ASSESSMENT OF SITE CONTAMINATION

IMPACT STATEMENT

29 MARCH 1999

PURPOSE OF DRAFT MEASURE AND IMPACT STATEMENT

In accordance with the requirements of section 18(1) of the NEPC Act 1994, the National Environment Protection Council (NEPC) has authorised the release of a Draft Measure and Impact Statement for the Assessment of Site Contamination. The purpose of the Draft Measure and Impact Statement is:

- to invite public comment on the appropriateness of the draft Measure and the Impact Statement;
- to encourage public discussion on the development of appropriate Guidelines for inclusion in the final Measure on the Assessment of Site Contamination; and
- to ensure the process of developing this Measure is as open and transparent as practicable.

Draft Measure and Impact Statement Status

The Draft Measure and Impact Statement are provided as the basis for discussion on what the final Measure (as required under the NEPC Act) might include and does not carry the endorsement of the NEPC or any member government.

The Draft Measure (and associated draft Guidelines) and Impact Statement are made available only for the purpose of obtaining comment. They should not be used as *de facto* guidelines.

Public Consultation

In developing and releasing this Draft Measure and Impact Statement, the NEPC recognises the importance of effective consultation during the development of the Measure.

The NEPC is particularly interested in your comments, information and feedback on:

- the appropriateness of the draft Measure
- the usefulness of the draft guidelines; and
- the analysis of the potential environmental, social and economic impacts of the draft Measure as outlined in this document.

The information provided will be used to facilitate the development of a robust final Measure and maximise community ownership of this important document. A Summary and Response document, which summarises the public comments made and the NEPC's responses, will also be developed.

Public Meetings

To assist people who wish to make submissions, public meetings will be held in every State and Territory. If you are interested in attending such meetings please contact your respective jurisdiction or the NEPC Service Corporation (see contact details on pages 3 and 4).

It is expected that the release of this Draft Measure and Impact Statement and the subsequent consultation on its contents will lead to a better-informed community on the issues that need to be considered when developing the final Measure.

The NEPC encourages you to make your views known on this matter and to make available any information that you consider pertinent to the development of the final Measure. Your input will ultimately ensure that when the NEPC meets to make a decision on this important Measure, that decision can be confidently made on the basis of the best possible information available.

Making a Submission on the Draft Measure and Impact Statement

Three months have been set aside for consultation on this Draft Measure and Impact Statement (29 March – 18 June 1999). All written submissions received on the Draft Measure and Impact Statement will be acknowledged by the NEPC. After the closing date for submissions, they will be collated and categorised. The categorisation involves dividing the submissions made on the various sections of the draft Measure and Impact Statement. For example:

- comments raised on issues in the draft Measure;
- comments on the information included in the Impact Statement;
- comments on the draft Guidelines, and
- additional information on the potential economic, social and environmental consequences of making this Measure and so on.

This means that comment from all the submissions on a specific issue is placed together to be reviewed as a whole. In this way, individual comment is considered in context as well as individually.

Summary and Response Document

The NEPC is required to consider all submissions made by the closing date for submissions (18 June 1999) and every effort is made to incorporate relevant comments into a Summary and Response document on public submissions made on the draft Measure and Impact Statement on the Assessment of Site Contamination. The Project Team will carry out this work.

After this work is completed, the final Measure and Impact Statement will be forwarded to the National Environment Protection Council for consideration in making the Measure. It is expected that this will occur in November 1999.

How can I have my say on what the final Measure contains?

The public comment period is an invitation to submit comments on any aspect of the draft Measure and Impact Statement.

The draft Guidelines/documents are available from the NEPC Service Corporation (see details page 4). The NEPC Service Corporation will be using electronic means as the preferred method of distribution of documents. The documents are available on the NEPC website, www.nepc.gov.au, by e-mail, CD ROM (in PDF Format, with an Adobe Acrobat reader supplied), or disc (in Word 8.0 format only). No charge will be made for copies of the documents in electronic format, however, a charge will be applied for printed copies. (Please note: Printed copies will be provided at no charge to those who do not have access to a computer or are financially disadvantaged).

Will I have an opportunity to discuss the draft Measure and Impact Statement with the NEPC?

Yes. Meetings will be held in all capital cities over the three-month period between 29 March and 18 June 1999, where issues can be discussed at a public forum. For details of the meetings in your jurisdiction please contact your respective jurisdictional representative (contact details below).

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What is the best form in which to submit my comments?

The quality of the comments received plays an important part in the quality of the final Measure and associated Guidelines, and so it is important to provide clear, concise comment on the draft Measure and Impact Statement. Comments are welcome from interested parties on technical and non-technical issues and all comments will be considered in developing the final Measure. Here are some important points to note:

- Comment is most useful when it is divided into general comments, for example, on style and grammar, and specific comment organised by section.
- General comments of an editorial nature, for example, on the tone or language of the draft or indicating a typographical error, should be presented under a separate title, clearly indicating that this is a non-specific comment.
- Comment should be specific, brief and to the point.
- Comment relating to the content of the draft Measure and Impact Statement and draft Guidelines should be numbered and titled in a way that clearly links it to the draft document. Whenever possible, please use identifiers (eg: Draft Guideline 2, page 41, line 56) for sections of the draft Measure and Impact Statement or Guidelines that you wish to make specific comments about.
- Comments of a technical nature must be accompanied by supporting evidence in the form of data or a reference to data. An argument that fails to provide any supporting evidence may be considered to be a subjective opinion.
- Any perceived omissions should be clearly indicated.

If you are making a submission of several pages, **you should include a summary at the beginning of your submission**, detailing the major points you wish to make. Finally, it is important to submit comment within the time allocated. Late comments may not be included in the Summary and Response document and cannot be guaranteed detailed consideration.

Can my comments make a difference?

Yes, the NEPC is required to consider **all** comments received by the 'close-of-submissions' date and will give consideration to those comments when developing the final Measure.

Procedure for making submissions to the NEPC

Written submissions on this document should be sent to the following address by 18 June 1999:

Project Manager
NEPC Service Corporation
Level 5, 81 Flinders Street
ADELAIDE SA 5000

Freecall 1800 626 028
Tel (08) 8419 1204
Fax (08) 8224 0912

To allow ease of photocopying, submissions should be in **writing** and **unbound**. To facilitate the review process, extensive comment should also be provided, if possible, in electronic form: preferably as a Microsoft Word for Windows document on a 3.5 inch floppy disk, or Email: mgilbey@nepc.gov.au

* *Please note: Subject to Freedom of Information Act (FOI) provisions, public submissions are considered public documents unless clearly marked "confidential".*

1. BACKGROUND

1.1 National Environment Protection Council

The National Environment Protection Council (NEPC) stems from the Special Premiers' Conference held in October 1990. At this conference the Prime Minister, Premiers and Chief Ministers agreed to develop an Intergovernmental Agreement on the Environment (IGAE), which came into effect on 1 May 1992.

The IGAE includes provision for the establishment of a national body with responsibility for making environment protection measures (Measures) with the objectives of ensuring:

- that the people of Australia enjoy the benefit of equivalent protection from air, water and soil pollution and from noise, wherever they live, and

- that decisions by businesses are not distorted and markets are not fragmented by variations between jurisdictions in relation to the adoption or implementation of major Measures.

Complementary legislation establishing this national body, the NEPC, has been passed in all jurisdictions.

The NEPC is a statutory body with law making powers. Members of Council are Ministers, not necessarily environment Ministers, appointed by first Ministers from each participating jurisdiction (ie. Commonwealth, State and Territory Governments).

The NEPC has two primary functions:

- to make National Environment Protection Measures (Measures)
- to assess and report on their implementation and effectiveness in participating jurisdictions.

The NEPC Committee is the principal advisory body to Council. NEPC Committee comprises the NEPC Executive Officer and one nominee of each Council member. In addition, a non-voting member has been appointed by the President of the Australian Local Government Association.

Council and Council committees are assisted and supported by the NEPC Service Corporation, based in Adelaide. The Service Corporation is managed by the NEPC Executive Officer. The development of each Measure is managed by a Project Manager from the NEPC Service Corporation.

1.2 National Environment Protection Measures (Measures)

Measures are broad framework-setting statutory instruments defined in NEPC legislation. They outline agreed national objectives for protecting or managing particular aspects of the environment.

- Measures may consist of any combination of goals, standards, protocols, and guidelines (see - Part 1 of the draft Measure).

(Note: Under Section 14(1)(d) of the NEPC Act a Measure relating only to 'guidelines' for the assessment of site contamination may be made by the NEPC).

A two-thirds majority is required for the Council to make a Measure. Implementation of Measures is the responsibility of each participating jurisdiction. A Measure will take effect in each participating jurisdiction once it is notified in the Commonwealth of Australia Gazette, although the Measure is subject to disallowance by either House of the Commonwealth Parliament.

The NEPC Acts prescribe that Measures may relate to any one or more of the following (Section 14(1)):

- *ambient air quality,*
- *ambient marine, estuarine and fresh water quality,*
- *the protection of amenity in relation to noise (but only if differences in environmental requirements relating to noise would have an adverse effect on national markets for goods and services),*
- *general guidelines for the assessment of site contamination,*
- *environmental impacts associated with hazardous wastes,*
- *the re-use and recycling of used materials.*

Measures may also relate to motor vehicle noise and emissions.

1.3 National Environment Protection Guidelines

"National Environment Protection Guideline" means a guideline that gives guidance on possible means for achieving desired environmental outcomes (Definitions section 6.1, NEPC Act 1994).

1.4 Purpose of Impact Statement

In making Measures, the NEPC must have regard to a number of considerations. These are detailed in section 15 of the *National Environment Protection Council Act, 1994*, and include:

- consistency with the IGAE,
- environmental, economic, and social impacts,
- relevant international agreements, and
- any regional environmental differences.

Prior to making a Measure the Council must prepare a draft of the Measure and an Impact Statement (section 17 of the NEPC Act). The legislation requires the Impact Statement to include the following:

- the desired environmental outcomes,
- the reason for the proposed Measure and the environmental impact of not making the Measure,
- a statement of the alternative methods of achieving the desired environmental outcomes and the reasons why those alternatives have not been adopted,
- an identification and assessment of the economic and social impact on the community (including industry) of making the proposed Measure,
- a statement of the manner in which any regional environmental differences in Australia have been addressed in the development of the proposed Measure,
- the intended date for making the proposed Measure,
- the timetable (if any) in relation to the proposed Measure.

These Impact Statement requirements reflect the views of the Commonwealth, State and Territory Governments as to the type of assessment needed to evaluate the potential impacts of adopting a proposed Measure. This Impact Statement has also been developed keeping in mind the COAG requirements contained in the *Principles and Guidelines for National Standard Setting and Regulatory Action by Ministerial Councils and Standard Setting Bodies*.

The NEPC legislation requires that both the draft Measure and the Impact Statement be made available for public consultation for a period of at least two months. The Council must also have regard to the Impact Statement and submissions received during public consultation in deciding whether to adopt a proposed Measure.

The key role of this Impact Statement is to assist in the process of public consultation regarding the proposals contained in the draft Measure for the Assessment of Site Contamination. This Impact Statement has been designed to provide a plain-English explanation of the content and intent of the draft Measure, and to explain the anticipated impacts of implementing the Measure. The Impact Statement endeavours to provide, where possible, a clear explanation of the costs and benefits anticipated, noting which sectors of the Australian community will be affected. The Impact Statement has been drafted in parallel with the development of the draft Measure so that the impacts of each element of the draft Measure can be considered as the proposal is refined. Although consultation to date on the development of the Assessment of Site Contamination Measure has enabled an informed statement to be drafted, it is anticipated that the release of the Impact Statement will invite constructive public comment so that impacts can be more completely identified, understood and considered when finalising the Measure.

Under the NEPC Act, this Impact Statement reflects the impacts of implementation of the draft Measure at a national level (ie. in all jurisdictions). It should be noted that any supporting regulatory or legislative mechanisms which jurisdictions may choose to develop to assist in implementation of the proposed Measure will need to go through appropriate processes in those jurisdictions (eg. a proposed Regulation to require Assessment of Site Contamination to conform with the Measure may need to be accompanied by a Regulatory Impact Statement in most cases).

1.5 Consistency with the IGAE

The Intergovernmental Agreement on the Environment (1992) is a comprehensive agreement which encompasses a number of key principles, including the Precautionary Principle (refer to the IGAE (1992) for details) as required under Section 15 of the NEPC Act.

1.6 Assessment of consistency with Competition Policy

Appendix 2 contains a competition policy assessment required as part of the process of making subordinate legislation under the COAG Competition Principles Agreement.

1.7 NEPC Act Requirements

The NEPC decision to commence the development of the Assessment of Site Contamination Measure was made having regard to the requirements identified in

section 15 of the *National Environment Protection Council Act, 1994* (Commonwealth) and the equivalent provisions in the corresponding Acts of the participating jurisdictions. The draft Measure and Impact Statement have been developed to meet the requirements of the NEPC Act, specifically*:*

1.7.1 Section 14

Section 14 explicitly provides for the making of a Measure for *'general guidelines for the assessment of site contamination*' (Section 14(1)(d)) which is referenced in the introductory section of the Measure. The draft Measure for the Assessment of Site Contamination comprises general guidelines only in accordance with subsection 14(1)(d).

1.7.2 Section 15

Section 15 sets out what the National Environment Protection Council is required to have regard to in making a Measure:

- **whether the Measure is consistent with section 3 of the Intergovernmental Agreement on the Environment (s15(a)).** The NEPC has been mindful to ensure that the principles of the Agreement have been considered and taken into account where appropriate during the development of the draft Measure;
- **the environmental, economic and social impact of the Measure (s15(b)).** Every effort was made to ensure that all available scientific, social, environmental and economic data were considered when developing the draft Measure and Impact Statement. Comments made during the key stakeholder consultation phase were also considered;
- **the simplicity, efficiency and effectiveness of the administration of the Measure (s15(c)).** The NEPC Committee has guided the development of the draft Measure so that its administration will be simple, effective and efficient eg. the draft guidelines recognise and build upon existing accepted procedures and methodologies where available;
- **whether the most effective means of achieving the desired environmental outcomes of the Measure is by means of a national environment protection standard, goal or guideline or any particular combination thereof (s15(d))**. The Impact Statement canvasses a number of options and suggests that the proposed Measure is the most effective way to achieve the proposed environmental outcomes espoused in the draft Measure. The NEPC will consider all relevant submissions on this matter;
- **the relationship of the Measure to existing inter-governmental mechanisms (s15(e))**. The draft Measure and Impact Statement takes account of inter-governmental mechanisms, eg ANZECC guidelines, NHMRC guidelines, the IGAE and COAG requirements contained in the *Principles and Guidelines for National Standard Setting and Regulatory Action by Ministerial Councils and Standard Setting Bodies*. The Impact Statement has been developed keeping these relationships in mind. The Assessment of Site Contamination Measure is also expected to assist with the information requirements of State of the Environment reporting;
- **relevant international agreements to which Australia is a party (s15(f))**. While there are no relevant formal international agreements to which Australia is a party in the context of this Measure, the Assessment of Site Contamination Measure will assist in meeting some of the aims of the Rio Declaration to which Australia is a signatory;
- **any regional environmental differences (s15(g))** have been considered. Regional environmental differences relating to soil, biota, climactic and other environmental

conditions were recognised and where appropriate the draft Measure is region specific and endeavours to take account of the wide variation in physiological responses to various contaminants across any community. (Refer to section on Regional Environmental Differences in the Impact Statement).

The requirements to give notice of intention to prepare a draft Measure and Impact Statement; and to undertake public consultation under Sections 16, 17 and 18 respectively have been appropriately fulfilled.

1.7.3 Section 19

Section 19 sets out what the NEPC is to have regard to, in addition to Section 15:

- **the Impact Statement that relates to the Measure (s19(a)).** The Impact Statement relating to the draft Measure is released as part of the public consultation process. The Impact Statement, along with any public comments relating to the Impact Statement, will be examined by NEPC as part of its considerations when deciding to make the Measure;
- **any submissions it receives that relate to the Measure or to the Impact Statement (s19(b)).** A summary of the submissions received during the consultations on the Draft Measure and Impact Statement will be prepared for NEPC's consideration; and
- **any advice from the NEPC Committee or from a committee established under section 33 (s19(c)).** Any advice from the NEPC Committee or any other relevant committee will be considered by NEPC prior to its decision on this Measure.

As required by Section 18 of the NEPC Act the 'Draft Measure and Impact Statement' will be made available for public consultation for a period of at least two months (actually three months).

2. ASSESSMENT OF SITE CONTAMINATION

2.1 Background to the Assessment of Site Contamination Measure Proposal

Contaminated land has become an increasingly important environmental, health, economic and planning issue in Australia over the past few years. With changing community standards and the redevelopment of former industrial and agricultural land, there is increasing recognition of the problems associated with contaminated sites. The environmental implications of chemically contaminated land have now become a world-wide issue and in response many countries, including Australia, have developed a range of approaches to deal with the associated problems.

2.1.1 ANZECC/NHMRC Involvement

Prior to the introduction of the National Environment Protection Council Act (1994) the responsibility for site contamination assessment legislation and policy lay entirely with each individual jurisdiction. In the absence of nationally agreed standards or guidelines, an ad hoc approach to the assessment and management of site contamination began to develop over time as each state and territory developed its own response to this issue. This resulted in a variety of approaches to the assessment of site contamination being applied across Australia.

In 1992, in an effort to overcome this situation, the Australian and New Zealand Environment and Conservation Council (ANZECC) and the National Health and Medical Research Council (NHMRC) jointly developed technical guidelines for contaminated sites to be used as the basis of a common approach Australia wide. The main purpose of the ANZECC/NHMRC guidelines was to provide a framework for the proper assessment and management of contaminated sites so as to bring about an acceptable level of consistency in site assessment and subsequent management of contaminated sites. It was believed at the time that the adoption of the ANZECC/NHMRC framework would provide the national guidance required by those responsible for the assessment and management of site contamination and provides assurance to the community that public health and environmental concerns were being addressed at a national level.

At the time the ANZECC/NHMRC Guidelines were developed it was recognised that the Guidelines were 'evolving' and that as more information became available, criteria developed and technologies for assessment and clean up improved, the guidelines would need to be amended and updated accordingly. The importance of maintaining "broadly based national support for the protocols and processes set out in the Guidelines" was also recognised.

In 1995 a joint ANZECC/NHMRC Contaminated Sites Technical Review Committee (CSTRC) began a systematic review of the policy and technical components of the 1992 Guidelines. This review concluded that the ANZECC/NHMRC Guidelines were basically sound, although they were deficient in several key technical areas.

2.1.2 NEPC Involvement

In 1995, the NEPC was established with a charter to "ensure that the people of Australia enjoy the benefit of equivalent protection from air, water and soil pollution and from noise, wherever they live; and that decisions by businesses are not distorted and markets are not fragmented by variations between jurisdictions…" (NEPC Act, 1994). Accordingly, ANZECC/NHMRC resolved that the most appropriate vehicle to develop the key policy and technical matters relating to the assessment of contaminated sites was via a National Environment Protection Measure (NEPM). In 1996 the NEPC formally decided to begin the development of a National Environment Protection Measure for the Assessment of Site Contamination and responsibility for the work was transferred from ANZECC/NHMRC to NEPC in cooperation with NHMRC.

In deciding to begin the development of a National Environment Protection Measure for the Assessment of Site Contamination the NEPC also recognised that, although most jurisdictions base their general approach on the ANZECC/NHMRC Guidelines, they have no formal status and there remain significant variations between jurisdictions.

2.2 Jurisdictional Regulatory/Policy Approaches to Site Contamination

The following is an outline of existing regulatory and policy approaches to site contamination that are presently in place across Australia:

Northern Territory

At present in the Northern Territory, contaminated land is assessed and managed in accordance with the ANZECC/NHMRC Guidelines for the Assessment and Management of Contaminated Sites.

Applicable legislation includes the Waste Management and Pollution Control Act, the Planning Act and the Water Act.

A policy framework for contaminated site management is being developed. The framework will address contaminated site prevention, identification, remediation, management and validation. It is expected that the Measure for the Assessment of Site Contamination will comprise the assessment component of the framework.

Contaminated sites which are to be redeveloped for a more sensitive use, such as residential, must be audited by an environmental auditor accredited under the Victorian Environment Protection Act.

The Department of Lands, Planning and Environment provides advice to developers and consultants on requirements for assessment, remediation action plans and validation programs. The Department also coordinates advice from other relevant government agencies.

Queensland

Contaminated land in Queensland is managed under the *Environmental Protection Act 1994* (EP Act). The Act provides for the identification, investigation, assessment, remediation and management of contaminated land.

The Environment Protection Regulation 1998 lists the prescribed organisations for the contaminated land provisions of the EP Act. Members of these organisations with the appropriate qualifications and experience in dealing with contaminated land can submit reports to the Department of Environment and Heritage (DEH) for assessment. Submitted reports must be accompanied by statutory declarations, which require certification of assessment and remediation work.

The *Integrated Planning Act 1997* (IPA) provides the planning and development control process which plays an important role in the management of contaminated land. IPA specifies developments on land prescribed under a regulation as requiring assessment in relation to contaminated land as 'assessable development' when an application is made for a material change of use or reconfiguration of a lot of the land. In these circumstances, a site investigation report is submitted to DEH for consideration regarding the development application.

The *Integrated Planning Regulation 1998* provides the mechanism for contaminated land investigation and assessment as part of the landuse planning process.

In June 1998, DEH prepared *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland* to coincide with the commencement of new contaminated land legislation. The *Guidelines* were produced for use by local government, planning authorities, landowners, developers, financial institutions, industry and environmental consultants in managing contaminated land.

The Guidelines include:

- a summary of the contaminated land legislation in Queensland and its integration with planning legislation;
- information on how planning and development controls deal with land contamination;
- mechanisms to manage contamination and reduce the environmental impact of remediation activities;
- administrative procedures for reporting and investigating contaminated land;
- the process of identification, investigation, assessment and remediation of contaminated land; and
- a staged decision-making process which responds to the information obtained form site investigations.

The approach in the *Draft Guidelines* is based on the Guidelines for the Assessment and Management of Contaminated Sites January 1992, ANZECC/NHMRC. It is planned that the Guidelines will be finalised in accordance with the NEPM on the Assessment of Site Contamination when it is made.

South Australia

The current process for the assessment and management of contaminated sites in South Australia is controlled by several key documents:

- Practice Circular 2 (September 1997), an advisory notice from the then Minister for Housing and Urban Development.
- EPA Information Sheet No. 8 (November 1997), Assessment Procedure for Contaminated Sites.
- EPA Special Bulletin No.1 (October 1995), The Use of Environmental Auditors:

Contaminated Land.

- Provisions in the Environment Protection Act 1993, including Section 83 notifications of incidents which may cause environmental harm, environment protection orders and clean-up orders.

With the exception of the provisions in the Environment Protection Act 1993, the other documents are essentially advisory and not statutory requirements. The current mechanisms for dealing with contaminated sites can be categorised as follows:

- Industrial /Commercial - These are normally managed by industry through civil law without EPA or statutory involvement (eg petrol station assessment and clean-up).
- Off-site and groundwater contamination - These are managed by EPA using a range of provisions in the Environment Protection Act 1993, including, Section 83 notification, environment protection orders, clean up orders and environment performance agreements (eg Mile End railway yards).
- Re-zoning or redevelopment of land to more sensitive use - These are managed by EPA and through the planning process and include the use of environmental consultants and auditors. Reference is made to planning Practice Circular No.2 and Environment Protection Authority Guidelines for use of Auditors. This is the area which requires improvement given the associated high risks. In practice the Environment Protection Agency is finding a variety of interpretations by local government, consultants and industry on the applicability and implementation of existing guideline documents.

In November 1995, the Authority approved the use of the Victorian EPA accredited environmental auditors (contaminated land) for the independent review of contamination assessment reports, and the provision of a report indicating appropriate land uses for sites. Previously the South Australian Health Commission and the Environment Protection Agency undertook this work but issues of liability and workload, delays in processing development applications, and the need to develop frameworks for the management of contaminated sites, lead to the use of accredited auditors.

Environmental auditors are primarily used where there is a planned change of land use or redevelopment for a more sensitive purpose (eg. from industrial use to residential use). Environmental audit reports are generally not needed for land transactions involving continuing use for industrial or commercial purposes and where there are no off-site impacts and risks to personnel working on the site. Audit reports can be used to provide assurance to planning authorities that the objectives of Practice Circular 2 have been achieved, in support of Section 7 statement under the Land and Business (Sale and Conveyancing) Act 1994, and to demonstrate compliance with environment protection orders and clean-up orders.

Legislation is proposed to provide a statutory framework for the effective assessment and management of contaminated sites in South Australia and, together with recently adopted amendments to Section 7 statements under the Land and Business (Sale and Conveyancing) Regulations, will provide confidence to the public, developers, industry, consulting organisations and the financial institutions that sites will be suitable for their intended use.

Western Australia

Most current site assessments/remediation in Western Australia are undertaken on a voluntary basis, with major sites undergoing Environmental Impact Assessment (EIA) under the *Environmental Protection Act 1986*. In addition, Local Government Authorities can set conditions for rezoning applications, which may require a person to investigate a site to the satisfaction of the Department of Environmental Protection (DEP).

A position paper on the assessment and management of contaminated sites, released by Western Australia in May 1997, is the forerunner to specific legislation and administrative arrangements, which deal with all aspects of contaminated site management from prevention, identification, characterisation, remediation and liability. Proposed legislation is currently being drafted based on that public position paper.

The DEP recommends the 1992 ANZECC/NHMRC guidelines for characterising contaminated sites and which form the basis of guidance to the public and contaminated sites professionals. Advice from the DEP, where there is no formal process such as EIA is used to manage a site, is on a non-statutory basis, including advice to the effect that a site is suitable for its intended use.

Victoria

The *Environment Protection Act 1970* defines the pollution of land and includes in the definition reference to detrimental effects on the "beneficial uses" of the land. These beneficial uses are established by State Environment Protection Policies (SEPPs). Victoria currently has a range of SEPPs including a SEPP relating to the groundwaters of Victoria and a draft SEPP relating to the prevention and management of contamination of land.

The Act also sets up a system of environmental audits to ensure that, prior to redevelopment of a potentially contaminated site an assessment is undertaken to ensure it is suitable for the proposed use. Certificates of environmental audit effectively mean the land under investigation has a 'clean bill of health' and will not affect any beneficial uses under any SEPP. A certificate is issued after an assessment in accordance with the Act and EPA guidelines. A copy of the report must be provided to EPA. Where an auditor believes the land is potentially detrimental to beneficial uses he/she must issue a Statement of environmental audit and must provide EPA with a copy of the audit report.

The audit system can be triggered by a planning scheme amendment, by the issue of an EPA Notice or on request. Where a planning scheme amendment is proposing a more sensitive use (eg: industrial to residential), the *Ministers Direction No 1* issued under the *Planning and Environment Act* requires that a statutory audit must be undertaken.

Where a site is not suitable for its current use or is polluting the offsite environment, EPA may require assessment and management using one of several tools available under the Act, including Pollution Abatement Notices, and Clean-Up Notices.

Victoria also has a system for the appointment of Environmental Auditors (Contaminated land). Auditors are appointed at the discretion of EPA. EPA issues guidelines on the appointment process. Only EPA approved auditors can carry out statutory audits of contaminated land.

New South Wales

The NSW EPA administers the following Acts that deal directly with the assessment, remediation and the management of contaminated sites. These Acts provide the EPA with a range of powers and responsibilities:

- *Contaminated Land Management Act 1997* - a process for investigation and remediating sites where contamination presents a significant risk of harm to human health or the environment;
- *Unhealthy Building Land Act 1990* - a process for declaring land, for health reasons, to be unsuitable for building;
- *Clean Waters Act 1970* - the removal, dispersion, destruction or mitigation of pollution or the source of pollution of waters;
- *Environmental Offences and Penalties Act 1989* - prosecutions for spillages, leaks and unlawful disposal of waste
- *Waste Minimisation and Management Act 1995* - controlling landfilling practices and disposal of contaminated soil.

The NSW Department of Urban Affairs and Planning (DUAP) and local councils deal with contaminated land through various landuse planning roles through:

- *The Environmental Planning and Assessment Act 1979* (EP&A Act) - a process to ensure that contaminated land is not rezoned or developed to allow a more sensitive use without adequate assessment of environmental and human health risks and, where necessary, remediation.

