

Department of the Environment:
Contaminated Land Research Report

**PRIORITISATION AND CATEGORISATION PROCEDURE
FOR SITES WHICH MAY BE CONTAMINATED**

CLR Report No 6

1995

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Prepared by M. J. Carter Associates

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DEPARTMENT OF THE ENVIRONMENT

CONTAMINATED LAND: Identification, assessment and control

PRIORITISATION AND CATEGORISATION PROCEDURE FOR SITES WHICH MAY BE CONTAMINATED

M. J. CARTER ASSOCIATES

This report is one of a series of reports financed under the contaminated land research programme of the Department of the Environment. The current series deals with: information needed to assess risks; procedures for categorising and assessing risks; and evaluation and selection of remedial methods.

The purpose of the reports is to provide regulators, developers and other interested parties with authoritative and researched advice on how best to identify and assess the problems contamination can pose and what can be done to tackle them. They cannot, however, address the specific circumstances of each site. Every site is unique. Anyone using the information in a report must, therefore, make appropriate and specific assessments of any particular site or group of sites. Neither the Department nor the authors can accept liability for the use or interpretation of the contents of any report.

General guidance on assessing contaminated land and developing remedial solutions which is complementary to the series is provided by the Construction Industry Research and Information Association (CIRIA).

The Department acknowledges with thanks the help of the National Rivers Authority, the Laboratory of the Government Chemist, The Centre for Research into the Built Environment of The Nottingham Trent University, ICI Chemicals and Polymers Limited and Sir William Halcrow and Partners Limited.

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CONTENTS

PAGE NUMBER

| | |
|---|----|
| Introduction | 1 |
| 1. Part I - Initial prioritisation | 3 |
| 1.1 Introduction | 3 |
| 1.2 Development | 3 |
| 1.3 Surface water | 4 |
| 1.4 Groundwater | 4 |
| 1.5 Preliminary Groups | 4 |
| 2. Part II - Assessment | 5 |
| 2.1 Introduction | 5 |
| 2.2 The collation and assessment of additional information | 5 |
| 2.3 The site visit | 7 |
| 2.4 Assessment of risks to development | 8 |
| 2.5 Assessment of risks to surface water | 8 |
| 2.6 Assessment of risks to groundwater | 9 |
| 2.7 The assessment of the need for an exploratory survey | 11 |
| 3. Further prioritisation | 12 |
| 4. Qualifications necessary to carry out each part of the assessment | 13 |

REFERENCES

14

TABLES

| | | |
|----------|--|----|
| Table 1: | Information which should be examined during the Part II Assessment if available | 6 |
| Table 2: | Details of the aquifer characteristics and importance of the major strata in the British Isles | 10 |

FIGURES

| | |
|-----------|---|
| Figure 1: | The prioritisation and categorisation procedure |
| Figure 2: | Part I Assessment - Development |
| Figure 3: | Part I Assessment - Surface Water |
| Figure 4: | Part I Assessment - Groundwater |
| Figure 5: | Part II Assessment - Development - Residential, allotments, agricultural land, commercial or industrial use, public open space or amenity |
| Figure 6: | Part II Assessment - Development - Unoccupied land |
| Figure 7: | Part II Assessment - Surface Water |
| Figure 8: | Part II Assessment - Groundwater |

ANNEXES

| | |
|----------|--------------------|
| Annex A: | Exploratory survey |
|----------|--------------------|

Introduction

- i. This report sets out a simple but systematic approach to deciding what priority to give to action on a site which may be contaminated. Actions which might be indicated by applying this procedure include a more detailed desk-top study, a site investigation or site-specific risk assessment, or the development of a remedial strategy.
- ii. The purpose of the report is to offer guidance to local authorities, landowners, developers and others with responsibilities or interests in the environmental effects of land contamination. Although the approach set out here is believed to apply to a wide range of situations it may need to be adapted to the particular circumstances at some sites. It should not be regarded as prescriptive.
- iii. It is important to note that the procedures outlined in this report make use of a limited amount of basic data. The placing of sites in a priority category is therefore not definitive and care must be taken with regard to the reliability placed on the priority categorisation of sites. Further site investigation or risk assessment may result in the revision of priority categorisation. This is outside the scope of this report.
- iv. The procedure is based on the hazard-pathway-target approach to contaminated land risk assessment. Hazards include toxicity, flammability, explosivity or potential for attack on building materials, but the presence of a hazard does not necessarily constitute a significant risk. A pathway, for example the means for a contaminant to migrate through soil, water or air, is required, as is a potential target - humans, ground or surface water, the ecosystem or buildings and other structures. Not all targets are vulnerable.
- v. The procedure has two main parts. Part I leads to a preliminary prioritisation of the site based on an assessment of the proximity of a target. The targets are assessed under the three headings of *development (humans, plants and the built environment); surface water; and groundwater*. Each site is assigned to one of three groups which determines the priority for assessment under Part II of the procedure.
- vi. In Part II, the prioritisation is refined into more specific categories using more detailed information about the hazards likely to be present, the pathways and targets. First, a desk study is carried out to assemble and review more detailed information about the site. This may lead to relative prioritisation of sites within a group. It should also identify the need for a site walkover or an exploratory survey to confirm or identify evident hazards on the site. Based on this information sites are then placed in one of four categories as follows:

- | | | |
|----------------------------|---|---|
| Priority Category 1 | - | Site probably or certainly not suitable for present use and environmental setting. |
| | - | Contaminants probably or certainly present and very likely to have an unacceptable impact on key targets. |
| | - | Urgent action needed in the short term. |

-
- | | |
|----------------------------|---|
| Priority Category 2 | <ul style="list-style-type: none">- Site may not be suitable for present use and environmental setting.- Contaminants probably or certainly present, and likely to have an unacceptable impact on key targets.- Action may be needed in the medium term. |
| Priority Category 3 | <ul style="list-style-type: none">- Site considered suitable for present use and environmental setting.- Contaminants may be present but unlikely to have an unacceptable impact on key targets.- Action unlikely to be needed whilst site remains in present use or otherwise remains undisturbed. |
| Priority Category 4 | <ul style="list-style-type: none">- Site considered suitable for present use and environmental setting.- Contaminants may be present but very unlikely to have an unacceptable impact on key targets.- No action needed while site remains in present use and remains undisturbed. |
-
- vii. The main steps in the procedure are summarised on Figure 1.
 - viii. If there is evidence of an immediate unacceptable risk on or near a site, further action should be carried out immediately without reference to the prioritisation procedure.
 - ix. The procedure is designed to minimise the possibility of a site being placed in too low a priority category as a result of the limited information used. Where there is any doubt about the answer to any of the questions in the procedure, the worse case is assumed and the site placed in the higher of the possible prioritisation categories until more information is obtained.
 - x. If the current use of the site or neighbouring sites is to change significantly, for example on redevelopment, the procedure should be repeated to ensure that changes in site conditions, particularly targets at risk, are assessed. An indication may be obtained regarding the probable future use of the site by reference to local plans.
 - xi. In some cases it may be necessary to decide priorities for action between sites in the same priority category. This must be a matter for professional judgement, taking all relevant factors into consideration. Some issues which may be considered are noted at the end of this report, but the procedure does not attempt to set out a method for reaching such decisions.
 - xii. The procedure does not cover possible impacts on ecosystems, which may be significant for certain sites. Specialist advice is needed on this.

1. Part I - Initial prioritisation

1.1 Introduction

1.1.1 The objective of Part I of the procedure is to provide a preliminary prioritisation of sites into groups for progression to Part II (see Figure 1).

1.1.2 The site is assessed under the following headings:-

- (i) Development (see Section 1.2)
- (ii) Surface water (see Section 1.3)
- (iii) Groundwater (see Section 1.4)

1.1.3 This part of the procedure can be carried out by non-specialist personnel provided they are familiar with maps and plans, and in particular with the maps of groundwater vulnerability published by HMSO as part of the National Rivers Authority (NRA) Groundwater Protection Policy and plans showing groundwater Source Protection Zones prepared by the NRA. The qualifications necessary to carry out each stage of the procedure are outlined in Section 4.

