Environmental RTDI Programme 2000–2006

Methodology for Assessment of Hazardous Waste Disposal Sites (2000-MS-12-M1)

Synthesis Report

Prepared for the Environmental Protection Agency

by

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DISCLAIMER

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1 Project Specification

1.1 Introduction

The Environmental Protection Agency (the Agency) published the National Hazardous Waste Management Plan (the Plan) in July 2001 in accordance with Section 26 of the Waste Management Act, 1996 (the Act). The Act requires the Agency to provide *inter alia* for the identification and assessment of sites at which the disposal of hazardous waste took place. The Plan presented a Methodology to identify and assess such sites.

It is implicit in the Methodology, as presented in the Hazardous Waste Plan, that Local Authorities will, as part of a Waste Management Plan for their administrative areas, have implemented Section 22 (h) of the Act. Implementation of this section of the Act involves identifying and undertaking risk assessments of sites where waste disposal or recovery activities have been carried on and implementing the necessary measures to prevent or limit any associated environmental pollution.

The Methodology comprises seven stages, starting with desktop studies to identify potential disposal sites based on contaminative uses (Stage 1) and regulatory records (Stages 2 and 3). This leads to the establishment of a register of all known or suspected hazardous waste disposal sites (Stage 4). Stages 5, 6 and 7 involve preliminary (Stage 5), intermediate (Stage 6) and detailed (Stage 7) risk assessments of the sites on the register.

The Agency appointed O'Callaghan Moran & Associates (OCM) under the Environmental RTDI Programme (2000–2006) to test and develop the proposed Methodology. The Environmental RTDI Operational Programme is funded by the National Development Plan.

1.2 Objectives

The Project objectives set by the Agency were to:

1. Develop the Methodology for the identification of historical hazardous waste disposal sites and other contaminated sites.

2. Demonstrate the feasibility and applicability of the Methodology to selected sites, in partnership with at least one local authority.

3. Demonstrate the use of risk assessment methods in relation to suspect sites and develop risk assessment methods for use at prioritised sites.

4. Identify any problems or shortcomings of the proposed Methodology.

5. Identify improvements to the proposed Methodology.

6. Establish the costs likely to be incurred in identifying and prioritising sites.

1.3 Assessment of the Methodology

County Laois was proposed as a suitable study area. The industrial/commercial profile of the county and the historic waste management practices were considered as typical of the majority of Irish counties. The county contains examples of almost all of the contaminative uses specified in Stage 1 of the Methodology as potential sites where hazardous waste could have been generated and possibly been disposed of.

The background information databases for the county maintained by Laois County Council (the Council) and other agencies, including the Geological Survey of Ireland (GSI), Department of the Marine and Natural Resources, Ordnance Survey of Ireland (OSI) and the Agency, would also be typical of the majority of other counties.

1.3.1 Stage 1

Stage 1 was a desktop exercise to identify potential hazardous waste disposal sites based on contaminative use specified in the Methodology (Table 1.1). Stage 1 involved the compilation and review of the primary information sources recommended in the Methodology, which included current and old local and national trade directories.

The range of potential hazardous waste generators identified in the Methodology is not comprehensive. The European Waste Catalogue/Hazardous Waste List (EWC/HWL) was used in conjunction with the trade directories to identify potential hazardous waste producers.

Table 1.1. Comparative contaminative uses specified in Stage 1.

Ireland Circular letter ENV 11/88, 1988	UK Contaminated Land Register, 1991	USA EPA Lists, 1998
1. Disused gasworks or other coking plants √	1. Brickworks √	1. Analytical & clinical laboratories √
2. Railway yards and lands √	2. Gasworks √	2. Chemical manufacturing & formulation industries √
3. Petroleum storage and distribution areas, including retail outlets √	3. Chemical works & chemical manufacturing industries √	3. Educational institutions √
4. Mines and metal processing areas √	4. Dry-cleaning premises √	4. Furniture manufacturing & re-finishing operations √
5. Chemical works √	5. Fish farms	5. Laundries & dry-cleaners √
6. Asbestos operations √	6. Garages √	6. Photography & printing √
7. Tannery sites √	7. Glass manufacturing	7. Metals & metal-product industries √
8. Paper-printing works √	8. Mining & extraction industries √	8. Paper & paper-product industries √
9. Areas where wood preservatives were produced and/or used √	9. Industries making or using wood preservatives √	9. Textile manufacturing √
	10. Metal surface treatment & metal product manufacturing √	10. Pesticide application & end-use √
	11. Munitions production & distribution sites	11. Vehicle & equipment maintenance √
	12. Paper & printing works √	
	13. Railway land (especially depots) √	
	14. Scrapyards √	
	15. Tanneries √	

The trade directories used included current and historic, local and national (e.g. the Red Book, the Golden Pages and the Kompass Directory). The current and old local directories and the Golden Pages were of limited value as the information provided usually was the company name and address. The most useful was the Kompass Directory which provided a description of the company activities. However, even this is limited to current businesses and does not contain information on historic activities.

