(Non editable number; historical data only; null for any soakaway without a baseline assessment)*.
- HADDMS ID
 - The HADDMS ID *(HD43 asset reference no. automatically assigned by HADDMS)*.
- Item Type
 - This should identify the soakaway type as one of four types (soakaway chamber; soakaway borehole; soakaway trench; infiltration pond). Where the soakaway type is uncertain the default is soakaway chamber.
- Baseline Score
 - This is the routine runoff Hazard Ranking System (HRS) core derived from the Revised Baseline Soakaways Assessment - retained for historical information *(non editable whole no. ; null for any soakaway without a baseline assessment)*
- Routine runoff (risk status)
 - Where a Revised Baseline Soakaways Assessment has been carried out, this data field will be populated with the unverified routine runoff risk category. *(data entered from Revised Baseline Soakaways Assessment; defined from pick list; verification status must be “baseline assessment carried out”)*.
- Overall Risk (status)
 - This field is automatically generated by HADDMS and is the same as the routine runoff (risk status) for baseline assessments.

Verified Information:

Populated after undertaking verification or new assessment process steps, as shown below. All register entries will have an HADDMS ID and item type.

Verification process/step	HADDMS priority register data field entry
HADDMS register populated on completion of Step1b (vii) Desk Study or on completion of Step 2 Field Study (latter if required).	<ul style="list-style-type: none"> Routine runoff (risk status) <ul style="list-style-type: none"> This is the verified routine runoff risk status following use of the Workbook verification tool. (<i>defined from pick list</i>). Spillage (risk status) <ul style="list-style-type: none"> This is the spillage risk assessment determined from the HD 45 Method D assessment. (<i>defined from pick list</i>) Overall Risk (status) <ul style="list-style-type: none"> This field is automatically generated by HADDMS as a combination of the routine runoff risk and the spillage risk. It also depends upon the Action and Verification Status fields
Register (re) populated at completion of Step 1 Desk study and Step 2 Field study (latter if required).	<ul style="list-style-type: none"> Verification status <ul style="list-style-type: none"> This field defines progress through the verification process (<i>defined from a pick list - - default values are "baseline assessment carried out" or "no assessment carried out"</i>)
Register populated on completion of Desk study or Field study (latter if required).	<ul style="list-style-type: none"> Action Status <ul style="list-style-type: none"> This field identifies whether action is required to provide a solution (<i>defined from a pick list- default is "not determined"</i>)
Register populated during Steps 3/4	<ul style="list-style-type: none"> Proposed solution <ul style="list-style-type: none"> Generic definition of proposed solution (<i>defined from pick list – default blank</i>) Proposed cost (£) <ul style="list-style-type: none"> Estimated cost (£) of proposed solution (<i>number field</i>)
Register populated on completion Step 4	<ul style="list-style-type: none"> Actual Solution <ul style="list-style-type: none"> Identification of actual solution implemented (<i>defined from pick list- default blank</i>) Actual Cost <ul style="list-style-type: none"> Final cost (£) of implemented solution (<i>number field</i>)
Register populated with each change	<ul style="list-style-type: none"> Last Update <ul style="list-style-type: none"> Date record last updated (<i>not user editable; auto populated whenever record is saved. Default is date asset added to system or date of bulk data imports from Revised Baseline Soakaways Assessment</i>)
Register populated as required	<ul style="list-style-type: none"> Comments <ul style="list-style-type: none"> free text field (<i>default blank</i>)

The type of data entry is highlighted in italics. A number of these fields are populated using pull down boxes (pick lists) – possible options in each case are shown in the “example” register entries in Appendix E.