1.2 Development

1.2.1 The preliminary prioritisation of potential risks to development (humans, plants and the built environment) should be based on information on the location and current use of the site. Ordnance Survey (OS) maps are available for urban areas at scales of 1:1,250 and 1:10,000 and for rural areas at scales of 1:2,500 and 1:10,000. Contours are shown only on the 1:10,000 and larger scale maps. 1:1,250 scale or 1:2,500 scale maps should be used for the assessment of risks to development depending on availability. For other areas where large scale detail is unnecessary the 1:10,000 scale maps should be used.

1.2.2 The following information should be identified and recorded where possible using the OS maps:-

- (a) the boundary of the site
- (b) the National Grid Reference of the approximate centre of the site
- (c) the presence of buildings or structures on the site
- (d) types of development or land use near the site: residential or schools, commercial or industrial development, agricultural land, allotments and land in amenity use such as parks or playgrounds, within 50m and 250m of the nearest site boundary.

1.2.3 The site should be placed in a preliminary group using the steps shown on Figure 2. If the land is subject to a combination of uses, the whole site should be placed in the highest possible group. For example if a site comprises residential development (Group A) and a park (Group B) the whole site should be classified as Group A.

1.3 Surface water

1.3.1 All surface water features on the site or within 500m of the boundary of the site such as drains, streams, pools, canals and rivers should be identified. For urban areas this should be done with reference to OS 1:1,250 scale maps where they are available or otherwise the 1:2,500 scale maps. 1:10,000 scale maps should be used for other areas.

1.3.2 The direction of surface water runoff at the site should be established by an interpretation of the contours shown on a 1:10,000 scale map. Where maps do not show clearly the direction of runoff it should be assumed that runoff from the site drains to the nearest watercourse.

1.3.3 The site should be placed in a preliminary group using the steps shown on Figure 3.

1.4 Groundwater

1.4.1 The site should be placed in a preliminary group on the basis of the National Rivers Authority Source Protection Zone plans and Groundwater Vulnerability maps⁽¹⁾ using the steps shown in Figure 4. If Source Protection Zone plans are unavailable, the documents listed by each Region of the NRA in their Appendix to the Aquifer Protection Policy should be used during the interim period until the finalised plans are available.

1.4.2 At this stage the possible protection of aquifers by superficial deposits is not taken into consideration.

1.5 Preliminary groups

1.5.1 At the end of Part I the site should be placed in the highest group identified under any of the above headings. For example if assessment under "Development" results in the placement of the site in Group A, assessment under "Surface water " results in the placement of the site in Group B and assessment under "Groundwater" results in the placement of the site in Group B, the site should be placed in Group A at the end of this part of the procedure.

1.5.2 Sites in preliminary Group A can then be assessed first using Part II of the procedure, followed by sites in Group B and, eventually, Group C.

2. Part II Assessment

2.1 Introduction

2.1.1 The purpose of Part II is to place the sites into Priority Categories using more detailed information about each site. The sites placed in Group A during Part I of the procedure are assessed first followed by the sites in Group B and then those in Group C. Individual sites are assessed for possible impacts on development, surface water and groundwater and placed in one of the following categories.

Priority Category 1

- Site probably or certainly not suitable for present use and environmental setting.
- Contaminants probably or certainly present and very likely to have an unacceptable impact on key targets.
- Urgent action needed in the short term.

Priority Category 2

- Site may not be suitable for present use and environmental setting.
- Contaminants probably or certainly present, and likely to have an unacceptable impact on key targets.
- Action may be needed in the medium term.

Priority Category 3

- Site considered suitable for present use and environmental setting.
- Contaminants may be present but unlikely to have an unacceptable impact on key targets.
- Action unlikely to be needed whilst site remains in present use or otherwise remains undisturbed.

Priority Category 4

- Site considered suitable for present use and environmental setting.
- Contaminants may be present but very unlikely to have an unacceptable impact on key targets.
- No action needed while site remains in present use and remains undisturbed.

2.1.2 This stage of the procedure is likely to require technically qualified and experienced personnel. Details of appropriate qualifications are given in Section 4.

2.2 The collation and assessment of additional information

2.2.1 If historical information on the use of the site or nearby sites has not been obtained previously it should be collated at this stage, together with additional relevant information such as that listed in Table 1⁽²⁾.

Table 1

Information which should be examined during the Part II Assessment if available

Applications and decisions concerning planning

Environmental Health reports

Building control reports

Waste disposal licences and reports

Details regarding construction, location and use of surface water drains and water supply pipes.

Consents to Discharge from the site.

Geological and hydrogeological maps.

Licensed surface water and groundwater abstractions in the vicinity, including location and use of source.

Monitoring data.

Site investigation data and reports.

Post remediation clean up or monitoring reports.

Report of any significant events eg fires, significant spillages etc on site.

2.2.2 The information about the site should be reviewed and assessed to establish what is known about the likely hazards present on the site. The review may lead to a refinement of the priority within the preliminary group prior to carrying out Part II of the procedure.

2.2.3 For example, the history of remediation on a site may be sufficiently well documented to confirm that there is unlikely to be significant contamination present. It is also possible that the contamination likely to be present on some sites is not considered relevant for the particular priority target; for example, some sites may not have

contaminants present which represent a threat to the water environment. Another possibility is to prioritise sites based on a selective ranking of the degree of contamination which may be present as a result of the particular history of the site. Some landowners and others who assess large number of sites have already considered or developed such a system.

2.2.4 The Department of the Environment is preparing guidance on the contamination which may be present on sites of former industrial use ^(3,4).

2.3 The site visit

2.3.1 The site should be visited to confirm the nature of any development, the present condition of the site and the surrounding area and, in particular, to identify any differences from information obtained from maps, historical records and other sources. It may be necessary to walk over the site to identify significant surface features. The usual precautions must be taken during site visits ^(5, 6) and land should not be entered without permission from the owner or occupier or appropriate legal powers of entry.

2.3.2 Sites in the same area may be visited together irrespective of the preliminary group allocation in Part I to facilitate rapid progress and to make optimal use of the available time and resources.

2.3.3 A current 1:1,250 or 1:2,500 OS map should be annotated on site. A photographic record should also be taken during the site visit.

2.3.4 During the site visit the following points should be considered:

- (i) Degree of public accessibility, the presence and condition of fencing or boundary walls and warning notices.
- (ii) Use of the site. For land in industrial use, identify the type of industry if possible. For agricultural land, note whether the land is under cultivation or used for grazing. If land is housing (including schools) note whether there are areas of exposed soil and the characteristics of the exposed soil. If the land use is allotments, note whether they are in use. If the land use is amenity, note the type of use and the type of surface (eg grass, concrete, tarmac).
- (iii) Derelict building, evidence of demolition, foundations, tanks, drums, pits, pipes and evidence of underground services or covered shafts.
- (iv) Land use in the area up to 1km from the site boundary particularly the proximity of housing and differences from information available at Part I.
- (v) Evidence of ground disturbance, eg discoloured soil or coloured water, signs of subsidence, evidence of fill material or fly tipping.
- (vii) Vegetation type (eg grass, scrub, shrubs, mature trees) and signs of distress.
- (viii) Significant odours.

-
- (ix) Direction of surface water runoff and the presence of ponding on site.
 - (x) Discharges of water from the site.
 - (xi) Rivers, streams, ditches, culverts, canals, lakes or any other surface water features within 500m of the site boundary.
 - (xii) Direction and rate of flow of water courses (ie fast, slow, negligible, stagnant).
 - (xiii) Discoloration of surface waters and the bubbling or frothing of surface water which may indicate gaseous emissions from beneath the water.

2.3.5 Guidance on the visual assessment of potentially contaminated sites is being prepared on behalf of the Department of the Environment. The report ⁽⁷⁾ contains a full check list for a site inspection.