Stage 1, as defined in the Methodology, would not identify any sites where it was known that hazardous waste had been disposed of. This is not unexpected given that the stage focuses on identifying potential hazardous waste producers, rather than looking for evidence of waste disposal, e.g. landfill records. In the course of Stage 1, the Methodology was amended to review the Council's records of current and historic landfills, as these are obvious potential disposal outlets for hazardous waste in the county. The review identified nine (9) such sites.

At the end of Stage I one hundred and twenty-one (121) sites in the county were identified as potential hazardous waste producers and possible disposal locations (Table 1.2).

1.3.2 Stage 2

Stage 2 involves the collection and evaluation of the following data from listed primary sources of information for the sites identified in Stage 1:

- Start-up year of activity
- Hazardous waste type(s) generated
- Hazardous waste quantities generated
- Historical hazardous waste disposal route, i.e. on-site or off-site disposal.

Table 1.2. Number of potential sites.

Characterised sites	Number of possible sites
Electrical works	1
Refrigerants	1
Textiles	3
Plastics/rubber/glass	3
Paper-printing works	3
Railway yards and lands	4
Paunch products	4
Areas where wood preservatives were produced and/or used	5
Chemicals	9
Waste disposal sites	9
Mines and metal processing areas	20
Scrap yards & fragmentation plants	25
Petroleum and oil storage sites and distribution areas, including retail outlets	34

The primary sources of information identified in the Methodology are relevant to identifying potentially contaminated land, but not necessarily historical hazardous waste disposal sites. Several additional sources, not referenced in the Methodology, were found to be of actual or potential value during Stage 2, including:

- The Special Waste Plan prepared by Laois County Council in 1982, amended in 1991
- Interviews with senior local authority staff and circulation of questionnaires to current and former Area Overseers
- Review of the Section 55 Notices issued under the Waste Management Act
- Records of incidents investigated under the Water Pollution Act 1977–1990. While this did not yield information in the present study, its inclusion as a primary information source is recommended.

Records maintained under the Toxic & Dangerous Waste Regulations, including consignment notes, the Special Waste Plan, and information from the questionnaire issued to the overseers were the most effective. The Toxic and Dangerous Waste Regulation records confirmed the disposal of hazardous waste at three (3) landfill sites and the storage of hazardous waste at one (1) site. The questionnaire survey revealed fourteen (14) additional small-scale landfills that had not been identified in Stage 1. The review of the Section 55 Notices identified six sites at which waste was disposed of illegally.

At the end of Stage 2 there were one hundred and forty-one (141) locations identified as potential hazardous waste disposal sites. The additional sites included the fourteen (14) former Council landfills sites and six (6) illegal waste disposal sites.

1.3.3 Stage 3

Stage 3 is an evaluation of the information collected in Stages 1 and 2 to refine the number of sites to those *most likely* to have been used for hazardous waste disposal. The majority of the recommended information sources on which the evaluation should be based had already been reviewed in Stage 2. A large number of sites had been identified solely on the basis of contaminative use. While these activities probably generated hazardous waste there was no documented or anecdotal evidence that hazardous waste had been disposed of at these locations.

The majority of the sites were located in urban areas and reviews of the available historic maps did not identify any feature on the sites, e.g. a quarry, that could have been infilled with waste. Many of the historic sites – gasworks, steel works and printing works – had been re-developed and searches of the relevant planning files did not find any record that evidence of historic hazardous waste disposal had been found during the development.

Eighty-nine (89) sites were removed from the list and from further consideration on the grounds that they were *least likely* to have been used for hazardous waste disposal. These included those sites where the available records (e.g. consignment notes) showed that hazardous wastes had been removed off-site for disposal or where there was no evidence that any on-site disposal had occurred. The urban location and areal extent of many of the suspect activities minimised the potential for on-site disposal. The availability of low-cost/no-cost disposal outlets at nearby local landfills also probably militated against on-site disposal.

Some of the sites eliminated included known generators of hazardous waste where there is documentary evidence that such wastes are sent off-site for disposal. These records only extend back to the mid-1980s and there is no available information on what happened before this time. However, all of those generators that are still operational in the county are subject to the IPC licensing regime, including comprehensive environmental monitoring programmes. A review of files maintained by the Agency did not identify any evidence of historic waste disposal at the IPC-licensed sites.

