

Response to Public Comments Matrix  
Remediation Closure Guide, dated May 2, 2011

The Indiana Department of Environmental Management (IDEM) has been updating the Risk Integrated System of Closure (RISC) nonrule policy document (NPD) that has been in effect since 2001. The scope of revision is extensive and IDEM has titled the updated guidance as the *Remediation Closure Guide (RCG)*. This pending nonrule policy document was released for public comment on May 6, 2011. IDEM received comments between May 6 and July 20, 2011, and the original comment documents can be viewed at: [http://www.in.gov/idem/files/remediation\\_closure\\_guide\\_comments.pdf](http://www.in.gov/idem/files/remediation_closure_guide_comments.pdf). IDEM staff have reviewed these comments and incorporated many revisions in response, including further streamlining the content and re-evaluating the process for the derivation of screening levels.

This Response to Comments matrix is organized by section to help the reader follow the flow of content and see how revisions were integrated into the RCG. The comments are consecutively numbered, the applicable section(s) listed, followed by the commenter identity, comment, and finally, IDEM's response. IDEM cut-and-pasted individual comments from the original comment letters and attempted to retain the original content intact without altering the context. Some comments are grouped together where they are clearly identical in content, while others are individually listed even where the concern(s) identified are very similar to others. Individual IDEM staff also provided their own comments through informal channels, and these were originally compiled into the matrix with the official public comments to guide staff in editing the RCG. IDEM subsequently determined these informal staff comments were deliberative in nature, and not part of the official public comment record, so the staff comments were removed and the label "internal" was added as a placeholder so there is no discontinuity in the comment numbering.

IDEM thanks everyone who provided comments for their contribution to the ongoing improvement of IDEM program guidance, and IDEM is confident the Response to Comments matrix will serve as a communication tool for better understanding IDEM's *Remediation Closure Guide*.

IDEM is currently accepting additional comment until February 6, 2012 on the pending revised RCG prior to its presentation to the Solid Waste Management Board as a nonrule policy document on February 21, 2012. This document may be viewed at: <http://www.in.gov/idem/4694.htm>

#	Page	Section	Commenter	Comment	Action
1	0		B&T	<p>IDEM does not appear to have followed some of the statutory requirements applicable to NPDs, particularly the mandate that IDEM evaluate the potential economic impact of its policy. This is particularly true for the core technical issues summarized above. IDEM's statutory directive provides:</p> <p>(a) If the department proposes to utilize a policy or statement that:</p> <p>(1) interprets, supplements, or implements a statute or rule; (2) has not been adopted in compliance with IC 4-22-2; (3) is not intended by the department to have the effect of law; and (4) is not related solely to internal department organization; the proposed policy or statement may not be put into effect until the requirements of subsection (b) have been met.</p> <p>(b) The department shall present the proposed policy or statement under subsection (a) to the appropriate board. At least forty-five (45) days before the presentation, the department shall make available to the public, including posting on the department's web site:</p> <p>(1) the proposed policy or statement;</p> <p>(2) information on the availability for public inspection of all materials relied upon by the department in the development of the proposed policy or statement, including, if applicable:</p> <p>(A) Health criteria; (B) analytical methods; (C) treatment technology; (D) economic impact data;</p> <p>(E) environmental assessment data; and (F) other background data.</p> <p>IND. CODE § 13-14-1-11.5(a) and (b) (emphasis added).</p>	<p>We did not rely on any economic impact data in developing this policy. Any environmental assessment data used in the policy came from and is consistent with USEPA guidance. Therefore, we believe that we are in compliance with the referenced statutory requirements.</p>

				<p>If these evaluations have not, in fact, been performed, this could be a serious shortcoming that could threaten to compromise the entire NPD process. The vapor intrusion portion suffers additional flaws as IDEM has failed to provide environmental assessment and/or other background data to support its approach, even though it indicated it would do so in April of 2006, and is arguably required to do so under subsections (b)(2)(E) and (F).</p>	
2	0		<p>B&amp;T Vectren</p>	<p>It would have been helpful if IDEM had been able to release its companion manual, the Remediation Program Guide (RPG), contemporaneously with the draft RCG so both documents could be reviewed concurrently. The RPG will contain many important features and provisions including IDEM's transition policy which is critical to a smooth administration of IDEM's remediation programs (see comment 21 below). Not having both documents available at the same time has meant we have been unable to integrate comments on both documents, and reserve the right to provide additional comments on the RCG, as well as on the RPG, that may be made necessary by a future review of the RPG. We recommend that IDEM undertake efforts to try to expedite release of the RPG so that it may progress in tandem with the RCG, and that both documents be presented to the Solid Waste Management Board at the same time as related NPDs. (B&amp;T)</p> <p>It would have been preferable for IDEM to have released a draft Remediation Program Guide (RPG) contemporaneously with the draft RCG so that both documents could be reviewed at the same time. We assume that many of the specific elements related to site remediation will be detailed in the RPG.(Vectren)</p>	<p>We agree, and plan to present both documents to the Solid Waste Management Board at the same time.</p>

3	0		Commissioner Easterly	Include a complete list of urls for doc. Links in sep. section (not references)	There is a new section of the document that lists actual URLs for referenced documents.
4			Internal		
5	0		Arcadis	In acknowledgements, under the Technical Workgroups heading, under Background, Brian Magee is with ARCADIS U.S., Inc., not AMEC.	We agree with this comment and have changed the text accordingly.
6	0		Arcadis	IDEM should have a clear process for updating any screening values provided in the final RCG. As demonstrated by previous efforts, it is clear that any new guidance will not be reissued frequently due to the requirements for extensive review of guidance. However, IRIS and other toxicity values will continue to be updated frequently, so that potentially one VOC IRIS value may be updated nearly every year. A clear process should thus be developed to account for changes in toxicity values that affect any screening levels that are provided in the guidance. The process for deriving screening levels for each media (e.g., soil gas, indoor breathing zone air, soil, and groundwater) should be transparent and clearly documented so screening levels can be easily and quickly updated when toxicity values change.	IDEM will publish screening levels adapted from the screening levels presented in the US EPA Regional Screening Levels Table. IDEM will update its screening levels as soon as possible after US EPA updates their Regional Screening Levels Table, using the process outlined in Appendix A.
7	0		B&T	HEA 1162 also added provisions to the VRP statute that allow the commissioner to include in a certificate of completion or a covenant not to sue conditions that must be performed or maintained after issuance of the certificate or covenant. See IND Code § 13-25-5-18(d). IDEM has also determined that conditions subsequent are appropriate for no further action (NFA)s too. We recommend that IDEM develop guidance further discussing its interpretation of conditional closures with, at a minimum, specific examples and case studies demonstrating sites where IDEM	We will take this comment under consideration for possible future implementation.

				approved "conditional" closure.	
8	0		B&T	<p>Please insert the following disclaimer in front of the RCG, similar to one in front of RISC.</p> <p>Disclaimer: This Nonrule Policy Document (NPD) is being established by the Indiana Department of Environmental Management (IDEM) consistent with its authority under IC 13-14-1-11.5. It is intended solely as guidance and shall be used in conjunction with applicable rules or laws. It does not replace applicable rules and laws, and if it conflicts with these rules or laws, the rules or laws shall control. Pursuant to IC 13-14-1-11.5, this policy will be available for public inspection for at least forty-five (45) days prior to presentation to the appropriate State Environmental Board, and may be put into effect by IDEM thirty (30) days afterward. If the nonrule policy is presented to more than one board, it will be effective thirty (30) days after presentation to the last State Environmental Board. IDEM also will submit the policy to the Indiana Register for publication</p>	We agree with and have added the proposed text.
9	0		B&T Arcadis	<p>Unlike the release of the RISC Technical and User's Guides, the RCG does not provide a transition policy clearly explaining how IDEM intends to utilize this new guidance. Under the existing transition policy published in February of 2001, IDEM allowed a one-year transition policy for the regulated community to use the then-current guidance or the "new" guidance. If IDEM intends to use the existing transition policy, it should say so. If IDEM intends to adopt a new transition policy for the RCG, then it must proceed through the statutory safeguards of notice and comment. We understand that IDEM may have developed a new transition policy and may release it with the draft</p>	<p>IDEM will honor its existing commitments. The Remediation Program Guide contains program-specific transition policies. Concerns regarding specific sites should be directed to the relevant program area(s).</p>

				<p>Remediation Program Guide - the companion to the RCG. As noted in comment D.2 above, this is yet another reason why it may have made good sense to have released them simultaneously. (B&amp;T)</p> <p>While we have not seen any official proposed change, we have received official comments from IDEM staff on pending projects which directly conflict with its current transition policy. For example, under the existing transition policy for the Voluntary Remediation Program (VRP), the date the Voluntary Remediation Agreement (VRA) is executed locks in the applicable guidance for that site. So, if a VRA was executed on January 1, 2004, the then existing guidance essentially governed all future work at the site even if cleanup levels changed or new policies were published by IDEM. See original comment for examples that B&amp;T cites. The smooth administration of the remediation programs demands that we not have constantly moving targets and that the rules of the game be known. IDEM needs to address this issue and receive input and comment. (B&amp;T)</p> <p>It is not explicitly clear whether the RCG is intended to be retroactive. IDEM should state that if sites are currently operating under one of the older programs (1996 VRP, 2001 RISC) that the site can be grandfathered into continuing operation under that program. For example, some sites have been collecting soil VOC samples in 4oz. jars and using USEPA SW-846 Method 8260 for years under an older program. These sites should be able to continue this protocol instead of switching to SW-846 Method 5035A in mid stream. (Arcadis)</p>	
10	11	1	Arcadis	Given the description of the process and the flowchart at the end, it is unclear what initiates the process found in the RCG	Earlier sections of the RCG address this comment. No change necessary.

				and where it is appropriate.	
11	11	1.1	B&T	At page 11, IDEM says that it "will update or revise the procedures described herein as necessary." We do not believe that IDEM can legally change the substantive content of an NPD without going through the regular NPD adoption process. This same practice with RISC has created a series of difficult issues, particularly regarding "grandfathering" and transition issues. Those problematic issues do not serve IDEM or the public well, and create serious program administration problems. It is critically important to the smooth administration of remediation projects that we not have a constantly "moving target" of values and substantive requirements that can be adopted by IDEM over time, through an administrative process that creates new "requirements" in the RCG, without following the statutory requirements applicable to NPDs. We recommend instead that IDEM develop a periodic process to occur, perhaps annually or bi-annually, by which IDEM would accumulate and make suggested changes to this NPD following the requirements of Indiana's NPD statute.	Substantive changes to IDEM guidance will go through the NPD process.
12	12	1.2	B&T	We have the following comments on this section: IND. CODE§ 13-12-3-2 provides that the remediation objectives of§ 8.5 of. the VRP statute (IND.CODE § 13-25-5-8.5) apply to "all remediation projects conducted under I.C. § 13-22...". Thus, § 8.5's remediation objectives apply to all RCRA TSD closures and corrective action, not merely to "subtitle C permitting and corrective action." We recommend that IDEM clarify that 8.5 applies all RCRA TSD closures, including interim status TSD closures, as well as all RCRA corrective action projects.	IDEM agrees with this comment and has made appropriate changes to the RCG.

				<p>IND. CODE§ 13-12-3-2 does not, by its terms, apply to RCRA Subtitle D Surface impoundment closures. As a result, IDEM's statement to the contrary is inaccurate. Nevertheless, as a policy matter, we would agree that it makes sense for RCRA Subtitle D surface impoundment closures to be evaluated consistent with the RCG.</p>	
13	13	1.3	B&T	<p>We believe that the provisions for determining background concentrations are overly conservative, unnecessarily complicated, and too expensive and need re-evaluation.</p> <p>We applaud IDEM for agreeing that the acceptable risk range in Indiana is <math>10^{-4}</math> to <math>10^{-6}</math>, and encourage IDEM staff to more readily accept site-specific remedial proposals developed based upon <math>10^{-4}</math> risk, particularly including VI projects. We recommend that IDEM develop guidance on this issue.</p> <p>IDEM states the following in 1.3.1: "The conservative assumptions built into IDEM's system of screening level equations make the probable additional carcinogenic risk of using those levels under appropriate land use scenarios substantially lower than <math>10^{-5}</math>. This candid acknowledgement means, among other things, that IDEM staff should be comfortable with non-default approaches using <math>10^{-4}</math> risk.</p>	<p>We re-evaluated the background section and made several revisions that provide greater flexibility for determining background concentrations.</p> <p>IDEM intends to employ an acceptable risk range of <math>10^{-4}</math> to <math>10^{-6}</math> in a manner consistent with EPA guidance.</p>
14	14	1.3	Mundell	<p>Contaminant is a leading and sometimes inflammatory term. Definition of contaminant based on the remediation objective will lead to different terminology for the same concentrations of the same chemical on different sites. The previous terminology of (potential) constituent or chemical of concern was adequate.</p>	<p>IDEM believes that the definition of contaminant in the RCG is appropriate and consistent with that found in the 2001 Technical Guide.</p>
15	16	1.3.2	GM/Environ	<p>IDEM should specify in 1.3.2 that site-specific levels are not necessarily cleanup levels.</p>	<p>IDEM agrees and has inserted a new subsection between existing subsections</p>

				<p>IDEM's discussion in Sections 1.3 (page 13), 7.5, and 7.6 appropriately explains that the need for remediation is based on the cumulative cancer risk and hazard index (HI), rather than on an exceedance of a single-chemical screening level. Section 1.3.1 also appropriately states that an exceedance of a screening level indicates a need for additional evaluation (and not necessarily remediation). IDEM should make a similar statement in Section 1.3.2 regarding exceedance of a site-specific level. Otherwise, the phrase in the first paragraph (page 16) "... need for further action..." could be misinterpreted to mean exceedance of a site-specific level requires remediation (which should not be the case if the cumulative cancer risk and HI are within acceptable limits).</p>	<p>1.3.2 and 1.3.3 that discusses site-specific risk assessments and affirms IDEM's position that such assessments are appropriate. We have also added language to Section 1.3.2 stating that site-specific levels are not necessarily cleanup levels.</p>
16	17	1.3.3	B&T	<p>We believe the following statement (emphasis added) regarding Institutional Controls (ICs) and Engineering Controls (ECs) is overly broad in certain contexts:  "However, effective risk management remedies require an ongoing commitment to monitor, operate, and/or maintain the remedy. The ongoing commitment will vary with the nature of the remedy, and could range from periodic inspections designed to monitor compliance with the terms of an ERC, all the way up to operation and maintenance of a complex engineered system."  We believe that certain land use and activity restrictions are so simple and/or routine that effectively using those ICs do not "require" the need for "an ongoing commitment" by the Responsible Party presenting the remedy to IDEM for approval.<sup>1</sup> For example, a restriction in an ERC that people cannot consume groundwater, or that the property</p>	<p>The quoted text states that an ongoing commitment may be necessary. It does not state that any such commitment must be from the responsible party. No change to the text is necessary.</p>

			<p>must remain non-residential, would not require <i>any</i> "ongoing commitment" from the Responsible Party.</p> <p>We understand the need to ensure compliance with ICs, and suggest that IDEM consider developing an IC tracking system that would be easy and cost effective to implement. One option would be for IDEM to develop a form letter to be sent to the then-current owner of property subject to an ERC, on some regular basis (<i>e.g.</i>, annually, bi-annually, every five years), that would remind that property owner of the existence of the ERC and ask the following kinds of questions:</p> <p>a. According to the terms of the ERC, the property cannot be used for residential purposes. Please check the box in the attached form, certifying that the property is not being used for residential purposes and return to IDEM.</p> <p>b. According to the terms of the ERC, groundwater at the site cannot be used for human consumption. Please check the box in the attached form that certifies that groundwater at the site is not being used for human consumption and return to IDEM.</p> <p>c. According to the terms of the ERC, an engineered barrier must be maintained at the location shown on the attached map. Please check the appropriate box in the attached form certifying that this engineered barrier is being maintained and return to IDEM.</p> <p>If the owner fails to respond, or provides an inadequate answer, IDEM could follow up and investigate. This would focus IDEM's limited resources and provide the level of comfort we all desire that ERCs and EROs are being met. A properly recorded ERC is binding upon the future owners of property. It is their responsibility to comply</p>	
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				<p>with the terms of ERCs. Particularly as we move forward in time from the final remedy approval decision, it will become increasingly ineffective and unreasonable to look to the original Responsible Party to ensure these conditions are met. Indeed, that is one of the reasons why the restrictions in an ERC "run with the land" and apply to future owners. We urge IDEM to convene a new work group to develop an institutional control tracking program that would provide comfort to IDEM, the regulatory community, and the public that these institutional controls are being met. A similar type of simple letter could be sent to local units of government that adopt EROs. One benefit of sending this kind of simple, direct letter is that it would remind the then-current property owner and current local government elected officials of the existence and importance of these ICs.</p>	
17	17	1.3.3	MSECA	<p>final paragraph: suggest that references to 'maintaining the remedy' be revised to 'maintaining the control', as this revised language more specifically addresses the point that the EC or IC established to facilitate closure in the first place must be maintained in order for the closure to remain/continue to be risk-protective.</p>	<p>IDEM agrees and has revised the second and third sentences of the last paragraph to read:  "However, effective risk management requires an ongoing commitment to monitor, operate, and/or maintain the control. The ongoing commitment will vary with the nature of the control, and could range..."</p>
18	18	1.4	MSECA	<p>Second to last paragraph, Suggest rewording to clarify that all data presented in support of the risk-based closure argument must meet the criteria cited here. (e.g., one may find a legacy report for a site that, in the whole, does not readily integrate into the current closure effort, but within which certain data may be pertinent and well qualified for</p>	<p>IDEM believes that the existing language adequately conveys our intent. No change necessary.</p>

				incorporation into the closure effort.	
19	19	Fig 1-B	MSECA	<p>a) Revise the flow chart to start with i. confirmation that a release of a contaminant has occurred</p> <p>ii. decision "if not, then ____", if, then _____"</p> <p>iii. instead of "begin", state "engaged IDEM OLO remediation program"</p> <p>b) first action item: revise to <i>strike</i> "investigation sufficient", <i>insert</i> "compile new and/or review existing data as"</p> <p>c) second action item: revise similar to item b</p> <p>d) between the existing decision step "meet unconditional closure" and the existing conclusion "unconditional closure (no further obligations)", insert decision step "IDEM approval?". If "N", then redirect flow to existing decision step "continue seeking unconditional closure". If 'Y', continue to existing conclusion "unconditional closure (no further obligations)".</p> <p>e) Fifth line, right-most block: reword as per item b above; also revise "remedy" to "remedies"</p> <p>f) After decision step "IDEM Approves?", insert action step "execute record of remedy selection".</p> <p>g) Sixth line, middle block: insert at top "compile/review data to".</p> <p>h) Sixth line, last block: <i>strike</i> "pass", <i>insert</i> "meet conditional closure criteria?".</p> <p>i) Final line, both blocks: <i>insert</i> "issued by IDEM"</p>	IDEM has revised item "h" as requested. IDEM believes that the other requested changes do not materially improve the flowchart, and that some add unnecessary detail and clutter to an already complex and crowded chart.
20	21	2.1	MSECA	in both the second and fifth bullets: consider clarifying what is meant by "characterization" in this application.	The word adds little or nothing to the text and we have deleted both instances.
21	23	2.1.1	GM/Environ	IDEM should clarify that CSM may be presented in formats	IDEM has added text to Section 2.1.1

				<p>other than diagrams.</p> <p>In addition to stating “there are many ways to draw CSM overview diagrams” IDEM should state in Section 2.1.1 that alternate formats (besides a diagram) are acceptable.</p> <p>Attachment 2.1 is an example CSM in tabular format, which provides useful information that may be difficult to show in a diagram, such as: which routes of exposure are relevant to current versus future land use at a site, rationale for why some pathways are incomplete; and which pathways will be evaluated quantitatively versus qualitatively.</p>	<p>explaining that there is no need for CSM diagrams to conform to any particular format.</p>
22	23	Fig 2-A	GM/Environ	<p>IDEM should make the example CSM more relevant by showing “vapor” as being emitted from soil and groundwater, rather than as a distinct type of release that is unrelated to soil or groundwater (Figure 2-A) The example CSM (Figure 2-A) shows "vapor" as an environmental medium to which a release may occur, which is confusing. If this is referring to a vapor release to air, IDEM should change “vapor” to "air" since air is the environmental medium. Additionally, while vapor releases to air are possible, vapor phase contamination at contaminated sites is typically derived from releases to soil and/or groundwater. As such, the assessment of inhalation exposures to such contamination in indoor and outdoor air should be depicted in the CSM as being a part of the assessment of other exposures to soil- or groundwater-derived contamination (e.g., outdoor inhalation of soil-derived vapor). To provide a more relevant example, IDEM should revise Figure 2-A to show "vapor" that is emitted from soil and groundwater into indoor air and outdoor air.</p>	<p>IDEM has changed Figure 2-A to make clear that vapors may arise from contaminated soil or ground water.</p>
23	23	Fig 2-A	GM/Environ	<p>IDEM should remove other atypical aspects from the example CSM to make it more relevant to most sites (Figure</p>	<p>Figure 2-A is intended only as an example. As indicated on page 22, CSM diagrams</p>

				<p>2-A)  Aside from the above issue, Figure 2-A has other aspects that are atypical. For example, Figure 2-A indicates that excavation workers are exposed to subsurface soil but not surface soil. Less obvious is the indication that residential and commercial/industrial receptors are not exposed to contaminants in the subsurface. Although this assumption is often reasonable for ingestion and dermal contact, it is not reasonable when VOCs are in subsurface soil. In this case, which is not uncommon, the CSM should indicate that these subsurface contaminants can result in inhalation exposures via both outdoor and indoor air. IDEM should remove such atypical aspects from Figure 2-A so that it will be an example that is more relevant to more sites.</p>	<p>should be tailored to the specifics of individual sites.</p>
24	24	2.2	MSECA	<p>fourth bullet: omit “historic” (even the most current aerial photos may be of use in this regard).</p>	<p>IDEM agrees with this comment and has made the requested change.</p>
25	24	2.2	MSECA	<p>seventh bullet: remove references to specific data repositories (“regional ...water records” from many sources may be available and relevant to the records review process. Avoid implying that the IDNR records are the ‘only’, ‘preferred’, or ‘prescribed’ records applicable to this step.)</p>	<p>IDEM will change the text to read “Regional ground water and surface water records from available sources, which may include Indiana Department of Natural Resources Water Well Records and logs for wells in the vicinity, and IDEM Office of Water Quality records on wellhead protection areas.”  Note that the paragraph preceding the list states that the information sources include, but are not limited to... The listing was not meant to constrain but to give examples of the most common information sources.  Viable information from other sources may also be useful.</p>

26	28	2.6	MSECA	“Preferential Pathways”: revise this paragraph to incorporate vapor intrusion, as preferential pathways can be of concern for this exposure medium as well.	IDEM has added vapor-related language to the second sentence of this paragraph.
27	28	2.6	MSECA	WHPA: refine/reword the definition of WHPA to be more consistent and thorough as per the glossary entry on page 199 of the RCG.	IDEM believes that both definitions are accurate. No change necessary.
28	28	2.6	MSECA	ESAs: Do the screening levels provided in the RCG apply to ecological receptors? If so, please clarify herein; if not, please provide input on where applicable screening levels may be found.	As noted in the text, Section 11 contains additional guidance on this topic. Indeed, Section 11 is the principle location of our ESA guidance. Section 2 serves only to introduce the concept. No change necessary.
29	30	2.8	GM/Environ	We recommend adding specific guidance for ERA and study design (e.g., Fletcher et al. 2008; MacDonald and Ingersoll 2003; USEPA 1995, 1997, 2000, 2001, 2002b and 2005; US Navy 1997). Given the potential ramifications of poorly designed studies, we encourage IDEM to expand the content discussion in Section 2.8 and add citations on the subject. (see also page 180)	Section 2 is intended only as a very brief introduction to the topic of ecological risk assessment. As stated in Section 11, extensive guidance on ecological risk assessment is beyond the scope of the RCG. IDEM did not intend to provide an exhaustive list of the very extensive guidance related to this topic.
30	30	2.9	GM/Environ	The selection of potential contaminants for investigation should be based on information and professional judgment regarding potential for significant releases, rather than pre-defined analyte lists. IDEM should revise the discussion in Section 2.9 to emphasize the use of information and professional judgment regarding the potential for significant chemical releases at a site in the selection of potential contaminants for investigation, rather than on the use of pre-defined analyte lists. Site-specific information can be used to target	IDEM has reworded section 2.9 to clarify that pre-defined analytes lists are typically only appropriate when there is little existing information about the nature of a release. Specially, the first sentence of the second paragraph of Section 2.9 now reads: “When site-specific operating information is incomplete or unreliable, IDEM programs <i>may</i> specify pre-defined lists of potential contaminants.”

