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NATIONAL CENTRE FOR RISK ANALYSIS AND OPTIONS APPRAISAL

Guidance Note Number 25

Guidance on the Application of Environmental Risk Assessment for Waste Management Licensing

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Management Summary

- This document provides technical guidance on the use of environmental risk assessment in the waste management licensing process, including applications for waste management licences and modifications of waste management licence conditions.

- It is principally intended to offer guidance to Agency staff and applicants, alongside other guidance and best practice, on the *reasonable* requirements of a risk assessment for waste management licensing.

- The Agency processes licence applications in accordance with the steps, procedures and guidance defined in the Licensing Process Handbook (LPHB). The Agency has developed a set of tools for use under the LPHB, by Agency officers in preparing and modifying licence conditions, and by applicants and operators in preparing and amending working plans. These tools are contained in the Library of Licence Conditions and Working Plan Specifications ('the Library').

- Use of the Library tools involves applicants, operators and the Agency in the identification and assessment of the environmental risks that are associated with the particular waste management operations on the site in question. This enables the Agency to set licence conditions that are based on the assessed environmental risks arising from the site. These will require an appropriate type and level of engineered and operational systems to be provided that will prevent, control and minimise those risks to acceptable standards.

- The application of risk assessment as a management tool for aiding environmental decision-making is widespread within regulation, business and finance. It is an activity familiar to, and performed by us all in our everyday life, albeit intuitively. However, the term 'risk assessment' and its associated techniques may not be widely understood or may be misinterpreted as a requirement for detailed technical assessments which require costly technical expertise.

- As applied in the use of the Library, risk assessment is primarily a relatively simple, systematic process, and only secondarily, and where necessary, a detailed technical assessment. The site and its operations are subjected to a 'simple risk assessment' (SRA) involving scoping and screening the risks, in each case answering the following series of questions in regard to the draft licence conditions and the draft working plan (Table 1).

- This document provides guidance on the use of 'simple and useable' tools to *assist* applicants and Agency officers in carrying out 'simple risk assessments' and in determining the appropriate level of detail required for risk assessments and working plans supporting waste management licence applications and modifications.

Table 1: Questions in regard to the Draft Licence Conditions and the Draft Working Plan

Licence conditions	Working Plans
Is there a risk to the environment from the waste management operations on this site?	Is there a risk to the environment from the waste management operations on this site?
Is a licence condition necessary to prevent or control the environmental risk of this site?	Is a risk management system relevant and necessary for this site?
What standards need to be specified in the condition / working plan?	What are the type and specification of the necessary risk management system?
Are technical default standards for the risk management systems available and appropriate in this case?	Will the specified risk management systems meet the requirements of the licence conditions?
Is a more detailed risk assessment (DRA) needed?	Is a more detailed risk assessment (DRA) needed?

How to use this Guidance Note

- This Guidance Note does not represent a specification for work, nor is it prescriptive. It is principally intended to offer guidance to Agency staff and applicants, alongside other guidance and best practice, on the *reasonable* requirements of a risk assessment for waste management licensing. Judgement will be required by Agency staff and applicants as to what level of detail is required, and guidance to this effect is provided in the Note. The document should be used alongside other guidance, statutory and best practice, to inform the decision-making process.

- Guidance provided here may be used by applicants in assessing *how* to achieve the standards set out in waste management licence conditions. The guidance does not, however, aim to set out how standards themselves are defined by the Agency.

- Agency staff should be able to appraise for themselves the level of detail required of the risk assessment having familarised themselves with this Guidance Note and related risk assessment guidance.

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1. Introduction

Context

1.1 **What is the role of risk assessment in the Environment Agency?**
The application of risk assessment as a management tool for aiding environmental decision-making is widespread within regulation, business and finance. It is an activity familiar to, and performed by us all in our everyday life, albeit intuitively. The Environment Agency of England and Wales (hereafter, the 'Agency') adopts risk assessment as a regulatory and management tool across its statutory remit in a wide range of forms and for a wide range of applications. These include, for example:

(i) in directing pollution prevention activities;
(ii) in resource allocation to individual regulatory functions;
(iii) in assessing new and existing chemical substances;
(iv) in deciding corporate business priorities; and
(v) in the drafting of waste management licences, which is the subject of this guidance note.

1.2 Application of risk assessment by the Agency for the purpose of assisting regulatory decision-making can be classed accordingly:

(i) **'regulatory' risk assessment**, whereby the Agency undertakes the risk assessment *itself*; for example, in the Agency's work for the Department of the Environment, Transport and the Regions (DETR) and the European Community on the notification of new and existing substances; and

(ii) **'applicant' risk assessments**, whereby operators, dischargers, developers or other persons, are required either by specific legislation, or at request of the Agency to undertake risk assessments in support of their application to discharge, operate or develop facilities. The majority of the Agency's activity in risk assessment is in guiding and reviewing these applicant risk assessments.

1.3 In addition to these two classes of activity, the Agency may develop its own risk assessment procedures, often in consultation with others, to assist in prioritising and resourcing its work. The development of Operator and Pollution Risk Appraisal (OPRA) within process industry regulation[1] and waste management inspection are two examples of this, but examples also exist from corporate planning, construction project management and in the delivery of the Agency's R&D programme.

1.4 **What is this Guidance Note for?**
This Guidance Note is concerned with 'applicant' risk assessments and follows two risk assessment workshops organised by the Agency's Environmental Protection National Service (EPNS) and held on 25th January and 23rd February 1999. The workshops were convened to discuss the application of risk assessment to waste management licensing, and specifically, the drafting of conditions for waste management licences. Representatives of the Agency, the waste management industry, their professional advisors and representative professional bodies were

[1] Environment Agency (1997) Operator and Pollution Risk Appraisal (OPRA), Version 2, 34pp.

present at these workshops.

1.5 The Agency's library of licence conditions makes clear the need for risk assessment as a tool to inform the licensing process. To support the library, and in discussion with workshop participants, it was agreed that guidance on the use of 'simple and useable' tools was required to *assist* applicants in the appropriate level of detail required for risk assessments (Table 1).

1.6 The Agency's National Centre for Risk Analysis and Options Appraisal (NCRAOA) were tasked with developing this Guidance Note within the remit of its corporate lead for the Agency on risk assessment. It has done this in liaison with colleagues in EPNS, waste policy and regulation and after discussion with representatives of the waste management industry and their professional institutions.

1.7 This Guidance Note should be read with the parallel guidance on the development of working plans. The position of this document within the overall process and hierarchy of technical guidance for waste management licensing is shown in Box 1.

How to use this Guidance Note

1.8 This Guidance Note does not represent a specification for work, nor is it prescriptive. It is principally intended to offer guidance to Agency staff and applicants, alongside other guidance and best practice, on the *reasonable* requirements of a risk assessment for waste management licensing. Judgement will be required by Agency staff and applicants as to what level of detail is required, and guidance to this effect is provided in the Note. The document should be used alongside other guidance, statutory and best practice, to inform the decision-making process.

1.9 The risk assessment Guidance provided here may be used by applicants in assessing *how* to achieve the standards set out in waste management licence conditions. The guidance does not, however, aim to set out how standards themselves are defined by the Agency.

1.10 Agency staff should be able to appraise for themselves the level of detail required of the risk assessment having familiarised themselves with this Guidance Note and related risk assessment guidance.

How to use this Guidance Note

1.11 This guide provides virtually all that is necessary to carry out environmental risk assessments.

1.12 The licensing process may be split into two phases:

a) the pre application discussions,

b) the main licensing process (constructing the licence).

1.13 Similarly risk assessment follows two phases here mirroring the above:

a) understanding the proposal and its potential impact on the environment (the environmental "footprint");
b) "problem definition/scoping" i.e. is it going to be a problem?
c) a more specific understanding of areas of concern presented by the proposal identified from a) – if they do this how will it impacts the locality?

1.14 Potentially there may be an Environmental Impact Assessment carried out by the applicant as part of the planning process or it may be necessary to complete a Simple Risk Assessment to help understand the project.

1.15 The process outlined in 1.13 above is fundamental to ensuring the appropriate conditions are inserted into the licence to provide full environmental protection. To provide a record of the above deliberations/discussions a form is provided in Appendix 5. This form is designed to be a "tool" for both applicant and Agency which will enable the site specific issues and the level of risk assessment identified be recorded. A copy of the form should be used / extended /developed for each site being licensed. Once the level of risk assessment has been decided to enable the licence to be determined this should be identified on the form. It will be an iterative process hence there are spaces on the form to record early views albeit they will change in light of further information/research. Also offered is a means to "audit" this decision process when constructing the licence.

1.16 A copy of the above form, recording the level of risk assessment used to determine the licence conditions should be passed to the applicant, now licence holder and Agency environmental protection team. The purpose is to identify the local significance of the conditions included within the licence and emphasis that should be applied to those conditions during the operational phases of the site by both the operator and Agency. It will also achieve more informed discussions when changes to the operations on the site are desired or sought by either party.

Box 1: Hierarchy of Technical Guidance on Waste Management Licensing

Five tiers of technical guidance exist that can be utilised to support waste management licensing.

Tier 1: Guidance issued by the Secretary of State to explain legislation e.g. Circular 11/94 in relation to The Waste Management Licensing Regulations 1994

Tier 2: Statutory guidance (section 35(8) and 74(5) of the Environmental Protection Act 1990) in the form of Waste Management Papers (WMP) e.g. WMP 4 "Licensing of Waste Management Facilities" and WMP26A "Landfill Completion"

Tier 3: Non statutory guidance on waste disposal e.g. WMP26B "Landfill Design, Construction and Operational Practice"

Tier 4: Technical Memoranda relating to specific waste types e.g. WMP 6 "PCB Wastes - a Technical Memorandum on Reclamation, Treatment and Disposal"

Tier 5: Other sources of technical guidance are Process Guidance Notes in relation to processes authorised under Integrated Pollution Control (IPC) and Environment Agency reports e.g. "Interim Internal Technical Guidance for Best Practice Flaring of Landfill Gas", and this Guidance Note

2. Basic Principles

Background to Risk Assessment

2.1 **Why is there a sudden emphasis on risk assessment – haven't we been doing it for years?**
All of us are familiar with the principles of risk assessment as part of our daily lives, for example in crossing the road or overtaking traffic in a car. When we make this judgement process more formal, as we do in environmental regulation, there is a need to develop a common understanding of the terms being used. Unfortunately, much of the language of risk can often be very technical, but the principles are very simple.