6 References

Design Manual for Roads and Bridges (DMRB):

HDXX Drainage Design Policy

HD 33. Surface and Sub-surface Drainage systems for Highways (DMRB 4.2)

HD 43 Drainage Data Management System for Highways. (DMRB 4.2)

HA 103. Vegetated Drainage Systems for Highway Run-off (DMRB4.2)

HA 118. Design of Soakaways. (DMRB 4.2)

HD 45. Road Drainage and the Water Environment (DMRB 11.3.10)

IAN 147 Drainage Data Management (SD15 and HD43)

Guidance note on drainage outfall and soakaway surveys. (Can be downloaded from HADDMS)

Highways Agency. Investigation of Soakaways Above Sensitive Groundwaters - Stage 2. Final Project Report. Halcrow. July 2008. (Can be downloaded from HADDMS)

Appendices – Supporting Information

Appendix A Workbook Verification Tool – Instructions for use

The following explains how to use the Highways Agency Priority Soakaways Workbook Verification Tool which allows the steps of the verification procedure to be followed in a systematic manner to generate relevant risk assessment information. The Workbook Verification Tool can be downloaded from HADDMS at www.haddms.com

The Workbook is intended to allow the ratification of soakaways currently in the Revised Baseline Soakaways Assessment, but may also be used to assess newly located soakaways that have not been subject to a baseline assessment.

Data entry commences with the verification sheet (“Clear all values” erases previous entries except the soakaway ID) and by filling information in rows 1-11 on the summary sheet.

Note worksheets require entry only in cells left white. This is generally done using pull down boxes. Green cells are automatically populated by the workbook. All worksheets must be fully completed before the summary sheet is properly populated.

Part 1 – Verification of HRS score [Worksheet Tab - Verification]

The first step in using the workbook allows for the verification (ratification) of scores based on locally sourced, desk study information [Step1a (iii) in Section 3.2]. It is then possible to update each of the component fields that make up the scores in the hazard ranking system

- For soakaways that have been subject to a revised baseline assessment, HRS scores are entered directly into the worksheet to show the revised baseline assessment soakaway category. This baseline information is taken directly from the Priority Soakaways Register on HADDMS.
- Use the pull down boxes for each component to verify the HRS score for each component field. Appendix B, Table B2 provides details of the HRS scores.

Note: if the SPZ score is 150 (i.e. SPZ 1) this is the default highest score for the “sensitivity” terms and scores for vulnerability and designations are set at zero. If this is revised downward (e.g. to SPZ 2, 3 or no risk) then the other sensitivity scores (aquifer classification, designation) must be added. Conversely if the SPZ score is increased to 150 (i.e. SPZ1) the other sensitivity scores will be reduced to zero.

- Once each component score has been verified, this will generate a revised total score and category.
- This worksheet will automatically populate the “verified HRS score” as the initial data in the subsequent worksheets – i.e. the HRS score before any risk reduction factors are applied. The verified score and revised category are recorded on the summary sheet (rows Sum 12, 13).

Part 2 - Spillage Risk Assessment [Worksheet Tab- Method D]

This step applies the spillage risk assessment from HD45 - Method D.

- Data is entered into columns for each length of road that discharges into the soakaway – the different columns are for sections of road with different junction types (which affects the risk).
- Risk reduction factors (if any) may be entered in Row D15 (enter a value of 1.0 if none exist).
- The risk return period is generated, if this exceeds 1% this will be highlighted and recorded in the worksheet.
- If a different risk return period is required (due to site specific factors – see guidance in HD45) this may also be entered – if not the value 1% must be entered
- The worksheet determines whether the risk is acceptable or unacceptable (i.e. pass or fail).
- The information is generated automatically on the summary sheet.

Part 3– Establishing Risk Reduction Factors [Worksheet Tab – RRF]

Data entry is based initially on desk study – if data is not known, the worksheets will prompt the need for field surveys.

The verified HRS post desk (or field) study is automatically entered in Row RRF 1.

- In Row RRF2 the user enters the known treatment system (using the drop down box). If other systems are available the user either enters that which gives an appropriate risk reduction factor (which is given on the worksheet) or enters none. If not known, the worksheet prompts the need for field survey and generates a 0 in the remaining fields.
- Once this is entered the revised HRS score (accounting for RRFs) is provided in Row RRF7.
- The type of treatment system is generated on the summary sheet and the revised HRS score is carried forward to the next stage where build type is assessed.