				<p>individual or classes of contaminants for testing, but can equally be used to exclude others that have a low potential to be present. In our experience, pre-defined analyte lists are not useful because they often include analytes that are unlikely to have been released at a site, and conversely, they do not always include analytes that are likely to have been released. For example, manganese is not on either Appendix VIII (40 CFR Part 261) or Appendix IX (40 CFR Part 264), but GM includes manganese in site investigations at some facilities (typically foundries and related operations) because of knowledge and judgment about the potential for manganese releases to soil and groundwater. We have also found that many chemicals on Appendices VIII and IX lack toxicity values, so using these longer analyte lists (as compared to the TCL/TAL, for example) does not result in risk evaluation that are materially more meaningful. In addition, IDEM should not consider Appendix VIII as an analyte list for soil investigations. USEPA developed Appendix VIII for the purpose of identifying the universe of hazardous waste constituents subject to RCRA hazardous waste regulation. Some chemicals on Appendix VIII may not be amenable to laboratory analysis in soil. In virtually all GM RCRA corrective action projects conducted over the past 16+ years, the oversight agency determined that the appropriate analyte list for investigating soil and groundwater is a subset of the TCL/TAL relevant to the particular site.</p>	
31	31	2.10	MSECA	<p>footnote 20: on what basis is <math>10^{-6}</math> cm/sec considered to be the threshold for “low” effective porosity?</p>	<p>This is more of a question than a comment. Footnote specifies both porosity and permeability. The concept intends, in general, to represent hydraulic conductivity.</p>

					The 10-6 cm/sec is a permeability (hydraulic conductivity) threshold based on restricted waste landfill construction standards in 329 IAC 10, sections 26 and 34. No change necessary.
32	31	2.11	GM/Environ	<p>IDEM should allow, but not require, UCLs to be calculated using data from judgmental samples as a screening step in comparison of data to screening levels of site –specific levels, or in calculation of risk estimates.</p> <p>Section 2.11 says, "It is usually inappropriate to generalize results from judgmental samples to the whole sample area by (for example) using judgmental results to calculate upper confidence limits." Although we agree that data from judgmental samples targeted at areas of contamination are likely to overestimate a receptor's exposure concentration, we believe that the use of such data to calculate UCLs should be allowed, if the use of such high-biased UCLs does not affect risk management decisions at a site (e.g., using the high-biased UCLs still leads to a conclusion that site risks are within acceptable limits). If the use of such UCLs suggests that risks at a site are unacceptable, then IDEM should allow additional data to be collected for calculation of less high-biased UCLs. This is similar to the widely used and efficient screening approach of using the maximum concentration instead of the 95% UCL to place an upper-bound on the exposure (USEPA 1989, page 6-25).</p>	IDEM has deleted the last three sentences in the second paragraph of Section 2.11, and will revise the more extension discussion of this topic in Section 8.4 to indicate that parties can, when using judgmental sample results of sufficient number and spatial distribution, use those results to calculate UCLs. IDEM notes that this approach is likely, particularly when screening tools are used to direct samples at areas of higher contamination, to result in UCLs that are biased high.
33	33	3.1	MSECA	<p>first paragraph: This text implies that sampling is conducted to know:</p> <p>a. "... whether contamination exists as a result of a release..."</p>	IDEM has deleted the word "are" and inserted the words "may be" between the words "receptors" and "affected" in item b.

				<p>b. "... whether receptors are affected..." and  c. "... the pathways by which contamination reaches receptors".</p> <p>It is suggested herein that sampling typically is not conducted for the purpose stated in item b ("whether receptors are affected). (e.g, In a typical remediation/closure effort, biological samples of plants, animals, humans typically are not collected.)</p>	
34	34	3.2.1	GM/Environ	<p>IDEM should allow flexibility in defining "surface soil", rather than defining it strictly as the top 6 inches. IDEM's basis for defining "surface soil" in Section 3.2.1 as the top 6 inches is unclear, and seems at odds with actual site investigation practice. In a recent survey we conducted of federal and state guidance, we found no universally accepted definition of "surface soil"; the definitions range from the top 2 cm to the top meter, for different reasons, as shown in Attachment 3.1 which we shared with USEPA Region 5 in July 2010. USEPA and many state agencies believe that residents and workers may be reasonably expected to contact soil as deep as 1 ft to 2 ft bgs during their normal range of activities (e.g., gardening). They also appear to recognize that surface soil samples are often collected via split-spoon (2 ft flight) during installation of deep soil borings, which makes it convenient to use the top 2 ft as the reasonable/plausible surface interval. Using the top 2 ft as surface soil has the additional benefit of avoiding problems associated with the need to collect multiple surface samples to obtain sufficient soil volume when a broad spectrum of laboratory analysis is necessary. Such problems include adding</p>	<p>IDEM has inserted new language that eliminates an arbitrary defined boundary between surface and subsurface soil. Samples should be collected from the location(s) best suited to meeting investigative needs; those locations may not fall within arbitrary depth intervals.</p>

				complexity to sampling and data evaluation, which in turn increases the potential for errors and increased costs. Unless IDEM has a compelling reason to define surface soil to be strictly the top 6 inches, IDEM should allow flexibility in the definition so that the considerations discussed above can be taken into account, as well as site-specific considerations such as data comparability (where a different but reasonable definition was used in previous investigations).	
35	35	3.2.3	Mundell	Question rationale in identifying the core interval displaying the greatest apparent effective porosity as that which should be sampled in the absence of any other screening data or visual cues. Encourage language that speaks to collecting the core interval sample from the depth that “most likely would contain the potential contaminant, given the physical characteristics of the Site and known data regarding the release and migratory pathways.”	IDEM has changed the cited text to read “within the core interval displaying the greatest apparent effective porosity or the greatest potential for contamination based on known site conditions.”
36	35	3.2.3	MSECA	footnote 23: Please either clarify how this code would “apply” within the context of the non-rule policy RCG document, or revise the footnote to state that a typical soil boring log should include the information listed at 329 IAC 10-15-4(d)(5).	IDEM has deleted the footnote.
37	36	3.2.3.1	Mundell	The use of the groundwater elevation could be misleading as many saturated zones in Indiana are confined or semi-confined. Groundwater may rise in monitoring wells screened across these saturated zones leading to soil results being eliminated from consideration in unsaturated samples. Field observation and description of saturation should be used rather than groundwater elevations from monitoring wells representative of the potentiometric surface.	IDEM does not agree with this comment. True confining conditions are unlikely at shallow depths. Ground water elevations in borings are representative of saturation in highly permeable units only. Low permeability units take time to equilibrate. Further, manmade alterations to the subsurface often breach so-called confining units. No change to the text necessary.

38	36	3.2.3.1	GM/Environ	<p>IDEM should clarify that subsurface soil samples should be collected from the vadose zone (and not saturated zone) when data are to be compared against not only migration to groundwater screening levels but also many other types of screening levels.</p> <p>Section 3.2.3.1 advises that subsurface soil samples should be collected from depth intervals above the water table if they are to be compared against migration to groundwater screening levels because the leaching model that IDEM uses to calculate these screening levels does not apply to saturated soil. IDEM should extend this advice to situations where subsurface soils data are to be compared against other soil screening levels, including those for vapor migration to outdoor air, particulate emission to outdoor air, and dermal contact, since these soil screening levels are also based on assumptions that do not apply to saturated soil.</p>	<p>As noted on the preceding page (35), “Appropriate criteria for evaluating subsurface soil results will depend on the purpose of the sampling.” No change necessary.</p>
39	37	3.2.4	Mundell	<p>Method 5035A – IDEM’s definition implies conditions not present in the EPA’s Method (such as obtain subsamples “immediately”) which will lead to greatly increased cost and waste from use and disposal of numerous unnecessary subsamples. The EPA description appears to provide for trimming and subsample collection below the sample surface layer, allowing for a brief amount of time to observe and describe the soil core, and selection of the interval(s) most likely to be impacted. While we understand the rationale in needing to sample any suspect core interval so as to not lose vapors and lessen quantitative results, it would be helpful and fair for IDEM’s programs, namely the LUST program to reimburse for extra 5035A kits used to comply with this policy, even when such samples are not ultimately</p>	<p>IDEM has revised Section 3.2.4 to address these concerns. The ELTF Section sees no need for special consideration or compensation for extra 5035A sampling kits if accepted industry standards are followed.</p>

				sent to a laboratory – perhaps not for all core intervals, but at least for multiple intervals per boring to allow for smoother, but fuller collection of desired intervals for analytical sampling, without the loss of multiple nonreimbursable sample kits.	
40	37	3.2.4	IPC	US EPA SW 846 Method 5035A when collecting closure samples for VOC or TPH fractionation analysis. However, per the RCG the method may not be necessary for samples collected in areas of known contamination. If Method 5035A is used for all soil samples, will it be reimbursable?	Reimbursement for all soil samples using Method 5035A is not automatic as it is not necessary for all sampling, as pointed out in the RCG. (B Davis)
41	37	3.2.4	MSECA	The segment of text beginning with the phrase “Thus, under this procedure...” and concluding with “... loss of VOCs (IDEM 2008)” is not supported by the preceding narrative above, contrary to the logical progression implied by the term “Thus”.	IDEM agrees and has revised Section 3.2.4 to address this concern.
42	37	3.2.4	MSECA	final paragraph: the clause “it is not necessary to collect ...” contradicts earlier statements in this section that do indicate that collection of subsamples from each core is required. Please clarify/revise.	IDEM agrees and has deleted the referenced clause in Section 3.2.4.
43	39	3.3	AW-ERM	The ITRC VI Guidance (2007) states on page D.2 that the goal of a VI groundwater sampling investigation should be to determine volatile concentrations in the uppermost groundwater beneath or near potential structures; November 2002 EPA OSWER says similar. Clarify the depth interval (with respect to the water table) at which it would be appropriate to collect groundwater samples for comparison to VI GWSL.	Please see the response to Comment 92
44	39	3.3	MSECA	Second to last paragraph, the term ‘analytes’ is used but not defined. Suggest using “contaminants”, consistent with the balance of the RCG document.	“analytes” should have read “analysis” IDEM has changed the text accordingly.
45	39	3.5	Vectren	<i>Waste fill</i> : Many sites have locations where fill was placed	IDEM has revised the language to read

				<p>on the land prior to the effective date of any law or regulation that governed that practice. We believe that many such historic fills sites are currently being addressed in the VRP outside of the solid and hazardous waste programs. We believe that such sites should continue to be addressed via the VRP and that the RCG should be amended to make it clear that a fill site can be remediated and closed under the risk-based provisions of the RCG.</p>	<p>“...disposal <i>may be</i> subject to...” and “...regulations and <i>requires a site-specific approach that is beyond...</i>”</p>
46	41	3.7	GM/Environ	<p>IDEM should acknowledge that sufficient site characterization does not necessarily require delineation to generic screening levels, and conversely, such delineation does not assure sufficiency.</p> <p>Section 3.7 begins by stating that the extent of an investigation should be "sufficient to allow evaluation of the risks." We agree that the appropriate basis for judging the adequacy of investigation is whether the lateral and vertical extent of a release and affected environmental media have been sufficiently characterized to not underestimate the reasonable maximum exposure (RME). However, we disagree with the later statement that says, "Delineation ... is the only way to know whether contamination might affect receptors." In our experience, the extent of investigation can be sufficient to support remedial decisions when concentrations are not delineated to general screening levels; and conversely, the extent can be insufficient even if concentrations are delineated to generic screening levels. The first situation often arises when only a few carcinogens drive the risks because their generic screening levels are based on a target risk of <math>10^{-5}</math> and the cumulative risk limit is <math>10^{-4}</math>.</p> <p>In this case, the sum of the cancer risks associated with</p>	<p>IDEM has revised Section 3.7.1 “Delineation” to acknowledge, among other things, that “There may be circumstances where defining contamination to land-use specific levels (on-site or off-site) is impractical or unnecessary...”</p>

				<p>the few carcinogens may be below <math>10^{-4}</math>, which would indicate that further sampling is not warranted since the concentrations are actually within the acceptable risk range. The other situation also often arises, when multiple noncarcinogens have the same target organ or mode of action because their screening levels are based on an HQ of 1 and the HI limit is 1. In this case, the HI may exceed 1 even though the HQs do not, which indicates that further sampling may be warranted to characterize the area over which the HI exceeds 1. IDEM should revise Section 3.7 to acknowledge these serious limitations of relying on delineation as the basis for judging if the extent of investigation is sufficient.</p>	
47	41	3.7.1	Mundell	<p>Does the RCG give direction in needing to use a groundwater monitoring well versus a geoprobe grab groundwater sample for purposes of groundwater screening levels and purposes of VI assessment?</p>	<p>Yes. The RCG addresses this in the first and second paragraph of Section 3.3.</p>
48	41	3.7.1	GM/Environ	<p>IDEM should provide an example of when vertical soil sampling can be considered adequate for evaluating exposure scenarios.</p> <p>In Section 3.7.1, IDEM should consider providing one or two examples of what is meant by, "Vertical delineation of soil should proceed as far as necessary for ... evaluation of exposure scenarios ..." One commonly encountered example is where subsurface soil sampling is not necessary because the concentrations in surface soil do not exceed the screening levels based on both surface and subsurface exposure pathways and there is reasonable basis for believing the release occurred at ground surface.</p>	<p>IDEM believes that the existing language adequately conveys the intended meaning. No change necessary.</p>
49	41	3.7.1	B&T	<p>We believe the recreational screening values are overly conservative and utilize unrealistic exposure</p>	<p>IDEM has adopted USEPA's recreational</p>

				<p>scenarios and durations. Some of these concerns are discussed in Attachment 3 of original comment letter.</p> <p>We recommend a separate effort to develop reasonable assumptions and to recalculate new values for this land use.</p>	<p>screening level calculator. IDEM recognizes that there are many different recreational scenarios, and the assumptions underlying the pending recreational numbers may be unrealistically conservative for some exposure scenarios. Adoption of the USEPA calculator will allow tailoring levels to site-specific circumstances.</p>
50	41	3.7.1	MSECA	<p>last paragraph: reference is made to the "... area of property control ...". Since this term (or a derivative thereof) appears in the glossary, please present this term in bold-face type.</p>	<p>IDEM has changed this term to read "exposure control area". In general, the RCG bolds only the first significant use of glossary terms; the term was bolded earlier in Section 3.7.1.</p>
51	43	Fig 3-A	MSECA	<p>Figure 3-A</p> <p>a. Add to key the "number in box" and a description "sample location" (or similar)</p> <p>b. Insert the &lt; and the &gt; symbols before the term "result (contaminant concentration)".</p>	<p>IDEM has made clarifying changes to the figure.</p>
52	44	3.8	Mundell MSECA	<p>Comment regarding delivering sample to lab within 48 hours. It seems that as long as the samples are stored in a secure location capable of consistently appropriate temperatures (such as a refrigerator or walk-in cooler and not a portable cooler) that this requirement is excessive. Many labs store samples in refrigeration more than 48 hours prior to extraction and analysis and this is acceptable provided that the samples are analyzed within the specified period. Sample delivery requirements could be modified to reflect Site specific situations where for example, indoor air samples are obtained from a distant Site with Summa Canisters, for which there is no short term holding time (or</p>	<p>IDEM has revised the first sentence of paragraph three as follows:          "It is important to deliver samples to the laboratory <del>within 48 hours of collection</del> as soon as possible after collection or within a set time frame <del>sooner</del> if the method requires it (U.S. EPA, 2009h)."</p> <p>The ELTF Section was denying claims for this 48-hour sample delivery requirement when backup documentation was not provided, or was not clearly indicated. It</p>

				<p>ice requirements). In these circumstances, it should be acceptable for the sampler to maintain the custody of the samples, and deliver at the earliest convenience upon return to the vicinity of the local laboratory, even if longer than 48 hours. (Mundell)</p> <p>third paragraph: irrespective of EPA’s adoption of the 48-hour sample-delivery “standard”, little scientific basis exists to indicate that samples delivered to labs at longer times after collection are flawed, biased, or otherwise compromised. The 48-hour time period ignores the realities and frequent logistical constraints of field sampling and should either be relaxed or removed. It should certainly not be the basis for ELTF-claim denials. (MSECA)</p>	<p>was also coupled with samples being delivered at inappropriate holding temperatures. We have since cleared this up with Chemistry and MSECA</p>
53			Internal		
54	48	3.10.2	?	<p>IDEM should clarify that the necessary degree of data validation should be determined based on how the data are to be used</p>	<p>In order to minimize the amount of data that is required to be submitted to IDEM, Section 3.9.1 has identified and discussed the two types of DQOs we believe are necessary and what elements are required to support them. Therefore, IDEM does not believe additional clarification is necessary.</p>
55	49	3.11	IPC	<p>Geological Setting Data – The cross section should show wells and screened intervals and consider vertical hydraulic gradient.</p>	<p>There are other items that should be in a cross-section. IDEM has revised the text to read “Geologic cross-section diagrams that include analytical results, borings, wells (with screened areas and water levels), subsurface utilities, excavated areas, tanks, and any types of piping or drains.” IDEM does not agree with the comment regarding vertical gradient. The vertical hydraulic</p>

					gradient would require nested wells at each location. This is better discussed in the text rather than in a graphic display.
56	49	3.11	MSECA	“Geological Setting Documentation”, fifth bullet: strike “Indiana ...water”, and strike “private wells”. Well information contained in other and/or public repositories (e.g., USGS, IGS Petroleum Section, etc.) may be of interest.	IDEM has revised the text to read “Indiana Department of Natural Resources Water Well Records for wells within one mile...” Although other public repositories do contain well records which may be of some use, this bullet refers to the IDNR well records only. Further, the text preceding this list makes clear that the list is not intended to be exhaustive, merely illustrative. Viable information from other sources may also be useful.
57	49	3.11	MSECA	“Geological Setting Documentation”, fifth bullet: What is the risk-based rationale for the one-mile and two-mile criteria? If there is none, consider revising this line item to establish more representative criteria for this documentation.	IDEM does not agree with this comment. There is no risk-based rationale for the one-mile, two-mile criteria. These are representative criteria and used as a starting point toward CSM development. Depending on the program and site conditions, the radii may be contracted or expanded as needed. The criteria came from the Indiana Leaking Underground Storage Tank Rule: 329 IAC 9-5-5.1 (E)(v). No change necessary.
58	49	3.11	MSECA	“Geological Setting Documentation”, ninth bullet: replace “slug/pump” with “aquifer hydraulic”, or replace “pump” with “pumping”.	IDEM has revised the text at the head of the parentheses to read “site-specific slug/pumping test results or other relevant local hydrologic data”
59	50	3.11	MSECA	“Susceptible Areas Documentation”: insert “Geologically	IDEM has added the suggested text.

				Susceptible area evaluation”.	
60	50	3.11	MSECA	“Data Analysis Documentation”: The term “real world coordinates” is not clearly understood. Revise to read “Geographic coordinates for each sample location with reference to a common public datum (e.g., UTM, Lat/Long., State Plane, etc.)” or similar.	IDEM has revised the fifth bullet under “Data Analysis Documentation” revised to read: “Real world coordinates for each sample locations based on <u><i>IDEM Office of Land Quality Spatial Data Collection Standards</i></u> (IDEM, 2008b)” (underlined text is a live link).
61	51	4	Vectren	IDEM should be applauded for their efforts in Section 4 and Appendix D of the RCG in developing an innovative approach that evaluates plume behavior using various lines of evidence (LOE). However, we find that many of the LOE, while important overall, do not relate directly with plume behavior. We believe that the primary factors in evaluating plume behavior are plume mass trend, plume flux trend and plume stability. (Also Appx D)	IDEM agrees that the primary factors in evaluating plume behavior are plume mass trend, plume flux trend, and plume stability. IDEM is not aware of other, omitted factors related directly to plume behavior. No change necessary.
62	51	4	MSECA	Please revise the text throughout this section to clarify that the objective is to build confidence in the understanding (or characterization) of plume behavior (e.g., the phrase “confidence in the plume behavior” does not accurately convey the intent of this section; rather “confidence in the characterization of ... (or “the understanding of”) plume behavior” is more appropriate).	IDEM has revised the text in this section to reflect confidence in the understanding of plume behavior.
63	51	4	B&T	As described in more detail in <u>Attachment 2</u> , we believe that the Plume Evaluation Matrix and accompanying scorecard system could be modified to serve a more useful function to help screen-out low risk sites and get them on a track toward closure in a more expedited fashion.	IDEM has removed the PEM from this version of the RCG.
64	51	4	B&T	The lines of evidence presented in the RCG provide sound, technical approaches to evaluating plume behavior, and	IDEM has removed the PEM from this version of the RCG.

				<p>should be kept. However, despite the best intentions to craft an objective system to "grade" plume behavior, the system does not work well when applied to actual sites that have been determined to present little to no risk. We asked the industry representatives from the MSECA Plume Stability Work Group to identify sites that had been determined to present little to no risk from groundwater plume migration and to score them using the approach prescribed in the RCG. As you will see from reviewing <u>Attachment 2</u>, these sites failed to achieve a score that would lead to the conclusion that we have a high level of confidence in plume behavior. We think these real-world examples demonstrate the flaws in the draft RCG and the difficulty of trying to develop an objective scoring system to grade and compare the inherently complicated nature of plume behavior. As a result, we believe IDEM should keep the lines of evidence in the final RCG, but reserve the scorecard system to screening out low-risk sites.</p>	
65	51	4	B&T	<p>If IDEM were to want to use the scoring system for more than screening out low-risk sites, something which this group does not support, an alternative would be to keep a modified form of the scoring system for use as a site screening tool, and to "ground-truth" the modified system using real-world data at, say, 30 sites. IDEM, the MSECA Plume Stability group, and others could then continue to discuss how the system could be refined to achieve our mutual goal of identifying sites where we have a high level of confidence in plume behavior. This process would, of course, take time, and might mean the fuller use of the scorecard component of the RCG</p>	<p>IDEM has removed the PEM from this version of the RCG.</p>

				would not be ready to present at the November Board meeting. But the fact that the scoring system does not appear to work for real-world sites strongly counsels that more work is needed before this approach is finalized in an NPD and applied to a wide variety of sites.	
66	51	4	B&T	Sites that are not screened out and not identified as low-risk would be subject to the same, if not all, of the plume trend/stability analyses that IDEM is recommending in the RCG (with the comments provided here taken into consideration) and those analyses would need to stand on their own merits.	IDEM agrees with this comment. No change necessary.
67	51	4	GM/Environ	IDEM should seriously consider using the evaluation factors in the PEM to facilitate professional judgment, rather than to use the PEM scorecard to replace professional judgment. The utility of the PEM scorecard in ensuring consistency in judging plume behavior is unclear. A key problem with the scorecard as described in Chapter 4 is that the PEM scores do not appear to be linked to specific consequences in terms of decisions about the need for further groundwater investigation or remediation. Other problems include the apparent lack of scientific or engineering basis for assigning scores to the various factors, and the elimination of professional judgment from the evaluation process. In our experience, the factors included in the PEM are all potentially useful (and compiling them into a checklist as IDEM has done is also useful), but professional judgment is essential in assessing these factors singly and in combination for a specific plume. As currently described, the PEM scorecard seems arbitrary and counterproductive to its intended purpose. In fact, there is no indication that the	IDEM has removed the PEM from this version of the RCG.

				PEM scorecard necessarily generates outcomes that are consistent with existing plume stability determinations that IDEM and/or USEPA has made without the PEM scorecard, such as the many RCRA CA750 Environmental Indicator determinations across the US.	
68	51	4	Lilly	Overarching comment: Lilly recommends that IDEM retain the LOE approach but delete the PEM from the Remediation Closure Guidance. Lilly has significant concerns about the plume stability evaluation process. In particular, Lilly is concerned that IDEM has attempted to over-simplify the LOE process and remove sound technical judgment from the process. Lilly is unaware that this “matrix” procedure has been used in any other jurisdiction, and it has not been properly developed or subjected to sufficient peer review by experienced environmental professionals. Lilly notes that EPA has not provided a rigid definition of stability, likely because they recognize the each site should be treated uniquely. (see also Appx D)	IDEM has removed the PEM from this version of the RCG.
69	51	4	Lilly	Overall, the approach outlined in the RCG is too rigid and impractical for assessing plume stability. While the statistical techniques selected can be applied to plume stability analysis, the criteria and assumption for applying these methods make the approach unworkable for stability analysis and would likely lead to excessive monitoring. A better technical approach would involve combination of trend analysis in individual wells and analyzing trends in the overall mass and aerial extent of the plume using the technique of spatial moment analysis. Such an approach has been developed by the United States Air Force and applied in various USEPA jurisdictions. (References provided; see also D.3.3.6.3)	IDEM has removed the PEM from this version of the RCG. If the plume can be defined consistently across its extent there is more confidence in understanding its behavior. LOEs described in the RCG include spatial analysis, such as mass flux and plume mass. The LOEs were added so that statics are not solely relied upon.
70	51	4.1	IPC	IDEM should consider changing the plume evaluation	IDEM has removed the PEM from this

				scoring checklist back so that a 2yr-4qtr/yr monitoring and verification groundwater monitoring program can occur for a low priority site. The draft rule plume evaluation matrix scoring model or scorecard should be reworked with higher weighting factors for low priority sites. Specifically the plume characteristic weights need to be increased from a weight of five to seven. (See also Sections 4.8, 4.8.1, 4.8.2, Appx D)	version of the RCG.
71	51	4.1	MSECA	Third paragraph: The last sentence is not understood. What are “indicator chemicals”, and by what definition would these be considered to “... accurately represent the plume...?”	IDEM agrees and has removed this paragraph.
72	51	4.1	MSECA	What is the basis for an equilibration period of one year after conclusion of active remediation? The equilibration period should be demonstrated by site data, not an arbitrary time period.	IDEM agrees and has removed the specific reference to one year.
73	51	4.1	Indy DOW	Request that plume behavior analysis steps include considerations of (1) planned future changes in groundwater pumping rates from existing drinking water supply wells and (2) planned future well field development, to the extent such information is available to the responsible party. Where information is available regarding potential impacts to plumes caused by planned changes in existing well use and installation of new wells, such impacts should be included in closure decisions based on demonstrations of plume stability	IDEM has added text to Section 4.6 emphasizing the importance of identifying sensitive receptors like wellhead protection area, municipal well fields, public reservoirs, etc. The text also recommends querying public water utilities or other significant local water users about plans to alter use patterns that might affect ground water elevation or flow direction.
74	53	4.3.1	Mundell	Does the RCG give direction in needing to use a groundwater monitoring well versus a Geoprobe grab groundwater sample for purposes of groundwater screening levels and purposes of VI assessment?	This section indicates that ground water data may be obtained from wells and boreholes, so the use of Geoprobe grab groundwater samples is addressed by the inclusion of “boreholes”. Data for the

					purpose of screening ground water for potential vapor intrusion may be collected this way, but vapor sampling within wells and boreholes is not advised (see response to comment #95 for more specific details regarding vapor).
75	53	4.6	MSECA	Change “free product” to “non-aqueous phase liquid [NAPL]” (not all NAPL is, or ever was, a ‘product’).	IDEM agrees and has made the requested change.
76	55	4.6.1	MSECA	Change “BTEX” to “petroleum”.	IDEM believes that it is important to retain a distinction between BTEX and petroleum. There can be constituents other than benzene, toluene, ethylbenzene and xylene that are important in evaluating the risk of a petroleum plume. No change necessary.
77	55	4.6.2	MSECA	How are the presence, distribution and/or volume of ‘free product’ adequately demonstrated?	IDEM agrees with this comment and has brought explanatory language forward from the former Appendix D.
78	55	4.6.2	MSECA	Define “core size”.	IDEM has provided additional explanation of “core size”, and brought explanatory text forward from Appendix D into Section 4.6.4.
79	55	4.6.2	Arcadis	The IDEM does not provide sufficient guidance on evaluating petroleum free product from a risk perspective. The only mention of free product is in terms of it requiring remediation if present. However, there are some situations where free product exists and the risk to human health and the environment is little to none. There are also situations where it is extremely difficult to completely remove free product. There are some oils (such as quench oil and some lubricant oils) that contain little to no constituent concentrations. There needs to be some guidance or	“NAPL may be an ongoing source of ground water contamination”. The opening statement in this section identifies the primary concern with free product from a risk perspective. It goes on to discuss lines of evidence that may be considered. How to “characterize free product to determine the risk it poses”, and the “how much residual free product is acceptable to close a site” should be evaluated in terms of

				reference to guidance, beyond TPH fractionation, on how to characterize free product to determine the risk that it poses. There should also be a general rule on the level of effort required for removal of free product, and how much residual free product is acceptable to close a site.	whether the product is an ongoing source for ground water contamination – is the plume stable? Section 4.5 addresses the properties of toxicity, mobility and persistence as lines of evidence that should be considered relative to ground water contamination, and these are relevant to a risk perspective for free product evaluation.
80	56	4.6.4	IPC	In general, it is hard to track plume core expansion. We usually rely on dissolved phase plume stability to support core stability.	The RCG does not require that the expansion of plume size be tracked. No revision required.
81	57	4.6.6 4.6.7	Lilly	For groundwater time of travel to nearest receptor LOE, the definition of nearest receptor is not adequately provided. Is it distance to nearest drinking water well or to the nearest property that does not have a groundwater use restriction placed on it? Would surface water bodies be considered receptors whether or not they have been shown to be in communication with shallow groundwater?	The answers to these questions are site-specific and will not be addressed in the RCG. No revision necessary.
82	57	4.6.6 4.6.7	Lilly	IDEM is calculating the time of travel based upon the movement of groundwater as a conservative and simplified approach. This totally disregards natural attenuation processes. Retardation factors could be easily calculated from partition coefficients available in literature and site specific data such as foc. Use of retardation factors to account for natural attenuation processes is typical in environmental industry and their lack of use is an unnecessary over simplification.	IDEM agrees with this comment and has revised the language accordingly to indicate a willingness to consider site-specific data.
83	60	4.7.6 D.6.1.1	Lilly	The RCG trend analysis relies on non-linear regression analysis as the first step in the analysis. Application of regression analysis as described in the RCG assumes that the data follows a first order decay model. While under optimal	IDEM believes this comment has merit. Other statistical methods may be used as long as they are applicable to the situation. IDEM has revised Section D.2.1 to allow