2.3.6 The output from data collection and the site visit is expected to be a short report summarising the information about the site, including results of previous site investigations and remedial treatment, identifying the contaminants which may have been or are still present and confirming the relative priority for the next step in the assessment. (Guidance on systems for storing information about sites is given elsewhere ⁽⁸⁾).

2.4 Assessment of risks to development (Figures 5 and 6)

2.4.1 Using the information from the site visit and the additional information, the site should be categorised following the procedures outlined on Figure 5 for land in residential, agricultural, commercial or industrial use, allotments, public open space or land in other amenity use. For unoccupied land the procedures outlined in Figure 6 should be used.

2.4.2 Figures 5 and 6 take account of the types of contaminants present, the type of land use and the risk of exposure to the contaminants.

2.4.3 Specialist advice may be required to decide whether the presence of particular contaminants constitutes a significant risk. Guidance notes should be used where they are available and appropriate. Levels of contamination at a site should be compared with action values where available and appropriate to the target under consideration ^(9, 10).

2.5 Assessment of risks to surface water (Figure 7)

2.5.1 Using the information from the site visit and additional data, technical knowledge and experience, the site should be categorised following the procedures outlined on Figure 7.

2.5.2 Where water from the site is either discharged directly to or runs off to a water body an assessment should be made of any impact on the water quality of the receiving water body.

2.5.3 Where there is a current Consent to Discharge, if the quality of the discharge is within the consent conditions the discharge is considered satisfactory. Where the discharge quality is outside the consent limit or there is no consent or the discharge is not from a point source, the quality of the discharge should be assessed against the water quality for the receiving watercourse in consultation with the NRA (11, 12).

2.5.4 Information on surface water abstractions licensed by the NRA will include grid references which should be located on a map of the site. A record should be made of the use of the abstraction, particularly if the source is used for human consumption which includes all public water courses, other supplies for domestic use and supplies used in food processing.

2.6 Assessment of risks to groundwater (Figure 8)

2.6.1 The surface geology, in particular the presence and type of superficial deposits, should be assessed at this stage. Reference should be made to British Geological Survey (BGS) data including geological plans, mineral reports, hydrogeological maps and drift edition maps, together with any site investigation data which is available.

2.6.2 An assessment should be made of the presence and thickness of any superficial material overlying the aquifer. Low permeability material such as clays and silts can restrict infiltration and provide significant protection to the underlying aquifer. Superficial deposits of permeable material such as sand, gravel and backfilled inert material such as brick rubble will facilitate infiltration to the underlying aquifer. If the nature of the superficial deposits is uncertain, the site should be placed in the worst case priority category until further information is obtained.

2.6.3 The nature of the aquifer can have a significant impact on the potential migration of contaminants. Contaminants may travel significant distances through a fracture flow system in which groundwater can move rapidly through fractures and fissures. Fracture flow is characteristic of strata such as chalk, limestone and igneous rocks.

2.6.4 If the underlying aquifer is dominated by intergranular flow (in which groundwater moves principally as laminar flow through a body of rock) groundwater will travel at much lower velocities than in a fracture flow system. Intergranular flow is characteristic of strata such as sands and gravels and sandstone. Table 2 summarises the aquifer characteristics of the major strata in the British Isles.

2.6.5 An assessment should be made of the direction of groundwater flow and groundwater abstractions down hydraulic gradient from the site should be identified. The use of each source should be established normally by reference to NRA licence records in order to assess the likely impact of the migration of contaminants.

| Table 2 | |
|---|--|
| Details of the aquifer characteristics and importance of the major strata in the British Isles | |
| Aquifers used largely for public supply (NRA Major Aquifers) | Flow characteristics |
| Chalk Upper and Lower Greensand Jurassic Limestones Permo-Triassic Sandstones Magnesian Limestone Carboniferous Limestone | Fracture flow Inter granular flow Fracture flow Intergranular flow mainly, some fracture flow Fracture flow Fracture flow |
| Aquifers of lesser importance for public supply (NRA Minor Aquifers) | Flow characteristics |
| Fluvial, glacial and Tertiary sands and gravels Coal Measures Millstone Grit Old Red Sandstone Some Igneous and metamorphic rocks | Intergranular flow Fracture and intergranular flow Fracture and intergranular flow Fracture flow Fracture flow |
| Rocks which have little importance for public supply (NRA Non Aquifers) | Flow characteristics |
| Clays and marls Siltstones, shales and Mercia Mudstone Most Igneous and metamorphic rocks Based on Reference 1 | Intergranular flow Fracture and intergranular flow Fracture flow (surface infiltration will be limited with these rocks and runoff to surface water is more likely) |

2.7 The assessment of the need for an exploratory survey

2.7.1 Where there is only limited data on actual contamination on the site, particularly where visual evidence indicates that contamination may be present, the benefits of an exploratory survey such as that described in Annex A or a limited additional survey should be assessed. If additional data is collected Part II of the procedure should be repeated to ensure that the site is placed in the most appropriate priority category.

3. Further prioritisation

- 3.1** Following the completion of the categorisation procedure it is likely to be appropriate to prioritise sites in each category for further action. Further action will normally be carried out for the sites placed in Priority Category 1 before the sites placed in Priority Category 2 and so on. The further action may be a more detailed desk top review of the site history, an exploratory survey or more detailed site investigation to confirm the presence or absence of contaminants or other hazards, examination of the effectiveness of any existing remedial or control measures, a detailed site specific risk assessment (10, 13) or the development of options for remediation.
- 3.2** Any further prioritisation requires subjective judgement of all the information available on the sites and should be carried out only by suitably technically qualified and experienced personnel. For example it may be necessary to study the data available for the site and consider in more detail the likely toxicity and mobility of contaminants, migration pathways, land use, adjacent land use, direct and indirect adverse effects on the health of site occupiers, users and neighbours (including the potential for the transport of aqueous and atmospheric contaminants), the impact of contaminants on ground and surface water and the impact of contaminants on vegetation and construction materials such as concrete and water supply pipes.
- 3.3** Although not always the case, sites which are placed in a high priority category based on each of the assessments of more than one of the targets (development, surface water, groundwater) will normally be of a higher priority for further action than sites which are placed in a high priority category for only one target.
- 3.4** Sites at which the relevant action values are greatly exceeded for a number of contaminants will generally be of a higher priority for further action than sites at which the relevant action values are exceeded only slightly for a few contaminants.
- 3.5** For some sites there may be non-environmental factors which are taken into account when allocating priorities for further action. For example where a number of sites represent a similar level of environmental risk, issues relating to plans for the development of the site, land sale and transfer, loan applications, or visual amenity etc may be relevant when allocating priorities for further action.
- 3.6** Once the proposed further action has been carried out and additional data has been obtained it may be appropriate to re-assess the site making use of the additional data in order to refine the priority category into which the site is placed.

4. Qualifications necessary to carry out each part of the assessment

- 4.1** Part I of the procedure is designed to be carried out by administrative personnel who are familiar with the use of maps and plans particularly those who can identify the site on the maps produced by the NRA which delineate protection zones.
- 4.2** Part II may involve the assessment and interpretation of technical information including analytical and geological data. In most circumstances those carrying out Part II should have a scientific qualification at degree or equivalent level in a discipline such as geology, chemistry, biology or biochemistry and should have at least 3 years experience in the assessment of contaminated sites. They should have or have access to someone with specialist experience in assessing risks from contamination to human health or the environment. Where the person carrying out the assessment is not qualified in geology or a related discipline they must consult someone with a geological qualification and experience to assist in the interpretation of some of the data. Similarly if the person carrying out the assessment is not qualified in chemistry they must consult someone with a chemical qualification and experience. Where there is a substantial amount of data for a site and where relevant guidance is available for all the contaminants present at the site Part II may be carried out by less qualified and experienced personnel as little subjective assessment will be necessary.
- 4.3** The procedure has been designed to provide a structured framework with a consistent outcome at each stage and avoid subjective judgement where possible. However, appropriate management control systems and Quality Assurance will assist in the proper and consistent application of the procedure.

