

COMMITTEE: Conceptual Site Model (CSM) Technical Guidance Committee
DOCUMENT: *Guidance for Preparation and Submission of a Conceptual Site Model (CSM)*

Start of Comment Period **13-Apr-11**
 End of Comment Period: **25-May-11**

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**NJDEP TECHNICAL GUIDANCE
 Draft Document Review Form**

Page	Chapter	Section	Subsection	COMMENTS	RESPONSE
--	--	--	--	General Comment: Document should reference ASTM CSM Guidance (ASTM E1689-95 (2008); also maty want to use/reference ASTM definitions	Added reference
1	1	2		Change throughout the life of "the" case to "a" case.	Changed to "throughout the remedial process"
1		2		Add the following sentence from the 3rd paragraph on page 9 to the end of the last paragraph on page 1 for emphasis "The use of the CSM does not replace the need...NJDEP regulatory requirements".	Inserted text at the beginning of 3rd paragraph.

1	2			This document is not required to be produced by the NJDEP. Documentation of site characteristics and decisions are required through the use of the PA/SI/RI/RA process. In most cases, Environmental Conceptual Site Models are used to determine distances to receptors, extent of contamination to the standard, the need for removal or control of contamination, with a Risk Assessments based upon site specific conditions. In New Jersey, the NJDEP has already performed a risk assessment utilizing a "generic model" of a New Jersey site. The site characterization inputs for these models, which in almost all cases do not correspond to site specific conditions being evaluated, are not allowed to be modified for site specific conditions, except for minor changes in impact to groundwater standards for soil. So by providing a CSM, is the investigator allowed to remodel the "generic" risk assessment by using site specific values which differ from the NJDEP modeled assumptions? If not, all the guidance on producing a CSM is repetitive and cost inefficient, and only adds another layer of bureaucracy (paperwork) to the PA/SI/RI/RA procedure.	As noted, the CSM is not a required deliverable, but is encouraged to be used. The CSM provides a scientifically valid means of presenting information collected during the various stages of the remedial process (PA/SI/RI/RA) to support professional judgment as it relates to understanding the extent of contaminant impacts and associated threats to receptors. Several NJDEP guidance documents reference the CSM as a tool to organize and interpret collected information when applying the guidance document. The CSM can be used in any regulatory framework with the above objectives in mind. The CSM is a useful and efficient tool even when generic standards are used to illustrate an understanding of contaminant sources, migration pathway(s) and identified receptors associated with exceedances of corresponding generic standards.
1	2			The guidance states that "The Department accepts the CSM as a valid scientific approach when applied in accordance with applicable regulatory requirements and guidance documents." There are no regulatory requirements for the development of a CSM. CSM is merely a tool that allows the investigator to visualize the processes operating at a site. This clarification should be added to first paragraph	Agreed - Changed text
1	2			A disclaimer, such as this one, should be added to the first paragraph of this section: "While the CSM can greatly assist in explaining results of an investigation, it is not a required deliverable for documents submitted to the NJDEP."	Agreed - Changed text
1	2		¶ 1	Insert after "representation of the" the phrase---"conditions onsite and"....(the physical, etc.)	Disagree - The definition of a Conceptual Site Model does not restrict it to being on-site.
1	2		P-1	Modify the second sentence to identify what the processes are affecting: The CSM is a written and/or illustrative representation of the physical, chemical and biological processes that control the transport, migration and potential impact of <i>contamination in soil, air, groundwater surface water and/or sediments to human and/or ecological receptors</i> . The CSM will also be relevant to the establishment of a CEA/WRA so some discussion on the cross-application of the CSM to this regulatory requirement is appropriate, even if CEA/WRA will be a separate guidance document.	Agreed
1	2		¶ 2	Intro Sentence to highlight key point: "The CSM is a critical tool that should be used.....to support the remedial decision making process."	Agreed - Changed text
1	2		P-2	Second sentence, change the word "make" to support . The CSM supports a scientifically and technically defensible position that is made by the investigator	Agreed - Changed text was added to clarify that the CSM supports the remedial decision.