				<p>conditions, the decay or degradation of some analytes, particularly organic compounds, may indeed follow a first order decay model, it would not be expected that all analytes would. A departure from a first order curve may be a result of various factors such as seasonal variations in water table elevation, unique hydrogeological conditions, and sampling or laboratory errors. Applying a regression analysis to data that violates this assumption will result in low R<sup>2</sup> values (less than 0.7) and may lead to erroneous conclusions of the plumes stability or instability. (see also D.6.1.1)</p>	<p>other methods.</p>
84	60	4.7.6 D.6.1.1	Lilly	<p>In applying the regression analysis, IDEM has established criteria for computed R<sup>2</sup> values based on the number of sampling events available for analysis. If these criteria are not met, the RCG requires that additional samples must be collected. This interpretation is statistically and operationally flawed. Lilly offers analysis and a data set embedded in their comment #9 to support this contention. (see also D.3.3.6.3)</p>	<p>Other statistical methods may be used as long as they are applicable to the situation. IDEM has revised Section D.2.1 to allow other methods.</p>
85	63	4.8	Vectren	<p>We believe that the PEM scoring system must undergo additional testing, verification, and calibration. It is recommended that at least 50 real world sites spanning various categories be tested, reviewed and analyzed to ensure that the scoring system performs as intended. (also Appx D)</p>	<p>IDEM has removed the PEM from this version of the RCG.</p>
86	63	4.8	Vectren	<p>An Excel spreadsheet should be made available for calculating PEM scores. Vectren is willing to provide real world site data and otherwise assist IDEM in any efforts to further refine the PEM. (also Appx D)</p>	<p>IDEM has removed the PEM from this version of the RCG.</p>
87	63	4.8	Lilly	<p>Lilly strongly objects to the approach taken in the RCG which attempts to make the LOE a mathematical calculation, rather than an exercise of professional judgment based on</p>	<p>IDEM has removed the PEM from this version of the RCG.</p>

				the characteristics of each site. (also Appx D)	
88	63	4.8	Vectren	It appears that the PEM scorecard is much too conservative in many of its assumptions. We have input test data for several of our sites and find that it is very difficult to attain a score indicating a high degree of confidence in plume behavior, even for sites with stable plumes with low to moderate level impacts and more than eight quarters of monitoring data. For example, if a site is completely successful in demonstrating a stable plume with no increase in plume mass or flux for 8 quarters, the maximum possible score achievable is 15 for these scoring criteria, which is well below the >35 score required for high plume confidence. (also Appx D)	IDEM has removed the PEM from this version of the RCG.
89	63	4.8.1	IPC	Spell out acronyms in titles (see also 12.8, 12.9, 12.10)	IDEM has made selected revisions to spell out the acronyms in some section and subsection titles.
90	63	4.8.1	IPC	The PEM is a concern in general; it is not clear what this tool is meant to achieve and the scoring system seems so conservative that this tool appears to be a barrier to site closure. The prescriptive method seems to be inconsistent with the Level of Evidence approach presented throughout the Guide. Additionally, we are concerned that a low or medium scoring site will lead to inefficiencies in the assessment/risk evaluation process, and it will be very expensive to demonstrate plume stability using the PEM. It is recommended that the weights and scoring criteria be reevaluated or the PEM concept be removed altogether. (also Appx D)	IDEM has removed the PEM from this version of the RCG.
91	63	4.8.1	IPC	Quantitative analysis needs to be defined on this plume evaluation scorecard.	IDEM has removed the PEM from this version of the RCG. Qualitative analysis is defined in Section 4.7.3.

92	67	5	AW-ERM	<p>The ITRC VI Guidance (2007) states on page D.2 that the goal of a VI groundwater sampling investigation should be to determine volatile concentrations in the uppermost groundwater beneath or near potential structures; November 2002 EPA OSWER says similar. Clarify the depth interval (with respect to the water table) at which it would be appropriate to collect groundwater samples for comparison to VI GWSL.</p>	<p>IDEM agrees that a clean layer of ground water at the water table can effectively prevent vapors from volatilizing from deeper depths. This is now clarified in Sections 5.4.2 and 5.12:</p> <ol style="list-style-type: none"> <li>1. Buildings are more than one hundred feet from a CVOC soil source or ground water exceeding VI GWSLs (as measured at the top of the shallowest saturated zone), and (Section 5.4.2)</li> </ol> <p>And</p> <p>Presence of a lens of clean ground water overlying ground water showing contamination that exceeds VI GWSLs (Section 5.12, last bullet under Item #2)</p>
93	67	5	AW-ERM	<p>For duplicate samples, should we collect 1 duplicate per 20 indoor air samples and 1 duplicate per 20 sub-slab samples? Or do we need just 1 duplicate per 20 total samples (indoor air and sub-slab combined)?</p>	<p>IDEM has revised the text to clarify the appropriate QA/QC procedures in Section 5.5.2</p>
94	67	5	AW-ERM	<p>Our lab, Air Toxics Limited, offers a certification process for canister cleanliness. 100% certification involves testing each individual canister and flow controller to make sure each canister is free of your target compounds. Air Toxics also offers a 10% certification process in which they test 1 in 10 canisters for this. The 100% certification process has additional costs associated with it. Do we need to use the</p>	<p>IDEM has revised the text to address the canister certification question in Section 5.5.2</p>

				100% certified canisters during every sampling event?	
95	67	5	Mundell	Is it appropriate to collect soil gas just above the groundwater interface of a properly screened groundwater monitoring well? Is a vapor sample from a MW crossing the water table acceptable?	IDEM has determined that it is not acceptable to use a well headspace vapor analysis as a stand-alone method to evaluate the vapor intrusion pathway in an occupied building. It is not possible to collect a high-quality, reproducible soil gas sample from a ground water monitoring well. Research presented by McHugh et al (2007) shows that well headspace samples are highly variable, both temporally and spatially. A key reason for this variability is simply because ground water monitoring wells were not designed for the collection of soil gas samples. Soil gas sampling ports need to be properly sealed, so that the vapor sample is collected from the desired depth interval. With headspace vapor sampling from a monitoring well, there is no way to seal the well, so the sample collect not only the vapors volatilizing off of the water table, but also the air within the well casing (and possibly from the ambient air). In a typical 2 inch monitoring well, there are over 3 L of volume per 5 ft length of well casing. This air, which would be difficult to purge prior to sampling, could highly dilute the sample, and add an extra layer of uncertainty onto an already uncertain sampling method. Additionally, because the monitoring well network would

					<p>be designed to evaluate the nature and extent of contamination in ground water, it is unlikely that the wells will be properly positioned to provide information about the vapor intrusion pathway in an occupied structure.</p> <p>Because of this, IDEM technical staff should put little weight on soil gas samples collected from ground water monitoring wells. The construction of soil gas monitoring points outlined in the RCG is the industry standard, and is not significantly different from the 2006 guidance.</p>
96			Internal		
97	67	5	AW-ERM	Clarify if the VI pathway may be eliminated if groundwater samples are collected from multiple depths and the most shallow zone collected is <VI GWSLs but a deeper interval is > VIGWSL.	IDEM agrees that a clean layer of ground water at the water table can effectively prevent vapors from volatilizing from deeper depths, and the text is clarified to that effect in several locations. See response to comment #92.
98	67	5	AW-ERM	Will stand-alone soil gas sampling be sufficient to assess possible VI migration from a "high risk" site to adjoining residential or commercial areas no matter the distance? Logically, it should be sufficient to first assess the soil gas (and bedding groundwater for a deep sewer) within the preferential pathway located between the source and the distant offsite receptors. If those samples do not exceed screening values then it should not be necessary to collect sub-slab/indoor air samples at individual homes.	<p>If this comment refers to preferential pathway (pp) sampling, then yes, stand-alone SGe sampling is sufficient to determine whether a potential pp is actually acting as a pp. See section 5.5.1, second paragraph.</p> <p>IDEM does not rely solely on SGe to screen out homes within 100ft of high risk sites.</p>

				Please let us know if IDEM’s interpretation of this is stricter and wants, for example, to see samples collected from a tier of homes regardless of the results of the preferential pathway sample results.	See Section 5.4.2 and 5.6 for exterior soil gas applicability.
99	67	5	Arcadis	<p>Throughout Section 5, IDEM mentions collecting paired indoor and sub-slab samples. IDEM should caution users that at some sites, collecting sub-slab samples concurrently with indoor air samples poses the risk of impacting indoor air. To be safe, indoor air samples should not be collected during the time that sub-slab ports are being installed or opened for sampling. A general practice by some practitioners for collecting “paired” indoor air and sub-slab samples has been as follows:</p> <ol style="list-style-type: none"> <li>1. Deploy indoor air sampling media.</li> <li>2. Upon collection of indoor air sampling media, install sub-slab port.</li> <li>3. After 24 hours, collect sub-slab sample.</li> </ol> <p>Another option could be:</p> <ol style="list-style-type: none"> <li>1. Install sub-slab ports.</li> <li>2. After a sufficient time is allowed to pass for a complete indoor air exchange, then indoor air is sampled.</li> <li>3. Then sub-slab samples are collected immediately following collection of indoor air samples.</li> </ol>	<p>IDEM has addressed these concerns by adding the following language to Section 5.5.2:</p> <p><i>IA Samples should not be collected during the time sub-slab ports are being installed or opened for sampling, to avoid impact to IA samples that is possible at some sites. Paired IA and SGss samples are collected concurrently or sequentially within the same general time frame when this impact to IA samples is a concern.</i></p>
100	67	5	Arcadis	The RCG provides little mention of VI mitigation or what is considered adequate for demonstrating a mitigation system is working. At a minimum, IDEM could mention other mitigation documents such as USEPA 1993, MADEP 1995, or DTSC 2004. Providing guidance on demonstration of an effective mitigation system seems critical. There was discussion during our technical focus group meetings on collecting confirmation samples (when?, how many?, etc.)	IDEM agrees that guidance on VI mitigation is important. However, the RCG does not provide guidance on mitigation of non-vapor media either, as mitigation guidance for the myriad available technologies is simply beyond the scope of the document. However, IDEM does plan to develop and provide, in another forum,

				and/or pressure readings to demonstrate a negative pressure below the floor. (or Section 10)	additional guidance on selected mitigation technologies.
101	67	5	Arcadis	<p>IDEM should allow differential pressure measurements as a line of evidence for evaluating vapor intrusion. The difference in pressure between the indoor air and the soil gas in the sub-slab region provides the primary driving force for vapor intrusion. Vapor intrusion will occur when the pressure inside a building is less than the pressure in soil gas adjacent to or below the building. If the flow through the soil and cracks is laminar, then the soil gas entry rate will be proportional to the square root of the pressure difference (ASHRAE 1993). If the pressure inside is positive compared to the sub-slab, there should be little or no vapor intrusion potential. The difference between indoor and outdoor air pressure also provides the primary driving force for the exchange of building air with ambient air, and thus the reduction through dilution of the indoor VOC concentration. USEPA staff have noted the importance of “building specific factors” in controlling vapor intrusion. Differential pressure measurements provide a way to integrate most of the building specific variables into one empirical measure. Differential pressure represents the product of a number of different factors including building HVAC system operation, changes in barometric pressure, wind effects on the structure, temperature-induced stack effects, etc. Commercially available, cost-effective instrumentation is available to measure pressure differential using small diameter sub-slab sampling points or pressure taps (USEPA 1993), and can log that information over hours, days, or weeks. Given the ease of collecting this data and the importance of pressure in affecting vapor flow, pressure</p>	<p>IDEM agrees that differential pressure measurements can be used as a line of evidence for evaluating VI. Our understanding of this comment is that a differential pressure measurement would be taken during a paired sub-slab and indoor air sampling event. This could demonstrate whether the sampling conditions at that time are favorable for VI to occur or not. IDEM has added language reflecting our agreement with this line of evidence to Sections 5.7.1 and 5.9.1.</p> <p>IDEM does not agree with the last sentence. Pressure differentials between the inside of a building and the subsurface have been demonstrated to be extremely variable, changing in a matter of a day or even hours. If a measurement shows the pressure inside is positive compared to the subsurface (meaning little VI will occur), there is no basis to assume that this will remain the case indefinitely; unless of course mitigation is being conducted in the form of a sub-slab depressurization system.</p> <p>Indoor air samples should be collected to assess the risk at high risk sites or where sub-slab sample concentrations demonstrate</p>

				differential should be recommended as a line of evidence in conducting vapor intrusion evaluations. Such information should be used as a substitute for collecting indoor air samples at every site. (also Section 10)	that this is necessary. Differential pressure measurements can be taken to demonstrate whether worst-case conditions are present at the time of sampling.
102	67	5	Arcadis	<p>Identification of indicator buildings should be allowed based on careful consideration of site-specific conditions. In situations where a neighborhood or cluster of buildings is near a subsurface source of VOCs, sampling each structure may not be necessary as a first step. Choosing a number of indicator buildings for initial sampling may effectively focus an investigation, saving both time and cost. This approach is also supported by the Interstate Technology and Regulatory Council (ITRC 2007, section 3.8). Multiple lines of evidence should be considered when choosing indicator buildings. These factors include are not limited to: proximity to subsurface sources, building construction characteristics, geology, and hydrology.</p> <p>Expansion of factors to consider and illustrations are contained in original comments.</p>	The RCG is not an all-encompassing document that provides prescriptive guidance for every possible scenario – to do so would result in a very large document, and ultimately leave the false impression that anything not included is not acceptable. The identification of indicator buildings is not specifically addressed, nor is it prohibited in the RCG. The RCG describes standard VI investigation procedures and allows for proposal of other site-specific procedures based on the CSM. Any approach that is not specifically addressed may always be proposed to IDEM, and it will be evaluated on its merits coupled with the specific site circumstances.
103	67	5	B&T	In general, the RCG provides a logical framework for assessing the VI pathway. As IDEM is well aware, substantial uncertainty, variability, and confounding factors can affect the VI pathway evaluation, and we all recognize that approaches to VI issues across the country are in a state of flux. However, wherever these uncertainties exist, the RCG defaults to very conservative assumptions that render the ultimate approach taken very conservative, and would unnecessarily expand the scope of VI investigations. (Also Section 10)	See response to comment #104 below.

104	67	5	B&T	<p>IDEM's proposed VI program will likely "screen in" a large number of sites (especially commercial structures) where investigation is unwarranted. Once a site is screened in, a full investigation is required under the RCG, and reasonable, structured off-ramps are not available. When assessed relative to these criteria, the proposed IDEM program is likely to be the most conservative approach of any of the other Region V states. Each of the Region V states has a mechanism that either screens in fewer sites or allows a simple off ramp from further screening without entry into a structure to collect indoor air samples. As just one example of available off-ramps, IDEM continues to reject the Johnson and Ettinger (J&amp;E) Model as a tool to screen out sites. We understand that Illinois EPA and Ohio EPA routinely use and accept this model for screening out sites. In our view, IDEM's proposed VI approach would likely delay site closures and could chill economic development, including brownfields redevelopment. IDEM needs to carefully evaluate these impacts since economic development is at the core of IDEM's mission statement.</p>	<p>IDEM agrees that the VI screening procedures are conservative. They are designed to address a wide variety of potential exposures and site conditions while protecting human health. The VI screening procedures incorporate current science in a manner consistent with other state guidance, federal guidance, and the direction that federal guidance is heading. The Commenter's overall conclusion is that the IDEM VI program should either have an additional "off ramp" from further screening without entry into a structure, or a mechanism to screen in fewer sites, especially in regards to commercial structures. IDEM has evaluated the specific comments in detail and does agree that there are places where changes can be made to screen in fewer sites and still remain conservatively health protective. IDEM proposes the following changes:</p> <p>The guidance already provides for less restrictive sub-slab screening criteria for large commercial/industrial structures. The proposed sub-slab attenuation factor for commercial/industrial structures meeting the criteria in Section 10.4 is 0.01. IDEM will extend the 10X adjustment in the attenuation factor to groundwater and soil</p>
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					<p>gas for these sites.</p> <p>IDEM will change the definition of shallow and deep SGe. Shallow SGe samples will be defined as those collected 5 feet or less below the building foundation and an attenuation factor of 0.1 (0.01 for some large commercial/industrial structures) will be applicable at this depth. Deep SGe samples will be defined as those collected more than 5 feet below the building foundation and an attenuation factor of 0.01 (0.001 for some large commercial/industrial structures) will be applicable at this depth.</p> <p>IDEM will change the attenuation factor used to compare preferential pathway results from 1 to 0.1, which is consistent with sub-slab screening levels. These changes will screen in fewer sites (especially commercial/industrial) and prevent investigations that are most likely unwarranted, while still remaining health protective. Exterior soil gas sampling is also available for “low risk” sites per Section 5.4.2.</p>
105	67	5	B&T	The process for identifying structures that trigger a VI screening is unnecessarily conservative. IDEM's VI screening program is a multi-layered process using conservative decisions in each element of the process. The	See response to #104

				accretion of redundant layers of conservatism is the primary reason so many sites are screened in. Common sense, risk-based decision making, and our governing statutes ( <i>e.g.</i> , IND. CODE §§ 13-14-1-11.5; 13-25-5-8.5) collectively require IDEM to balance the increased level of protection from successive conservative choices in screening level development against the increased costs and economic impact.	
106	67	5	B&T	IDEM's continued "preference" for stakeholders to collect paired sub-slab soil gas and indoor air sample, and its requirement to develop unnecessarily robust preferential pathway analyses, will result in significant additional costs and delays at sites that often do not warrant further investigation.	IDEM does prefer paired sub-slab and indoor air sampling because it provides the most complete picture of the relationship between the subsurface and indoor air, and results in a direct measurement of human health risk due to the VI pathway. This is preferred but not required. In instances where sub-slab sampling is conducted without indoor air sampling, IDEM recommends a more structured preferential pathway (pp) investigation at each building location. IDEM envisions an example of this structured investigation being one exterior soil gas sample per residence in the potential pp. This is not overly robust and will not result in significant additional cost or delays. IDEM has revised the text in Section 5.7 to clarify expectations.
107	67	5	Mundell	There may be need for additional clarity in regards to categorizing if building is low risk or needs evaluation with this combination of observations about how the RCG is sequenced. On Page 74, the questions are posed on if	IDEM has revised the text in question to clarify that the distance measurements are specific to ground water and a building (the term receptor is no longer used). We

				<p>groundwater concentrations greater than ten times (and five times) the VI GWSL are within 100 and 50 feet of a potential receptor. Receptor is defined on page 195 as “a human or ecological entity exposed to a stressor”. The table on page 75 asks if potential receptors are within 50 and 100 feet, etc. This determination seems to be separate from the consideration of a preferential pathway (which can be thought of as a “receptor” in common terms and so is a little confusing). On Page 70, paragraph one it lists “whether preferential pathways and/or potential receptors exist”, which furthermore shows they can be considered separate items. The listing in the flow chart as receptor was the only thing a little confusing. Perhaps stating this might be a helpful articulation of one case to go along with Figure 5-C: For example, just because a utility corridor is within 50 or 100 feet of a VI GWSL, it does not obligate the investigation at the “receptor”-or property which may be further than 50 to 100 feet. But neither is that preferential pathway ruled out of consideration of a connection between a source area and VI GWSL and a potential receptor that although it may be over the 50 or 100 feet, might fall within a category of needing Standard VI Investigation steps because of the significant preferential pathway that exists (as Section 5.4.1 shows clearly). It all depends on if the pathway is connected with the groundwater VI GWSL and the receptor(s). (note multiple pages and citations)</p>	<p>believe this terminology change provides the additional clarity that is sought by the commenter.</p>
108	67	5.1	Mundell	<p>CSM-Vapor could use an explanation why depth and soil classification are no longer considered as factors in GWSLs for vapor intrusion.</p>	<p>The depth and soil classification factors referenced in the comment are modeled results using the Johnson Ettinger Model (JEM). IDEM recognized that using modeled inputs for the calculation of</p>

					<p>screening criteria was a misapplication of EPA policy regarding the JEM, and the decision was made to discontinue this approach.</p> <p>IDEM will post a more detailed explanation on the VI website once the guidance is finalized.</p>
109	67	5.1	GM/Environ	<p>IDEM should critically review the extensive public comments that have been submitted in response to USEPA’s effort to update its vapor intrusion assessment approach by 2010 (included as Attachment 5.1).</p> <p>Much of the vapor intrusion assessment approach described in Chapters 5 and 10 appears similar to many of the approaches that some USEPA staff has considered as USEPA works towards a goal of updating its 2002 draft vapor intrusion guidance by the end of 2012. Because of these similarities, the comments that we submitted to USEPA in May 2011, in response to its request for comments on the 2002 draft guidance, are pertinent to IDEM’s vapor intrusion assessment approach. These comments are included here as Attachment 5.1. We also encourage IDEM to critically review the other public comments that were submitted to USEPA. (see pages 67-97)</p>	<p>The approach is similar because IDEM is trying to be as consistent as possible with federal guidance. If federal guidance changes, then IDEM will consider revisions consistent with EPA final guidance.</p> <p>IDEM does not plan to review comments on the USEPA draft, as the comments are not specific to the RCG.</p>
110			Internal		
111	67	5.1	Arcadis	<p>IDEM states that “Understanding or ruling out the VI pathway typically involves two or more rounds of exterior soil gas (SGe), sub-slab soil gas (SGss), and/or indoor air (IA) sampling”. This leaves the impression that soil gas sampling can be used as a single line of evidence for ruling out the VI pathway if sampled for two rounds.</p>	<p>This paragraph has been re-worded to clarify that SGe is only applicable as a stand-alone tool for ruling out VI when the site is low risk: “<i>At certain sites that qualify as low risk, this may typically involve exterior soil gas (SGe) measurements (Section 5.4.2).</i>”</p>

112	67	5.2	MSECA	Second bullet: define “significant”.	IDEM has rewritten the referenced bullet to read: “vapor phase chemicals may move into previously unaffected structures”.
113	69	Fig 5-A	MSECA	First action step (with reference to Section 5.4): insert reference to Figure 5-B	IDEM agrees with this comment and has made the proposed change.
114	69	Fig 5-A	MSECA	Second action step (with reference to Section 5.5): insert reference to Figure 5-F.	IDEM agrees with this comment and has made the proposed change.
115			Internal		
116	70	5.4	Arcadis	The RCG states that “field instruments may prove useful in verifying the presence or absence of acute, explosive, or imminently dangerous conditions at a site.” Field instruments are also useful for identifying vapor entry points and preferential pathways. A parts-per-billion level photoionization detector (PID) can identify some constituents at VI screening level concentrations.	IDEM agrees with this comment and has added the following text: <i>“Field instruments, such as a photoionization detector (PID) or a flame ionization detector (FID), may be useful for identifying vapor entry points and preferential pathways in a building.”</i>
117	71	Fig 5-B	MSECA	Fourth action step (with reference to Section 5.4.1): insert reference to Figure 5-C.	IDEM agrees with this comment and has made the requested change.
118	71	Fig 5-B	MSECA	Action step “go to Section 5.4.3”: insert reference to Figure 5-E	IDEM agrees with this comment and has made the requested change.
119	71	Fig 5-B	MSECA	Action step “go to Section 5.4.2”: insert reference to Figure 5-D	IDEM agrees with this comment and has made the requested change.
120	72	5.4.1	Arcadis	IDEM needs to provide more guidance and direction on how to deal with soil impacts and potential VI. Perhaps a conservative range of concentrations for some constituents can be established for screening a site, so that there is some guidance for what level of VOCs in soil would trigger a vapor intrusion evaluation. Concentrations below this range would likely not pose a VI risk. Concentrations within this range require further evaluation. Concentrations above this range would require prompt action or paired sampling. (also	IDEM agrees that the topic of soil as a vapor source was not adequately addressed within the RCG. IDEM has revised the text in several places to incorporate consideration of soil media as a vapor source. For example, see last paragraph in Section 5.4.1 and the second paragraph of Section 5.4.2 for further clarification.