- *The State Environmental Planning Policy* (SEPP) 55 - Remediation of Land made under the EP&A Act and "Managing Land Contamination - Planning Guidelines" jointly authored with the EPA are in place to ensure the appropriate assessment of contamination issues throughout the planning process and the recording of relevant information.

Of other agencies, the NSW Department of Mineral Resources administers the provisions of the Mining Act 1992 relating to the rehabilitation of land after mining activities and the Land Titles Office, within the NSW Department of Land and Water Conservation, maintains the Central Register of Restrictions on land titles within NSW.

The following guidelines have been developed or endorsed by the NSW EPA for use by contaminated sites consultants, auditors and other stakeholders in NSW:

- NSW EPA 1994, Contaminated Sites: Guidelines for Assessing Service Station Sites, NSW Environment Protection Authority, Sydney
- NSW EPA 1995, Contaminated Sites: Guidelines for the Vertical Mixing of Soil on Broad-Acre Agricultural Land, NSW Environment Protection Authority, Sydney
- NSW EPA 1995, *Contaminated Sites, Sampling Design Guidelines*, NSW Environment Protection Authority, Sydney
- NSW EPA 1997, *Bananalands Contaminant Distribution Study,* NSW Environment Protection Authority, Sydney
- NSW EPA 1997, *Guidelines for Assessing Banana Plantation Sites,* NSW Environment Protection Authority, Sydney
- NSW EPA 1997, *Guidelines for Consultants Reporting on Contaminated Sites*, NSW Environment Protection Authority, Sydney
- NSW EPA 1998, *Guidelines for the NSW Site Auditor Scheme,* NSW Environment

Protection Authority, Sydney

- NSW Agriculture and CMPS&F 1996, Guidelines for the Assessment and Cleanup of Cattle Tick Dip Sites for Residential Purposes, Wollongbar
- NSW DUAP and NSW EPA 1998, *Managing Land Contamination - Planning Guidelines, SEPP 55 - Remediation of Land*, NSW Department of Urban Affairs and Planning, NSW Environment Protection Authority, Sydney.

Tasmania

Contaminated site management is currently undertaken within the scope and powers of the Environmental Management and Pollution Control Act 1994 (EMPCA). This Act was not developed specifically to deal with site contamination issues, however, there are a number of powers that can be used in this context. For instance, EMPCA presently states that those responsible for pollution should pay for any required remediation. In addition to provisions under EMPCA, advice has been provided to planning authorities regarding the need for assessment of potentially contaminated sites prior to rezoning. At this stage the Department of Primary Industries, Water and Environment reviews reports and provides "sign off" letters.

A contaminated sites management system is currently under development. In October 1996 the Contaminated Sites task force released a Position Paper for public comment. Taking account of submissions, this paper has been developed into a set of recommendations and a Cabinet Minute. It is proposed that this system be implemented via amendments to EMPCA, planning notes and guidelines. The major features of the proposed system include:

- Development of a formal system to ensure that planning authorities do not rezone land for residential or other "sensitive uses" without first being satisfied that it is not contaminated to the extent that it is unsuitable for this use.
- Once a potentially contaminated site is assessed and/or remediated a final judgement must be made regarding its suitability for its proposed use. It is proposed that Tasmania adopt a system used in several other states, whereby suitably qualified auditors are accredited to "sign off" on contaminated site assessments.
- A hierarchy of liability will be established for cleanup of sites that are causing environmental harm. Currently, liability only extends to the polluter. Under the proposed amendments the owner may also be liable in certain circumstances.

The guidance available to contaminated land professionals includes the recommendations of the task force, departmental information bulletins and nationally approved guidelines.

Commonwealth

There is no Commonwealth legislation dealing specifically with site contamination, nor any formal policy to guide Commonwealth land management entities when dealing with such matters. Management of land owned or occupied by the Commonwealth is the responsibility of the land-owning or -managing department, authority or agency:

- Commonwealth GBEs and statutory authorities may be required by Commonwealth legislation to comply with the requirements of States and Territories in which they operate. In other cases, whether Commonwealth organisations are legally obliged to follow State and Territory requirements depends on the legal situation in the particular case, based on the organisation concerned, its activities, and the relevant

State or Territory law and any relevant Commonwealth law;

- the *Airports Act* 1996 and *Airports (Environment Protection) Regulations* set out a comprehensive process for the assessment and remediation of contaminated sites on leased Federal airports. The process is centred on the polluter pays principle and allows for the Airport Environment Officer, a Statutory Office Holder of the Commonwealth, to require an expert assessor to be appointed to review and report against any site investigations undertaken. The Airports (Environment Protection) Regulations specify an expert assessor as someone who is formally recognised by the State in which the airport is located as suitably qualified. When carrying out an assessment, an investigator must have regard to the 1992 ANZECC/NHMRC *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*;
- although not formally required to do so, Commonwealth Departments, authorities and agencies also usually behave as a 'good neighbour' and aim to comply with the requirements of any States and Territories in which they operate.

This arrangement will continue, at least in the short term (eg. until the Measure on Assessment of Site Contamination is made and the Commonwealth National Environment Protection Measures (Implementation) Bill is enacted. The current approach may also change with any move towards formalising Commonwealth policy on contaminated sites.

The States and Territories play an active role at the time of disposal of Commonwealth land and the Commonwealth generally aims to clean up any contamination to a level suitable for the use proposed for the land concerned.

Australian Capital Territory

A Strategic Plan for Contaminated Sites Management (1995) was developed which set out the Government's broad policy approach to the management of contaminated land in the ACT. The Plan was based on the Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites 1992.

In the ACT, the 1992 Guidelines have been endorsed for use as the principal guideline for the assessment of site contamination. In addition to the 1992 Guidelines the ACT endorses for use, guidelines and standards endorsed by other jurisdictions, for specific aspects of assessment not covered by the 1992 Guidelines (eg. NSW EPA Guidelines for Assessing Service Station Sites.)

In the ACT contaminated sites are dealt with on an individual basis. In the absence of specific legislation, the provisions of the Environment Protection Act 1997 (the Act) apply. The Act provides the ACT with legislative provisions, which treat the various components of the environment (air, land, water and biosphere), as an integrated system.

2.3 Variations in Approach to the Assessment of Site Contamination

The above information provides some understanding of the differences in approach adopted by each jurisdiction. While in a number of jurisdictions there is a similarity in their approach to site contamination, significant variations also exist. An analysis of the different approaches suggests that the more significant variations relate to:

- the processes and methodologies used for the assessment of health and ecological risk;
- the processes for 'signing off' sites as suitable for use;
- criteria (eg. soil acceptance criteria);
- the levels of investigations required for assessing site contamination;
- the approaches to community consultation;
- the ways in which groundwater contamination is assessed;
- accreditation requirements for auditors and related professionals; and
- the ways data are collected, analysed and reported during the assessment of site contamination

These variations can lead to a number of often negative social, environmental and economic impacts as the community (including conservation groups and industry), must, at a national level, deal with a multiplicity of approaches to the assessment of site contamination. From a national perspective this can, in some cases, result in:

- some uncertainty over what is regarded as 'acceptable', both in terms of human health and environmental acceptability, when assessing a contaminated site;
- increased costs and reduced efficiencies for industry resulting from differences in jurisdictional data requirements;
- increased costs in developing individual approaches to comply with differing jurisdictional procedures and requirements;
- varying levels of commitment to community consultation across Australia;
- restrictions on the capacity of some professionals to work in all jurisdictions because of variances in accreditation requirements;
- reduction in community confidence in some assessment procedures to fully explore the health and ecological risks associated with a contaminated site because of perceived differences in accuracy and rigour across jurisdictions.

These inconsistencies and the resultant effects can, in some cases, cause increased costs and sub-optimal health and environmental outcomes in relation to the assessment of site contamination. This Measure is directed at removing some of those inconsistencies. Adoption of this Measure should result in:

- greater certainty over what is regarded as 'acceptable' when assessing a contaminated site;
- reduced costs and increased efficiencies for industry resulting from removal of differences in jurisdictional data requirements;
- reduced costs in developing individual approaches as jurisdictional procedures and requirements become more consistent;
- consistency in the approach to community consultation across Australia;
- increased opportunities for some professionals to work in all jurisdictions as accreditation requirements are harmonised;
- increased community confidence due to improvements in the in accuracy and rigour in the assessment of health and ecological risks associated with a contaminated site.

(For more detailed information on the social, economic and environmental impacts of the draft NEPM please refer to the relevant sections in this Impact Statement).

The NEPC was also cognisant of the expectations in the broader community, including conservation groups and industry, that a National Environment Protection Measure which included national guidelines on the assessment of site contamination should be developed as soon as possible.

Objectives of the Measure
The NEPC recognised that a Measure on the assessment site contamination would:

- enhance the ability of industry to understand and adopt sound environmental practices as part of its normal business procedures;
- provide the community with information on the issues involved in assessing contaminated sites;
- improve the quality of assessment of the potential health and environmental impacts of site contamination; and
- provide an accepted common basis to be used throughout Australia to assist assessors, environmental auditors, developers and regulators to avoid costly duplication in the development and application of assessment methods.

It is generally accepted that the adoption of the ANZECC/NHMRC Guidelines did result in improvements in site contamination assessment and management across Australia. However, in deciding to develop this Measure the NEPC recognised that the formal status afforded a Measure was far more likely to provide:
a) the level of national guidance required by those responsible for the assessment and management of contaminated sites; and
b) the appropriate level of assurance to the community that public health and environmental concerns were being properly addressed at the national level.

The development of a Measure for the Assessment of Site Contamination ensures that the existing ANZECC/NHMRC Guidelines on the assessment of site contamination are augmented and updated. It also allows new guidelines to be developed to take into account new information, criteria and technologies as they are developed for site assessment. The Measure is also seen as the most appropriate process to ensure that broadly based national support for guidelines occurs.

2.4 The Measure development process

2.4.1 Background
The foundation for the assessment and management of contaminated sites was laid down in the *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*, published by the Australian and New Zealand Environment and Conservation Council (ANZECC) and the National Health and Medical Research Council (NHMRC) in January 1992 ("the 1992 Guidelines").

Although most jurisdictions base their approaches on these Guidelines, they have no formal status and there remain significant variations between jurisdictions.

A systematic review of the policy and technical components of the 1992 Guidelines began in 1995, through the joint ANZECC/NHMRC Contaminated Sites Technical

Review Committee (CSTRC). This review decided that the Guidelines were basically sound, although they were deficient in several key technical areas. It was intended that these gaps be filled through the review process that was underway. It was then resolved that policy and technical documents related to Assessment of Site Contamination, drafted as part of the CSTRC's defined work program, form part of the National Environment Protection Measure for the Assessment of Site Contamination.

Responsibility for the work was transferred from ANZECC/NHMRC to NEPC in cooperation with NHMRC.

Given that the NEPC Acts confine the role of this Measure to "*general guidelines for the assessment of site contamination*" (Sec 14(1)(d)) the Measure principally covers aspects of site assessment of site contamination. It is, however, recognised that assessment cannot be undertaken independently of an understanding of the options for management and that assessment of the efficacy of some management aspects must also be reflected in the Measure.

2.4.2 Measure development

In December 1996, the NEPC, in accordance with Section 16 (1) of the NEPC Act, advertised in all metropolitan daily newspapers its intention to develop a Measure for the Assessment of Site Contamination. Actual development of the Measure began in June 1997. Public comments were sought on the scope of the Measure and the methodology to be used in developing the Measure.

Dr Bryan Jenkins, CEO, Department of Environmental Protection, Western Australia, a member of the NEPC Committee, was appointed as the Project Chair of this Measure. A NEPC Project Team for the Assessment of Site Contamination Measure was established consisting of a Project Manager drawn from the NEPC Service Corporation and technical/policy experts drawn from the Western Australian, Victorian and Queensland Governments. The Project Team also benefited from the inclusion health experts from the Queensland and South Australian health agencies acting as representatives of the National Health and Medical Research Council.

A Peak NGO Advisory Group was established. Peak industry, conservation and community groups were invited to participate. This Group provides high-level policy/technical advice to the NEPC Committee and is chaired by the Project Chair.

A Jurisdictional Reference Network was also established consisting of government representatives of all NEPC jurisdictions. Members are responsible for obtaining their Government's views and arranging consultation with interested parties within their respective jurisdictions.

2.4.3 Discussion Paper

In order to provide key stakeholders with an avenue to provide early input into the development of this Measure, the Project Team was tasked with developing, in the first instance, a Discussion Paper on the proposed Measure.

Development of the Discussion Paper also required the development of a number of draft policy documents and guidelines which were proposed for inclusion in the Draft Measure. Some of the draft Guidelines proposed for inclusion had already been developed eg. The draft guideline on *Laboratory Analysis of Potentially Contaminated*

Soils was developed through ANZECC and the draft Guideline on *Ecological Risk Assessment* was developed through Environment Australia. Other drafts were developed by experts from within government and the Project Team, while others were drafted by Consultants engaged by the NEPC Service Corporation.

During the development of the draft policy and guideline documents, technical reviewers were sought from health, industry and community representative bodies, to review the technical material developed and provide feedback to the Project Team. Those persons who were nominated by representative bodies then reviewed the drafts. Not all representative bodies nominated reviewers. The Project Team then considered the reviews and, where appropriate, the documents were adjusted.

This Discussion Paper, titled, "*Towards a National Environment Protection Measure for the Assessment of Site Contamination*" was released on 13 July 1998 by the NEPC Committee, and was followed by a two-month period of consultation aimed at key stakeholders. Copies were sent to all stakeholders registered on the NEPC database for this Measure and were also posted on the NEPC website.

The views of key stakeholders were then sought through meetings held with Project Team members and jurisdictional representatives in every State and Territory (and with Commonwealth stakeholders) during this period. Written submissions were also sought on any issue regarding the development of the formal draft Measure and Impact Statement. The NGO Advisory group participated in a major workshop on the Discussion Paper. Consultants from PPK Environment, who were engaged by the NEPC Service Corporation to assist the Project Team in developing an Impact Statement on the proposed Measure, facilitated this Workshop.

2.4.4 Response to Stakeholder submissions on the Discussion Paper

A total of 36 key stakeholder submissions were received on the Discussion Paper. Each submission was analysed and the comments considered by the Project Team when developing the Draft Measure and Impact Statement. A **Discussion Paper Summary and Response Report** was developed outlining the stakeholder submissions and the NEPC Committee response to those submissions.

The submissions generally supported the development of a Measure for the Assessment of Site Contamination. A number of submissions commented on the appropriateness of including a draft Guideline on the Assessment of On-site Containment of Contaminated Soil. It was submitted that the inclusion of what was seen as essentially a 'management' issue as a Guideline was not appropriate given that the focus of the Measure is on 'assessment' rather than 'management'. Subsequent legal advice has also suggested that the inclusion of this Guideline may be outside the scope of the Measure. Accordingly, the NEPC has decided that a Guideline on the *Assessment of On-site Containment of Contaminated Soil* should not be included in this Measure and that the finalisation of this Draft Guideline be managed through the ANZECC process.

The Discussion Paper Summary and Response Report was provided to the NEPC as part of the advice from the NEPC Committee on the development of the Draft Measure and Impact Statement.

2.4.5 Public release of Draft Measure and Impact Statement

Having considered the key stakeholder submissions on the Discussion Paper, the Project

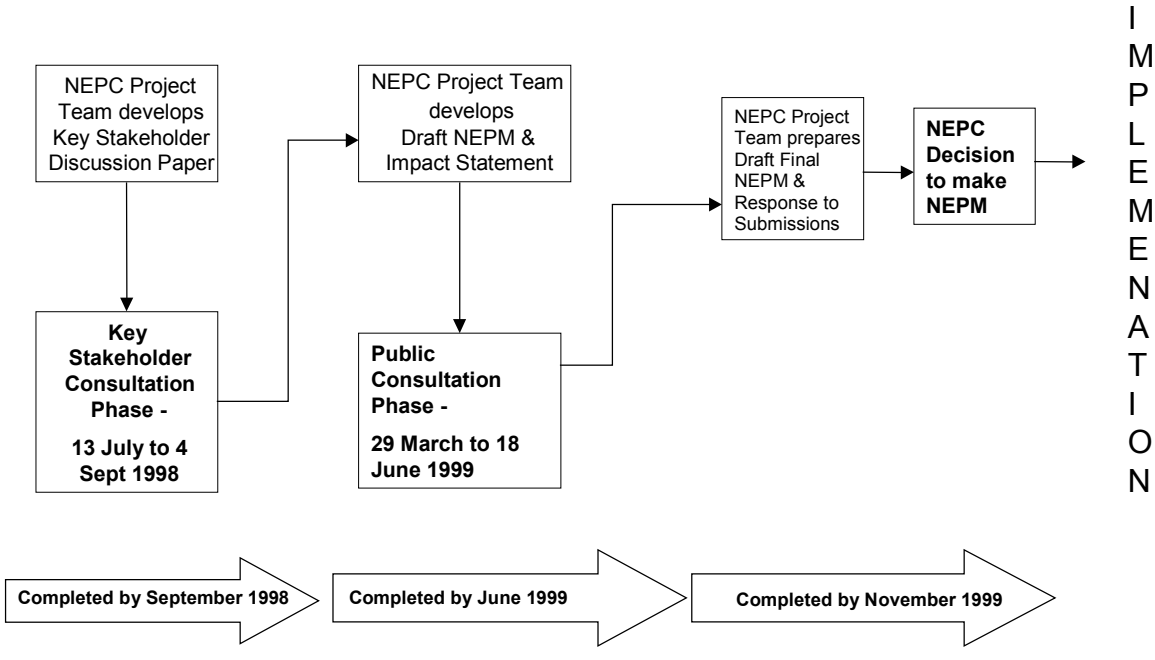
Team developed a draft version of the Draft Measure and Impact Statement, which was first considered by the NEPC Committee, and then forwarded to the NEPC for consideration for public release. The NEPC met on 12 March 1999 and, in accordance with Sections 17 and 18 (1) of the NEPC Act 1994, authorised the public release of the Draft Measure and Impact Statement for a period of three months for public comment and consultation.

The draft Measure and Impact Statement are available for public comment from **29 March 1999 to 18 June 1999**. Once the public submissions have been received, a final Measure will be developed in the latter half of 1999, taking into account those submissions. A formal Summary and Response Document outlining the public submissions and the NEPC's response will also be developed. The NEPC will then consider making the Measure for the Assessment of Site Contamination, taking into account the public submissions and the NEPC Committee's advice. If the NEPC agrees to make the Measure (to be considered in November 1999) it will then be laid before both Houses of the Commonwealth Parliament where it can be allowed or disallowed.

Diagram (1.1) shows an outline of the development process for the Assessment of Site Contamination Measure.

Diagram 1

NEPM DEVELOPMENT PROCESS
Assessment of Site Contamination NEPM



3. INTRODUCTION TO THE DRAFT MEASURE FOR THE ASSESSMENT OF SITE CONTAMINATION

The Draft Measure consists of a number of clauses containing;

- Title (citation),
- Definitions,
- Heads of power,
- Purpose and desired environmental outcome
- Policy Framework
- Schedule A being the recommended general process for the Assessment of Site Contamination.
- Schedule B1–10 being the draft Guidelines for use when assessing site contamination.

3.1 Policy framework

The policy framework defines a set of principles under which detailed guidelines on the Assessment of Site Contamination can be applied for the assessment of pre-existing site contamination.

3.2 Schedule A

Schedule A is a flowchart that outlines the general process for the assessment of site contamination and provides guidance on when the draft Guidelines can be applied.

3.3 Draft Guidelines (Schedule B 1 to B 10).

Each Schedule (B–10) (see Table 1.2) refers to a draft Guideline relevant to the policy framework. Each Draft Guideline is designed to address the priority issues that were identified through the ANZECC/NHMRC/CSTRC and NEPC processes. They include a draft Guideline on Investigation Levels for Soil and Groundwater that integrates a range of current and proposed soil investigation levels.

All draft Guidelines proposed for inclusion in the Measure are available for comment.

3.4 Draft Guideline Source and Availability

The ten draft Guidelines (Schedules B1–10) included in the draft Measure originate from a variety of sources, including the NEPC.

Please note that the Draft Measure, including the draft Guidelines and Impact Statement are available on the NEPC website: www.nepc.gov.au .

Guideline source and availability is outlined below (Table 1.2)

Table 1.2

The NEPC Service Corporation will be using electronic means as the preferred method of distribution of documents. The documents are available on the NEPC website, www.nepc.gov.au, by e-mail, CD ROM (in PDF Format, with an Adobe Acrobat reader supplied), or disc (in Word 8.0 format only). No charge will be made for copies of the documents in electronic format, however, a charge will be applied for printed copies. (Please note: Printed copies will be provided at no charge to those who do not have access to a computer or are financially disadvantaged).

DRAFT GUIDELINES, SOURCE AND AVAILABILITY

Draft Guideline	**Source**
(Draft) Guideline on Investigation Levels for Soil and Groundwater	NEPC website: www.nepc.gov.au or Contact NEPC Service Corporation
(Draft) Guideline on Data Collection, Sample Design and Reporting of Data	
(Draft) Guideline on Laboratory Analysis of Potentially Contaminated Soils	
(Draft) Guideline on Health Risk Assessment Methodology	
(Draft) Guideline on Ecological Risk Assessment	
(Draft) Guideline on Assessment of Groundwater Contamination	
(Draft) Guidelines on Health-based Investigation Levels	
(Draft) Guideline on Community Consultation and Risk Communication	
(Draft) Guideline on Protection of Health & the Environment During Assessment of Site Contamination	
(Draft) Guideline on Competencies & Acceptance of Contaminated Land Auditors and Related Professionals	

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Draft Guidelines should not be used for any purpose other than as a basis for providing comment to the NEPC.

3.5 Relationship of Draft Guidelines to ANZECC/NHMRC/ CSTRC Work

Table 1.3 details the relationship of the proposed Measure guidelines to previous work. Some of the issues relating to assessment have already been covered by the ANZECC/NHMRC/CSTRC (Contaminated Sites Technical Review Committee) work, but only in general terms. A substantial body of new work has therefore been developed by the Project Team (with assistance from consultants in some cases) to cover more comprehensively aspects relating to the Assessment of Site Contamination outlined in the ANZECC/NHMRC Guidelines (1992).

Given that the NEPC Act limits the Measure to assessment of site contamination, not all parts of the ANZECC/NHMRC guidelines are covered by the scope of the proposed Measure, especially aspects relating to the prevention and management of contaminated sites. It is anticipated that these will be dealt with through other mechanisms such as ANZECC.

Table 1.3
Relationship of Measure Guidelines to previous work

Stage/Functional Area in the Assessment/Management of Contaminated Sites Process	1992 ANZECC/NHMRC Guidelines/CSTRC Workplan	Measure Guidelines
Strategic Framework	Policy basis	Policy Framework
Implementation Strategies	Framework provided	Not covered
Assessment and Clean-up Preventative Measures Decommissioning considerations Identification Initial evaluation	Framework provided	 Mentioned in framework Not covered 2,3 2,3
Nature and extent of contamination site investigation sampling and analysis health considerations environmental considerations community involvement occupational health and safety	Framework provided	 2,3 2,3,4,6,7 4,9 5,9 8,9 (partial coverage 9 (partial coverage)
Groundwater Contamination	Mentioned but not addressed	2,6
Environmental and Health Impacts toxicity exposure assessment risk assessment	Framework provided. Environmental and Health risk assessment documents drafted	 4,5 4,5 4,5
Site Specific Criteria Soil criteria Investigation levels Public health Environmental health	Framework provided. Guideline for soil investigation levels drafted.	 1,4,7 1,4,5,7 1,4,7 1,5,6
Validation and Future Monitoring	Referred to but not addressed	Not covered
Reporting Requirements	Framework provided	2,3
Risk Characterisation	Framework provided	4,5,6
On-site containment	Not mentioned. ANZECC to develop new guidelines	Not covered
Competencies of Auditors/related professionals	Not mentioned	10

Key to Draft Measure Guidelines:
1. Investigation Levels for Soil and Groundwater
2. Data Collection, Sample Design and Reporting of Data
3. Laboratory Analysis of Potentially Contaminated Soils
4. Health Risk Assessment Methodology
5. Ecological Risk Assessment
6. Assessment of Groundwater Contamination
7. Health-based Investigation Levels
8. Community Consultation and Risk Communication
9. Protection of Health and the Environment During Assessment of Site Contamination
10. Competencies and Acceptance of Contaminated Land Auditors and Related Professionals

3.6 Purpose and Desired Environmental Outcome of the Assessment of Site Contamination Measure

3.6.1 Purpose of the Measure

The purpose of the Measure is to establish a nationally consistent approach to the assessment of site contamination where it has occurred and to ensure sound environmental management practices by regulators, community, assessors, environmental auditors, landowners, developers and industry.

3.6.2 Desired Environmental Outcome

The major objective of this Measure is to achieve the proposed *desired environmental outcome* for this Measure which is:

> "the development of an efficient and effective national approach to the assessment of site contamination which allows for adequate protection of human health and the environment".

3.7 Nature of Site Contamination

Contamination is defined as the condition of land or water where any chemical substance or waste has been added at above background level.

It is recognised that in certain circumstances the addition of substances which raises the background levels of soils is a valid and legitimate activity. While some soils may have raised background levels, they may pose no risk for the current or proposed use. In some cases, the raised levels may be an essential requirement for the current use. For example, materials are often added to soil to improve its suitability for current uses such as yield improvement in agriculture. Such valid activity may raise background levels but will not necessarily introduce a risk, particularly where it is undertaken in accordance with relevant statutory laws and best practice guidelines.

Background level refers to ambient concentration levels of contaminants in the local area of a site. For example, high levels of some materials in naturally occurring mineralised rock and soils (eg. chromium) may be a source of contamination in certain localities.

The most common form of contamination is of land, however, contamination may also apply to groundwater. Contamination of soil on a site is often the source of groundwater pollution. Historically, contamination of soil and groundwater has principally resulted from the industrial manufacture, use and disposal of chemicals. However, contamination is not limited to industrial sites. Commercial and agricultural land may also be chemically contaminated. Activities which may result in contamination include (ANZECC/NHMRC; 1992):

- disposal of wastes (controlled or uncontrolled);
- accidental spillage;
- leakage during plant operation;
- storage or transportation of raw materials, finished products or wastes;
- spreading of sewage sludge;
- deposition from the atmosphere from an industrial site;
- migration of contaminants into a site from neighbouring land, either as a vapour, leachate or movement of liquids through the soil;
- use of agricultural chemicals.

It is noted that, in some localities, background concentrations of certain chemicals in the soil may be a source of health and environmental concern for certain land uses.

Whilst any site used for industrial, commercial or agricultural activities can potentially be contaminated, experience has shown that certain activities have greater likelihood of giving rise to contamination more frequently than others. Examples of such industries are given below (ANZECC/ NHMRC; 1992). This list is by no means exhaustive, and the presence of contamination on any particular site can only be confirmed by adequate site assessment.

- Agricultural/horticultural activities;
- Airports;
- Asbestos production;
- Brickworks;
- Chemicals manufacture and formulation;
- Defence works;
- Electroplating and heat treatment premises;
- Explosives factories;
- Fertiliser manufacturing plants;
- Gas works;
- Mining and extractive industries;
- Oil production, treatment and storage;
- Pesticide manufacture and formulation;
- Pharmaceutical manufacture and formulation;
- Power Stations;
- Scrap Yards;
- Service Stations;
- Transport/Storage Areas;
- Waste treatment plants in which solid, liquid, chemical, oil, petroleum, or hospital wastes are incinerated, crushed, stored, processed, recovered or disposed of;
- Wood preservation.

Contamination may also occur as a result of an accident during transport, or as a result of a fire involving hazardous chemicals.

Contamination of land or groundwater can be caused by a single incident (eg. spill of chemical from a ruptured storage tank), or due to the accumulation of a contaminant in an area over an extended period of time (eg. slow leak in process equipment).

3.8 Scope of environmental problems associated with site contamination

This section provides background information on the current situation in Australia with regard to site contamination impacts. This evaluation of current impacts is designed to provide a benchmark of existing impacts against which the Measure impact assessment can be made.