1	2		P-2	Modify the last sentence as follows: The Department accepts the CSM as a valid scientific approach <i>to remedial investigation and remedial action decisions</i> when applied in accordance with applicable regulatory requirements and guidance documents.	Disagree - The CSM should not be restricted to the Remedial Investigation and Remedial Action phases but can be used in all phases of the investigation from the PA though the RA.
2	2		P-3	The Remediation Standards (N.J.A.C. 7:26D) are critical to defining receptors and need to be specifically identified in this guidance as an applicable regulation.	Agreed - Changed text
2	3		¶ 1	After "simple illustration", insert reference to one of the figures (ie Fig 1).	Agreed - Changed text
2	3		P-2	Change the second sentence to state that the CSM will aid in the remedial <i>investigation and remedial action</i> decision making processes.	Disagree - The CSM should not be restricted to the Remedial Investigation and Remedial Action phases but can be used in all phases of the investigation from the PA though the RA.
2	3		P-3	The Section 5.2 description also needs to mention the assessment of potential receptors.	Agreed - Changed text
2	4			Add definitions; e.g., COC, smear zone	Agreed - Definitions added
2	4			Add the acronym COC after "the" and before "transport" in the 3rd sentence.	CHANGED to reflect comment at end of sentence
2	4		P-1	The conceptual site model definition needs to state, like comment 1, that the model is concerned about the contaminants of concern in the affected media.	Agreed - Changed text
2 and/or 3	3 and/or 5	5.1	5.1.1	In either or both pgs./chapters, should clarify what is meant by anincomplete vs.a complete a pathway.	Agreed - Additonal definitions were added
		5.1		Is an RP/LSRP Required to explain when it does not use a CSM?	NO
3	5	5.1	5.1.1	1st P, 3rd Senatance. Delte "including soil, surface water, groundwater, surface water, biota and air". These specific media are detailed in section 5.1.2	Agreed - Changed text
3	5	5.1	5.1.1	Biota is included here but not in Section 5.2.5; delete	Agreed - Changed text

3		5.1	5.1.1	Delete the second reference to "surface water" in the 3rd sentence.	Agreed - Changed text
3		5.1	5.1.1	This section should note that not all COCs are targeted compounds. Some site discharges to groundwater affect general groundwater and/or surface water quality criteria, or narrative surface water criteria. These parameters could include TOC, DO, TDS, pH, chloride, sulfate, ammonia, nitrate, etc. Site discharges that affect surface water aquatic life conditions must be included in the CSM.	Disagree - The identification and characterization of the source(s) is included in Section 5.2.
3	5	5.1	5.1.1	2nd P, 2nd Sentence: "become" not "becomes"	Agreed - Changed text
3	5	5.1	5.1.2	In the Summary of Impacted Media section I suggest adding language at the end, similar to the following : When data is available, the CSM could include summary tables and/or other data summary methods for concisely describing data available for all media, collected throughout the history of the site.	Agreed - Changed text
3	5	5.1	5.1.2	Biota is included here but not in Section 5.2.5; delete	Agreed - Changed text
3	5	5.1	5.1.3	2nd Sentence: "medium" not "media"	Agreed - Changed text
3	5	5.1	5.1.3	This is the whole "raison d'etre" for a CSM---	Agreed
3		5.1	5.1.2	Title should include "and Applicable Remediation Standards". You can't tell what is impacted if you don't also reference the criteria.	The text of the document was modified to emphasise this point.