				Section 5.4.2)	
121			Internal		
122	72	5.4.1	B&T	It is important that the section regarding preferential pathway investigations be clarified and fleshed out to provide IDEM's expectations on what constitutes a "significant" preferential pathway and the rationale which triggers a preferential pathway investigation. IDEM should provide specific examples, case studies, and literature references to support its position. (also page 81)	The forthcoming Technical Guidance Document (TGD) titled "Investigation of Preferential Pathways for Contaminant Transport" will address many of the concerns raised in this comment. As discussed in both the TGD and the RCG, a preferential pathway investigation does not always mean sampling. The preliminary screening process consists of identifying and mapping potential preferential pathways, and providing details about their depth, method of installation, etc. The need for further investigation will be assessed on a site specific basis, based on factors such as: the nature of the contaminant release, magnitude of the contamination, proximity of the contamination to the preferential pathway, proximity of the contamination to the occupied building, native soil type, how the utility lines enter the building, etc. If the data indicates that further investigation of the preferential pathway is needed, soil gas sampling within the preferential pathway is permitted. The preferential pathway investigation sections (5.4.1 and 5.5.1) have been clarified to better convey IDEM's expectations.
123	72	5.4.1	IPC	The last paragraph of Section 5.4.1 indicates there are no	Section 5.4.3 is a section devoted entirely

				generally accepted soil screening levels for vapor intrusion and therefore none are listed. IDEM needs to confirm whether the 5 ft clean soil separation distance from “residual petroleum” in Fig 5-E can be used as an exit criteria for soil sources of any benzene or TPH concentration. It could be interpreted that there is no soil source exit criteria or there is unlimited criteria in terms of soil concentrations. (see also Figure 5-E)	to petroleum hydrocarbons. This section clearly confirms the 5 feet of clean soil separation distance. That concept is reinforced in Figure 5-E.
124			Internal		
125	75	Fig 5-D	MSECA	First decision step: insert reference to Figure 5-C	Figure 5-D has been substantially revised and includes references to figures.
126			Internal		
127	76	5.4.3	MSECA	First bullet: what methods are acceptable/recommended for the ‘detection’ of petroleum vapors, and how is ‘detection’ defined?	This section is revised to now reference “reports” of vapors not “detection” of vapors.
128	76	5.4.3	MSECA	First bullet: revise this clause to differentiate vapors emanating from contaminant/source (representing potential VI exposure) from vapors emanating from unrelated sources (e.g., ambient conditions, indoor air background, etc.).	No change necessary. This bullet pertains to emergency conditions – determining the source of vapors as suggested in the comment is usually not practical during emergency conditions. If vapors are reported in a building due to ambient conditions, further investigation is appropriate to verify ambient conditions.
129	76	5.4.3	IPC	What is the basis for requiring VI assessment if NAPL is within 30’ of a building? How can it be shown that 5’ of clean unsaturated soil with 5% oxygen content exists between source and receptor?	IDEM is relying upon literature values and procedures that are cited by IPC (Davis). This approach should be very beneficial at most LUST sites, and IDEM believes that further investigation is always appropriate when NAPL is present in close proximity to a building.

130	76	5.4.3	IPC	Last bullet: Less than five feet of clean, unsaturated soil with an oxygen content greater than five percent exists between the residual petroleum and the building and/or TPH in soil is less than 100 mg/kg.	No change necessary. The comment suggests a TPH measurement be included in the referenced procedure. IDEM is discontinuing risk-based TPH assessment. There is no technical/literature support for screening VI sites using TPH measurements including the value cited in the comment.
131			Internal		
132	76	5.4.3	Arcadis	IDEM states that further investigation of the PVI pathway is appropriate if Petroleum vapors are detected in the building. Under normal VI scenarios, petroleum vapor intrusion would not occur at a rate significant enough for vapors to be detectable by odor. Shallow significantly impacted groundwater water entering a building or free product touching a building with significant vapor entry points are scenarios where petroleum vapors may be detectable. In these cases, groundwater will need to be addressed and interim measures taken to reduce interior vapors. However, outside of these scenarios, normal partitioning and migration of vapors will not result in vapor concentrations that are detectable by odor. It may be that a nearby remediation system has been poorly designed and vapors are being forced into a structure. Please use caution with jumping to the conclusion that normal VI is occurring under situations where odors are being detected.	No change necessary. IDEM cited “reports of petroleum vapors” as a condition that requires further evaluation, not an indication that VI is occurring.
133	77	Fig 5-E	Commissioner Easterly	Make more descriptive by including the actual decision criteria from page 76? This would make it like Figure 5-D.	This figure is now revised by including the decision criteria as suggested.
134	77	Fig 5-E	IPC	Having complimented the use of Robin Davis criteria, the Preliminary Screening VI Process flowchart for Petroleum (Fig 5-E) seems to have a flaw in its logic. It implies that	Figure 5E has been restructured to more clearly present the exit ramps, and no longer presents the dilemma identified in

				<p>free product &gt; 30 ft below the foundation gives you an exit ramp from VI, but then if the benzene concentration in groundwater &gt; 1000 ug/l, it draws you back in, regardless of how deep the groundwater is and how much clean soil separation exists.</p> <p>We think Robin Davis intended that that 30 ft of clean soil separation from free product with a petroleum signature automatically exits you from VI, period. Further adding to the confusion on this issue is that free product gasoline will almost certainly have &gt; 1000 ug/l benzene but this is normally not quantified since it is problematic to get true dissolved phase readings when free product is present. The diagram should have both free product and dissolved-only logic legs to avoid this dilemma.</p>	the comment.
135	78	5.5	Mundell	<p>Statement in last sentence of paragraph 2 seems contradictory – IDEM recommends SGe or paired SGe and IA sampling. This does not makes sense as IA sampling would not be allowed if owner did not give access.</p>	<p>The statement is not contradictory. Based upon IDEM’s experience, some homeowners are agreeable to allowing access for the placement of IA sampling canisters inside their home, but are reluctant to permit their concrete slabs to be drilled through for the purpose of SGss sampling.</p>
136	78	5.5	IPC	<p>First paragraph, last sentence, and third paragraph: On what is this sentence and paragraph based? For example, if you have ND in soil gas for all samples, why would you need to re-sample? There is no scientific basis for this requirement.</p>	<p>IDEM indicates the need for resampling to address the inherent variability associated with air flux in buildings and seasonal influence on vapor migration. This variability is not a matter of IDEM’s opinion, rather it’s well-established in the literature and is identified as a concern in US EPA Region 5 guidance.</p>
137	78	5.5	IPC	<p>The RCG states that exterior soil gas sampling for stand-</p>	<p>Petroleum VI sites do not have the need for</p>

				<p>alone Vapor Intrusion Risk Evaluation is only appropriate at sites evaluated as Low Risk. There is no Low Risk Site Definition for Petroleum sites. If you use the Low Risk Site Definition listed for Chlorinated VOCs, you get a low risk site screening level (600 ppb within 50 feet of a commercial building) that is less than the Petroleum Vapor Intrusion screening level presented in Section 5.4.3 (1,000 ppb under the building).</p>	<p>Low Risk Site criteria as they have the greater benefit of multiple exit ramps based upon distance and high concentrations (Section 5.4.3), which are not applicable for chlorinated VOCs. If the 1000 ppb of petroleum substance is under at least 5 feet of clean soil, it requires no further evaluation. However this is not true of the 600 ppb of chlorinated VOCs. So the comparison in the comment is not relevant.</p>
138	78	5.5	Arcadis	<p>IDEM states that at least two rounds of sampling are imperative before ruling out the VI pathway when a site does not screen out during the preliminary screening process. IDEM should provide, perhaps on a site-specific basis, the opportunity for the VI pathway to be sufficiently investigated with one round of sampling, assuming enough data is collected. For example, if someone wanted to close the door on the VI pathway, and wanted to collect multiple sub-slab samples, two week integrated indoor air passive samples, soil gas samples, pressure differential readings, etc., this could adequately determine if the VI pathway is a concern. The option should also be given for someone to proactively install a mitigation system or barrier instead of multiple sampling events. IDEM should also take into consideration whether active remediation is being conducted to reduce or eliminate contaminant concentrations. In this case, long term potential exposure to VI would be reduced or eliminated.</p>	<p>IDEM generally agrees with the comment. The approach identified in this comment may be acceptable depending upon the detailed elements of the investigation. The procedures in the RCG are not requirements, but guidance. Any approach not specifically identified in the RCG would be evaluated on its merits, and this statement is repeated throughout the RCG. IDEM has revised this section to include the option of installing a mitigation system rather than repeating a sampling event. If active remediation is being conducted, IDEM will consider that as part of the objective of further sampling.</p>
139	80	5.5.1	IPC	<p>Second paragraph: Summa canisters should only be used for indoor air or subslab samples sent offsite. Tedlar bags should be used, which are easier to fill and are disposable</p>	<p>IDEM does not agree that Tedlar bag sampling is superior to Summa canisters. The limitations and applicability of using</p>

				with no hardware or carryover issues.	Tedlar bags for vapor sampling are addressed in Section 5.5.2
140	80	5.5.1	IPC	TO-17 should be listed as an acceptable method to use.	IDEM agrees that TO-17 may be an acceptable method, and the text has been revised accordingly in Section 5.5.2
141			Internal		
142			Internal		
143			Internal		
144			Internal		
145	80	5.5.1	Arcadis	IDEM should specifically mention acceptance of passive indoor air samples under certain circumstances. See comments provided in response to Section 5.9.5 (Passive IA Sampling).	<p>Partially Accept</p> <p>Alternative sampling devices and techniques will be evaluated on a site-specific basis, as described in section 5.9.5. Sorbent-type sampling devices used in passive mode (sorbent exposed to ambient flow) with various analytical procedures are being evaluated, but are currently not recommended for quantitative analysis in vapor investigations. The use of passive devices is limited to gathering qualitative data in most cases due to:</p> <ul style="list-style-type: none"> <li>• Variations in procedures, devices and sorbent materials used,</li> <li>• Potential site-specific complications, and</li> <li>• Questions regarding converting the measured, adsorbed contaminant mass to a vapor concentration that can in turn be compared to a screening level.</li> </ul>

					Site-specific use of passive sorbent-type devices should be discussed with IDEM. Revisions to section 5.9.5 proposed in Comment #175 offer clarification. Additional revisions are not needed.
146	81	5.5.2	AW-ERM	5.5.2 of the RCG describes the potential to have to sample sewer and manhole structures as part of a preferential pathway assessment. Does IDEM have a certain set of procedures for sampling a sewer and/or manhole? What sample timeframe intervals would you need (10 minute, 8-hr, 24-hr)? What would you compare the results to – Indoor Air screening values? How many samples should be collected? Do these samples need to be collected at 2 separate times (summer and winter)?	Partially accept Vapor phase contamination within a sewer is only a concern if explosive vapors are present above the lower explosive limit (LEL). Propose changing the sentence to read: “In situations when explosive vapors are accumulating within a sewer at concentrations that could exceed the Lower Explosive Limit (LEL), vapor monitoring within the sewer and associated manholes may be necessary.”
147	81	5.5.2	Vectren	Third paragraph: It appears that the preferential pathways that IDEM refers to would consist primarily of buried utility lines and more specifically the backfill surrounding those lines. We are not sure that the risk of vapor exposure via these preferential pathways justifies the additional risk involved with sampling these locations. Vapor sampling of utility backfill via probing or drilling could greatly increase the risk of hitting a buried gas or electrical line which could result in serious accident and injury. Some of these lines could be difficult to locate with sufficient accuracy to allow safe sampling of the vapor in the backfill materials. We recommend that IDEM carefully weigh the risk of accident/injury during sampling versus the potential risk due	Accept, this will be clarified in the upcoming Preferential Pathway document that Geological Services is drafting. Additionally the following sentence was added to section 5.5.2:  <i>If a buried gas or electrical utility line is considered to be a significant preferential pathway, soil gas sampling near the backfill material, rather than in the backfill material is appropriate due to safety considerations.</i>

				to vapor exposure through utility backfill pathways.	
148	81	5.5.2	Arcadis	IDEM states that in some cases, vapor monitoring within the sewer and associated manholes may be necessary. In almost all cases, sampling within the sewer and associated manholes is not appropriate. It is nearly impossible to distinguish one source from another in a sewer system.	Accept Situations when sampling within a sewer is appropriate have been clarified in Section 5.5.2.
149	81	5.5.2	Arcadis	IDEM states that “Contamination in a preferential pathway is an indicator of likely VI. Any exceedance of indoor air screening levels (IASLs) in a preferential pathway warrants further investigation.” An exceedance of indoor air screening levels in a preferential pathway is extremely conservative, as attenuation occurs even through preferential pathways, especially for petroleum constituents.	IDEM agrees. This text has been revised to say “... Any exceedance of SGss criteria in a preferential pathway may warrant further investigation.”
150	82	5.6	AW-ERM	RCG requires leak testing the annular seal and fittings prior to collecting exterior soil gas samples. The RCG is silent on the need for leak testing prior to collecting sub-slab samples. Can you please clarify whether leak testing is necessary when collecting sub-slab samples? If so, is there a reference for leak detection procedures to follow?	IDEM agrees. The text has been revised in Section 5.7.4 to address leak testing procedures for sub-slab soil gas sampling.
151	82	5.6	IPC	First sentence, first paragraph: Vertical samples should be taken to evaluate if VI pathway is complete, and there is no need to ever go deeper than 10 feet. Shallow samples will be most important to document if VI pathway is complete; two foot depth samples can be used for this purpose. Last sentence, first paragraph: Again, no need for Summa canisters for soil gas samples.	No change necessary. IDEM is not aware of any literature support for this comment. The approach identified in this section is consistent with EPA guidance and recent literature. Regarding the use of Summa canisters, please see response to comment #139.
152			Internal		
153	82	5.6.1	AW-ERM Arcadis	5.6.1 addresses “Appropriate Conditions” for soil gas sampling. This section states that IDEM recommends waiting 72 hours after a “significant” precipitation event	IDEM agrees, and has revised the text to indicate that “significant” in this respect means any event yielding greater than 1

				to sample soil gas. How much precipitation constitutes a "significant" precipitation event? (AW)  IDEM should define what is considered "a significant precipitation event". (Arcadis)	inch of precipitation.
154	82	5.6.2	IPC	Third paragraph: Several EPA studies have documented that 2 foot depth samples can be considered an accurate indicator of soil gas concentrations when sample points are properly installed.  Last paragraph: Again, the most important sample is the shallow sample that will determine if the VI pathway is complete. The deep sample really tells you nothing about the impact of VI to the receptor.	IDEM disagrees. Staff is not familiar with the generically referenced studies. The preliminary screening process for petroleum chemicals will screen out most petroleum sites. (Section 5.4.3)  Deeper samples are more important in settings where the stratigraphy is more complex, as stated in the text. The shallow sample may be discontinuous.
155	82	5.6.1	IPC	If there is sufficient clean soil between receptor and source, there is no need to do this.	IDEM agrees, but no change is necessary. This section is directed at further investigation. If you have clean soil between the receptor and source, you have already screened out. See figure 5-E for clarification.
156	83	5.6.3	IPC	See our prior comment regarding "need" for multiple sampling events.	IDEM disagrees. See our prior response (response to comment #136).
157			Internal		
158	85	5.7	IPC	Last paragraph: IDEM considers paired SGss and IA samples best for evaluating potential into IA when the VI pathway has shown to be complete or there is a high potential for the VI pathway to indoor air to be complete.	IDEM agrees that paired IA and SGss samples provide the best information for evaluating the VI pathway. This is true regardless of whether the pathway has high potential or low potential.
159	85	5.7.1	IPC	There is no need in many cases for resampling.	IDEM disagrees. See our prior response

					(response to comment #136).
160	85	5.7.1	Arcadis	IDEM states that “buildings equipped with cooling systems will have the windows and doors closed, and the cooling system will create a pressure differential that favors VI”. This is not necessarily true. Most air conditioners positively pressurize the interior of the room or building. In commercial and industrial cases where an office is connected to an operation, the HVAC units are intentionally designed to positively pressurize the space to keep dust and odors from the manufacturing operation out of the office. It should be stated somewhere that the HVAC system should be evaluated for it’s potential to positively pressurize the space, which then becomes a “mitigation” approach for the space.	IDEM agrees, and has removed the cited text.
161	86	5.7.2	Arcadis	IDEM should specify what is considered “near the edge of the building”.	IDEM disagrees. A certain level of professional judgment is preferable to a prescriptive yet subjective measurement.
162	86	5.7.4	AW-ERM	RCG requires leak testing the annular seal and fittings prior to collecting exterior soil gas samples. The RCG is silent on the need for leak testing prior to collecting sub-slab samples. Can you please clarify whether leak testing is necessary when collecting sub-slab samples? If so, is there a reference for leak detection procedures to follow?	IDEM agrees, see response to comment #150
163	86	5.7.4	IPC	A 24-hr wait period after ss probes installed is not necessary and increases the number of trips to a person's home and drives up costs.	IDEM agrees there may be circumstances where a 24 hour delay is not necessary. This section was revised to suggest “Avoid sampling until the soil gas has equilibrated within the port (typically two hours).”
164	86	5.7.4	Arcadis	IDEM indicates that it is evaluating sorbent-type sampling devices for use in sub-slab sampling, but does not specifically mention using USEPA Compendium Method	IDEM agrees there may be useful applications for TO-17 methodology. Staff has revised text in Section 5.5.2 to address

				TO-17. Instead, IDEM states “TO-15 or similar”. Absorbent media used for collecting sub-slab samples generally require Method TO-17. TO-17 is also not “similar” to Method TO-15. Method TO-17 is considered to be a more reliable analytical method.	this.
165			Internal		
166	88	5.8.3	AW-ERM	Please verify that it is true that either eight-hour or 24-hour composite samples are appropriate for commercial/industrial sites. If eight-hr samples are sufficient, should they be collected during the workday? What if there are multiple shifts at an industrial facility – at what time should the 8-hour sample then be collected?	IDEM agrees the text was not clear and has revised this section to address these issues.
167	89	5.9	IPC	First sentence: This is true, which is why IDEM should not be pushing for indoor air samples so readily in this RCG.	No change necessary. The rest of the paragraph explains that this is why IDEM recommends concurrent sub slab sampling anytime indoor air is sampled to enable better interpretation of the IA results.
168	90	5.9.2	AW-ERM	For duplicate samples, should we collect 1 duplicate per 20 indoor air samples and 1 duplicate per 20 sub-slab samples? Or do we need just 1 duplicate per 20 total samples (indoor air and sub-slab combined)?	IDEM agrees this issue was not addressed and has revised the text in Section 5.5.2 to indicate that most project sampling objectives do not require field duplicates. If required, collect 1 field duplicate for every 20 samples (regardless of sub-slab or indoor air).
169	91	5.9.4	AW-ERM	Our lab, Air Toxics Limited, offers a certification process for canister cleanliness. 100% certification involves testing each individual canister and flow controller to make sure each canister is free of your target compounds. Air Toxics also offers a 10% certification process in which they test 1 in 10 canisters for this. The 100% certification process has	IDEM agrees. Please see response to comment #94.

				additional costs associated with it. Do we need to use the 100% certified canisters during every sampling event?	
170			Internal		
171			Internal		
172	91	5.9.4	Arcadis	<p>IDEM states that “AA sample concentrations should not be directly subtracted from the measured IA concentrations.” In a multiple lines of evidence evaluation subtracting out of background levels before estimating site-related risk should be allowed.</p> <p>Background sources of VOCs in outdoor and indoor air are well documented in the literature and in various state guidance documents. Investigators should be able to subtract the outdoor air contribution from indoor air samples prior to screening data or evaluating vapor intrusion-related exposures in order to gain a better understanding of vapor intrusion significance in a given building. Since many pollutants are commonly found at higher concentrations in indoor air at sites without soil/groundwater contamination than in ambient air, the background correction approach should also take into account typical indoor air levels. In studies with large datasets from office buildings, indoor air concentrations of many VOCs are typically higher than outdoor concentrations (USEPA, 2001). Dawson and McClary (2009) reviewed background concentrations of VOCs in homes in North America from recent literature and found that many VOCs common to vapor intrusion investigations were often detected in indoor air. The USEPA (2008) Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors also states that most VOCs of concern for vapor intrusion are also present due to indoor air sources. The planning stages of a vapor intrusion evaluation should</p>	<p>IDEM disagrees. IDEM’s position of not subtracting out background levels numerically is consistent with EPA guidance. The presence of background AA contamination should be addressed qualitatively – this is consistent with EPA guidance on how to evaluate background concentrations. The end result is the same: you get the benefit of background concentrations at any building.</p>

				<p>thus consider that VOCs are a common component of air, and air quality is easily affected by the use of common products containing VOCs, and other indoor air sources such as cooking (Fortmann 2011), showering (Jo 2006), and human exhalation (Cailleux 1993). Conducting a building survey that identifies potential background sources of VOCs and inventorying products currently being used in the building are important steps to consider and include in any evaluation but are not sufficient to identify all indoor sources.</p> <p>Specific examples listed in original comments</p>	
173	91	5.9.4	Arcadis	<p>Building-specific attenuation factors (AF) can easily be calculated by dividing the concentration measured in indoor air by the concentration measured in a representative number of sub-slab soil gas samples at a site. Values above 1 suggest an indoor air source, and values below 1 indicate a potentially significant contribution from a subsurface source, although typical AFs are much lower than one. When USEPA examined a very large set of AFs, the majority fell between 0.001 and 0.01 (USEPA 2008). Site-specific AFs for each chemical should be benchmarked against these values to gain a clearer picture of site conditions. In many cases when indoor air concentrations are compared with sub-slab soil gas concentrations, questions arise about the source of the indoor air concentrations. The guidance should allow allocation of an AF from a known site contaminant, or another line of evidence, to re-estimate an indoor air concentration of a COC from the sub-slab environment alone. This “indicator VOC” approach was applied by USEPA to analyze the data from the Raymark site (DiGiulio et al. 2006).</p>	<p>IDEM agrees. However, nothing in the RCG precludes the evaluation suggested in this comment. The procedures in the RCG are not requirements, but guidance. Any approach not specifically identified in the RCG would be evaluated on its merits, and this statement is repeated throughout the RCG.</p>

174	91	5.9.4	Arcadis	Collecting radon measurements as a line of evidence has been successfully used at other sites to calculate an additional site-specific attenuation factor. These AFs were consistent across similar buildings, consistent temporally, and were consistent with AFs reported by USEPA (2008) for VOCs (King et al. 2010; Lutes 2010). Applying an AF (calculated from site data, from USEPA (2008), or from radon measurements) to sub-slab data can provide a reasonable estimate of indoor concentration of a VOC that is attributable to subsurface sources. These estimates can be a valuable line of evidence in understanding vapor intrusion and the contribution of background sources of VOCs.	IDEM agrees that this approach shows some potential for this application. However, EPA is presently evaluating the reliability of radon measurements for VI investigations, and guidance may be forthcoming this spring. Until then, IDEM is reluctant to include this method in the RCG.
175			Internal		
176	92	5.9.5	Arcadis	Can IDEM elaborate on what type of demonstration it would like to see for acceptance of using sorbent-type sampling device, along with USEPA Method TO- 17. There are literature sources that indicate sorbent-type sampling devices and TO-17 provide representative results. Is this sufficient?	IDEM agrees that sharing literature sources comparing the quality of TO-17 procedures with TO-15 procedures is a reasonable “demonstration”.
177	92	5.9.5	Arcadis	Sorbent-based methods are an emerging technology for vapor intrusion assessment. Current standard practice for indoor air VOC monitoring in the United States includes the use of negatively-pressurized, ultra-clean, stainless steel canisters for sample collection. Practitioners frequently use 8- to 48-hour integrated samples with Summa canisters in an attempt to average samples over an exposure period. This is the United States’ “gold standard” for indoor air analysis, but it is expensive to implement. Professional experience shows that the flow controllers currently used in commercial practice are subject to substantial flow rate and final pressure errors when set for integration times in excess of 24	IDEM agrees that sorbent-based methods are an emerging technology for vapor intrusion assessment. But it is definitely a technology that is still emerging, and little if any guidance is currently available to guide IDEM or the regulated community for this application. EPA may incorporate some much-needed direction in its updated VI guidance due out in draft form in March 2012. IDEM staff will accept any methods presented in that guidance when it is presumably finalized later in the year.