Part 4 – Evaluating Build Type [Worksheet Tab- Build Type]

Build type must also be considered as this may alter the level of risk. Risk reduction is possible from the build type – this is linked to the RRF i.e. the influence of these factors is assumed to be cumulative. Note that professional judgement is needed here as treatments provided by the soakaway itself (e.g. an infiltration trench) and that provided by pre treatments may not always be complementary.

- The revised HRS score (accounting for RRFs) is brought forward from the previous worksheet and is automatically entered in Row BT4
- Simple soakaways, trenches or infiltration basins generate a RRF and provide an amended score – other build types must be used within these generic descriptions
- If the build type is not known (even after field survey) or if it is >5m deep, these represent an unknown and potentially high risk to groundwater and invalidate some of the HRS scoring components. Such a situation must be referred to the HA.

The Summary Sheet

The summary sheet imports the outputs from other sheets. It provides prompts to certain actions according to the HRS score, the spillage risk assessment, the RRFs and the evaluation of build type. It will not be fully populated until all other worksheets are complete. The summary sheet:

- identifies the routine runoff category and the verified HRS score following verification, but before taking RRFs and build type into account. (Rows SUM 12 and SUM 13)
- highlights the spillage risk status (pass or fail) to be entered into the HADDMS priority register. (Row SUM 17)
- provides the treatment and soakaway type identified (Rows SUM 18 and SUM 19)
- and the “final” calculated HRS score including the allowance for risk reduction from treatment and build type (Row SUM 20)
- if the final calculated HRS score is <175 , the risk from routine runoff is low risk (category D) and the routine runoff is shown as “pass” (Row SUM 21)
- if the final calculated HRS score is ≥ 175 , the routine runoff risk is reported “fail” (Row SUM 21)

The final runoff risk category is reported in row SUM 22 – by choosing from a pull down box. This is the information that is to be recorded on the HADDMS priority soakaway register. If the HRS score (reported in Row SUM 20) is <175 , category D is entered.

If the score is ≥ 175 , the originally verified HRS category, A,B,C (as reported in Row SUM 13) is entered (also on the HADDMS priority soakaways register) as the risk reduction from treatments and build type are deemed insufficient to address the risk and further action will be required.

The “continuation guidance” box prompts the next action, which may be:

- undertake field survey
- no additional work to be undertaken, conditions acceptable, update register
- update register and move to conceptual design step

In all cases, these and subsequent actions should be subject to appropriate professional judgement.

Appendix B Assessment, Categorisation and Prioritisation

B1 Assessment Methods

The assessment of risk from routine runoff has been adapted from that in HD45 and is based on the Hazard Ranking System (HRS) more fully described in the Investigation of Soakaways Above Sensitive Groundwaters - Stage 2. Final Project Report, Halcrow, July 2008³. The Baseline Soakaways Assessment (the initial register) was developed from nationally available generic data sets and the categorisations given to each soakaway are based on this data. The revised baseline assessment was run in February 2012 to take account of updates to the soakaway dataset in HADDMS and minor revisions in the methodology. Each soakaway has been assigned an HRS score and allocated a risk category A-D. These risk categories are summarised on Table B1 below.

Table B 1 – Runoff risk categorisation

Description	No. of soakaways in revised baseline soakaways assessment report	Routine runoff risk category (status)
Within SPZ1. DtW* ≤5m	134	A (Very High)
Within SPZ1. DtW >5m	161	B (High)
Not SPZ1. HRS Score ≥175	101	C (Moderate)
HRS Score <175	6118	D (Low)

* DtW = Depth to groundwater

For those soakaways identified since the completion of the 2012 Revised Baseline Soakaways Assessment, the soakaway will be assigned a runoff risk category using the workbook verification tool, until this process is complete this runoff risk category is entered in the priority soakaway register as “not determined.”

