

# Summary of submissions and EPA responses

Assessment and management of hazardous ground gases:  
Contaminated Land Guidelines



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# Introduction

This document has been prepared to summarise the submissions received from the public consultation on the *Assessment and Management of Hazardous Ground Gases: Contaminated Land Guidelines*. The guidelines were revised to reflect significant updates and changes to other relevant guidance since the first *Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases* were published in November 2012.

The consultation was open for six weeks, from 27 August until 8 October 2019.

If you have any questions about this document or the consultation process, please email us at [CLM.Consultation@epa.nsw.gov.au](mailto:CLM.Consultation@epa.nsw.gov.au).

## Stakeholders and submissions

Thirteen submissions were received from local councils, accredited site auditors, consultants, environmental and consultant groups.

Comments in the submissions have been summarised and simplified for this document. Where different submissions raised the same issue, comments have been summarised in a single line item.

Unfortunately, we cannot provide individual responses to specific submissions made on the guidelines.

## EPA responses

The EPA reviewed and considered all comments. When the EPA agreed with a comment, it changed the guideline.

The table on the following pages summarises the comments and the EPA's responses.

Section no.	Section title	Submission comment	EPA response	Changes to guidelines
N/A	N/A	Including measurement and management of toxic soil vapours in a guideline essentially about landfill gas is not helpful to someone seeking guidance on measurement of toxic vapours. Suggest consideration is given to producing a separate document on toxic soil vapours.	Noted – however, it is not possible at this stage to develop two separate guidelines	No change except to provide more clarity when the guideline is referring to landfill gas or toxic vapours
N/A	N/A	What is the definition of a qualified person? Suggest this is clarified.	Agreed	Guideline amended
N/A	N/A	The guidelines may like to consider the most recent guidance/research related to ground gas assessment and mitigation including: <ol style="list-style-type: none"> <li>research presented in Australia this year via an ALGA training event</li> <li>Card G, Wilson S &amp; Lucas J, Technical paper: Risk and reliability in gas protection design – 20 years on: Part 1, <i>Ground Engineering</i>, August–September 2019 (<a href="https://www.geplus.co.uk/technical-paper/technical-paper-risk-reliability-gas-protection-design-20-years-part-1-05-08-2019/">https://www.geplus.co.uk/technical-paper/technical-paper-risk-reliability-gas-protection-design-20-years-part-1-05-08-2019/</a>)</li> <li>Card G, Wilson S &amp; Lucas J, Technical paper: Risk and reliability in gas protection design – 20 years on: Part 2, <i>Ground Engineering</i>, October 2019 (<a href="https://www.geplus.co.uk/technical-paper/technical-paper-risk-reliability-gas-protection-design-20-years-part-2-09-09-2019/">https://www.geplus.co.uk/technical-paper/technical-paper-risk-reliability-gas-protection-design-20-years-part-2-09-09-2019/</a>)</li> </ol>	Noted	No change
1.3	This edition	The BS8485 reference should include the 2019 revision/amendment.	Agreed	Guideline amended
1.3	This edition	Consider including CIRIA guidance 748 given the guideline is also for VOCs and that the guideline provides mitigation design advice.	Agreed	Guideline amended
2.1	Sources of ground gases, Table 1	Should this include shale as a source of CO <sub>2</sub> given the discussion under Section 2.1.3?	Agreed	Guideline amended
2.1.1	Putrescible waste landfill sites	'... landfill site can produce gas when under significant pressure'. Should it say, '... landfill produces gas which can result in pressure'?	Agreed	Guideline amended

