

LICENCE REFERENCE No.	RISK ASSESSMENT METHODOLOGY STAGE & STEP	REPORT VERSION
Insert licence reference number	Insert methodology stage and step, e.g. Stage 1 Step 2	Insert report version no., e.g. Draft, Final

INSERT COMPANY LOGO/HEADER

**Guideline Template for
Detailed Site Assessment
Report**

**for the Environmental
Protection Agency**

(Month Year)

(LICENCE No.)

INSTRUCTIONS ON USE OF THIS TEMPLATE

This document presents a guideline reporting template for stakeholders to use when reporting a Detailed Site Assessment under the EPA Contaminated Land & Groundwater Risk Assessment Methodology. It is designed to assist stakeholders with the submission of the correct information in a suitable format to the EPA. It should be regarded as a comprehensive guide; it is not intended to be a wholly prescriptive template.

Where there are deficiencies or uncertainties in the information provided these should be clearly marked and annotated to indicate where further data gathering may be required.

In the template, those parts written in red indicate where relevant information and/or assessment should be entered. In entering this information the red text should be deleted or written over and the text reformatted to normal style.

For a glossary of terms and acronyms used in this template report and for a list of key technical guidance documents, refer to the ‘Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites’ (EPA, 2013).

Delete this page before submitting this report to the EPA.

Project Title: Detailed Site Assessment Report
Licence No: (complete)
Project No: (complete)
Contract No: (complete)
Report Ref: (complete)
Status: (Draft/2nd Draft/Final (examples))
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Prepared by (consultant)	Insert here	Insert here	Insert here	Insert here	Insert here
Approved by (consultant)	Insert here	Insert here	Insert here	Insert here	Insert here
Site Approval by	Insert here	Insert here	Insert here	Insert here	N/A

LIMITATION

All limitations that apply to the work should be summarised here, including reference to the original proposal for the work and the originally proposed project objectives and scope of works. State if these were achieved and the scope of works completed. Where the scope deviated significantly from the originally proposed scope, this should be summarised herein (if a limitation). State the limit of liability, reliance, etc., that apply to this project.

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Update table of contents once all relevant report sections have been completed.

FIGURES (TO BE EXPECTED)

- Figure 1 Site location plan
- Figure 2 Site layout plan showing main buildings and infrastructure including historical operational information and infrastructure (if significantly different)

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Figure 3+	Site plan(s) showing, by Contaminant/Chemical of Potential Concern (COPC) or COPC group, the main areas of potential concern identified
Figure 4+	Relevant site plan(s) showing intrusive investigation and all other sampling locations
Figure 5+	One or more cross-sections showing actual/inferred site-specific geology (and hydrogeology)
Figure 6+	Site plan illustrating inferred hydrogeological flow regime(s)
Figure 7+	Site plans showing key soil (soil vapour) data by sample location/depth (split as needed into key COPC or COPC groups)
Figure 8+	Site plans showing key groundwater (water) data by monitoring well (other) location/depth (split as needed into COPC or COPC groups)
Figure 9+	Changes made to the Conceptual Site Model (CSM) (can be previous and current versions of CSM if this is the best way to illustrate this); in all cases the CSM should be illustrated in diagrammatic form

TABLES (TO BE EXPECTED)

Table 1+	Site Soil/Sediment/Groundwater/Surface Water/Soil Vapour/Bulk Ground Gas Sampling and laboratory analysis inventories
Table 2+	Site groundwater monitoring information (water levels; depth to well base versus installed depth; wellhead measured field parameters)
Table 3+	Site ground gas monitoring data (concentrations, pressures, flows, etc.)
Table 4+	Summaries of other field-measured data (e.g. hydraulic conductivity, soil vapour survey, etc.)
Table 5+	Summary table of key chemical analysis results
Table 6+	Summary of Generic Assessment Criteria (GAC) if Generic Quantitative Risk Assessment (GQRA) performed at this stage