The HRS is based on scores assigned to 7 key components of the Source –Pathway – Receptor linkage between runoff and groundwater. The scoring assigned to individual components is summarised on Table B2, although the verification tool provides pull down boxes that allocate the score. These scores are also incorporated in the Revised Baseline Soakaways Assessment.

Note that in the revised baseline assessment, the aquifer type (vulnerability classification) score generated for Secondary Aquifers does not distinguish between Secondary A,B,U, so these scores must be adjusted as necessary during verification.

³ The derived risk categories have changed and are somewhat simplified from those described in the original report

Table B2 **Hazard Ranking System Scores**

Field description	Attribute description	Score component (1)	Score component (2)	Total Score	Notes
Sensitivity					
				150	Max Value for Sensitivity
Source Protection Zones	none			0	All SPZ Zone 1 default to maximum score for the component
	1			150	
	2			50	
	3			30	
Aquifer type (Vulnerability Classification)	Unproductive Strata			0	(Incorporates Soil Class)
	Principal_H1	5	10	50	Principal and secondary aquifer scores (component 1) factorised by multiplication by soil class (component 2).
	Principal_H2	5	8	40	
	Principal_H3	5	6	30	The EA are changing the way aquifer vulnerability is identified and it may not be possible in future to access groundwater vulnerability mapping. Where the soil class is no longer available, aquifer scores may be allocated in accordance with the following: Principal aquifer: Score 40 Secondary aquifer: Score 20 Unproductive strata: Score 0
	Principal_HU	5	5	25	
	Principal_I1	5	4	20	
	Principal_I2	5	3	15	
	Principal_L	5	2	10	
	Secondary A_H1	3	8	24	
	Secondary A_H2	3	6	18	
	Secondary A_H3	3	5	15	
	Secondary A_HU	3	4	12	
	Secondary A_I1	3	3	9	
	Secondary A_I2	3	2	6	
	Secondary A_L	3	1	3	
	Secondary B_H1	2	6	12	
	Secondary B_H2	2	5	10	
	Secondary B_H3	2	4	8	
	Secondary B_HU	2	3	6	
	Secondary B_I1	2	3	6	
	Secondary B_I2	2	2	4	
	Secondary B_L	2	1	2	
	Secondary U_H1	2	6	12	
	Secondary U_H2	2	5	10	
	Secondary U_H3	2	4	8	
	Secondary U_HU	2	3	6	
	Secondary U_I1	2	3	6	
	Secondary U_I2	2	2	4	
	Secondary U_L	2	1	2	
Designated Sites	Special Area of Conservation			50	
	Special Protection Area			50	
	Other Natura 2000 Sites			50	
	Site of Special Scientific Interest			30	
	None defined			0	Undesignated sites - no score
Magnitude (Pathway)					
Type of flow of run off to groundwater (hydrogeological description)	Concealed aquifers, aquifers of limited potential, regions without significant groundwater			5	(Unproductive Strata) - retains score as may contain groundwater
	Aquifers in which intergranular flow is significant			10	
	Aquifers in which flow is dominantly in fissures and other discontinuities			30	
Depth to groundwater (metres)	Depth to water table ≥15m and non-aquifers			10	
	Depth to water table 5 to <15m			20	
	Depth to water table ≤5m			50	
Magnitude (Source)					
Average rainfall volume (mm)	<740			5	
	740 to <1060			10	
	≥1060			20	
traffic density (two way AADT)	<50,000			5	
	≥50,000 to < 100,000			15	
	≥100,000			30	

B2 Prioritisation of Studies and Actions

Prior to proceeding to Field Studies for verification purposes, where a large number of soakaways are identified in a particular area, it may be necessary to undertake field studies in order of priority (see below).

Similarly, where verification has been completed, but actions have been identified as being necessary, before proceeding with conceptual design of mitigation measures (solutions) an order of priority must be established.