				<p>hours. Schuver and Mosley (2009) have persuasively argued that temporal variability should be expected to be significant over time periods longer than 48 hours. Passive sampling using absorbent media has been demonstrated to provide representative results when compared to stainless steel canister sampling. Passive sampling methods provide an efficient way to monitor indoor air quality as average concentrations measured over a long time period. Long sampling time periods are desirable, because most health effects associated with indoor air pollution are associated with chronic exposures. Passive samplers provide an average measure of potential exposure over a known time duration, during which concentrations may have short term fluctuations.</p> <p>Further support for passive sampling devices is contained in original comments.</p>	<p>Until then, IDEM welcomes any information from this commenter and others who have experience with sorbent-based methods.</p>
178	93	5.10	GM/Environ	<p>IDEM should allow comparison of indoor air data to published indoor background levels as an additional line of evidence in vapor intrusion assessments.</p> <p>Section 5.10 lists several approaches for assessing the potential for indoor air data to be affected by indoor and outdoor sources, which should be taken into account in vapor intrusion assessments. IDEM should add to this list the comparison of indoor air data to published indoor background levels. This is an important additional line of evidence when assessing vapor intrusion for residential buildings because many studies of residential background indoor air levels have been published. For example, USEPA recently published a compilation of such studies (USEPA 2011). This compilation is an update of one USEPA had used in attempting to exclude</p>	<p>IDEM agrees that the USEPA compilation of background indoor air studies may be utilized as a line of evidence in vapor intrusion assessments. There are many lines of evidence that could be identified in this section, and staff identified those which might be the most useful. Staff believes the indoor air database is not as useful as the other factors listed because it is not yet fully vetted. It is IDEM's understanding based on discussions with EPA staff that the interpretation of this data is still uncertain, and IDEM is reluctant to include it in the RCG until there is additional clarification by EPA on the best use of that</p>

				empirical attenuation factors potentially affected by indoor sources from a statistical analysis of its 2008 database of empirical attenuation factors (USEPA 2008a).	data.
179	93	5.10	Arcadis	In addition to using radon as a tracer gas to determine a site-specific attenuation factor, radon should also be allowed for screening to identify indicator buildings. Multiple studies have demonstrated that radon acts very similarly to other subsurface volatile constituents with respect to vapor intrusion potential (King, 2010; Lutes, 2010; McHugh 2005, Wisbeck, 2006). Additional support and documentation provided in original comments.	See response to comment #174.
180			Internal		
181			Internal		
182	95	5.11	IPC	Third sentence: Why not simply apply the exclusion criteria previously stated that is based on the Robin Davis paper? For example, if you can document you have 5 feet of clean soil between source and surface, there is no VI pathway.	IDEM agrees. The exclusion criteria are used to screen petroleum VI sites from further evaluation. This section (and others) is applicable to buildings that do not screen out.
183	96	5.12	MSECA	Revise list to remove duplicate or redundant items.	IDEM agrees. The list was reviewed and duplicate or redundant items were either removed or edited for clarity.
184	99	6	BWG	The Guide provides the recommended approaches for evaluating background data. IDEM states that they will evaluate other alternative methods on their merits. It is unclear how these alternative methods will be treated by IDEM. The Expert Panel believes methods allowed by USPEA should not be treated differently in terms of the review time or the likelihood of approval from IDEM if applied properly.	We agree. IDEM revised the background section to provide increased assurance of IDEM's willingness to review and approve alternative approaches that are applied properly. Since there are many different site scenarios and many possible approaches for evaluating background, we are unable to provide specific information

					on how alternative approaches may be treated. We added text that notes we will evaluate approaches for sound methodology, scientific validity, and consistency with U.S. EPA guidance. While we strive to review all submissions in a timely manner, unfamiliar approaches may require longer review time.
185	99	6.1	BWG	Some of the IDEM's recommendations are not necessarily consistent with USEPA approach (USEPA, 2002), such as the use of non-parametric procedures and the requirement that no data be transformed. The Expert Panel believes that all USEPA allowable methods should be considered potential options	We agree this should be clarified. IDEM added new section (6.4.3) on general statistical considerations that clarifies the recommendations regarding parametric versus non-parametric statistical procedures and data transformations. We agree that U.S. EPA methods are potential options as reflected in the text.
186	99	6.2	GM/Environ	IDEM should allow the use of literature sources of background levels on metals in Indiana soil. Section 6.2 states that "At this time, there are no regional or state-wide background databases that IDEM recognizes for derivation of generic background screening levels." However, background levels for metals in Indiana soil are available from at least a couple of well known and widely used literature sources (e.g., Dragun and Chekiri, 2005; Boemgen and Shacklette, 1981). Using these literature sources sometimes can be just as useful and representative as developing site-specific background levels. IDEM should allow the use of such sources or explain why they are not acceptable.	We agree this should be clarified. IDEM revised this text to remove the sentence and we added some general guidelines for using literature values or previous background studies to subsection 6.4.8.
187	99	6.2	BWG	The Expert Group recommends the addition of this paragraph:	No change necessary. We recognize the value of regional or state-wide background

				We believe that a regional or state-wide study would be a useful tool for all, and this statement in the Remediation Closure Guide may encourage study planning and execution.	studies as a cost-effective approach for many sites and we welcome the opportunity to collaborate with stakeholders on the design and execution of such studies. However, we do not believe this statement has a place or purpose in the RCG.
188	99	6.2	BWG	The Expert Group disagrees with the existing language which states the IDEM does not recognize the use of any existing database for the derivation of background screening levels. The Expert Group recommends the addition of this statement: Regional background studies have been completed by private parties or other states and the use of these studies in whole or part will be considered by IDEM on a case-by-case basis.	We agree this should be clarified. IDEM revised this text to remove the sentence and we added some general guidelines for using literature values or previous background studies to subsection 6.4.8.
189	99	6.2	NiSource	Development of State-side database. NIPSCO believes that Draft Guide's focus on the issue of chemical background levels in the environment to be a positive step. NIPSCO recommends that in the interim, IDEM develop a preliminary list of background values based on existing and readily available data.	We recognize the potential value of such a list, but are unaware of an existing database of background values that addresses the variability of background constituents in Indiana.
190	100	6.4	GM/Environ	IDEM should mention that it is more important to quantify the increment by which site data exceed background since the risk associated with this increment is the risk that should be used in determining the need for remediation. Section 6.4 addresses establishing background levels and comparing site data to these levels in determining whether the site data should be considered the same as background. If the site data are not the same as background, another important determination is the amount by which the site	No change necessary. We have traditionally treated background demonstrations and risk assessments as separate and distinct approaches to developing remediation objectives. While we are willing to evaluate proposals that involve a combined approach on a case-by-case basis, we think such approaches would be unnecessarily complicated for many sites.

				<p>data exceeds background. Quantifying this increment above background is important because the risk associated with this increment is the risk that should be compared to the cancer risk and HI limits of <math>10^4</math>, and 1, respectively, which are the acceptable limits for site-related risks. IDEM should include a discussion of this important aspect of characterizing background levels.</p>	
191	100	6.4	BWG	<p>The Expert Panel disagrees that the guidance does not differentiate between naturally occurring and anthropogenic substances. Section 6.4.1 disallows background sampling in the very places that one would expect anthropogenic substances, such as PAHs. By disallowing areas with anthropogenic concentrations of PAHs, the Guide is differentiating between naturally occurring and anthropogenic substances.</p>	<p>We agree this discussion requires clarification. IDEM revised section 6.4.1 to clarify the guidance on this topic.</p>
192	100	6.4.1	BWG	<p>The Guide states: "Avoid the following when selecting a background reference area:"</p> <p>The Expert Panel recommends that some more specific guidance be provided <i>in lieu</i> of general statements such as "avoid the following." What does IDEM intend "avoid" to mean? Does "avoid" mean sample no closer than 1000 m? 100 m? 10 m? The Expert Panel's memoranda from 2010 made some quantitative recommendations that we recommend be added to the Guide. We believe that the regulated community needs concrete guidance, such as: "Background samples should not be taken any closer than 10 m from storm drains or ditches..."</p> <p>The Guide states that areas affected by roadways, parking lots, etc. should be avoided. The Expert Panel disagrees with this approach. As noted in previous Expert Panel submissions, these areas, as well as highway and railroad</p>	<p>We agree this section requires clarification. IDEM evaluated these recommendations at length and concluded that the considerations for selecting a background reference area cannot be reduced to a simple list of setbacks. We recognize there are practical difficulties with finding and gaining access to good background reference areas, but a list of setbacks would be a poor substitute for the professional judgment that is necessary to select background references. In any case, we revised section 6.4.1 to clarify this guidance.</p>

				rights-of-way, are ubiquitous and are not associated with site activities. A major goal of the Background and Off-site Sources section of the Guide is to ensure that identified sites are not remediated to levels that have lower PAH concentrations than the rest of the town in which the site is situated. The rest of the town is affected by similar anthropogenic activities associated with transportation. Remediating site releases is a benefit to the environment but remediating site releases to PAH levels lower than the levels near roadways, parking lots, railroad tracks, right-of-way, etc. is not sustainable and sometimes is not feasible.	
193	100	6.4.1	BWG	The Expert Panel suggests adding the following clarification after the sentence: "For instance, soil lead concentrations along a major highway may not be representative of anthropogenic lead concentrations in a residential neighborhood" Add: "However, it is appropriate to collect samples along roadways of a size that is relevant to the site location, such as a residential street if the site is in or adjacent to a residential neighborhood."	We agree. IDEM added the suggested language with minor revision to provide additional clarification.
194	101	6.4.1	BWG	The Guide states that fill areas should be avoided. Is there a rigorous method for determining if one has fill in a background sample? In many urban areas, it might be hard to find areas that do not contain fill.	We agree. IDEM can appreciate the practical difficulties with positively identifying fill areas, or identifying areas that do not contain fill. We revised the reference language to clarify this guidance. The guidance on fill acknowledges that background samples in fill may be necessary and appropriate in some cases.
195	101	6.4.1	BWG	IDEM's requirement on restricting background reference areas by a 2 mile radius, is too stringent for many urban areas where it is difficult to locate appropriate background sites within such a short distance from the site. The Expert	We agree. IDEM revised the referenced language to clarify that this is a recommendation and guideline – not a restriction.

				Panel suggests that the selection of the background site should focus more on similar geological characteristics or similar patterns of being affected by non-point or offsite sources.	
196	102	6.4.3	BWG	IDEM recommends against eliminating low outliers from background data sets but recommends that high outliers be eliminated. The stated reason for eliminating high outliers is that they are associated with previously unidentified contamination areas. The Expert Panel's opinion is that high outliers may not necessarily be indicative of a contamination source; they are more likely related to variation within a background data set. High and low outliers represent both sides of extreme data within a background data set, and both should be eliminated once identified to ensure that the background data pools are not skewed by extreme data.	We agree that this section requires further clarification. IDEM pared the outlier guidance down to some general guidelines to provide greater flexibility.
197	102	6.4.3	NiSource	The Final Guide should not reflect the exclusion of outliers. NIPSCO is concerned with the concept expressed in the Draft Guide of removing outliers; and, more generally, NIPSCO is concerned with the Draft Guide's apparent intent to rely on statistical evaluation of the data, rather than on professional judgment. In particular, NIPSCO believes that the use of the Sprent Outlier Test would result in the development of background values for constituents that are unnecessarily low. A better approach would be to run the outlier test and then verify using professional judgment, that identified potential outliers are likely to be background values. –see original comment for additional info.	We agree. IDEM removed the Sprent test and pared the outlier guidance down to some general guidelines to provide greater flexibility. We agree that professional judgment is important in evaluating the outcome of any outlier test and that multiple lines of evidence should be considered before deciding to discard outliers.
198	102	6.4.3	NiSource	The Draft Guide does not appear to allow for data transformations. That position should be reversed.	We agree. IDEM revised the guidance on data transformations to address this comment. The revised content is now in

					the third bullet in Section 6.4.3.
199	102	6.4.3	NiSource	Although the Sprent test is non-parametric, its methodology includes inherent underlying assumptions that the dataset is symmetric. This is a problem with all outlier tests; they have to be based on the assumption that there is some underlying feature of the dataset so that deviations from this characteristic can be identified. However, the problem is exasperated for non-parametric tests as their nature is generally exactly their lack of underlying patterns. In the absence of an underlying pattern, it is not possible to conclude that certain data are not representative of the dataset and should be excluded.	We agree. IDEM removed the Sprent test and pared the outlier guidance down to some general guidelines to provide greater flexibility.
200	102	6.4.3	NiSource	Because the Sprent test assumes an underlying symmetric dataset, it is important to identify potential outliers at the low end of the data range as well as the high end. If Upper-end outliers are to be removed, lower end ones should be too, to eliminate this bias from the evaluation.	We agree. IDEM removed the Sprent test and pared the outlier guidance down to some general guidelines to provide greater flexibility.
201	102	6.4.3	NiSource	Were the 90 <sup>th</sup> percentile used for the background conditions would be incorrectly identified as contaminated about 10% of the time. While 90% is perhaps a reasonable policy decision, the final Guide should reflect an understanding of the implications of an IDEM decision to use 90% value. Would, for example, action need to be taken if a background investigation identified high outlying concentrations on public lands? IDEM should anticipate that the datasets will include a great deal of outliers. NIPSCO is also concerned that finding appropriate green spaces not adjacent to roads or railroad tracks will continue to be a challenge	We agree – no change necessary. IDEM agrees that the 90% value is a reasonable policy decision – particularly since the text recommends that exceedances of the 90% value trigger additional evaluation - not an automatic conclusion that areas represented by exceedances are not consistent with background.
202	103	Fig 6-A	MSECA	First decision step: how is it determined if there are “sufficient background samples”? (Can a reference to a particular section of the RCG or equation be inserted here?).	We agree this section requires clarification. The number of samples is dependent on the complexity of the site and the methodology

					<p>used. IDEM revised the following sections to clarify how to determine how many samples are necessary:</p> <ul style="list-style-type: none"> <li>We revised Section 6.4.2 to recommend 8 to 10 or more samples for calculating a background threshold value, and note that investigators should document that they have enough samples to support their methodology.</li> <li>We revised Section 6.4.7 to provide an example procedure for estimating a BTV based on 4 to 7 non-outlier samples.</li> </ul> <p>We added new Section 6.4.3. The number of samples is an important factor in the general statistical considerations discussed in this section.</p>
203	103	Fig 6-A	MSECA	<p>"Evaluate outliers" and "belong in background" steps: how are these steps performed/completed? (Can a reference to a particular section of the RCG or equation be inserted here?).</p>	<p>We substantially revised the guidance for evaluating outliers in section 6.4.4. The revised guidance provides flexibility in applying appropriate outlier tests, graphical displays and professional judgment in determining whether outliers belong in the background population.</p>
204	104	6.4.4	BWG	<p>In the context of Section 6.4, it is not clear to the Expert Panel why IDEM has determined the need to have four different methods for BTV comparisons (judgmental site samples and large background sample sets, judgmental site samples and small background sample sets, systematic site</p>	<p>We agree this section requires clarification. IDEM added the text in the first bullet of Section 6.4.3 to clarify the rationale behind the different approaches as suggested in this comment. We removed the guidance and</p>

				<p>sampling and large background sample sets, judgmental site samples and small background sample sets). The Guide would be more useful and understandable if IDEM would add a few sentences that explain the reasons for the four different approaches.</p> <p>Specifically, the Expert Panel does not understand the logic of defining the BTV four different ways:</p> <p>Judgmental site samples  Large background set - 90th percentile  Small background set - maximum  Systematic site samples  Large background set - 95th UCL  Small background set - 50th percentile</p> <p>The background characterization of a constituent such as benzo[a]pyrene is independent of the method used to collect site samples.</p> <p>Similarly, the Expert Panel does not understand the logic of having four different comparison methods:</p> <p>Judgmental site samples  Large background set – point by point comparison  Small background set – point by point comparison  Systematic site samples  Large background set – comparison to site mean  Small background set – comparison to site EPC (usually 95<sup>th</sup> Upper Confidence Limit)</p>	<p>example procedure for comparing a small sample set to systematic on-site samples.</p>
205	104	6.4.4	BWG	<p>The Guide has proposed different approaches for <i>judgmental</i> and <i>systematic</i> site samples. According to the glossary, judgmental sampling is: "A method of selecting sample locations based on the professional judgment of the sampler. The history of the site, current site conditions, and terrain should guide these decisions." Systematic sampling is: "A</p>	<p>No change is necessary. IDEM does not intend for the guidance to imply that judgmental sampling approaches are preferred to systematic approaches. Both approaches are valid and each has its advantages. Some programs and site</p>

				method of placing sample locations at fixed intervals beginning at a random starting point, or according to a predefined pattern." The Guide states that judgmental sampling is often chosen by the sampler, and IDEM may be implying that systematic sampling is preferred over judgmental sampling. In fact, the method of sampling is often out of the control of the sampler. The Expert Panel notes, for instance, that judgmental sampling is often required by the regulator at and around each Solid Waste Management Unit as in a RCRA Facility Investigation, or within or near an Area of Concern (AOC) or where a recognized environmental condition (REG) is identified.	investigation scenarios do tend to favor judgmental approaches as noted in the comment, but the applicable regulations do not strictly require it. We don't see that any preference for judgmental sampling is expressed or implied in the text, only that the commenter is seeking reassurance that this is not the case.
206	104	6.4.4	MSECA	Second paragraph, final statement: How is "... minimally above..."demonstrated?	No change necessary. This text is intended to convey the idea that a calculated BTV value should not be viewed as a bright line standard. Investigators may present lines of evidence based on professional judgment in support of an argument that levels of contaminants in on-site samples are not significantly above the levels in the background reference.
207	105	Fig 6-B	MSECA	First decision step: revise "Site samples exceed?" to "Site data exceed 90 <sup>th</sup> percentile?"	We agree. IDEM revised the figure as suggested.
208	105	Fig 6-B	MSECA	"Exceedances acceptable" step: What are the criteria by which this question is evaluated? (Can a reference to a particular section of the RCG or equation be inserted here?).	The referenced text and figure 6-B were revised and are now in Section 6.4.5. This section notes that samples only minimally above the BTV may still be within the range of background. The "Exceedances acceptable?" decision diamond in figure 6-B is intended to represent this text. In general IDEM does not view the BTV

					value as a bright-line standard and expects that in many cases it will be appropriate to apply professional judgment in interpreting BTV exceedances. There is no specific criteria, but as noted in the text, IDEM will expect that investigators document the basis for their interpretations.
209	105	Fig 6-B	MSECA	Last instruction step: Change “Exclude grouped exceedances from the background area” to “Exclude grouped exceedances from the remainder of site data.”	We agree this step requires some clarification. IDEM revised the last instruction step to make it clear that the on-site area represented by grouped exceedances may be excluded from the background evaluation and investigated as a possible source.
210	105	Fig 6-B	MSECA	Last row: change “Area is background” to “Site data represent background conditions”; change “Remaining area is background” to “Remaining data represent background conditions”; change “Area is likely not background” to “Site data likely are not representative of background conditions”.	We agree this step requires further clarification. IDEM clarified the referenced language in the figure.
211	106	6.4.5	GM/Environ	IDEM should consider two-sample hypothesis tests to be acceptable methods which do not require case-by-case justification. Section 6.4.5 acknowledges that USEPA guidance identifies statistical methods for comparing site data to background that IDEM has not included, such as the two-sample hypothesis tests. In our experience, two-sample tests are at least as applicable and useful as the methods IDEM included. It is unclear why IDEM seems to be relegating these tests to methods that require case-by-case justification: "IDEM will evaluate such alternate	We agree. IDEM added text noting that hypothesis testing is another appropriate approach. See the first bullet in new Section 6.4.8.

				approaches on their merits." In fact, in the USEPA guidance that IDEM cited, the only condition for using these tests is having enough data (e.g., at least 8 to 10 samples) for each population. As such, IDEM should either include these methods or state that they are acceptable alternative.	
212	106	6.4.5	BWG	Hypothesis testing, <i>in lieu</i> of the recommended methods in the Guide, is recommended as a more robust statistical method by USEPA (USEPA 2002) for comparing background data to site data. The Expert Panel believes that this USEPA recommended method should be included as the preferred method in the Guide.	We agree that clarification is required. IDEM added text noting that hypothesis testing is another appropriate approach and that it will be evaluated for consistency with the U.S. EPA guidance. See the first bullet in new Section 6.4.8. We elected not to make it - or any other specific method - the "preferred" method in the guidance.
213	107	Fig 6-C	MSECA	Sixth line: change "Area is background" to "Data represent background conditions".	We agree. IDEM clarified the referenced language in the figure.
214	107	Fig 6-C	MSECA	Penultimate line: change "Exclude grouped exceedances from the background area" to "Exclude grouped exceedances from the remainder of site data."	We agree that clarification is required. IDEM revised the last instruction step to make it clear that the on-site area represented by grouped outliers may be excluded from the background evaluation and investigated as a possible source.
215	107	Fig 6-C	MSECA	Last step: change "Area is likely not background" to "Site data likely are not representative of background conditions".	We agree that clarification is required. IDEM clarified the referenced language in the figure.
216	110	6.5	BWG	The Guide recommends using the 95%UCL for the groundwater background data. However, in various USEPA programs, 95% or 99% UPLs or UTLs are usually used to represent the background level calculated from the upgradient monitoring data. The Expert Panel suggests that IDEM adopt a program consistent with USEPA's approach.	No change deemed necessary. IDEM recommended the 95% UCL to account for the uncertainty in this analysis considering the small sample set. Other statistics may be appropriate when applied consistent with the U.S. EPA guidance.

217	111	Fig 6-E	MSECA	Continue flow chart after completion of step “Re-evaluate background wells”.	The flow chart has been revised as suggested.
218	113	7.1	GM/Environ	<p>IDEM’s citation of ERA guidance is missing key documents. Environ includes a suggested list of documents in their comment letter.</p> <p>We recommend expanding the lists of citations appearing in the first paragraph of Section 7.1 and the second paragraph of Section 13.10 to include USEPA guidance for ERA (USEPA 1992, 1993, 1997, 1998, 1999, 2002a, and 2003). Two particularly important ERA guidance sources that are missing are the Wildlife Exposure Factors Guidance (USEPA 1993) and the National Recommended Water Quality Criteria (USEPA 2002a). (see also Section 13.10)</p>	We will reference additional USEPA ecological risk assessment documents in Section 11.
219			Internal		
220	114	7.2.1	Arcadis	<p>IDEM should provide additional guidance on exposure scenarios involving ecological receptors, agricultural use, surface water use, etc. Either provide IDEM specific guidance, or reference other acceptable guidance documents to use for scenarios likely to be realistic in Indiana. Given that Indiana is a significant agricultural state, a method for looking at agricultural risks should be established.</p> <p>The Oak Ridge National Laboratory (ORNL) database provides information on the fraction of chemical constituents present in soils that are taken up by plants (<a href="http://rais.ornl.gov/cgi-bin/tools/TOX_search?select=chem_spef">http://rais.ornl.gov/cgi-bin/tools/TOX_search?select=chem_spef</a>).</p> <p>USEPA 1997 Exposure Factors Handbook (Table 9-26) also provides vegetable consumption rates and represent portion sizes for each vegetable per eating occasion.</p>	We acknowledge that the RCG does not address every risk assessment scenario, and will consider other guidance as appropriate. No change necessary.
221	115	7.2.3	GM/Environ	IDEM should mention that there are other methods of	We will evaluate alternative proposals on

				<p>estimating the EPC that may be as appropriate and as useful as those IDEM identified.</p> <p>Section 7.2.3 says, "For judgmental samples, each sample result is usually an EPC. For systematic samples, the EPC is an appropriate upper confidence limit (UCL) of the mean for each potential contaminant." We believe both of these statements are inaccurate. First, it maybe appropriate and useful to use data from judgmental samples to calculate UCLs (even though such UCLs may be high-biased), as we explained elsewhere. Second, the UCL is not the only method of estimating an EPC. Another estimator that is often appropriate is the area-weighted average. Geostatistics (or kriging) is yet another method of estimating the EPC that is mentioned in USEPA guidance. IDEM should indicate that these other methods of estimating the EPC are also acceptable.</p>	<p>their merits. In addition, we will revise selected portions of the text to allow calculation of UCLs from appropriately located judgmental samples, though we believe this will result in an upward bias.</p>
222			Internal		
223	117	7.5	GM/Environ	<p>IDEM should recognize that site-specific risk assessment conducted consistent with USEPA guidance would qualify for a target cancer risk up to <math>10^{-4}</math></p> <p>Section 7.5 says, "Reducing uncertainty in the site-specific risk assessment process may allow consideration of a higher target risk level (up to <math>10^{-4}</math>). It further says, "IDEM will evaluate site-specific target risk proposals within the <math>10^{-4}</math> to <math>10^{-6}</math> risk range in a manner consistent with the National Contingency Plan [40 Code of Federal Regulations (CFR) 300, Subchapter J] and U.S. EPA (1991f)." However, site-specific risk assessments conducted consistent with the NCP, by design, always reduce uncertainties enough to warrant use of the <math>10^{-6}</math> to <math>10^{-</math></p>	<p>This section has been revised to clarify how IDEM will address target risk proposals within the <math>10^{-4}</math> to <math>10^{-6}</math> risk range, and the text in question is no longer present.</p>

				<p><sup>4</sup> risk range under the NCP. All risk assessments involve uncertainties, including: uncertainties in the spatial and temporal distribution of chemicals; uncertainties in the magnitude, frequency, and duration of exposure to receptors; uncertainties in the potential for chemicals to cause adverse health effects; and uncertainties in how these and other uncertainties interact. However, in site-specific risk assessments conducted consistent with USEPA guidance, many conservative assumptions and methods are used to address all of these uncertainties so that the resulting cumulative cancer and noncancerous risk estimates are virtually certain to be higher than the risks actually associated with the reasonable maximum exposure. In Section 7.5, IDEM should acknowledge that the use of such conservative assumptions and methods, consistent with USEPA risk assessment guidance, would qualify for a target cancer risk up to <math>10^{-4}</math></p>	
224	118	7.6	IPC	<p>Third paragraph, second bullet: In the last paragraph of Section 7.6, it states that compound additivity of risk may be appropriate to the extent that the same target organ or mode of action (cancer, non-cancer) is affected. This poses two questions:</p> <p>It is unclear what the first bullet in this section (“site-specific population exposure characteristics are integrated into the derivation of site-specific levels”) means, which is important since it implies additivity must be considered.</p> <p>If additivity is to be considered for a particular site because the above bullet applies or a cancer risk higher than <math>10^{-5}</math> is being used, can Table B-8b be used to identify and limit those compounds whose risks to be added?</p>	<p>IDEM has revised this section and deleted the text in question as well as Table 8b. Critical effects will require site-specific evaluation.</p>