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FIGURES

Figure 1

The prioritisation and categorisation procedure

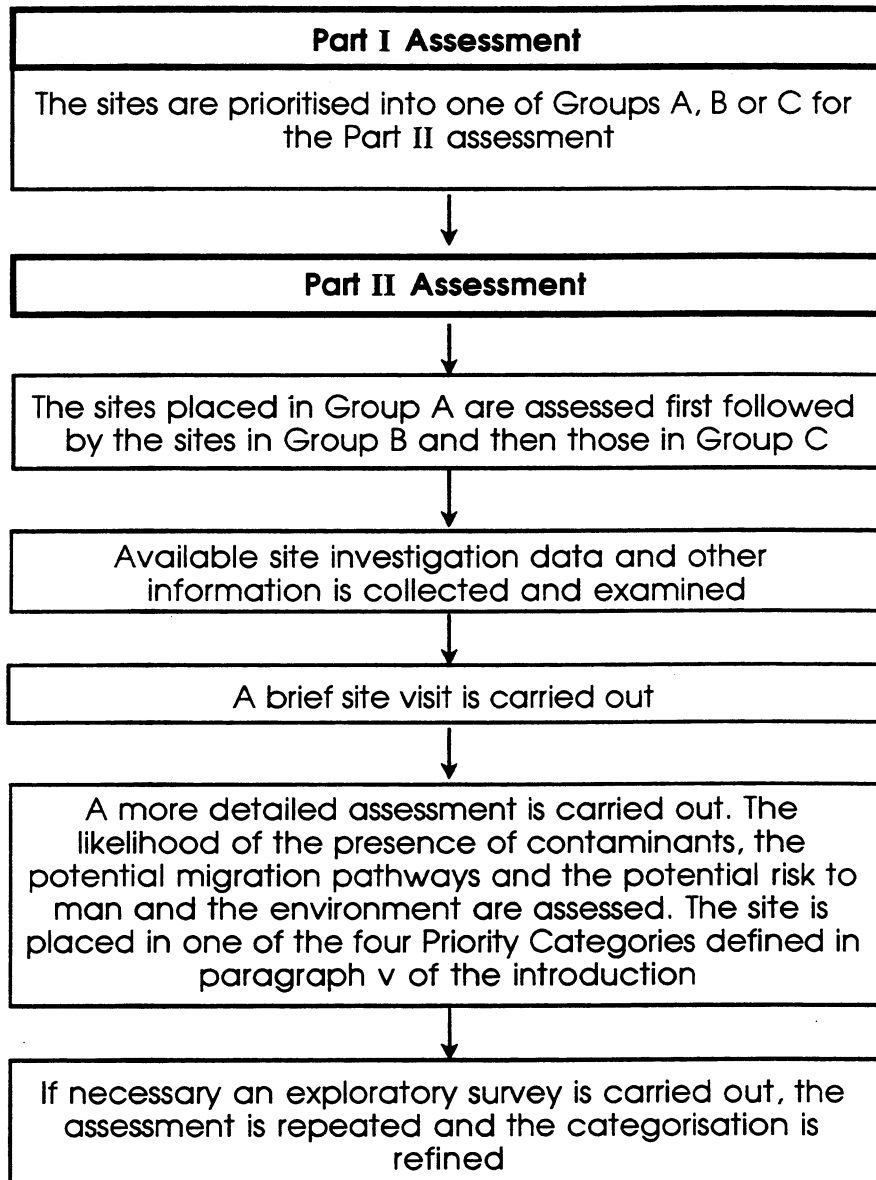


Figure 2

Part I Assessment - Development

Type of development on or around the site

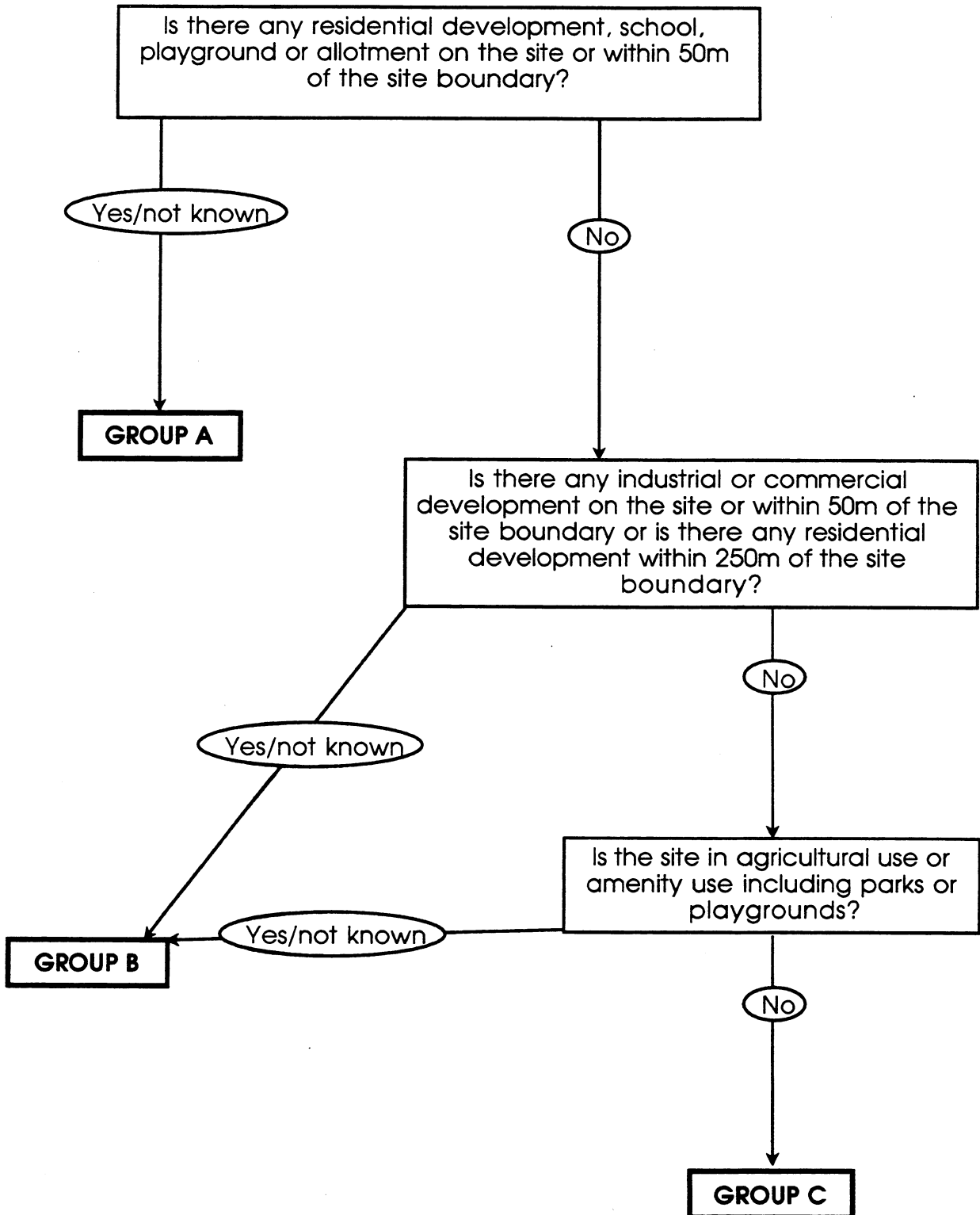