2.2 Many of the judgements made by those managing risks are made implicitly based on years of experience. One of the major benefits of formalising risk assessment is in making these judgements, and the underlying logic, explicit by writing it down. The information can then be analysed, recorded for future use and used in a more formal manner for managing risk. This is the principal reason the Agency is requiring risk assessments to support the drafting of waste management licence conditions. A further benefit of formalising risk assessment is in making the judgement process and its underlying logic transparent for others.

2.3 **What is the difference between hazard, risk and harm?**
'Risk' is a term used to denote the probability of suffering harm from a hazard and embodies both likelihood and consequence.

2.4 The **'hazard'** under consideration refers to the potential adverse *effect* posed by the source of the hazard – a toxic substance or hazardous situation - and this effect represents the potential to do harm.

2.5 The *actual* **'harm'** that results from a risk relates to the observable *damage* that occurs and can often referred to as the detriment, impact or response. Hazard, risk and harm are discrete terms and should not be confused or used interchangeably.

2.6 As an illustrative example, consider one of the risks from methane gas emanating from an active landfill site. Methane gas represents an explosion hazard (effect) at elevated concentrations and in confined spaces. Methane poses a high risk where the likelihood of concentrations building up to the lower explosive limit are high (high probability; due to sufficient pressure, permeable strata, building ingress etc.) and where there are occupied buildings in the vicinity (high consequences). The damage that can result from explosion risks includes loss of life, property and structural damage (harm).

2.7 Risks can not occur without *exposure* of a target or receptor to the source of the hazard. In terms of chemical exposure, this principle is encapsulated within the phrase 'the *dose* makes the poison', that is it is the amount of a hazardous substance that reaches a receptor that is important in determining the risk.

2.8 Risk assessment is a process for combining what is known and what can be reasonably inferred about an exposure situation for the purpose of managing the risk. Risk assessment can be conducted at various levels, ranging from an initial 'scoping' and 'screening' of risk using a simple 'source-pathway-receptor' approach through to a

detailed analysis of complex risks using quantitative techniques to assess and express consequence and probability in numerical terms. The Agency is promoting a tiered approach to risk assessment as depicted in Figure 1. An array of existing background guidance on risk assessment is available to which the reader is referred, some of which deals specifically with risks from waste management facilities[2345].

2.9 There is often considerable uncertainty involved in assessing environmental risk, particularly in the assessment of environmental exposures and impacts. Assessment effort must therefore be targeted accordingly, where risks or uncertainties are high, or where the costs of the assessment are justified by the benefits to decision-making. The Agency's staged, tiered and iterative approach[6] to risk assessment facilitates early risk prioritisation, avoids unnecessary detail and matches the level of approach in the methodology to assess risks, to the needs of the problem under investigation (Figure 1). Here, a simple "screening" approach is used first to determine the key risks and priorities. If the decision cannot be made based on this approach then more detailed approaches are used, focusing on the key risks identified at the screening stage.

2.10 The tiered process is iterative in that it requires re-examination of assumptions throughout, as one progresses from screening to more detailed approaches and more data becomes available. It is also pragmatic, however, allowing exit of the scheme according to need. It is with this 'suitable for use' approach in mind that the level of risk assessment for each relevant activity covered by a licence condition has been appraised in this Guidance Note.

2.11 **What is involved in conducting a risk assessment?**
The process of risk assessment typically involves the following stages, with answers being sought to various questions):

- **'What hazards are present and what are their properties?'**;
  or *hazard identification*. Identification of the sources of the hazard and assessment of the consequences of the hazard if realised, including the identification of dose-response relationships, where appropriate;

- **'How might the receptors become exposed to the hazards and what is the probability and scale of exposure?'**;
  or *exposure assessment*. Evaluating the plausibility of the hazard being realised at the target, and by which mechanisms, allowing an assessment of the probability, magnitude and duration of exposure;

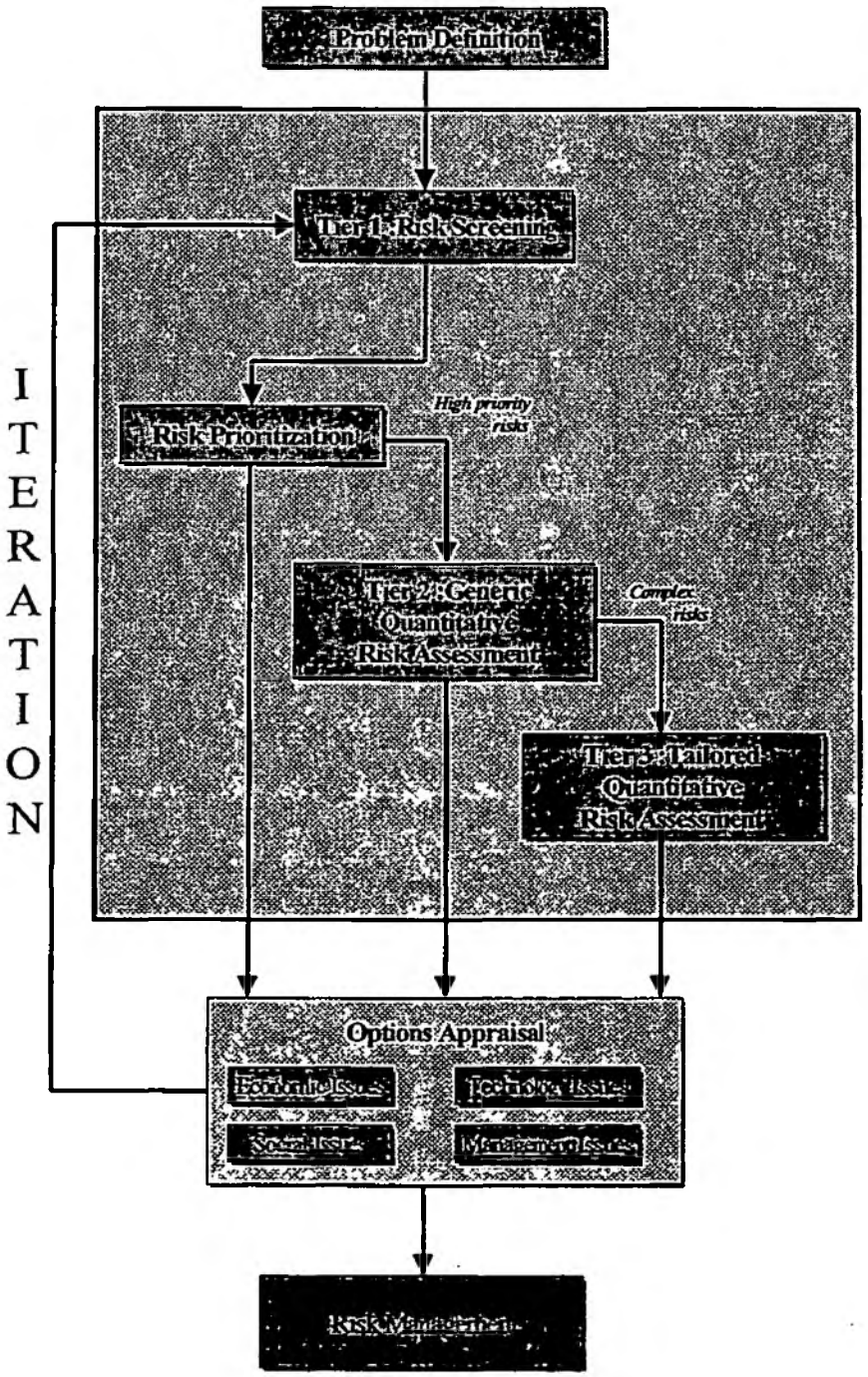
- **'Given exposure occurs at the above probability and magnitude, what is the probability and scale of harm?'**;

[2] Department of the Environment (1995) *A Guide to Risk Assessment and Risk Management for Environmental Protection*, HMSO, London, 92pp.
[3] Hester, R.E. and Harrison, R.M. (eds.) (1998) Risk Assessment and Risk Management. *Issues in Environmental Science and Technology* 9, Royal Society of Chemistry, Herts, 168pp.
[4] European Environment Agency (1998) *Environmental Risk Assessment: Approaches, Experiences and Information Sources*, Copenhagen, 252pp.
[5] Douben, P.E.T. (ed.) (1998) *Pollution Risk Assessment and Management*, John Wiley & Sons, Chichester, 464pp.
[6] Environment Agency (1997) *A Guide to Risk Analysis at the National Centre for Risk Analysis and Options Appraisal*, Environment Agency, London, 5pp.

or *risk estimation*: consideration of the consequences of exposure with reference to effects and dose, expressed as a likelihood or probability of the hazardous effects of exposure being realised; and expressed over a range of spatial and temporal fields;

- **'How significant is the risk and what are the uncertainties?'**;
  or *risk characterisation*: evaluating the acceptability and significance of risk with reference to standards, targets, background risks, cost-benefit criteria or risk 'acceptability' and 'tolerability' criteria and commenting on the uncertainties associated with the assessment.

Figure 1: Tiered Approach to Environmental Risk Assessment



2.12 **What types of risk are we talking about in waste management?**
A principal consideration for the application of risk assessment is the *type* of risk under consideration. With respect to environmental risks, the Agency is concerned with three main types of situation:

(i) **the risk of an initial event** that may result in a release (e.g. the failure of a landfill gas extraction system);
(ii) **the risk of exposure to the wider environment** following a release (e.g. derogation of a drinking water supply from an leachate plume);
(iii) **the risk of harm** resulting from exposure (e.g. risks to human or ecological health as a result of exposure to asphyxiant gases).

These types of risk often require quite distinct treatment and particular tools for their analysis.

2.13 **How do I go about the risk assessment?**
It should be clear from the above discussion that different types of risk will influence the technique used to assess them. 'Closed' systems involving engineered features, for example, are amenable to event/fault tree analyses that assess performance characteristics, whereas subsequent environmental exposures often rely heavily on distribution modelling. Risks of harm, beyond a simple reference to environmental standards, require a more detailed understanding and evaluation of physical, chemical or biological damage.

2.14 Complex risks may require a range of models at various levels of sophistication for the different types of risk encountered. Many risks can be screened out, however, using simple risk assessment methods.Hence appropriate application of risk assessment requires:

(i) selection of the appropriate **level** of sophistication (tier) as needs, complexities, priorities and data allow; and, within this,

(ii) selection of the appropriate **technique** with reference to the type of system under study.

2.15 The start of the risk assessment process is the problem definition stage and here, an assessment of whether a risk assessment is required at all takes place. The rationale for this choice needs to be made explicit and well-founded on the basis of a scientific assessment of the situation. Also critical at this stage is an explanation of the circumstances of exposure – what or whom is exposed to which hazards. This is often best undertaken using a pictorial representation and is then termed the 'conceptual model'. The conceptual model will be refined as one progresses through the various tiers of Figure 1, to the level required.