In both cases the order of priority is as set out below:

Hazard Ranking Category	Spillage Risk Assessment	Overall Risk Category	Priority Order
A (very high risk)	Fail	Very high risk	1
B (high risk)	Fail	Very high risk	2
C (moderate risk)	Fail	Very high risk	3
D (low risk)	Fail	Very high risk	4
A	Pass	Very high risk	5
B	Pass	High risk	6
C	Pass	Moderate risk	7
D *	Pass	Low risk	8

* applies only to prioritisation of field studies

Appendix C Data Requirements and Data Sources

This Table provide information on data requirements and sources to carry out the verification and assessment processes described in Section 3. Other guidance on data and data sources may be found in HD45. Website links provided were up to date as of March 2010

Process	Data Requirements	Possible Data Sources	Comment
Step 1 (ii) – (iii). HRS verification			These procedures need staff with appropriate skills.
(ii) Verify soakaway location.	Soakaway Location/NGR.	As built drawings. Other service provider records.	
(iii) Verify SPR pathway linkage to SPZ and designated sites.	Source protection zone mapping; detailed geology maps and sections; delineated groundwater management units; borehole and other SI data; topographical maps.	<p>Environment Agency (EA) Website; http://www.environment-agency.gov.uk/ EA Regional offices, EA WISKI and BWS databases, relevant CAMS. http://www.environment-agency.gov.uk/research/planning/33374.aspx</p> <p>British Geological Survey (BGS); http://www.bgs.ac.uk/home.html</p> <p>Natural England; http://www.naturalengland.org.uk/</p> <p>Scottish Natural Heritage http://www.snh.gov.uk/</p>	<p>Pathway to sensitive feature may depend upon soakaway type.</p> <p>BGS's Open Geoscience webpage has an online geological mapping service to 1:50,000 scale for solid and superficial geology as well as boreholes. http://www.bgs.ac.uk/opengeoscience/home.html An index of BGS boreholes is included on HAGDMS. www.hagdms.com</p> <p>Natural England website "Nature on the Map" provides details of designations. http://www.natureonthemap.org.uk/map.aspx</p> <p>The MAGIC website also provides information on designated sites http://www.magic.gov.uk/</p> <p>SNH website has an interactive map of designations. http://www.snh.gov.uk/publications-data-and-research/snhi-information-service/map/</p>

Process	Data Requirements	Possible Data Sources	Comment
		<p>Countryside Council for Wales http://www.ccw.gov.uk/default.aspx</p> <p>HADDMS, HAGDMS (which has geological maps and HA boreholes), HAEnvIS; As built drawings; service providers records; SI reports; staff and site information.</p>	<p>CCWs LANDMAP provides details of designations. http://www.ccw.gov.uk/landscape--wildlife/protecting-our-landscape/landmap.aspx</p> <p>Much EA sourced mapping data is already available on HADDMS www.haddms.com and HAEnVIS http://www.highways.gov.uk/business/31173.aspx</p>
(iii) Verify depth to water.	Borehole data; regional/ local groundwater level observation data; SI data.	As aboveHAGDMS; EA; BGS; SI reports and data etc.	Weight of evidence in location may be used to estimate depth to water at soakaway location. Need to be aware of "perched" water tables. The data used in the baseline assessment is a generic national dataset and is not robust.
(iii) Verify other data.	Aquifer vulnerability class, flow type, (hydrogeological mapping), annual rainfall volume, traffic density (AADT).	EA; Met Office (local station records); http://www.metoffice.gov.uk/ HA traffic records.	Assuming mapping is correct these data are more likely to be robust on the baseline data report - this is a brief check only. Refer Table B2 ref. aquifer vulnerability classification
Step 1 (v). Catchment Characteristics and risk reduction			
(v) Characterise catchment. (vi) Risk Reduction Factors	<p>Length of road (km) draining to soakaway, for each road (junction) type; AADT flow; %HGVs; rural or urban.</p> <p>Identification of any treatment types upstream; identification of maintenance procedures if any.</p>	<p>As built drawings. HA traffic data. Topographic mapping and surveys. Service provider procedures (ref. maintenance). Natural England (site designations).</p>	Used for assessment by HD45 - Method D and for assessment of risk reduction.