Operational and closed landfill sites were retained on the list. While there was no information indicating the widespread use of landfills for the disposal of significant quantities of hazardous waste, there were known producers of hazardous waste relatively close to these sites who potentially have used them. Furthermore, anecdotal information provided by Council staff suggested that some hazardous waste may have been disposed of at some of the sites.

The scrapyards and car dismantlers were retained as they are known producers of hazardous waste (waste oils) and, while there was little or no information on historic disposal arrangements, there was the possibility that waste oils had been disposed of on-site.

The Stage 3 process is dependent on the availability and quality of records to establish whether or not hazardous waste disposal occurred at a suspect site. The study found that such records are limited, particularly prior to the late 1980s. The refinement process is largely subjective and based on sites that are least likely to have been used for hazardous waste disposal.

If the information identified in Section 22 (7) (h) of the Act were available it would be assessed in Stage 3 of the Methodology. The list of sites developed at Stage 4 would then be based on desk-study (Stages 1 and 2) and possibly site investigation data.

The experience of applying the Methodology in this project suggests that while most local authorities will have identified sites at which waste disposal or recovery activities occurred, it is unlikely that risk assessments of all such sites will have been undertaken. An investigation may have been made where an environmental impact has been identified, but otherwise little or no investigation of sites will have taken place.

It is also likely that there are more former waste disposal sites than those already identified in Waste Management Plans. The disparity is due to the lack of documentary evidence of sites which may have closed 20–30 years ago. Such sites are only likely to be identified based on interviews with former local authority employees.

1.3.4 Stage 4

Stage 4 involves the preparation of a register of sites, identified during Stages 1–3 and known to have, or suspected of having, been used for the disposal of hazardous waste. The majority of the sites on the register are included on the basis of suspicion, rather than proof, of hazardous waste disposal.

The Plan states that "*It must be noted that inclusion of a site on a 'Section 26 Register' would not necessarily imply that the land was contaminated, polluted or otherwise dangerous. Rather, it is an approach that is consistent with the precautionary principle which states that where significant evidence of environmental risk exists, appropriate precautionary action should be taken even in the absence of conclusive scientific proof of causes*".

With the exception of three locations, all of the sites were included on the basis that the type of activity – e.g landfill, car dismantling – may have resulted in the disposal of hazardous waste rather than any site-specific evidence. The caveat in the Plan that the inclusion of a

site on the Register "*would not necessarily imply that the land is contaminated, polluted or otherwise dangerous*" is certainly justified.

1.3.5 Stage 5

Stage 5 is a desk-study mechanism for ranking the urgency with which a site should be assessed. The ranking system as defined in the Methodology is presented in Table 1.3. All of the information on the sites upon which the ranking should be based had already been evaluated in the previous tasks and there were no new sources to assist in the ranking.

The wording of the ranking system is slightly ambiguous. For example, Category C-1: Sites which are *known* to have been used for historical waste disposal but which are unlikely to contain **significant** deposits of hazardous waste. This could be taken to mean whether an impact was observed in a receiving environment. Significant could also be interpreted as referring to the nature and volume of hazardous waste present.

With the exception of three sites there was no documented or anecdotal evidence record that hazardous waste had been disposed of, nor was there any evidence, circumstantial or otherwise, of any environmental pollution at any of the sites. The latter was due to the fact that the sites had not yet been inspected.

In order to rank the sites in accordance with the Methodology, and in the absence of direct evidence of hazardous waste disposal, it was assumed that a **source** was present at all of the sites, i.e. that hazardous waste disposal had occurred. Whether the volume of hazardous waste disposed of was significant or not depended on whether there was a **pathway** for, say, leachate migration from the source to either an on-site or off-site **receptor(s)**. Potential **receptors** included adjacent land users, surface watercourses and groundwater.

The following preliminary rankings were assigned to the sites:

Category A-1	2	(Landfill)
Category A-2	0	
Category B-1	0	
Category B-2	48	(Landfills and illegal disposal sites, vehicle dismantlers)
Category C-1	0	
Category C-2	0	

1.3.6 Stage 6

The project specification called for intermediate risk assessments to be carried out on at least four (4) Category B sites.

However, because of the very limited data upon which the Stage 5 ranking was based, it was decided to complete

Table 1.3. Priority categories.