4	1	5	5.2	Appendix A Checklist: are investigators supposed to submit this? To whom? And under what circumstances	The Checklist is not a required submittal. It was included as a guide that would identify components that can be included in a CSM
4	5	5.2		2nd P, 1st Sentence: "that" not "which"	Agreed - Changed text
4		5.1	5.1.4	The figure 1 and 2 scenarios are very simple. The CSM can have its greatest benefit by helping to organize complex sites, including multiple water bearing zone impacts, bedrock structural controls, etc.	Agreed
4		5.2	5.2.1	This section must make some reference to the applicable remediation criteria based on the aquifer classification, the surface water body classification and applicable aquatic life, human health and narrative criteria, and the applicable antidegradation provisions that could affect a remedial action decision.	Agreed - Changed text
4	5	5.2	5.2.2	In the first sentence add that the following information:" Should be available from the PA, SI, RI, RA, etc.", and don't say" investigator should also evaluate the PA, SI, etc.because these documents are where all the information will come from.	Agreed - Changed text
4	5	5.2	5.2.2	At the end of the Summarizing Available Information section I suggest adding language similar to the following: Once significant contaminant data is available, summary tables, maps, graphs or other figures should be used to describe the nature and extent of contamination in all media and/or to concisely illustrate any temporal trends in the data. Historical monitoring/investigation data and past remedial actions taken should be included. Information that does, or may, explain any trends in the data could also be discussed. In addition, any important implications for receptor exposure that may be associated with changes in various contaminant levels over time in any media could be noted.	AGREE, Changed in Section 5.2.4
5		5.2	5.2.2	The list of information to be provided should include: 1) the aquifer classification and surface water body classification; 2) the applicable remediation standards for these types of aquifer and surface water bodies; and 3) any applicable antidegradation policies.	Agreed - Changed text
4	5	2	3 and 4	The guidance states that : "The investigator should conduct a diligent inquiry into... " These activities belong in PA, SI, RI phases and should be completed as required by the TRSR regardless of whether a CSM is prepared. The guidance should be stressing that a properly conducted PA/SI/RI will be providing this information.	Agreed - Changed text
5	1	5		This section starting to sound like a primer on How to Conduct a Site Investigation	Thank you for your comment.
5	1	5	5.2.5.1	RE: Evaluate each exposure pathway----This is really the goal of the whole CSM exercise----to determine who or what might be impacted by the area (AOC or site) being investigated.	AGREE, Thank you for your comment.
5		5.2	5.2.3	Source areas and plumes that overlap are encouraged to be investigated together and included in the same CSM.	Agreed - Changed text
5	5	5.2	5.2.4	3rd P: "Source" characterization instead of "The" characterization	Agreed - Changed text
5	5	5.2	5.2.4	5th P, 3rd Sentence: "Source control or remediation of these" add word "constituents"	Agreed - Changed text
5	5	5.2	5.2.4	last paragraph: change "defuse" to "diffuse"	Agreed - Changed text

5		5.2	5.2.4	This section appears to be primarily related to the originating contaminant release location. The guidance document needs to be clear on how the term "source" is being used and may need to use different terms or phrases. For example, the "source" of some receptor impacts (e.g. VI, surface water, sediment) is often a dissolved plume whose "source" was a leaking UST. For DNAPL, the initial "source" may have been an UST or degreaser unit, but the subsurface "source" of perched DNAPL or attenuated residual DNAPL may have very different dimensions.	Disagree, We believe source is described adequately as currently revised in Sections 5.2.3 and 5.2.4
6		5.2	5.2.4	The characterization discussion must include the media impacted by the release (soil, air, groundwater, surface water, sediments); the potential migration paths; media characteristics that could affect contaminant migration and contaminant attenuation.	This is discussed in Section 5.2.5
6		5.2	5.2.4	Historic fill may have contaminants that are not associated with site use. The guidance should be clear that impacted fill does not preclude site investigation and remediation of impacts that are associated with site operations.	Agreed - Changed text