3.8.1 General

Recognition of the importance of the human health and environmental impacts of contaminated sites is a relatively new issue in Australia. The chemical substances which cause contamination can migrate by a variety of methods to human and

ecological (plants and animal) receptors. The exposure of sensitive receptors to the chemicals at sufficiently high levels can result in a wide variety of toxic effects. Although reported occurrences of such toxic effects are not common they are of sufficient concern due to the biophysical nature of the impacts. Of significance is the public reaction to risks posed by contaminated sites. Due to the difficulty in visualising the contaminants or recognising the exposure, contaminated sites can offer an unseen hazard. This insidious and involuntary risk contributes to what is perceived to be a very low tolerance of the risks from contaminated sites within the public at large. Given this intolerance, the impact of contamination on land use can be significant. This in turn can have dramatic impacts upon people's perception of their quality of life and the value of the land. Thus, the liabilities and economic impacts from contaminated land can be substantial.

The scope of the problem of site contamination in Australia is still largely uncertain and depends to some extent on the criteria used for defining contamination. There have been widely varying estimates of contaminated sites Australia wide. Some reports include landfills and mining activities in the total sum of contaminated sites. ANZECC/ NHMRC (1992) suggested that were approximately 10,000 potentially contaminated sites in Australia. In addition, hundreds of sites which had been used for waste disposal and mining activities had the potential to be sources of soil and groundwater contamination. Other estimates at that time put the number of potentially contaminated sites in NSW alone at 60,000, approximately 7,000 of which would require remedial action (Rowe & Seidler; 1993).

A 1997 ANZECC Fellowship Report proposes that there are approximately 80,000 potentially contaminated sites Australia wide. This report estimates that New South Wales and Queensland both contain 30,000 potentially contaminated sites while in Victoria there is an estimated 10,000 contaminated sites. South Australia and Western Australia are thought to contain 4,000 contaminated sites each while the Northern Territory was estimated to contain 1,000 potentially contaminated sites. Both Tasmania and ACT have an estimated 500 contaminated sites. Other references from Australian States and Territories, however, are inconclusive. In its 1998 State of the Environment Report, Western Australia stated that "detailed information on the extent and severity of contaminated land in Western Australia is not available". However, a figure of "over 1,500 contaminated sites are thought to exist...". In 1992 DEP Tasmania commented that "the number of potentially contaminated sites is unknown", however, "the total number of potentially contaminated sites is in the order of thousands".

The estimates above rely on self-reporting and different case definitions, eg. 'potentially contaminated sites' are reported in some jurisdictions, whereas others refer to 'contaminated sites'. Queensland has a rigorous notification mechanism, backed up by severe penalties for non-notification. The Queensland register of potentially contaminated sites has 24,000 properties on it. Whilst there are some instances where users are unlikely to have contaminated soil (eg. areas that are in enclosed buildings), there are also instances of non-reporting detected by due diligence investigations and an estimate of 20,000 contaminated sites is considered to be reasonable by Queensland authorities. Extrapolation nationally would result in an estimate of 200,000 contaminated sites.

3.8.2 Current Environmental Impacts from Site Contamination

(Please refer to each section on the draft Guidelines for more detailed discussion on the environmental, social and economic impacts of the draft Measure).

Key environmental or ecological impacts from site contamination include:

- reduced or impaired function within the soil profile of the site contamination;
- toxic effects within plant species ranging from failure to thrive to lethal impacts;
- impacts to fauna either directly from the contaminants in the soil, or via ingestion of plants which have accumulated the contaminants of concern;
- the build up of contaminants within the food chain;
- environmental deterioration of other segments of the environment due to migration of the contaminants (to groundwater, surface water or marine receptors, or to the air segment) - the direct impacts from the contaminated site may not produce a measurable or significant impact, but for larger receptors such as a river or lake, the increased loading of contaminants will have a cumulative effect.

Although impacts to the environment from contaminated land have been reported, and are considered important issues to manage, the focus of current contaminated land management is towards the protection of human health, and management of financial liabilities associated with contaminated land.

3.8.3 Current Social Impacts from Site Contamination

The most significant concern with contaminated sites is that the presence of certain contaminants may pose immediate or long-term potential impacts to human health or the environment. Some contaminants have the potential to be toxic, carcinogenic, teratogenic, or mutagenic to humans and/or other organisms at particular dosages (eg. some polycyclic aromatic hydrocarbons such as benzo(a)pyrene). Others are persistent and bioaccumulating, even when present in minute ambient concentrations (eg. some chlorinated pesticides such as DDT). For some contaminants, significant risk to health only occurs when the contaminant is present in relatively high concentrations (eg. diesel fuel). Certain contaminants can detrimentally affect the integrity of building and service structures. (It should also be noted that volatile contaminants can also provide flammable or explosive mixtures which can lead to serious injury, even death).

Impacts are directly related to the exposure routes available to the contaminant. Human health exposure routes include inhalation and ingestion of soil, and uptake and subsequent bioaccumulation by plants and animals. In residential areas, the most important and sensitive exposure route is usually the ingestion of contaminated soil by children.

Aesthetic issues also arise from contaminated sites. Concentrations of substances which are not shown to have detrimental health impacts can still give rise to concerns regarding how the site is perceived. These can be visual impacts such as discolouration, or impacts such as malodorous soils.

Possibly the most significant social impact from contaminated sites, and certainly the most common, relates to the management of stakeholders' concerns. Typically, residents who perceive they may be impacted by a contaminated site (or by the activities to manage the contamination) are highly concerned about the potential health, environmental and economic impacts. It is thus vital to have consistent, validated and

acceptable methods for assessing such sites so that consultation processes can aim to meet these concerns.

Lastly, it should be noted that contaminated site remediation taking place in Australia includes a significant number of projects in which heavy equipment is used as part of the remediation, (eg for excavation). These site works are inherently 'risky' and can result in serious injury, even death. In addition, exposure of workers to contaminants in the process of assessment or remediation of contaminated sites may be significant and may lead to harm. Application of health and safety protocols for contaminated site assessment and remediation is an important issue.

3.8.4 Current Economic Impacts from Site Contamination

Contamination on a site commonly becomes an issue when it is to be rezoned or redeveloped for a more sensitive land use. The change of land use may provide exposure pathways which can potentially affect human health or the environment, and also cause occupational health concerns during redevelopment. Typically, such issues will arise during redevelopment of an industrial site for use as a residential zone. Public awareness of the potential issues associated with such sites has increased significantly in the past decade with a recognition that site assessment should be carried out prior to such activity.

In addition, the act of changing either the landuse or the owner of a property often highlights a liability which has not previously been evaluated. The liability for a contaminated site is implicitly related to the comparison of the contaminant levels at the site with acceptance criteria for the proposed land use for the site, (generally, the more stringent the acceptance criteria, the higher the liability associated with the management of the contaminated land). The ready availability of generic assessment / investigation criteria, and the use of appropriate acceptance criteria for any given land use is an important factor in contaminated site assessment. However, the use of site specific health risk assessments is beginning to allow contaminated land to be brought into use with less stringent (but still 'safe') site specific acceptance criteria.

3.8.5 Current Levels of Contaminated Land Assessment Expenditure

The magnitude of expenditure in Australia associated with contaminated land management is poorly researched, but the following estimation has been developed for this Impact Statement.

It is estimated that the current cost of site contamination assessment activities in Australia is approximately $60 million per annum. This figure has been derived from an evaluation of the current level of contaminated site assessment business within the consultant community, which undertakes by far the majority of contaminated land assessments on behalf of landowners. The figure is based on the following conservative estimated cost breakdown:
(Of these costs, the following breakdown has been estimated, using the $60M figure):

Consultant/environmental specialist costs	$20M
Laboratory costs	$20M
Contractor costs, (typically drilling / well construction)	$15M
Industry management costs	$5M
TOTAL	$60M

These costs do not include the following:

- regulatory costs;
- research costs (institutions etc);
- economic impacts relating to land value (ie the loss of value in the land due to being contaminated/unsuitable for use, the ensuing liabilities, the improvement in land value from assessment/remediation, the economic improvements associated with bringing land back into the development cycle).

The petroleum industry in Australia is one of the most conspicuous industries which manages contaminated land. It is estimated that the industry currently spends approximately A$40M per annum on site assessment and remediation, with approximately A$15M per annum being spent on assessment. This industry represents approximately one quarter of the commissions for site assessment, also placing current Australian expenditure levels at approximately $60M per annum.

As a further "reality check" on this estimate, experience in the contaminated site assessment and management area suggests that assessment activities are approximately 20% of the total assessment and remediation expenditure. This would indicate that the current economic activity in contaminated site assessment and remediation is of the order of $300M per annum. This figure compares favourably with the estimated figure of US$194M per annum for the Australian contaminated site business in the USEPA 1996 report on the global environmental industry ("The Global Environmental Industry: A Market Needs Analysis").

These estimated 'baseline' numbers have been used as a basis for evaluating the economic impacts from the proposed Measure. The NEPC would be keen to receive information in response to this draft Measure and Impact Statement which could refine these baseline cost estimates.

3.9 The International Context

The international scope of the problem of site contamination is large. European countries have been aware of the problems associated with contaminated sites for many years. It is a problem acknowledged to exist in many industrialised countries. The Netherlands, for example, has identified over 100,000 sites as potentially contaminated, with 10,000 sites confirmed as contaminated. Similarly, over 50,000 potentially contaminated sites have been identified in West Germany (ANZECC/ NHMRC, 1992).

There appears to be an increasing trend, in developed countries, of commitments made by governments to assess and remediate contaminated sites. Environment Canada, in its Plans and Priorities Report for 1998/99, has committed to playing a leadership role in addressing the issue of site contamination by focusing on hotspots of federal concern. The USEPA has developed a 'Brownfields Initiative' to aid with identification, assessment and cleanup of abandoned or idle commercial sites which are potentially contaminated. It is thought that there are tens of thousands to over 500,000 sites in the USA.

On a global scale, the cost of analysis and remediation of site contamination is estimated to be US$32.5 billion ("The Global Environmental Industry: A Market Needs Assessment", USEPA 1996). Australia comprises a small proportion of this with estimated costs totalling US$194M (ibid).

The following provides an outline of global trends in site assessment:

3.9.1 Policy Trends

- Policy development internationally is often a reflection of the cultural, economic and geographic situation of the country in question. For example in The Netherlands, concerns over potential impacts to groundwater (a primary source of drinking water) has led to a highly developed policy structure for assessment, and a quite different approach to remediation. As the Netherlands is densely populated the opportunities for landfilling of contaminated soils are minor and much more emphasis is placed on *in situ* or *ex situ* remediation, to the extent that government subsidies are available for development of treatment technologies.
- Performance versus Prescription: Internationally, regulators appear to have taken up the approach of risk-based management of site contamination and support the use of tools such as health risk assessment. This performance-based approach is bred by the recognition that the variability of site contamination scenarios cannot be covered by regulations. However, the opposite tends to be the case with regard to data collection and reporting methodologies, where concerns of variability in sampling and analytical methodologies have led to a prescriptive approach to methodologies and documentation of assessments.

3.9.2 Technical Trends

Commercial pressures such as competition and the need to innovate to succeed have led to several developments in site assessment technologies in recent years. Foremost amongst these are:

- refined field methodologies which enable:
  - more rapid collection of samples;
  - screening of samples on-site;
  - site screening methodologies such as geophysical tools (eg. ground penetrating radar); and,
  - more cost effective collection of groundwater samples.
- site specific risk assessment: as the algorithms used in risk assessment become more refined, and more widely accepted, their use for individual sites has expanded significantly. This has led to a rise in the availability of computer tools to drive such assessments. The key factors in enabling proper use of such tools is the ability of the risk assessor to correctly utilise such models (their simplicity of operation can lead to their use by poorly qualified assessors who fail to use the systems/tools correctly).

3.10 Environmental Impacts of not Making a Measure

If a Measure is not made, governments will not have the benefit of nationally accepted guidelines that they can specify when evaluating the potential environmental condition of land. Without the use of nationally endorsed guidelines and the inclusion of a risk-based assessment methodology which allows for consideration of site-specific aspects, the accuracy and therefore validity of assessment is not likely to significantly improve.

Not making a Measure would also deny the introduction of a nationally accepted methodology for Health Risk Assessment and Ecological Risk Assessment and the development of appropriate investigation levels for a range of human and ecological exposure settings. Feedback on the draft Guidelines released with the NEPC

Assessment of Site Contamination Discussion Paper suggests that making this Measure represents a significant opportunity to advance the quality of assessment of the potential health and environmental impacts of site contamination. Not making the Measure could deny the opportunity to deliver on Australia's strong commitment to conserving, protecting and restoring the health and integrity of Australia's ecosystem.

3.11 Regional Environmental Differences

In making any Measure, the National Environment Protection Council must have regard to, inter alia, "any regional environmental differences in Australia" (section 15(g) of the *National Environment Protection Council Act 1994* (Commonwealth)) and the equivalent provisions in the corresponding Acts of other participating jurisdictions. In addition, section 17(b)(v) of the Act requires that the Impact Statement to be prepared with the draft Measure include "a statement of the manner in which any regional environmental differences in Australia have been addressed in the development of the proposed Measure".

While the NEPC Acts do not provide any explicit definition of the term "regional environmental differences", its meaning is nonetheless made clear. The legislation, and sections 15 and 17 in particular, provides a clear indication that the term is not intended to encompass regional economic and social differences.

The term "regional environmental differences" is included in the provisions identified above in recognition of the fact that fundamental environmental characteristics of different regions may be very different, and that to apply simplistic uniform approaches that do not reflect regional environmental differences, would not further the desired outcome of equivalent protection espoused in the legislation. For example, the issue of salinity in water bodies would provide a clear example of the need for regional environmental differences to be taken into account in developing Measure standards, goals and guidelines for water quality.

Proper assessment of site contamination is determined by a combination of factors, including such matters as regional environmental differences relating to soil, climate and biota, complicated in some cases by physical factors such as topography and urban form. NEPC has considered the relevance of regional environmental differences in Australia in the development this draft Measure and associated draft Guidelines.

Accordingly, where possible, the Measure and associated draft Guidelines recognise the wide variation in soil, biota and climatic and other environmental conditions across Australia and endeavours to take into account the wide variation in physiological responses to various contaminants across any community. NEPC has concluded that the application of a simplistic uniform approach, which does not reflect regional environmental differences, could not practically reflect the fundamental environmental characteristics of different regions in the Assessment of Site Contamination. Where regional environmental characteristics are considered important the NEPC has concluded that these differences should be identified at national and regional levels eg in the development of a Matrix of Investigation Levels for Soil and Groundwater. Therefore some aspects of the Measure will apply across Australia as in the case of Health Investigation Levels, while others will be region-specific as in the case of Regional Environmental Investigation Levels.

3.12 Implementation

The NEPC Act deliberately leaves the implementation of Measures to each individual jurisdiction. This allows for local knowledge, conditions and systems to be considered and applied in managing site contamination.

Once the Measure is made, all governments are required to report annually on progress towards implementation of the Measure. To comply with the Measure, governments are expected to adopt the Measure as part of their site contamination strategies. There is no other requirement placed upon governments.

Each government will continue to assess the priority to be given to site contamination initiatives in the context of overall government programs. The Measure will provide a sound basis for assessing site contamination and will, therefore, assist governments in setting priorities. Most governments already have well developed site contamination strategies that accord with the Measure proposals.

The annual compliance reports from each jurisdiction to the NEPC will be tabled in each of the parliaments and made public.

A detailed overview of how each jurisdiction might implement this Measure, should it be made by NEPC, can be found in Appendix 4.

3.13 Alternative methods for achieving the outcome of the proposed Measure

Section 17(b) of the NEPC Act requires that an Impact Statement include:

> '*a statement of the alternative methods of achieving the desired environmental outcomes and the reasons why those alternatives have not been adopted*'.

There are five main alternatives to a Measure which must be considered in the light of their ability to deliver the desired environmental outcomes.

These are:

- (1) the Commonwealth enacts legislation on the Assessment of Site Contamination;
- (2) review of NHMRC/ANZECC guidelines;
- (3) States, Territories and the Commonwealth enact mirror or complementary legislation on the Assessment of Site Contamination;
- (4) All jurisdictions enter into an agreement to ensure national consistency in the Assessment of Site Contamination; and
- (5) maintain the status quo.

3.14 Commonwealth enacts legislation on the assessment of site contamination

Given its powers under the Constitution, the Commonwealth may not have the power to introduce legislation which could deliver the desired environmental outcome being pursued through the development of this Measure. The Commonwealth would need to take account of the significant resources already dedicated to the establishment of the NEPC to develop Measures for the protection of the environment and its commitments under the IGAE before attempting to introduce its own legislation on this matter. In addition, the Commonwealth would not be likely to pursue a unilateral approach, given

the cooperative approach being taken at present in relation to environmental issues, particularly through the NEPC. It is recognised that unilateral Commonwealth action could alienate State and Territory environment agencies.

Another key issue which mitigates against adopting this alternative method of achieving the desired environmental outcome is that the Commonwealth is not well placed to take on a hands-on role in land management issues such as contaminated sites. The Commonwealth would also need to invest significant resources to duplicate systems already in place at State and Territory level. Parliaments have specifically legislated for National Environment Protection Measures in order to overcome the inherent difficulties of any Commonwealth legislated approach on the Assessment of Site Contamination.

3.15 Review of ANZECC/NHMRC Guidelines

The ANZECC/NHMRC Guidelines have been in place since 1992 and have been adopted either in whole or in part by most jurisdictions. However, there still remain differences in the approach adopted in each jurisdiction in the way assessment is conducted. Not all the Guidelines have been fully accepted by all jurisdictions. Governments, industry and the community recognise that a review of existing ANZECC/NHMRC Guidelines is required and that gaps in those Guidelines need to be addressed. ANZECC and the NEPC, in consultation with the NHMRC, have agreed that the best mechanism to review the existing ANZECC/NHMRC Guidelines and develop any new guidelines for the Assessment of Site Contamination is through the development of a Measure. The open nature of the Measure development process and the fact that any revised or new Guidelines will have the force of a Measure is seen as a positive step in the area of Assessment of Site Contamination.

3.16 States, Territories and the Commonwealth enact mirror or complementary legislation on the Assessment of Site Contamination

An agreement to enact mirror or complementary legislation on the Assessment of Site Contamination would possibly provide for a level of national consistency in the Assessment of Site Contamination.

The issue of how such mirror or complementary legislation should be developed and the impacts of this approach would need to be addressed. This could be achieved by agreement, either roughly in line with the proposed NEPC process or by each jurisdiction agreeing to handle this issue within their jurisdiction in some way. In the latter case, a number of jurisdictions would need to establish mechanisms of the type currently envisaged under the draft Assessment of Site Contamination Measure. This approach would not necessarily provide a sufficient degree of national consistency or compatibility in the assessment of site contamination as each Parliament would have the right to amend any proposed legislation, possibly leading to differences in the legislated approach to the assessment of site contamination. These differences may reflect regional environmental differences but may also reflect more political influences, such as regional economic differences, a factor not necessarily in keeping with the national approach sought through the development of this Measure.

Changes to jurisdiction-based legislation could also be made unilaterally and would not be subject to the same public scrutiny at a national level as Measures, nor would there be any jurisdictional obligation to report on the implementation and effectiveness of the legislation.

This approach does not appear to offer any obvious advantage over Measures as a similar process would be required to develop complementary legislation and no legal obligations would fall on jurisdictions to report on the implementation and effectiveness of the legislation.

3.17 All jurisdictions enter into an agreement to ensure national consistency in the assessment of site contamination

An overarching agreement would provide for a common starting point for the development and implementation of national consistency in the assessment of site contamination.

Again, the issue of how such consistency should be developed and the impacts of this approach would need to be addressed. Similar to complementary legislation, this could be achieved by agreement, either roughly in line with the proposed NEPC process or by each jurisdiction agreeing to handle this issue within their jurisdiction in some way. In the latter case, a number of jurisdictions would need to establish mechanisms of the type currently envisaged under the draft Assessment of Site Contamination Measure. This approach would not necessarily provide a sufficient degree of national consistency or compatibility in the Assessment of Site Contamination.

Such an approach would not necessarily have any legislative basis, making withdrawal from any agreement relatively easy compared to that of repealing or amending legislation.

This approach does not appear to offer any obvious advantage over Measures as a similar process would be required and no legal obligations would fall on jurisdictions.

3.18 Maintaining the status quo

Arguments to maintain the *status quo* imply that the present approach to the development guidelines for the Assessment of Site Contamination, whereby individual jurisdictions develop their own guidelines (or adopt/modify already developed guidelines) is the most efficient. It also assumes that any 'natural evolution' of a national approach to the Assessment of Site Contamination would address issues such as equivalent protection and variations in jurisdictional approaches. The *status quo* has the potential to create, or may have already created, market distortions or pollution havens, and may not be in keeping with National Competition Policy.

The *status quo* needs to take into account systems as they would naturally evolve and does not necessarily mean that nationally consistent Assessment of Site Contamination guidelines would not develop at some point. It is recognised that there are a number of developments in jurisdictions which will result in more consistency in the approach to this topic. Some improvements are the result of national strategies eg the development of the Health-based Investigation Levels by the National Environmental Health Forum (NEHF) and the work undertaken by ANZECC. Other strategies have been developed

by individual jurisdictions aimed at improving particular aspects of their approach to the Assessment of Site Contamination, such as mutual recognition of auditors etc.

Under the *status quo* it is likely that some jurisdictions will continue to institute different approaches to the assessment of site contamination, despite the reasonably wide acceptance of the ANZECC guidelines. At present, approaches to the assessment of site contamination differ in a number of areas between jurisdictions, reflecting their often different local requirements and agendas. Costs are also incurred by some jurisdictions in developing and revising their respective approaches to the assessment of site contamination, resulting in duplication of costs and effort. The different procedures and interests of each jurisdiction can also result in additional industry costs and effort in providing data and input into developing individual approaches during the development or revision of guidelines.

At present opportunities for community input during the development of jurisdictional approaches to the assessment of site contamination varies from jurisdiction to jurisdiction. It is also unclear whether the development or revision of a nationally consistent approach to the assessment of site contamination would evolve under these circumstances would provide industry and the general community with the level of access and input legislated for, in the development of a Measure. It could also be expected that any evolution towards a nationally consistent approach to the Assessment of Site Contamination that did take place would occur at different rates among jurisdictions depending on their environmental management experience and supporting systems already in place, thus making it more difficult for industry to plan at the national level.

The ‘status quo’ option does not deliver any improved national uniformity. Consequently, the development of a Measure was recommended as the preferred option.

4. ASSESSMENT OF DRAFT MEASURE

4.1 Stakeholder views on proposed Measure

In July 1998, the NEPC Committee released a Discussion Paper on the Assessment of Contaminated Sites to key stakeholders who had registered with the NEPC Service Corporation as having an interest in this Measure. Consultation involving meetings with key stakeholders occurred in all jurisdictions and submissions were sought on the Discussion Paper. Stakeholders raised a number of issues during the Discussion Paper consultation period. Some of the key issues included:

- General support for the proposal to develop a Measure for the Assessment of Site Contamination.
- Concern as to the appropriateness of including a draft Guideline on the Assessment of On-site Containment of Contaminated Soil. The general view was that the inclusion of what was seen as essentially a 'management' issue as the Guideline was not appropriate, given that the focus of the NEPM is on 'assessment' rather than 'management'.

4.1.1 Response

Having considered the submissions the NEPC agreed that a Guideline on the Assessment of On-site Containment of Contaminated Soil not be included in this NEPM and that the finalisation of this Draft Guideline be managed through the ANZECC process.

4.2 Overview of Draft Measure

The Draft Measure consists of a policy framework for the assessment and management of contaminated sites in Australia. This policy framework is designed to support the ten draft Guidelines included in Schedule B of the draft Measure. The policy framework includes definitions of relevant terms and prescribes those issues not covered by the Measure.

A flow chart detailing the proposed asssessment process is included in the Draft Measure (Schedule A).

4.3 Overview of Environmental, Social and Economic Impacts of Draft Measure

4.3.1 Environmental Impacts

Quality of Accuracy of Assessment

A number of approaches are currently used throughout Australia for the Assessment of Site Contamination. The ANZECC/ NHMRC (1992) *Guidelines for the Assessment & Management of Contaminated Sites* was a first step in developing a national approach to site contamination. These Guidelines have been adopted as a *de facto* standard by many stakeholders including regulators, consultants and land developers. However, these Guidelines do not have any legislative basis, and their application varies between jurisdictions. In addition, for many contaminants, these Guidelines do not provide

specific criteria which stakeholders can use to make decisions on the suitability of the land for its intended use or for determining appropriate contamination management requirements. As a result, most jurisdictions have developed their own legislation and guidelines for the range of issues dealing with contaminated site assessment and management. This has resulted in a variety of approaches to site assessment across Australia. It is noted that certain other documents have been widely used for specific aspects of site assessment (eg. *AS 4482.1 A guide to the Sampling and Investigation of Potentially Contaminated Soil Part 1: Non-volatile and semi-volatile compounds).*

Implementation of the draft Measure across all jurisdictions would provide a nationally consistent approach to assessment of site contamination. The draft Measure builds on experience to date, particularly the use of the ANZECC/NHMRC (1992) Guidelines, and incorporates a matrix for investigation levels for soil and groundwater which allows consideration of "fit for use" aspects associated with health and ecological impacts. In addition, a framework is provided which allows for regional ecological differences to be formally considered.

Implementation of the draft Measure should improve the quality of assessment of site contamination. This will have a number of positive impacts for key stakeholder groups, including the following:

Governments at all levels have a duty of care to ensure that public health and the environment are not put at risk. In particular, the proposed Measure will provide the States and Territories with an accepted basis for establishing what constitutes an acceptable level of assessment for sites within their jurisdictions, whilst still allowing flexibility in the application of their own requirements. The proposed Guidelines will provide Local and State Government Authorities, especially those which do not have a scientific background in such matters (eg. land use planners) with guidance on what is required to carry out an assessment to an adequate level.

The proposed Measure will provide *Land Owners and Developers* with nationally-accepted guidelines which they can specify when evaluating the potential environmental condition of land for which they are responsible or which they are considering purchasing. Adoption of the risk-based approach to site assessment will ensure that all key aspects are considered in the site assessment and that the approach is scientifically defensible. The standardisation of data collection, assessment and reporting will provide easier specification of the process and outcomes, and evaluation of the potential liabilities associated with land under consideration. This will also apply to *Lending Institutions* associated with such transactions.

Consultants currently carry out site contamination assessments using a range of approaches. For instance, data collection may be based on identification of "hot spots", with sampling based on history, or using a general grid. Assessments may be tailored to specific criteria established by the client (eg. cost), or requirements of a particular regulator involved in the project. The presentation of results can vary widely between individual consultants, even those working for the same company. The variation in assessment requirements and guidelines between jurisdictions, including the qualifications and experience required of consultants to carry out the work, is a major problem for nationally based companies. Another important consideration is the potential financial liability, and the associated financial insurance which must be carried by all companies working in this field. Implementation of the proposed Measure

nationally would address many of the uncertainties involved with these issues. Standardisation of the approach to assessment, particularly introduction of the risk-based approach, would streamline the consultants' work considerably making for easier, more efficient project management.

Community concerns regarding assessment of site contamination are generally based on not being provided with what they consider to be sufficient information, or in a format which is "user friendly". In addition, data may be presented in a variety of formats which do not allow for easy cross reference or consideration of regional/local differences. For example, assessments carried out in other locations may be presented as the basis or supporting argument for assessment of a local site. Comparison of results may not be possible because different sampling approaches and assessment criteria have been used. Standardisation of these aspects through adoption of the draft Measure would make this information more accessible to the general public.

Adoption of the draft Measure should improve the accuracy and therefore the validity of assessment, specifically through the use of endorsed guidelines and the inclusion of a risk-based assessment methodology which allows for consideration of site-specific aspects. For example, one of the most significant issues which currently concerns many stakeholders is the apparent lack of consistency between laboratories undertaking chemical analysis. This may be due to systematic variations such as the use of different methods for analysis or level of detection specified by the client, however, the current level of quality assurance and quality control generally does not provide adequate confidence. By default, this situation raises questions concerning the accuracy of laboratory analyses as the basis for site assessment. Adoption of a standardised approach to laboratory analyses including third party certification, as referred to in draft *Guideline 3*, will endorse the preferred methods of analyses. These will be primarily based on the ANZECC (1996) *Guidelines for Laboratory Analysis of Potentially Contaminated Soil*.