Category A	Sites *known* to have been used for hazardous waste disposal (A-1) Sites *suspected* of having been used for hazardous waste disposal and for which there is *strong evidence* (circumstantial or otherwise) that environmental pollution is occurring (such as unexplained poor surface water quality downstream of the site, unexplained morbidity in livestock on neighbouring farms or a significant incidence of historical contaminative activities in the catchment area of the site) (A-2)
Category B	Sites *suspected* of having been used for historical hazardous waste disposal and for which there is *some evidence* that environmental pollution is occurring (B-1) Sites about which very *little information* is available but which are considered to be *suspect* (based on desk-study results). It is consistent with the precautionary principle that these sites be included in this category as there is no evidence to suggest that they *do not* represent an environmental risk (B-2)
Category C	Sites which are *known* to have been used for historical waste disposal but which are unlikely to contain significant deposits of hazardous waste (C-1) Sites which are *suspected* of having been used for historical waste disposal but for which there was no significant incidence of historical contaminative activities in the catchment area (C-2)

intermediate assessments on the Category A, B and C sites. Following this, the preliminary ranking assigned in Stage 5 would be refined. The intermediate risk assessment comprised:

- Review of site-specific desk-study information
- Site inspection to identify potential impacts
- Review of surface and groundwater quality data from monitoring locations within 5 km up and down the hydraulic gradient of the site
- Review of local authority water pollution control records for areas adjacent to identified sites
- Assessment of the above in the context of the site geology and hydrogeology based on an aquifer protection plan developed by the GSI and local authority knowledge of local conditions.

The Stage 6 process outlined above is a modification of that proposed in the National Hazardous Waste Management Plan. It was developed because of the lack of information upon which to apply the intermediate risk assessment procedure originally proposed in the Methodology. Stage 6 found no evidence to suggest that significant hazardous wastes had been deposited at the majority of the sites. If hazardous wastes were present, the site inspections did not identify any adverse environmental impacts (e.g. visual evidence of surface water pollution, vegetation die-back, etc.). The limited data on adjacent surface and groundwater quality did not indicate any impacts associated with the subject sites.

Stage 6 did not alter the status of the two (2) A-1 sites identified in Stage 5. Forty-two (42) of the B-2 sites were re-categorised as C-2. These included twenty-four (24) car dismantlers and eighteen (18) former landfill sites. The remaining six (6) illegal waste disposal sites were retained as Category B-2 pending further investigation.

The modified Stage 6 was required to prioritise sites for investigation in the absence of the detailed site-specific information envisaged in the Methodology.

1.3.7 Stage 7

Stage 7 involves the detailed risk assessment, including intrusive site investigations and environmental monitoring, of a Category A site. As all of the Category A sites were in private ownership it was not possible to complete the detailed assessment.

It was agreed with the Agency that the information obtained during Stages 1–6 would be used to create a hypothetical hazardous waste disposal site, which would then be subjected to a virtual detailed risk assessment. The objective was to demonstrate the approach that should be applied.

The assessment involved a phased site investigation programme, including the development of a site investigation Health & Safety Plan, a topographic site survey, a preliminary ground investigation, and surface water, leachate, groundwater and landfill gas monitoring programmes. This was followed by a qualitative assessment of the site investigation findings and a quantitative assessment which included the development of fate and transport predictive modelling of contaminants and the development of site-specific clean-up goals.

1.4 Assessment Findings

The term ‘Section 26 Register’ has evolved from the development of the methodology. While Section 26 (2) (c) of the Act states that "*a hazardous waste management plan shall provide for, as appropriate, the identification of sites*" it does not state that a Section 26 Register of such sites shall be prepared.

It is implicit in the Methodology, as presented in the National Hazardous Waste Plan, that Local Authorities will have implemented Section 22 (h) of the Waste Management Act, 1996 in their functional area.

Section 22 (h) of the Act states that a Waste Management Plan prepared by a Local Authority shall have regard to “*the identification of sites at which waste disposal or recovery activities have been carried on, the assessment of any risk of environmental pollution arising as a result of such activities, measures proposed to be taken, or where such an assessment has already been made, measures taken in order to prevent or limit any such environmental pollution, the identification of necessary remedial measures in respect of such sites, and measures proposed to be taken, or, where such measures have already been identified, measures taken to achieve such*

remediation, having regard to the cost effectiveness of available remediation techniques".

If information were available as suggested by Section 22 (7) (h) of the Act, its assessment would be undertaken at Stage 3 of the Methodology. The list of sites developed at Stage 4 would then be based on desk-study (Stages 1 and 2) and the site investigation data from the Section 22 (7) (h) assessment. Inclusion of a site on the list would be based on "the identification of sites at which waste disposal activities, being activities that to a significant extent involved hazardous waste have been carried on" in accordance with Section 26 (2) (c) of the Act.

