



Vermont DEC Sites Management Section Conceptual Site Model (CSM) Guidance

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As stated in ASTM International E1689-95, “a CSM should be used to enable experts from all disciplines to communicate effectively with one another, resolve issues concerning the site and facilitate the decision-making process.”

Frequently Asked Questions:

- 1) Q: I followed the IRule but my CSM was sent back. Why did this occur?
A: A CSM is not a checklist. It is a process that helps focus the direction of the site investigation by identifying the available data for the site and what data gaps must be filled. Please synthesize the information you are providing and demonstrate you have thought about the site. For example, if the CSM quotes the surficial geologic map and states there are glaciolacustrine deposits at the site, explain how this can affect plume formation and transport. If the depth to bedrock at the site is shallow, explain how this will inform the SI work plan. The CSM should also include information about potential historical and existing sources to help guide the development of the work plan.
- 2) Q: I haven't done a Phase II yet so I can't do a CSM. Right?
A: Incorrect! A preliminary CSM based on available data and possibly site visit observations should be developed before any media is sampled. As data are collected, the CSM is refined.
- 3) Q: I took lots of samples in soil/soil vapor/groundwater etc. Why are you asking about the CSM?
A: A good CSM will let you know where the data gaps are, and allow the investigator to focus limited resources so, when additional samples or other data are collected, they are the most useful to delineate the extent of the release. Conversely, the CSM will demonstrate any exposure pathways, and may indicate that no additional analytical samples are needed.
- 4) Q: I reported all the data collected in my (SI, LTM, etc.) report in the CSM. Why have I been told I haven't followed the IRule?
A: The CSM is not just a regurgitation of data. It is an interpretation of data to define the extent of the contamination and the potential migration pathways. This interpretation must assimilate collected data, site conditions, geology, hydrogeology, as well as specific contaminant properties, which, when evaluated concurrently, allows for the development of a more defined picture of what is occurring at the site.





A Conceptual Site Model should answer the question “What does this mean, and what does it tell me to do?”

A conceptual site model (CSM) is an evolving tool and should be refined with increased knowledge regarding the site. A preliminary CSM should be developed before any media is sampled. Past and current site use, site boundaries, topography, geography, geology, and potential anthropogenic preferential pathways should all inform the CSM. Additionally, a discussion of the nature of the contaminant(s) should be included; the contaminant’s physical and chemical properties, the most likely phase the contaminant will be found in (vapor, dissolved, sorbed to soils, NAPL, etc.), and the recalcitrant nature of the contaminant. Any infrastructure on the site, present and past, should be taken into consideration.

However, a conceptual site model is not simply a list of these aforementioned items. A good CSM uses the most comprehensive information at the time and synthesizes it into a roadmap. Sensitive receptors include both human and environmental, and future development of the site might shift one or both types of sensitive receptors. A CSM should contain all of the items in the IRule list (or more depending on the complexity of the site), but it is more than a sum of those parts. A CSM is not a checklist, but an evolving tool that needs to be updated as information (analytical, historical uses, future uses) becomes available. The CSM is a tool to assist in site management decisions.

The CSM should define source areas, and as more data are collected, refine these areas. In this manner, data gaps can be identified and inform where additional data is needed. Fate and transport need to be considered for each chemical and media. Evaluating migration pathways and the role of site geology in both facilitating and retarding contaminant transport, source(s) of contaminants, and receptors is an ongoing process. Future site development (when known) is a key component in considering remedial options in the overall understanding of the site.

The conceptual site model can identify data gaps, or conversely, if a good CSM demonstrates there is not an exposure pathway, it can eliminate the need for further analytical testing.

A CSM is a holistic depiction and should be able to relay germane site information to all stakeholders. It may include a schematic to depict the site and migration pathways. A CSM should answer the question “What does this mean, and what does it tell me to do?”

The CSM should be available to the field crew so they can refine it as new and unexpected data are collected. For a large site, it may be helpful to have weekly or monthly phone or skype conferences to discuss the CSM and refine it as necessary with the field crew, stakeholders, and regulators. Development of a CSM does not stop when site remediation begins. As data are collected during corrective action implementation, the CSM should be refined to help make decisions about what is working or what needs to be changed.