APPENDICES (THAT MAY BE EXPECTED TO BE USEFUL)

Appendix A	Exploratory logs (borehole/trial pit etc.)
Appendix B	Laboratory Analysis Certificates (laboratory signed-off versions)
Appendix C+	Other appended information may include: <ul style="list-style-type: none"> ➤ Supporting field and/or laboratory data (if not tabulated/appended or referenced elsewhere (hydraulic testing, hydrographs, other party's data, etc.) ➤ Groundwater, soil vapour, ground gas monitoring records and data (if not explicitly summarised/referenced elsewhere) ➤ Details of statistical methods (if used) ➤ Copies of previous report figures that help provide further context

EXECUTIVE SUMMARY

An Executive Summary is considered necessary for all reports of any size to allow a reader to quickly understand project objectives and scope of work and all the main findings.

This must include, as a separate page within the executive summary, the latest diagrammatic Conceptual Site Model (CSM) based on data collected during this phase of the site programme of works.

It must also include a flow chart illustrating where this report sits in the overall contaminated land and groundwater site assessment and corrective action process, confirming all aspects already completed (see attached example).

Stage 1 Step 2 Detailed Site Assessment Conceptual Site Model



Replace this image with a diagrammatic Conceptual Site Model showing the current understanding of site circumstances.

EPA Contaminated Land & Groundwater Risk Assessment Methodology		Report Reference	Report Date	Status
STAGE 1: SITE CHARACTERISATION & ASSESSMENT				
1.1	PRELIMINARY SITE ASSESSMENT	(Insert previous report author & reference)	(Insert previous report date)	(Should be Final)
1.2	DETAILED SITE ASSESSMENT	(Insert this report author & reference)	(Insert this report date)	(Draft, Final, etc.)
1.3	QUANTITATIVE RISK ASSESSMENT			
STAGE 2: CORRECTIVE ACTION FEASIBILITY & DESIGN				
2.1	OUTLINE CORRECTIVE ACTION STRATEGY			
2.2	FEASIBILITY STUDY & OUTLINE DESIGN			
2.3	DETAILED DESIGN			
2.4	FINAL STRATEGY & IMPLEMENTATION PLAN			
STAGE 3: CORRECTIVE ACTION IMPLEMENTATION & AFTERCARE				
3.1	ENABLING WORKS			
3.2	CORRECTIVE ACTION IMPLEMENTATION & VERIFICATION			
3.3	AFTERCARE			

1. INTRODUCTION

1.1. PROJECT CONTRACTUAL BASIS & PARTIES INVOLVED

Confirm the contractual basis for the work including the proposal reference number.

List the name and role of the main people who completed the work and their qualifications and years of experience, including the main subcontracted elements, if applicable (e.g., sub-consultants; drilling contractor; laboratory analysis).

1.2. BACKGROUND INFORMATION

This section should succinctly inform the reader what the report is about. It should provide the licensee/site name, its location with reference to a site map and the activity at the site. It should be mentioned that this report covers a detailed site assessment including intrusive site investigations and hydrogeological assessment.

Summarise background information relevant to the site assessment, such as the main findings of works completed in the Stage 1.1 Preliminary Site Assessment and/or previous phases of the Stage 1.2 Detailed Site Assessment (which may be expected to be multi-phased). Reference these reports as required.

Summarise relevant information from the earlier stages, specifically:

- The location, nature, extent and/or magnitude (where known) of Contaminants/Chemicals of Potential Concern (COPC) and associated potential pollutant linkages;
- Existing understanding of site history/operations/layout, regional and site geology, regional and site hydrogeology, site geochemistry, and potential influences on land and groundwater contamination and associated potential risks pertinent to the identified pollutant linkages.

Use site plans to illustrate this information (Figures 1, 2, 3+) or, failing this, reference these figures that have appeared in other reports (if so can include copies in an appendix herein for ease of reference).