The introduction of the draft *Guideline on Investigation Levels for Soil and Groundwater* (draft Guideline 1) is a significant step forward in the quality of assessment of the potential health and environmental impacts of site contamination. The draft Measure builds on the approach proposed in the ANZECC/NHMRC Guidelines (1992); namely, that a site may be assessed by using soil criteria, or site-specific means, or a combination of both. The central issue is the incorporation of a consistent methodology for *Health Risk Assessment* (draft Guideline 4) and *Ecological Risk Assessment* (draft Guideline 5*),* and the development of appropriate investigation levels for a range of human and ecological exposure settings. The database currently available is not large or complete and would not cover all scenarios or allow for all regional differences. However, the guiding principles should allow the potential for more consistent assessment.

Classification of Sites

The use of the risk-based approach to human health and ecological aspects proposed in the draft Measure provides an improved basis for this classification of site of contaminated sites, compared with other previous approaches. In particular, the additional data on Health-based Investigation Levels (HILs) (draft *Guideline 7*) and Ecologically-based Investigation Levels (EILs) (draft *Guideline 5*) which will be developed will improve confidence in this process of classification. Use of Regional EILs (REILs) will also enhance this approach for specific sites. However, it is noted

that there are two issues which should be addressed outside the Measure:

- The current list of HILs and EILs is not extensive enough to cover all "current or proposed uses" for all sites which need to be assessed. Possibly, the HILs are in a better position, with the four substances included in the ANZECC/NHMRC Guidelines (1992) now expanded to more than twenty substances (draft Guideline 6). However considerable work will be required in the foreseeable future to "fill in the gaps".

- The draft Measure is restricted to assessment of chemical contamination. Sites may be contaminated by other sources of contamination; namely, unexploded ordnance (UXO), radioactive substances, contaminated sediments, biologically pathogenic materials or wastes, and other materials with the potential to impact on the environment. These sources of contamination are generally dealt with under specialised approaches. The classification system should acknowledge the (potential) contamination of a site by these sources, and refer to appropriate standards which apply.

Policy Framework Criteria

The draft Policy Framework acknowledges fundamental principles of environmental protection. Whilst many of these principles are included in the ANZECC/NHMRC Guidelines (1992), and subsequently incorporated in relevant documents (eg. EPA Victoria's *Prevention and Management of Contamination of Land Issues Paper* (1997)), the draft Measure emphasises consideration of these issues, including the following:

- Contamination, or further contamination, of a site such that it may pose an unacceptable health or environmental risk to the community must be prevented. The draft Measure acknowledges the community as including all stakeholders (eg. regulators, landowners and developers, financial institutions, consultants, general public). Intrinsically, the draft Measure includes health and ecological risk assessment to help determine what constitutes an "unacceptable risk".

- The draft Measure recognises that jurisdictions are ultimately responsible for implementation of the Measure. Whilst it advocates the positive aspects of adoption of a consistent approach to the Assessment of Site Contamination, and provides a legal and scientific basis for the methodology, the draft Measure provides jurisdictions with sufficient flexibility to implement it in a way which best suits its local situation.

- The draft Measure acknowledges that informed assessment and management is based on an adequate understanding of the risks (actual and perceived) associated with a particular site. The draft Guidelines address issues which until quite recently have been dealt with at best, on an ad hoc basis. For instance, draft Guideline 6 addresses the assessment of groundwater contamination. As stated previously, the issue of groundwater contamination is significant for a number of reasons including protection of beneficial uses (which may be difficult to define for particular situations) and the relatively high cost involved with most groundwater remediation projects.

- The draft Measure acknowledges that community consultation is an essential aspect of the process in particular situations, providing the opportunity for two-way communication between the community and other stakeholders (eg. regulators, land developers, consultants) which can be mutually beneficial. On the one hand, local residents may provide information on a specific site which allows the assessment to be targeted to known "hot spots", thus streamlining the data acquisition phase. In return, effective community consultation forums provide the opportunity for free and frank discussion on actual or perceived risks associated with a site. Draft *Guideline 8, 'Guideline on Community Consultation and Risk Communication',* expands on the ANZECC/NHMRC Guidelines (1992) and provide national recognition of approaches which are currently in place in a number of jurisdictions.

Remediation goals and options are well established within most jurisdictional legislation or guidelines. The implementation of the "polluter pays" principle and the "precautionary principle" have for some years formed the basis of legislation across a wide range of environmental issues in the various States and Territories in Australia. The influence of regional issues in the decision-making process is formally acknowledged in the draft Measure.

Consideration of Regional Environmental Differences

The draft Measure allows for regional (local) environmental differences to be considered in the decision-making process, principally through the development of REILs. For example, where it is known that background levels of certain substances exceed generic EILs, then the relevant decision makers (ie. regulators, land management planners, consultants) may choose to require site-specific studies which will result in the development of site-specific EILs.

The "fit for use" concept still applies even though regional environmental differences are considered.

4.3.2 Social Impacts

Community Education and Awareness

The community includes all groups that may be affected, either directly or indirectly, by implementation of the draft Measure. These groups include the regulators at all levels (planning, environmental), industry, land developers and financial managers, consultants, environmental issues action groups, adjacent landowners, and the general community. The draft Measure encourages implementation of education and consultation programs to inform various groups within the community. In particular, it recommends adoption of Guidelines for consultation with the general community on a range of issues including risk communication (draft Guideline 8*, 'Guideline on Community Consultation and Risk Communication'*). The emphasis is placed on consideration of the importance of the need and opportunity for consultation in the assessment process for a particular site, and the mechanisms by which this may be achieved.

Community Confidence

As discussed previously, the increased uniformity of assessment through the use of nationally accepted approach to assessment proposed by the draft Measure should provide increased community acceptance, and assurance to industry, regulators and consultants.

Planning Controls
The draft Measure recognises the importance of planning controls associated with assessment and management of (potentially) contaminated sites. The rezoning or change in use of a site provides the opportunity for planning authorities to require evaluation of the suitability of the site for its intended use. The draft Measure recommends that planning authorities adopt planning controls to ensure that this happens. A number of planning authorities already have such controls in place.

In addition, planning officials at Local and State level will have increased confidence in classification of a particular site for a range of uses when they have assurance that the assessment has been carried out to an accepted National standard. Specifically, classification of a site for a particular range of activities against the proposed Measure will provide an increased assurance that the site will be suitable for its' current or intended (beneficial) uses. It should be noted, however, that the contaminants requiring specialised treatment (refer to Draft Measure) should be adequately accounted for, where appropriate.

On and Off-site Health and Safety
The draft Measure recognises that protection of community health and the environment, both on-site and off-site, during assessment of site contamination is an important objective. Draft *Guideline 9, 'Guideline on Protection of Health and the Environment During Assessment of Site Contamination',* provides guidance in this area, with details of the likely hazards associated with the activities which will be carried out on site and actions to minimise associated risks. The document acknowledges approaches which have been developed in this area by the various jurisdictions, and emphasises the need to involve the community in decision-making to establish credibility with the community.

4.3.3 Economic Impacts

In 1994 ANZECC published *Financial Liability for Contaminated Site Remediation - A Position Paper*. The aim of the position paper was to encourage community debate on the financial liabilities associated with remediation of contaminated sites. The guiding principles include the following, which is significantly based on the "polluter pays" principle:

- *equity:* the liability regime should seek to treat parties fairly and justly with even-handedness and impartiality;
- *effectiveness:* the regime should minimise risks to human health and the environment and achieve the desired outcomes of timely clean-up to appropriate levels;
- *efficiency:* the regime should ensure that the funds are directed to the maximum extent possible towards achieving the above outcome at the lowest possible cost to society; and
- *prevention of future pollution:* the system should ensure that polluters bear primary liability for remediation of sites which they have contaminated, thereby discouraging future contamination.

The draft Measure has adopted these key principles.

Consistency in Assessment Processes
A number of submissions received by NEPC pointed out the tendency for some sites to be 'over-assessed', as a result of applying by rote grid-based sampling methodologies,

rather than applying a risk-based sampling approach. On the other hand, it is also the case that some sites are 'under-assessed' due to lack of confidence on the part of the assessor, or cost constraints.

By emphasising and providing guidelines for risk-based sampling and investigation methodologies, the draft Measure should lead to an optimisation in the overall amount of data required to accurately assess a site. Unfortunately, there are no data available on which to accurately quantify the economic impacts associated with this optimisation. The following represents a reasonable approach to estimating these economic impacts, based on experience from within the consulting industry.

Under/inadequate-assessment of a contaminated site can result in failure to properly define the environmental and health risks of the site, with the consequent increased likelihood of incorrect management or remediation actions being prescribed. However, the adoption of the auditor system by many jurisdictions and the increased competencies amongst regulatory staff is already leading to a rejection of unsatisfactory under-assessment of sites. In a significant number of such situations, the assessment work is required to be repeated or extended, at additional cost. Furthermore, under/inadequate-assessment is not a practice that can be supported, given the potential adverse environmental or health consequences.

There are no data available to accurately quantify the economic impact associated with under/inadequate assessment. However, in one example which reached the Australian courts, it was estimated that inadequate assessment of a site resulted in the order of 2000 cubic metres of soil being extracted from a site when later laboratory analysis of the removed soil suggested that the extraction of only 350 cubic metres would have satisfied the remediation requirements of that site. While the firm responsible for the site analysis and remediation strongly disputed this finding, the case illustrates the potential costs resulting from inadequate assessment of contaminated sites. Persons or organisations with information that could assist the NEPC to more accurately quantify the economic impacts associated with under/inadequate assessment are encouraged to include it in their submissions.

Informal consultation within the consulting industry indicates that currently perhaps approximately 10% of contaminated sites may be subject to overassessment each year, and their assessment could be improved by adoption of the draft Measure guidelines, with the potential for a savings of the order of 20-30% in each case. From the current baseline of $60 M per annum expenditure on contaminated site assessment, this would equate to a **positive economic impact of $1.2 M to $1.8 M per annum.**

"Fit for Use" Investigation and Soil Guidelines

The adoption of "fit for use" or risk-based investigation and acceptance criteria will endorse the approach to site assessment currently used by many consultants and landowners. Although outside the scope of the draft Measure, it is clear that remediation costs could potentially be reduced by clearly defining the proposed end use of the site, and the accompanying level of residual contamination which can be tolerated. The greatest potential economic impact of the draft Measure will arise from the increased use of health and ecological risk assessments to identify soil guidelines for the proposed use of the site. Whilst there will be additional costs involved in undertaking site specific health and ecological risk assessments these costs will be overshadowed by the positive economic impacts arising from reduced requirements for

remediation in most situations. This is the case because at present many consultants simply adopt the currently available investigation levels as default response guidelines, rather than conduct site specific risk assessments.

Once again, there are no data available to accurately quantify the economic impact associated with a greater adoption of risk-based soil guidelines. Consultation within the consulting industry has revealed that this can lead to a very significant reduction in remediation costs. This is supported from the experience in New Zealand where risk-based soil guidelines were developed as fairly extensive 'look-up' tables which provided acceptance criteria for evaluation of soils in a number of scenarios. One major industrial operator in New Zealand who had a portfolio of 80 sites, reduced management and remediation costs from approximately A$1M to less than A$0.1M after introduction of this approach.

For this Impact Assessment report a fairly conservative approach has been taken in assessing the positive economic impacts recognising that these approaches are already being adopted by some consultants and regulators. We have assumed that the increase in the use of site-specific acceptance criteria will be a modest 10%. Furthermore it has been assumed that in these cases the remediation costs may be reduced by a factor of 20-40%. From the current baseline of $240 M per annum site remediation costs (refer section 2.2) this would equate to a positive economic impact of the order of $4.8 M to $9.6 M per annum.

This benefit would be offset to some extent by the increased costs of conducting the site-specific risk assessments. Typically risk assessment is of the order of 10-20% of the site assessment costs, such that the increase in the use of such risk assessments in the 10% of cases will lead to an increased cost of approximately $0.6 M to $1.2 M per annum.

Thus the estimated positive economic impact of the draft Measure on remediation costs through the adoption of site-specific assessment is $4.2 M to $8.4 M per annum.

The NEPC would be keen to receive information in response to this draft Measure and Impact Statement, which could refine these cost impact estimates.

Significant other, but unquantified impacts are considered to be:

- landfill disposal costs: reduction in the use of landfill for disposal of contaminated soil is expected. This may result in an oversupply of landfill space and a reduction in costs available for those more contaminated soils which require disposal. There may be a marginal economic benefit in deferment of expenditure on infrastructure.
- land sales: as the costs for management/remediation reduce, this will encourage more land to be released for sale. Obviously, the most attractive property values (and hence greatest negative impact from contamination) is found within Australia's highly developed/urbanised cities, especially in those inner city areas which are now becoming sought after for residential development. Attendant impacts from the bringing of land to market are not discussed here.
- a reduction in contracting opportunities for land remediation.
- a continued investment by the regulators to stay abreast of the activity in this field and to manage existing regulations/implement policy.

Consultation with Stakeholders
The proposed Measure includes a formal acknowledgment of the need to adequately assess the need for consultation with the wider community, and provides a basic strategy for this activity (draft Guideline 8*, 'Guideline on Community Consultation and Risk Communication'*). There may be minor costs associated with upgrading consultation processes in some instances, however, as a principle the potential increase in "good will" between stakeholders should more than compensate for any increased costs of consultation. Indeed there are many examples where consultation has enabled the development of an assessment or remediation program with reduced costs.

Groundwater Contamination
Draft Guideline 6, *'Guideline on Assessment of Groundwater Contamination'*, addresses groundwater contamination in the context of site contamination. This issue has previously received limited coverage in nationally recognised contaminated site assessment guidelines. The assessment methodology identifies human and ecological receptors and applies the ANZECC Australian Water Quality Guidelines and NHMRC/ARMCANZ Drinking Water Guidelines within a risk-based framework. This process will not supersede, but will complement existing groundwater management strategies for protecting resources and associated environmental values. While some additional assessment costs may be incurred with some sites, landowners and developers will have greater assurance that liability and land use issues can be more effectively identified and resolved.

4.3.4 Conclusions

Development of a consistent and accepted methodology for Assessment of Site Contamination will provide an improvement on the current approach used in most jurisdictions in Australia. The assessment approaches currently used, mostly based on the ANZECC Guidelines (1992) as a *de facto* standard, provide a broad overview of the environmental status of a site. The proposed Measure includes an added degree of sophistication that will enable all stakeholders to have increased confidence in establishing risks and managing liabilities associated with any particular site. Significant improvements will be gained from the development of a soil criteria matrix which involves establishment of Investigation Levels for human health and ecological risks, the use of health and ecological risk assessment to define site-specific acceptance criteria, and the use of draft Guidelines for identified key issues. Whilst there are data gaps, this approach sets the framework for future development. Stakeholder confidence in the assessment process and resultant outcomes is increased. Jurisdictional costs associated with implementation of the draft Measure are estimated to be minor.

The economic impact of the draft Measure is estimated to be a saving of the order of $5.4M to $10.2M per annum, largely due to the benefits arising from a greater adoption of risk-based assessment, leading to reduced expenditure on remediation.

Assessment of Draft Guideline on Investigation Levels for Soil and Groundwater (Schedule B(1) of Draft Measure)

Stakeholder views on draft Guideline

In July 1998 the NEPC Committee released a Discussion Paper on the assessment of site contamination to key stakeholders who had registered with the NEPC Service Corporation as having an interest in this Measure. Consultation involving meetings with key stakeholders occurred in all jurisdictions and submissions were sought on the Discussion Paper. Stakeholders raised a number of issues during the discussion paper consultation period. Some of the key issues are included below:

- Lack of clarity as to how the Guideline is intended be used, with concerns that the health-based investigation levels may become default soil guidelines, without due consideration being given to ecological, structural and aesthetic concerns.
- Phytotoxicity, structural and aesthetic issues of soil contamination should be addressed.
- Concern was expressed that the draft Guideline Matrix of Investigation Levels for Soil and Groundwater will be unworkable if EILs are not provided. The Matrix should minimise the number of gaps.
- The need for REILs is recognised but some suggest that ANZECC B levels should be used as default soil guidelines until better alternatives are developed.

Response

- This guideline has been rewritten to reduce the number of gaps and take account of the issues raised. An interim approach to setting EILs for several exposure scenarios, based on background levels found in soil surveys, is proposed pending development of REILs. The draft Guideline has also been renamed to reflect the changes made.

Overview of Draft Guideline

Investigation Levels for Soil and Groundwater

Consultants and regulators consider that the appropriate use of investigation levels is an important component in the Assessment of Site Contamination. In particular, it is important to be able to select the most appropriate criteria for use from a range of criteria that are based on considerations including the protection of health, ecology, groundwater, structures, and aesthetic values.

In the ANZECC/NHMRC Guidelines (1992) a balance between the use of soil criteria and site-specific assessment was recognised. This document builds on that approach. A site may be assessed wholly by site-specific means or, alternatively, the initial assessment can be based on the use of the soil criteria. This section details a framework for the use of soil criteria. The framework is based upon a matrix of health, ecological and aesthetic-based soil criteria. This approach will benefit from the further development of Investigation Levels at national and regional levels.

Definitions

A variety of terms have been used to describe criteria. In the Discussion Paper, *Towards a National Protection Environment Measure for the Assessment of Contaminated Sites'*, the principal terms used were **Investigation Levels** and **Response Levels**. Where appropriate, other terms were used such as **Aesthetic Guidelines** and **Structural Protection Guidelines**. It is recognised that the use of multiple terms may lead to confusion and a key component of the process of drafting the Measure will be on ensuring that standard terms and definitions will be used.

The definitions of 'Investigation Levels' and 'Response Levels' were first detailed in the ANZECC/NHMRC Guidelines for the Assessment and Management of Contaminated Sites (1992). Further explanations (and qualifications to their use) are provided in that text and draft Guidelines 4 & 7*, 'Guideline on Health Risk Assessment Methodology*' & '*Guideline on Health-Based Investigation Levels'*. Investigation Levels are commonly Health-based or Ecologically-based (HILs and EILs). Because of Australia's ecological diversity it is proposed that, over time, regional EILs will be developed that can be applied to the approximately 100 Biogeographic Australian regions identified in documents such as the Victorian Biodiversity Guidelines. These will be known as Regional Environmental Investigation Levels (REILs).

"An Investigation Level is the concentration of a contaminant above which further appropriate investigation and evaluation will be required." (ANZECC/NHMRC 1992)

"Response Level is the concentration of a contaminant at a specific site based on a site assessment for which some form of response is required with an adequate margin of safety to protect public health and ecological values."

Use of Investigation Levels

Documents referred to in this draft Guideline have discussed the derivation of Health-based Investigation Levels (HILs) and Regional Ecologically based Investigation Levels (REILs) and groundwater protection policies. To accommodate the range of human and ecological exposure settings, there are a number of categories of HILs and EILs. Aesthetic Guidelines address issues relating to matters such as odour, appearance and consistency, and Groundwater Guidelines provide groundwater criteria.

It is important to recognise that **HILs and EILs are not intended to be *de facto* cleanup or response levels** but are intended to prompt an assessment the aim of which is to determine whether unacceptable health risks exist and the nature and magnitude of environmental risks. At concentrations higher than the HILs and REILs a site-specific sequence of Response Levels will be generated and these will determine the responses which may range in magnitude from site management plans for landowners and users of the nature of contamination to large-scale remediation.

HILs will apply across Australia. REILs take into account region-specific factors such as soils and biota. Some REILs may be applied generically at a jurisdictional or national level where there are no other ecological values relevant to a particular site (eg REIL2s which apply to domestic gardens). Where REILs are exceeded, a site-specific investigation should be undertaken based on the ecological values and biota relevant to that site.

The Aesthetic Guidelines may be generic or site-specific and are based on the principle that the soils should not be discoloured, malodorous (including when dug over) nor of abnormal consistency.

Exposure Settings

Human exposure settings have been established for HILs (see draft *Guideline 7, 'Health-Based Investigation Levels'*). These are:

A. 'Standard' residential with garden/accessible soils (homegrown produce contributing less than 10% of vegetable and fruit intake; no poultry): this category includes children's day-care centres, kindergartens, preschools and primary schools.

B. Residential with substantial vegetable garden (contributing 10% or more of vegetable and fruit intake) and/or poultry providing any egg or poultry meat dietary intake.

C. Residential with substantial vegetable garden (contributing 10% or more of vegetable and fruit intake), poultry excluded.

D. Residential with minimal opportunities for soil access: includes dwellings with fully and permanently paved yard space, such as high-rise apartments and flats.

E. Parks, recreational open space and playing fields: includes secondary schools.

F. Commercial/Industrial: includes premises such as shops and offices as well as factories and industrial sites.

The Interim EILs provided in *Schedule B(1) Investigation Levels for Soil and Groundwater* have been set for an urban setting and have not been derived to protect nominated ecological values. (See Schedule B(1) p2).

For example for 'residential uses with minimal opportunities for soil access' where there are no ecological elements to be protected, HIL(D) would be applied. Where the protection of groundwater is the prevailing concern on such a site, Groundwater Guidelines (GGs) will be applied.

Exposure settings for groundwater are:

1. Fresh Waters
2. Drinking Water
3. Recreational Use
4. Stock Watering
5. Irrigation Water

Investigation Levels for Soil and Groundwater

The need to be able to use both the Health-based Investigation Levels (HILs) and Regional Ecologically-based Impact Levels (REILs) when assessing soil contamination is well recognised. In 1995 the ANZECC/NHMRC Contaminated Sites Technical Review Committee endorsed the framework for a matrix incorporating a variety of soil guidelines.

Several types of guidelines may need to be considered for a particular site with site-specific factors identifying the key guideline to be applied. For a particular proposed land-use, the key guideline that will prevail will need to be determined on a site-specific and chemical-specific basis. The proposed use/key guideline matrix, Guideline on Investigation Levels for Soil and Groundwater, highlights the key guidelines to be considered.

The Guideline contains HILs (refer to *Schedule B(7*), '*Guideline on Health-Based Investigation Levels'*) and EILs. For some substances such as phenols and sulfates, their impact on structures (effects on PVC piping and cement**,** respectively) may override the health and environmental considerations. Regarding aesthetic guidelines, the fundamental principle is that the soils should not be discoloured, malodorous (including when dug over), nor of abnormal consistency.

The derivation of soil criteria for volatile contaminants has been complicated by their complex environmental behaviours and the absence of a generally accepted model that could be used to determine exposures. A process for the determination of soil criteria has been proposed as part of the future work plan that will arise from the Measure.

Impact Assessment

Environmental Impacts

Framework on Investigation Levels for Soil and Groundwater
The draft Measure introduces a framework for the application of risk-based soil investigation criteria to site assessments. The framework is a valuable tool which recognises the relative importance of health, ecological (and potentially, aesthetic and structural) assessment investigation criteria.

The draft Measure reaffirms the concepts of Health and Environmental "Investigation Levels" and "Response Levels" introduced in the ANZECC/NHMRC Guidelines (1992). The proposed tiered structure of human and ecological exposure settings will allow effective and efficient assessment of individual sites. The development of Health Investigation Levels (HILs) (Schedule B(7), *Draft Guideline on Health-based Investigation Levels)* and Ecological Risk Assessment for specific exposure settings will significantly assist the assessment of the need for management/ clean-up required for particular current or proposed land uses.

The use of HILs and EILs, and particularly Regional EILs (REILs) could be categorised as a "stretch objective" since there are significant data gaps at the present time. Similarly, the methodology and investigation levels for aesthetic and structural aspects have not been developed to date. However, the concept has validity and general acceptance amongst most stakeholder groups as it provides a framework for the inclusion of aspects that are generally considered important. In the short-term, the situation will be "no worse" than it is currently, but a concerted and cooperative effort will be needed by the jurisdictions to address the data gaps. It is envisaged that default values which are no worse than the current approach will need to be adopted until specific values are developed; these default values could potentially involve significant error-bars (refer to Schedule B(5), *Draft Guideline for Ecological Risk Assessment*, in particular).

Health-based Investigation Levels
The need to use Health-based Investigation Levels (HILs) in risk assessment is well recognised, and formalises sound environmental practice used throughout Australia and overseas. The initial work referred to in the ANZECC/NHMRC Guidelines (1992) involved development of HILs for four substances: lead, arsenic, cadmium and benzo(a)pyrene. This has now been extended to more than twenty substances for inclusion in the draft Measure. This list of Health-based Investigation Levels will be updated from time to time by national health advisory bodies.

Ecological Investigation Levels
The ANZECC/NHMRC Guidelines (1992) recognised the need to consider threshold Investigation Levels for protection of the environment. These Investigation Levels were designed to take account of "worst case scenarios". The draft Measure formalises the framework for estimating harmful effects on plants and animals resulting from contamination.

The general framework has undergone international peer review before introduction in the draft Measure as *Guideline 5, Ecological Risk*. However, the draft Measure acknowledges that there is minimal environmental toxicology data for Australian plants and animals. It is important that priority be given to development of Investigation Levels for Australian conditions. However, it is unclear at this stage what mechanism will be used to develop the EILs.

Two other important points are worth noting in regard to the application of EILs:
- Investigation levels are not intended to be de facto cleanup or response levels. They are to be used as indicators that further site-specific investigation is required to determine whether the level of risk is acceptable for the intended use.
- Many contaminated sites are in urban areas where potential ecological impacts are minimal and potential health effects are important. Therefore, the perceived difficulties in using the investigation levels for soil and groundwater caused through lack of a comprehensive series of EILs is unlikely to be a handicap.

Regional Considerations
The "fit for use" concept allows regional ecological differences such as biota and soils to be incorporated through development of Regional EILs (REILs). This approach, taking account of background levels for a range of substances, has been previously acknowledged by the ANZECC/NHMRC Guidelines (1992). In particular, naturally occurring substances in certain localities, including some types of mineralised soil can be the source of environmental and health concerns depending on the intended use of the site. The lack of data will restrict the potential application of REILs in the short term.

Whilst the draft Measure does not provide guidance as to the mechanism of how this data gap will be addressed, it identifies a suitable general framework which could be used by those stakeholders who may choose to carry out risk assessments using REILs.

Social Impacts

Community Awareness and Confidence
The draft *Guideline on Investigation Levels for Soil and Groundwater* formally recognises that assessment of a site should include consideration of human health,

environmental, aesthetic and built environment aspects. Moreover, it acknowledges that the decision making process should include consideration of current and proposed uses of the site. Allowance is made for local regional environmental values to be considered through development of REILs.

The development of a relevant, centralised database will be necessary to ensure full implementation of the draft Guideline on Investigation Levels for Soil and Groundwater, for risk-based site assessment. Consideration will need to be given as to the best mechanism for developing this database.

It is acknowledged that there is a lack of data currently available, specifically for determination of REILs. However, as relevant data become available, assessment based on the draft matrix of investigation levels for soil and groundwater will provide benefits to all sections of the community. Regulators, land planners, developers and consultants will have increased assurance that all relevant factors have been considered and prioritised during the risk assessment. The approach will help to streamline the assessment process by using risk-based "fit for use" criteria. Benefits to the wider community, over time, will include an increased awareness and confidence that a standard approach is being used, and that the guideline on investigation levels for soil and groundwater ensures consideration of all relevant human health, environmental and aesthetic aspects during the assessment phase.

Minimisation of Adverse Health Effects

The Health Risk Assessment (HRA) methodology (Schedule B(4), *Draft Guideline on Health Risk Assessment Methodology*) and development of the HILs (Schedule B(7), *Draft Guideline on Health-Based Investigation Levels*) underpins the assessment of health issues in the draft Guideline on investigation levels for soil and groundwater. The rigour with which the twenty or so HILs have been developed to date, and the proposed assessment of sites on the basis of "fit for use", will ensure that adverse health impacts (both real and indirect) are systematically identified and managed.

Economic Impacts

General Risk Assessment

Assessment of sites using the investigation levels for soil and groundwater will provide guidance on what constitutes a baseline assessment for current or proposed uses. Whilst HILs and EILs are not intended to be *de facto* cleanup or response levels, the range of human and ecological exposure settings will most likely be used as the basis for evaluating whether the condition of a site is suitable for its current or intended use(s). Further, the exposure settings will provide guidance on the level of management and/or cleanup which will be required for a site to be made suitable for more sensitive uses.

The emphasis on "fit for use" criteria established through the exposure settings could prevent unnecessary costly remediation. Currently, many assessments target criteria within a narrow applications framework (eg. ANZECC B for residential use, ANZECC C for industrial use in an urban area). The addition of other categories in the exposure settings provides appropriate flexibility for determining the level of contamination which can be "tolerated" for a range of potential activities.