3. Risk Assessment and Waste Management

The Roles of Risk Assessment in Waste Management

3.1 The planning, siting, operation and decommissioning of waste management facilities carries certain risks that are assessed at various stages of the 'life cycle' of a facility, from inception and design to surrender. The formal stages that invite application of risk assessment at present are:

(i) the **planning stage** (through submission of an environmental impact assessment and environmental statement, including a risk assessment);

(ii) during the **parallel process of waste management licensing** (through reference to the library of licence conditions (Table 1) and including requirements for a 'Regulation 15' assessment);

(iii) prior to **licence amendment**, resulting from changes to operation; and

(iv) prior to licence surrender.

3.2 Aspects of these processes are covered by various waste management papers and Agency documents to which readers are referred (Box 1). The role of risk assessment at these various phases is shown in Figure 2.

Figure 2: Role of Risk Assessment at various stages in the Planning and Waste Management Licensing Cycle

[Schematic to be provided]

3.3 This Guidance Note is concerned principally with stages (ii) and (iii), although the opportunity to assess risks of relevance to the licensing stage at the initial planning stage should be noted. In particular, the potential to scope and screen risks during the environmental impact assessment (EIA) stage of the planning application should be regarded as a valuable opportunity to undertake work of direct relevance to agreeing the working plan with the Agency. Such scoping risk assessments can provide an early identification of issues of critical importance to the waste management licensing process, as well as highlighting those risks that will require a detailed level of assessment. Similar opportunities should be sought through the preparation of risk assessments supporting a Regulation 15 assessment for installations where List I and II substances are of relevance.

4. Risk Assessment, the Library of Licence Conditions and Working Plan Specifications

Introduction

4.1 **How does the risk assessment relate to the licence conditions and working plan?** A Waste Management Licence is issued with conditions attached. Those conditions may relate to the activities which the licence authorises; and precautions to be taken and works to be carried out in connection with or in consequence of those activities. Accordingly, requirements may be imposed in the licence that are to be complied with before the activities authorised by the licence have begun or after they have ceased.

4.2 The licence conditions will be risk-based, and will set requirements and standards which are necessary to ensure that the above objectives are met for each waste management operation which is to be covered by the licence for the site (Table 1).

4.3 Licence conditions and sub-conditions will be of 2 basic types:

- Conditions which set absolute requirements or absolute environmental performance standards to an appropriate level of detail

- Working plan-referenced conditions which require the operator to carry out an activity as described in a specifically referenced section the working plan.

4.4 The licence conditions set the requirements for the risk management systems that must be provided by the operator, and the performance standards which those systems must meet. The working plan describes the site operations and risk management systems to the level of detail that shows clearly and convincingly that the prescribed requirements and standards will be met.

4.5 It is important to realise that although the working plan is produced by the operator and is their document, those sections specifically referenced in the licence conditions will become an operational and enforceable adjunct to any licence issued. The Agency must therefore approve those sections of the working plan prior to the issue of a licence, and, following issue of a licence, must be notified and approve of any proposed changes to those sections of the working plan *before* they are implemented.

4.6 Since the sections of the working plan which are referenced in the licence conditions will describe the necessary risk management systems for the site, the licence conditions will require that, prior to the amendment of referenced sections of the working plan, the effects that the proposed changes on the environmental risk assessment are reviewed and assessed.

4.7 The working plan and proposed amendments to it will therefore need to be supported by an assessment of the risks of the proposed waste management operations, taking into account the risk management provisions described in the working plan.

4.8 Detailed guidance on the risk management systems covered by specific licence conditions and working plan specifications is given in the Library.[7] The complexity of the systems that will be needed will depend upon the type and level of risks that the operations will present to the environment. The risk management systems needed to prevent and control the risks may be relatively simple, such as operational procedures requiring simple actions and documentation, or relatively complex, such as engineered systems requiring fully documented and quality assured stages of design, construction, testing and validation, operation and maintenance. An example of the former would be waste acceptance and control procedures for a transfer station handling inert, non-hazardous or low hazard, non-special wastes. An example of the latter would be the systems underlying the provision of an engineered site liner for a landfill, or of a groundwater monitoring programme for a landfill. These will place different levels of demand on supporting systems such as record keeping, and the training and competence of site staff.

4.9 Risk management systems, whether simple or complex, should be regarded as an integrated whole. A change to one part or element of the system, such as the design standards, or the quality and content of record keeping, or the training and competence of staff, will potentially change the effectiveness or performance of the risk management system as a whole. This means that any proposed changes to any part of a risk management system should be assessed for their effect on the overall performance of the risk management system, to ensure that the necessary standards of environmental protection are maintained.

4.10 **What should the environmental risk assessment provide?**
Environmental risk assessment when applied to waste management licensing is a process to estimate and evaluate the potential hazards and risks to the environment associated with a particular site. Environmental risk management provisions will then be required so as to adequately prevent, control, minimise and/or mitigate the risks to the environment identified and evaluated through the risk assessment.

4.11 The risk assessments should be based upon reasonable worst case scenarios, data and assumptions, except where otherwise justified. Qualitative analyses and assessments may be sufficient where these give a clear demonstration that proposed risk management provisions are fit for purpose and will give the required standard of environmental protection. This may include, where justified, an assessment that the hazard and associated risks are so insignificant that they require neither prevention, control, nor monitoring.

4.12 Where qualitative analyses and assessments do not give clear justification for the proposed risk management provisions, then the assessment should be based on qualitative-quantitative or else on quantitative methods, as necessary and appropriate. The output of the risk assessment process should be a categorisation of risks according to significance and sufficient a understanding of the contributing factors to establish the various options for managing the risk. Options analysis is the process of evaluating these options for risk management.

[7] Environment Agency (1999) Library of Licence Conditions and Working Plan Specifications.

4.13 **Where do costs and benefits fit in?**
Risk management offers the *benefit* of risk reduction, so risks can be characterised with reference to the *costs* of implementing measures to mitigate them. Under Section 39 of the Environment Act, the Agency has a duty to take account of likely costs and benefits in deciding whether or not to exercise its *powers*, and in deciding how to exercise those powers. It is important to note that this duty does not affect the Agency's obligations to discharge specific *duties*, comply with legal requirements or meet objectives.

4.14 The approach taken to considering costs and benefits should be proportional to the outcome. The resources required to take undertake the economic appraisal should not be disproportionate to the costs and benefits of the decision. The duty to take account of likely costs and benefits does not require consideration of costs and benefits to involve quantification or monetisation of costs and benefits.

4.15 In its' waste licensing decisions, the Agency has a duty to prevent pollution of the environment, harm to human health and serious detriment to amenities of the locality. However, these waste licensing decisions do include a qualitative consideration of likely costs and benefits through the application of the test of reasonableness. A similar level of judgement on the part of the regulator occurs with reference to process modifications

Guidance Methodology

4.16 **Is risk assessment always required?**
The EPNS workshops enabled a discussion of those aspects of the licensing process requiring risk assessment and those aspects for which risk assessment was deemed by workshop participants as not being required. This Guidance Note extends the approach by considering the following categories of risk assessment requirement for activities covered by the library (refer to Figures 1-2 and Appendix 1):

(i) *Not applicable*
Risk assessment does not apply to activity. This will usually be because the activity does not relate to risk from the installation

(ii) *No requirement*
Risk assessment applicable but not required. This may be due to the requirement for an absolute condition or because the activity is deemed insignificant in risk terms.

(iii) *Simple approach required*
Qualitative (risk screening, Tier 1) or semi-quantitative (risk prioritisation) approach suitable;

(iv) *Detailed approach required*
Quantitative (generic, Tier 2; or tailored, Tier 3) approach suitable;

4.17 Having considered each of the activities in turn for various classes of waste management facilities, candidate risk assessments are presented *as illustrative case study examples* of risk assessments at each level of sophistication.

4.18 Adoption of these approaches is recommended in sequence such that all activities requiring a detailed quantitative analysis, which will be few in number, will be subjected to a prior simple qualitative treatment. This 'cascade' structure is consistent

with forthcoming guidance from the DETR and Agency and also common to other areas within the Agency, such as in the derivation of soil remediation criteria for water resources affected by land contamination.

4.19 The overall outcome of this methodology is a risk assessment framework for waste management licensing that allows a qualitative risk assessment for simple, low risk activities and a more detailed treatment for complex, higher risk activities (Figure 1, Appendix 1). Further, for an individual complex facility, certain individual activities may be dealt with using a qualitative approach whilst others may require a detailed quantitative treatment. Treating risks using this 'cascade', progressing down the tiers of Figure 1 allows the approach to matched to the significance of the risk.

Activity Screening

4.20 Appendix 1 presents a matrix of activities (from the library of licence conditions) against type of waste management installation and indicates the *level* (tier) of risk assessment proposed for each activity.

4.21 The types of facility are classified under eight generic types of waste management operation, which will each potentially require an identifiable range of risk management provisions. These are simplified descriptions to assist the scoping and screening of risk assessment and risk management systems. They are consistent with the descriptions and classifications of waste management operations and site types used by the Agency elsewhere within the Library and in the draft Waste OPRA system (Operator Pollution Risk Appraisal) for determining risk-based inspection frequencies.

4.22 Viewing Appendix 1, it can be seen that risk assessments for any single type waste installation may require different levels of approach according to the issue (condition title) under study. This represents an increasing focus for certain aspects of the proposed or operating facility. The Appendix does not at this stage indicate suggested types of approach within each tier, but simple risk assessment can be used to refer to screening and prioritisation tools, and detailed risk assessment for generic fault/event tree approaches, the application of LANSIM[8] and the use of site-specific risk assessment.

4.23 It must be acknowledged that Appendix 1 represents the level of risk assessment activity that would normally be required but that site-specific issues may override and place more onerous requirements on specific installations.

4.24 Application of individual tools is at the discretion of the applicant though unit processes, for example, lend themselves toward an event/fault tree approach and liner leakage toward the use of LANSIM and subsequent dispersion modelling using models such as MODFLOW, where appropriate.

4.25 It is always assumed where detailed risk assessment is suggested, that a prior simplified scoping and screening exercise will have been conducted first. Thus the nominal level of risk assessment represents the point at which the 'cascade' ends.

5. Risk Assessment Techniques and Case Studies

5.1 This section provides a brief description of the approaches to risk assessment at various levels. The descriptions are not prescriptive, but rather outline the general philosophy of each approach. Applicants have flexibility in their selection of specific techniques.

