Conceptual Site Models

Overview, Requirements, and Uses

Conceptual Site Model (CSM) Review

- Provides a complete picture of site conditions, known and potential receptors, and any data gaps which need to be addressed.
- Aids in determining next steps for investigation or cleanup.
- Clearly presents all information needed for closure preparation.

CSM – Page 1

MT DEQ Petroleum Tank Cleanup Section -- Release Closure Plan (7 Mar 2018)
for the Investigation, Cleanup, Monitoring & Closure of Petroleum Releases

Part 1: Site Summary & Remedial Investigation (RI) Results
reference: MT DEQ Remedial Investigation (RI) Guidance for Petroleum Releases

	Consultant:		Date:		DEQ PM:	
	Facility Name / Address:					
	Facility ID:		**Release:**		WP ID:	
Site Information	Release Cause, Source(s) & Petroleum Types:					
	other releases onsite and nearby:					
	Site Use(s) -- Former, Current & Planned:					
	Surface Conditions & Access:					
	former Petroleum Tank Systems:					
	current Petroleum Tank Systems:					
	Other:					
Subsurface	Stratigraphic sequence - layers & thicknesses:					
	Stratigraphic Continuity - Lateral Variation(s):					
	Groundwater Depth & Flow Direction(s):					
	Aquifer(s) unconfined, confined, perched:					
	Receptor Depth/Location (basements, utilities):					
	Other:					
Extent & Magnitude	Petroleum Types, Age & NAPL Mobility:					
	Surface Soil Impacts (0 to 2 ft bgs):					
	Vadose-Zone Soil Impacts:					
	Smear-Zone Soil Impacts:					
	Groundwater Impacts:					
	Surface Water Impacts:					
	Petroleum Vapor Impacts:					
	Other:					
Reports	RI and Monitoring Reports & Dates:					
	Pilot Tests & Results:					
	Results from Cleanup(s):					
	Other:					
	What currently prevents Release Closure?					
	additional information required for PMZ Closure:					
	Information & Data Gaps:					
	Recommendations and comments:					

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Site Information

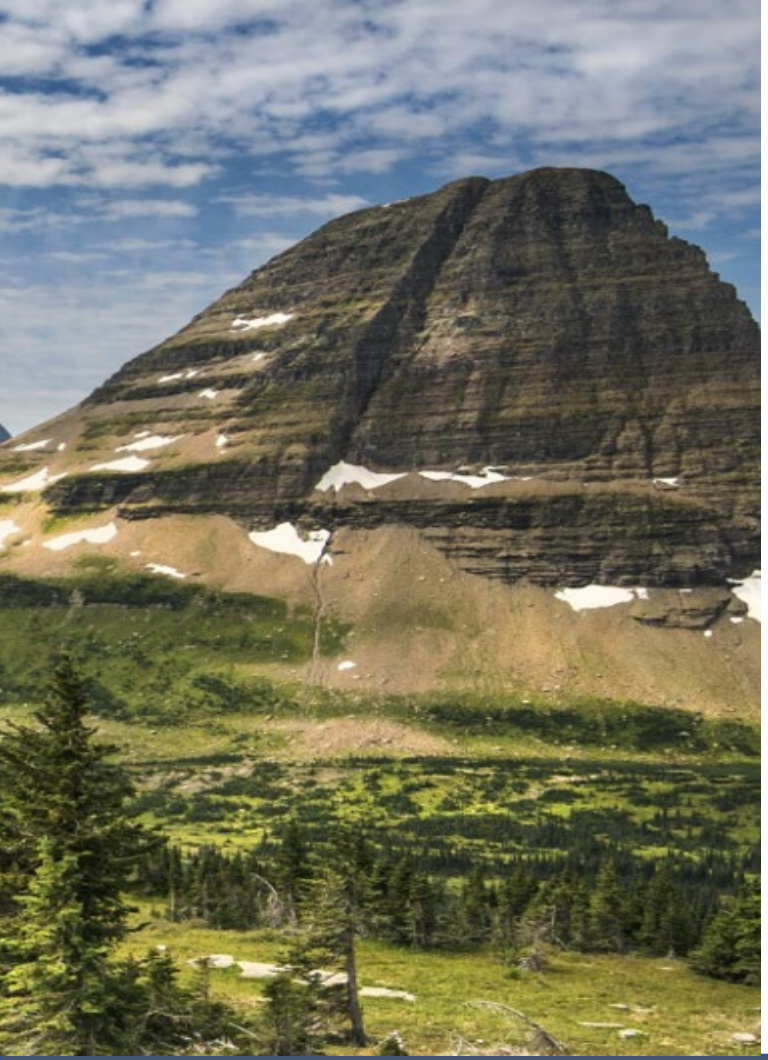
Site Information	
Release Cause, Source(s) & Petroleum Types:	
other releases onsite and nearby:	
Site Use(s) -- Former, Current & Planned:	
Surface Conditions & Access:	
former Petroleum Tank Systems:	
current Petroleum Tank Systems:	
Other:	