6		5.2	5.2.4	The guidance should be clear that the presence of dissolved contamination in upgradient site groundwater, or the presence of nearby contaminated sites, does not preclude the remedial investigation and remedial action of site specific contaminant sources and source impacts. Upgradient groundwater impacts do not always affect the area of concern being investigated at a site.	Agreed - this is included in Section 5.2.5.2
	5	2	5	The guidance suggests the collection and presentation of certain types of information. Much of the same information would have been collected in the PA/SI/RI process and should have been presented in the corresponding deliverables. A statement should be inserted in the beginning of this section clarifying that the objective is not to create a separate deliverable or a new reporting requirement, but to assist the investigator to organize the data in a way that supports the overall site remediation activities.	Agreed this was clarified in Section 5.2 first paragraph
5	5	5.2	5.2.5	Depending on how incomplete vs. complete pathway is defined, the following sentence in this subsection (last sentence of the first paragraph) could be confusing: "This section should also identify when the migration pathway(s) are not complete and therefore will not be evaluated." In the current and draft NJDEP VIG, the VI pathway is only considered complete if VI has occurred to the extent that indoor air (IA) quality exceeds the IA screening level. If complete pathway is defined/used in this way, one must evaluate it before deciding whether or not it is complete, thus the above sentence would be illogical. If however, VOCs are not a COC at all, one can conclude the VI pathway is incomplete before evaluating it. Further explanation would be appropriate here regarding this concept. A definition/use of the phrase "complete pathway" that is consistent with how it is used in the NJDEP VIG (current and draft) is strongly recommended.	Definitions were added for complete and incomplete pathways (DO GLOBAL SEARCH FRO BOTH TERMS)
5		5.2	5.2.5	1st sentence: change "migrations" to "migration".	CHANGED
6		5.2	5.2.5	The first paragraph should note that where site contamination is above the remediation standard is identified at the limits of the area being evaluated by the CSM, further investigation will be conducted.	Disagree - This issue is being addressed in the Attainment/Compliance Technical Guidance Document Committee
			5.2.5.1	Change "Soil" to "Soil and Rock."	Disagree, this section discusses soil in relation to characterizing soil to NJDEP soil based standards.. This section does state that you should identify when bedrock is encountered.
5	5	5.2	5.2.5.1	1st Sentence: Add "Investigation" between "Soil" and "Guidance"	Agreed - Changed text
5		5.2	5.2.5.1	1st sentence: add "E" to TRSR citation.	Agreed - Changed text
5		5.2	5.2.5.1	1st sentence: consider adding cross reference to NJDEP Field Sampling Procedures Manual.	Agreed - Changed text
6	1	5	5.2.5.1	Re; Exposure Risks---add Proximity to Residential areas, schools, park, etc.	Agreed - Changed text
3 and/or 5	5	5.1 and/or 5.2	5.1.1 and/or 5.2.4	In these sections source(s) is used only to refer to original or primary releases. The term "Potential Secondary Source" is used as a heading in what appears to be Fig. 3/pg. 13 (but labeled Figure A-2, ID from its originating doc.?) and in Figure 2-2 in Appen. B. It would be appropriate to introduce this term in the text prior to its use in these figures. The term secondary source is appropriate in describing contaminated soil (including vapors in the vadose zone) and dissolved contaminants in ground water when they act as a potential or actual source for VI. Suggest adding a brief discussion in one or both these sections about the concept of primary and secondary sources. See attached Word doc. re. Comment 4 for additional support for this addition/suggested wording.	Definitions added for primary and secondary sources

6	5	5.2	5.2.5.1	The following phrase (underlined) could be added to the end of the next to last sentence of the Soil subsection which starts and ends "Documentation of above mentioned properties...in developing a fate and transport analysis" - <u>and in identifying any potential secondary sources.</u>	Agreed - Changed text
6	5	5.2	5.2.5.1	1st Sentence: change "must define the boundaries" to "must identify the boundaries"	Agreed - Changed text
			5.2.5.1	2nd para: Add a bullet: The nature and extent of organic COCs sorbed within low permeability soil and rock matrices, both above and below the saturated zone, where their migration is governed predominantly by diffusion and not advective flow.	This is discussed in the Ground water section below.
			5.2.5.1	2nd para, 4th bullet: Can "smear zone" be better described, ie smear zone or zone of soil within which the groundwater table fluctuates?	We have added the definition of a smear zone.