Process	Data Requirements	Possible Data Sources	Comment
(vii) Retrieve build type data.	Build type (soakaway, soakaway trench, soakaway with borehole, infiltration basin). Soakaway cover level, invert depth of chamber, invert depth of borehole. Soakaway infill, lining, construction material	As built drawings. Design drawings, schedules and specifications. HADDMS records. Field observations and records.	Soakaway build type and construction may be used to further revise risk level.

Appendix D Verification- Additional Notes

Verifying HRS Score – Pollutant Pathways

During verification desk studies it will be necessary to confirm pollutant pathways between drainage via the soakaway and sensitive groundwater receptors (such as source protection zones or designated sites). As such receptors add significantly to the hazard to groundwater, they must be fully evaluated on the basis of locally available information. For example:

- a soakaway may have been assessed initially (i.e. in the Revised Soakaways Assessment) as affecting an SPZ but local conditions (for example an intervening impermeable layer between the soakaway discharge and the “protected aquifer”) may mean that there is no pollutant linkage and the source protected by the SPZ will not be affected.
- similarly, topography or other site conditions might dictate that a designated site (previously identified as “at risk”) is unlikely to be affected by the soakaway drainage.

In these instances, data entry in the Workbook during verification should be amended to denote lower risk (“None” for SPZ, “None defined” for designated site).

Verifying HRS Score – Depth to Groundwater

Groundwater depth is particularly significant in the HRS as shallow groundwater results in high scores in the HRS. Depth to groundwater data must apply to the groundwater body into which the soakaway is discharging. As groundwater levels vary temporally, the minimum depth to groundwater should be used. Typically groundwater levels are at their shallowest in late winter/early spring (February/March).

Where site investigation data are available (from road construction) there may be local details of groundwater level from piezometers – however these often only represent a snapshot of groundwater level data and may not take seasonal level variations into account.

Where only limited data is available in the vicinity of the soakaway, there will be a need to use nearby data. For example, suitable data may be available from Environment Agency observation boreholes. Minimum water level depths for that record may be used, extrapolated to ground levels in the vicinity of the soakaway site.

Whatever the data source and constraints, the assessment of a hydrogeologist or geotechnical specialist may be required to verify groundwater level at the site.

Spillage Risk Assessment - discharges to more than one soakaway

In general terms where there are a string (or group) of soakaways very close together that take drainage from a single “road catchment” (i.e. from the same drainage input) these may be considered as a single point of discharge and assessed as such. This may be the case where the rate of infiltration is slow and a number of soakaways are required to allow storage of the design storm prior to discharge into the ground.