Figure 3

Part I Assessment - Surface Water

Surface water features on or around the site

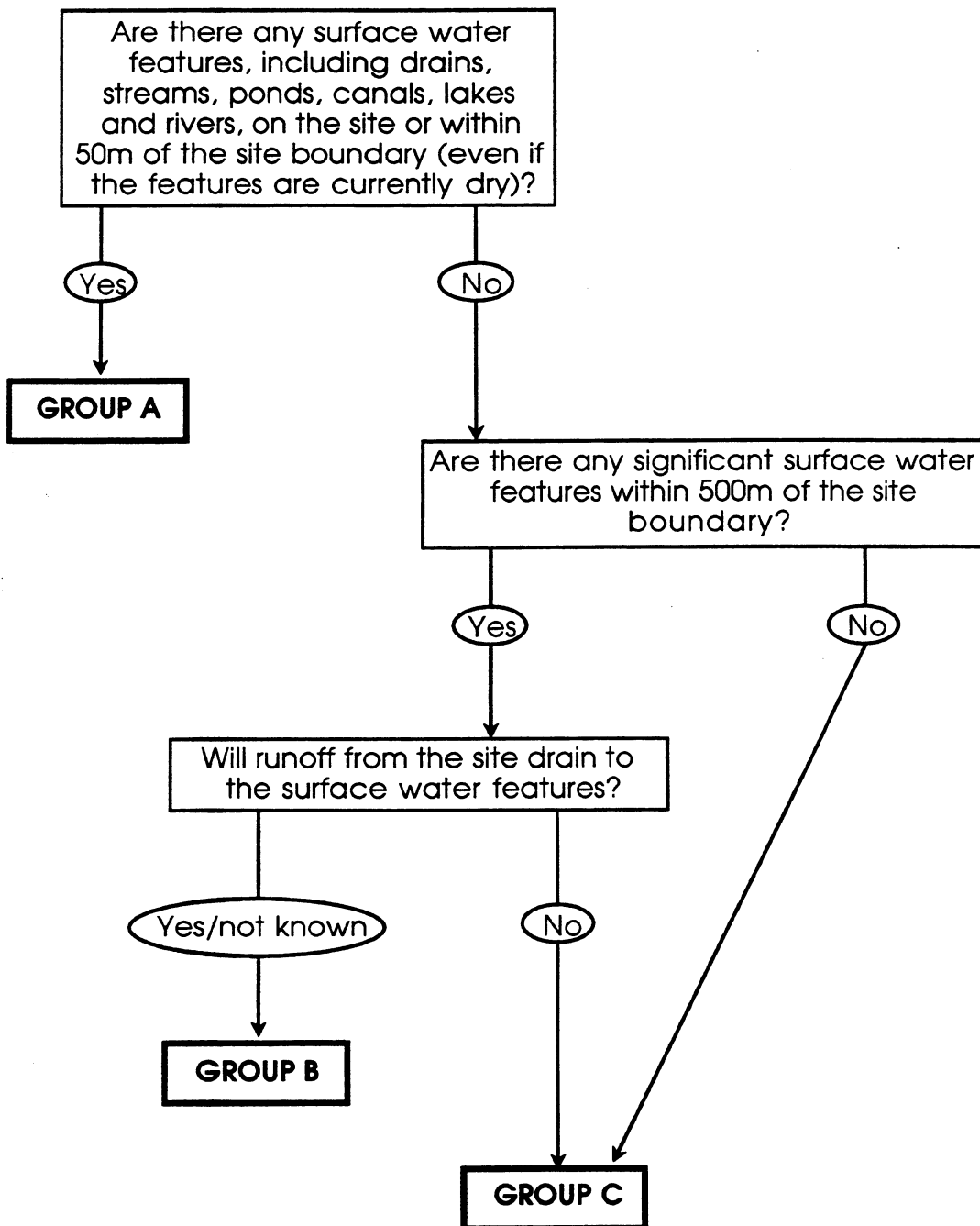


Figure 4

Part I Assessment - Groundwater

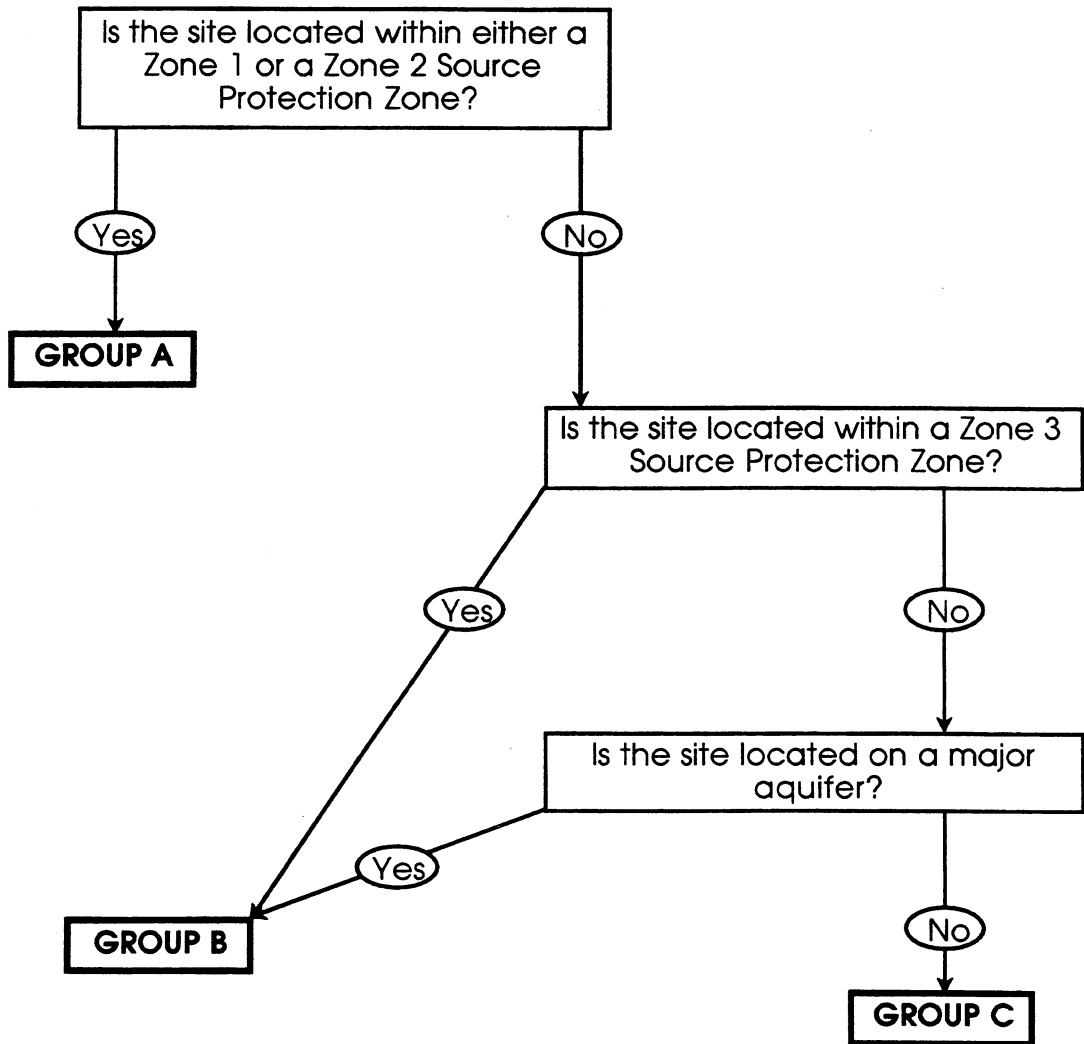
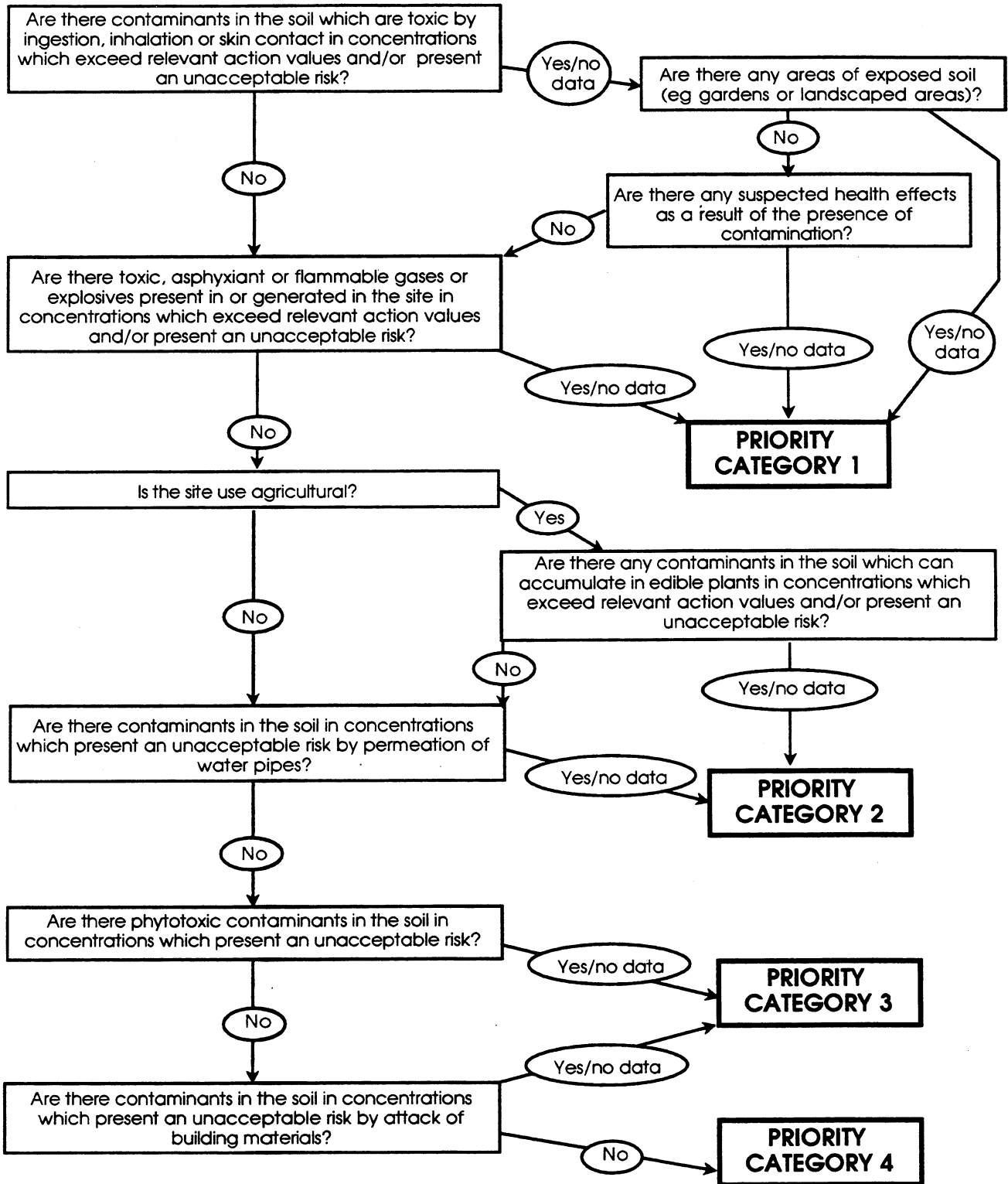