6	5	5.2	5.2.5.1	6th bullet: Add "or" between "water" and "wetlands"	Agreed - Changed text
6	5	5.2	5.2.5.1	9th bullet: Add "migration" between "preferential" and "pathways"	Agreed - Changed text
6	5	5.2	5.2.5.1	Last sentence: Change "mediums" to "media"	Agreed - Changed text
6		5.2.5	5.2.5.1	Bullet 1 should also include the remediation standards for comparison to the COCs and their concentrations.	Agreed - Changed text
6		5.2.5	5.2.5.1	Bullet 2 should include field descriptions of contamination, including PID, odors, discoloration sheen/NAPL evidence, as well as moisture content.	Agreed - Changed text
7		5.2.5	5.2.5.1	The example of site conditions that may represent potential exposure risks and/or migration pathways should include: areas of impermeable surfaces; surface and subsurface drainage features, including detention/retention basins, subsurface storm water infiltration galleries, and ditches.	Agreed - Changed text. All examples, however were not included since the list is not intended to be a comprehensive list but is only meant to provide some examples to consider
6	5	5.2	5.2.5.2.	Last bulleted item should be titled: Water Use Area: Potable? Irrigation? Industrial, etc.	Agreed - Changed text
			5.2.5.2	Groundwater: Add a paragraph: Organic contaminants can migrate into low permeability formations of clay or rock where they remain at high concentrations, and diffuse slowly into adjacent, aquifer formations. Attributing the source of aquifer contamination to COC mass in groundwater, rather than diffusion from the low permeability formation, leads to an erroneous CSM.	Agreed - Changed text
6	5	5.2	5.2.5.2	Should add the following bullet to the info. list to be evaluated & included in CSM: • Heterogeneities within the saturated geologic matrix	Agreed - Changed text
6	5	5.2	5.2.5.2	It is unrealistic and punitive to expect the investigator to pay the costs necessary to collect the requisite data and develop the CSM for background contamination. Delete the sentence "If an off-site source of contamination is identified then the same information should be collected as if the groundwater contamination was coming from the site and/or AOC."	Disagree, if one is characterizing on site contamination in groundwater, you are required to identify what background is in accordance with N.J.A.C 7:26E-
6	5	5.2	5.2.5.2	Last bullet: Revise to: "Identification of aquifer use (water supply, irrigation, not used, etc.)"	CHANGED, see comment 48
6		5.2	5.2.5.2	1st sentence: add "E" to TRSR citation.	Agreed - Changed text
6	5	5.2	5.2.5.2	Regarding "One common error:" What level reader is this targeted at? The RPs, or the LSRPs?	The audience encompasses all stakeholders
6	5	5.2	5.2.5.2	3rd P (after bullets): Last sentence: Change to "...also identify future receptors that may be impacted by contaminant migration."	Agreed - Changed text
6	5	5.2	5.2.5.2	4th P, 3rd Sentence: Change "which could" to "that can"	Agreed - Changed text
7	5	5.2	5.2.5.2	Suggest adding something like the attached discussion regarding secondary sources to the end of the Groundwater subsection. References to attached Tom Sale pdf are included in the language.	Additional definitions added
6		5.2	5.2.5.2	1st sentence: consider adding cross reference to NJDEP Field Sampling Procedures Manual.	ADDED
6		5.2	5.2.5.2	"matrix diffusion" from clay and rock, which is now coming to be understood as an important way to look at contaminant sources, should be considered.	This was added to Section 5.2.5.2
7		5.2.5	5.2.5.2	The first paragraph should state that the listed information should be evaluated for each impacted aquifer unit, if necessary. Many sites include impacts to an overburden and bedrock aquifer unit with different flow conditions, extent and aquifer characteristics. Other sites impact more than one unconsolidated aquifer formation.	Agreed - Changed text

7		5.2.5	5.2.5.2	Bullet 2 should note that variations in site lithology will affect contaminant migration and attenuation; Bullet 3 must note that more than one aquifer classification may be impacted by one source or site, and that the aquifer classification will affect the applicable remediation standards; Bullet 5 must include information on horizontal and vertical gradients; Bullet 6 must recognize the greater use of infiltration galleries for storm water management in developed areas and the potential effect on groundwater and subsurface gas migration. Additional bullets are recommended that include: 1) bedrock structure information that may control contaminant migration; 2) locations of unpaved and paved areas (diving plumes, clean water lens); 3) preferential pathways caused by subsurface utilities. In older urban areas, utilities of large diameter and/or depth may affect groundwater flow and contaminant migration.	Bullet 2 - Heterogeneities within the saturated zone was added as a bullet. Bullet 3 - agreed added Bullet 5 - agreed added Bullet 6 agreed Additional Bullets added
7		5.2	5.2.5.3	1st sentence: add "E" to TRSR citation.	Agreed - Changed text
7		5.2	5.2.5.3	Delete the second period after last sentence.	DELETED
7	5	5.2	5.2.5.3	Background contamination is stressed here, but not in other sectors where that could be a factor.	Agreed - A discussion of background contamination was added to 5.2.