Simplified Approach: Tier 1, Risk Screening

5.2 Risk screening (scoping/problem definition) is exactly what it means:

- considering what is being proposed,
- where is it to be carried out,
- how is it to be carried out

all being referenced to the local site circumstances. What is produced are the advantages of site specific issues being identified and prioritised at an early stage enabling the appropriate risk assessments to be undertaken or commissioned.

5.3 Consider two proposed sites, one in a rural area the other adjacent to a major airport, both taking commercial waste which contain food scraps. A risk assessment is required for both sites, the rural one would be a simple one whilst the site adjacent to the airport would be a detailed assessment; reasoning, probability of bird strike and the consequences of such an incident.

Process flow for Risk Assessment

Objective: to show the linkage of risk assessment to the life of the site from inception to surrender of the licence to the Agency

Step 1: Applicant contacts the Agency to discuss project.

Where this is concurrent with discussions the applicant may be having with the planning authority then every effort should be made to ensure no duplication of information required takes place.

An example: where an Environmental Impact Assessment (EIA) is being carried out under the planning regime seek to ensure issues (risk assessments) required at the licensing stage are identified. However, it will still be the applicants decision whether to commission any additional work other than that required to meet the EIA

Reason – it may save the applicant time and effort to provide more information than is required for the EIA because it will be required at the licensing stage

Note – where an EIA is being carried out it will almost certainly provide the necessary information for the project scoping (problem definition) and should be used within the licensing process

Step 1 is viewed as an iterative process where the EIA may identify areas where more detailed risk assessments may be required for the licence, conversely the EIA may provide all that is necessary for the licensing process to proceed

Step 2: Risk assessment supports the licensing process.

The licensing process handbook explains the steps involved with the library of conditions identifying where risk assessments are necessary and what detail they are expected to be carried out. An initial scoping/problem definition will have identified the site specific issues that need consideration during the licensing process (from the EIA or from a simple risk assessment carried out when first contacted) hence this may vary the type of risk assessment identified within the library.

The applicant will submit options for the project, referencing various waste management papers and based on Agency standards, each supported by a risk assessment, the Agency considering these in the licensing process.

Step 3: Following the procedures within the process handbook the licence will be issued and the working plan "agreed".

Step 4: Site is now operational being inspected on a regular basis

Step 5: The operator of the site/Agency seek to modify/vary the licence conditions, amend the working plan. The risk assessments used in the determination of the licence identify the significance of any changes being proposed and will determine the level of response required to modify/vary the licence.

Step 6: Site completed, operator seeks to return the licence. The risk assessments carried out for the EIA, and the modifications, variations to the licence and or working plan used to help assess the application.

5.4 The emphasis is on isolating *discrete* source-pathway-receptor 'linkages' and examining their actual or potential connectivity. Clearly, where there is no exposure or linkage between the three components, there can be no risk.

5.5 Definitions are important in these exercises because some features may appear as both pathways and receptors. For example, groundwater can be a pathway and receptor, as can air. With reference to Appendix 2, the following defintions are offered:

(i) **contaminant**: where relevant, the *specific* chemical under study, e.g. asbestos fibre;

(ii) **hazard**: the *effect* posed by the contaminant, e.g. organ damage;

(iii) **source**: the source of the hazard where the contaminants are located, e.g. leachate, landfill gas;

(iv) **pathway**: the means by which receptors may come into contact with the source, e.g. surface water run-off, inhalation of windblown dust, migration through permeable strata;

(v) **receptor**: the target, that which is at risk, e.g. humans, groundwater, flora and fauna, surface water, dwellings.

5.6 **How easy is a simplified risk assessment?**
The approach requires:

(i) construction of a source (contaminant, hazard), pathway, receptor table as shown in Appendix 2 for the facility or situation under study, paying specific attention to the completion of *discrete* linkages (hazard identification). This means no linkage should have more than one source, pathway or receptor;

(ii) a subjective evaluation of the actual or potential connectivity of these components (exposure assessment);

(iii) consideration of the relative likelihood and scale of exposure and scale of consequences by reference to the nature of the hazard (potency), availability of the pathway and sensitivity of the receptor (risk estimation); an

(iv) classification of the relative magnitude of the risk together with a justification for the assignment of risk class (risk charaterisation).

5.7 'source-pathway-receptor' approach works well across a wide range of disciplines and risks, providing strict attention is paid to the definitions and clear justifications are made and *recorded* throughout. Though simple, it still requires a thorough approach to be of value. Care should be taken not to confuse situations before and after the introduction of risk management measures. The assessment should identify areas where risk management will be required and the assessment can then be undertaken *separately* once measures have been proposed to assess the residual risks. Source-pathway-receptor tables can also be used as a pre-requisite to designing event trees for the risk assessment of engineered systems. Examples of qualitative source-pathway-receptor risk assessments are presented in Appendices 2 and 3.

Simplified Approach: Risk Prioritisation

5.8 When are risk scoring systems appropriate?
Risk prioritisation involves separate consideration of probability and consequence. In most instances this can follow on from the source-pathway-receptor analysis. The hazard and source characteristics and the sensitivity of the receptor dictate the consequences. Probability is usually dominated by the availability of the linkage between the source and receptor. Consequence is a function of the hazard and the sensitivity of the receptor. These can be ranked or scored using the qualitative indicators high, medium, low, negligible or by using scales of 1-5, for example, to reflect different degrees of significance. The product of probability and consequence reflects the overall risk that is useful for the purposes of prioritisation. Understanding whether risks are probability or consequence driven offers different approaches to risk management and can assist in scoping out more detailed studies where these are

required.

5.9 Prioritisation can be achieved by ranking probability and consequence aspects separately, either in a qualitative (high, medium, low) or semi-quantitative (on a scale of 1-5, having defined each point in the scale) fashion. The benefit of prioritisation is to distinguish between low probability, low consequence risks and high probability, high consequence risks, which will usually require some further level of analysis. As with the risk screening approach, there is a need to be explicit about the scales used with clear definitions of scale and assumptions made transparent. An example of a simple prioritisation approach is provided in Appendix. This approach would be improved further by referring to discrete linkages for each source.

5.10 Risk prioritisation or rating systems have some specific advantages and disadvantages which place restrictions on their use (Table 1). Such systems are used to prioritise sites and identify key risk contributions. They should never be used to infer 'absolute' levels of risk, to compare with risk criteria or to test the effectiveness of detailed risk management options.

5.11 The value of prioritising risks within a band, for example, for ranking all high risks in order of the first highest to the fifth highest is of limited value if all high risks must be addressed. This will often be the case in setting conditions for waste management licenses.

Table 2: Capabilities and Limitations of Risk Prioritisation Schemes

Capabilities: Risk rating systems **can:**	**Limitations:** Risk rating systems **can not:**
distinguish between risks posed by facilities or situations of a generic type	provide absolute estimations of risk; scores are relative
allow prioritisation of risks from risk scores, usually through the separation of probability and consequence	provide a degree of resolution beyond that inherent to the subjectivity of the scoring system; scores are best 'banded' in ranges
allow comparisons between situations with similar risk, but with different 'driving' factors	be applied without training
accommodate simple 'what if' questions	
allow fast screening of numerous facilities or situations	
prioritise and focus further risk assessment effort	
support the identification of high risk situations which may develop after authorisation or licensing	

5.12 Prioritisation approaches usually incorporate a numerical scoring system that reflects the magnitude of the probability or consequences of adverse effects occurring at a location. At this level of assessment scoring systems are arbitrary. Scores can not reflect absolute risk and scoring systems need to be simple, clear, easy to follow and reproducible. Critically, they should never assume a degree of sophistication in their design beyond what they can deliver in terms of distinguishing between risks.

5.13 More sophisticated tools are available for detailed estimates of risk (see below), and scoring systems implying high levels of 'precision' should not be employed, given the relative nature of risk prioritisation. Where different scales are used for scoring (e.g. 1-5 vs. 1-30), these should be properly justified.

Detailed Approach: Tier 2, Generic Quantitative

5.14 Quantitative risk assessment is used for high priority, complex risks and is a specialist area of expertise. Numerical models and computer software, such as LANSIM, for example, have been developed to assist in the quantification of risks. Two circumstances exist:

'*generic*': where a generic numerical model is used to simulate the facility under study for the purposes of informing the general type of risk management measures required; and

'*tailored*', or '*site-specific*' where attempts are made to model the authentic facility under study using a site-specific model representation and site-specific data (Figure 2).

5.15 Generic quantitative risk assessment adopts models representative of a general situation; e.g. a generalised engineered landfill. For example, LANSIM is a performance assessment model for landfills and is capable of selecting from a wide range of liner types, landfill geometries, drainage systems and leachate strengths to estimate contaminant breakthrough curves. It does not represent the actual site under consideration *per se* because of the site-specific complexities. Use of the model is explained elsewhere.

5.16 The value of these approaches is that they:

- allow adoption of recognised equations in a probabilistic mode;
- allow intrinsic handling of uncertainty;
- formalise the decision-making approach;
- facilitate a full assessment of all possible outcomes within the constraints of the model that has been set up;
- provide an assessment more meaningful than a qualitative treatment;
- allow sensitivity analyses of components of risk; and
- allow and promote discussion of expert judgement issues.

5.17 Most generic models operate in predictive mode and are concerned with improving an understanding of how a system behaves rather than being over concerned with the accuracy of output. Given their appropriate use, however, the results generated from these models should not be so divergent from actual site-specific data that radically different decisions would have been made, over cell design, for example.

5.18 Generic and site specific models are used appropriately when:

- inputs are matched to output simulations, that is the user understands the output that relates specifically to the selection of input variables selected – otherwise 'garbage in-garbage out';
- input data is justified and referenced; and
- data ranges are unbiased.

Event Tree and Fault Tree Analysis

5.19 Event and fault tree analysis are used for assessing the risks of an initial release, usually from containment. There are two basic approaches, both of which calculate the probability of the event by considering the causes of the incident. The first involves the use of historical, statistical data on failure of containment, sometimes referred to as the 'historical approach'. The second approach uses what is termed 'synthesis analysis', such as fault and event trees, to break the system down into contributing factors and causes.

5.20 There is also a problem of demonstrating very low probability, that is in obtaining a statistically meaningful estimate of rare and accidental events. In any case, it is valuable to collect event data over time, as much of this is useful in reliability and availability studies. This type of information is also very valuable for testing results from synthesis analysis against historical data to determine whether the approaches used lead to comparable predictions.