Tabulate and/or append existing relevant information (Table xx/Appendix xx, e.g. exploratory borehole logs, geological cross-sections, groundwater/land gas monitoring data, etc.) or, if presented elsewhere in previously submitted and readily available reports, clearly reference the data used (including report title, author, date, reference, figure/table/appendix number and page).

1.3. PROJECT OBJECTIVES

Confirm the project objectives as previously outlined or established prior to this phase of work commencing (introduced previously in the final section of either the Stage 1.1 or earlier phase Stage 1.2 reports).

1.4. SCOPE OF WORKS

1.4.1. RATIONALE & STRATEGY

Describe the sampling strategy and broadly what techniques were selected to implement this and why. Use the Conceptual Site Model (CSM) to justify these decisions. This section should include detail on the following:

- The rationale and specific objectives of sampling;
- Justification for the number and location of sampling positions.

Different drivers relevant to different parts of a site may influence the scope of sampling.

This should be captured here such that the decisions underpinning the scope of the site investigation are, from the outset, clearly understood. For example, certain areas of hazardous chemical storage/use may have been targeted, plus areas where known historic losses occurred.

For more complex sites, illustrate the sampling strategy via site plans (Figures 3+)

1.4.2. INTRUSIVE INVESTIGATIONS

Describe in some detail the scope of investigative site works undertaken:

- What investigation methods (e.g. soil vapour survey, trial pitting, solid stem augering, etc.) and what equipment/plant (e.g. PID (photo ionisation detector), tracked 360 back-hoe excavator, etc.) were used;
- Who carried out the work (e.g. Borehole Drilling Ltd under the direct supervision of xxxx etc.);
- The number and position of sample locations and how these locations are uniquely identifiable (e.g. 14 boreholes designated BH101-BH114, drilled to final depths between 10.2 and 12.5m; refer to sample inventory tables);
- How observations were recorded (soil arisings logged in accordance with an appropriate standard and how this information is reproduced in the report (appended borehole logs etc.);
- The basis for soil (soil gas) sample collection in terms of depth and lithology;
- How groundwater/ground gas monitoring wells were constructed and what materials were used. How they were developed prior to sampling;
- Any other pertinent information (e.g. sample locations were cleared for underground/overhead services etc. by specialist contractor, groundwater and surface water monitoring points levelled to Ordnance Datum or site datum, etc.).

In a complicated or heavily contaminated site the investigations could be extensive, using a number of different investigation and sampling methods. In such situations, consideration should be given to covering Scope of Work and Methodology (including sampling & monitoring discussed in Section 1.4.3 below) in separate sections.

1.4.3. SAMPLING & MONITORING

Use this section to describe how sampling and/or monitoring were undertaken. Refer to Guideline Template for Groundwater Monitoring Report for further information. Provide detail on the following:

- Water level monitoring (to be completed prior to sample collection);
- Collection of wellhead parameters (e.g. pH, electrical conductivity, temperature, redox potential, dissolved oxygen) and the techniques and instruments used to measure these;
- Sampling techniques and protocols (well volumes purged);
- Sample containers/bottles used;
- Filtering and preservation protocols (mainly needed for waters);
- Dates and number of monitoring events undertaken (waters/gases/vapours only);
- Sample handling protocols (uniquely labelled, refrigerated, use of cool boxes with frozen ice packs, logged onto chain of custody form, how delivered to laboratories, etc.).

1.4.4. LABORATORY ANALYSES

Summarise information on laboratory analyses, such as:

- Confirm timing and condition of samples upon receipt at the laboratory undertaking the analysis (and how long they were in transit);
- Which laboratories were subcontracted, status of laboratory accreditation for the sample types and analyses (groups) performed;
- What analyses were scheduled and the numbers of samples analysed.

Tabulate a comprehensive sample analysis inventory (typically done by sample type, soil, water, vapour, etc.).