8		5.2.5	5.2.5.3	Bullet 3 surface water remediation standards must recognize the surface water body classification and include aquatic life and narrative criteria as well as the compound specific human health criteria. Additional bullets are recommended that include: 1) estimated plume area, concentration and flow (Q) to estimate a mass loading to surface water. Indirect plume discharges may affect the total maximum daily load of a surface water body and in turn impact the discharge limits applied to a point source discharge; 2) whether antidegradation policies apply; 3) determination as to whether the site discharges may negatively affect aquatic life conditions by changing TDS, DO, pH, etc.	Additional generic bullets were added. Specific will be addressed within the Ecological Evaluation technical Guidance Document and Section 3.8 of the Technical Regulations for Site Remediation.
7	5	5.2	5.2.5.4.	1st P, 2nd Sentence: Change "user" to "investigator"	Agreed - Changed text
7	5	5.2	5.2.5.5	1st Sentence: Delete "major and minor"	Agreed - Changed text
7	5	5.2	5.2.5.5	Consistent with the current and draft NJDEP VIG, I suggest the opening of this section be changed as follows (insertions underlined): <u>The CSM should be used in determining if</u> "a Vapor Intrusion (VI) investigation is warranted. <u>The CSM should identify...</u> " . The current wording of the first sentence seems to suggest that the preliminary CSM would not play a major role in determining if a VI investigation is needed. Relying solely on current ground water data, and/or post excavation soil data, may significantly underestimate VI risk for contaminants that do not rapidly biodegrade in the subsurface. Source areas previously removed from the site and any ground water and soil data previously collected must be taken into account; this should be considered a major function of the CSM. See attached Word document for additional info. supporting this concern and later, related comments.	cite the VIG to understand when it is "warranted" then this comment would be addressed without getting bogged down in the VIG requirements
8		5.2	5.2.5.5	Next to last paragraph, last sentence: consider revising as follows: "A discussion of migration pathways for vapor intrusion is discussed in Appendix B".	This is the exact sentence that is in the last paragraph, no revision was suggested.
8	5	5.2	5.2.5.5	The Vapor Concern and Immediate Environmental Concern Guidance documents should be included in the sentence referring to the Vapor Intrusion Guidance Document.	The section does reference the VIG. Additional reference to the IEC Guidance Document is not necessary
8	5	5.2	5.2.5.5	2nd Sentence after 1st Bullet" : Revise to read: "The NJDEP Vapor Intrusion Guidance Document provides direction for the performance of such investigation."	Agreed - Changed text
8	5	5.2	5.2.5.5	Suggest following changes to first sentence of next to last paragraph of Vapor and Air subsection (insertions underlined): "The CSM should document all sources, pathways, receptors and associated investigative/ <u>remedial actions and long-term monitoring data. This should include source, soil and/or ground water remedial measures relevant to fate and transport of vapors in the subsurface and any investigation/mitigation</u> conducted in accordance with the Vapor Intrusion Guidance Document and 7:26E-1.18."	Disagree. This section references the VIG which address these issues.