5.21 When historical performance data are not sufficient, synthesis analysis is used. The two most common methodologies used are fault trees and event trees. These techniques are based on diagrammatic methods and are initially qualitative in nature, although they provide the basis for subsequent quantitative analysis, if required. They can be made highly site-specific being tailored to the system being analysed. They can also identify event scenarios that have not been realised in the past, which allows for the introduction of risk reduction measures to reduce the likelihood of an event taking place in the future. However, this type of analysis still requires data to quantify the contributory causes. Quantification often involves value judgements, which are often difficult to justify when not substantiated by historical records.

5.22 Fault tree analysis is the best known and most widely used technique for developing failure logic. This technique requires information on failure rates of components within the system. The data are used to provide an estimate of the probability of the system failing over time or of 'failure on demand'; for example, failure of a safety system to operate when required. The fault needs to be accurately defined; for example, it is important to define a failure in terms of the size of the release of material and the duration of that release.

5.23 The aim is to select an undesired event, (usually called the top event), which is often categorised at the hazard identification stage, and trace it back to the possible causes, which can be component failures, human errors or any other possible events that can lead to the top event. The causes are related using simple logic relationships (i.e. AND/OR 'gates') to allow for the construction of a logical structure that models the failure modes of the system. The technique should produce a list of the events that

could lead to the fault (i.e. top event) being realised.

5.24 Event tree analysis operates in the opposite way to fault tree analysis by following initial causes through to several possible outcomes. The starting point is an initiating event and is often used to model how safety systems or other mitigating systems will work. It is a powerful technique for modelling event sequences that are time dependent (e.g. operator actions). Guidance on these techniques is under preparation in the Agency's National Centre for Risk Analysis and Options Appraisal Guidance Note 18.

Detailed Approach: Tier 3, Tailored Quantitative

5.25 specific risk assessment extends use of the generic tool to the specific site. Adoption is usually restricted to complex high priority cases, such as radioactive waste repositories, for example. In routine waste management licensing, it is rare that the application of site-specific risk assessment will be required. Where it is used, it will often involve construction of one or several models linked together. This level of risk assessment is a highly specialised activity. The subject is not given wide discussion in this document.

Appendices

Appendix 1: Matrix of suggested risk assessment approaches

Appendix 2: Simple source-pathway-target analysis

Appendix 3: Example risk assessment for recycling plant

Appendix 4: Example risk priorities matrix for materials recycling facility

Appendix 5: Form: Record of Scoping/Risk Assessment

Appendix 1: Matrix of suggested risk assessment approaches

NOTE: The following matrix is based upon the Index to Volumes 1 & 2 of the Library of Licence Conditions and Working Plan Specifications. It should be used in conjunction with that document. Please read the endnotes following this table, when you are using it.

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
0.	DEFINITIONS										
0.1	**Definitions of Terms within the Conditions**	All	Definitions of Risk terms.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1.	**GENERAL CONSIDERATIONS**										
1.1	Specified Waste Management Operations	All	Basis of risk assessment and risk management provisions – source of hazards.	Haz id	Haz id	Haz id	Haz id	Haz id	Haz id	Haz id	Haz id
1.2	Permitted Wastes	All	Basis of risk assessment and risk management provisions – source of hazards.	Haz id	Haz id	Haz id	Haz id	Haz id	Haz id	Haz id	Haz id
1.3	Hours of Operation	All	Risk management –exposure factor.	Exp. Factor	Exp. factor	Exp. factor	Exp. factor	Exp. factor	Exp. factor	Exp. factor	Exp. Factor
1.4	Duration of Activities - Groundwater Protection	Any site subject to r.15 requirements.	Risk management – duration of risk and review (R.15 regulations).	Reg. 15 RA	Reg. 15 RA	Reg. 15 RA	Reg. 15	Reg. 15 RA	Reg. 15 RA	Reg. 15 RA	Reg. 15 RA

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
							RA				
1.5	Staffing and Understanding of Requirements of Licence Conditions and Working Plan	All	Basic risk management requirement.	N/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1.6	Changes in Technically Competent Persons	All	Basic risk management requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1.7	Relevant Convictions	All	Basic risk management requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1.8	Maintenance of Financial Provision	All	Basic risk management requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1.9	Amendments to Working Plan and Supporting Information	All	Basic risk management requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1.10	Notification of Change of Operators/Holders Details	All	Supervision and enforcement requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1.11	Notification of Preparatory Works	All	Supervision and enforcement requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1.12	Notification of Commencement, Cessation	All	Supervision and enforcement requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
	and Recommencment of Waste Handling Operations										
1.13	Notifications to the Agency	All	Supervision and enforcement requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2.	SITE ENGINEERING FOR POLLUTION PREVENTION AND CONTROL										
2.[111]	Engineering Surveys	D1, D3, D4, D5, D12.	Basic regulatory information requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2.[210]	Engineered Site Containment and Drainage Systems (includes effluent collection systems)	D8, D9, D10, D13, D14, D15. R1 to R13.	Risk management system – containment. Technical guidance and best practice standards in development.	SRA	DRA	DRA	SRA	SRA or DRA	DRA	DRA	SRA or DRA
2.[310]	Surface Preparation - Unengineered Sites	D1	Basic risk management requirement.	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
2.[320]	Engineered Landfill Containment System	D1 to D5, & D12.	Risk management system – containment. Technical guidance and standards available and in development.	SRA or DRA	DRA	DRA	n/a	n/a	n/a	n/a	n/a
2.[330]	Leachate Management Systems	D1 to D5, & D12.	Risk management system – containment, control, treatment/disposal. Technical guidance and standards available and in development.	SRA or DRA	DRA	DRA	n/a	n/a	n/a	n/a	n/a
2.[340]	Landfill Gas Management Systems	D1 to D5, & D12.	Risk management system – containment, control, treatment/disposal. Technical guidance and standards available and in development.	SRA or DRA	DRA	DRA	n/a	n/a	n/a	n/a	n/a
2.[350]	Surface Water Management Systems	D1 to D5, & D12.	Risk management system – containment and control. Technical guidance and standards	SRA	DRA	DRA	n/a	n/a	n/a	n/a	n/a

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
			available and in development.								
2.[360]	Installation, Maintenance and Protection of Final Capping	D1 & D5	Risk management system – containment. Technical guidance and standards available and in development.	SRA or DRA	DRA	DRA	n/a	n/a	n/a	n/a	n/a
2.[403]	Removal of Residual Wastes from Site	All sites	Basic risk management requirement.	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
2.[404]	Site Completion - Final Landform	D1 & D5.	Basic risk management requirement.	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
3.	SITE INFRASTRUCTURE										
3.1	Provision of Site Identification Board	All sites, except where justified for security reasons.	Basic regulatory requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
3.2	Site Security	All sites, except where no risk which requires site security systems.	Risk management system – prevention of human exposure to risks and compromising of other risk management systems.	SRA	SRA	SRA	SRA	SRA	SRA	SRA	SRA
4	SITE OPERATIONS										

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
4.[140]	Control of Mud and Debris	All sites, except where no risk which requires either control or remediation systems.	Risk management system – containment and control.	SRA	SRA	SRA	SRA	SRA	SRA	SRA	SRA
4.[151]	Potentially Polluting Leaks and Spillages	All sites, except where no risk which requires either control or remediation systems.	Risk management system – containment and control, and action plans.	SRA or DRA	SRA or DRA	DRA	SRA	DRA	DRA	DRA	SRA or DRA
4.[153]	Fires on Site	All sites, except where no risk which requires control systems.	Risk management system – prevention and control, and action plans.	SRA	DRA	DRA	SRA	DRA	DRA	DRA	SRA or DRA
4.[210]	Waste Acceptance and Control Systems and Procedures	All sites.	Risk management system – identification and control of wastes.	DRA	DRA	DRA	SRA	DRA	DRA	DRA	SRA or DRA
4.[220]	Waste Sampling and	All sites taking	Risk management system –								

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
	Testing	waste types requiring more than visual inspection	identification and characterisation of wastes.	SRA	DRA	DRA	SRA	SRA	DRA	DRA	SRA
4.[230]	Waste Quantity Measurement Systems	All sites.	Basic regulatory requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4.[301]	Storage of Wastes	D15, R13	Risk management system – control of wastes.	SRA	SRA or DRA	DRA	SRA	DRA	DRA	DRA	SRA or DRA
4.[410]	Waste Treatment Processes – Plant, Equipment and Procedures	D2, D8, D9, D10, D13R1 to R11	Risk management system – control and environmental performance of waste treatment processes.	n/a	n/a	n/a	SRA	DRA	DRA	DRA	SRA or DRA
4.[520]	Waste Discharge and Emplacement	D1, D2, D3, D4, D5.	Risk management system – control of landfill disposal process.	SRA	SRA	SRA	n/a	n/a	n/a	n/a	n/a
4.[521]	Use of Daily and Intermediate Cover	D1, D5.	Risk management system – control and containment of landfill disposal process.	N/a	SRA	n/a	n/a	n/a	n/a	n/a	n/a
5.	**POLLUTION CONTROL**										

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
	MONITORING & REPORTING										
5.[100]	Monitoring of Landfill Gas within the Waste Body or Engineered Containment	D1, D3, D5	Risk management system – monitoring and action plan.	SRA	SRA	DRA	n/a	n/a	n/a	n/a	n/a
5.[101]	Monitoring of Landfill Gas external to the Waste Body or Engineered Containment	D1, D3, D4, D5, D8, except where no risk.	Risk management system – monitoring and action plan.	SRA	DRA	DRA	n/a	n/a	N/a	n/a	n/a
5.[103]	Monitoring and Reporting for Gases and Aerosols other than Landfill Gas	All sites, except where no risk.	Risk management system – monitoring and action plan.	SRA	SRA or DRA	SRA or DRA	SR A	SRA or DRA	SRA or DRA	SRA or DRA	SRA
5.[200]	Leachate Monitoring and Reporting	D1, D4, D5, except where no risk.	Risk management system – monitoring and action plan.	SRA	SRA	SRA	n/a	n/a	n/a	n/a	n/a
5.[400]	Groundwater Monitoring and Reporting Systems	D1 to D5, D8 to D10 & D12, except where	Risk management system – monitoring and action plan.	SRA or	SRA or	SRA or DRA	SR A	SRA	SRA	SRA	SRA

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
		no risk. D13 to D15, R1 to R13, except where no risk or engineered site containment meets Agency default technical guidance & standards.		DRA	DRA						
5.[500]	Surface Water Monitoring and Reporting	D1 to D5, D8 to D10 & D12, except where no risk. D13 to D15, R1 to R13, except where no risk or engineered site containment	Risk management system – monitoring and action plan.	SRA	SRA	SRA	SRA	SRA	SRA	SRA	SRA