Figure 5

Part II Assessment - Development
- Residential, allotments, agricultural land, commercial or industrial use, public open space or amenity

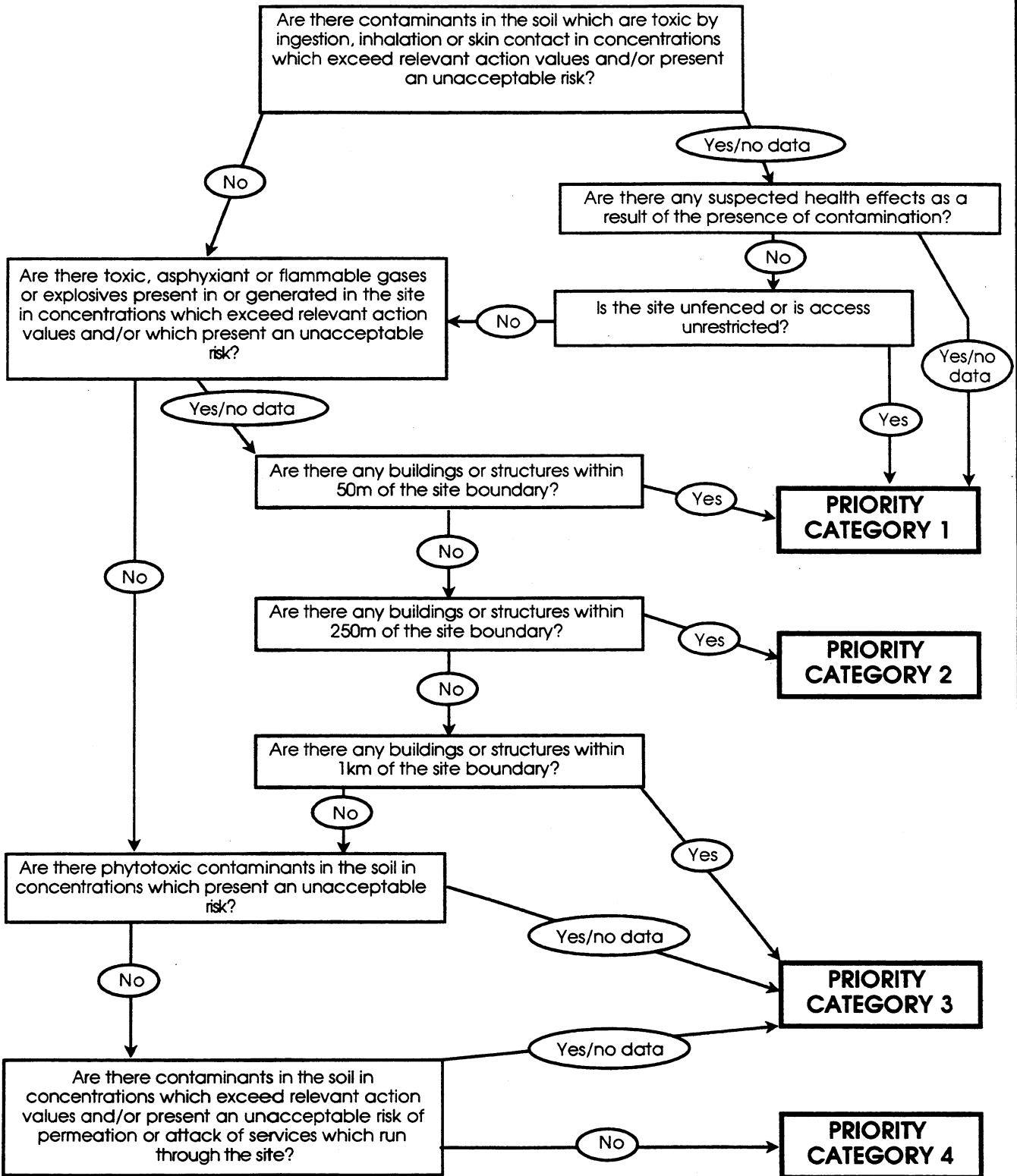


NOTE: The answer NO only applies where the data on contamination has been compared with a checklist for the contaminants expected on this site relevant to the particular target and has been evaluated to determine the statistical validity. For example, if a contaminant is expected to be present but has not been included in the testing programme or otherwise discounted the answer must be NO DATA (Reference 4 and 15)