If a comprehensive assessment has been undertaken of a site identified under Section 22 (7) (h), then Stages 5, 6 and 7 of the Methodology would be redundant. Where comprehensive risk assessments have been undertaken under Section 22 (7) (h) by a local authority it could also address obligations outlined in the Act under Section 26 (2) (c).

The experience of applying the methodology in this project suggests that, while most local authorities could potentially identify sites at which waste disposal or recovery activities occurred, it is unlikely that risk assessments of such sites will have been undertaken. Such assessments may have been made where an environmental impact has been identified as being associated with a site but otherwise little or no investigation of sites will have taken place. This project also demonstrated that not all sites used for waste disposal may be known to the local authority.

In the event that the Section 22 (7) (h) assessments have not been completed, either the Methodology may have to be modified or the Section 22 (7) (h) assessments will have to be completed prior to the compilation of a list of Section 26 (2) (c) sites.

In the event that Section 22 7 (h) assessment has not been completed, the application of the Methodology to compile a Section 26 (2) (c) list will result in a larger number of sites included on the list than may be necessary. This is because the precautionary principle should be applied in the absence of information about a site. In other words, a site would be included on the list because there is insufficient information to determine if hazardous waste was disposed of on a site and, even if it was disposed of, whether or not its presence is significant in the context of environmental risk.

From a risk management and cost viewpoint, it would be practical to ensure that the number of sites identified on a list of sites or register by applying the Methodology is manageable without compromising the risks to the environment of any individual site.

It is, therefore, recommended that a Section 22 (7) (h) assessment be implemented prior to Section 26 (2) (c) for the Methodology to be applied in its current form.

In the absence of Section 22 (7) (h) information, consideration should be given to completing Stages 5 and 6 before preparation of the list/register.

1.5 Assessment of Individual Stages

The assessment of the methodology was an on-going process from the initiation of the project and has been commented on in the discussion of each of the tasks above. While the framework and proposed approach were found to be effective, it is recommended that certain aspects should be amended.

The emphasis in Stage 1 is on the identification of hazardous waste producers based on contaminative use, rather than the identification of waste disposal sites. However, the range of potential hazardous waste producers specified in the Methodology is limited. The EWC/HWL should be used to identify both current and past potential hazardous waste generators.

The list of primary sources of information to be used in Stage 2 is limited. Sources not referenced in the Methodology, but which were found to be useful, included Special Waste Plans, interviews/surveys of local authority personnel, Section 55 Notices and water pollution investigation records.

While local authorities, in the course of the preparation of waste management plans, will have identified sites at which waste disposal or recovery activities occurred, it is unlikely that risk assessments will have been undertaken at all such sites. It is also likely that not all sites used for

waste disposal, be it hazardous or non-hazardous, may be known to the local authority.

The available information on historical activities, planning files and waste management records maintained by the local authorities are likely, with a few exceptions, to be insufficient to allow definitive conclusion on whether a suspect site has been used for the disposal of hazardous waste. This means that the majority of sites included in the list of sites at the end of Stage 4 will be there solely on the basis of suspicion. The Plan clearly acknowledges this, and states that the presence of a site on the Register would not necessarily imply that the land is contaminated or otherwise dangerous.

In the absence of site-specific information, the Stage 5 desk-based prioritising of the sites will be subjective. At a minimum, a walk-over inspection of each of the sites should be carried out to establish if there is any visual evidence of environmental pollution, e.g. vegetation die-back.

1.6 Assessment of Costs of Applying the Methodology

As part of the assessment process, an evaluation of the costs of applying the methodology was undertaken. The assessment of costs included a complete breakdown of the costs of the work carried out. The cost assessment reflected a typical or average cost of carrying out intermediate and detailed risk assessments on individual sites, or at individual locations.

Depending upon the level of experience of local authority personnel, it may be possible for all seven stages of the project to be completed internally. However, it is more likely that specialised services will be required to undertake Stage 7. A local authority may, therefore, decide to undertake Stages 1–6 internally and to appoint an external consultant to complete Stage 7.

Two separate costing scenarios were developed for the implementation of the Methodology. The first assumed that the work would be completed by an external consultant and the second assumed that it would be completed solely by local authority personnel. The cost breakdowns are presented in Tables 1.4–1.7. Table 1.4 outlines the time allocations for completion of the project by an external consultant. Table 1.5 outlines the time allocation for local authority personnel whose assistance will be required by the external consultant to complete the project. The table illustrates that, even where an external consultant is employed, there will still be a significant input from local authority personnel.