A key advantage of the draft *Guideline of Investigation Levels for Soil and Groundwater* is that the use of general exposure settings will make many assessments

more efficient, and therefore less costly. In particular, regulators, consultants and other stakeholders will be in possession of a broader range of soil guidelines than in the ANZECC/NHMRC Guidelines (1992) but with a wider range of "fit for use" options.

Costs will be involved in carrying out appropriate studies to establish appropriate values.

Derivation of EILs/ REILs will need to be supported by a large database. Under the draft Guideline, EILs/ REILs will be determined by jurisdictions on a regional basis. There will be a negative financial impact on regulators who will need to fund appropriate studies. The cost will depend on the methodology eventually adopted.

Reduction in Liability and Land Valuation

Formal adoption of an extended range of HILs (compared with that currently available), and inclusion of (R)EILs will provide increase assurance to stakeholders that health and environmental effects have been adequately addressed in the risk assessment. Owners and prospective developers will be able to provide additional evidence to potentially affected parties that the land is "fit for use", particularly where more sensitive uses are proposed. This approach builds on current audit systems such as the statutory Statement or Certificate of Environmental Audit introduced in Victoria. However, it will have the added advantage of being based on a nationally-accepted methodology which, once the data base is sufficiently established, will be accepted by insurers, land planners and the general community as a suitable approach to assessment of risks associated with a particular site. As a consequence, there should be a greater acceptance amongst stakeholders of "fit-for-use" standards, with less demand for unnecessary and more expensive clean up.

Conclusions

The draft *Guideline on Investigation Levels for Soil and Groundwater* offers a systematic approach to the assessment of human health, environmental, aesthetic and structural aspects associated with site contamination. The risk-based approach allows assessment of whether the site is "fit for use" through the formal adoption of a range of health and environmental exposure settings. Investigation Levels for health (HILs) and ecology (EILs) are based on the concepts introduced in the ANZECC/NHMRC Guidelines (1992). It is acknowledged that there is currently a shortage of data for Ecological Investigation Levels for many substances, particularly Regional EILs which provide for consideration of regional ecological diversity.

The draft *Guideline on Investigation Levels for Soil and Groundwater* offers the potential to be developed as the central aspect of the proposed Measure, provided focus is given by relevant stakeholders to addressing the data gaps.

Assessment of Draft Guideline on Data Collection, Sample Design & Reporting of Data (Schedule B(2) of Draft Measure)

Stakeholder views on draft Guideline

In July 1998 the NEPC Committee released a Discussion Paper on the assessment of site contamination to key stakeholders who had registered with the NEPC Service Corporation as having an interest in this Measure. Consultation involving meetings with key stakeholders occurred in all jurisdictions and submissions were sought on the Discussion Paper. Stakeholders raised a number of issues during the discussion paper consultation period. Some of the key issues are included below:

Stakeholder submissions suggested

- The incorporation of groundwater sampling into the draft Guideline.
- Use of AS4482.1, '*Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-Volatile and Semi-Volatile Compounds'* as a reference document.
- Various views were expressed regarding the degree of prescriptiveness in preparation of reports. In general, a uniform approach was favoured.

Response

- The design of sampling strategies for the assessment of groundwater has been incorporated into the draft Guideline.
- AS4482.1 is a reference document for assessment of soil contamination.
- The draft Guideline outlines minimum reporting requirements.

Overview of Draft Guideline on Data Collection, Sample Design & Reporting of Data

Summary

Data collection entails the acquisition and analysis of information about chemicals on a site that may affect human or ecological health and which will be the focus for the particular risk assessment (US EPA, 1989). At the end of the data collection process an accurate appraisal of the nature and magnitude of contamination should be possible.

A thorough data collection process, well presented, is the foundation for an adequate site assessment process. The data collected must be collated, analysed and presented in a way that enables consultants, regulators, landowners and other stakeholders to readily understand the nature and magnitude of the contamination.

This guideline provides specific requirements for the content of investigations and having them presented in uniform, coherent and logically developed reports will enable more efficient, accurate, timely and transparent decision-making and a greater consistency of decision-making across Australia. The principles and guidelines in this document are intended to assist that process and, ultimately, the qualitative process of determining whether remediation is required or not for the proposed use.

The intention of the risk assessment process is "to provide complete information to risk managers, specifically policymakers and regulators, so that the best possible decisions are made" (*Paustenbach, DJ (ed), The Risk Assessment of Environmental and Human Health Hazards: A Textbook of Case Studies, 1989, p28*). As such the data needs to be clearly presented and to cover all of the relevant issues. "The process of risk assessment should enable consistent decisions to be made by the specialists undertaking the process". Site-specific risk assessments should not lead to significant variations in the management of similar sites" (ANZECC/NHMRC 1992, p34)

There are similarities in the stages involved in producing health and ecological risk assessments and both have a fundamental dependence on accurate, appropriate and sufficiently complete data collection:

Health	**Ecological**
Data collection	Problem identification
	Receptor identification
Toxicity assessment	Toxicity assessment
Exposure assessment	Exposure assessment
Risk characterisation (US EPA 1989)	Risk characterisation (Vic EPA, 1997)

The stages are closely linked and each is highly dependent on the preceding stages. Many of the data collection requirements (cf table above) are common to both the health and ecological risk assessment processes.

The issues for a particular site are often sufficiently complex that a manageable and complete algorithm for data collection for all sites, that will replace professional expertise, cannot be drafted.

Components of Data Collection

1. Use of Data Quality Objectives

The objectives of data collection, even for initial assessments, should be determined as the initial step in the data collection phase.

2. Proposed Land Use

The proposed land use (eg residential rather than industrial, high density residential rather than detached housing) will influence the nature of the assessment.

3. Site Histories

This will drive the sampling strategy and the choice of analytes.

4. Site inspection and site description

This will influence the sampling strategy and the choice of analytes.

5. Geology and hydrogeology data

These provide information about matters such as the presence of (potentially contaminated) fill and the groundwater on a site and may influence the sampling strategy.

6. Sampling

The greatest concern, in collecting soil samples, is to ensure that the samples taken represent all the soils in all relevant strata present on the site. Designing sampling strategies and sampling patterns is a complex process based on a clear understanding of the sampling objectives and a range of other matters including the site history and the proposed land use. Professional judgement is usually required to ensure the most effective sampling. Issues relevant to the development of a sampling program include the following:

- Sampling strategies
- Sampling patterns
- Sampling density
- Sampling depth
- Sample description
- Soil morphology
- Strata/borehole logs
- Composite sampling
- Sample handling, storage and transport
- Chain of custody

7. Choice of Analytes

An appropriate choice of analytes must be made in the face of the millions of known chemicals. Potential contaminants on the site are defined by site history, site inspection and knowledge of activities on the site.

8. Analysis of samples

Consistency of sampling, speciation and extraction are important issues in the Assessment of Site Contamination. Other issues include:

- Calibration of field instruments
- Analytical methodologies
- Quality assurance of analytical data used in site-specific risk assessment
- See draft Schedule B(3) – Draft Guideline for the Laboratory Analysis of Potentially Contaminated Soils.

9. Assessment of summary statistic data and presentation of data in reports

There is a need to analyse data and present it in a logical and readily comprehensible manner so that patterns of contamination can be detected and to enable comparison of results with soil criteria. Issues relevant to assessment include the use of:

10. Summary Statistics

- Contouring
- Graphic Representation
- Photography
- Censored data
- Data supplied to regulators on disk
- Comparison with appropriate levels

11. Checklist of Report Content.

Data must be drawn together in a logical and coherent sequence to ensure rapid and full comprehension and appropriate decision-making by all relevant parties.

Impact Assessment

Environmental Impacts

Data collection including the sampling regime is a critical step in assessing the environmental status of a site. Site assessments are currently carried out using a variety of methodologies. A range of policy/ guideline documents has been developed by the jurisdictions as a recommended basis for assessment.

At present, not all site assessments are completed with optimum outputs, as:

- a proportion of site assessments contain too little detail (under-assessment);
- a proportion of assessments contain too much detail (over-assessment);
- a proportion fail to meet the needs of the assessment.

In the first case, this may result in a need to re-do the original assessment (rare) or at least supplement the original investigation with further work. In the second case, over assessment obviously leads to over expenditure. In the last case, costs may accrue if the assessment is re-done, but it is possible that the errors resulting from the work are not picked up and incorrect management/remediation actions are developed as a result.

Standardisation/optimisation of data collection, sampling design and reporting will have a positive impact on the quality of site assessment by providing a (minimum) consistent approach to be used.

Consultants currently carry out site contamination assessments using a range of approaches. For instance, data collection may be based on identification of "hot spots" or using a general grid (perhaps based on AS 4482.1), or a combination of both. Assessments may be tailored to specific criteria established by the client (eg. cost), or requirements of a particular regulator involved in the project. The presentation of results can vary widely between individual consultants, even those working for the same company. The variation in assessment requirements and guidelines between jurisdictions, including the qualifications and experience required of consultants to carry out the work, is a major problem for nationally based companies. Another important consideration is the potential financial liability, and the associated financial insurance which must be carried by all companies working in this field. Implementation of the proposed Measure, which would apply nationally to all consultants, would address many of the uncertainties involved with these issues.

Standardisation of the approach to assessment, particularly introduction of the risk-based approach, would streamline the consultants, work considerably making for easier, more efficient project management. It should be noted that consultants, and other associated industries (eg. laboratories), which may currently carry out work which is not of a suitable quality, will find it difficult to continue working in this field once national guidelines for assessment are fully implemented.

Social Impacts

Community concern regarding contaminated site assessment is generally based on the perception that insufficient information has been provided, or information has been provided in a format which is not "user friendly". In addition, data may be presented in a variety of formats which does not allow for easy cross-reference or consideration of regional/ local differences. For example, assessments carried out in other locations may be presented as the basis or supporting argument for assessment of a local site. Comparison of results may not be possible because different sampling approaches and assessment criteria have been used. Standardisation of these aspects through adoption of the draft Measure would make this information more accessible to the general public.

Use of a standard approach to data collection, sample design and reporting will improve the ability of the wider community to understand and have confidence in the reported contamination status of the site. The use of an open and understood methodology develops trust in the assessment process and increases acceptance of the identified outcomes.

For specific issues which potentially impact on local communities, the interaction of assessors with the local community and other stakeholders provides the opportunity for better data collection (eg. site history provides opportunity for community involvement, and development of confidence in the assessment process.

Economic Impacts

Provision of clear guidelines on data collection, sampling design and reporting should lead to a reduction in assessment costs. Emphasis on data quality objectives should have a positive economic impact by avoiding the collection of unnecessary data and the need to repeat investigations.

A number of submissions received by NEPC pointed out the tendency for some sites to be 'over-assessed', as a result of applying by rote grid-based sampling methodologies, rather than applying a risk-based sampling approach. On the other hand, it is also the case that some sites are 'under-assessed' due to lack of confidence on the part of the assessor, or cost constraints.

By emphasising and providing guidelines for risk-based sampling and investigation methodologies, the draft Measure should lead to an optimisation in the overall amount of data required to accurately assess a site. Unfortunately, there are no data available on which to accurately quantify the economic impacts associated with this optimisation. The following represents a reasonable approach to estimating these economic impacts, based on experience from within the consulting industry.

Under/inadequate-assessment of a contaminated site can result in failure to properly define the environmental and health risks of the site, with the consequent increased likelihood of incorrect management or remediation actions being prescribed. However, the adoption of the auditor system by many jurisdictions and the increased competencies amongst regulatory staff is already leading to a rejection of unsatisfactory under-assessment of sites. In a significant number of such situations, the assessment work is required to be repeated or extended, at additional cost. Furthermore, under/inadequate-assessment is not a practice that can be supported, given the potential adverse environmental or health consequences.

There are no data available to accurately quantify the economic impact associated with under/inadequate assessment. However, in one example which reached the Australian courts it was estimated that inadequate assessment of a site resulted in the order of 2000 cubic metres of soil being extracted from a site when later laboratory analysis of the removed soil suggested that the extraction of only 350 cubic metres would have satisfied the remediation requirements of that site. While the firm responsible for the site analysis and remediation strongly disputed this finding, the case illustrates the potential costs resulting from inadequate assessment of contaminated sites. Persons or organisations with information that could assist the NEPC to more accurately quantify the economic impacts associated with under/inadequate assessment are encouraged to include it in their submissions.

Standardisation of data collection methodology including reporting formats will also assist the efficiency of the decision making process for regulators and other stakeholders.

Inherent in any assessment is the need to determine liabilities associated with identified risks. Use of an accepted standardised methodology will provide assurance to regulators and other affected parties (eg. land developers, consultants) that legal liability is reduced.

Conclusions

Data collection, sample design and reporting methodology is a critical aspect of site assessment. The development of a uniform approach to this aspect will enhance the likelihood that the environmental status of a site is accurately defined and that suitable management strategies are subsequently defined.

The elimination of duplication and unnecessary sampling regimes will provide a reduction in the cost of assessment. From the current baseline of $60 M per annum expenditure on contaminated site assessment, it is estimated that this would equate to a **positive economic impact of $1.2 M to $1.8 M per annum.** There may be an increase in some situations where assessments are less than satisfactory due to cost restraints, but this is likely to be offset in these cases by the need to extend the investigation at a later stage to meet the requirements of third parties; eg auditors.

The use of a transparent, accepted methodology will increase confidence in the basis of decision making by all stakeholders.

Assessment of Draft Guideline on Laboratory Analysis of Potentially Contaminated Soils (Schedule B(3) of Draft Measure)

Stakeholder views on draft Guideline

In July 1998 the NEPC Committee released a Discussion Paper on the assessment of site contamination to key stakeholders who had registered with the NEPC Service Corporation as having an interest in this Measure. Consultation involving meetings with key stakeholders occurred in all jurisdictions and submissions were sought on the Discussion Paper. Stakeholders raised a number of issues during the discussion paper consultation period. Some of the key issues are included below:

- There was general acceptance of this draft Guideline.
- The draft Guideline should have the flexibility to be updated as relevant Australian Standards are produced.
- There was a requirement for field analysis to be incorporated into the draft Guideline.

Response

- The draft Guideline will be written so that there is flexibility to adopt the relevant Australian Standard to replace those in the ANZECC 1996 document*, Laboratory Analysis of Potentially Contaminated Soil*.
- Comments included in Schedule B(2) that, providing field analyses are undertaken in accordance with QA/QC procedures outlined in Schedule B(2), they may be used for screening purposes to determine where additional samples need to be taken for full laboratory analysis.

Overview of Draft Guideline on Laboratory Analysis of Potentially Contaminated Soils

Consistency in analysis can only be achieved if there is uniformity in procedures and nomenclature, beginning with sampling, sample storage, pre-treatment, extraction, analytical methodology through to data analysis. The ANZECC Guidelines, which have been adopted as draft Guideline 3, begin with the philosophy behind the methods selected. They then provide guidance on quality assurance procedures and techniques for sample preparation, designed to provide greater confidence and comparability of the analytical results. The remainder of the document describes analysis of physiochemical properties: inorganic and organic analytes in soils.

For most methods only the procedures of extraction are given. This is one of the areas of greatest inconsistency in the analysis of soils. Once extracted, the analytes can be determined by one of the commonly accepted and easily available techniques. For some methods of organic analysis, outlines of relevant United States Environmental Protection Agency procedures are given but, where available, selected alternative procedures are used.

The ANZECC Guidelines are seen as provisional due to the growing expertise in the analysis of contaminated soil within Australia. For example, methods in the ANZECC

Guidelines may be replaced or supplemented, as the relevant Australian Standards become available. This would be the case for AS 4439.2 – 1997 *Wastes, sediments and contaminated soils Part2: Preparation of leachates – Zero headspace procedure* and AS 4439.3 – 1997 *Wastes, sediments and contaminated soils Part 3: Preparation of leachates – Bottle leaching procedure*. Similarly, Standards Australia is currently developing standard methods for the analysis of Total Petroleum Hydrocarbons.

Given the ongoing process of developing standard methods under the auspices of Standards Australia (and other similar organisations) which may supersede the methods in the ANZECC guidelines, the ANZECC guidelines have not been revised to account for changes since its release in 1996.

Impact Assessment

Environmental Impacts

Quality of Assessment

Laboratory analyses of soils is a key aspect of the assessment of the environmental status of a site. Analytical results are used as the basis for comparison with standards such as the exposure levels specified (eg. HILs and EILs) for current and potential uses of a site. The provision of sound scientifically based analytical procedures is essential to ensuring that quality assessments are carried out.

Draft Guideline 3, based on the ANZECC (1996) Publication: *Guidelines for the Laboratory Analysis of Contaminated Soil,* provides a sound basis for encouraging an acceptable quality of analytical work. The philosophy of this publication includes the following:

- The procedures are easy to follow, and use reagents which are commonly available.
- The methods for extraction/digestion and analyses are relatively rapid and non-labour intensive.
- The methods have been designed to allow processing of large batches of samples, preferably using automated analysis.
- Where possible, the procedures have been selected to allow a variety of chemical components to be analysed using the same sample extract.
- The procedures have been selected with safety as a prime consideration.
- The test methods are derived from authoritative recognised sources, such as the United States Environmental Protection Agency (USEPA) or American Public Health Association (APHA).

The ANZECC (1996) Guidelines provide a number of recommended extraction and analytical methods for various substances. However, it recognises the validity and potential advantages of other methods, provided *"they can be demonstrated by the user to be at least as rigorous and reliable as those recommended in these guidelines, or have been validated by the user against an appropriate certified reference material (p2)"*

Standardisation using these methods will ensure that the analyses carried out are as accurate as can be expected with current scientific knowledge. However, further work is required to verify that these also apply to Australian soils and groundwater, with appropriate changes made to procedures where necessary. It is noted that this draft

Guideline acknowledges that the ANZECC Guidelines (1996) are provisional for this reason, and that they will be supplemented or replaced as relevant Australian Standards are developed.

Quality Control and Quality Assurance
Accreditation of laboratories and endorsement of analytical methodologies by such bodies as the National Association of Testing Authorities (NATA) provide a level of quality management which is recognised and endorsed nationally and internationally. However, some Australian laboratories are criticised by those who use their services on a regular basis for lack of accuracy of analyses, and poor consistency of results between laboratories. Endorsement of procedures initially recommended by the ANZECC Guidelines (1996), and of NATA accreditation, will assist in obtaining reliable analyses (eg. *Guidelines for Quality Control in the Analytical Laboratory; Good Laboratory Practice (AS2830.1-1985*). NATA should be encouraged to run interlaboratory proficiency testing for soil media.

Social Impacts

Confidence in Analytical Results
Adoption of standardised analytical methods, including NATA accreditation of those methods for the specified analytes, will result in increased stakeholder confidence. This aspect is particularly important to regulators and consultants who rely on the results of laboratory analyses as the basis for their Assessment of Site Contamination. Decisions on health and environmental aspects of the status of land require confidence that laboratory results are a true indication of contaminant levels on the site being assessed. It is expected that one of the outcomes of this draft Measure will be that laboratories which cannot demonstrate suitable proficiencies will not be able to continue to operate in this field, most likely through non-compliance with NATA's quality assurance requirements.

Community Trust
Members of the community in general do not have scientific training nor an understanding of the uncertainties which exist in chemical analyses. When confronted with assessment of the environmental status of a site which has been made largely on the basis of laboratory sample analyses, they may justifiably ask for some validation of the analyses. The use of nationally accepted methodologies as recommended in this draft Measure (provided Australian or regional conditions are acknowledged and allowed for) will result in an increased level of trust in the decision-making process.

Economic Impacts

It is considered that adoption of the draft guideline (Schedule B(3)) will have minimal economic impact on most commercial laboratories in Australia. The competitive nature of the industry has meant that many laboratories have already established analytical procedures which are consistent with relevant Australian or International Standards, including the ANZECC Guidelines (1996), which largely form the basis of the draft Guideline. In addition, most laboratories have NATA accreditation for a range of tests and quality management. While this approach has been largely driven proactively by the laboratories themselves, the users of laboratory services have preferentially used those laboratories which can demonstrate these aspects simply because it provides an increased level of confidence in the analyses carried out. For the small group of companies which have not adopted these practices to date, the cost of equipment and

methodology development, and staff training, could be significant. However, it is unlikely that these laboratories would continue to be commercially viable if they could not demonstrate proficiencies specified in the draft Guideline, even in the absence of the draft Measure.

Conclusions

Draft Guideline 3*, 'Guideline on Laboratory Analysis of Potentially Contaminated Soils'*, primarily endorses chemical analyses methods based on the ANZECC *Guidelines for Laboratory Analysis of Potentially Contaminated Soil (1996)*. Adoption of a nationally accepted standardised approach to chemical analyses, including accreditation of the laboratories and individual analytical methods by NATA, will endorse the competency of many Australian laboratories which have already proactively implemented quality management procedures which are consistent with this publication. The draft Guideline acknowledges that many of the procedures are based on overseas experience, and may need to be replaced or amended, as relevant Australian Standards become available.

Assessment of site contamination depends significantly on evaluation of chemical analyses of soil samples. Use of standard analytical methods will provide stakeholders with increased confidence in this process and the outcome. Whilst there may be an initial increase in costs for some laboratories due to the need to implement new procedures and training, and to purchase appropriate equipment, it is considered that this will be offset in the medium to long term by streamlining of analytical requirements.

Assessment of Draft Guideline on Health Risk Assessment Methodology (Schedule B(4) of Draft Measure)

Stakeholder views on draft Guideline

In July 1998 the NEPC Committee released a Discussion Paper on the assessment of site contamination to key stakeholders who had registered with the NEPC Service Corporation as having an interest in this Measure. Consultation involving meetings with key stakeholders occurred in all jurisdictions and submissions were sought on the Discussion Paper. Stakeholders raised a number of issues during the discussion paper consultation period. Some of the key issues are included below:

- A number of submissions referred to the importance of differentiating between health-based investigation levels and site-specific acceptance/clean-up criteria, with the concern that HILs are used as de facto clean-up criteria without recognition of aesthetic, ecological and built environment concerns.

- The Health Risk Assessment (HRA) methodology for the development of site-specific response criteria was widely supported.

- It was suggested that sections within this guideline belonged in the Data Collection Guideline.

Response

- Improved understanding of the use of HRA and the basis and proper application of HILs is expected to follow the introduction of the Measure.
- The Matrix of Investigation levels for Soil and Groundwater will provide for recognition of aesthetic, ecological and built environment concerns.
- Text has been moved to the Data Collection Guideline.

Overview of Draft Guideline on Health Risk Assessment Methodology

Site-specific health risk assessment provides an appraisal of the nature and magnitude of the health risks arising from chemical contamination of a site. The assessment takes into account factors relevant to the site such as the proposed use, physico-chemical and bioavailability characteristics of the particular contaminant(s), and the depth and distribution of the contamination. Health risk assessment complements the process of ecological risk assessment.

Site-specific health risk assessment is intended "to provide complete information to risk managers, specifically policymakers and regulators, so that the best possible decisions are made" (Paustenbach, 1989, p28). Good risk assessment is dependent upon a high degree of objectivity and scientific skill and should be distinguished from the risk management process which selects options in response to health risk assessments and which incorporates "scientific, social, economic and political information" and which "requires value judgements eg on the tolerability of risk and reasonableness of costs" (ANZECC/NHMRC 1992, piii)

A preliminary site-specific appraisal risk assessment can be undertaken by choosing to apply the Health-based Investigation Levels. These are derived using risk assessment techniques and can be applied generically to a range of exposure settings. Where there are exceedances of the Health-based Investigation Levels, site-specific health risk assessments may be used to determine whether further action is needed for a site. The action may range from informing residents or owners of the site of the contamination to requiring large-scale remediation. Thus, risk assessment for the site generates response levels.

Risk assessment enables:

- baseline risks and whether site remediation or other action is necessary to be determined;
- tolerable levels of contaminants that can remain in place with adequate protection of public health to be determined;
- a comparison of the potential health impacts of various remediation techniques; and
- a consistent method of appraising and recording public health risks at sites to be provided (US EPA 1989).

There are several models of risk assessment and various sets of definitions for the relevant terms. This document uses a model comprising:

- data collection and evaluation of the chemical condition of the site;
- toxicity assessment of contaminants;
- exposure assessment for the population on or near the site; and
- risk characterisation. (US EPA 1989)

These four stages are closely linked and highly dependent on each other.

Data collection entails the acquisition and analysis of information about chemicals on a site that may affect human health and which will be the focus for the particular risk assessment (US EPA, 1989).

Toxicity assessment considers:

a) the nature of adverse effects related to the exposure;
b) the dose-response relationship for various effects;
c) the weight of evidence for effects such as carcinogenicity.

Both qualitative and quantitative toxicity information are evaluated to determine "the incidence of adverse effects occurring in humans at different exposure levels" (US EPA, 1989, p 1.6).

Assessment of the available exposure pathways is an important aspect of site-specific risk assessment. Exposure assessment involves the determination of the frequency, extent and duration of exposures in the past, currently, and in the future. There is also the identification of exposed populations and particularly sensitive subpopulations, and potential exposure pathways. Environmental monitoring and predictive models can be used to determine the levels of exposure at particular points on the exposure pathways. The contaminant intakes from the various pathways under a range of scenarios can then be estimated (US EPA, 1989).

Given this information, risk characterisation details the nature and potential incidence of effects for the exposure conditions described in the exposure assessment. An integral part of this stage is to evaluate the uncertainties and assumptions in the risk assessment process (Langley and El Saadi, 1991). The uncertainties should be "taken into account in planning the management of a site" (ANZECC/NHMRC 1992, p34). The uncertainties may be addressed by gathering further information, the incorporation of safety factors (eg in the development of criteria) and conservatism, and professional judgement.

"The process of risk assessment should enable consistent decisions to be made by the specialists undertaking the process. Expert professional judgement is an integral part of the process. Site-specific risk assessments should not lead to significant variations in the management of similar sites" (ibid, p34)

In many instances site-specific health risk assessments will not be necessary as problems will be 'obvious' and the significant resources required for an adequate site-specific risk assessment or the generation of site-specific soil criteria should be directed to the management of the site. For some sites health risk assessment may be unnecessary as "there may be no population at risk, or decisions may be made on other grounds" (ibid, p20).

Numerical estimates of risk will rarely be feasible because of "limitations in toxicological and exposure data" (ibid, p34) which will be reflected in the uncertainty assessment, but a degree of quantification may be possible for some components such as data collection and exposure assessment.

It should be recognised that, as a consequence of data limitations (for example, not every square metre of a site will be tested), site-specific health risk assessment is a screening process where there may be low rates of false negatives and false positives. "Risk assessment is based on probabilities rather than absolutes and this should be reflected in decision-making" (ibid, p34).

The “Draft Guideline for Health Risk Assessment Methodology” provides an approach to site-specific health risk assessment. Due to the complexity and scale of the health risk assessment process a concise 'cookbook' is not practicable. Similarly, the issues that are relevant for a particular site are sufficiently complex and site-specific that a manageable and complete algorithm for decision-making cannot be drafted: The document provides a series of guidelines (and prescriptions) to assist the decision-making process. Where possible, the document is prescriptive about certain aspects of risk assessment. The proposed prescriptive elements are italicised in the text. Having specific requirements for the content of investigations and having them presented in uniform, coherent and logically developed reports will enable more efficient, accurate, timely and transparent decision-making and a greater consistency of decision-making across Australia. The principles and guidelines in the health risk assessment methodology document are intended to assist that process and the qualitative process of determining whether remediation is required or not for the proposed use.

The site-specific process is a multi-disciplinary task and requires considerable expertise. People involved in specific components of the health risk assessment process should be adequately qualified and experienced and have a broad understanding of health risk assessment and management and the practical realities of contaminated sites.

Professional skills that may be used include: soil science, engineering, geology, history, chemistry, planning, statistics, occupational hygiene, occupational and public health medicine, environmental health, toxicology and health science and epidemiology. While it is unlikely that one person will have the breadth of skill to undertake all components of the health risk assessment, there must be a single person coordinating and taking responsibility for the assessment.

Impact Assessment

Environmental Impacts

The draft Guideline is a comprehensive document. It contains fairly detailed methodologies to describe the health risk assessment process and a significant number of prescriptive areas which are viewed as prerequisites for the conduct of a valid HRA.

The conduct of HRAs at contaminated sites is becoming a more common practice as the tools, experience, and applicability of the methods are more familiar to environmental professionals and other stakeholders. In general, the guide supports and promotes common approaches to the practice of health risk assessment and its comprehensive nature is a valuable tool to practitioners.