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
		meets Agency default technical guidance & standards.									
5.[600]	Monitoring of Meteorological Conditions	D1, D2, D4, to D5, D8 to D10, D13 to D15, R1 to R13, except where no risk which requires specified monitoring for risk management.	Risk management system – hazard factor which may require monitoring and action plan.	SRA	SRA	SRA	SRA	SRA	SRA	SRA	SRA
	AMENITY MANAGEMENT & MONITORING										
6.[010]	Control, Monitoring & Reporting of Dusts, Fibres and Particulates	All sites, except where no risk which	Risk management system – control, monitoring and action plan.	SRA	SRA or	SRA	SRA	SRA or	SRA or	SRA or	SRA or

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
		requires either control or sampling and monitoring systems.			DRA			DRA	DRA	DRA	DRA
6.[020]	Control of Odours	All sites, except where no risk which requires either control or monitoring systems.	Risk management system – control, monitoring and action plan.	SRA	SRA	SRA	SRA	SRA	SRA	SRA	SRA
6.[030]	Control and Monitoring of Noise	Only sites where there is an assessed risk which requires noise control and/or monitoring systems, and which are not covered by the relevant planning permission.	Risk management system – control, monitoring and action plan.	SRA	SRA	SRA	SRA	SRA	SRA	SRA	SRA

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
6.[040]	Control of Pest Infestations	All sites, except where no risk which requires control systems.	Risk management system – control of pollution vector.	SRA	SRA	SRA	SRA	SRA	SRA	SRA	SRA
6.[041]	Control of Scavenging Birds and Other Scavengers	All sites, except where no risk which requires control systems.	Risk management system – control of pollution vector.	SRA	SRA	SRA	SRA	SRA	SRA	SRA	SRA
6.[050]	Control of Litter	All sites, except where no risk which requires control or remediation systems.	Risk management system – control of pollution vector.	SRA	SRA	SRA	SRA	SRA	SRA	SRA	SRA
7.	SITE RECORDS										
7.1	Security and Availability of Records	All	Basic regulatory requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7.[200]	Recording Special Waste Deposits	Landfill	Basic regulatory requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

No.[i]	Title	USE: Facility Types[ii]	Risk Assessment[iii] (indicative guidance only) Risk Management[iv]	Landfill: inert wastes only	Landfill: non-inert	Lagoons: treatment or storage	Transfer: inert only	Transfer: non-inert	Treatment: physico-chemical	Treatment: biological	Metal Recycling
7.[300]	Records of Waste Movements	All	Basic regulatory requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7.[400]	Site Diary	All	Basic regulatory requirement.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7.[500]	Periodic Reporting of Environmental Performance		Basic regulatory requirement for review of risk management systems and performance.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Appendix 2 Illustrative Source-Pathway-Receptor Analysis

Contaminant	Hazard	Source	Pathway	Receptor	SPR Connected?	Probability	Consequence	Risk	Justification
List here the compounds or contaminants of concern	*List here the adverse effects of concern posed by the contaminants*	*List here the source of the contaminants*	*List here the means by which the contaminants reach or may reach the targets of concern*	*List here the targets of concern; the things we are protecting or are at risk*	*For each source-pathway-receptor linkage, are they currently, or potentially connected?*	*Assess the likelihood of the effects being realised; high, medium or low*	*Assess the consequences of the effect, high medium or lows*	*State the overall risk*	*Provide a justification for your judgement*
Specific examples									
Asbestos	Asbestosis /lung cancer	Builders rubble	Inhalation of windblown dust	Humans	Yes	[Depends on availability of pathway]	[Depends on potency of contaminant and sensitivity of receptor]		
Ammonical nitrogen	Derogation of groundwater quality	Leachate	Migration through permeable strata	Groundwater	Yes	As above	As above		
Methane gas	Explosion	Degrading waste	Migration through permeable strata	Crops on adjacent farmland	Yes	As above	As above		
n/a	Aircraft engine failure	Seagulls	Intercepting flight path	Aircraft	Yes	As above	As above		
Suspended solids	Derogation of water quality	Mud/debris from vehicles	Surface run-off to adjacent stream	Adjacent stream	Yes	As above	As above		

Appendix 3

RECYCLING PLANT

ENVIRONMENTAL RISK ASSESSMENT

CONTENTS

1.0 Introduction

2.0 Identification of Potential Hazards

3.0 Environmental Risk Assessment

4.0 Monitoring

1.0 INTRODUCTION

1.1 Risk assessment is the estimation and evaluation of the likelihood or frequency of occurrence of a hazard and the magnitude of the consequences of occurrence.

1.2 The management of risk is common place and forms a routine part of all our lives. Almost every decision we make arises from some sort of risk assessment. In recent times the term risk assessment has been coined to formalise and raise the status of the every day activities of receiving information, thinking and making decisions.

1.3 Environmental risk assessments associated with waste management licensing are conducted to ensure that any hazards arising from the proposals do not cause harm to human health, to the environment or serious detriment to amenity. The procedure for conducting an environmental risk assessment is as follows:

1) Identify potential hazards

2) Determine the likelihood and frequency of the hazard occurring

3) Determine the magnitude of the consequence of the hazard

4) Allocate a level of risk

5) Provide controls to manage the risks at acceptable levels

1.4 Provided the risks can be managed effectively to ensure that human health, the environment and amenity are safe guarded, then the development would be classed as sustainable, i.e. the development meets the needs of the present without compromising the ability of future generations to meet their needs.

2.0 IDENTIFICATION OF POTENTIAL HAZARDS

Table 1 shows the hazards which should be considered at the recycling plant. The source of each hazard is identified and the route or pathway which it follows to the target or potential recipient of the hazard.

Source and Hazard	Pathway	Targets
1. Waste – odour	Airborne	Site operatives Visitors / users / neighbours
2. Waste - spillages	Surface water drains Foul water drains Soak into ground	Surface water courses Leachate collection system Ground water
3. Waste – fires Plant – fires	Overland or underground via service ducts	Site operatives / site users / landfill site composting area / other landfill plant / restored areas off site
4. Waste - dust	Airborne	Site operatives in building / visitors / users / neighbours
5. Waste - litter	Airborne	Landfill site / neighbouring land / leachate lagoon / neighbouring water courses e.g. Foss Dike
6. Pests	Airborne or overland	Neighbours / neighbouring crops / site operatives / visitors
7. Waste - explosion	Airborne	Site operatives in building / site visitors
8. Problem wastes	Direct contact by personnel or may result in 1-7 above	Site operatives
9. Plant - noise	Direct to	Site operatives / site users / visitors / neighbours
10. Building – visual impact	Direct to	Site operatives / site users / visitors / neighbours

Table 1: Source, pathway and target of hazards

3.0 ASSESSMENT OF RISK

3.1 Table 2 shows the allocation of scores associated with the environmental risks identified at the site. Risks relating to the waste treatment process and to the storage of materials after processing are considered separately.

An indication of the likelihood or frequency of occurrence of each hazard is given in column 1.1 and 2.1. A score of **N** = negligible, **L** = low, **M** = medium, **H** = high is allocated. Columns 1.2 and 2.2 show the magnitude or seriousness of the consequences of the hazard occurring and is similarly assigned a score. The two scores are combined to give a measure of risk as shown at columns 1.3 and 2.3. The risks identified require control and as a result of the controls, the risk is reduced to the levels indicated in columns 1.4 and 2.4.

	1.0 During Processing				**2.0 After Processing**			
	1.1 Probability of occurrence	1.2 Magnitude of consequence	1.3 Level of risk before controls	1.4 Level of risk with controls in place	2.1 Probability of occurrence	2.2 Magnitude of consequence	2.3 Level of risk before controls	2.4 Level of risk with controls in place
Odour	L	M	L	N	L	L	L	N
Spillages	M	M	M	N	N	M	L	N
Fires	M	H	M	L	N	H	L	N
Dust	H	H	H	L	H	L	M	L
Litter	M	L	L	N	L	L	L	N
Pests	M	M	M	N	L	M	L	N
Explosions	L	H	M	L	N	M	L	N
Problem Wastes ①	H	H	H	L	L	L	L	N
Noise	H	H	H	L	N	L	L	L
Visual Impact	M	L	L	L	M	L	L	L

Table 2: Assessment of environmental risks before and after applying control measures

Notes ① Problem wastes may be almost anything, however, the most likely wastes in mixed loads which could cause problems at the site are:

a) small quantities of bonded asbestos
b) broken glass and other sharp objects
c) small quantities of liquid waste in containers
d) unidentified wastes

The procedure for dealing with the above circumstances are given in the Working Plan.

The nature of the potential hazards and the proposals for managing the risks identified in Table 2 are described below:

3.2 Odour

Odour from wastes delivered to the recycling plant may cause a nuisance to operatives if not controlled. The waste acceptance and rejection procedure employed at the landfill site has been adapted to suit the recycling plant. The procedure would exclude odorous loads from the building and will enable minor odorous constituents of loads to be identified and removed from the building for more suitable disposal (see Working Plan Section 9 and Appendix 2, Environmental Procedures). In addition, forced ventilation would be provided at the work stations on the picking lines and axial fans at each gable and would provide general ventilation of the building.

3.3 Spillages

Wastes delivered to the recycling plant would be deposited in the reception area before initial sorting and transfer to the picking line. Spillages of liquids from the waste or machine maintenance would be managed by the use of absorbents provided at the plant. The used absorbents would be bagged and disposed of to the landfill site. Any excess run off would flow over the cambered concrete floor to the perimeter foul water collection system. The foul water drains would be connected to the landfill leachate collection system, Phase 2 (see Working Plan Section 6). Details of the design of the concrete floor and drainage system are given in the Working Plan, Section 5.0. A procedure for the control of spillages is included in the Working Plan, Environmental Procedures, Appendix 2 and in the Harewood Whin Emergency Plan, Appendix 7.

3.4 Fires

Hot loads are specifically excluded from the site, however, there is a risk of fires resulting from waste delivery and processing. The risk is controlled by ensuring that effective procedures are employed by staff trained to manage emergency situations using suitable equipment and resources (see Working Plan, Section 12).

The nature of loads would be verified prior to acceptance and checks upon deposits in the reception area (see Working Plan – paragraphs 9.1 and 9.2 and Appendix 2, Environmental Procedures). Fire extinguishers and blankets would be provided for use in the control of a variety of situations and staff would be trained in fire control. Alarms would be provided in the building. Details of the equipment provided to protect against fires are given in the Working Plan – paragraph 10.6 and Appendix 2, Environmental Procedures. Appendix 7, Harewood Whin Emergency Plan explains in more detail the actions which would be taken in the event of a fire.

