



## INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

# Conceptual Site Model

Office of Land Quality

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## **Background**

The IDEM Remediation Closure Guide issued March 22, 2012 (hereinafter referred to as the RCG), is based on the process of developing a conceptual site model (CSM). The purpose of this guidance document is to provide additional tools to enhance CSM development. This technical guidance document does not alter any existing IDEM guidance, rule, etc. The information contained herein was obtained from the referenced U.S. EPA sources.

## **CSM Development**

The following was modified from the U.S. EPA Triad Resource Center webpage entitled "Conceptual Site Model Development".

The conceptual site model (CSM) synthesizes and crystallizes what is already known about a site that is pertinent to decision-making requirements. Using all available information and with the assistance of appropriate disciplinary expertise, the project team develops a CSM that distills what is already known about the site. The CSM, in turn, can then be used to identify what more must be learned in order to achieve project goals.

- **A project's CSM may take any of a number of formats (usually a combination of text and diagrams).** The CSM should effectively portray concerns significant to site decisions. Formats should be decision-specific. For example, early in the site investigation phase, a CSM may be a schematic of the site showing primary areas of concern along with an accompanying text that describes the basis of each concern with supporting information (e.g. Sanborn maps) attached. As the site moves to the remedial investigation and on to remediation, the CSM could possibly include a pathways analysis to support risk evaluation, a fate and transport model, maps and cross-sections of the site with all pertinent features (e.g. surfacing materials, building footprints, fences, above- and below-grade utilities, topography, stratigraphy, extents of contamination, etc.) as well as text describing where contamination is believed to exist and what pathways are complete and have the potential to become complete.

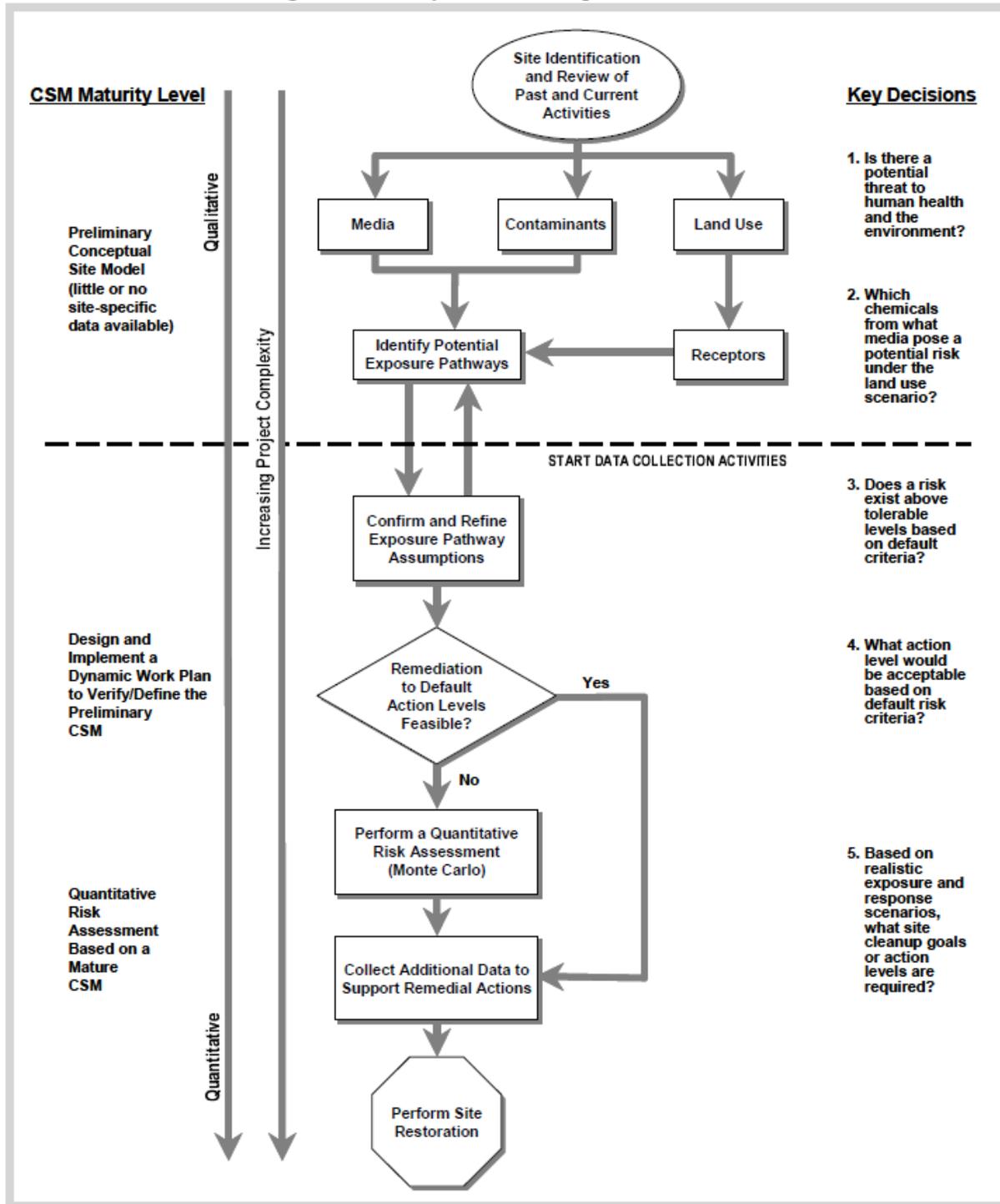
- **A project's CSM will evolve and mature as the project progresses.** At any given point in time, the maturity of the CSM reflects both the level of site understanding and the amount of information and complexity of analysis required to support the decisions that need to be made.
- **A sufficient CSM not only captures what is known about a site, but serves as a tool to identify data gaps.** A CSM helps evaluate the uncertainty associated with decision-making based on what is currently known. The result is to identify data gaps that, if addressed by additional data collection, will allow decision making (and thus the project) to move forward. The CSM should provide the foundation for developing information-gathering programs to reduce decision-making uncertainty to acceptable levels.