Table 1.6 outlines the indicative cost of completing a single detailed risk assessment incorporating site investigations and risk assessment modelling using an external consultant. Costs are provided for site investigation and laboratory analyses required as part of the detailed risk assessment, including the installation of soil borings, geotechnical sampling, installation of groundwater and gas monitoring wells and geophysical surveys.

A costing for completion of the assessment programme by Local Authority staff alone was also prepared by a Local Authority Senior Executive Engineer. The assessment of costs is included in Table 1.7. These costs do not include costs for completion of detailed site investigations.

1.7 Additional Costs

A Geographic Information System (GIS) software package was used as part of this project and its use is strongly recommended in the implementation of the Methodology. Local authorities already use GIS applications as part of their day-to-day operations, although they may not yet be used by or available to the relevant sections. The cost of a GIS package and training or the appointment of appropriate technical staff may also have to be allowed for. Typical software costs range from €1800 to €2500, excluding VAT. Annual maintenance of a GIS system is estimated at €400. Training courses can be undertaken which range in cost from €300 to €1200.

Stage 6 costs include an intermediate-level risk assessment of the sites identified in this study. It is important that the information compiled and assessed on any site is as complete as possible for Stage 6. It is reasonable, therefore, to assume that some specialised external assistance may be required during the completion of Stage 6. A cost for external assistance is not included for Stage 6 in Table 1.6.

Table 1.4. Staff time allocations (days).

	Project		
	Director	**Manager**	**Staff**
Stage 1	7	10	24
Stage 2	7	11	22
Stage 3	5	8	18
Stage 4	7	6	10
Stage 5	6	12	24
Stage 6	6	25	40
Stage 7	8	23	30
Total	**46**	**95**	**168**

Table 1.5. Local Authority staff (time allocation in days).

	Planning	**Environment**	**Sanitary services**	**Computer services**
Stage 1	1	1	1	5
Stage 2	5	1	0.5	5
Stage 3		1	1	5
Stage 4	0	0	0	5
Stage 5		1		
Stage 6		1		
Stage 7		1		
Total	**6**	**10**	**2.5**	**20**

Table 1.6. Indicative costs (€) for a single Stage 7 detailed risk assessment.

Site survey	**Drilling trial pit**	**Laboratory**	**Optional geophysics**	**External consultant**
1500–2500	15,000–21,000	5500–8200	3000–5000	12,000–20,000

Table 1.7. Programme and estimate for list preparation.

	Annual salary	Rate	Months												Total sal.	% add.	Addition	Total	Day factor
Labour unit			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**					**Days**
Data collection																			
Senior Engineer	**65,499**	5458.29	×			×			×			×		×					
			545.83			545.83			545.83			545.83		545.83	2729.14	29	791.45	3520.59	**2**
Senior Executive Engineer	**58,831**	4902.56	×			×			×			×	×	×					
			2451.28			4902.56			4902.56			4902.56	4902.56	4902.56	26964.10	38	10246.36	37210.46	**10**
Executive Engineer	**52,104**	4341.96	×		×		×		×		×		×						
			4341.96		4341.96		4341.96		4341.96		4341.96		4341.96		26051.78	43	11202.26	37254.04	**20**
Executive Engineer	**52,104**	4341.96	×	×		×		×		×		×		×					
			4341.96	4341.96		4341.96		4341.96		4341.96		4341.96		4341.96	30393.74	43	13069.31	43463.04	**20**
Technician 1	**35,219**	2934.89	×	×	×	×	×	×	×	×	×	×	×	×					
			2934.89	2934.89	2934.89	2934.89	2934.89	2934.89	2934.89	2934.89	2934.89	2934.89	2934.89	2934.89	35218.73	82	28879.36	64098.09	**20**
Grade 3	**28,066**	2338.86	×		×		×		×		×	×	×	×					
			701.66		701.66		701.66		701.66		701.66	701.66	701.66	701.66	5613.26	32	1796.24	7409.50	**6**
Overseer	**32,000**	2666.67			×	×													
					533.33	533.33									1066.67	30	320	1386.67	**4**
Risk Assessment																			
Senior Executive Engineer	**58,831**	4902.56	×			×			×		×		×	×					
			1225.64			1225.64			1225.64		1225.64		1225.64	1225.64	7353.85	38	2794.46	10148.31	**5**
Executive Engineer	**52,104**	4341.96	×	×		×	×		×	×	×	×	×	×					
			2170.98	2170.98		2170.98	2170.98		2170.98	2170.98	2170.98	2170.98	2170.98	2170.98	21709.81	43	9335.22	31045.03	**10**
															157101.07		78434.66	235535.74	
														%	67%		33%		