225	118	7.7	IPC	Note that IDEM is treating ethylbenzene and naphthalene (inhalation only) as carcinogens. IDEM also treats the carcinogenic PAHs as well as chromium VI and vinyl chloride as mutagens (have a pronounced effect on children), which means the risk equations are now broken down into 4 age groups (0-2, 2-6, 6-16 and 16+), which requires software to be re-programmed to assess site-specific risk levels. This is the first state one member knows of to incorporate the US EPA mutagenic algorithms. The final IRIS database values should be used and the RCG should be updated when the new toxicity changes are finalized by the US EPA.	We are following USEPA guidance. The procedure is consistent with those used in the USEPA Regional Screening Level Tables.
226	119	Fig 7-A	MSECA	Penultimate line: change “pursue” to “implement”.	IDEM agrees and will make the suggested change.
227	119	Fig 7-A	MSECA	Last line: change “Continuing obligations” to “pursue additional closure”; change “Done” to “Risk evaluation complete, pursue unconditional closure”.	IDEM does not believe that the suggested changes to Figure 7-A reflect the intent of the text. No change necessary.
228	122	8.3	IPC	IDEM needs to clarify the depths for applicability of soil direct contact exposure pathway. The RCG indicates that the depths could be anywhere between 2’ and 15’ bgs.	The appropriate depth for direct contact evaluation is inherently site-specific. Determining that depth requires judgment and an evaluation of various lines of evidence.
229	121	8	GM/Environ	IDEM should note that residents and commercial/industrial workers may be exposed to contaminant in subsurface soil, and excavation workers would be exposed to surface soil. As noted elsewhere, residents and commercial/industrial workers may be exposed to volatile contaminants in subsurface soil, in addition to contaminants in surface soil. Conversely, excavation workers could be exposed to not only subsurface soil but also surface soil. IDEM should	IDEM has revised the text in these sections, and the referenced text has been replaced by a discussion of some of the lines of evidence that should be considered when determining the appropriate interval for direct contact evaluation. This approach provides more flexibility to address site-specific circumstances.

				make these clarifications in Chapter 8. (see pages 121-127)	
230	121	8.2	Arcadis	In Section 8.2, IDEM states that “most soil direct contact exposure occurs at or near the existing soil surface. Where surface soil exposure is likely, it is appropriate to evaluate at least the uppermost six inches of the soil column against direct contact remediation objectives.” IDEM then goes on to state in Section 8.3 that “generally, there is a good probability that soils within the top two feet of the ground surface will be excavated. For these reasons, IDEM recommends routine evaluation of the direct contact pathway to a minimum of two feet below ground surface.” This may be confusing or seem conflicting to the user as to what depth should be evaluated for surface soil direct contact.	See response to comment # 229 above.
231	121	8.2	Arcadis	IDEM should specify the appropriate depth range at which excavation worker exposure is typically relevant. Other guidance such as Virginia DEQ suggests evaluating soil and groundwater within the upper 15 feet for excavation worker exposure. Specific depths for construction workers and utility workers are provided in the Massachusetts regulation 310 CMR 40.0000: Massachusetts Contingency Plan Subpart I: Risk Characterization 310 CMR 40.0924(2)(b)(3)(g)(4). For current or potential soil exposures, the following depths shall be considered with any applicable site-specific information when determining Exposure Points: a. zero to three feet for exposures associated with surficial activity; b. zero to six feet for exposures associated with utility installation and repair; and	See response to comment # 229 above.

				c. zero to 15 feet for exposures associated with excavation scenarios and building construction.	
232	122	8.3	MSECA	Third paragraph: What is the basis for the position "... there is a good probability ... top two feet"? If this is a standard risk evaluation assumption that will be applied routinely, and that could be modified by a site-specific condition, it is recommended that this be stated in the RCG. If this is an arbitrary dimension, it is recommended that the explicit numeric value be omitted and language revised to indicate that the risk evaluation should adequately address this potential exposure scenario to a depth appropriate to address current and future land uses.	IDEM agrees that an arbitrary dimension is very limiting, that the appropriate interval is a site-specific determination, and has revised the text accordingly.
233	122	8.3	MSECA	Third paragraph: An apparent two-foot criterion is established here to address direct contact with potentially contaminated soil. In contrast, the criterion for definition of "surface soil" and subsurface soil" appears to be six inches (see Glossary, p 197). Please clarify.	IDEM has revised the text to eliminate an arbitrary dividing line between surface and subsurface soil. Appropriate evaluation criteria will be site specific.
234	123	8.4	Mundell	The calculation of an EPC mean or median derived from judgmental samples should be allowed for sites where the source area is reasonably well known. Sampling on these sites usually progresses in a step-out fashion from the most impacted areas. If anything, this will lead to means which are biased high and are more protective of health based levels. This procedure is already allowed for LUST sites and seems appropriate for sites where the source area is known.	We will evaluate alternative proposals on their merits. In addition, we will revise selected portions of the text to allow calculation of UCLs from appropriately located judgmental samples, though we believe this will result in an upward bias.
235	127	8.7	GM/Environ	IDEM should clarify that a site-specific risk assessment may be used to determine if an unacceptable risk exists, when an EPC exceeds a concentration limit. Section 8.7 says that unacceptable risks are unlikely if EPCs are below concentration limits. It then proceeds to outline remediation options if an EPC exceeds a concentration limit,	IDEM agrees that a site-specific risk assessment or risk characterization is an acceptable alternative. Section 7 has been revised to expand on this point. See also Section 1.3.

				without 'mentioning that another option is to conduct a site-specific risk assessment to determine if an unacceptable risk in fact exists. IDEM should revise this section to clarify that a site-specific risk assessment may be conducted to determine if an unacceptable risk exists, before considering remediation.	
236	129	9	Mundell	Include parameters such as the chemical's soil partitioning and solubility when discussing migration to groundwater potential	These parameters are already incorporated in screening level calculations. No change necessary.
237	130	9.3	GM/Environ	<p>IDEM should recognize the importance of accounting for temporal trends when estimating groundwater EPCs, and that approaches other than those IDEM identified may be more appropriate.</p> <p>Section 9.3 discusses two approaches for calculating groundwater EPCs. The first is to treat each groundwater concentration as an EPC, and the second is to calculate an UCL using all the data for a well. Neither of these approaches is particularly appropriate for groundwater because they ignore the fact that groundwater data generally vary over time, often showing an apparent trend, unlike most soil data. In our experience, accounting for increasing or decreasing temporal trends is critical in the estimation of appropriate EPCs for predicting future exposures. An UCL or the maximum concentration over time can underestimate (if trend is increasing) or overestimate (if trend is decreasing) EPCs for current as well as future exposures. We have found USEPA guidance on this topic to be useful, which is to use the most recent data (which may include the most recent two or three sampling events) and supplement such data as necessary with predictive groundwater flow and transport</p>	IDEM agrees and has added a footnote in this section that states: "At sites with many quarters of ground water data, UCLs calculated using the most recent eight quarters of data provide a better indication of current conditions than UCLs calculated using the entire data set."

				<p>modeling. We recognize that Section 9.3 says, "... IDEM will consider other proposals on their merits.", but it is unclear why IDEM would require case-by-case justification of an approach that is superior to the two approaches IDEM has included. IDEM should revise Section 9.3 to discuss the importance of accounting for temporal trends when estimating groundwater EPCs, and cite USEPA guidance on this topic.</p>	
238	132	9.5	GM/Environ	<p>IDEM should clarify that a site-specific risk assessment may be used to determine if an unacceptable risk exists, when an EPC for groundwater exceeds a concentration limit. Section 9.5 says that "most groundwater direct contact risk evaluations employ groundwater direct contact screening levels as remediation objectives". In our experience, many situations in which an EPC exceeds a concentration limit (particularly for non-drinking water exposures), the most appropriate next option would be to conduct a site-specific risk assessment to determine if an unacceptable risk in fact exists. IDEM should revise this section to clarify that a site-specific risk assessment may be conducted to determine if an unacceptable risk exists, before considering groundwater remediation.</p>	<p>IDEM agrees and has added language to Section 9.5 that affirms the acceptability of risk characterization for the ground water exposure scenario.</p>
239	133	9.6.1	Indy DOW	<p>Specify local drinking water supply authorities as stakeholders that should be consulted by RPs seeking closure of sites in a wellhead protection area. Local drinking water authorities are the primary stakeholder impacted by contaminated groundwater and should participate in/be consulted on any remedy.</p>	<p>IDEM has added a request of this nature to Section 9.6.1</p>
240	134	9.6.2	GM/Environ	<p>IDEM should recognize that the need for precautionary groundwater monitoring should consider the vertical extent to which the vadose zone is contaminated.</p>	<p>IDEM agrees with this comment, but notes that no change in the RCG text is necessary. The comment focuses</p>

				<p>Section 9.6.2 states that IDEM will generally require "up to four consecutive quarters of precautionary groundwater monitoring" when groundwater has not been affected but a subsurface soil concentration exceeds the migration to groundwater remediation objective. As discussed in Comment 9.4, we often encounter situations where proper vertical characterization of contaminants in the vadose zone demonstrates that precautionary groundwater monitoring is not warranted (e.g., the deepest exceedance from a historic release is well above the water table.).</p>	<p>specifically on paragraph 3 of Section 9.6.2 and does not fully consider all of the discussion throughout Section 9.6.2. It is stated that the duration of sampling/monitoring is dependent on "the level of confidence in plume behavior", and IDEM will "generally expect up to four" quarters of ground water monitoring. The site investigator should not summarily dismiss the consideration of ground water monitoring. Lines of evidence for or against monitoring are acceptable and the site investigator may state their case. As worded, the RCG allows for limited/no ground water monitoring under appropriate conditions.</p>
241	135	Fig 9-B	MSECA	<p>Revise overall chart to continue beyond the steps currently shown in the right-most column (each of these should continue through to ground water closure).</p>	<p>The proposed changes would take far more room than that available on the page. In any case, IDEM has decided to delete the figure, as the text adequately describes IDEM's intent.</p>
242	136	9.7	GM/Environ	<p>IDEM should allow data from the deepest subsurface soil sample in a boring to be EPCs for the migration to groundwater screening levels where subsurface data show a decreasing trend.</p> <p>Section 9.7 explains that the EPC for comparison against migration to groundwater screening levels should be a depth-weighted average of the data from a boring if the boring has multiple judgment samples of subsurface soil. IDEM should clarify that depth-weighted concentrations should include surface soil data, in addition to subsurface</p>	<p>IDEM does not agree with this comment. Newer releases may still be migrating vertically through the soil column, which makes it inappropriate to rely on the deepest sample result. No change warranted.</p>

				<p>soil data. This would be consistent with the leaching model that IDEM uses to calculate the migration to groundwater screening levels, which assumes the entire vadose zone is uniformly contaminated. Where subsurface soil data indicate that the entire vadose zone is not contaminated (i.e., contaminant concentrations decrease with depth), IDEM should generally allow the EPC to be based on concentrations in the deepest subsurface sample at the boring. This is similar to the idea IDEM expressed in Section 9.6.2, which recognized that groundwater monitoring may not be necessary if the migration to groundwater screening levels are exceeded by only surface soil (and subsurface soil data do not exceed the screening levels). This idea should also apply when data from a shallow subsurface soil sample exceed the screening levels but data from deeper samples do not, which indicate that groundwater has not been adversely affected.</p>	
243	136	9.7	GM/Environ	<p>IDEM should clarify that the EPCs for migration to groundwater should be calculated over an area consistent with the DAF used in derivation of a particular migration to groundwater screening levels.</p> <p>Section 9.7 explains the calculation of the EPC for a given soil boring (see Comment 9.4). However, IDEM should recognize that it is also appropriate to calculate the EPC over a volume of soil (i.e., volume-weighted average, rather than depth-weighted average). This is appropriate because IDEM's derivation of the migration to groundwater screening levels include a dilution-attenuation factor (DAF) that is dependent on the lateral extent of the area being investigated, as discussed in Section 9.9.3. IDEM should explain in Section 9.7 that the</p>	<p>This approach may be appropriate. However, IDEM does not intend for the RCG to list every possible approach. As noted throughout the RCG, IDEM will evaluate alternative proposals on a site-specific basis. No change necessary.</p>

				EPC for the migration to groundwater pathway should be calculated using soil data over an area that is consistent with the DAF used in deriving a particular migration to groundwater screening level.	
244			internal		
245	144	9.10	GM/Environ	<p>IDEM should clarify that a “worst-case” SPLP test may be used instead of performing an actual SPLP test, as a screening approach for determining whether actual SPLP tests are warranted.</p> <p>In Section 9.10, IDEM discusses the collection of soil samples for analysis by the synthetic precipitation leaching procedure (SPLP) to determine whether contaminants in the soil may adversely affect groundwater. An often cost-effective variation of this approach is to simply use the soil data to calculate the worst-case SPLP leachate concentration by assuming that 100% of the contaminant mass in a soil sample leaches into the SPLP extraction fluid. This approach is more efficient than performing an actual SPLP test if the worst-case soil leachate concentration, after dividing by the DAF, would not exceed the target groundwater concentration. If this approach indicates a potential for adverse impact to groundwater, IDEM should then allow the use of actual SPLP tests.</p>	IDEM agrees with the suggestion with one clarification. Rather than divide by the DAF, IDEM believes it is appropriate to divide by twenty which is the dilution factor integrated into the method. We believe the commenter confused the DAF with the DF or dilution factor. This section has been revised accordingly.
246	144	9.10	Arcadis	<p>IDEM states that “ground water impacts from future leaching are unlikely when leachate concentrations are less than ground water remediation objectives. An exceedance suggests the need for additional evaluation or a remedy.” However, the aggressive acidic treatment to which soils are subjected in the SPLP extraction procedure do not always provide appropriate results to derive lead soil-water partition</p>	The use of SPLP as an alternative method will be evaluated on a case-by-case basis and the concerns identified in the comment will be taken into account as they appear to be restated components of SW-846 Method 1312 and other documentation for SPLP. Additional clarification is not necessary.

				<p>coefficients (Kd) and may over predict the amount of leachable lead that is potentially impacting groundwater (TCEQ 2001).</p> <p>The SPLP is a test intended to simulate acid rain conditions. This analysis is also a relatively conservative prediction since the analytical method assumes an acid rain pH of 4.2. The pH distribution in precipitation for Indiana averages between 4.3 and 4.5 (USGS 1992). Leachate concentrations by SPLP that minimally exceed default screening levels should necessarily constitute further evaluation or a remedy. The over predictability of SPLP analysis should be taken into consideration along with other LOE for the site, such as the absence of groundwater impacts, pH soil concentrations outside the default range, the location of the soil impacts on site, the usability of the underlying groundwater aquifer, etc. It should be noted that samples collected for SPLP analysis should be collected using the traditional 4 oz jars. Encore® type samplers using methanol preservation are not appropriate. Methanol cannot be added to an SPLP sample, because it affects contaminant desorption. Additionally, the Encore® sampler comes in 5 or 25 gram sizes, which would require the collection of multiple samples to achieve the required sample size for the SPLP test and total soil analysis. These separate samples would need to be composited, which is difficult to accomplish without loss of VOCs. (NJDEP 2005). If VOCs analysis is also be performed on the sample, separate samples using the Encore sampler and an unpreserved glass jar should be collected in duplicate.</p>	
247	145	10	B&T	The use of indoor air measurements at	IDEM agrees that there are significant

				<p>commercial/industrial structures does not seem to align with national approaches regulating indoor air in the workplace. Significant differences in acceptable exposure levels stand out between the American Council for Governmental Industrial Hygienists (ACGIH), OSHA, and IDEM. IDEM has developed screening levels for commercial structures that are many orders of magnitude lower than levels of protection determined to be safe by ACGIH and OSHA. There is a factor of approximately three to four orders of magnitude (8,000 - 30,000) difference between IDEM and OSHA/ACGIH. IDEM should justify, with appropriate published literature support, the technical basis for these wide-ranging disparities between the use of their concentrations which are commonly regulated as a safe working environment and OSHA/ACGIH. Absent such a justification, IDEM should not pursue a program that is out of sync with these other authorities. We also believe that IDEM needs to make it abundantly clear that facilities subject to OSHA regulation shall not be subject to IDEM's commercial VI values.</p>	<p>differences between ACGIH/OSHA indoor air criteria and the indoor air criteria contained in the RCG. ACGIH TLVs are guidelines with no specific legal status. OSHA PELs are derived to protect healthy adult workers. Neither considers possible exposure to sensitive individuals or populations, or the possible future use of the site. Additionally, OSHA PELs for volatile chemicals most often addressed within OLQ remedial programs are based upon the state of the science as it existed in 1968, and they are rarely updated. However, IDEM acknowledges the OSHA PELs have a specific application at OSHA-regulated facilities, particularly where workers are exposed to chemical vapors that originate from both a subsurface release and their own work environment. We have revised the text to clarify when the OSHA PELs are applicable versus IDEM indoor air criteria. We feel this policy is consistent with US EPA and Region 5 state regulatory programs.</p>
248	145	10.1	GM/Environ	<p>Comments on the evaluation of the potential for significant vapor intrusion exposures are included in 5.10 and in Attachment 5.1 to the letter. Attachment 5.1 is a letter Environ sent to EPA Region 5 on May 13, 2011 commenting on EPA Region 5's 2002 Vapor Intrusion Guidance.</p>	<p>This comment is a restatement of comment #109. Please see response to comment #109.</p>

				Comments on the evaluation of the potential for significant vapor intrusion exposures are included in Comment 5.1 (which is discussed in Attachment 5.1) and in Comment 5.2.	
249	145	10.1	IPC	Second paragraph, first sentence: This makes it appear you can not accurately evaluate the VI risk for a site, which is not true. Refer to the exclusion criteria previously outlined for confidence that VI risk can be assessed under all conditions.	This section is focused on risk evaluation of a completed VI pathway. The exclusion criteria referenced in the comment would be applied during the site investigation (Section 6). In that context, IDEM believes the information is accurate. No revisions are necessary.
250	146	10.4	AW-ERM	Please verify that at large open commercial/industrial sites it is okay to use an attenuation factor of 0.01 from sub-slab to indoor air rather than 0.1.	This section clearly includes the information suggested by the comment. No revisions are necessary
251	146	10.4	IPC	Propose they change default ss and shallow soil gas alpha to 0.02 from 0.1 (5x less restrictive) as Song argues in a recent article.	IDEM agrees the soil gas attenuation factors are conservative. The suggested revision may or may not be reasonable. VI science is in a constant state of flux, so the literature is evolving regarding how this parameter should be evaluated. IDEM believes it is premature to change the soil gas alpha factor for residential application until other research confirms it is appropriate to do so. However for certain commercial industrial structures, IDEM has changed the alpha factor to be ten fold less conservative.
252	146	10.4	B&T	IDEM's proposed VI screening approach is considerably more conservative than the environmental screening used for direct soil contact and groundwater for both residential and commercial/industrial land uses. We do not believe	Both groundwater and soil are sampled much more extensively than vapors at every site. Furthermore, soil and groundwater concentrations do not vary over short

			<p>that IDEM can technically or legally support this even more conservative approach to VI, or square that approach with IDEM's overarching RCG risk range of <math>10^{-4}</math> to <math>10^{-6}</math>. This observation is even more apparent when one considers the following statement IDEM makes at page 15 of the RCG: "the conservative assumptions built into IDEM's system of screening level equations make the probable additional carcinogenic risk using those levels under appropriate land use scenarios substantially lower than <math>10^{-5}</math>." In our view, IDEM has not provided a sound, reasoned, technical basis for this very conservative approach to VI screening levels.</p>	<p>periods of time at each sampling point. The same is not true for assessment of vapor intrusion, and this is clearly supported by the literature. Therefore there is less confidence in the exposure assessment for indoor air, than the exposure assessments for groundwater consumption and soil direct contact.</p> <p>IDEM now uses the same methodology that EPA uses to calculate their IA screening levels. IDEM has revised the guidance to incorporate the following changes which will have the effect of making the VI approach less conservative:</p> <ul style="list-style-type: none"> <li>• The sub-slab attenuation factor for commercial/industrial structures meeting the criteria in Section 10.4 has been changed from 0.1 to 0.01. IDEM revised the guidance to extend the 10X attenuation factor adjustment to both groundwater and soil gas for these sites.</li> <li>• IDEM revised the definition of shallow and deep SGe, and also adjusted the alpha factors to be 10 times less conservative for some sites.</li> <li>• IDEM has revised the preferential pathway attenuation factor by 10.</li> </ul>
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					These changes will allow more sites to screen out appropriately.
253	146	10.4	B&T	The RCG specifies the use of attenuation factors to derive screening levels for sub-slab soil gas, soil gas, crawl space, and preferential pathways. These attenuation factors are unnecessarily conservative, and in general, fail to follow the current state-of-the-science. This is inconsistent with many other Region V states' approaches, and does not appear to be well supported from a technical perspective.	Partially accept This comment is basically a restatement of the information in the previous comment (#252). Please see response to comment #252.
254	146	10.4	B&T	The "default" groundwater VI screening levels are biased because, among other conservative assumptions, they are based on the assumption that vapors migrate through all soils in Indiana at the same rate that vapors migrate through sand. This ignores basic diffusive transport processes and US EPA published data. We realize and appreciate that IDEM is aware of this issue but has to date not been willing to remove or modify this layer of conservatism. We hope IDEM reconsiders its position on soil type for attenuation factors. IDEM should allow stakeholders to classify soil type and use site stratigraphy to calculate more representative VI groundwater screening levels to better align with the current state-of-the-science and actual site- specific conditions.	The Draft Vapor Intrusion Pilot Program Guidance from 2006 utilized soil-type specific ground water screening levels, which were derived from Figure 3b in the 2002 EPA VI Guidance. In the RCG, IDEM is discontinuing the soil-type specific ground water screening levels, for the following reasons:  1) The screening levels were calculated using the Johnson and Ettinger model. Since the time of the EPA 2002 publication, the J and E model has fallen out of favor with regulators, and it is no longer endorsed as a stand-alone method for evaluating the vapor intrusion pathway by most states. The US EPA OSWER document, "Review of the Draft 2002 Subsurface Vapor Intrusion Guidance", recommends abandoning "semi-site-specific, model-based estimated attenuation factors" and

					<p>adopting a multiple lines of evidence approach. IDEM's own position does not allow the use of the J and E model as a stand-alone method for evaluating the vapor intrusion pathway, as discussed in the document titled <i>Use of the Johnson &amp; Ettinger Model to Evaluate Vapor Intrusion</i>, dated 10/19/07. The IDEM 2006 Draft Guidance's reliance on the J and E model to calculate soil-type specific ground water screening levels is inconsistent with current scientific thinking and IDEM's own position on modeling.</p> <p>2) Indiana is the only state with a vapor intrusion program that utilizes default soil-type specific ground water screening levels. Scientists for the US EPA indicate that, despite their inclusion in the 2002 EPA Guidance, the soil-type specific ground water screening values in Figure 3b have not been applied at any of their sites.</p> <p>3) The soil-type specific screening levels were difficult to implement in practice. The screening numbers assumed that sub-surface soils were homogeneous from the ground surface to the top of the water table, which rarely occurs in Indiana. Often, only the fine-grained soils were considered when determining the appropriate VI screening</p>
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					number, and coarser, more permeable units were ignored. It is often difficult to accurately describe fine-grained soils in the field which could greatly affect the appropriate screening level. For example, at a VRP site in Indiana, the consultant described the soils as a “lean clay”, but sieve testing of that unit showed that it contained around 16% silt and clay, and 80% sand. Additionally, the soil-type specific screening levels did not take into account the fractures and fissures found in almost all clay-type soils, or man-made preferential pathways, such as underground utility lines or basements that penetrate fine-grained material.
255			internal		
256	148	10.5.1	IPC	Acceptable soil gas levels down to 5' bgs based upon alpha = 0.1. This is not a good idea for PHCs and will lead to many, unnecessary VI investigations. The value for PHCs should be at least 100x higher based upon Robin Davis' original soil vapor analysis.	No change necessary. Most petroleum sites will screen out using the criteria identified by Robin Davis whom the commenter references. See Section 5.4.3.
257	149	10.5.3	AW-ERM	“IDEM recommends multiple rounds of paired IA/SS sampling”. Is this the case even if the first round of samples is collected during a worst case condition and both the IA and SS results are below screening levels?	Spatial and temporal variability are influenced by many factors including building airflow dynamics and meteorological conditions. This means indoor air concentrations can change on a daily basis. It is not realistic to screen out the vapor pathway with any confidence based upon a single “snapshot in time”.