Section no.	Section title	Submission comment	EPA response	Changes to guidelines
2.2.6	On-site generation and attenuation	Section suggests 'many VOCs' attenuate through the soil provided there is oxygen. While this is true, it may be worth mentioning the persistence of chlorinated vapours (i.e. PCE, TCE and DCE).	Agreed	Guideline amended
2.2.7	Intrusion into buildings	Suggest the sentence clarifies preferential pathways can be present via some types of piles but not all.	Noted – the piling issue is already discussed in some detail in Section 5.6. Equally pathways may exist through some but not all ducts, trenches etc.	No change
3.	Site assessment and characterisation	Suggest this section refer to the guidelines on the EPA website for consultants reporting on contaminated land.	Agreed	Guideline amended
3.4.2	Investigation methodology	'Ground gas investigations must extend to the base of potential source zones, or migration pathways identified in the CSM or by MIPs.'	Partly agreed	Guideline amended
		In most cases this is highly inappropriate for an assessment of toxic soil vapours (i.e. like a VOC vapour intrusion assessment). The use of the word 'must' in this context is not justified.		
3.4.2	Investigation methodology	Consider referring reader to BS 8576:2013 and National Environment Protection (Assessment of Site Contamination) Measure 1999 Schedule B2 for further information about investigation methods	Partly agreed – further reference added, but not for the National Environment Protection (Assessment of Site Contamination) Measure 1999	Guideline amended
3.4.3	Groundwater and gas monitoring wells	The use of slotted PVC pipe to allow collection of VOCs is not appropriate, according to most reputable guidance on sampling of toxic soil vapours. The guidance states that this section is applicable to 'trace ground gases'.	Noted	No change
3.4.3	Groundwater and gas monitoring wells	VOC and bulk gas installation and construction methods are not clearly defined, which may confuse the reader.	Partly agreed	Guideline amended
		Suggest a brief outline of the risks involved when using dual purpose bores – refer to BS 8576.		

Section no.	Section title	Submission comment	EPA response	Changes to guidelines
3.4.6	Duration of gas monitoring	Consider referring the reader to the local CRC CARE technical doc 23 guideline, which provides guidance on appropriate number of vapour sampling rounds for PVI using a 'margin of safety' approach.	Agreed	Guideline amended
4.3.2	Risk analysis and assessment – Level 1	Is the first sentence under 'Risk communication' incomplete?	Agreed	Guideline amended
4.3.4	Risk analysis and assessment – Level 2	BS 8485 recommends a worst-case check, but the standard states '[T]o adopt the worst case $Q_{hg}$ as the GSV, the assessor should be confident that to do so is prudent and reasonable and does not result in unnecessarily conservative protection of the development. The basis for decisions should be set out clearly and justifications stated'.	Agreed	Guideline amended
5.2.2	Active protection measures	Suggest stating active systems are not warranted unless there is a high level of building management (e.g. owners corporation).	Noted – the section already states that 'active systems should only be considered for properties where effective long-term management is feasible'.	No change
5.2.3	Management controls	Is council involvement expected in the acceptance of what controls will be placed on a site, including monitoring the management of controls?	Noted – yes, when the council is the planning consent authority. See Section 6.	No change
5.3.1	Obtaining a guidance value, Table 7	The values differ from those of BS8485:2015. Was this intentional?	Noted – yes. As in the first edition of the guidelines, there are some differences from BS8485, reflecting local conditions.	No change
5.3.2	Evaluating protection measures, Table 8	Relying on basement car park ventilation alone is unlikely to be appropriate for vapour intrusion (from VOCs) sites.	Noted	No change
5.3.2	Evaluating protection measures, Table 8	The allocation of four points appears to be based on BS8485 which relies on the UK Building regulations, not the Australian one. The BCA is commonly misinterpreted to mean that basements will have an air exchange rate of two to six changes per hour, however the reality is these mechanical ventilation systems run intermittently, if at all, as they are connected to carbon monoxide monitors that may or may not be triggered.	Noted	Guideline amended

Section no.	Section title	Submission comment	EPA response	Changes to guidelines
5.3.2	Evaluating protection measures, Table 8	Suggest the assignment of four points for ventilated carparks (basement or undercroft) be reconsidered.	Partly agreed	Guideline amended
5.3.2	Evaluating protection measures, Table 8	The score for ventilated carpark basement is based on UK building codes and construction methods, in many cases with high natural air exchanges due to louvres around semi-submerged basements. BCA requirements focus on ventilation capacity based on the size of the basement, managed by a sensory system for car fumes. Consider separating basement and undercroft as distinct items. Further guidance to minimum operation or exchange requirements on a per-hour basis would assist. Consider a comment regarding the goal of prevention rather than management.	Noted	No change
5.3.2	Evaluating protection measures, Table 8	Suggest definition of 'fully tanked basement' is provided. It's rare that Australian builders can build a water-tight basement. It will also be difficult to define a building design that meets the requirements for a 'fully tanked basement', given there is no Australian Building Code for basement waterproofing. Suggest the score should depend on a site-specific assessment and design.	Partly agreed – footnote has been added to table	Guideline amended
5.4	VOC and mercury vapours	For the design concentration in the ventilation area, suggest adding a comment regarding the use of other Level 3 Derived Criteria discussed in Section 4.4.4.	Agreed	Guideline amended
5.4	VOC and mercury vapours	Regarding the 'Honouring the design principles...' dot point: Should this apply only when a venting system and slab are proposed? If a membrane is also proposed then it may be possible to justify higher vapour concentrations in the ventilation system.	Noted – in most cases, a venting system and membrane are used together to provide redundancy. Each should be able to function as a stand-alone system. It has not generally proved difficult to meet the design objectives for venting systems. See first dot point of the relevant guideline section.	Guideline not amended
5.4	VOC and mercury vapours	Is this comment regarding the need for post-construction monitoring needed in the landfill gas-	Agreed	Guideline amended – footnote added to Table 8