Figure 6

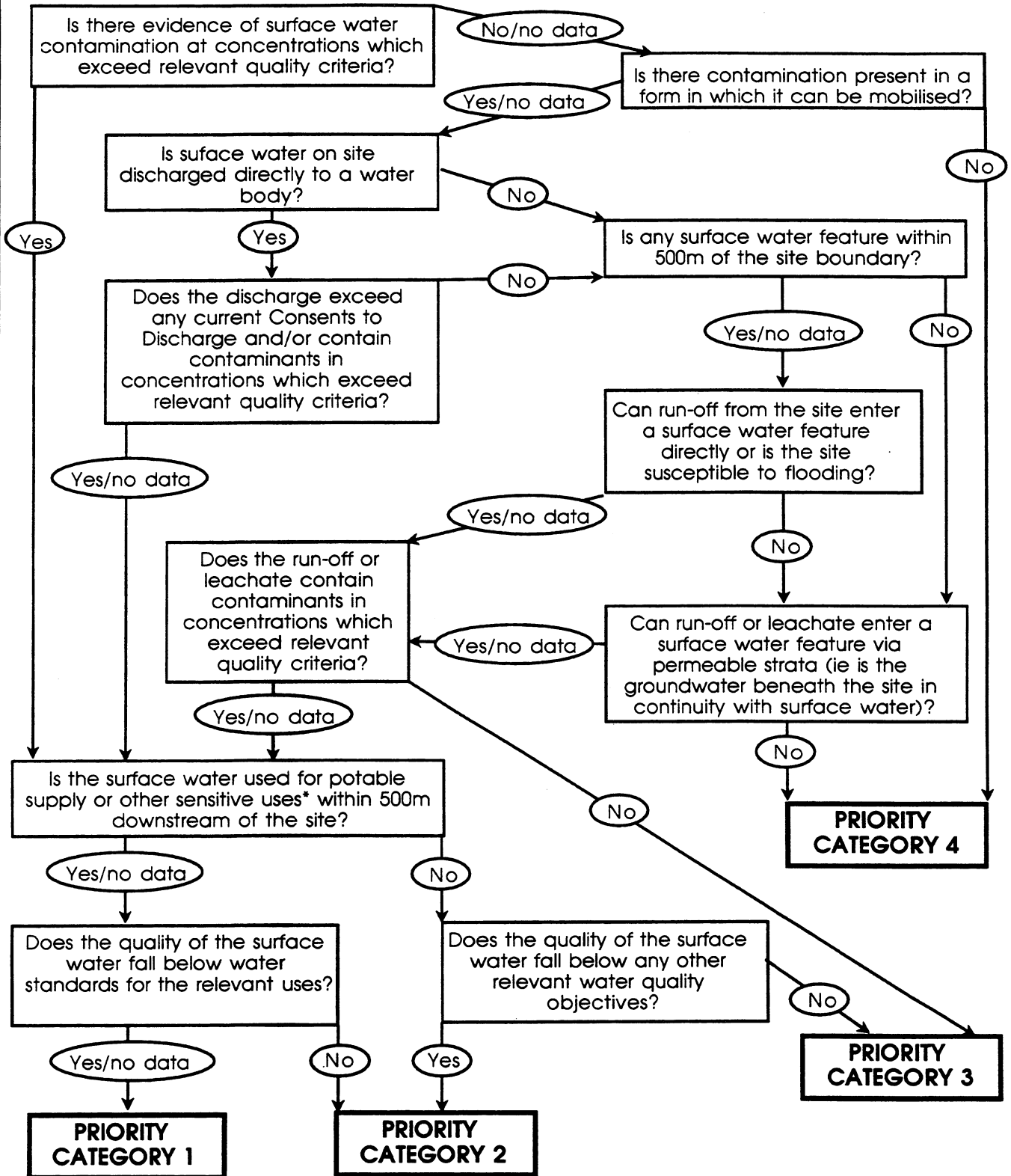
Part II Assessment

Development - Unoccupied Land



NOTE: The answer NO only applies where the data on contamination has been compared with a checklist for the contaminants expected on this site relevant to the particular target and has been evaluated to determine the statistical validity. For example, if a contaminant is expected to be present but has not been included in the testing programme or otherwise discounted the answer must be NO DATA (Reference 4 and 15)

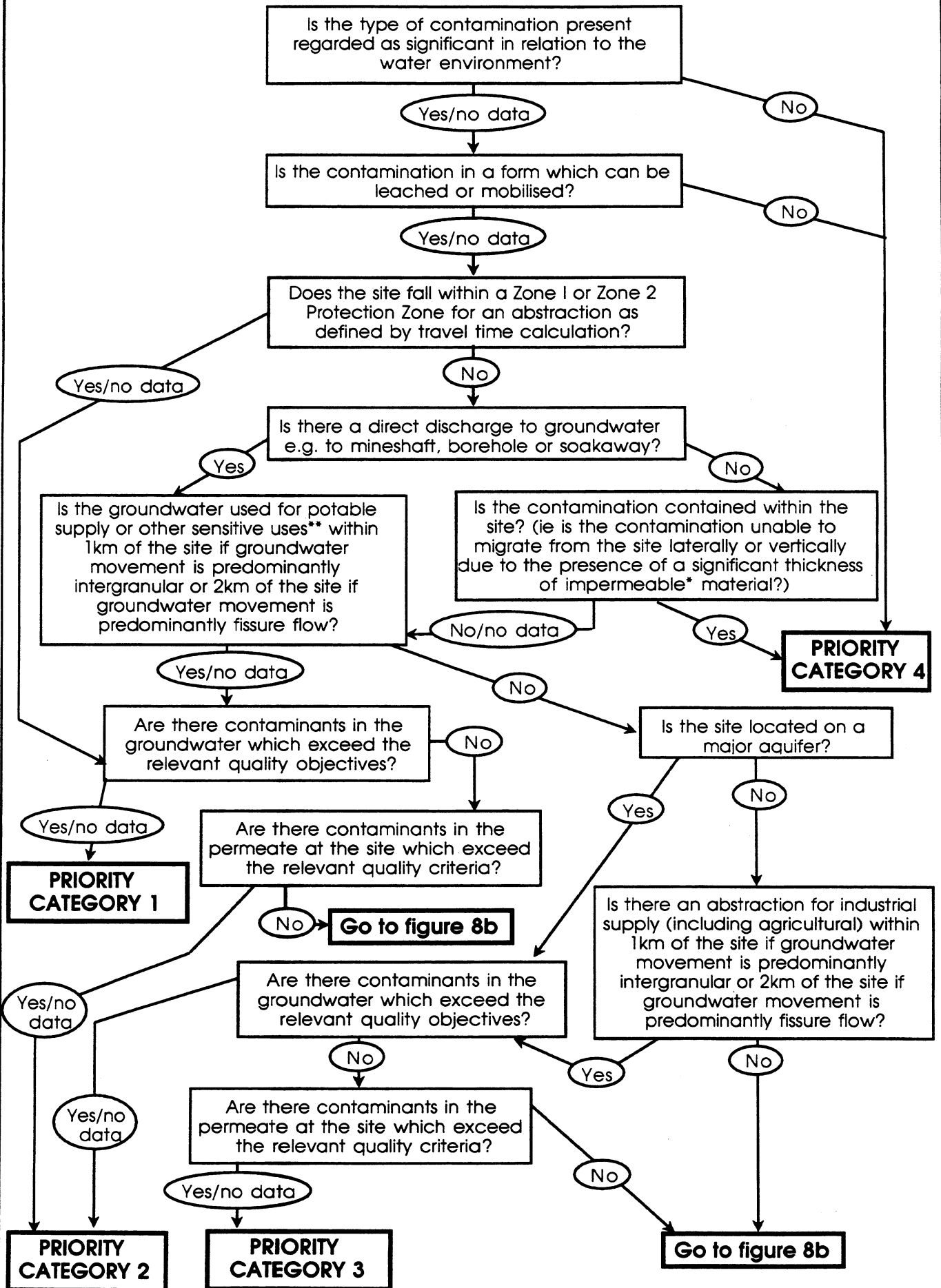
Figure 7
Part II Assessment - Surface Water



NOTE: The answer NO only applies where the data on contamination has been compared with a checklist for the contaminants expected on this site relevant to the particular target and has been evaluated to determine the statistical validity. For example, if a contaminant is expected to be present but has not been included in the testing programme or otherwise discounted the answer must be NO DATA (Reference 4 and 15)