8	5	5.2	5.2.6	1st P: Delete 3rd Sentence; 4th sentence says the same thing.	DELETED
8	5	5.2	5.2.6	Insert: The id of potential receptors-----is the key function of the CSM and----and should take place.....	INSERTED
8	5	5.2	5.2.6	Receptor Eval form: the new form is too limited to convey the type of information needed for a meaningful evaluation of Human and / or Ecological Receptors.	Thank you for your comment. The text specifically addresses that the RE form will help identify information, not the only information that is needed to be collected.

8	5	5.2	5.2.6	Move 4th P ("The human receptor evaluation...plus 3 bulleted items) under the 1st P	CHANGED
8	5	5.2	6.2.6	Suggest the FIGURES are introduced much earlier in the document, to give the reader a better idea of what is being suggested as a CSM.	Thank you for your comment
8	5	5.2	5.2.6	2nd P, 1st Sentence: replace "i.e." with "e.g."	CHANGED
8	5	5.2	5.2.6	2nd P, Last Sentence: Change to: "Generally, the ecological receptor evaluation should address the following components:"	CHANGED
9		5.2	5.2.7	Delete the second period after the 1st sentence.	DELETED
9	5	5.3		1st sentence: Change to: "...relationship between sources (CoCs), migration pathways and receptors associated with the Site or AOC."	CHANGED
9	5	5.3		2nd Sentence and elsewhere in subsequent text: replace "and, or" with "and/or" or just "or"	SEARCH AND REPLACED
10		5.3	P-1	Please strongly identify that the CSM can change DRAMATICALLY as a remedial investigation proceeds and ALL data (soil, groundwater, surface water, air, sediment) must be continually and collectively evaluated over time. Changes in groundwater use, changes due to partial or evolving remedial actions over time, etc. will affect the understanding of site conditions and in turn the CSM. New information must not be ignored even when it changes a previously "established" CSM. Example: a bedrock site investigation with a reasonable CSM that was supported by water quality and pump test information, indicated that fracture frequency was great enough to support flow conditions similar to an unconsolidated site. Additional wells installed to confirm the plume boundaries, however, found that this was not in fact the case and there was significant contaminant migration in vertical fractures (joints) parallel to faults in the area. Cross-fault horizontal bedding plane and vertical fracture features existed and did account for some plume migration, but a greater portion was controlled by the jointing parallel to the faults. This resulted in additional RI and receptor impacts.	Agreed - this was emphasised in Section 5.4
9	5	5.3	Table 1	SI Section, Last Bullet: Replace "i.e." with "e.g."	REPLACED
9		5.3	Table 1	The 3rd bullet item is confusing to me.	The 3rd bullet item in the PA category identifies that the information collected in the PA phase of the investigation can be used to develop the initial CSM that can serve as a basis to determining an approach in the SI phase such as sampling locations at AOCs, identifying COCs, media of interest, migratoin pathways.
9		5.3	Table 1	4th bullet: is DAP an acronym for Diffuse Anthropogenic Contaminant?	Yes
10	5	5.4		1st P, Next to last Sentence: add "both" between "'of" and "ecological"	ADDED
10	5	5.4		1st P, Last Sentence: Replace "expands and builds" with "will act to incrementally refine the CSM"	Agreed - Changed text
10	5	5.4		3rd P: Delete 1st sentence (2nd sentence covers same topic)	The first sentence leads into the second sentence, which is more descriptive about assumptions. Thank you for your comment.
16		App A	5.1	The summary of impacted media should include basic information for groundwater and surface water, such as classification and applicable remediation standards, to establish the potential risk from source impacts.	Agreed - Additional text added
17		App A	5.2	"Cleanup Goals" must be based on the remediation standards at N.J.A.C. 7:26D, which are in turn based on groundwater and surface water standards based on classifications and uses. Surface water quality standards include narrative criteria, human health criteria and aquatic life criteria. Under Sensitive Receptors, include the location of any PCWS-surface water intakes. Items recommended for inclusion in the summary of soil, groundwater and surface water sections were provided above (5.2.5.2 - 5.2.5.3) and should also appear in the Appendix A table. For indoor air assessments, a sump groundwater sample should be collected for analysis of site contaminants. Sumps may discharge to land surface outside of the house, to a drainage ditch or surface water body, to a storm water utility, etc. and this is another exposure pathway to be documented.	Section 5.2 was revised to include a discussion of remediation standards. In addition 5.2 references Appendix A as an optional checklist. It is assumed the investigator can use the checklist in conjunction with the appropriate sections of the guidance document.