					Therefore IDEM recommends multiple rounds of paired IA and SGss sampling.
258	149	10.5.3	Mundell	Does IDEM recommend multiple rounds of paired IA/SS sampling even if the first round of samples is collected during a worst case condition and both the IA and SS results are below screening levels?	Please see reponse to comment #257 above.
259	151	11	?	<p>Proposed guidelines for conducting ERAs do not have screening levels or otherwise set criteria for when an ERA is required, how to evaluate the pathways of concern, and IDEM's minimum standard. While there are three levels of investigation presented -- "baseline ERA," screening level ERA" and "detailed" ERA" – the RCG is not clear what triggers the need for ERAs and what standard/process IDEM requires for each of the three levels of effort cited.</p> <p>For screening level triggers at ecologically sensitive sites, IDEM could consider adopting established levels: EPA Eco SSLs or EPA Reg V ESLs.</p> <p>IDEM could consider incorporating these (or other) screening levels by reference into the RCG.</p> <p>The Draft RCG states that complete guidance for conducting the three levels of ERA investigation is outside the scope of the manual. The Draft RCG refers to the Ohio EPA Ecological Risk Assessment Guidance Document (2008) and several EPA Guidance Documents. IDEM may want to consider adopting the stepwise approach presented in the Ohio EPA Ecological Risk Assessment Guidance Document as a model for conducting baseline, screening level and detailed ERAs.</p>	IDEM does not have significant Indiana-specific guidance on ecological risk assessment. Instead, the RCG cites ecological risk assessment guidance from U.S. EPA and other states, including Ohio. Among the citations already in the RCG are references to U.S. EPA Ecological Screening Levels and Region 5 Ecological Screening Levels. IDEM will evaluate ecological risk assessments using appropriate guidance documents from among those we cite.
260	151	11	GM/Environ	IDEM should clarify the types of areas and organisms warranting ecological evaluation.	IDEM does not have Indiana-specific ecological risk assessment guidance and

				<p>Section 2.6 defines ESAs in such general and limited terms that it may lead to: (1) unintentional inclusion of some land or water bodies that are not truly ecologically sensitive; (2) exclusion of others that are truly ecologically sensitive; or (3) a combination of both. For example, under this definition, a constructed, rip-rap lined detention basin within a shopping plaza could be considered an ESA due to the presence of surface water. In contrast, thousands of acres of forest would not meet that definition if there are no threatened, endangered or special concern species documented as present. IDEM should expand the definition of ESAs to be as precise and complete as possible (e.g., including sensitive terrestrial/upland habitats), and to specifically exclude examples of areas or water bodies for which a BEE is not warranted (e.g., constructed drainage ditch, constructed detention or settling basin). Also, the text in Sections 2.6 and 3.7.1 are inconsistent with one another regarding the designation of an ESA. These should be synchronized. Additionally, because the concept of ecological receptors is critical to ERA, it should be explicitly stated in Section 11.1.4 that evaluation is warranted for representatives of major feeding guilds with potential exposure. (see also pages 152, 28, 41)</p>	<p>relies instead on U.S. EPA guidance for that purpose. It is not feasible to describe every circumstance in which an ecological risk assessment might or might not be necessary; the decision will depend on the judgment of those involved. Sections 2.6 and 3.7.1 are inconsistent on the subject of designating ESAs because Section 3.7.1 does not, by design, discuss designation of ESAs. IDEM defers to U.S. EPA guidance on the subject of feeding guilds.</p>
261	151	11	GM/Environ	<p>IDEM's expectations for baseline ecological risk assessment, screening level risk assessments and detailed ERAs should be more clearly stated. Section 11 provides brief (one paragraph) summaries for completion of the BEE, SLERA, and detailed ERA with little reference to other guidance (see previous commentary on this issue). IDEM should more clearly articulate the goals and objectives for each of these</p>	<p>IDEM defers to U.S. EPA guidance on ecological risk assessment. Nevertheless, IDEM has revised Section 11.1.2 to note that SLERAs can use existing data, that risk characterization is acceptable for ecological risk assessments, that there are many sources of ecological screening levels, and that remediation objectives other than</p>

				<p>documents. For example the SLERA could include the following:</p> <ul style="list-style-type: none"> <li>• Generally SLERAs employ existing data, rather than requiring a dedicated field program;</li> <li>• SLERAs should follow the USEPA framework, including problem formulation, exposure assessment, effects assessment, and risk characterization.</li> <li>• Receptor selection should take into consideration documentation of threatened, endangered, or special concern species, as well as exposure potential, ecotoxicological sensitivity, social and ecological relevance, and feasibility.</li> </ul> <p>Section 11.1.2 should explicitly state that the ecological screening levels cited are not equivalent to remediation goals, and that other sources of ecological screening values exist. Figure 11-A should be revised to make this clear under "Implement remedy of relevant media."</p>	screening levels are acceptable.
262	151	11	GM/Environ	<p>IDEM should clarify that a site-specific risk assessment may be used to determine if an unacceptable risk exist for ecological and other scenarios.</p> <p>IDEM should revise Section 11 to clarify that a site-specific risk assessment may be conducted to determine if an unacceptable risk exists, before considering remediation, if generic screening criteria are exceeded, similar to the language in Section 1.3</p>	IDEM agrees and has revised Section 11.1.2 to indicate that site-specific remediation objectives and risk characterization are acceptable alternatives to generic ecological screening levels.
263	151	11.1.1	Arcadis	<p>IDEM should define what the minimum acceptable standards for a desktop review are.</p>	Section 2.6 contains additional guidance on identification of ecologically susceptible areas. Section 11.1.1 has been revised to include a reference to Section 2.6.
264	151	11.1.1	Arcadis	<p>IDEM should define how far off-site (or how far downstream) an ESA inspection should be conducted.</p>	IDEM does not consider it feasible to provide a single answer to this question.

					The distance will depend on the characteristics of the site and potential contaminants.
265	152	11.1.4	GM/Environ	Background should be included under the special consideration for the ecological risk assessment. Background conditions in multiple environmental media (including sediment and surface water) are important for evaluating the significance, severity, and spatial distribution of ecological effects. Given the potential for background characterization to influence remedy decision in aquatic systems, as well as the complexity of characterizing background, IDEM should expand Section 6 and Section 11.1.4 to include guidance on characterization and use of background in the ERA. For example, some considerations related to background in the ERA include physical nature of sediment, flow dynamics, fluvial geomorphology, wetland classification, tidal and oceanographic conditions and biological composition (e.g., benthic invertebrate communities).	IDEM has added background to the list of special considerations in Section 11.1.4. Detailed guidance regarding ecological risk assessment is beyond the scope of this guidance.
266	153	Fig 11-A	MSECA	Revise flow chart as follows: after “all site contaminants below screening criteria? NO”, establish a decision step “Perform detailed site specific risk assessment?” if “Y”, then flow to existing decision step “Ecological risk acceptable?” if “N”, then establish action step “Implement remedy”, then flow from “implement remedy” to existing decision step “Ecological risk acceptable?” revise existing decision step “Ecological risk acceptable? NO” to flow back to action step “implement remedy”.	IDEM has revised the second decision point in Figure 11-A to read: “All site chemicals below relevant criteria?” and believes that this revised flowchart adequately expresses the Agency’s intent.
267	154	11.2	GM/Environ	Clarify that evaluation of “other” scenarios can be performed using simulated data and do not necessarily	IDEM has added language to Section 11.2 reiterating our intent to evaluate ecological

				<p>require additional data collection.</p> <p>IDEM's discussion in Section 11.2 appropriately explains that the previously discussed exposure scenarios are not all encompassing. The additional scenarios identified in this section appears to be reasonable examples of exposures that could also be evaluated at certain sites. However, to avoid the potential for misinterpretation that evaluation of such alternate exposure scenarios require collection of specialized data (e.g., fish tissue), IDEM should mention that USEPA has published guidance on evaluating such exposures and that data collection may not be necessary if using reasonable worst-case assumptions for uptake and or transfer of contaminants from one media to another does not identify a significant risk above the remediation triggers.</p>	<p>risk characterizations on their merits. The list of possible approaches (e.g., modeling fish consumption exposure) is too long to include in the RCG.</p>
268	155	12.1	GM/Environ	<p>IDEM should clarify that remediation to protect human health is necessary only when a release poses an unacceptable risk.</p> <p>Section 12.1 states the "a remedy consists of one or more measures taken to control risks to human health and/or the environment arising from a contaminant release". IDEM should revise this statement to clarify that remediation to protect human health is necessary only when a release poses a risk that exceeds a cumulative cancer risk of <math>10^{-4}</math> or an HI of 1.</p>	<p>IDEM has inserted the word "unacceptable" between the words "control" and "risks" in the first sentence of Section 12.1.</p>
269	155	12.1	MSECA	<p>The bullets "physical barriers that separate ...." and "engineering controls (ECs) are redundant.</p>	<p>IDEM agrees that the wording is redundant and has deleted the bullet that reads "physical barriers that separate contamination from receptors"</p>
270	155	12.1	B&T	<p>We applaud IDEM for including "land and groundwater use restrictions" as part of the definition of "remedy"</p>	<p>IDEM has revised this bullet to read "Land use and activity restrictions, including</p>

				<p>as envisioned and required by H.E.A. 1162.</p> <p>We suggest this bullet should be amended to read as follows to make it more consistent with the statute: "Land use and activity restrictions including those developed through ERCs and EROs."</p>	ERCs and ERO"
271	155	12.1	B&T	<p>We suggest the following edit to the last sentence in Section 12.1: "The most effective ICs <i>often</i> work in conjunction with other controls and active treatment of contaminants." There are situations where an IC is perfectly effective but it does not exist "in conjunction with other controls and active treatment."</p> <p>IDEM should not create the perception or presumption that a stand-alone IC may not be effective.</p>	IDEM agrees with the proposed change and has revised the RCG accordingly. IDEM has also updated the USEPA 2000 reference to a newer 2010 reference.
272	155	12.2	GM/Environ	<p>Engineering and institutional controls are valid risk management options for preventing unacceptable risks and facilitating site remediation and redevelopment</p> <p>We agree with the statement in Section 12.7 that says engineering and institutional controls (EC/IC) are valid risk management options. In our experience, proper use of ECs and ICs can prevent unacceptable risks while at the same time facilitate remediation and redevelopment of industrial and Brownfield sites.</p>	No change necessary.
273	155	12.2	B&T	<p>Footnote 48 states: "Certain land uses (e.g., highways, railroads) <i>may</i> not require ERCs or EROs for closure, even when underlying contamination exceeds residential remediation objectives." We applaud IDEM for recognizing that we do not always need an ERC or an ERO on a public highway or rail line. Imposing a requirement to obtain ERCs or EROs on these kinds of properties is frequently unobtainable at any cost, and unreasonable and unnecessary.</p>	IDEM disagrees with this comment. The proposed change is too broad. No change necessary.

				We suggest that IDEM amend the RCG and say that ERCs and EROs are not required for public right-of-ways and railroad lines.	
274	156	12.3	B&T	<p>IDEM states that interim remedial actions may be "necessary" in some cases to address an immediate threat. We believe this section should be amended and expanded to include the notion that interim remedial actions may often be a prudent and the most cost effective way to reduce contaminant mass and thereby allow the environment to begin cleaning itself up while the more formal CSM and remedy selection process unfolds.</p> <p>Too often, we have experienced delays – sometimes years, and most frequently in the VRP – in implementing common sense interim remedial actions, such as excavating contaminated soil, while we respond to IDEM comments and demands that further investigation needs to be performed before a remedy can be selected.</p> <p>We encourage IDEM to include a statement in this section that interim remedial actions are encouraged where benefits are demonstrable prior to completing full delineation, fuller CSM understanding, and full remedy evaluation.</p>	IDEM agrees, and has revised the text accordingly to explicitly acknowledge that interim strategies of the sort described in the comment may be “prudent and cost effective”.
275	156	12.3	B&T	<p>We have encountered a problem at a number of sites and which we recommend be addressed in this RCG. At some sites, IDEM has required that a proposed remediation plan provide evidence that "validates" that a particular remedy will meet proposed groundwater cleanup standards.</p> <p>This "requirement" then creates delays in the implementation of a remedy as the regulated community and its consultants try to provide this level of proof. We believe at many sites, especially</p>	IDEM requires some evidence that a remedial approach will be effective when our technical staff’s professional judgment and experience indicate that such an approach is unlikely to succeed. In those cases IDEM requests that the responsible party/applicant provide documentation that the proposed remedy has been successful at other sites under similar conditions

				<p>chlorinated solvent sites that no one can ever truly "validate" or promise that a particular source area remedial strategy will achieve a particular groundwater result until after the remediation has been implemented, conditions have re-equilibrated, and groundwater data is obtained post-remedy.</p> <p>If this level of proof is required as a pre-condition to implementing any remedial work, IDEM cannot approve the proposed remediation program because the success of the proposed remedial strategy cannot be determined until after the remediation is performed. We believe that none of us can predict with total confidence whether a particular remediation of a chlorinated solvent source area will lead to the desired end points in groundwater.</p> <p>We suggest that the RCG encourage implementation of reasonable solutions based upon site facts, coupled with contingencies that may be triggered if, despite our best judgments presented in the remediation proposal, the remedy fails to achieve the predicted results. If we wait for this kind of level of validation or proof before IDEM can approve a remediation plan, we will simply find ourselves mired in endless comments and responses that will delay getting sites closed.</p>	<p>consistent with the conceptual site model. IDEM will never "validate" or guarantee that any particular remedy will meet a proposed cleanup standard, nor would staff require the same from the regulated community.</p>
276	156	12.4	MSECA	<p>Final paragraph: reference is made to "active remedies", implying that there are other ("passive?") remedies, but none are addressed. Please clarify.</p>	<p>Other classes of remedies, including institutional controls, are discussed earlier in the same subsection. No change necessary.</p>
277	156	12.4	IPC	<p>First paragraph: Does this mean that if there is no risk then no remedy selection is needed? That seems to contradict the next paragraph that says "Indiana Code ... directs responsible parties to specify remediation objectives for sites where releases occur"...</p>	<p>Yes. If there is no unacceptable risk, then IDEM will not require a remedy.</p>

278	156	12.4	B&T	<p>(Emphasis added): "The formal remedy selection process is undertaken <i>after</i> characterization of the release has been performed, the risks to human health and the environment have been assessed, and the conceptual site model (CSM) indicates that there is one or more exposure scenarios with an unacceptable risk."</p> <p>This approach of only allowing the remedy to be selected "after" full characterization needs to be addressed and fixed by encouraging implementation of common sense remedies or components of remedies earlier in the site investigation and evaluation process, subject to the caveat that if groundwater does not clean up as projected, additional work may be required.</p>	IDEM agrees, and has revised the text accordingly to explicitly acknowledge that the formal remedy selection process need not prevent implementation of suitable interim remedial actions.
279	157	12.5	B&T	<p>We want particularly to applaud the following IDEM statement: "However, entities implementing remedies are generally free to consider the advantages and disadvantages of various options for themselves." There is perhaps no better example of IDEM's good faith embracing of the requirements of H.E.A. 1162 than this sentence.</p>	No response required.
280	158	12.6	B&T	<p>We believe that IDEM "requiring" Responsible Parties to complete the Record of Remedy Selection and Record of Site Closure documents (State Form 54471 and 54472) can at times be an unnecessary and redundant paperwork burden and may not be necessary for all sites.</p>	IDEM believes that it is reasonable to ask that parties complete these forms, and is unaware of sites where this is not the case. No change necessary.
281	159	12.7	B&T	<p>IDEM states as follows: "Where remedies incorporate controls that effectively reduce exposures, it is appropriate - though not always necessary - to use IDEM's system of equations to calculate site-specific levels that take the effect of those exposure controls into account."</p>	IDEM agrees with the sense of the comment and has revised the text to read "Where remedies incorporate controls that effectively reduce exposures, one option is to use the equations in U.S. EPA (2011) to calculate site-specific levels that take the

				<p>We have two comments. First, we believe the sentence should read "it may be appropriate, but is often not required" to use IDEM's system of equations. Second, this statement seems to indicate a preference to use the equations to calculate site-specific levels. When the remedy is an exposure prevention remedy, there is no numeric level that needs to be presented as part of the remedial proposal. The whole point of exposure prevention is that there will be no completed exposure pathway to the underlying contamination and therefore, by definition, the existing levels remaining in the environment would be safe as is. In these circumstances, there is no basis to require calculation of site-specific cleanup levels.</p>	<p>effect of those exposure controls into account.”</p>
282	159	12.7	B&T	<p>IDEM makes the following statement: "...IDEM will require the responsible person to make an ongoing commitment to operate and/or maintain that remedy. The ongoing commitment will vary with the nature of the remedy, and could range from periodic inspections designed to monitor compliance with the terms of an ERC all the way up to operation and maintenance of a complex engineered system."</p> <p>We disagree that the Responsible Party can be legally obligated to ensure all risk management features are "operated and/or maintained." This issue is discussed in our comment 5, which we incorporate by reference here. As discussed there, an ERC may contain simple restrictions such as: (a) the property shall not be used for residential purposes; (b) groundwater at the site cannot be used for human consumption; and (c) a particular paved area must be maintained as an engineered barrier. These restrictions run with the land and are therefore binding upon future owners of the site. At some point, it becomes impracticable to look back to</p>	<p>IDEM has revised the second sentence of paragraph three to read: “However, effective risk management remedies require compliance with selected land use, ground water, and/or activity restrictions, and may require an ongoing commitment to operation and/or maintenance of the remedy. When applicable...”</p>

				<p>the original Responsible Party to be responsible for these kinds of institutional controls. In these cases, IDEM should instead look to the then-current owner for compliance and impose upon it/him/her the obligations to comply with the restrictions and to remedy any environmental or human health risks created by their violation of the ERC.</p> <p>At some point, the original Responsible Party needs repose from further claims. If the Responsible Party created a perfectly safe remedy, and someone later violated an ERC causing that remedy to fail, IDEM's remedy should be against the party creating the new harm, not the original Responsible Party. On the other hand, we recognize that a Responsible Party may be responsible to operate and maintain other kinds of risk management features such as a pump and treat system.</p>	
283	159	12.8	B&T	<p>IDEM makes the following statement: "ERCs limit human exposure ... "</p> <p>ERCs can do more than merely limit human exposure. For example, an engineered barrier can also limit environmental exposure by eliminating direct contact.</p>	IDEM agrees but does not propose to revise the RCG. The referenced statement was not meant to include an exhaustive list of ERC characteristics.
284	159	12.8	B&T	<p>IDEM says that ERCs "are typically cross-referenced to the deeds of a property." We believe the better language would be the following: "ERCs should be recorded in the office of the recorder of the county in which the real property is located, and the ERC must cross-reference the most recent deed of record in the recorder's office." This is consistent with Indiana Code provisions regarding recording easements. <i>See</i> IND. CODE§ 32-23-2-5(a)</p>	IDEM agrees with this comment and has made the proposed change.
285	159	12.8	B&T	<p>IDEM makes the following statement: "When an ERC is proposed as a remedy or</p>	IDEM has revised the referenced paragraph to read as follows:

			<p>component of a remedy, IDEM will evaluate it to determine (a) whether the restrictions and obligations proposed are sufficient to protect human health, and (b) whether it meets the statutory criteria set out in the definition of "restrictive covenant" in 13-11-2-193.5. IDEM recommends submission of a draft for review prior to recording an ERC. IDEM may suggest changes to proposed ERC language, and may deny closure if IDEM determines the restrictions are not sufficiently protective or the ERC is not legally enforceable."</p> <p>IDEM's permissible role in reviewing ERCs has been the subject of legislation (IND. CODE§ 13-14-2-8), and we believe portions of this statement go beyond IDEM's authority. We believe the following revised statement more accurately reflects IDEM's authority:</p> <p>"When an ERC is proposed as a remedy or component of a remedy, IDEM will evaluate it to determine (a) whether the <u>activities and land use restrictions and obligations</u> proposed are sufficient to protect human health <u>and the environment</u>, and (b) whether it <u>contains the provisions required</u> <del>meets the statutory criteria set out</del> in the definition of "restrictive covenant" in 13-11-2-193.5. IDEM recommends submission of a draft for review prior to recording an ERC <u>for the purpose of conducting this limited evaluation.</u> IDEM may suggest changes to <del>proposed ERC language, and may deny closure</del> <u>the proposed activity and land use restrictions and may suggest changes to ensure compliance with the statutory definition of an ERC, and may reject the ERC</u> if IDEM determines the restrictions are not sufficiently protective or the ERC <del>is not legally enforceable</del> <u>does not meet the requirements of the statute.:</u></p>	<p>"When an ERC is proposed as a remedy or component of a remedy, IDEM will evaluate it to determine (a) whether the activities, land use restrictions, and obligations proposed are sufficient to protect human health and the environment, and (b) whether it attaches to the correct real estate and includes all the necessary elements of a restrictive covenant as defined in IC 13-11-2-193.5. IDEM recommends submission of a draft for review prior to recording an ERC. IDEM may suggest changes to proposed ERC language, and may deny closure if IDEM determines the restrictions are not sufficiently protective or the ERC is not enforceable by IDEM."</p>
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286	160	12.8.2	Indy DOW	Selection of ERC restrictions and obligations should include input from local stakeholders, specifically local drinking water authorities, who should be given an opportunity to participate in the remedy selection process so that adequate safeguards for the drinking water resource are implemented.	Section 9.6.1 on Wellhead Protection Areas now states that “Remedy selection for ground water contamination within a WHPA will be a site-specific decision that should be made in conjunction with IDEM and local stakeholders such as drinking water providers.”
287	161	12.8.2	B&T	IDEM refers to subsurface soils that may need restrictions as "easily accessible soils" or "near surface soil" in Table 12-A. These terms are ambiguous. If IDEM intends to incorporate this flexibility, it should provide a fuller discussion of what it means.(Table 12-A)	IDEM has revised text related to “surface” and “subsurface” soils in many places throughout the RCG to clarify that we cannot provide a depth-based bright line that decides whether or not evaluation for soil direct contact is appropriate. That decision will of necessity be site-specific.
288	163	12.9	Indy DOW	Revise last line of the second paragraph to state that there is a rebuttable presumption that EROs are not an appropriate mechanism for controlling exposure risks associated with contaminated groundwater at sites located within a WHPA. The presumption would need to be rebutted by demonstrating that potential human exposures has been eliminated or controlled, such as by demonstrating treatment of groundwater prior to consumption or that the contaminant will not reach the wellhead at levels of concern.	As noted in the referenced section, EROs may not be acceptable in WHPAs. No change necessary.
289	163	12.9	MSECA	First paragraph: Why are EROs limited to the ground water application? Could an ERO not establish other restrictions that are constructive to a remediation/closure strategy?	No. The statute specifically defines EROs with respect to ground water at 13-11-2-71.2 as an ordinance that regulates ground water. No change necessary.
290	164	12.9.1	Indy DOW	Revise fourth bullet point to state that local drinking water supply authorities, whether municipal or private, must be consulted and receive written notification when a responsible party proposes to utilize an ERO to obtain site	IDEM has revised the last paragraph on page 164 to include water supply systems as parties to notify regarding ERO proposals.

				closure.	
291	164	12.9.1	B&T	This section contains six main bulleted points and nineteen "sub-bullets." This makes it very cumbersome to comment on and will make it difficult in the future for people to reference which points or sub-points are being discussed or referenced. We recommend a numbering system for the bullets and sub-bullets for clarity.	IDEM agrees with this comment and will revise the referenced lists using numbers and/or letters.
292	164	12.9.1	B&T	The number of restrictions and comments in this section provide continuing evidence of IDEM's lack of comfort and distrust with EROs. IDEM is statutorily required to "give effect to" EROs, and yet all of these purported "requirements" and restrictions on the ERO process seem designed to make them impractical solutions. If a local government unit adopts an ERO, IDEM "shall" give it effect and not effectively limit the use of these important tools through cumbersome processes and procedures. IDEM cannot modify its statutory obligations through this NPD.	IDEM will consider and give effect to all EROs adopted by local government units. The guidelines in Section 12.9.1 of the RCG are some of the things that IDEM may use in its consideration of EROs. No change necessary.
293	165	12.9.1	B&T	In the fourth bullet, IDEM says that consultants are encouraged to work directly with the local government unit. We suggest the sentence should be changed to say "responsible parties and their consultants..."	IDEM agrees and has revised the text accordingly.
294	165	12.9.1	B&T	The second sub-bullet of the fifth bullet states that there must be a plan or mechanism in place that includes, as an example, a requirement for a Responsible Party to have a "continuing obligation" for active monitoring and outreach to ensure that the ERO is complied with. IDEM does not have the authority to impose upon a Responsible Party a continuing obligation to ensure public awareness of the ERO. The Responsible Party <i>may</i> play a role, at the time leading up to and immediately following the adoption of	IDEM has substantially revised the referenced text to read, in part: "...hinges on public acceptance and awareness of the ordinance. Continued compliance with an ERO is necessary for the ERO to remain effective at managing risk and controlling completed or potential exposure pathways. Therefore, a plan or mechanism that ensures continued public awareness of and

				<p>an ERO, to help facilitate public awareness and knowledge of an ERO. But IDEM does not have the legal authority to require such a role in general and in particular to require a continuing obligation post-adoption to perform these activities.</p>	<p>compliance with the ERO can help to ensure that the ERO remains effective at managing exposure pathways. Some examples of such plans may include but are not limited to:          (first sub-bullet) If there is an existing local well permitting authority, notification to that entity of the existence of the ERO so that no potable wells, or wells that may exacerbate the contamination are permitted.          (second sub-bullet) Active monitoring or outreach by the local government unit so there is an on-going public awareness of the ERO.”</p>
295	165	12.9.1	B&T	<p>In the fifth sub-bullet to the last bullet, IDEM says that the ERO should contain a legal description of the ordinance boundaries. There is no such requirement in the statute. We believe this "requirement" is not legally permissible, and may be unnecessarily cumbersome and unreasonable in certain circumstances. The geographic boundaries of an ERO that encompass less than the entire local government boundaries need to be understood and depicted, but not legally described.</p>	<p>IDEM agrees that legal descriptions are not required. They are only one of several acceptable alternatives to clearly depict the geographic boundaries of the ERO. IDEM has revised the referenced bullet by inserting the word “or” between the words “boundaries” and “common”.</p>
296	165	12.9.1	B&T	<p>IDEM states that it will not issue closure documentation until it receives a certification from an authorized local government official "that the approved ERO is <i>complete, accurate, and in effect.</i>" We object to the italicized language as again beyond IDEM’s legal authority. IDEM’s only statutory authority is to ensure that the ERO meets the requirements of the governing statute and it has been lawfully adopted. We suggest that this language be</p>	<p>IDEM agrees with the comment and has revised the text to read “that the approved ERO meets the requirements of the governing statute and has been lawfully adopted by the local unit of government.”</p>

				amended to read "that the approved ERO meets the requirements of the governing statute and has been lawfully adopted by the local unit of government." We do not know what it means to say the ERO is "complete, accurate, and in effect."	
297	167	12.10	B&T	IDEM says that ECs should be supported by ICs. Although that is sometimes the case, it is not always necessary. We believe the sentence should read: "ECs should <i>often</i> be supported by ICs...."	IDEM recognizes that it is possible to conceive of circumstances in which an EC may not need to be supported by an IC, and has revised the text to read "ECs should usually be supported by ICs..."
298	167	12.10	MSECA	Final paragraph: What agency or authority would 'approve' written operation and maintenance plans as contemplated by this section of the RCG?	Appropriate IDEM program staff will approve written operation and maintenance plans.
299	168	12.12 12.12.1 12.12.3	GM/Environ	IDEM should make the financial assurance requirements consistent with federal requirements, when financial assurance is warranted. Section 12.12 says, "IDEM does not intend to routinely request [financial assurance]" and lists examples of remedies that do not generally merit financial assurance. We agree with these examples, and also agree that financial assurance may be warranted "where there is a substantial potential exposure risk from failure or need for eventual replacement of a costly remedy". However, where financial assurance is warranted, we believe the requirements should be consistent with the federal requirements under RCRA. Some discussion in Section 12.12 appears to describe requirements that are not consistent with the federal requirements, including: need for an amount greater than the cost estimate to operate, maintain and inspect all ECs at a site (Section 12.12.1); need to maintain financial	IDEM has adopted FA rules that are based on the federal rule for use in RCRA programs. The FA guidance provided in the RCG has been modified from the state rule for use at IDEM remediation sites, and is not intended to be completely consistent with the state or federal rules.  Section 12.12.1 has been modified to remove language indicating that FA may be required for an amount greater than the cost estimate.  Section 12.12.3 has been modified to clarify that the RP can propose any of the FA mechanisms.