2. RESULTS & DISCUSSION OF SITE INVESTIGATION

2.1. SITE GEOLOGY

Describe the ground conditions encountered in this section. Specifically provide detail on:

- The nature, depth, thickness and spatial distribution of key geological strata. Clearly distinguish Made Ground from natural strata;
- Relate site observations to existing understanding of site geology;
- Provide physical laboratory test data (Particle Size Distribution (PSD) curves and Fraction of Organic Carbon (FOC) data for example).

Illustrate geological understanding in site plans and/or cross-sections (usually beneficial). Detailed borehole and well construction logs shall be included in an Appendix.

2.2. SITE HYDROGEOLOGY

Infer and describe the hydrogeological regime from groundwater/surface water monitoring data and your understanding of site geology. Specifically provide detail on:

- Which geological media contain groundwater;
- What is the local Groundwater Body (GWB) and to what extent has it been investigated;
- The inferred direction(s) of groundwater flow (consider vertical as well as horizontal flow);
- Features in the groundwater flow field (mounded groundwater levels, flow divide, boundary effects, sources/sinks, etc.);
- Likely degree of interaction between groundwater and surface water;
- The apparent governing flow regime – intergranular, fissure-flow;
- Hydraulic parameters – hydraulic conductivities, hydraulic gradients, estimated groundwater flow velocity, travel time to potential receptor, etc.

Use contoured site plans and cross-sections to illustrate the site hydrogeology. Tabulate and/or append groundwater/surface water monitoring data, as well as the data and analysis from any hydraulic (well) testing completed.

2.3. RESULTS

2.3.1. E.G. BY MEDIA (E.G. SOILS & SOIL VAPOUR)

2.3.2. E.G. BY COPC OR COPC GROUP

2.3.3. E.G. BY POTENTIAL SOURCE AREA (E.G. TANK FARM X)

Use this section and additional sub-sections (where appropriate and required) to present and discuss data by, for example, potential source area, site operational area, by COPC group or geological/hydrogeological unit. Use the CSM and sampling strategy to guide this decision. Describe and relate sample laboratory data with your previous understanding of potential source areas and groundwater flow and observations made during the site investigation. Present and consider:

- The nature, magnitude and extent of COPC and other key parameters;
- Evidence for transfer/interactions between different phases in the system – leaching, migration in groundwater, etc.;
- Provide detail on the likely fate and transport of all the main COPC or COPC groups identified beneath and potentially down-gradient of the site;
- Relate this to the previous phase CSM (historical land use, for example).

Tabulate and/or append key data. Annotate site plans and/or geological cross-sections to illustrate the chemical character, magnitude and extent of land and groundwater contamination.

2.4. CONCEPTUAL SITE MODEL

Discuss the updated CSM of pollutant linkages here with reference to the results and findings of the site investigation above, and make reference to the diagrammatic CSM included as a figure in the report. Note that the CSM may also be presented as a well-constructed matrix or network diagram.

3. GENERIC QUANTITATIVE RISK ASSESSMENT

3.1. POTENTIAL POLLUTANT LINKAGES

It may not be possible to undertake generic quantitative risk assessment (GQRA) if this is considered inappropriate or if generic assessment criteria are unsuitable. If this is the case, delete this section of the template and go straight to Summary, Conclusions & Recommendations.

If undertaken, clearly state which COPCs and pollutant linkages are being assessed by GQRA and why this is the case, with clear reference to the CSM.

It may be necessary to perform several GQRAs if multiple receptors are identified, e.g. human health GQRA, groundwater GQRA. If this is the case, for clarity, describe the GQRA for each type of receptor in separate sections.

3.2. GENERIC ASSESSMENT CRITERIA

Justify the selection of generic assessment criteria (GAC) for each receptor type with reference to the updated CSM and reference their sources. For example, Interim Groundwater Values (IGVs) and Groundwater Threshold Values (GTVs) represent such criteria for groundwater in Ireland.