Section no.	Section title	Submission comment	EPA response	Changes to guidelines
		protection measures section also – perhaps in Section 5.3.2?		
5.7	Independent review of gas protection measures	What enforcement measure does this refer to, and does the EPA expect councils to be part of the enforcement process?	Noted – enforcement measures as they relate to s3.4.6 of the NSW Site Auditor Guidelines, 3 <sup>rd</sup> edition. Councils are responsible for enforcing any long-term protection measures where the contamination was managed under the planning framework.	No change
6.2	Interface with the NSW EPA and other relevant authorities under the POEO Act	Do councils need to be notified as well? This is not currently listed under section 6.2.	Noted – yes. Local councils are listed under section 6.2, point (c).	No change
6.5	Environmental management plans	Is a council considered to be an authority that needs to be notified? What does the EPA expect from a council should it be notified?	Noted – yes, when the council is the consent authority under Part 4 of the EP&A Act, is the appropriate regulatory authority under s6 of the <i>Protection of the Environment Operations Act 1997</i> , or is provided with a Site Audit Statement under s53B of the <i>Contaminated Land Management Act 1997</i> .	No change
6.5	Environmental management plans	Further guidance on potential mechanisms for ensuring the completion of management plan reviews and associated reporting would be useful.	Agreed	Guideline amended
Appendix 4, A4.3	Gas monitoring well design and construction	Consider inclusion of further information regarding the minimum depths of sealing below ground surface for monitoring wells. Specify the minimum size of the gravel that should be used in the gravel pack.	Noted – however, it is inappropriate to be too prescriptive. The need for site-specific design has been emphasised.	No change
Appendix 4, A4.4.2	Flow, pressure and temperature measurement	The Ion Science GasClams cannot measure flow. A comment should be included that flow rates will need to be obtained by other means.	Noted – the section does not state that the GasClam can measure flow.	No change



Section no.	Section title	Submission comment	EPA response	Changes to guidelines
Appendix 4, A4.4.2	Flow, pressure and temperature measurement	Suggest adding the Ambisense GasfluX gas monitors.	Agreed	Guideline amended
Appendix 4, A4.5.1	Borehole flow and gas concentration measurement	Include guidance on minimum duration for measurements, intervals and sequence of measurements.	Partly agreed – the preferred measurement sequence is already provided, as is the need to obtain steady readings of concentration. Wording has been added to indicate that operator judgement is required.	Guideline amended
Appendix 6, A6.2.4	Types of gas-resistant membrane	Reinforced LLDPE composite membranes with aluminium cores are not VOC membranes.	Noted – the treatment of aluminium-core membranes in Table 6.3 is considered adequate and sufficiently robust. The requirements for membranes in Section 5.4 have been strengthened.	No change
Appendix 6, A6.2.4	Types of gas-resistant membrane, Table A6.3	We suggest that the names of manufacturers and supplier be removed. There have been negative experiences where site owners have approached the supplier directly. Many suppliers are not designers/risk assessors.	Noted – the guidelines repeatedly say that these activities should be carried out by qualified and experienced professionals.	No change
Appendix 6, A6.2.4	Types of gas-resistant membrane, Table A6.3	The list of manufacturers/suppliers in the table is very limited. This document should not provide commercial advantage to any supplier or installer and should indicate if they are a registered producer, agent or distributor. Furthermore, if the list of manufacturers/suppliers is to stay in the document, the list should be comprehensive and include other local providers who have similar capabilities.	Partly agreed – the table is provided as a starting point. Column heading has been updated to reflect this.	Guideline amended
Appendix 6, A6.2.4	Types of gas-resistant membrane, Table A6.3	In addition to the permeation data provided, consider including PCE, TCE and benzene diffusion data for VI-20 (CETCO product) as it is widely used in Australia and the test data is available to the public.	Partly agreed – this is already listed in Table A6.3 – it is a 0.5mm LLDPE/EVOH co-polymer. CETCO's trade name has been added.	Guideline amended