Given that the recommended methodologies follow those approaches used most commonly, the net effect of the draft Guide is viewed as providing for common practices and promotion of HRAs. Detailed fate and transport information is not generally available: the development of this information would benefit both HRA and ERA.

Social Impacts

- **Risk communication**: The risk assessment process can appear to be somewhat of a 'black box' to some stakeholders (eg public) to whom the results of the process are communicated. Although the draft Guideline is not intended to form part of a risk management process, the very act of providing a documented methodology will assist in lifting the aura of mystique around the practice. This positive outcome will leave stakeholders better informed to take part in the risk management process.

- **Stakeholder Acceptance:** Formal recognition of the role of HRA in the assessment and management of contaminated sites, as a result of the draft Measure, should provide for increased acceptance by all stakeholders (ie. regulators, industry, community and local government). Use of a standardised HRA methodology including reporting will assist this process.

- **Community Awareness:** Understanding the potential health impacts of contamination present on a site is a critical factor in the assessment and management of contaminated sites. Consistency in HRAs should assist a community's understanding and acceptance of contaminated site management. In addition, uniform and logical presentation of information provides easier community understanding of the assessment process.

Economic Impacts

In situations where the HILs are used as default acceptance criteria there is not anticipated to be any increase in cost of assessment. However where site specific assessments (toxicity assessment, risk characterisation and appraisal of risk) are used extra cost will be incurred. In such cases the follow on reduction in management/remediation costs are expected to more than compensate for this additional assessment cost.

Submissions received have emphasised the importance of differentiating between investigation criteria and response criteria. The greatest potential economic impact of the draft Measure will arise from the increased use of health and ecological risk assessments to identify investigation/response criteria for the proposed use of the site. Whilst there will be additional costs involved in undertaking site specific health and ecological risk assessments these costs will be overshadowed by the positive economic impacts arising from reduced requirements for remediation in most situations. This is the case because at present many consultants simply adopt the currently available investigation levels as default response criteria, rather than conduct site specific risk assessments.

Once again, there are no data available to accurately quantify the economic impact associated with a greater adoption of risk-based response criteria. Consultation within the consulting industry has revealed that this can lead to a very significant reduction in remediation costs.

This is supported from the experience in New Zealand where risk-based response criteria were developed as fairly extensive 'look-up' tables which provided acceptance criteria for evaluation of soils in a number of scenario's. One major industrial operator in New Zealand who had a portfolio of 80 sites, reduced management and remediation costs from approximately A$1M to less than A$0.1M after introduction of this approach.

For this Impact Assessment report a fairly conservative approach has been taken to assessing the positive economic impacts recognising that these approaches are already being adopted by some consultants and regulators. It was assumed that the increase in the use of site-specific acceptance criteria will be a modest 10%. Furthermore an assumption was made that in these cases the remediation costs may be reduced by a factor of 20-40%. From the current baseline of $240 M per annum site remediation costs (refer section 2.2) this would equate to a positive economic impact of the order of $4.8 M to $9.6 M per annum.

This benefit would be offset to some extent by the increased costs of conducting the site-specific risk assessments. Typically risk assessment is of the order of 10-20% of the site assessment costs, such that the increase in the use of such risk assessments in the 10% of cases will lead to an increased cost of approximately $0.6 M to $1.2 M per annum.

Thus the estimated positive economic impact of the draft Measure on remediation costs through the adoption of site-specific acceptance criteria is $4.2 M to $8.4 M per annum.

(It should be noted that this economic analysis includes both soil and groundwater aspects of site contamination assessment and management.)

The NEPC would be keen to receive information in response to this draft Measure and Impact Statement, which could refine these cost estimates.

Significant other, but unquantified impacts are considered to be:

- landfill disposal costs: significant reduction in the use of landfill for disposal of contaminated soil is expected. This may result in an oversupply of landfill space and a reduction in costs available for those more contaminated soils which require disposal.
- land sales: as the costs for management / remediation reduce, this will encourage more land to be released for sale. Obviously, the most attractive property values (and hence more negative impact from contamination) is found within Australia's highly developed / urbanised cities, especially in those inner city areas which are now becoming sought after for residential development. Attendant impacts from the bringing of land to market are not discussed here.
- a reduction in contracting opportunities for land remediation.
- a continued investment by the regulators to stay abreast of the activity in this field and to manage existing regulations / implement policy.

Conclusions

The inclusion of a guideline on HRA provides a common methodology to enhance practices currently used by consultants and regulators. The use of default HILs or a site specific risk assessment remain options which can be utilised at the discretion of affected parties to facilitate an optimised result.

Assessment costs will probably increase if site specific risk assessment is carried out but will be offset by reduced remediation and management costs. **Thus the estimated positive economic impact of the draft Measure on remediation costs through the adoption of HRA and the development of site-specific acceptance criteria is $4.2 M to $8.4 M per annum.**

Stakeholder acceptance of HRAs will be enhanced through formalisation within the draft Measure.

Assessment of Draft Guideline on Ecological Risk Assessment (Schedule B(5) of Draft Guideline)

Stakeholder views on draft Guideline

In July 1998 the NEPC Committee released a Discussion Paper on the assessment of site contamination to key stakeholders who had registered with the NEPC Service Corporation as having an interest in this Measure. Consultation involving meetings with key stakeholders occurred in all jurisdictions and submissions were sought on the Discussion Paper. Stakeholders raised a number of issues during the discussion paper consultation period. Some of the key issues are included below:

- There is a recognised need for a national methodology to ensure consistent ecological risk assessment of site contamination, although concern has been expressed at the lack of Australian data and the cost and resource implications of developing EILs specific to Australian conditions.
- There is concern that currently available ERA methodologies are relatively untested and still the subject of international discussion and debate.
- There is concern that the assumptions used in such methodologies will generate EILs that are too conservative.

Response
While acknowledging that the development of EILs requires further research, the draft Guideline indicates a range of methodologies that may be used to derive EILs, including Part B of the draft National Framework for Ecological Risk Assessment for Contaminated Sites (draft National Framework, developed by EPA Victoria under contract to Environment Australia,). A process for appraisal of Part B and other ecological risk assessment methodologies that can be used for the determination of soil criteria has been proposed as part of the future work plan that will arise from the Measure.

Overview of Draft Guideline on Ecological Risk Assessment

The aim of this Guideline is to promote a consistent, rational approach to Ecological Risk Assessment (ERA) of site contamination that is specific to Australian plants and animals and to describe a clear framework for ERA of chemically contaminated soils that can be readily used by regulatory agencies and risk assessors.

Summary

The draft Guideline presents a framework for ecological risk assessment based on Part A of the draft National Framework for Ecological Risk Assessment for Contaminated Sites.

The Framework is based on the following principles:
- It has been developed to assist in the protection of plants and animals from the adverse effects of chemical contaminants in soil.
- The partitioning of contaminants from soil to other environmental media (for example, air and water) and subsequent exposure to terrestrial biota needs to be considered.

- The protection of ecological values is based on the question, "What do we want to protect?" The answer will be dependent on social relevance, and the ecological and economic significance of plant and animal life that inhabit or visit the region, local area or site as well as the use/proposed use of the contaminated site.
- A site-specific ecological impact level (ie a response level) is the concentration of a contaminant which, if exceeded, may adversely impact upon ecological values.
- ERA considers ecological effects beyond a single organism. This may include individuals of one or more species and/or population, community and ecosystem level effects.
- The protection of the species that is at greatest risk within a set of identified ecological values is to be considered to be protective of all ecological values associated with the site.
- ERA methodologies are typically predictive, using exposure, toxicological and chemical parameters to estimate the level of contamination that will not cause adverse ecological impacts and then compares the level with on-site contaminant concentrations. Where appropriate retrospective monitoring may be used to assist in determining ecological risk.
- Where the EIL for a contaminant is less than the background soil concentration, the background concentration is considered sufficiently protective of the ecological values and becomes the EIL.
- Where specific data are unavailable, best estimate assumptions based on the advice of a toxicologist should be made to fill the data gaps to ensure the protection of ecological values.
- When using data, best estimates are calculated using median/mean parameters.
- Toxicological data from chronic studies of the relevant species are the preferred data for use.
- Explicit consideration of the duration spent on a site, vegetative cover and soil structure must be incorporated into the use of the methodology and the derivation of soil guidelines.
- It is intended that EILs will be determined by jurisdictions on a regional basis. In other cases ecological values may be selected as required by the respective jurisdiction for a land-use/site in a specific region for which EILs are calculated.

A range of methodologies have been, or are being, developed internationally for ERA, which may be consistent with the framework presented in this schedule. Part B of the draft National Framework is an example of such a methodology that was developed in Australia and is consistent with the framework presented in this schedule. Part B has been released as a draft. Further review, refinement and demonstration of this methodology should be undertaken and NEPC will be further considering these issues over the next several months. A copy of the document, "*Victorian pilot study – Development and Application of Ecological Investigation Levels*" is available through the JRN, EPA Victoria (see page 23 for contact details).

A mechanism is needed to facilitate a coordinated approach to validating, consolidating and expanding Australian ecotoxicological databases. Some areas that may be covered are outlined below:

1. Evaluation of the quality of currently available Australian ecotoxicological data.

    - Toxicity data: Generation of high strength toxicity data that is specifically relevant to the Australian environment. Of particular usefulness would be data on Australian amphibia which are generally regarded as being very sensitive to

environmental factors. Funding bodies should be made aware of the importance of supporting such proposals.

- Bioavailability parameters: Further research in this area would significantly reduce the conservatism inherent in many ERA methodologies. Bioaccumulation beyond a second order trophic level relies largely on conservative assumptions which are, in part, based on theoretical and factual information. Further research into this area will also reduce conservatism. Funding bodies should be made aware of the importance of supporting such proposals.

2. A review of what ecological values should be protected in the different end use scenarios, given the continued paucity of ecological and ecotoxicological data now and in the near future.

3. A review of the international 'state of the art' on ecological risk assessment methodologies be undertaken so as to obtain an understanding of what is achievable, scientifically justifiable, practical and cost effective ERA. This should include a realistic evaluation of the experience of those international agencies in implementing the different ERA methodologies.

Impact Assessment

Environmental Impacts

Development of a consistent and accepted methodology for ecological risk assessment (ERA) is recognised as a requirement for effective assessment of site contamination. ERA is a set of formal, scientific methods for assessing the undesired effects of contaminants on plants and animals of ecological values. The development and application of ERA is difficult because of the diversity and complexity of ecosystems and is compounded by the limited amount of data derived directly from Australian species. Ecological Impact Levels (EILs) are based on threshold levels for phytotoxicity, or uptake on contaminants which may result in impairment of plant growth or reproduction or unacceptable residue levels for plants and adverse toxicological effects for animals. It should be noted that, because of Australia's ecological diversity, the development of Regional Environmental Investigation Levels (REILs), is proposed for use in the draft Matrix of Investigation Levels for Soil and Groundwater. Where data are of poor quality or unavailable, the use of safety or extrapolation factors in generating soil guidelines may lead to substantial conservatism and this should be appreciated and explicitly identified in the derivation and use of the guidelines.

The social, cultural and economic value of a species will be considered in determining the ecological values to be used in establishing soil guidelines. The protection of a species is intended to protect the species as a whole rather than the protection of all individuals within a species.

The concept of REILs has been developed to account for regional ecological differences. However, significant gaps in the data base will mean that effective use of this system is delayed until such time as commitment, funds and data are available for the derivation of the REILs by the jurisdictions. It is expected that the development of REILs will focus on those areas in which most site contamination assessment occurs (eg urban areas).

Social Impacts

Use of EILs/REILs will be determined by jurisdictions on a regional basis. This should provide ease of understanding for stakeholders and provide background to the relevance of assessment.

When developed, adoption of a consistent methodology for ecological risk assessment will potentially increase community understanding. EILs/REILs will provide community/stakeholders with increased acceptance of the process and potential outcome. Ecological values which are more closely aligned with local ecological values should promote a greater level of community acceptance.

Economic Impacts

Derivation of EILs/REILs will need to be supported by a large database. Under the draft Guideline, REILs may be determined by jurisdictions on a regional basis. There will be a negative impact on regulators who will need to fund appropriate studies. Based on estimates derived from a current Victorian pilot study, the resources required for development of EILs, using the methodology outlined in the draft national Framework, is expected to be in the order of 3.5 days per contaminant, based on obtaining data from published literature. The resource implications of adopting such a methodology will be dependent on the number of regions for which REILs will be limited to areas of most concern in site contamination, typically the major urban and industrial areas. If the development of EILs requires new eco-toxicological or other data, or if the EILs are based on retrospective monitoring data the resources required may increase. This compares favourably to the resources required to produce the Australian Water Quality Objectives for toxicants of about 4.3 days per contaminant (*National Water Quality Management Strategy: Draft Guideline for Fresh and Marine Water Quality, Volume 2 Aquatic Ecosystem Protection and Background Information ARMCANZ/ANZECC*).

Inherent in any assessment is the need to determine liabilities associated with identified risks. Use of an accepted standardised methodology for EIL will provide assurance to regulators and other affected parties (eg land developers, consultants) that potential liabilities are minimised.

Conclusions

Development of a consistent and accepted methodology for ecological risk assessment (ERA) is recognised as a requirement for effective assessment of site contamination. However, the data are too sparse for ERA to be of practical use in the short-term, except in high value assessments which would support the cost of data acquisition to fill the data gaps.

Assessment of Draft Guideline on the Assessment of Groundwater Contamination (Schedule B(6) of Draft Measure)

Stakeholder views on draft Guideline

In July 1998 the NEPC Committee released a Discussion Paper on the assessment of site contamination to key stakeholders who had registered with the NEPC Service Corporation as having an interest in this Measure. Consultation involving meetings with key stakeholders occurred in all jurisdictions and submissions were sought on the Discussion Paper. Stakeholders raised a number of issues during the discussion paper consultation period. Some of the key issues are included below:

- Consideration should be given to the protection of possible future receptors.
- The Guideline should not infer that an aquifer may be contaminated provided the "Australian Water Quality Guidelines for Fresh and Marine Waters" 1992, are not exceeded at the point of use.
- All current and future uses of the groundwater resource should be considered for protection.
- Information on when to assess groundwater contamination should be provided.
- Draft Guideline should be consistent with the National Water Quality Management Strategy, "Guidelines for Groundwater Protection in Australia", September 1995 (ARMCANZ/ANZECC).
- Draft Guideline is useful but too superficial in its present form: information on data collection should be expanded.
- All reference to management and remediation should be removed.

Response

- Technical detail relating to data collection and sampling has been expanded and incorporated into Schedule B(2), *Data Collection, Sample Design and Reporting of Data*.
- The management and remediation sections have been removed as they are no longer within the scope of the Measure.
- A section on 'When to Assess' has been added.

In the context of a contaminated site and the draft assessment framework, groundwater is considered to be contaminated when it is not suitable for its current or intended use or presents the likelihood of causing an unacceptable environmental impact in the discharge environment. The definition of intended use has been expanded to include a realistic assessment of possible future uses. All potential receptors associated with these uses should also be considered with appropriate consideration given to possible or predicted impacts on the most sensitive receptor(s). Management of groundwater contamination through legislation and policy is a regulatory issue for each jurisdiction. Jurisdictions generally consider that contamination of groundwater is unacceptable and is the responsibility of the polluter.

The draft Guideline has been amended to be more consistent with the AWQG criteria and now refers to environmental values rather than beneficial uses. The AWQG criteria

are still recommended for use as 'investigation' levels at the point of extraction but their application at the point of use has been changed from 'clean up' to 'action' levels, recognising that it is not always practicable (although it is preferred) to clean up contaminated groundwater to AWQG criteria.

Overview of Draft Guideline on the Assessment of Groundwater Contamination

This draft Guideline provides a general framework for the assessment of groundwater impacts associated with land contaminated by liquid and solid materials. The draft Guideline deals with land contamination which originates from mainly industrial, mining or mineral processing and commercial and agricultural activities other than groundwater affected by nutrient levels and salinity.

Impact Assessment

Environmental Impacts

- **Risk Assessment:** In keeping with current practices, the draft guideline proposes a risk-based approach to the assessment process which parallels the approach to assessment of soil contamination.

  Groundwater in association with a contaminated site is considered to be contaminated when it is not suitable for its current or intended use or presents the likelihood of causing an unacceptable environmental impact in the discharge environment. Intended uses include realistic assessment of possible future uses with particular attention paid to unused aquifers of reasonable water quality and yield. Intended uses do not include all possible uses eg high salinity groundwater of limited extent and low yield are capable of being treated and used. However, this is usually not practicable because of the high economic cost involved. The initial process consists of preliminary investigations involving site history review, inspection and sampling of investigation or monitoring levels.

  The Guideline uses a risk-based approach that contributes to protection of groundwater resources. The groundwater issues associated with most contaminated sites are usually of limited extent and effective remediation is often costly and disruptive to local communities. The risk-based approach provides a methodology which clearly identifies risk and low risk sites from a groundwater contamination perspective and provides a basis for determining when clean up or ongoing monitoring is necessary.

  When a receptor(s) is identified, levels of contamination above the appropriate AWQG at the point of extraction in investigation or monitoring levels triggers further investigation. If this shows that contamination levels currently exceed or are expected to exceed levels, the appropriate AWQG at the point of use are then used as action levels for subsequent remediation.

- **Regional Differences:** The adoption of environmental value criteria provides for consideration of regional (local) differences. It should be noted that groundwater is used extensively across Australia for potable water supply and irrigation. It is widely recognised that Australia must endeavour to preserve the quality of groundwater

resources, whether they are currently used or not (recognising inter-generational equity for such resources). It is therefore considered that stringent application of recommended guidelines in all areas with a potentially useful water supply will result in the best environmental outcomes for Australia.

Social Impacts

- **Confidence in Analysis:** Adoption of the Guideline should provide increased confidence to regulators and other stakeholders that results can be relied upon as a true indication of contaminant levels which will protect identified environmental values.

- **Community Trust:** Use of an accepted methodology should lead to greater community confidence. It should be noted that contaminated groundwater often raises more concerns for stakeholders neighbouring a contaminated site that the presence of contaminated soil at the site. The references within the draft Guideline referring to the full delineation of a contaminated groundwater plume, if followed, will provide certainty to the community especially in respect of identifying the presence or otherwise of the contaminated groundwater beyond the boundaries of the source site.

Economic Impacts

- **Assessment Costs:** Standardisation of the groundwater assessment methodology will promote the requirements for competent assessment, and avoidance of duplication or need to repeat part or all of an assessment to meet regulatory / independent audit requirements resulting in lower overall costs. However, there will potentially be an increase in the costs associated with assessments currently regarded as not meeting the guidelines or which need to be more stringent to meet the requirements of the Guideline.

- **Remediation and Management Costs:** Groundwater cleanup costs are a potential major cost for all stakeholders. Cleanup to background levels is not always technically feasible, and attempts to achieve total clean-up can be prohibitively expensive. The risk-based assessment approach should provide the basis for a positive economic impact through preventing unnecessarily stringent cleanup. The positive economic impacts arising from risk-based acceptance criteria are dealt with in section 3.4.3. There will be cases, of course, where the process will lead to substantial remediation costs.

- **Reduction of Liability:** Inherent in any assessment is the need to determine liabilities associated with identified risks. Use of an accepted standardised methodology will provide assurance to regulators and other affected parties (eg. land developers, consultants) that the assessment has been carried out in a formal and structured fashion and thus any question of technical competence of the assessment with regard to potential liabilities is reduced.

Conclusions

The draft Guideline provides a risk-based framework for assessment of groundwater contamination which is consistent with the health and environmentally-based risk assessment approach proposed for soil contamination. The adoption of existing water quality criteria as investigation levels allows for "fit for use" assessment and consideration of regional differences.

Assessment of Draft Guideline on Health-Based Investigation Levels (Schedule B(7) of the Draft Measure)

Stakeholder views on draft Guideline

In July 1998 the NEPC Committee released a Discussion Paper on the assessment of site contamination to key stakeholders who had registered with the NEPC Service Corporation as having an interest in this Measure. Consultation involving meetings with key stakeholders occurred in all jurisdictions and submissions were sought on the Discussion Paper. Stakeholders raised a number of issues during the discussion paper consultation period. Some of the key issues are included below:

- Many submissions support the use of HILs as a way to screen sites and the guideline is seen to provide a good overview of health-based investigation levels for a range of contaminants.
- It has been suggested that there should be HILs set for all commonly tested substances.
- Where HILs are not currently established, the process by which these could be set should be provided.

Response

- HILs have been developed according to importance of contaminants, the availability of data for acceptable (or tolerable) daily intakes (ADIs) and the availability of resources.
- The development of criteria for carcinogenic contaminants where there is no ADI is awaiting the outcome of the NHMRC Working Group on Cancer Risk Assessment of Soil Contaminants.
- Where HILs are not available there should be consultation with the relevant health authorities. An HIL for a substance may be derived by the processes set down for the development of HILs.
- Review and updating of the HILs is expected to be done by the National Environmental Health Forum.

Overview of Draft Guideline on Health Based Investigation Levels

Background

Given the need for soil criteria identified in the preparation of the ANZECC/NHMRC Guidelines (1992), Health-based Investigation Levels (HILs) were developed for four substances: lead, arsenic, cadmium and benzo(a)pyrene. The detailed rationales for these are provided in El Saadi and Langley (1991) and a summary rationale in Imray and Langley (1996, 1998).

Further HILs were derived according to the principles established in ANZECC/NHMRC (1992) and detailed rationales have been published in Langley and van Alphen (1993), Langley, Markey and Hill (1996) and Langley, Imray, Lock and Hill (1998). A consolidated list of HILs for more than 20 substances (or groups of substances) was published in Imray and Langley, *'Health-based soil investigation levels'*, *National Environmental Health Forum Monographs (1986, 1989),* which provides information on the principles of derivation and use of HILs. The material in the sections below from 'Derivation' onwards is from that document.
HILs have been derived for a range of human exposure settings and these exposure settings are detailed in Taylor and Langley (1996, 1998). They are summarised in 'Exposure Settings' below. The HILs have been reviewed at four national workshops with representatives of health and environment agencies and by the National Environmental Health Forum which represents environmental health agencies.

Definition of HILs

There are two prerequisites for comparison of soil test results with defined soil criteria. The first prerequisite is a uniform soil sampling methodology which provides an appropriate amount of information about the distribution and level of contaminants on a piece of land. The second is a uniform approach to data analysis to enable a meaningful interpretation of sampling results.

Investigation Levels

An investigation level is the concentration of a contaminant above which further appropriate investigation and evaluation will be required. The investigation and evaluation is to ascertain:

- the typical and extreme concentrations of the contaminant(s) on the site;
- the horizontal and vertical distribution(s) of the contaminant(s) on the site;
- the physico-chemical form(s) of the contaminant(s);
- the bioavailability of the contaminant(s).

(Langley and El Saadi 1991)

Health-based Soil Investigation Levels are not intended to be clean up levels.

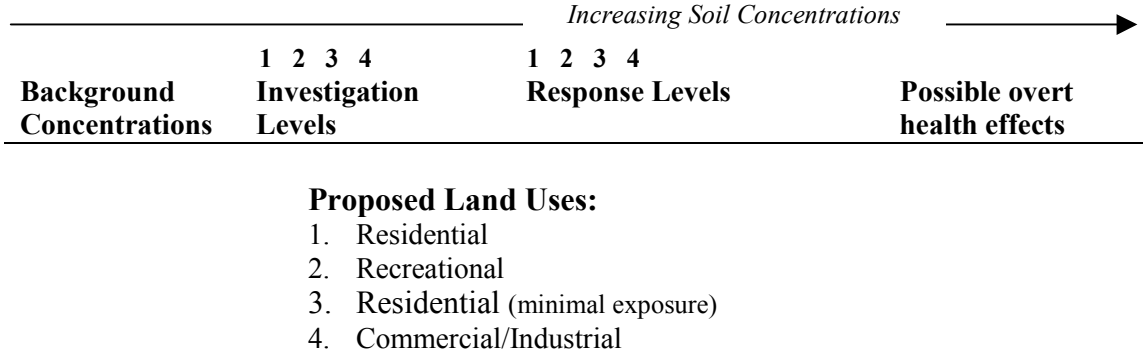
Levels slightly in excess of the investigation levels do not imply unacceptability or levels likely to pose a significant health risk.

Once the further investigation(s) is (are) completed, a site-specific health risk assessment will be required to determine the presence of health risk and, if present, its nature and degree.

Final assessment of the degree of contamination should take into account any uncertainties arising from the sampling and analytical methodologies.

When dealing with substances which are considered to have possible effects at very low doses (eg. some carcinogens), a specific approach will need to be established to derive the investigation and response levels. The NHMRC Technical Working Party on the Carcinogenic Risk Assessment for Soil Contaminants will establish Guidelines for Cancer Risk Assessment. Their report, 'Draft Cancer Risk Assessment for Environmental Contaminants' (in press) is currently being reviewed following a process of public consultation and will be retitled 'Toxicity Assessment Guidelines for Carcinogenic Soil Contaminants'.

Figure 2
The relationship of soil criteria levels for Substance X.



(Figure not to scale, sequence of '1234' will vary from substance to substance. For example, for another substance, the sequence may be 2134)

(ANZECC/NHMRC, 1992, p36)

When assessing the environmental/health significance of levels of contamination above an investigation level, the following factors should be considered: potential ground water contamination; land use; the history and nature of the contamination; evidence of potential contamination from site inspection; the local background levels; the problems of the presence of multiple contaminants; and the size of the site. Exposure pathways will be more diverse for a larger site.

HILs do not take into account all environmental concerns (for example, the potential effects on wildlife): where relevant, these require further consideration. Environmental concerns are intended to be addressed by Ecologically-based Investigation levels.

Derivation

ANZECC/NHMRC (1992) and Imray and Langley (1998) detail the derivation of HILs. In general terms, a variable percentage of the Tolerable Intake will be allowed for contaminated soil, and background exposures (eg. from food) are considered.

Exposure Settings

The following exposure settings (Taylor and Langley 1998) are based on several conservative assumptions and are used to provide a 'tiered' set of soil criteria for different exposure settings:

A. 'Standard' residential with garden/accessible soil (homegrown produce contributing less than 10% of vegetable and fruit intake; no poultry): this category includes children's day-care centres, kindergartens, preschools and primary schools.

B. Residential with substantial vegetable garden (contributing 10% or more of vegetable and fruit intake) and/or poultry providing any egg or poultry intake.

C. Residential with substantial vegetable garden (contributing 10% or more of vegetable and fruit intake); poultry excluded.

D. Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise apartments and flats.

E. Parks, recreational open space and playing fields: includes secondary schools.

F. Commercial/Industrial: includes premises such as shops and offices as well as factories and industrial sites. It is assumed that thirty years is the duration of exposure.

Where land is used predominantly for one purpose, but contains within it a more "sensitive" use, then the exposure setting relevant to that more sensitive use must be adopted for that particular parcel of land. For example, if an industrial site is also used for residential purposes such as a caretaker's residence, or there is an on-site creche within a commercial facility, then the appropriate residential setting "A" should be used for areas of the site that may give rise to soil exposure.

There are numerous qualifications and constraints to the use of these exposure settings and Taylor and Langley (1998) must be examined closely before these exposure settings are used.