If used, summarise the derivation of in-house generic assessment criteria using risk assessment tools/models. Reference and justify sources of model parameter data in relation to the updated CSM.

Tabulate and refer to summaries of all GAC used in this report (Table X).

Identify and comment on any limitations with respect to the application of GAC to this risk assessment.

3.3. SOURCE ZONE CONTAMINANT DATA MANAGEMENT

Clearly describe how the contaminant datasets were managed to facilitate comparison with generic assessment criteria. Use the updated CSM to justify your decisions. This could include:

- How and why contaminant data were segregated, for example by soil type, depth, groundwater unit, receptor, site zoning;
- The application of statistical methods;
- Any calculations/modelling undertaken to facilitate generic quantitative risk assessment, for example, soil source partitioning to pore water calculation;
- Any assumptions and/or limitations with respect to the above.

Tabulate/append relevant source data (Table X/Appendix X, e.g. laboratory data, groundwater/gas monitoring records, statistics, calculations, etc.) or, if presented elsewhere, in previously submitted and readily available reports, clearly reference the data used (including report title, author, date, reference, figure/table/appendix number and page).

3.4. RESULTS OF GENERIC QUANTITATIVE RISK ASSESSMENT

Describe how the GAC were applied and the results of the GQRA. For example, list the nature, magnitude and distribution of contaminants for which generic risk assessment confirms there to be a potential pollutant linkage. Tabulate a summary of the results of GQRA screening and evaluate the risk of the potential pollutant linkages.

Draw conclusions with respect to the potential pollutant linkages under assessment. Justify these conclusions with regard to the CSM, limitations and assumptions made in the Generic Risk Assessment process. Use technical diagrams to illustrate these conclusions (usually beneficial).

State what action is to be taken with respect to relevant potential pollutant linkages. For example, detailed quantitative risk assessment (see separate Guideline Template Report for Quantitative Risk Assessment), further data collection, move toward feasibility and design of corrective action, no action required as no identified potential risk, etc.

4. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

4.1. SUMMARY AND CONCLUSIONS

This section must bring together all the above findings in a concise and clear way so that the reader is able to understand the findings of the site investigation and generic quantitative risk assessment (if undertaken at this stage) and what decisions have been made with respect to the potential pollutant linkages identified.

Summarise the updated CSM of pollutant linkages again here and use technical diagrams to illustrate this. The text should clearly state the main identified contamination source areas, all remaining COPC, the expected fate and transport of these along identified migration pathways and the potential receptors that are relevant to the site.

4.2. RECOMMENDED WAY FORWARD

Where potential risks (or data gaps) have been identified using GQRA or have not been assessed, further action will be required, such as detailed quantitative risk assessment (DQRA) or corrective action. This may need to be supported by the collection of additional site data.

This section must include a summary of what action is to be taken and outline the objectives of this next phase of work whether it is linked to DQRA, further investigation or a move to Stage 2 corrective action planning. Provide some detail on the scope of further work, which

may include:

- Additional investigations that may be needed to better understand the nature, magnitude and extent of relevant source zones and/or pathway and/or receptor characteristics. Include the locations of proposed investigative sampling points to facilitate further GQRA, DQRA, or other decision making;
- Outline proposal for ongoing groundwater/gas monitoring to confirm the findings of site investigation/GQRA (or otherwise) including the monitoring locations, frequency, COPC and other parameters to be determined, etc.;
- At sites where there is an existing groundwater/gas monitoring programme, comment on whether amendments to the number or location of monitoring points, frequency of monitoring or the analytical schedule are necessary;
- Outline a possible corrective action strategy, which may be expected to be expanded upon as part of Stage 2 Step 1 (the results of site investigation and/or GQRA should inform objective setting for Corrective Action) for cases where action is needed but a decision not to proceed to the DQRA step has been made (rationale to be defined).

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Respectfully submitted

On behalf of **Consultant Name**

Sign Here

(Project Manager/Project Director/Lead Consultant)