				assurance for a "rolling 30-year period" instead of a 30-year period (Section 12.12.1); and having IDEM instead of the regulated entity select the type of financial assurance mechanism (Section 12.12.3).	
300	168	12.12	NiSource	The final guide should reflect that financial assurance will not be required for VRP Closures. NIPSCO acknowledges that financial assurance may be important in some situations, i.e with respect to enforcement actions resulting in remediation's employing engineering controls, the failure of which would result in an imminent and substantial threat to human health or the environment. NIPSCO strongly believes, however, that financial assurance should not as a matter of policy be required with respect to voluntary closures through IDEM's Voluntary Program (the VRP). The reason for this is simple—IDEM has already ensured that VRP conditional closures very well situate the agency to require appropriate additional measure on the event of the failure of an active engineering control. –see original comment for additional info.	IDEM does not agree that FA is not applicable to VRP closures. IDEM's legal ability to take action against an RP is irrelevant if the RP becomes insolvent, regardless of what IDEM program provides oversight.
301	168	12.12	NiSource	The final guide should to clarify that the "passive ECs" referenced in the introductory paragraph of Draft Guide Section 12.12 include aspects of a containment remedy without moving parts (e.g solidified masses and containment walls). As presented, the Draft Guide presents only two examples of passive ECs unlikely to warrant a financial assurance requirement – an asphalt cap or cover. The Final Guide, and all interested parties would benefit from a more detailed description of such passive controls (with further examples). That is, the Final Guide should explain a passive ECs are those without moving parts. Also to afford predictably for the regulated community, the Final Guide	FA should not be limited to sites with active engineering controls. Some passive remedies (such as a slurry wall) can fail and result in exposure. Replacement cost can be substantial, and should not fall to the state.  IDEM decided to remove specific examples of engineering controls that would or would not require FA since it appeared to result in confusion.

				should (a) state clearly that financial assurance will not be required with respect to ICs or passive ECs and (b) identify the circumstances in which IDEM may require financial assurance for something other than an active EC for high risk contaminants.	
302	168	12.12	IPC	The financial assurance section needs to be revised where no financial assurance mechanism is required for institutional controls. This requirement should be deleted from the draft.	IDEM does not anticipate requiring FA for sites with only institutional controls. While that was already clear in the document, the specific examples have been removed from the document.
303	168	12.12.1	B&T	In the relatively rare case when IDEM requires financial assurance, if the period of financial assurance is substantial (e.g., more than seven years or so), the development of the cost estimate should allow the use of developing a present value of that stream of payments over time, and only require financial assurance for that present value amount	It is IDEM's opinion that this is already clear in the RCG. No change necessary.
304	168	12.12.1	NiSource	The final guide should be revised to reflect a requirement for the most narrow extent of financial assurance reasonably necessary. (a) The Draft Guide's Section 12.12.1 contemplates that any provided financial assurance should include funds "equal to or greater than the cost estimated to operate, maintain and inspect all ECs for the duration of the risk. If the duration of the risk is expected to exceed 30 years, FA will need to be structured to provide a rolling 30-year period." NIPSCO has several concerns with said statements of the Draft Guide –additional sub-comments included in original document.	IDEM has adopted FA rules that are based on the federal rule for use in RCRA programs. The FA guidance provided in the RCG has been modified from the state rule for use at IDEM remediation sites, and is not intended to be completely consistent with the state or federal rules.  Section 12.12.1 will be modified to remove language indicating that FA may be required for an amount greater than the cost estimate.  Section 12.12.3 will be modified to clarify

					that the RP can propose any of the FA mechanisms.
305	168	12.12.1	NiSource	(b) The Draft Guide’s Section 12.12.1 states that “where a remedy will require the eventual replacement of an engineered system or control, the cost estimate includes the cost of such replacement.” This statement regarding replacement cost is among the most troubling of the Draft Guide and should be deleted from the Final Guide, or at the very least, limited to not apply to voluntary conditional closures. The inclusion of replacement costs within financial assurance could, if broadly interpreted, dramatically increase (virtually double) the cost of many sound remedies. The result is likely to be that a voluntary remediator will no longer be able to reasonably consider many otherwise cost-effective remedies causing overall remedy costs to increase significantly. Voluntary remediators would then have a reduce incentive to proactively accomplish remedial project allowing properties to return to a beneficial reuse. Alternatively, if a similar statement must be retained in the Final Guide, NIPSCO offer additional comments. – additional sub-comments included in original document.	IDEM does not agree and does not anticipate changing the RCG in response to this comment.
306	168	12.12.1	NiSource	(c) The Draft Guide’s Section 12.12.1 also stated that all financial assurance mechanisms will need to be updated annually either by compiling a new cost estimate or by multiplying the previous year’s cost estimate by “a specified inflation factor.” Said statement is vague and should be clarified. –additional sub-comments included in original document.	The text has been modified to indicate that updates are required as needed, or at least once every 5 years. The text was also modified to indicate that new or updated costs should be based on current dollars
307	169	12.12.3	NiSource	The final should clearly reflect that a remediator may, at its discretion, utilize any of the described financial assurance mechanisms (a trust fund, an irrevocable standby letter of	The text has been modified to clarify that any of the FA mechanisms are available, and that IDEM will evaluate the

				credit, a surety bond, insurance, and a financial test or corporate guarantee). To reflect such a revision, NIPSCO asks that IDEM replace the second sentence of Section 12.12.3 as follows: “A reasonable party may propose to use any of the below-described financial instruments to demonstrate FA. IDEM will evaluate each proposed instrument for sufficiency.” –additional sub-comments included in original document.	appropriateness of all proposals.
308	169	12.12.3	NiSource	The descriptions of the financial assurance mechanisms at section 12.1.2.3 of the draft guide should be revised to refer to the RCRA definitions and descriptions or to otherwise detail the specific requirements associated with each mechanism. Absent such a revision, a remediator cannot be certain as to the requirements associated with each mechanism. Such uncertainty could be highly problematic – it is important for the Final Guide to, for example, clearly identify the acceptable financial test(s).	An appendix has been added to the RCG with additional information about each FA mechanism, and templates for each.
309	169	12.12.3	MSECA	Does the RCG limit the selection to this list as well, or may other FA instruments be presented for consideration outside of a RCRA closure effort?	IDEM is not aware of any other acceptable FA mechanisms, but will consider any proposals.
310	174	13.3.3	GM/Environ	IDEM should explain the basis for its selection of toxicity values for TPH fractions In Section 13.3.3, IDEM uses the toxicity of a single reference compound (or mixture such as JP-8 or white mineral oil) to represent the toxicity of an entire fraction, which is consistent with the approach of other state agencies and the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG). However, IDEM should provide its rationale for selecting a particular reference compound/mixture for each fraction, when toxicity information is available for more than one	We are adopting EPA inputs, including toxicity values, by adapting EPA tables.

				compound/mixture in the range.	
311	174	13.3.3	GM/Environ	<p>The uncertainty factor in the calculation of default closure level for diesel fuel appears to be arbitrary.</p> <p>The criteria discussed in Section 13.3.3 include an uncertainty factor of 0.5 in the calculation of the default closure level for diesel fuel which IDEM believes is needed to account for possible co-contamination with gasoline. IDEM provides no justification for this adjustment, which seems unnecessary if samples already include analysis of diesel and gasoline components, and these data show that no gasoline component is present. For example, a site that employs the COC approach may have already analyzed for TCL VOCs and SVOCs. If the VOC results indicate that no gasoline component is present, then the 0.5 uncertainty factor in the default closure levels for diesel seems unwarranted.</p>	<p>IDEM agrees there is much uncertainty associated with TPH risk-based analyses. As a result we are eliminating TPH from our tables, and will no longer evaluate risk using TPH as a parameter. However, it may still have some utility for the purpose of guiding petroleum release investigations.</p>
312	175	13.5	IPC	<p>The current VI equations provided in RCG do not allow for the development of site specific Screening levels using geotechnical parameters.</p>	<p>IDEM screening levels are based on the EPA regional screening levels, which are in turn based on U.S. EPA equations. Geotechnical parameters have an effect on screening levels only to the extent that they are included in the underlying equations.</p>
313	177	13.6.3	GM/Environ	<p>The dispersion factors used to calculate the VF and PEF are inappropriate for use in the State of Indiana. IDEM uses USEPA's default air dispersion factors from the Soil Screening Guidance (USEPA1996, USEPA 2002c), but these dispersion factors are for cities that are not in or near Indiana. The dispersion factor for the VF is based on air dispersion in Los Angeles, CA and the dispersion factor for</p>	<p>IDEM is now using the EPA regional screening tables as the source of all screening levels in Appendix A, and this includes inputs such as the referenced dispersion factors. On a site-specific basis, anyone is free to propose using criteria from the cities cited in the comment.</p>

				<p>the PEF is based on air dispersion in Minneapolis, MN. While USEPA's choices of air dispersion factors may be appropriate defaults for the entire United States, they are not necessarily appropriate defaults for Indiana. IDEM should select default air dispersion factors that are relevant to Indiana. For example, IDEM could see if the dispersion factors USEPA calculated for cities near Indiana, such as Chicago, IL, Cleveland, OH, and Huntington, WV are appropriate for Indiana.</p>	<p>IDEM believes the recalculated screening levels or remedial objectives calculated using these regional dispersion factors will not be significantly different from those calculated by IDEM and EPA.</p>
314	177	13.7	B&T	<p>We request that IDEM re-evaluate its hierarchy of sources for toxicity values in Section 13.7 and preferences for physical and chemical parameters in Section 13.8.</p>	<p>IDEM has eliminated its hierarchy. Based upon numerous comments regarding the chemical toxicity and physical/chemical properties values, and the appropriate hierarchies for the above, the risk-based algorithms, inconsistencies with EPA, and concerns about timely updates for all the above, IDEM has decided to utilize the EPA unified regional screening tables as the basis for IDEM's screening levels. Specific policy inputs will be used to adapt EPA's tables to IDEM-specific screening levels. These include: target risk of <math>10^{-5}</math>, residential exposure frequency for soil direct contact of 250 days/year, and a DAF of 20 for migration to ground water screening levels. Staff will calculate VI ground water screening levels for 12 selected volatile chemicals (EPA's tables do not include this feature). These are easy mathematical adjustments that can be accomplished with a simple spreadsheet</p>

					<p>(eg, multiply EPA's soil migration screening level by a factor of 20). The advantages of this are numerous: all chemical parameters and their associated hierarchies are integrated by EPA into their tables, therefore we are consistent with EPA methodology. EPA updates their screening level tables twice each year, and IDEM will do the same. IDEM will maintain an archive of outdated tables to facilitate transition and other issues. Several hundred chemicals have been added to the IDEM screening level tables by adapting EPA's tables. Screening levels for commercial/industrial ground water ingestion and the associated soil migration to ground water pathways are not included in EPA tables, and with the 2009 statutory revisions that now give effect to risk management strategies (ERCs and EROs), these criteria are no longer useful or relevant, and are not included in IDEM's screening level tables.</p>
315	178	13.7	GM/Environ	<p>HEAST is higher on USEPA's hierarchy of toxicity values than PPRTV-Appendix values, which USEPA advises to not use in risk assessments. In Section 13.7, IDEM states that values from HEAST should be used after consideration of PPRTV-Appendix values. This is inconsistent with USEPA's interpretation of its PPRTV- Appendix values, which says such values are below Tier 3 of the three-tier hierarchy</p>	<p>See response to comment #314. That response directly addresses this issue.</p>

				of toxicity values described in OSWER Directive 9285.7-53 (USEPA 2003). Since USEPA considers HEAST as a Tier 3 source (USEPA 2003), values in HEAST should be used before considering whether to use PPRTV-Appendix values. In addition, USEPA has advised that PPRTV- Appendix values are of such low quality that they should not be used in quantitative risk assessments.	
316	180	13.8	GM/Environ	<p>The hierarchy for selecting physical and chemical parameters is internally inconsistent.</p> <p>In Section 13.8, IDEM states that values from USEPA's 1996 Soil Screening Guidance (SSG) will be used first, which implies that IDEM agrees with the hierarchy of data sources set forth in the SSG. However, IDEM then places SCDM (which is on the SSG hierarchy) below ATSDR, RAIS, and the Regional Screening Levels which are not on the SSG hierarchy. IDEM should correct this inconsistency by using the SSG hierarchy before looking to other sources.</p>	See response to comment #314. That response directly addresses this issue.
317			Internal		
318	186	Glossary	MSECA	<p>“Chain of Custody”: “Documentation (typically a paper trail) of the collection, custody, control, transfer, analysis, and disposition of a sample, recorded to establish that the sample is in fact an accurate representation of the subject medium, properly handled, transported and stored between the time of collection and analysis. An identifiable person must always have the physical custody of a sample. In practice, this custody may be transferred from the sampler to a custodian, a courier, a laboratory sample receiving representative, the analyst, etc. These transactions, and every</p>	<p>IDEM has revised this entry, but prefers the definition provided in the U.S. EPA Guidance on Data Verification and Data Validation, EPA QA/G8 (2002), which includes all of the components identified in this comment in an abridged version:</p> <p>“Chain of custody – an unbroken trail of accountability that ensures the physical security of samples, data, and records.”</p>

				<p>succeeding transaction between the collection of the sample and completion of all analyses, should be completely documented chronologically in order to withstand challenges to the integrity of the sample and validity of the data as reported. Documentation should include the identity of each/all sample custodians and the manner in which evidence is transferred to subsequent custodians each time such a transfer occurs, along with the signatures of persons involved at each step.”</p>	
319	190	Glossary	MSECA	<p>“Free product”: provide a definition for the term “regulated substance”</p>	<p>IDEM has revised the definition of “free product” to read “A substance that is present as a nonaqueous phase liquid”</p>
320	191	Glossary	MSECA	<p>“karst terrain”: a suggested revision: “A naturally occurring geologic setting of distinctive landforms and hydrology created from the dissolution of soluble rocks (e.g., limestone and dolomite), characterized by springs, caves, sinkholes, and a unique hydrogeology that results in aquifers that are highly productive and vulnerable to contamination. This setting is typified by a network of interconnected fissures, fractures, and conduits within a relatively low permeability rock matrix. Most of the ground water flow and transport occurs through the network of openings, while most of the ground water storage occurs in the matrix. As a result, most karst aquifers are highly heterogeneous and anisotropic.</p>	<p>IDEM does not accept this comment. The RCG glossary is intended to provide a brief meaning for terms, within the context of its usage in the RCG, not to redefine or broaden the term with extraneous or cumbersome additions. The glossary definition for “karst terrain” provided in the RCG is a suitable, condensed version of definitions from the USGS and many other creditable sources. Key terminology, such as the dissolution of soluble rock and the resulting features and landforms, are included in the RCG text. No changes in the definition of the term appear needed.</p>
321			Internal		
322	192	Glossary	MSECA	<p>“mean”: This definition is not clear, revision is requested. Consider defining “arithmetic mean” (as opposed to, for example, geometric mean, harmonic mean, population mean, etc.).</p>	<p>IDEM has revised the definition of the term “mean” to make clear that we are referring to “arithmetic mean”. The RCG does not currently refer to any other type of mean.</p>

323	197	Glossary	MSECA	“subsurface soil” and “surface soil”: see comment 233.	IDEM is revising the text to eliminate an arbitrary dividing line between surface and subsurface soil. Appropriate evaluation criteria will be site specific.
324	199	Glossary	GM/Environ	IDEM should make its various definitions of subchronic exposures consistent with the USEPA definition. IDEM is inconsistent in its definition of subchronic exposure duration. The glossary (p.199) defines "Subchronic exposure" as "Contact with a contaminant that occurs for more than two weeks but less than one year", while the abbreviation key for B.3 (p. 251) defines "Subchronic" as "Exposure to a chemical for a shorter time period; assumed to be five years" and the abbreviation key for B.5 (p. 270) defines "Subchronic" as "Exposure to a chemical for a shorter time period; IDEM [follows] U.S. EPA guidance and considers chronic exposure durations to be greater than 7 years". IDEM should correct these inconsistencies and make its definition consistent with the USEPA definition in RAGS Part 1A (1989). (see also pages 248 and 266)	IDEM agrees with the comment that there was an inconsistency in the glossary and cited text. However, with the changes to the screening level tables (see response to comment #314), IDEM has redefined the terms “chronic” and “subchronic” relative to indoor air action levels and indoor air screening levels, eliminating this inconsistency.
325	217	Appx	Arcadis	There should be a control number or date included in the footer or header of the screening tables.	IDEM agrees with this comment and has added the requested information.
326	217	Appx	B&T	It appears that subchronic toxicity values for many non-carcinogens, as used in the indoor air inhalation pathway, are inconsistent with well established US EPA policy and common toxicology practice. For instance, many subchronic values appear to be directly extrapolated from chronic values, and there are examples where subchronic values are less than chronic values. See attachment 3 for more detail.	With the changes to the screening level tables (see response to comment #314), IDEM has redefined the terms “chronic” and “subchronic” relative to indoor air action levels and indoor air screening levels, eliminating this inconsistency.

327	217	Appx	B&T	<p>IDEM proposes a substantial change to the oral toxicity value for PCE based on values derived by the California EPA (Cal-EPA). As IDEM is aware, US EPA is finalizing an extensive analysis of PCE toxicity and has published a draft range of oral slope factors. The new draft US EPA values are up to fifty times less conservative compared to Cal-EPA. A similar approach was taken with the ubiquitous industrial solvent, TCE years ago. These TCE changes decreased screening levels by up to a factor of 70 times. These changes were the result of policy considerations and were not based on commonly accepted health based toxicity practices. The US EPA policy choices were eventually overturned but not until significant economic impact had already occurred. If IDEM moves forward with the proposed oral slope factor, than there will be no meaningful distinction between residential and commercial/industrial screening levels in soil (58 vs 61 ug/kg, respectively) and groundwater (5 vs 5.3 ppb, respectively). It is important that IDEM establish a health based reason for this change. The Cal-EPA toxicity value was derived before the US EPA draft and the US EPA draft assessment of toxicity for PCE does not agree with Cal-EPA. A request is made for IDEM to carefully consider the health based need for changes versus the economic impact to what is now being proposed for PCE. See Attachment 3 for more detail.</p>	<p>See response to comment #314. IDEM defers to EPA's toxicologists for this determination, and we will utilize the toxicity values in the EPA unified regional tables.</p>
328	217	Appx	B&T	<p>For certain compounds, like benzene, there are a range of cancer potency estimates and IDEM has selected the most conservative portion of that range. What is the basis for IDEM's decision to select the most conservative range? Will IDEM follow this same logic for</p>	<p>See response to comment #314. IDEM defers to EPA's toxicologists for this determination, and we will utilize the toxicity values in the EPA unified regional tables. IDEM is not aware of any sites</p>

				PCE? Under what circumstances will the less conservative portions of the range be allowed? See Attachment 3 for more details.	where EPA has selected a potency estimate (within a range) that was different from the value they used in their screening tables.
329	217	Appx	B&T	Given the significant change from the RISC "default" closure levels to the proposed "screening" levels, we recommend that IDEM develop a risk communication handout explaining the meaning of the screening levels. A separate stand-alone communication tool also seems appropriate for the indoor air screening levels. <i>See</i> Comments A.2 and D.5.c. from the original comment letter regarding the concept about the conservative nature of the screening levels. See Attachment 3 for more detail.	IDEM believes that this comment has merit and will consider the suggestion as a future project.
330	217	Appx	B&T	Certain quality assurance issues have been identified in that RCG Draft Screening Level Tables when assessed relative to the US EPA Regions Screening Level Tables (RSLs). Many of these are simple typographical or other errors. However, some important items are noted which may require closer examination. See Attachment 3 for more details and tables to be checked.	See response to comment #314. That response directly addresses this issue.
331	217	Appx	B&T	The Regions use an entirely different source for all of the Chemical and Physical parameters used to derive screening levels. Meaning, <u>none</u> of IDEM's chemical/physical parameters match parameters used in the RSLs. This may be an important consistency issue as it appears to have a wide ranging impact on screening levels. See Attachment 3 for details.	See response to comment #314. That response directly addresses this issue.
332	217	Appx	B&T	There does not appear to be any information available on how IDEM derived or selected certain toxicity factors and surrogates. See Attachment 3 for details.	See response to comment #314. The EPA unified regional tables identify the toxicity references for each chemical.
333	217	Appx	B&T	How will IDEM address volatile compounds for which there is no toxicity information in the tables and yet	See response to comment #314. The IDEM tables now include all the chemicals in

				screening levels will be needed?	EPA's tables.
334	217	Appx	B&T	We request that IDEM coordinate an external peer review process to, among other things, derive slope factors, inhalation unit risks, reference doses, and reference concentrations, and perhaps even to review the proposed changes in the RCG and any future updates.	See response to comment #314. These tasks are integrated into the derivation and updates of the EPA unified regional tables by EPA toxicologists, and IDEM has no role in this process.
335	217	Appx	B&T	It appears that subchronic toxicity values for many non-carcinogens, as used in the indoor air inhalation pathway, are inconsistent with well established US EPA policy and common toxicology practice. For instance, many subchronic values appear to be directly extrapolated from chronic values, and there are examples where subchronic values are less than chronic values.	See response to comment #314. IDEM defers to the toxicity values identified by EPA toxicologists in the unified regional tables.
336	217	Appx	IPC	VI Calculations for petroleum contaminated sites need to incorporate biodegradation rates.	Biodegradation rates vary depending upon site circumstances, so IDEM is not incorporating them into this guidance. Biodegradation should be evaluated on a site-specific basis guided by EPA protocols and the literature.
337	289	Appx C	Keramida	Combine the chronic and subchronic health protective levels (HPLs) equations into one equation, providing the variable for (Exposure Duration) to calculate the chronic and subchronic screening level. The only difference in the two equations is the exposure duration term (ie, 5 years (sub-chronic) or 30 years(chronic)). Currently, the RCG provides a separate equation for calculating the chronic and subchronic HPLs.	Because we are adopting EPA inputs and equations, this comment is no longer relevant.
338	326	Appx C Eq 72	GM/Environ	The soil ingestion rate for excavation workers is not scientifically justified. IDEM cites the <i>Supplemental Soil Screening Guidance</i> (USEPA 2002c) as its source for the soil ingestion rate of 330 mg/day for excavation workers.	IDEM agrees with some of the observations discussed in this comment. However, the commenter offered no suggestion on what the appropriate reference should be for this

				<p>However, this soil ingestion rate lacks scientific credibility for at least the following reasons. It is the 95<sup>th</sup> percentile value from a study (Stanke et al. 1997) of only 10 adults, none of who were apparently engaged in construction activities. The distribution of ingestion rates was extremely skewed, with an estimated median of 0 mg/day (and the actual median was a negative value of -11mg/day before the authors set it to zero) and the estimated mean was 6 mg/day (see Table 9 in Stanek et al. 1997). In addition, using an extreme percentile from such a limited study is also inconsistent with other USEPA risk assessment guidance (e.g., RAGS Part E, regarding selection of soil adherence factors) which advises that such values have too much uncertainty for use in quantitative risk assessments</p>	<p>parameter. It is IDEM's experience that the excavation worker scenario rarely, if ever, drives the risk at any site. Because of the limited intake associated with excavation worker exposure, the screening criteria are very high, and often default to 100,000 mg/kg. Practically speaking, IDEM sees no value to changing the ingestion rate for this scenario. However, IDEM would consider the use of alternative ingestion rates on a site-specific basis.</p>
339	353	Appx D	Lilly	<p>No guidance as to when a score adjustment would be made, or if a score adjustment can be appealed. Allows for little flexibility or innovation.</p>	<p>IDEM proposes to remove the PEM from this version of the RCG.</p>
340	353	D.1	Lilly	<p>To achieve a high PEM, you will need to analyze most if not all LOEs. May need to install more monitoring wells than technically required to complete plume delineation. Will result in higher investigative costs for the regulated community. For example, for the plume core size determination, it is required to place wells at 10-foot spacing to justify the most favorable score (which is very excessive and typically not required for plume characterization by other regulatory agencies). There is no valid technical justification to install wells on 10 foot spacing.</p>	<p>IDEM proposes to remove the PEM from this version of the RCG.</p>
341	356	D.3.1	Lilly	<p>Since there are many chemicals not included in the RCG table, there would presumably be an intensive discussion with IDEM prior to starting the PEM process in order to develop proprieted and threshold values for such</p>	<p>IDEM is now utilizing the EPA unified tables as the basis of our screening tables. There are many advantages to doing this, and one of them is that our tables now</p>

				compounds. How are unlisted compounds handled when evaluating the PEM?	include several hundred more chemicals than were available previously. However, the comment is correct that IDEM recommends contacting your project manager to discuss any necessary evaluation of chemicals not appearing in the Appendix A tables.
342	381	D.6.2.1	Lilly	The proposed use of regression analysis in this guidance document is unique and not statistically sound. The result of applying regression analysis under the criteria outlined will likely result in unnecessary additional monitoring and remediation costs. Examples to support this statement are provided in Comment #10 of letter.	IDEM believes that this comment has merit. Other statistical methods may be used as long as they are applicable to the situation. The text has been clarified in Section 4 to allow other methods.
343	383	D.6.2.2	Lilly	The criteria proposed for interpreting Mann-Kendall Trend analysis and Sen's Slope Estimators are not consistent with typical plume stability analysis. Due to the dynamic nature of complex plumes, plume stability should never be treated as an all or nothing concept dictated purely by a rigid statistical analysis. (Supporting examples provided in Lilly's Comment #11)	IDEM proposes to remove the PEM from this version of the RCG. LOEs described in the RCG include spatial analyses, such as mass flux and plume mass. The LOEs were added so that statistics are not solely relied upon.