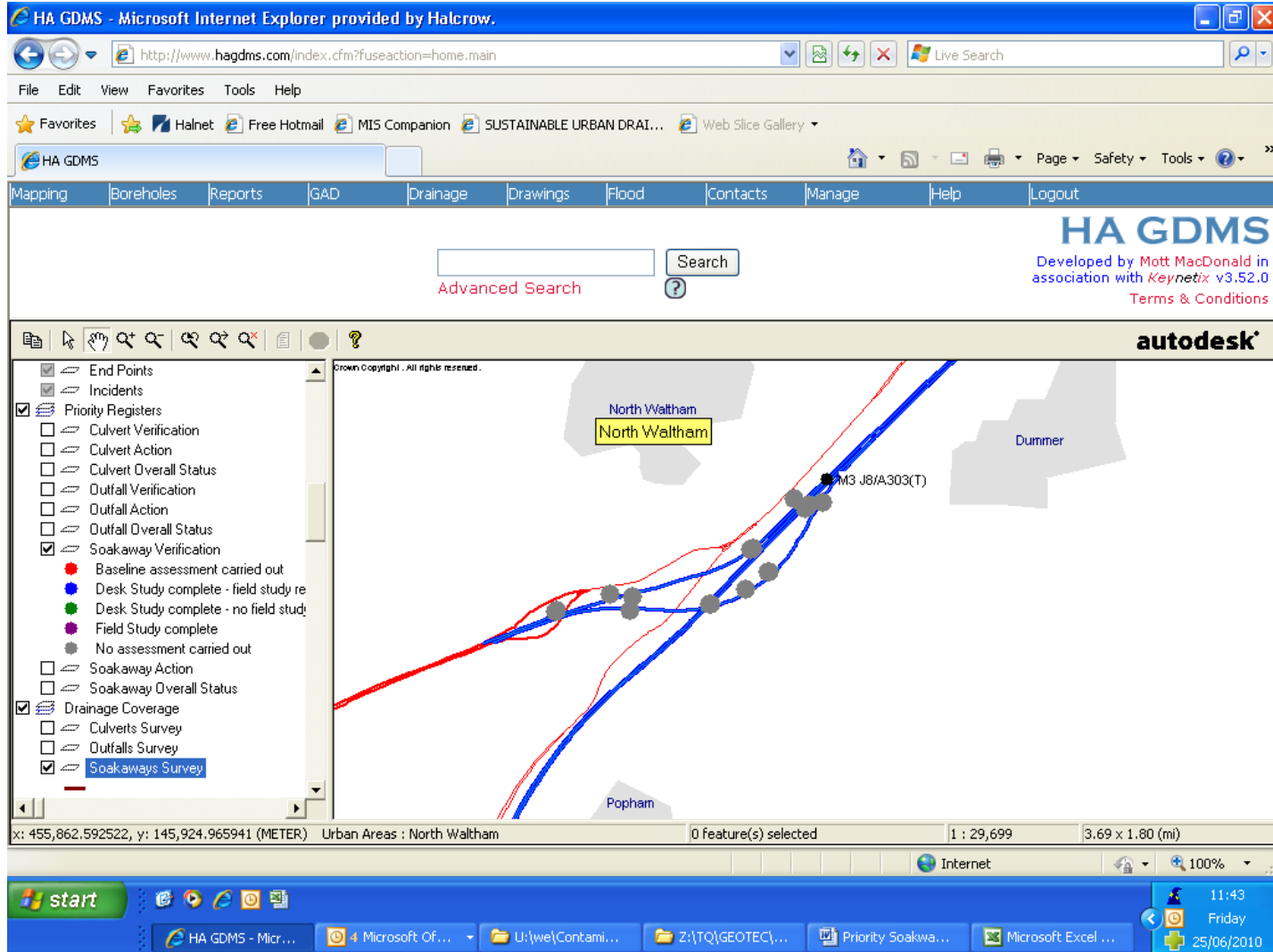
However if there are a number of soakaways (taking discharge from “separate” road catchments) discharging close by to the same aquifer, the cumulative spillage risk of these should be determined, in accordance with HD45 – this process is not included in the Workbook. The general approach to be adopted will be as follows:

- For each defined groundwater body, undertake the spillage risk assessment for all individual (or groups of) soakaways that discharge into that groundwater body.
- For all soakaways, sum the individual spillage risk values to determine the overall spillage risk to the single groundwater body (this is synonymous with undertaking spillage risk to a single reach of a river).
- If the overall spillage risk is unacceptable (e.g. worse than 1:100 years), identify those soakaways with highest risk and apply risk reduction factors (in accordance with Step 3(iv) and the spillage risk worksheet) to successive soakaways until the cumulative risk becomes acceptable. This will help determine conceptual design solutions needed to address the risk from spillage.

Appendix E Example Register Entries

Appendix F (1)

Screenshot of HADDMS showing status of soakaways



Appendix F (2)**Screenshot of HADDMS Soakaway Register**

Soakaway Register	
Soakaway Register ID	1654
HD43 asset ref	SU5645_8602b
Item Type	SO - Soakaway
Routine runoff	Not determined
Spillage risk	Not determined
Verification status	No assessment carried out
Action status	Not determined
Overall risk status	Not determined
Proposed solution	Not yet designed
Actual solution	Not yet built
Last updated	05/03/2010