18	Appendix A / CSM Checklist	5.2	Air(Soil Gas/Indoor Air)	Suggest adding something like the following two items/rows after the current 3rd item/row: <ul style="list-style-type: none"> Chlorinated VOC levels in GW within the last few years (at least 3 to 5 years) significantly greater than current levels. Past location of any known/likely chlorinated VO product in vadose zone or near water table in relation to current/future receptors 	Agreed - an additional bullet was added and included in Appendix A

	Appendix A / CSM Checklist			Column A: Type of Site (ie Gas Station, Industrial, DPW, Highway Authority, Residential, Farm, etc.)	Agreed - Changed text
	Appendix A / CSM Checklist			Column B: Areas of Concern--choose one or more (ie Gas Tank System Leak, Chemical Storage, Transformers, Septic Systems, Drums/Waste Storage, Lagoons, Landfills, etc.	Agreed - Changed text
	Appendix A / CSM Checklist			Column C: For Each AOC listed, provide data (as outlined in this document)	Agreed - Changed text
	Appendix A		5.1	Consider adding "Sediment" to Summary of Impacted Media cell.	Agreed - Changed text
	Appendix A		5.2	Typo: "heterogeneities"	Agreed - Changed text
	Appendix A			Inclusion of this "checklist" without further clarification on its use, implies that it is a required deliverable. A note should be added that clarifies that it is meant only as an aid to the investigator and it is not a deliverable.	CHANGED - We also added text in 5.2 that states the checklist is not required but we will reiterate in top of checklist.
20	Appendix B	Ex. 1		Most of the language in the first paragraph/bullet list is a repeat of info. in subsection 5.2.5.5 and seems too redundant. Suggest modifying the first half of Example 1 (the section before the figure) as indicated in the attached Word document.	DISCUSS Email Diane Groth. Ask her to look at modified sections (make changes before sending) and provide us with input. Copy Tracy
22 & 23	Appendix B	Ex. 2	Exposure Assessment	The exposure assessment discussion seems to indicate that the concept of a complete pathway differs from how that term is used in the NJDEP VIG. The latter document indicates that the VI Pathway is not considered complete unless vapor intrusion has occurred to the extent that the indoor air screening levels are exceeded. This Example and Figure 2-2 appear to be stating that the VI pathway is complete even though neither soil gas nor indoor air data have been obtained.	This example is to illustrate how to document development of the conceptual site model for an entire site. This figure was included to illustrate how to identify potential sources, pathways, and receptors. This was not associated with the previous example and has been revised to clarify these points.
24	Appendix B	Ex. 2	Figure 2-1	This figure is very difficult to see both on screen and when printed.	This figure was revised with higher resolution.
	Appendix B			This is not so much a CSM as an example of the questions that would be asked during the development of the CSM, and valuable in that respect. However, the title should be changed to something like: "Thought process in developing a CSM for vapor migration"	The title was modified to clarify.
	FIGURES			Most are too hard to read in this version.	Thank you for your comment
		General		The document describes the acronym "COC as chemicals of concern (page 2) and constituents of concern (Appendix A, Section 5.2), and also uses Contaminants of Potential Concern (COPC) in Appendix B. One acronym that represents one term should be used for consistency.	CHANGED to chemicals of concern
	General Comment:			Suggest we give some better CSM examples up front so this document does not scare people by its suggested level of complexity for a CSM. A full blown complex CSM may be needed for a large industrial site, but a much more limited CSM would be appropriate for a small gas station leak.	Thank you for your comment
	General Comment:			Perhaps we could develop a list of Types of CSMs to choose from for starters:	It is a good idea but it may limit the CSM, every CSM will be different and we feel the CSM should not be standardized. Thank you for your comment.