3.5 Dust

Dust may arise at different stages during the waste management process, from waste deposits and sorting, from the site access roads during waste delivery and deposition, from waste processing, from processed materials and from stockpiles.

Dust arising from vehicle movements would be controlled by use of the landfill wheelwash and road sweeper. Water would be applied to the road to suppress dust if necessary (see Working Plan, Paragraph 10.2 and Appendix 2, Environmental Procedures).

Within the building the sorting would give rise to dust. The nature of the controls would be determined by a Health and Safety consultant who would assess the requirements during the commissioning of the plant. All recommendations to comply with Health and Safety legislation and best practice would be introduced (see Working Plan, paragraphs 10.8, 10.9 and 10.10 and Appendix 2, Environmental Procedures).

Stockpiles, particularly of fines, may be a source of dust. Dust would be suppressed by applying water as necessary (see Working Plan paragraph 9.3).

3.6 Litter

The waste sorting process would be conducted inside the building and contraries stored in a skip inside the building, therefore, no litter problem external to the building is anticipated. General tidiness inside the building would be maintained by daily sweeping as part of good housekeeping. See Working Plan, paragraphs 10.1, 10.2 and 10.3 and Appendix 2, Environmental Procedures.

3.7 Pests

Potential pests are flies, rats and mice. Site operations and procedures are designed to prevent infestation by such pests by ensuring general good housekeeping and programmes of control by approved specialist contractors (see Working Plan, paragraphs 10.1, 10.2, 10.3 and 10.4 and Appendix 2, Environmental Procedures).

3.8 Explosions

The waste acceptance procedure is designed to ensure that unlicensed wastes, including explosive substances, are excluded from the site or isolated and managed appropriately (see Working Plan, paragraphs 9.1, 9.2, 9.8 and 10.13 and Appendix 2, Environmental Procedures).

If in the unlikely event bombs, grenades or the like are received at the site, then the Harewood Whin Emergency Plan, Working Plan, Appendix 7 would be activated.

3.9 Problem Wastes

There is a risk of hazards from problem wastes to human health. Waste types accepted would be restricted to industrial, commercial and inert wastes to minimise the risks. The waste acceptance / rejection procedure would ensure that loads are checked for compliance with licensed waste types. Specific procedures would be followed to ensure that unacceptable wastes are removed from the waste stream prior to delivery of the rotary trommel (see Working Plan, paragraphs 9.1, 9.2, 9.8, 10.11, 10.12 and 10.13 and Appendix 2, Environmental Procedures).

Small quantities of bonded asbestos would be removed for onward disposal to the adjacent landfill site. Broken glass and sharp objects would be removed by the processing plant and transferred to the contraries container or into the metals bin, thereby avoiding contact as far as possible with personnel.

Small quantities of liquid wastes in containers where possible would be removed before transfer of the waste to the picking line to avoid unnecessary spillages. If the landfill site is licensed to accept the waste, then it would be transferred directly to the contraries container for landfill disposal. If the site is not licensed to accept the waste, then it will be isolated and a suitable alternative or treatment would be arranged.

3.10 Noise

Noise from the recycling operations may originate from vehicles delivering and despatching wastes, waste unloading and processed materials loading, transfer of waste inside the building and the waste processing plant, conveyors, trommels, crushers, etc.

The impact of vehicles would be negligible. Vehicle movements to and from the site are expected to increase very slightly owing to the removal of processed materials. Noise from operations within the building would be baffled by the structure, therefore, external noise nuisance is expected to be minimal. Within the building, noise may be a hazard to site operatives, users and visitors although the level of noise is uncertain. We intend to employ a Health and Safety advisor to conduct noise surveys inside the building once the plant is in place. The consultant would assess whether attenuation or other controls are required and the nature of any ear protection which may be needed by the site operatives, users and visitors. We would follow advice given by our specialist advisors and monitor the effectiveness of any protective measures employed. Refer to the Working Plan, paragraphs 5.2, 10.7 and 14.2 and Appendix 2, Environmental Procedures).

3.11 Visual Impact

The building is located in the centre of the landfill site and is of restricted height to minimise the impact of its appearance external to the landfill. The visual impact aspects have already satisfied planning requirements. Refer to Planning Permission at Appendix 1 of the Licence Application.

4.0 MONITORING

4.1 In order to ensure that the risk identified above are managed effectively, monitoring will be conducted:

- Quality monitoring
- Environmental monitoring
- Health and Safety monitoring
- Environmental Auditing Procedure Review

The results of monitoring would also be used to review and improve physical controls and procedures where necessary.

4.2 Quality Monitoring

Plant performance would be monitored by assessing plant breakdowns, maintenance records and the quality of the recycled product. Quality monitoring may assist in identifying potential environmental risks (see Working Plan, Section 14).

4.3 Environmental Monitoring

Landfill gas would be monitored to check for any migration from the waste towards the building. Probes and underground services would be checked. A fixed gas monitoring alarm system may be installed if monitoring indicates that it is necessary (see Working Plan, paragraph 10.14). Regular checks would be conducted by the Site Manager to ensure that the plant is kept tidy and runs efficiently. Checks on plant and equipment would be conducted in accordance with manufacturers instructions to ensure efficient and safe operation of plant (see Working Plan, Appendix 3, Maintenance Schedules). Catchpits serving the drains from the building would be checked monthly. Drains would be cleaned and any maintenance work conducted as necessary and thereafter annual jetting or rodding (see Working Plan, Appendix 2).

4.4 Health and Safety Monitoring

Noise and dust are potentially harmful to operatives working in the plant over long periods. A risk assessment would be conducted by our health and safety consultant to identify hazards at the plant and recommend how they should be managed. The advice given by our specialists would be followed (see Working Plan, paragraphs 10.7, 10.8, 10.9, 10.10 and 14.2 and Appendix 2, Environmental Procedures).

4.5 Environmental Auditing Procedure Review

Site procedures would be audited regularly in accordance with ISO 14001 to check for compliance to review and improve practices. The results of any incidents would be reported. Any lessons to be learned would be applied to improve procedures and minimise the occurrence and effects of incidents in the future.

Appendix 4

RISK ASSESSMENT IN SUPPORT OF WASTE MANAGEMENT LICENCE APPLICATION –MATERIALS RECYCLING FACILITY

Introduction – Method of risk estimation

This risk estimation has been produced for the waste management activities to be undertaken at the site and subject to an application for a Waste Management Licence.

Activities to be undertaken at the site will result either directly or indirectly in hazards, as identified in Table 1. Each hazard may reach a target or targets (receptors) via a number of different pathways. For each separate hazard and receptor identified, the risk will be identified. All risks are highlighted through a scoring system, with those of most risk to the environment or human health showing a higher score. The risk comprises two elements, the probability and the consequences, which are semi-quantitatively estimated and combined to produce a risk factor. All risks are assessed in Table 2. For each estimated risk, appropriate protective measures, controls and action plans may be proposed and documented in Table 2 along with an assessment of their mitigating effects which will then be taken into account in a mitigated risk factor which will also be detailed in Table 2.

The scoring system to be used is used as follows:-

Probability of hazard occurring:

0	Never
1	Annually or less frequently
2	Monthly or less frequently
3	Weekly or less frequently
4	Daily or less frequently
5	More frequently than daily

Consequences of hazard to the environment or human health:

0	Harmless
5	Almost harmless
10	Some harm
15	Harmful
20	Very harmful
25	Extremely harmful

Mitigation to risk:

1	Ineffective or non existent
2	Partly effective
3	Effective
4	Very effective
5	Entirely effective

TABLE 1: WASTE MANAGEMENT ACTIVITY RISK ASSESSMENT HAZARD IDENTIFICATION

Assessment of hazards arising from combination of site operations and waste types. (As per licence conditions LC1.110 and LC1.120)

Activity/Waste Type Receptor	**Hazard**	**See Table 2; Section as indicated below**
Receipt and despatch of all waste materials		
Persons	Toxic effects of combustion products from fire of plastics, paper, cardboard, wood, etc. in waste delivery vehicle.	4.153
	Unacceptable noise levels from waste delivery/materials despatch.	6.030
	Windblown litter.	6.050
Atmosphere	Contribution to global warming due to fire of combustible wastes in delivery vehicle.	4.153
Land	Spread of windblown litter (visual effect on amenity).	6.050
Acceptance of wastes		
Leachate discharge/surface water discharge	Contamination of discharges above compliance limits due to unacceptable waste types outside site design limits.	4.210
Discharge/loading		
Persons	Inhalation of nuisance dusts.	6.010
	Nuisance odours during deposit.	6.020
	Unacceptable noise levels.	6.030
	Attraction of rats/flies/birds (pests and scavengers) to site due to discharge and loading of biodegradable wastes.	6.040 and 6.041
	Windblown litter (hygiene issues).	6.050
Land	Windblown litter (amenity issues).	6.050
Storage on site		
Persons	Toxic effects of combustion products from fire of wastes (plastics, paper, cardboard, wood, etc.).	4.153
	Nuisance odours from stores wastes.	6.020
	Attraction of rates/flies/birds (pests and scavengers) to site due to storage of biodegradable wastes.	6.040 and 6.041
	Windblown litter (hygiene issues).	6.050
Atmosphere	Contribution to global warming due to fire of combustible wastes.	4.153
Land	Windblown litter (amenity issues).	6.050
Ground water/Surface water/ Soil	Contaminated run off from wastes.	2.210

Activity/Waste Type Receptor	**Hazard**	**See Table 2; Section as indicated below**
Storage on site (continued)		
	Contamination due to accidental spillage of fuel oils via filling operations or rupture of storage tank.	4.151
Processing of wastes		
Persons	Inhalation of nuisance dusts.	6.010
	Nuisance of odours during sorting.	6.020
	Unacceptable noise levels.	6.030
	Attraction of rats/flies/birds (pests and scavengers) to site due to processing of biodegradable wastes.	6.040 and 6.041
	Spread of windblown litter (hygiene issues).	6.050
Land	Spread of windblown litter (amenity issues).	6.050
General		
Persons/animals	Contact with waste – mechanical hazard.	3.500
	Contact with waste – disease/infection.	3.500
Land	Effect upon surface area (visual amenity) due to unauthorised release of wastes (paper, plastics, etc.).	3.500
Ground water/Surface water	Contamination due to unauthorised release of wastes.	3.500