Since the CSM evolves as new data are collected, it is never "complete." The complexity of the CSM is commensurate with the complexity of the site, including its geology, history, contaminants, etc.

### **CSM Life Cycle Diagram and CSM Checklist**

The following pages contain a diagram of the CSM Life Cycle and a CSM Checklist, both developed by the U.S. EPA. Please note, although some terms may be slightly different than those used by the RCG, the overall CSM process is the same.

Figure 4. Life Cycle of a Conceptual Site Model



Conceptual Site Model (CSM) Items Checklist

<b>Facility Information</b>		
<b>CSM Item</b>	<b>Complete?</b>	<b>More Info Needed?</b>
Identify current and historical facility structures (buildings, drain systems, sewer systems, underground utilities, etc)		
Identify process areas, including historical processing areas (loading/unloading, storage, manufacturing, etc)		
Identify current and historical waste management areas and activities		
Other		

<b>Land Use And Exposure</b>		
<b>CSM Item</b>	<b>Complete?</b>	<b>More Info Needed?</b>
Identify specific land use(s) on the facility and adjacent properties		
Identify beneficial resources (groundwater classification, wetlands, natural resources, etc)		
Identify resource use locations (water supply wells, surface water intakes, etc)		
Identify subpopulation types and locations (schools, hospitals, day care centers, etc)		
Identify applicable exposure scenarios (residential, industrial, recreational, farming, etc)		
Identify applicable exposure pathways (contaminant sources, releases, migration mechanisms, exposure media, exposure routes, receptors)		
Other		

<b>Physical/Geological Features</b>		
<b>CSM Item</b>	<b>Complete?</b>	<b>More Info Needed?</b>
Identify topographical features (hills, gradients, surface vegetation, or pavement)		
Identify surface water features (routes of drainage ditches, links to water bodies, etc)		
Identify surface geology (soil types, soil parameters, outcrops, faulting, etc)		
Identify subsurface geology (stratigraphy, continuity, connectivity, etc)		
Identify hydrogeology (water-bearing zones, hydrologic parameters, impermeable strata, direction of groundwater flow, etc)		
Identify existing soil boring and monitoring well logs and locations		
Other		

CSM Items Checklist

<b>COC Release Information</b>		
<b>CSM Item</b>	<b>Complete?</b>	<b>More Info Needed?</b>
Identify potential source(s) of release(s)		
Identify potential contaminants of concern (COC) associated with each potential release		
Identify confirmed source locations		
Identify confirmed release locations		
Identify existing delineation of release areas		
Identify distribution and magnitude of COPCs and COCs		
Identify migration routes and mechanisms		
Identify fate and transport modeling results		
Other		

<b>Risk Management</b>		
<b>CSM Item</b>	<b>Complete?</b>	<b>More Info Needed?</b>
Identify a summary of risks		
Identify impact of risk management activities on release and exposure characteristics		
Identify performance monitoring locations and media		
Identify contingencies in the event performance monitoring criteria is exceeded		
Other		

<b>Cleanup Considerations</b>		
<b>CSM Item</b>	<b>Complete?</b>	<b>More Info Needed?</b>
Identify study options		
Identify study requirements		
Identify cleanup options		
Identify cleanup requirements		
Other		

## **Further Information**

Further information may be found in the RCG available here: <https://www.in.gov/idem/cleanups/resources/technical-guidance-for-cleanups/>

The following American Standards for Testing and Materials (ASTM) guide is available for purchase from <http://www.astm.org/>

- ASTM. 2003. *Standard Guide for Developing Conceptual Site Models for Contaminated Sites*. E 1689-95 (Reapproved 2008). ASTM International.

## **References**

IDEM, Remediation Closure Guide, March 22, 2012 (with corrections through July 9, 2012). Source:

<https://www.in.gov/idem/cleanups/resources/technical-guidance-for-cleanups/>

U.S. EPA Triad Central, "Conceptual Site Model Development". Source: [www.triadcentral.org/mgmt/splan/sitemodel/index.cfm?printversion=true](http://www.triadcentral.org/mgmt/splan/sitemodel/index.cfm?printversion=true)

U.S. EPA Triad Central, "Conceptual Site Model (CSM) Items Checklist". Source:

<http://www.triadcentral.org/tech/documents/CSM%20Items%20Checklist%2021Nov13.doc>

U.S. EPA "Using the Triad Approach to Streamline Site Assessment and Cleanup", June 2003. Source:

<http://www.triadcentral.org/tech/documents/Triadprimer.pdf>