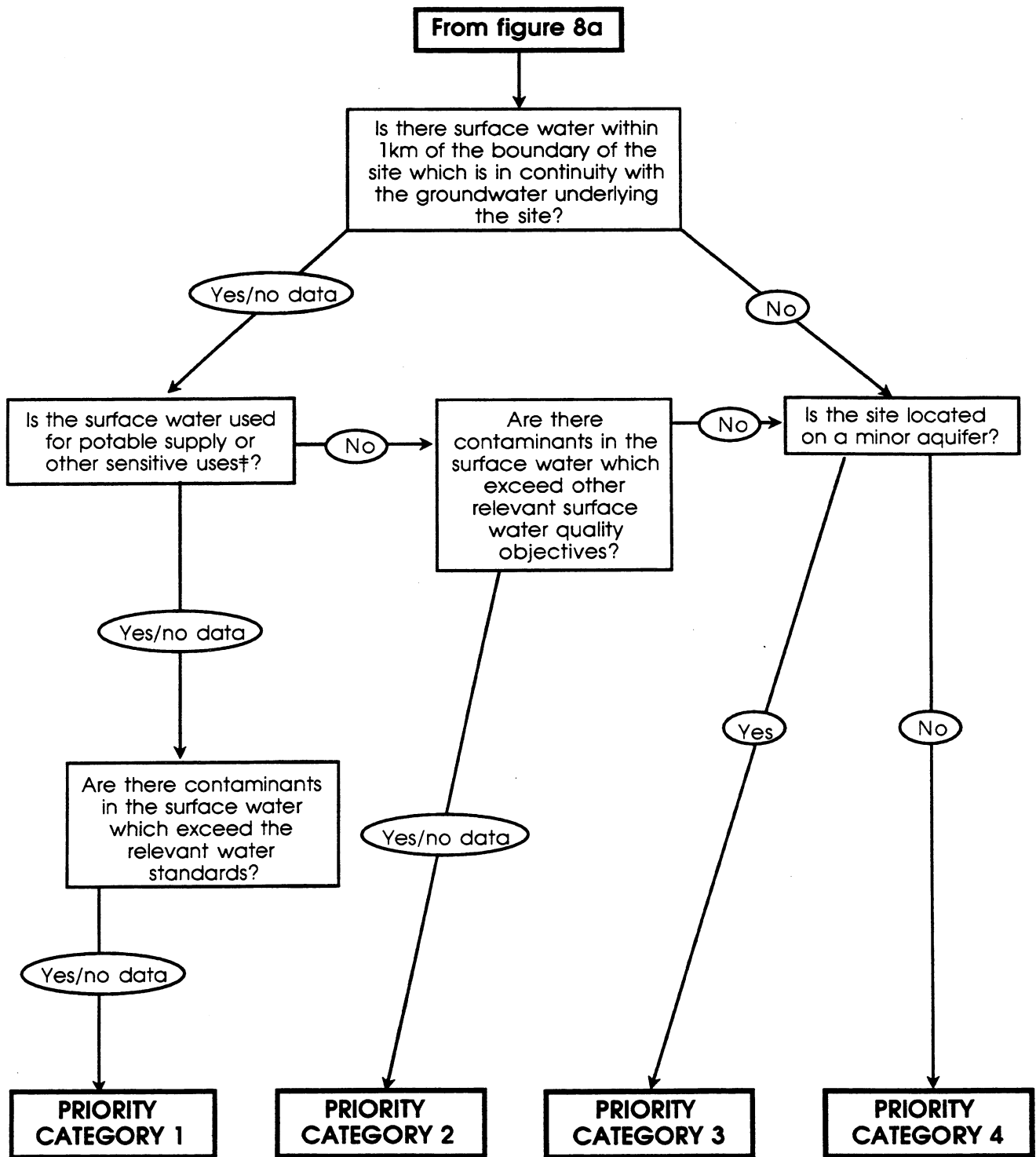
* Other sensitive uses of surface water include recreation (bathing/canoeing) salmonid fishery and SSSI designation

Figure 8a
Part II Assessment - Groundwater



For notes see figure 8b

Figure 8b Part II Assessment - Groundwater



NOTE: The answer NO only applies where the data on contamination has been compared with a checklist for the contaminants expected on this site relevant to the particular target and has been evaluated to determine the statistical validity. For example, if a contaminant is expected to be present but has not been included in the testing programme or otherwise discounted the answer must be NO DATA (Reference 4 and 15)

* For the purposes of this assessment material is defined as permeable if it has a vertical coefficient of permeability equal to or greater than 5mm/day

** Other sensitive uses of groundwater include use in food manufacture, mineral water bottling and brewing

‡ Other sensitive uses of surface water include recreation (bathing/canoeing), salmonid fishery and SSSI designation

ANNEX A
EXPLORATORY SURVEY

Annex A

Exploratory survey

- A.1** The purpose of an exploratory survey (ES) is to help to determine whether there is evident contamination present and not to carry out or to replace a full site investigation which would delineate laterally and vertically the nature and extent of contamination (14).
- A.2** The design of the ES should be site specific and should be based on the results of the site visit, the assessment of available additional information and the ICRCL Industry Profiles (3). During the design of the ES account should be taken of the type and layout of all past site uses and not just the most recent use.
- A.3** From these sources the anticipated indicator contaminants relevant to the targets at risk and the areas in which potential "hot spots" of contamination may be located will be identified. The ES should be designed to target areas of likely maximum concentrations. The number of sampling locations will be determined by a number of factors including the size of the site (15, 16). The method and depth of sampling and the specific analysis of samples will also be determined by an assessment of the former activities at the site, the anticipated contaminants and the current use and setting of the site (14, 15, 16, 17, 18).
- A.4** Where the presence of flammable or toxic gases is anticipated gas concentrations should be monitored at the ground surface and in the ground subsurface to a maximum depth of 1m using an impact searcher bar technique and portable electronic or chemical monitoring equipment. This technique carried out by a suitably competent person is considered adequate to provide a general indication of the concentrations of gases present for the purposes of the exploratory survey. The limitations inherent in data obtained during only one set of meteorological conditions must be taken into account when assessing the data obtained. Where the previous use of the site has been identified as a landfill reference should be made to the guidance given in Waste Management Paper 27 (19).
- A.5** If the contaminants expected to be found on site are relatively immobile substances it may be appropriate to sample only the ground surface and shallow subsurface. Generally samples from the ground surface to a depth of 0.5m to 1.0m will identify immediate hazards to current users. Such sampling may be possible without resorting to trial pitting methods, for example by auguring or hand digging at a small number of locations. Services and foundations are generally exposed to contaminants at depths of up to 1.5m below ground level. If the ground is covered with demolition or other waste materials, it will be necessary to sample the waste materials and to excavate through them to expose the underlying ground. In many instances a combination of ground surface and shallow subsurface sampling and trial pitting techniques will be necessary. Where appropriate use could be made of rapid sampling techniques.
- A.6** Where mobile contaminants are expected, or where surface or groundwater is potentially at risk from contamination, the extent of potentially contaminated material on site should be estimated and samples taken for confirmation. Where there is

uncertainty about the mobility of contaminants at the site, samples should be taken and subjected to leach tests.

- A.7** If there are water bodies on the site, or if the groundwater is intercepted during the excavation of trial pits, samples of water should be collected and analysed. If surface water is discharged to a watercourse and data is not available on the quality of the discharge, or the background water quality, a sample should be obtained and analysed. If there is no obvious point of discharge from the site, water samples from the watercourse upstream and downstream of the site should be compared.
- A.8** As the ES is designed only to provide a general impression of the status of the site it is not necessary to specify the analysis for a wide range of parameters to a high degree of accuracy.
- A.9** An ES should normally take no more than half a day for a site of 1 hectare or less, or a full day for a site of 5 hectares or less but this will of course be dependent on the complexity of the site and the specific requirements of the ES.

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