Health Investigation Levels

Table 4
Health-based[a] Soil Guidelines for Individual Substances
for Exposure Settings A – F

Substance	Health-based Investigation Levels[b] (mg/kg)					
	A	B[c]	C[d]	D	E	F
Aldrin + Dieldrin	10			40	20	50
Arsenic (Total)	100			400	200	500
Benzo(a)pyrene	1			4	2	5
Beryllium	20			80	40	100
Boron	3000			12000	6000	15000
Cadmium	20			80	40	100
Chlordane[e]	50			200	100	250
Chromium (III)[fg]	12%			48%	24%	60%
Chromium (VI)	100			400	200[j]	500
Cobalt[k]	100			400	200	500
Copper	1000			4000	2000	5000
Cyanides (Complexed)[h]	500			2000	1000	2500
DDT + DDD + DDE	200			800	400	1000
Heptachlor[e]	10			40	20	50
Lead	300			1200	600	1500
Manganese	1500			6000	3000	7500
Methyl mercury[i]	10			40	20	50
Mercury (inorganic)[f]	15			60	30	75
Nickel	600			2400	600[j]	3000
Polycyclic aromatic hydrocarbons (PAHs)	20			80	40	100
PCBs (Total)	10			40	20	50
Phenol[k]	8500			34000	17000	42500
Total Petroleum Hydrocarbons						
$>C_{16} - C_{35}$ Aromatics[1]	90			360	180	450
$>C_{16} - C_{35}$ Aliphatics	5600			22400	11200	28000
$>C_{35}$ Aliphatics	56000			224000	112000	280000
Zinc	7000			28000	14000	35000

a Environmental Soil Quality Objectives and Aesthetic/Functional Soil Guidelines are in preparation
b See exposure settings detailed in Taylor and Langley (1998)
c Site and contaminant specific: on-site sampling preferred
d Site and contaminant specific
e See Appendix 1 of Imray and Langley (1998) for relevance to the Northern Territory
f Need to ensure valency state by site history/analysis/knowledge of environmental behaviour
g Soil discolouration may occur at these concentrations
h The nature of cyanides on a site must be assessed. To use the HIL for complexed cyanides, no more than a five percent of free cyanides should be present and *vice versa* for free cyanides (see p.28, Taylor and Langley (1998)
i Need to ensure form of substance by site history/analysis/knowledge of environmental behaviour
j Skin contact resulting in exacerbation of pre-existing skin sensitisation is the critical effect and recreational use is considered the same as residential use because of the skin contact opportunities
k Odours and skin irritation may occur at lower, as yet undetermined, concentrations. PVC pipes may be affected at high concentrations with possible adverse effects on the water therein.

[1] The carbon number is an 'equivalent carbon number' based on a method that standardises according to boiling point. It is a method used by some analytical laboratories to report carbon numbers for chemicals evaluated on a boiling point GC column.

The arithmetic mean and standard deviation of results, and localised elevated values must be considered in the interpretation of results (see Imray and Langley 1998, p 11).

There are numerous qualifications and constraints to the use of these soil criteria. Imray and Langley (1998) must be examined closely before these soil criteria are used.

Impact Assessment

Environmental Impacts

The HILs have been developed with a clear focus on human health; it is inappropriate to use HILs to assess ecological impacts.

Social Impacts

- **Exposure settings**: To accommodate the range of human exposure settings the draft Guideline provides six tiers of HILs. It is acknowledged that the categories of exposure settings are somewhat arbitrary/judgemental and semi-quantitative. Occurrences will arise during site assessments of exposure settings which differ or are more complex than those provided. However, as the document (and its references) includes relevant data on the preparation of the exposure settings, then competent professionals should be able to develop variations from the six levels provided.

- **Defacto acceptance criteria**: HILs for exposure settings A-F are currently available for a range of substances. In many situations the exposure settings and investigation levels will be used as acceptance criteria, (since the methods for site-specific health risk assessments are complex and could be costly to apply for small or routine site assessments). This will lead to a degree of conservatism in the setting of criteria as part of site assessment. It is considered that this will be most prevalent for smaller sites where time and cost issues will mitigate against the derivation of site specific criteria.

- **Regional differences:** As HILs are based on a single species, (humans), with fairly consistent behaviours (especially soil ingestion) between regions, regional differences will have minimal impact. However, as the HILs do not consider highly volatile substances, differential temperatures between Australia's regions should not impact significantly nor require major revision of the HILs on a regional basis.

- **Community Trust:** Adoption of HILs and promulgation of the factors relating to their determination will potentially increase community understanding and confidence in the level to which sites are being assessed and or remediated.

- **Community Health Related Effects:** There is a potential for the health benefits being related to the agreed HILs (from reduced incidence of illness, absenteeism, avoided health costs). However, as detrimental health impacts from contaminated land are either very minor or poorly documented, the significance of this impact cannot be elaborated upon.

Economic Impacts

- **Conservatism**: Both the extrapolation of toxicological data and the setting of exposure criteria (eg. for residential the period of exposure is set at 70 years and for occupational exposure at 30 years; assumption of 100% bioavailability) may mean that the HILs are too conservative. Given that the derivation of the HILs are clearly defined, including the exposure settings, the levels are merely a statement of a result of a defined process. However, the likelihood of industry use of the numbers as de-facto acceptance standards may lead to pressure to revise some of the assumptions. The use of the HIL's as de-facto response criteria may lead to unnecessary clean-ups being recommended.

- **Risk Assessment Database:** The current draft Guideline includes HILs for approximately 20 substances, however, it is anticipated that this list would need to be revised as the use of HILs expands and data for more environmental contaminants becomes available. This will initially involve costs and it is expected that these will be borne by the public sector or result from specific work on significant problem sites.

- **Investigation Costs:** The draft Guideline provides a potential positive economic impact by reducing costs of assessment and remedial actions via the use of HILs. However, these HILs are already in common usage so the cost impact of the draft Measure in this area will be minimal. In the case of the development of a specific HIL or other contaminant threshold limits, some additional analysis requirements and/or assessments may be required. It is considered that these additional costs would not be significant.

- **Community Health Costs:** Dependent on the agreed HILs, it is possible that costs associated with community impacts (incidence of morbidity, mortality, absenteeism and health costs) from contaminated land could be reduced, although no data are available and it is anticipated that the impacts would be minor.

Total petroleum hydrocarbons: Due to the variability of mixtures of hydrocarbons and their volatile nature the task of producing a simple uniform set of criteria for these compounds based on the methodology for the HILs is not possible at this time. However, a significant number of sites are impacted by fuel related products. Given the complexities of this area it is likely that industry will take a conservative view on hydrocarbon impacts until more specific guidance is available. This will result in some unnecessary expenditure on clean-ups as a result. However, aesthetic concerns for fuel impacted soils arise at relatively low levels and these concerns predominate in practice. A process for the determination of soil criteria has been proposed as part of the future work plan that will arise from the Measure.

Conclusions

The inclusion of a draft Guideline relating to HILs provides a uniform approach to the requirement of further investigation of contaminated sites by utilising a common set of investigation levels for a variety of contaminants in a variety of exposure settings. Process descriptions for the derivation of HILs have been provided within the draft Guideline to allow for contaminants not covered by the current HILs. In relation to the community it is likely that the use of consistent HILs will provide increased community confidence in the assessment process. Some costs would be expected from the

implementation of site specific HRAs (covered in a previous section on HRA methodology) and in relation to the development of additional HILs for further contaminants, however the use of default HILs could decrease the costs of assessments.

Assessment of Draft Guideline on Community Consultation and Risk Communication (Schedule B(8) of the Draft Measure)

Stakeholder views on draft Guideline

In July 1998 the NEPC Committee released a Discussion Paper on the assessment of site contamination to key stakeholders who had registered with the NEPC Service Corporation as having an interest in this Measure. Consultation involving meetings with key stakeholders occurred in all jurisdictions and submissions were sought on the Discussion Paper. Stakeholders raised a number of issues during the discussion paper consultation period. Some of the key issues are included below:

- Many submissions agreed with the aims of the draft Guideline and suggested additional emphasis on the two-way communication flow between the community and the practitioners.
- The consultation strategy should be flexible and open to input from community members as it is developed.

Response

- The draft Guideline recognises the community as a legitimate partner, able to contribute important information to the site assessment process and be involved in the decision-making process.
- Additional emphasis has been placed on the role of the community in the early stages of a site assessment, especially in the development of the consultation strategy to be adopted.

Overview of Draft Guideline on Community Consultation and Risk Communication

This draft Guideline is primarily designed for use by contractors and regulators involved in assessments of potentially contaminated sites. However, they have been written in an accessible way so that all those involved in the process (eg community, industry, government) can find out easily what an effective communication and consultation strategy should contain.

Introduction

A successful consultation and communication strategy is one step towards achieving the successful assessment and management of a contaminated site. No detailed contaminated site assessment should be commenced until an evaluation has been made regarding the probable need, nature and extent of consultation for the project. The goals of any consultation and communication strategy are to inform the wider community of what is happening, to build and maintain the credibility of the organisation, to meet regulatory requirements and to provide maximum opportunity for community input.

Successful consultation and communication does not always mean that the wider community will be satisfied with the decisions all the time but it does mean that they should have greater trust in the organisation's commitment to protect the environment and public health and a greater acceptance of the limitations of the assessment process.

This draft Guideline outlines a number of actions that contractors and regulators can take to help ensure those affected by the assessment of a contaminated or potentially contaminated site are fully informed and involved.

Perceptions and Perspectives

In the draft Guideline, risk is defined as the chance of a prescribed undesired effect, such as an injury, disease, death, resulting from human actions or a natural catastrophe. Determining what is an acceptable risk is a social decision influenced by different competing factors such as:

- the magnitude of the risk and the uncertainties associated with any estimate (eg risk);
- community perceptions of risk;
- the control or lack of control of the management of the site felt by the wider community; and
- political and economic factors.

To consult effectively, practitioners need to be aware of the various stakeholders, including people from different interest groups such as industry, government, residents, non-government organisations, employees/unions, associations and the media, and to ensure that they all have the opportunity to be involved.

Practitioners should also consider the types of questions that may arise during the consultation process. Questions on topics such as health and lifestyle, data and information, the assessment process and risk management issues.

Guiding Principles

The draft Guideline lists a number of guiding principles for practitioners to follow based on the need to give as much weight to community concerns as meeting regulations or project plan commitments and to ensure the consultation process is a two-way process These are outlined below.

- accept and involve the community as a legitimate partner;
- plan carefully;
- allow sufficient time for the consultation process;
- listen to the community's specific concerns; be open, honest and frank; collaborate and coordinate with other credible sources;
- meet the needs of the community;
- communicate clearly and with compassion, kindness and respect; and
- evaluate your performance.

Consultation Strategy

The aims of any consultation strategy should be to integrate the consultation and communication activities with the risk assessment and management process. To increase the effectiveness of the consultation and communication strategy the draft

Guideline recommends allocating adequate resources and ensuring there is sufficient dialogue to reduce unwarranted tension within the wider community. Experience suggests that the formulation of some of the best consultation and communication strategies come from a team effort involving persons from differing perspectives.

The role of planning in preparing a strategy preparation is viewed as essential. The draft Guideline lists the type of research and planning needed which includes the following:

- demographic profile of the local area;
- past media reports;
- maps, diagrams and reports relevant to the project;
- identification of issues and concerns of individuals, groups and the wider community;
- identification of the various stakeholders affected by the assessment;
- area of impact of the project;
- identification of key community leaders;
- determining requirements for consultation and stakeholder involvement;
- designing appropriate notices and signage;
- incorporating an evaluation process to measure the effectiveness of the consultation process;
- developing a consultation and communication protocol; and
- documenting the strategy.

Consultation Techniques

An effective consultation strategy should include all affected stakeholders and use techniques that ensure all who wish to participate in the consultation are able to do so. The extent of the consultation depends on the nature and impact of the contaminants, the proximity of the community and the particular stage of the assessment process. As a general guide, the more significant the impact of the contamination on the community, the greater the level of community participation expected. This draft Guideline also recognises that there is no single type of stakeholder and that different techniques should be used to reach different stakeholders. Consultation is more likely to be effective if it builds an ongoing relationship between various stakeholders.

When consulting with the wider community there is usually a diversity of concerns and opinions on risk issues. The draft Guideline recognises the need to accept the wider community's views and concerns to ensure there is recognition that their issues are being acknowledged and communication barriers can be broken down. This helps to establish a two way process and starts the important process of building mutual trust, credibility and respect. Conversely, not being able to accept the different perceptions is likely to create distrust, hinder communication and impede future actions.
Further information on the advantages of various consultation techniques, ranging from large public meetings to individual discussions, are comprehensively detailed in the draft Guideline. An easy to refer to table of communication "Dos and Don'ts" is also included in the draft Guideline.

The Appendix provides details on two case studies, one a relatively undeveloped site in a metropolitan area alleged to contain radioactive material, the other a residential area of Melbourne suffering from severe lead contamination. These examples demonstrate how proper planning and implementation of a consultation strategy can lead to well-

informed communities; able to contribute to decision-making and generally satisfied with the assessments and actions undertaken.

Impact Assessment

Environmental Impacts

Consultation with the community and key stakeholders can often assist in determining with more certainty the actual site history for the site being assessed, and therefore improve the technical site contamination assessment. This is an important step in the data collection phase of any assessment.

There are many cases where consultation with relevant stakeholders, including the community, can assist in identifying the best outcome for the site in terms of its remediation requirements.

Social Impacts

- **Community and Stakeholder Confidence:** Community perception of the potential impacts related to contaminated sites, especially in the case of controversial sites, can have a significant impact on the management of contaminated sites and the credibility of organisations involved. Appropriate inclusion and liaison with the community and other relevant stakeholders, and using a uniform methodology prior to and during assessments of contaminated sites, is likely to increase the level of stakeholder confidence (although not always satisfaction regarding decisions) in the organisations involved.

- This can lead to a reduction in resources and time requirements to resolve community based concerns.

- **Multi-disciplinary Approach:** The use of clearly established guidelines will avoid confusion and clarify concerns at an early stage (especially identifying when such a consultation process is not essential). This approach will increase the potential for informed involvement of site personnel (including contractors) stakeholders, including community and the understanding and anticipation by industry of stakeholder perceptions.

Economic Impacts

Given that current practice does not generally involve much consultation at the assessment phase the introduction of a consultative component is likely to marginally increase costs and resources used associated with the assessment process. However, these costs may be counteracted by the reduction in costs associated with resolving community-based concerns during or after completion of the site assessment or remediation process.

Conclusions

The inclusion of a guideline for community consultation and risk communication is likely to increase, to some extent, the level of stakeholder confidence in organisations undertaking assessments as well as providing an indirect mechanism for reducing health, safety and environmental risks associated with site activities on contaminated sites. In addition, this consultation stage will provide a process for increasing stakeholder (including site personnel) awareness and understanding of potential risks. Cost and increased resource use may be incurred in relation to the addition of such a consultative phase in assessments, however these costs will then be off-set by the reduction in liabilities and potential incidents and/or costs associated with resolving community based concerns, as well as the increased opportunity to identify more cost-effective remediation outcomes.

Assessment of Draft Guideline on the Protection of Health and the Environment During the Assessment of Contaminated Sites (Schedule B(9) of the Draft Measure)

Stakeholder views on draft Guideline

In July 1998 the NEPC Committee released a Discussion Paper on the assessment of site contamination to key stakeholders who had registered with the NEPC Service Corporation as having an interest in this Measure. Consultation involving meetings with key stakeholders occurred in all jurisdictions and submissions were sought on the Discussion Paper. Stakeholders raised a number of issues during the discussion paper consultation period. Some of the key issues are included below:

- Appendix 5 on OHSA levels of hazard A to D was viewed as misleading as it did not explain the hazards to which people are potentially exposed.
- Some sections were viewed as understating potential hazards.
- The section on incident reporting was viewed as too simplistic. Suggestions were made for ranking the seriousness of incidents and providing information on report content.
- There was insufficient emphasis on other control measures besides the use of personal protective equipment.

Response

- Appendix 5 has been removed as it was confusing and did not add value to the draft guideline. It has been replaced with information from Worksafe on Guidance of Atmospheric Exposure Levels.
- Certain sections have been revised and expanded to include more appropriate information on possible hazards. This guideline is intended to provide general information on the potential risks to health and the environment and, where necessary, the reader has been referred to more detailed information and standards as well as the relevant authority.
- The guideline now promotes a range of control measures rather than seeming to advocate the use of personal protective equipment above all other control measures.

Overview of Draft Guideline on the Protection of Health and the Environment during the assessment of contaminated sites

Introduction

During the assessment of a contaminated or potentially contaminated site, the protection of the environment and the health and safety of site investigation personnel, other personnel on the site, users of adjoining land and passers-by is paramount. This Draft Guideline covers issues to be considered and action to be taken to minimise the possible risks posed to human health and the environment during the Assessment of Site Contamination. This draft Guideline is intended primarily for site investigation specialists but is also intended to be referred to by other consultants and regulatory authorities.

In preparing this draft Guideline, account has been taken of the relevant jurisdictional requirements to ensure these are also met. This draft Guideline is not intended to be a prescriptive guide to safety rules for site assessment, but rather to provide a draft Guideline framework of the issues to be considered when preparing a site specific safety plan.

Responsibilities

The draft Guideline assigns responsibility for the assessment of risks to human health and the environment posed by the current site condition and any impact arising during assessment to a site safety assessor. The site safety assessor should be appropriately qualified and experienced. Following identification of these risks the site safety assessor devises and implements a site-specific safety plan to remove or appropriately mitigate the identified risks. The information upon which the site safety assessor makes this judgement is via:

- a Preliminary Site Investigation. As part of this phase, an assessment of potential risk posed by physical disturbance of the site should be completed before any detailed field work is undertaken;
- a Detailed Site Investigation. This is an intrusive investigation targeted at obtaining detailed information on the nature and distribution of contaminants on a potentially contaminated site to enable quantification of the risk posed by any identified contamination and any remediation plan, if required.

For minor works, and in the absence of site-specific safety plan, the draft Guideline recommends making available a generic site safety plan to all workers. For major works the draft Guideline details the type of information that should be included in a site specific safety plan and the actions required to obtain this information. At all times, strict observance must be made of all current, relevant legislation.

Protection of Health

Detailed information is included on the health risks associated with the hazards most likely to be encountered with earthworks (dust, contamination carryover, spillages and run-off); physical hazards posed by vehicles and equipment, underground services, confined or enclosed spaces, ground stability, excavations, noise, vibration and explosive or flammable materials, and risks posed by chemical and biological hazards. Possible methods for reducing these risks are also proposed.

Actions to reduce risks also need to be complemented by processes of consultation, public information and risk communication. For details of these, refer to the Draft Guidelines for Community Consultation and Risk Communication in the Assessment of Site Contamination.

Protection of the Environment

The draft Guideline also stresses the importance of adopting measures to ensure protection of the environment. Potential environmental problems are described together with, actions to overcome these, where appropriate. Potential problems identified are:

- contamination of groundwater resources;

- migration of contamination to adjacent sites;
- contaminated run-off water reaching stormwater systems or local surface water environments;
- noise, dust, vapour and odour;
- initiation or spread of fire; and
- collection and disposal of contaminated groundwater.

The draft Guideline also recognises that sub-consultants or sub-contractors may often be involved in site investigations and recommends they are kept fully informed of the potential risks and procedures and bound to comply with the Site Specific Safety Plan.

Monitoring of the success or otherwise of these procedures is also important and the draft Guideline recommends that records of all accidents and incidents should be kept together with the action taken to remedy these. The draft Guideline also recommends determining the need for appropriate monitoring of the health of staff who may be reasonably expected to be regularly involved in the investigation or remediation of contaminated sites. Generally, resources should be used for protecting occupational health and safety rather than health monitoring.

Appendices

Appendix 1: *Relevant Statutes and Guidelines for Work on Contaminated Sites* provides information on Australian Standards relating to protective equipment, quality assurance and potential hazards, and Guidelines and Codes of Practice on hazardous substances and contaminated assessment and management. There is also a section detailing, jurisdiction by jurisdiction, relevant current and proposed legislation, regulations and guidelines.

Appendix 2 lists safety equipment currently approved by Australian Standards.

Appendix 3 lists organisations and regulatory bodies which provided published information and/or feedback assisting in the preparation of the guideline.

Appendix 4 lists field equipment suggested for a detailed contaminated site investigation.

Impact Assessment

Environmental Impacts

Standard of Health and Environment Protection
Protection of the environment and the health and safety of site personnel and other potentially impacted stakeholders is an essential component in assessments. The adoption of a uniform methodology for health and safety management on sites will ensure a minimum level of protection and that responsibility for such protection is undertaken by industry during assessments.

Minimising Adverse Environmental Effects
Improved health and safety and environmental protection mechanisms during assessments is likely to decrease adverse effects on the environment as a result of

assessment activities. Supporting this is the requirement for preliminary investigations to be undertaken prior to assessment works at a site and the ability to devise site specific safety plans, which will help to identify potential environmental issues associated with the site and allow appropriate measures to be undertaken during the assessment phase.

Social Impacts

Reduction of Risk to Stakeholders
Conformance to required health, safety and environmental procedures should potentially reduce the level of risk to the health and safety of all stakeholders (eg. neighbouring community). In addition, the severity and/or occurrence of incidents may be reduced (eg. including off-site emergency response) by improved site assessment management and awareness of environmental issues associated with individual sites. For example, the removal of contaminated groundwater (extracted during monitoring) off-site rather than to stormwater.

Stakeholder Confidence
The guideline specifically targets the site safety assessor as the responsible party for the management of health, safety and protection of the environment during site assessment works. It also requires that site safety assessors are appropriately skilled. In addition, it is the responsibility of the site safety assessor to determine the site specific health, safety and environmental protection requirements for a site. Allocation of responsibility to site safety assessors and provision of site work requirements in the guidelines is likely to provide some assurance to stakeholders (such as land developers, environmental authorities) that an appropriate level of works is being undertaken at the site. In addition the guidelines should provide confidence amongst professionals (including sub-contractors) of the standard of health safety and environmental protection requirements undertaken during site works.

Community Perception
Health, safety and environmental protection measures undertaken during some site investigations as a required standard can sometimes generate a negative reaction by community. For example, although maybe only taken as a precautionary measure during site works, the wearing of a full set of health and safety equipment by site personnel can be perceived by the community as an indication of a much larger problem than actually exists. Introduction of a uniform approach to the management of health, safety and environmental protection during site assessments, along with community awareness of such requirements may positively alter such a perception, if such practices are accepted as part of the normal process.

Economic Impacts

Reduction of Risks
The potential reduction in the level of risk to the health and safety of personnel may result in a lower incidence of potential claims against stakeholders (eg. site assessment professionals, land developers). Also the use of site safety assessment professionals required to adhere to a common standard by relevant parties (eg. land developers, site owners) is likely to reduce the liabilities associated with the appointed professionals.

Administration of OH&S and Environmental Controls
For industry currently working below minimum standards outlined within the guideline, improvement of practices may result in an increase in costs. In some cases, however, the follow on reduction in incidents/liabilities/claims/environmental risk costs may compensate for this additional assessment cost.

Conclusions

The inclusion of a guideline for the Protection of Health, Safety and Environment provides a common methodology to enhance practices currently used through jurisdictions. Improved health, safety and environmental controls should benefit all stakeholders via the reduction in risk and potential claims. Negative costs may be incurred by some industry professionals, who have previously worked at less than minimum standards, however these costs may be offset by the potential decrease in incidents/claims/liabilities.

Assessment of Draft Guideline on Competencies and Acceptance of Contaminated Land Auditors and Related Professionals (Schedule B(10) of the Draft Measure)

Stakeholder views on draft Guideline

In July 1998 the NEPC Committee released a Discussion Paper on the assessment of site contamination to key stakeholders who had registered with the NEPC Service Corporation as having an interest in this Measure. Consultation involving meetings with key stakeholders occurred in all jurisdictions and submissions were sought on the Discussion Paper. Stakeholders raised a number of issues during the discussion paper consultation period. Some of the key issues are included below:

- There was general support for the guideline approach and for consistency between jurisdictions in recognition of competencies for contaminated land professionals.
- Clarifications were sought over the terms "environmental auditor", "contaminated land auditor" and "site assessor" which have different meanings in different jurisdictions.
- Recognition of a wider range of related environmental competencies and professional experience should be considered in acceptance of professionals.
- Greater emphasis should be placed on a multidisciplinary team approach to site assessment.

Response

- Amendments have been made to deal with stakeholder concerns. The revised guideline provides clarification that its use is intended primarily for jurisdictions that apply an acceptance process to contaminated land professionals who are *required to certify contaminated land assessments* under statute. In this context, distinctions are not drawn between contaminated land auditors and assessors as either term would be limiting depending on the jurisdiction.
- The term "environmental auditor" has been deleted from the guideline as it has a wider application.
- The competencies for consideration by jurisdictions have been expanded to cover relevant and related environmental experience of long term duration.
- The ability to recognise the need for a multidisciplinary team approach and to form and manage such teams for complex site assessments has received greater emphasis in the revised guideline.

Overview of Draft Guideline on Competencies and Acceptance of Contaminated Land Auditors and Related Professionals

Introduction

The assessment of site contamination is a specialised area involving a number of disciplines. Practitioners must have a range of competencies and be able to recognise the need for supporting professional advice and a multidisciplinary team approach to site assessment when necessary. In legislated contaminated land auditor systems, a high level of competency is required across a range of disciplines and specialised work areas

before an appointment is made. In other jurisdictions site assessment reports submitted to regulatory authorities must be accompanied by statutory declarations which certify the assessment and demonstrate that the assessor has qualifications and experience relevant to the site investigation.

The purpose of this draft Guideline is to describe the competencies for recognition by regulatory authorities for contaminated land auditors and related professionals who are required under statute to certify site assessments. In this context, the guideline does not provide a distinction between auditing and assessment roles and focuses on the professional requirements for certification of assessment work to determine appropriate land uses.

A range of competencies is identified which provides sufficient ability to determine the level of contamination, the health and environmental impacts and safe land uses for particular sites. The competencies recognise issues specific to contaminated sites and also identify relevant and related competencies and experience in assessment and management of major environmental issues. A framework is also provided for assessment of those competencies and a procedure which may be employed for the acceptance of individual professionals. The assessment process places emphasis on core competencies in contaminated land assessment and also provides flexibility for jurisdictions to consider other relevant environmental experience of significant scope and duration.

The framework recognises that the assessment of competencies would be more stringently applied for the appointment of contaminated land auditors and for professionals certifying assessments of complex contaminated sites. Not all jurisdictions employ a formal system of contaminated land auditors or require certification of site assessments under statute. However, this document provides a basis for jurisdictions implementing similar systems if they choose to do so.

Impact Assessment

Environmental Impacts

Quality of Assessment

The assessment of site contamination is a specialised area, involving consideration of a range of health and environmental issues. The competencies required to carry out such assessments may vary depending on the complexity of the issues involved. Use of suitably experienced and qualified practitioners is a critical factor in achieving high quality assessment. This draft Guideline provides a framework of competencies required to undertake site assessments, including criteria for selecting suitable professionals for this work. It also recognises that whilst a practitioner working in this field should be able to demonstrate a range of competencies to carry out such assessments, it is likely that additional expertise may be required from other professionals for more complex assessments.

The assessment of contaminated land has grown as an issue in Australia since the early 1980s. Traditionally, this work has been taken up in an opportunistic manner by professionals involved in related disciplines (eg. engineers, chemists, geologists) who have “learnt on the job” in response to the requirements of their clients (eg. landowners

or occupiers), and regulatory and planning authorities. The quality of assessments has varied widely. Subsequently, during the 1990s, a number of jurisdictions have developed competency requirements for practitioners working in assessment of sites. For example, a contaminated land auditor system has operated successfully in Victoria for a number of years and Queensland legislation requires professionals to demonstrate relevant qualifications and experience to certify site assessments.

The draft Guideline recognises the competencies which are required for assessment work for use by Australian jurisdictions for the acceptance of individual professionals. This approach will facilitate the adoption of appropriate administrative arrangements between jurisdictions for a nationally accepted system to endorse practitioners who can demonstrate a suitable level of competency in assessment, and allow these skills to be recognised across jurisdictional boundaries.

Implementation of the Measure
Quality of assessment will depend largely on effective implementation of the draft Measure within the jurisdictions. Whilst the regulatory and planning authorities have a significant role to play in this process, the effectiveness of the draft Measure in achieving high quality Assessment of Site Contamination will depend to a large extent on the practitioners in the field. Draft *Guideline 10* will assist by requiring the professionals undertaking this work to be able to demonstrate an understanding of the Measure, and relevant legislation, regulations and guidelines relating to contaminated sites within each jurisdiction in which they choose to work. This requirement should enhance implementation of the Measure and therefore the assessments carried out within each jurisdiction.

Social Impacts

Community Confidence
The recognition that suitably qualified and experienced professionals have carried out an assessment of a site will increase credibility and confidence in the process and outcomes for all stakeholders. For the general community, the use of such professionals, whether involved in statutory audits or other site assessments, provides an assurance that a basic level of competency will be met.