TABLE 2: WASTE MANAGEMENT ACTIVITY RISK ASSESSMENT

Stewponey Materials Recycling Facility

Hazard	Pathway and Receptor	Probability of Hazard	Consequence of Hazard	Risk Factor	Protective Measures / Controls (Mitigation)	Mitigated Risk Factor
Section 2.210						
Contamination of surface waters by runoff from waste storage areas.					*(As below and see also sections 4.13 and 5.6 of the operational working plan).*	
	Contaminated runoff from rapidly biodegradable wastes, such as paper, cardboard, entering surface water systems or ground water via surface drainage, site ditches.	4	10	[4x10] 40	Storage in specified areas on impermeable pavement, with sealed drainage system. Limit on maximum storage times to reduce potential for biodegradation. Storage of unsorted wastes within enclosed building or of segregated wastes in enclosed containers.	[40/5] 8
	Contaminated runoff from more slowly biodegradable wastes, such as wood, green waste.	2	10	[2x10] 20	Storage in specified areas on impermeable pavement, with sealed drainage system.	[20/4] 5
	Contaminated runoff from non-biodegradable wastes, such as soils, concrete, hardcore.	1	10	[1x10] 10	Storage in specified areas on hardstanding. Wastes non-biodegradable or inert.	[10/2] 5

Hazard	Pathway and Receptor	Probability of Hazard	Consequence of Hazard	Risk Factor	Protective Measures / Controls (Mitigation)	Mitigated Risk Factor
Section 3.500						
Contact with waste materials.					*(As below and see also section 4.6 of the operational working plan).*	
	Injury to humans or animals through accidental contact with stored materials.	3	10	[3x10] 30	Provision of site security fence, utilising existing fence and gates and storage within secure building.	[30/4] 7.5
	Contraction of disease/ infection by with waste materials. Residential area in proximity.	2	15	[2x15] 30	Provision of site security fence, utilising existing fence and gates and storage within secure building.	[30/4] 7.5
	Release of wastes to areas adjoining the site through interference by unauthorised persons. Impact upon visual amenity.	3	5	[3x5] 15	Provision of site security fence, utilising existing fence and gates and storage within secure building.	[15/4] 3.75
Section 4.140						
Road traffic hazard					*(As below and see also section 4.09 of the operational working plan).*	
	Spreading of mud and other debris onto the public highway, with impacts upon visual amenity and road traffic hazard.	4	10	[4x10] 40	Use of wheel cleaning facility, already existing on adjoining landfill area. (Provision of hardstanding areas for waste storage will also reduce likelihood of occurrence).	[40/4] 10

Hazard	Pathway and Receptor	Probability of Hazard	Consequence of Hazard	Risk Factor	Protective Measures / Controls (Mitigation)	Mitigated Risk Factor
Section 4.151						
Contamination of surface water and ground water by fuel oil.					*(As below and see also section 4.11 of the operational working plan).*	
	Accidental spillage during filling operations of site plant or fuel oil storage tanks, with contamination via ground surface of surface water or ground water.	4	10	[4x10] 40	Use of appropriate filling procedures, and storage of filling hoses, tanks, inlets, etc. within bunded area.	[40/3] 13.34
	Accidental spillage through rupture of fuel oil storage tanks, with contamination via ground surface of surface water or ground water.	1	20	[1x20] 20	Provision of bunded fuel tank, with minimum bunded capacity of 110% of the total storage capacity of the tank.	[20/5] 4
Section 4.153						
Thermal and chemical threats posed by combustion of wastes.					*(As below and see also section 7.5 of the operational working plan).*	
	Contribution to global warming through combustion gases (carbon dioxide).	1	5	[1x5] 5	Procedures for checks on incoming materials, segregation if required and implementation of fire action plan in event of fire.	[5/2] 2.5
	Toxic effects to persons and environment from combustion products of certain wastes (plastics, etc.).	1	15	[1x15] 15	Procedures for checks on incoming materials, segregation if required and implementation of fire action plan in event of fire.	[15/2] 7.5

Hazard	Pathway and Receptor	Probability of Hazard	Consequence of Hazard	Risk Factor	Protective Measures / Controls (Mitigation)	Mitigated Risk Factor
Section 4.210						
Contamination of surface water, or breach of leachate/ surface water discharge consent limits					*(As below and see also sections 5.3 and 5.4 of the operational working plan).*	
	Acceptance of wastes outside site design limits (unacceptable wastes), resulting in storage on inappropriate areas, contamination of surface water resources or leachate quality in excess of consent limits.	2	15	[2x15] 30	Implementation of waste acceptance and control systems, including assessment of wastes prior to delivery, on site inspection and waste handling protocols.	[30/5] 6
Section 6.010						
Inhalation of dust					*(As below and see also section 7.4 of the operational working plan).*	
	Generation of dusts by waste discharge, handling and wind. Inhalation by site operatives and humans at site boundary of nuisance dusts only due to restricted range of wastes.	5	10	[5x10] 50	Undertake operations involving commercial, industrial and unsorted wastes within enclosed building, with ventilation. Implementation of dust suppression measures including water sprays/ sprinkler systems. Use of concrete hardstanding for external materials storage.	[50/4] 12.5

Hazard	Pathway and Receptor	Probability of Hazard	Consequence of Hazard	Risk Factor	Protective Measures / Controls (Mitigation)	Mitigated Risk Factor
Section 6.020						
Nuisance odours					*(As below and see also section 7.3 of the operational working plan).*	
	Windborne odours from biodegradable wastes, detectable at site boundary by general public. Greater perception of nuisance than actual harm itself.	5	5	[5x5] 25	All operations involving storage of biodegradable wastes (except sorted wood) to be undertaken inside building. Limit on maximum storage time for biodegradable wastes to prevent advanced stage of biodegradation.	[25/5] 5
Section 6.030						
Unacceptable noise levels					*(As below and see also section 7.7 of the operational working plan).*	
	Noise generation by use of recycling equipment and plant movement. Impacts upon residential properties and persons in vicinity of site boundary. Greater perception of nuisance than actual harm itself.	5	5	[5x5] 25	Wastes sorting and primary activities to be undertaken inside enclosed building, reducing impact at site boundary. Secondary activities (crushing/wood chipping) undertaken outside will only be periodic when sufficient materials are available for activities. Screening around recycling area will attenuate noise. Operations will be restricted to Planning Permission hours, limiting duration of impact.	[25/5] 5

Hazard	Pathway and Receptor	Probability of Hazard	Consequence of Hazard	Risk Factor	Protective Measures / Controls (Mitigation)	Mitigated Risk Factor
Section 6.040						
Attraction of pests to site, spread of disease.					*(As below and see also section 7.2 of the operational working plan).*	
	Attraction of pests to site due to storage of biodegradable wastes. Small quantities of contamination by food may exist. Spread of disease by rats and flies to persons outside site. Also nuisance to residents near site.	3	10	[3x10] 30	Site not accepting domestic wastes or waste types likely to include large quantities of food wastes. Storage of relevant wastes types within building will deter pests. Use of specialist pest control contractor.	[30/3] 10
Section 6.041						
Bird nuisance					*(As below and see also section 7.2 of the operational working plan).*	
	Attraction of birds to site due to storage of biodegradable wastes. Small quantities of contamination by food may exist. Nuisance to residents near to site and possible spread of litter and disease. Greater perception of nuisance than actual harm itself.	5	5	[5x5] 25	Site not accepting domestic wastes or waste types likely to include large quantities of food wastes. Storage of relevant waste types within building will effectively exclude birds from contact with waste and deter presence.	[25/5] 5

Hazard	Pathway and Receptor	Probability of Hazard	Consequence of Hazard	Risk Factor	Protective Measures / Controls (Mitigation)	Mitigated Risk Factor
Section 6.050						
Litter nuisance					*(As below and see also section 7.1 of the operational working plan).*	
	Spread of windblown litter (paper, cardboard, plastics, etc.) to adjoining parts of the site and beyond site boundary. Visual amenity impact. Hygiene issues. Greater perception of nuisance than actual harm itself.	4	5	[4x5] 20	Storage of relevant waste types within an enclosed building or of appropriate sorted materials in enclosed containers on site. Site inspections for presence of litter and clearance of any found. Sheeting and netting of delivery vehicles.	[20/5] 4

Appendix 5:

Record of Scoping/Risk Assessment

Site.....

Hazard Identification and risk assessment form

	Initial/date	2nd date	3rd date	Licence
Water **Streams, etc.** **Ponds** **Groundwater (wells, aquifers)**				
Landfill gas **Biodegradable wastes?** **Nearest properties?**				
Gases, vapours, or aerosols				
Odours				
Dust, fibres, particulates				
Noise				
Mud and debris from vehicles				
Litter				

The above is designed to act as a prompt only and is not intended to be comprehensive, please extend as necessary depending on the activity, types of waste, or site specific circumstances being considered. In the column labelled hazard these items may also be sources, pathways, or receptors depending on the specific circumstances

Notes on the Index Headings and Abbreviations:

[i] **No.** = reference number of template and working plan specification. Licence conditions and working plans should replace reference numbers within square brackets with the appropriate number to give a numerical sequence within the conditions or working plan sections, e.g. 2.[210] with either 2.1 or 2.2, as appropriate.

[ii] **USE: Facility Types** = Guidance on the types of facilities and waste management operations for which the relevant licence condition templates and working plan specifications should be used, based on the classifications of 'Waste Disposal' and 'Waste Recovery' operations listed in Parts III and IV of Schedule 4 of the Waste Management Licensing Regulations 1994. See the Library Entries and Working Plan Specifications for more detailed guidance.

[iii] **USE: Risk Assessment** = Indicative listing of risk assessments required to support working plan and proposed risk management systems, under 8 broad categories of types of site, based on the likely types of risks and the risk management systems that are likely to be needed. The listing is indicative only – it is assumed that each detailed risk assessments (DRA) will be based upon a simple risk assessment (SRA), and that the simple risk assessment may show that a detailed risk assessment is not necessary, or, in other cases, that a detailed risk assessment is necessary. The entries in these columns are based on the following levels of risk assessment, as described in Guidance Note 25: 'n/a' = not applicable; 'n/r' = not required; 'Haz. Id.' = Hazard identification – basis of source and of simple/detailed risk assessment; 'Exp. Factor' = Exposure factor for risks (which may need to be controlled); 'SRA' = simple risk assessment; 'DRA' = Detailed risk assessment. See Guidance Note 25, the Library Entries and Working Plan Specifications for more detailed guidance.

[iv] **USE: Risk Management** = Summary of what condition template specifies as a risk management requirement, and what must be covered by the working plan and supporting risk assessment (where required under 'Risk Assessment'). See the Library Entries and Working Plan Specifications, and Guidance Note 25 for more detailed guidance.