	Percentage additions to salaries					
Cost Area	**S.E.**	**S.E.E.**	**E.E.**	**Tech.**	**Grade 3**	**Overseer**
O/head	**20**	**20**	**20**	**20**	**20**	**20**
Travel/Sub	**5**	**10**	**15**	**50**	**0**	**10**
Pc h/ware	**1**	**2**	**2**	**3**	**3**	**0**
Pc s/ware	**1**	**2**	**2**	**3**	**3**	**0**
Mapinfo	**1**	**2**	**2**	**3**	**3**	**0**
Other	**1**	**2**	**2**	**3**	**3**	**0**
Total	**29**	**38**	**43**	**82**	**32**	**30**

Notes

1. Salary costs are based on annual salary to which a percentage is added.
2. In any month the number of days worked are given by Day Factor – and is based on a 20 working day month.
3. Overheads are the sum of the various items.
4. To make changes to total sum, change only the figures in bold type – salary, % additions to salaries, or days.
5. To make changes to programme put an "×" in the relevant square.

2 Conclusions and Recommendations

2.1 Conclusions

Conclusions on individual stages applied during the project are as follows.

2.1.1 Stage 1

Stage 1 identified 121 sites as potential hazardous waste producers or disposal locations. However, the range of potential hazardous waste generators identified in the Methodology is not exhaustive. Stage 1 did not identify any confirmed hazardous waste disposal sites. However, this was not unexpected given that Stage 1 focuses on identifying potential contaminative uses.

2.1.2 Stage 2

The potential primary sources of information identified in the Methodology are relevant to identifying potentially contaminated land but not necessarily hazardous waste disposal sites. Of the primary sources tested, the records maintained under the Toxic & Dangerous Waste Regulations, including the Special Waste Plan and consignment notes, and information from the questionnaire issued to the overseers were the most effective.

Several sources of information found to be of actual or potential value during Stage 2 are not referenced in the Methodology, including The Special Waste Plan prepared by Laois County Council in 1982 and amended in 1991, interviews with senior local authority staff and circulation of questionnaires to current and former Area Overseers, and the review of the Section 55 Notices issued under the Waste Management Act. A further source not referenced in the Methodology, which may be useful, is records of incidents investigated under the Water Pollution Act 1977–1990.

It is implicit in the Methodology that Local Authorities will have identified waste disposal sites in accordance with Section 22 (h) of the Waste Management Act, 1996 in their functional area prior to the implementation of the Methodology.

Where the local authority had completed assessments of the waste disposal facilities in its functional area these would be a valuable source of information on the potential or actual hazardous waste disposal sites. However, the experience in this project suggests that while most local authorities may potentially have identified sites at which waste disposal or recovery activities occurred it is unlikely that any level of risk assessment of such sites will have been undertaken, although investigations may have been carried out where an environmental impact has been identified. It is also likely that not all former waste disposal sites have been identified in a local authority area.

At the end of Stage 2, one hundred and forty-one (141) locations had been identified as potential hazardous waste disposal sites.

2.1.3 Stage 3

Stage 3 comprised an evaluation of the information collected in Stages 1 and 2 to refine the list to those sites *most likely* to have been used for hazardous waste disposal. The majority of the recommended information sources upon which to base the Stage 3 evaluation regarding potential on-site hazardous waste disposal had already been reviewed in Stage 2.

The majority of the sites had been identified solely on the basis of contaminative use. While these activities probably generated hazardous waste there is no documented or anecdotal evidence that any such waste had been disposed of on-site.

The majority of the sites were located in urban areas and reviews of the available historic maps did not identify any feature on the sites, e.g. a quarry, that could have been infilled with waste. Many of the historic sites – gasworks, steel works, printing works – had been re-developed and searches of the relevant planning files did not find any record that evidence of hazardous waste disposal had been found during the development.

Eighty-nine (89) sites for which there was no evidence of on-site waste disposal were considered *least likely* to have been used to dispose of hazardous waste and were removed from the list. This was either because the records indicated that hazardous wastes had been removed off-site for disposal or there was no evidence

that any on-site disposal occurred. Such sites included activities with limited capacity for on-site disposal of hazardous wastes and IPC-licensed facilities where records indicate off-site disposal.

Operational and closed landfill sites were retained on the list. While there was no information indicating that they had been used for the disposal of significant quantities of hazardous waste, there were hazardous waste producers relatively close to these sites who possibly could have availed of them. In addition, anecdotal information provided by Council staff suggested that some hazardous waste could have been disposed of at some of the closed landfill sites.