Recognition of Competency
Draft *Guideline 10* recognises that practitioners must have a range of competencies and also be able to have access to supporting professional advice beyond their own expertise. Further, it proposes that a hierarchical framework be established by regulatory authorities for appointment of suitably qualified and experienced professionals. This framework will identify various levels of competency required for the level of contamination, complexity and role of the assessment. This approach identifies contaminated site auditors (accredited auditors) with their regulatory-appointed role to carry out statutory audits, and specialised professionals who must certify assessment work under statutory declarations and demonstrate relevant qualifications and experience when presenting assessment reports to regulatory authorities. The list of competencies for accredited auditors and professionals undertaking assessments of complex contaminated sites would be more stringent than for those undertaking less complex assessments. The proposed approach provides the jurisdictions with flexibility as to how the draft Guideline would be implemented within

the requirements of their environmental and planning legislation.

The draft Guideline would assist relevant stakeholders who wish to retain the services of a practitioner (eg. landowners or developers) to select appropriately qualified professionals and consultancies seeking to improve in house training of staff.

Economic Impacts

Consultancy Fees

The overall cost during the assessment phase is largely driven by the costs associated with collection of samples and laboratory analyses. Furthermore, as anyone who has requested proposals from consultants for such assessments will testify, the overall costs can vary widely depending on the sampling and analyses regime (These issues are addressed in other Guidelines, particularly draft *Guidelines 2* and *3*). The associated consultancy or management fee for compilation and professional assessment of the data can also be significant, and vary greatly between consultants. The hierarchy and associated competencies will enhance the ability of prospective clients to target appropriately qualified professionals for particular projects. Whilst such services are always going to be largely market driven (ie. the more experienced and highly qualified professional will cost more), the overall effect will be to allow direct comparison between competing services. This refinement of the consultancy selection process will assist stakeholders, and overall should not result in a fee rise for most projects except for the more complex assessments where more experienced and qualified professionals are required. This approach will have the added benefit of restricting or eliminating the possibility of individuals carrying out assessment work for which they cannot demonstrate the required experience and qualifications. In some jurisdictions this may increase the cost of initial assessment. In the longer term, the client will have greater assurance regarding future liability concerns and there will be less likelihood of costs associated with the regulatory authority intervening and delaying assessment outcomes over concerns relating to the quality of assessment work.

Use of Jurisdictional Resources

Development and on-going administration of the accredited auditor and professional competency system will require inputs by the jurisdictions. The draft Guideline proposes an assessment process which could be adopted by regulatory authorities, including the possibility of the establishment of a Panel for selection and review of candidates. Further, it allows for provision for updating the qualifications and experience of accepted professionals at regular intervals. Based on experience of current systems (eg. Victoria), the costs associated with these activities could be largely defrayed by charging application and annual administration fees for the system.

Conclusions

Adoption of the draft *Guideline on Competencies and Acceptance of Contaminated Land Auditors and Related Professionals* formalises a process which has already been established or considered in most Australian jurisdictions, for recognition of the competencies and general framework of appointment of professionals who are involved in assessment and certification of contaminated sites.

APPENDIX 1: GLOSSARY OF TERMS

"Agency" means a body or bodies of a participating State or a participating Territory which that State or Territory has nominated for the purposes of this Measure.

"Agreement" means the Intergovernmental Agreement on the Environment made on 1 May 1992 between the Commonwealth, the States, the Australian Capital Territory, the Northern Territory and the Australian Local Government Association, a copy of which is set out in the Schedule to the Commonwealth Act.

"Assessment of site contamination" means a set of formal methods for determining the nature, extent and levels of existing contamination and the actual or potential risk to any protected beneficial uses on and/or off-site resulting from that contamination.

"Background concentrations" means the naturally occurring, ambient concentrations in the local area of a site.

"Chemical substance" means any organic or inorganic substance, whether liquid, solid or gaseous, used for any commercial, industrial or domestic purpose because of its chemical properties.

"Commonwealth Act" means the National Environment Protection Council Act 1994 of the Commonwealth.

"Contamination" means the condition of land or water where any chemical substance or waste has been added at above background level.

"Council" means the National Environment Protection Council established by Section 8 of the Commonwealth Act and the equivalent provisions of the corresponding Acts of participating States or Territories.

"Ecological Risk Assessment" is a set of formal, scientific methods for estimating the probabilities and magnitudes of undesired effects on plants and animals of ecological values resulting from the release of chemicals, other human actions or natural catastrophes.

"Epidemiology" is the study of the distribution and determinants of disease in humans.

"Health Risk Assessment" is the process of estimating the potential impact of a chemical, biological or physical agent on a specified human population system under a specific set of conditions.

"Investigation level" means the concentration of a contaminant above which further appropriate investigation and evaluation will be required.

"Measure" means national environment protection Measure.

"National environment protection goal" means a goal that:
(a) relates to desired environmental outcomes; and
(b) guides the formulation of strategies for the management of human activities that may affect the environment.

"National environment protection guideline" means a guideline that gives guidance on possible means for achieving desired environmental outcomes.

"National Environment Protection Measure" means a measure made under section 14(1) of the Commonwealth Act and the equivalent provisions of the corresponding Acts of participating States or Territories.

"National environment protection protocol" means a protocol that relates to the process to be followed in measuring environmental characteristics to determine:
(a) whether a particular standard or goal is being met or achieved ; or
(b) the extent of the difference between the measured characteristic of the environment and a particular standard or a particular goal.

"National environment protection standard" means a standard that consists of quantifiable characteristics of the environment against which environmental quality can be assessed.

"Non-risk site" means a site at which the concentrations of chemical substances in soil and associated air, surface water or groundwater are above background concentrations, and a site assessment (in which site use is considered) indicates that the site is suitable for its current use.

"Participating jurisdiction" means the Commonwealth, a participating State or a participating Territory.

"Participating State" means a State:
(a) that is a party to the Agreement; and
(b) in which an Act that corresponds to the Commonwealth Act is in force in accordance with the Agreement.

"Participating Territory" means a Territory:
(a) that is a party to the Agreement; and
(b) in which an Act that corresponds to the Commonwealth Act is in force in accordance with the Agreement.

"Response Level" is the concentration of a contaminant at a specific site based on a site assessment for which some form of response is required with an adequate margin of safety to protect public health and ecological values.

"Risk" means the probability that an adverse outcome will occur in a person, a group, or an ecological system that is exposed to a particular dose or concentration of a hazardous agent, ie. it depends on both the level of toxicity of hazardous agent and the level of exposure.

"Site" means the parcel of land, and associated surface water, sediments and groundwater being assessed for contamination.

APPENDIX 2: COMPETITION POLICY ASSESSMENT

Assessment of draft NEPM against COAG Competition Policy Principles

Under the COAG Competition Principles an assessment of competitive implications is required as part of the process for making subordinate legislation. If approved by NEPC, the proposed Measure will be adopted as subordinate legislation within most jurisdictions (under the processes for adoption of Measures set out in the NEPC Act passed by each jurisdiction).

The proposed Measure and the anticipated implications of its adoption are explained in detail in the Impact Statement

The draft Measure for the Assessment of Site Contamination has been framed within the objects of the NEPC (as set out in Section 3 of the NEPC Act) to ensure that:

- people enjoy the benefit of equivalent environmental protection from air, water or soil pollution and from noise wherever they live in Australia; and
- decisions of the business community are not distorted, and markets are not fragmented, by variations between participating jurisdictions in relation to the adoption or implementation of major environment protection measures.

These objectives generally complement the aims of the Competition Policy Principles. Accordingly, every effort has been made to ensure that the proposed Measure reflects these objectives and that due regard was given to Competition Policy principles.

An assessment of the COAG Competition Policy Principles against the draft Measure indicates that it will not affect competition within any market. The Measure does not impose a requirement for direct environmental improvement action by firms or individuals. As noted in the Impact Statement, the draft Measure proposes to establish a consistent national approach to contaminated site assessment, which will:

- enhance the ability of industry to understand and adopt sound environmental practices as part of its normal business procedures;
- provide the community with information on the issues involved in assessing contaminated sites; and
- provide an accepted common basis for the assessment of site contamination to be used throughout Australia to assist assessors, environmental auditors, developers and regulators to avoid costly duplication in method development.

The development of a Measure, which includes a consistent set of national guidelines for the assessment of site contamination, is expected to contribute greatly towards achieving the National Competition Policy Principle aims of:

- reducing regulatory complexity and administrative duplication between various governments; and
- ensuring that, as far as possible, the same rules of market conduct apply to all market participants, regardless of the form of business ownership (eg government business activities should not enjoy any special advantages).

As the Measure provides guidelines only, as required under Section 14.1(d) of the NEPC Act, it is considered unlikely to introduce inequalities which would run counter to aspects of the Competition Policy Principles Agreement. The draft Measure has been designed to provide for an improved approach, execution and understanding of contaminated site assessment, but not in such a manner that will affect a particular stakeholder or stakeholder group in an unequal manner.

In addition, as the framework in the draft Measure provides for a risk management approach, potential inequalities arising from geographical issues can be managed in a site-specific manner. It is not considered that any service or goods provider will be subject to significant change in competitive status and a potential for growth in the provision of risk assessment services will not restrict competition for provision of these services.

APPENDIX 3: PROJECT TEAM AND TECHNICAL SUPPORT

Project Team

Project Manager: Mr Brendan Carroll, NEPC Service Corporation
Project Team: Ms Catherine Harrison (WA Department of Environmental Protection)
Dr Elizabeth Gibson/Mr. Stuart McConnell (Environment Protection Authority Victoria)
Dr Andrew Langley (NHMRC)
Dr Paula Imray (NHMRC)
Mr Greg O'Brien (Queensland Environmental Protection Agency)

(Ms Cathy Dyer (NSW EPA) and Mr Gavin Scally (formerly of WA DEP) were previously on the Project Team).

Project Officer: Ms Judy Goode, NEPC Service Corporation
Project Assistance: Ms Monina Gilbey, NEPC Service Corporation

Non-Government Organisation Advisory Group (NGOs)

Mr Ken Hodges (Australian Institute of Valuers and Land Economists)
Mr Jim Starkey (Australian Institute of Petroleum)
Dr David Bowman (Business Council of Australia)
Mr David Sinclair (Minerals Council)
Mr Ross McFarland (Australian Contaminated Lands Consultants Association)
Mr Trevor Lorman (Royal Australian Chemical Institute)
Mr Peter Ramsey (Institution of Engineers)
Mr Bill Ryall (Australian Contaminated Lands Consultants Association)
Mr Edward Anderson (Australian Gas Association)
Dr Nick McClure (Waste Management Association of Australia, and National Environment Consultative Forum)
Mr Mark Wheeler (Environment Management Industry Association of Australia)
Mr John Newton (Australian Industry Group)
Mr Lee Bell (National Environment Consultative Forum)
Dr Darryl Luscombe (National Environment Consultative Forum)
Mr David Brideson (Oil Environment Working Group)

Consultants

PPK Environment & Infrastructure (Draft Guideline on Community Consultation and Risk Communication, Impact Assessment Report)

GH&D (Draft Guideline on Protection of Health and the Environment during the Assessment and Remediation of Site Contamination)

Golder &Associates (Draft Guideline on On-site Containment of Contaminated Soils)

Mr Gavin Scally (aspects of the Draft Guideline on Assessment of Groundwater Contamination)

With thanks to the WA Department of Environmental Protection and the Water and Rivers Commission of Western Australia for their assistance in the development of aspects of the Draft Guideline on Assessment of Groundwater Protection, and the Draft Guideline on Data Collection, Sample Design and Reporting of Data.

The NEPC wishes to acknowledge the work of the NHMRC in the initial development of the Policy Framework, and for assistance provided in the development of the draft Measure and Impact Statement through the funding of NHMRC representatives, Dr. Andrew Langley and Dr. Paula Imray.

The NEPC also thanks the NHMRC and the NEHF for the provision of documents developed under their auspices which are included in this draft Measure.

Technical Reviewers

The NEPC would like to extend its gratitude to those people who reviewed the technical papers and provided valuable technical feedback to the Project Team.

APPENDIX 4: COMMONWEALTH, STATE AND TERRITORY ASSESSMENT OF SITE CONTAMINATION IMPLEMENTATION PLANS

This section provides an overview of the assessment of site contamination implementation plans likely to be followed by each jurisdiction. The information contained in this section should be used as a guide only. The reader is directed to each individual jurisdiction for precise information on individual implementation plans.

Northern Territory

Background
The Northern Territory has relatively few contaminated sites when compared with other jurisdictions. This is due to a low level of industrialisation and a small, dispersed population.

Over the last decade, contaminated site issues have gained a higher profile in the Territory. Some of the reasons for this are:

- The release of the ANZECC & NHMRC Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites in 1992;
- The release of the discussion paper Contaminated Sites in the Northern Territory in 1997 by the NT Government;
- National and international companies introducing Environmental Management Systems and Environmental Auditing to their NT operations;
- Increased concern by finance and insurance companies over potential liabilities associated with contaminated sites;
- The redevelopment of several commercial and light industrial sites for residential purposes; and more recently
- The development of the National Environment Protection Measure for the Assessment of Site Contamination.

To date, the most common contaminated site issues in the Territory have involved former or current fuel storage facilities, ranging in scale from single underground storage tanks to the relocation of the "tank farm" bulk fuel storage facility from the Darwin CBD to the new port at East Arm.

Another significant contaminated site issue in the Territory, particularly the Top End, is unexploded ordnance (UXO). Between 1942 and 1943, Darwin was subjected to 64 air raids and was the focus for a considerable concentration of allied forces and munitions. While UXO is recognised as requiring specialised assessment in the *National Environment Protection Measure for the Assessment of Site Contamination*, this issue remains of concern to the Territory.

In some areas of the Northern Territory, mineralised areas are present where naturally occurring levels of certain elements exceed expected background levels. For example, soil in parts of the Darwin Region contain levels of total Arsenic and Chromium which exceed background levels (ANZECC B). This has caused concern in several contaminated site assessments, but it is believed that these levels are naturally occurring and may be associated with laterite forming processes in the tropics.

Framework for the Management of Contaminated Sites
The Northern Territory is currently developing a framework for managing contaminated sites. A strategic approach will be adopted incorporating site prevention, identification, assessment and management.

The *National Environment Protection Measure for the Assessment of Site Contamination* will comprise the assessment component of the framework.

Legislation
The *National Environment Protection Measure for the Assessment of Site Contamination* will be implemented in the Northern Territory through the *Waste Management and Pollution Control Act 1998*.

Current thinking is that an Environment Protection Objective (EPO) will be developed under the Act to set the set the broad objectives for managing contaminated sites. An EPO may contain ambient environment goals and standards, guidelines, waste emission criteria, waste reduction targets, features or uses of the environment that need to be protected, or criteria or indicators to be used for assessing environmental quality.

Certain provisions in an EPO may be made mandatory while others will be used for guidance only. By focussing on outcomes, the mandatory provisions of an EPO will provide performance benchmarks and allow industry to establish the most effective means for implementation and compliance, leading to greater flexibility.

Consistent with the Territory's obligations under the *National Environment Protection Council (Northern Territory) Act*, National Environment Protection Measures (NEPMs) may be incorporated into an EPO and implemented accordingly. Where existing NT legislation contains more stringent requirements than a NEPM incorporated into an EPO, the NT legislation will take precedence. Public consultation on the incorporation of a NEPM into an EPO is not required since the *NEPC (NT) Act* requires detailed public consultation during the development of a NEPM.

The proposed EPO will be the vehicle for coordinating the NEPM and necessary administrative arrangements. The proposed EPO may be called the *Environment Protection (Contaminated Sites) Objective.*

Victoria

Victorian approach to implementation
Victoria has a range of statutory and non-statutory instruments available to implement any future NEPM for the Assessment of Site Contamination. The detail of which mechanisms would be used will be finalised as the NEPM takes shape and once all Victorian agencies have had an opportunity to provide input.

EPA has powers to introduce the NEPM guidelines through State Environment Protection Policies (SEPP) or Industrial Waste Management Plans (IWMP). Section 72(2) of the *Environment Protection Act* enables a range of documents to be 'called up' through SEPP or IWMP. Depending on what the final NEPM comprises, Victoria is likely to implement the guidelines by 'calling them up' under the SEPP (*Prevention and Management of Contaminated Land*) currently being developed.

The Guidelines may need to be supplemented or additional information may be required on the application of the Guidelines. EPA is able to provide supplementary or more detailed information by issuing Best Practice Environmental Management Guidelines under section 13 of the *Environment Protection Act.*

Queensland

Pursuant to Section 8 of the *National Environment Protection Council (Queensland) Act 1994* it is the intention of the Queensland Parliament that the State will, in compliance with its obligations under the Intergovernmental Agreement on the Environment, implement, by such laws and other arrangements as are necessary, the National Environment Protection Measure for the Assessment of Site Contamination in respect of activities that are subject to State law (including activities of the State and its instrumentalities).

It is envisaged that implementation will be achieved through a combination of strategies, namely subordinate legislation, guidelines and education. By adopting a combination of flexible strategies, it is believed that implementation can be best achieved in Queensland.

Subordinate legislation could occur through:

- a regulation made in respect of Section 34 of the Environmental Protection Act 1994; and/or
- a regulation made pursuant to section 220 of the Environmental Protection Act 1994.

The guidelines, due to their importance, may be endorsed by the Queensland Cabinet. The National Environment Protection Measure for the Assessment of Site Contamination would be contained in any guidelines approved by Cabinet.

Tasmania

Tasmania currently manages contaminated sites through the provisions of the Environmental Management and Pollution Control Act 1994. It has been recognised for some time that these provisions are not entirely adequate, and a Task Force has developed a series of proposals to amend the Act and take other steps to implement integrated contaminated sites management system.

If the proposed management system is put in place we believe that it will be consistent with, and give effect to the framework set out in the Discussion Paper. The proposed legislative framework does not overtly address the community consultation or cultural and spiritual significance components of the framework, but we do not see this as being a major difficulty as these issues can be addressed through administrative means and

encouraging good operating practice.

Under our proposed system (based on sign-off by accredited auditors) it will be possible to require that the guidelines are used where assessment is being carried out for the purposes of a statutory sign-off or an investigation that is required by a statutory instrument. A condition of accreditation for auditors could be that they use and give effect to the appropriate guidelines as eg. those dealing with data collection, sample design etc., laboratory analysis, health risk methodology, assessment of groundwater contamination, HILs etc. On the other hand, the implementation of the auditor guidelines will be in the hands of the Government, and the risk communication and consultation guidelines would be dealt with more appropriately as a tool rather than a requirement.

The potential regulatory impact of the NEPM in Tasmania cannot be determined without more knowledge about the likely format of the NEPM. However, based on the above assessment and assumptions, there would be relatively little impact on the manner in which contaminated sites are assessed in Tasmania, and if the NEPM is made, no new regulatory instruments will be required.

Western Australia

Site Contamination in Western Australia – The Problem

The issue of site contamination is of special importance in Western Australia, particularly in coastal regions because of the great reliance on groundwater and the threat posed to groundwater quality by land contamination. The exact number of contaminated sites in Western Australia is not known, but it has been estimated that there are at least 1500 sites on the Swan Coastal Plain. The true scale of the issue in WA is likely to be known within 18 months of proposed legislation.

In addition to posing a threat to public health and the environment, site contamination has significant economic, legal and planning implications. Already in Western Australia there have been delays in the planning and development of sites, multi million dollar clean-ups and legal complications concerning liability. Proposed legislation should ensure that all these factors are considered for future development of land.

Regional differences in Western Australia are an important consideration in the development of a Measure for the assessment of site contamination, because of the vast size and diverse geological and climatic conditions in the State. It is important therefore to ensure that any methodology developed and endorsed under the Measure and its associated guidelines allows for consideration of differences in geology, climate and groundwater use in the assessment of a site. As stated above, WA has a heavy reliance on groundwater for human consumption which is influenced by all of the abovementioned considerations.

Site Contamination in Western Australia – Current Management

The current approach to site contamination management in Western Australia is through the WA Environmental Protection Act. However, the present act has several deficiencies which are being addressed through legislative changes. To date individual site contamination has been handled in an *ad hoc* fashion. Current management of site contamination may utilise Part IV and in some cases Part V of *the Environmental Protection Act 1986* (the Act). Under Part IV of the Act, proposals which, if implemented, are likely to have a significant effect on the environment can undergo

environmental impact assessment. This process allows conditions to be set on the proposal by the Minister for the Environment. Most contaminated sites in WA are not so significant to warrant this level of control. The limiting factor with Part V of the Act is that pollution or discharges of waste must be occurring off-site. Clearly this is not always the case with in-situ contamination.

The Department of Environmental Protection currently recommends the 1992 ANZECC guidelines for characterising site contamination. Most current site assessments/remediation in WA are undertaken voluntarily, with major sites undergoing EIA.

There are no specific Western Australian soil or groundwater criteria for site contamination assessment.

The DEP has adopted the ANZECC/NHMRC approach towards criteria, ie. criteria can be either site specific (based on a risk assessment) or drawn from a set list of values. ANZECC/NHMRC have developed a set of criteria for the assessment of soil contamination in Australian conditions. These criteria are used as a first choice.

It should be noted that ANZECC/NHMRC criteria provide only background and investigation levels for assessment of soil contamination, and do not provide any levels for the assessment of groundwater contamination.

Where ANZECC criteria are not available for some soil parameters, the 1986 Dutch criteria are used. It should be noted that these criteria were revised in 1994; the use of the older criteria is recommended because the revised levels are specifically based on Dutch conditions, and thus are largely irrelevant to WA. The 1986 criteria have been accepted as providing a conservative guide, and the DEP will continue to recommend their use until more relevant criteria are developed.

Groundwater criteria are applied on a 'beneficial use' basis. That is, the most sensitive beneficial, or potential beneficial use of the waterbody is to be protected.

Site Contamination in Western Australia – Proposed Management Initiatives

The Government released a public position paper in May 1997 entitled, "Assessment and management of contaminated land and groundwater in Western Australia" to address deficiencies in the current Act. This paper presents a coordinated 'whole of government' approach to site contamination management which addresses the needs of developers, government and the environment, whilst reflecting the specific requirements of WA. It provides certainty for all parties including the community.

It lists guiding principles used as a basis for developing the approach, outlines the proposed management scheme, recommends principles for dealing with the issue of liability, outlines proposed administrative arrangements and finally, describes the role of government agencies and proposed mechanisms for funding the strategy. From the paper, drafting instructions have been prepared for those parts of the arrangements which require legislation. Other policy instruments such as memoranda of understanding, regulations, administrative procedures and guidelines will be developed to support and complement the proposed legislation.

Because of the liability provisions contained in the proposed legislation, the WA

Government is likely to assume responsibility for ensuring a large number of risk sites are remediated to an acceptable extent. Clearly then, some of the provisions of this Measure such as soil and water investigation levels are going to influence the cost to Government, by defining the need to undertake site assessments or health and ecological risk assessments.

The proposed WA legislation is designed to provide incentives for self initiated or voluntary investigations and the Measure and associated guidelines could be seen as facilitating this process.

Measure – Proposed Implementation Approach

The position paper, "Assessment and management of contaminated land and groundwater in Western Australia" philosophically commits WA to adopting the 1992 ANZECC approach to site characterisation and assessment. Logically this would be extended to adopting the approach and principles outlined in the Measure for characterisation and assessment.

Because the Measure involves guidelines, the DEP does not envisage implementation by incorporation in legislation in WA. Rather, the Measure will be implemented through administrative instructions linked to legislation. The intent would be that if the guidelines were followed, the environmental outcomes sought by the DEP in WA for the assessment of site contamination would be met in each specific circumstance.

The position paper commits WA to groundwater investigation levels based on the Measure groundwater criteria. This is likely to be through administrative instructions to allow for some flexibility in approach, as the attribution of beneficial uses to groundwater bodies is the province of regulatory authorities within each of their respective jurisdictions and it should not be confined to the five broad categories of environmental values outlined in the Australian Water Quality Guidelines. The establishment of other beneficial uses to cover specialised uses of groundwater may need to be considered in determining the appropriate level of protection to be assigned to a particular water body. Such uses are foreshadowed in the draft of the State Groundwater Environmental Protection Policy.

The position paper commits WA to soil investigation criteria being developed through the Measure. Again, this is likely to be through administrative instructions to allow for some flexibility in approach, for example where standards are changed or new contaminants included, they can be replaced or added to the schedule easily.

WA will establish a scheme of accredited auditors/assessors and will as far as practicable utilise the criteria established in the Measure to be consistent with other jurisdictions to allow for mutual recognition of them interstate. This scheme may be established through specific legislative provisions.

As stated above, the DEP will be utilising where appropriate, the other methodologies as guidance documents for use in the assessment of site contamination. The content of some of these documents may be endorsed as WA DEP documents.

New South Wales

Under the existing legislative and administrative framework for contaminated site management in NSW, a range of options is available for implementation of the Measure, including:

- Endorsing and implementing the Measure, in whole or in part, as an endorsed guideline(s) under section 105 of the Contaminated Land Management Act 1997, or
- Making and implementing the Measure, in whole or in part, as a Protection of the Environment Policy (PEP) under the Protection of Environment Operations Act 1997.

The EPA could also call the Measure, in whole or in part, into a regulation.

South Australia

Under Section 28A of the Environment Protection Act 1993, National Environment Protection Measures automatically operate as Environment Protection Policies (EPPs). The Environment Protection Authority and its delegates must have regard to the EPP in determining any matters, including environmental authorisations to which the policy has relevance. The Measure, and hence the EPP, cannot be varied or revoked except by a further Measure or by an EPP under the Environment Protection Act that makes more stringent provisions for the protection of the environment.

In addition, the Environment Protection Authority and staff from the Environment Protection Agency could elect to use the guidelines as educational tools that guide consultants, local government, auditors and the general community.

Commonwealth

Commonwealth Government Measures for the Implementation of National Environment Protection Measures
Under the *National Environment Protection Council Act 1994,* the Commonwealth is required to develop legislation to facilitate the implementation of National Environment Protection Measures (NEPMs). A Bill scheduled to be presented to the Senate in the 1998 Spring Sitting of Federal Parliament will meet this requirement for the Commonwealth. The draft Commonwealth *National Environment Protection Measures (Implementation) Bill 1998* provides for the implementation of NEPMs in respect of certain activities by or on behalf of the Commonwealth and Commonwealth authorities, and for related purposes.

The major features of the Bill include provisions for the implementation of Measures:

i) in Commonwealth places by extending the application of certain applied State Laws to Commonwealth activities; or
ii) by extending the application of certain State and Territory laws to Commonwealth activities; or
iii) by the making of appropriate regulations; or

iv) by environmental audits and environment management plans; or
v) by another law of the Commonwealth that the Environment Minister is satisfied will achieve appropriate environmental outcomes in relation to implementation of the Measure.

An exemption from implementing a particular measure at a certain Commonwealth place or with regard to a specific Commonwealth activity will only be given on the ground of a matter of national interest. Exemptions will be decided on a case-by-case basis.

Non-compliance with a national environment protection measure will be published in the Gazette, and the details of authorities not complying will also be publicly available through the annual report to Parliament on implementation of the measures.

Government business enterprises which will be open to prosecution under relevant provisions of applied State or Territory environment laws where application of State or Territory law is the chosen implementation route.

The draft Commonwealth *National Environment Protection Measures (Implementation) Bill 1998* was first presented to the Commonwealth Parliament in 1997. On 12 March 1998 the Senate Environment, Recreation, Communications and the Arts Legislation Committee presented its report on the *National Environment Protection Measures (Implementation) Bill*. The proroguing of Parliament on 31 August 1998 has meant that all previous action in relation to this Bill has lapsed, and the Bill will have to be re-introduced. It is envisaged that re-introduction of the Bill will occur during the 1998 Spring Sitting of Parliament.

Australian Capital Territory

With the commencement of the Environment Protection Act 1997, the ACT now has legislative provisions, which treat the various components of the environment (air, land, water and biosphere) as an integrated system.

In July 1998, the ACT Government released, for public comment, an amendment Bill to the Environment Protection Act 1997, which provides for the management of contaminated land and its remediation.

The key objectives of the Environment Protection (Amendment) Bill are to:

- establish a process for the assessment of, and remediation of, contaminated land, and to ensure control of the future use of contaminated land;
- provide a role for accredited independent auditors for expert assessment of all work associated with contaminated land which will provide the community and business sector with confidence in the process and quality of land in the ACT;
- allow for the recovery of costs of assessment and remediation, generally from the polluter or the party who gains to benefit from the remediation of the land; and
- establish a register of contaminated land.

The ACT could implement those compounds of the Measure not already addressed in the current and proposed legislation through a Contaminated Sites Environment Protection Policy. This would allow the necessary flexibility to adapt to the inevitable changes to contaminated sites management including the Measure and any other relevant guidelines or standards.