The scrapyards and car dismantlers were retained on the list as they are known producers of hazardous waste (waste oils), there was little or no information on historic disposal arrangements and the possibility existed that waste oils had been disposed of on site, even if unintentionally, e.g. leaks and spills.

2.1.4 Stage 4

The term 'Section 26 Register' has evolved from the development of the methodology. While Section 26 (2) (c) of the Act states that "*a hazardous waste management plan shall provide for, as appropriate, the identification of sites*" it does not state that a Section 26 Register of such sites shall be prepared.

The Plan states that "*It must be noted that inclusion of a site on a 'Section 26 Register' would not necessarily imply that the land was contaminated, polluted or otherwise dangerous. Rather, it is an approach that is consistent with the precautionary principle which states that where significant evidence of environmental risk exists, appropriate precautionary action should be taken even in the absence of conclusive scientific proof of causes*".

Sites were included on the Register on the basis that the type of activity – landfill or car dismantling – was likely to have resulted in the disposal of hazardous waste rather than any site-specific evidence. The caveat in the Plan that the inclusion of a site on the Register "*would not necessarily imply that the land is contaminated, polluted or otherwise dangerous*" is certainly justified.

The Methodology does not include a mechanism for removing a site from the Register in the event that the investigations find that the site does not present a risk.

2.1.5 Stage 5

Stage 5 involves the ranking of the order of the investigations of the sites on the Register and for the majority of the sites this will be based solely on limited desk-study information. Where local authorities have already completed preliminary risk assessments of waste disposal/recovery facilities the findings should be used to determine the rankings.

The reliance on mainly limited desk-study information presents difficulties given that, in the absence of site-specific data, an impact may be occurring, e.g. groundwater contamination, but that there is no evidence of the impact. This may lead to the incorrect ranking of sites.

2.1.6 Stage 6

The project specification required that an intermediate risk assessment be carried out on at least four Category B sites. However, because of the very limited data upon which the provisional categorisation was based, it was decided to complete intermediate assessments on all of Category A, B and C sites.

With the exception of three sites, the desk study of the 52 sites remaining at Stage 5 identified little or no information that could be used to apply the intermediate risk assessment model proposed in the Plan. It is possible that this model could be applied if sufficient information had been generated as part of a Section 22 (7) (h) investigation of sites.

At the end of Stage 6, there was little evidence to suggest that significant hazardous wastes had been deposited at the majority of the sites. If hazardous wastes were present, there was no physical evidence based on site inspections that an environmental impact was occurring. Based on limited data on adjacent surface and groundwater quality no impacts were identified associated with the presence of any of the identified sites.

The modified Stage 6 intermediate risk assessment was used to prioritise sites for future investigation in the

absence of more detailed site-specific information. This form of risk assessment should be applied where detailed site-specific information is not available.

2.1.7 Stage 7

At the end of Stage 6, there were no Category A sites where it was possible to gain access to undertake a detailed risk assessment. For the purpose of the project, the information obtained during Stages 1–6 was used to create a hypothetical hazardous waste disposal site, which was then subjected to a detailed risk assessment. The objective was to demonstrate to the local authorities the methodology to be applied.

2.2 Recommendations

2.2.1 Stage 1

It is recommended that all 20 categories specified in the HWL be used to identify activities which may have resulted in the generation of hazardous waste requiring disposal on-site or off-site and not just contaminative uses.

2.2.2 Stage 3

It is recommended that sites regulated by the Agency or any other statutory authority outside of the local authority be included on a list of sites until investigation of such sites has been carried out to determine the potential environmental risks presented. If a review of relevant files, such as those maintained by the Agency, indicates that on-site disposal of hazardous waste did not occur then a site can be removed from the list. Until this process is complete all such sites should remain on the list.

2.2.3 Stage 4

It is preferable that the identification and assessment of former hazardous waste disposal and recovery facilities (Section 22 (7) (h) of the Waste Management Act) be implemented before the Methodology is applied. If these assessments have not been completed it is recommended that consideration be given to completing Stages 5 and 6 of the Methodology before preparation of the Register.

It is recommended that consideration should be given to a procedure for removing sites from a Register following the completion of the investigations. It is further recommended that such a procedure be based on an individual site audit by suitably qualified personnel.

2.2.4 Stages 5, 6 and 7

Given that desk-study information is likely to be limited, it is recommended that a site walk-over/inspection be undertaken as part of the Stage 5 preliminary risk assessment process. As with this study, the Stage 6 intermediate risk assessment process may have to be altered for the same reason.

It is recommended that Stages 5, 6 and 7 be completed in consultation with or by persons experienced in environmental risk assessment.