- Potential sources of information
  - Existing releases at facility
  - Phase II ESAs
  - Initial site visits

Subsurface and Extent & Magnitude

Subsurface	Stratigraphic sequence - layers & thicknesses:	
	Stratigraphic Continuity - Lateral Variation(s):	
	Groundwater Depth & Flow Direction(s):	
	Aquifer(s) unconfined, confined, perched:	
	Receptor Depth/Location (basements, utilities):	
	Other:	
Extent & Magnitude	Petroleum Types, Age & NAPL Mobility:	
	Surface Soil Impacts (0 to 2 ft bgs):	
	Vadose-Zone Soil Impacts:	
	Smear-Zone Soil Impacts:	
	Groundwater Impacts:	
	Surface Water Impacts:	
	Petroleum Vapor Impacts:	
	Other:	

- Potential sources of information
  - Remedial Investigations
  - High Resolution Site Characterizations



CSM – Page 2

MT DEQ Petroleum Tank Cleanup Section -- Release Closure Plan (7 Mar 2016)

for the Investigation, Cleanup, Monitoring & Closure of Petroleum Releases

Part 2: Conceptual Site Model (CSM) - Evaluation of Exposure Pathways

reference: MT DEQ Risked-Based Corrective Action (RBCA) Guidance for Petroleum Releases

Consultant:	0		Date: 1/0/1900	DEQ PM:	0
Facility Name:	0				
Facility ID:	0	Release: 0		WP ID: 0	

Complete Description for All Receptors

Describe why a Receptor is not threatened or impacted; and Describe proposed Investigation, Cleanup, and/or Monitoring Methods for each threatened or impacted Receptor.

Petroleum Source(s)	Affected Medium	Exposure Medium / Point	Exposure Route	Receptor	
Required: Complete Description of the Source(s) of Petroleum Release	Surface Soil (0 - 2 ft bgs)	Soil	Ingestion Dermal	Resident and/or Worker	
		Soil	Leaching	Groundwater	
		Dust/Vapors	Inhalation	Resident and/or Worker	
		Surface Erosion to Surface Water and Sediment	Ingestion Dermal	Recreator, Ecological Receptor [1]	
	Sub-Surface Soil (> 2 ft bgs)	Soil	Ingestion Dermal	Construction Worker [2]	
		Soil	Leaching	Groundwater	
		Indoor Air	Inhalation	Commercial or Residential Indoor Air	
		Dust/Vapors	Inhalation	Construction Worker	
		Buried Water Line	Ingestion Dermal	Resident and/or Worker	
		Buried Utility Line	Inhalation of Indoor Air	Indoor Resident and/or Worker	
	Groundwater	Groundwater		State water [3]	
		Indoor Air [4]	Inhalation of Indoor Air	Resident and/or Worker	
		Groundwater and Vapors	Ingestion Dermal Inhalation	Construction Worker [2]	
		Drinking Water	Ingestion Dermal	Resident and/or Worker	
		Surface Water and/or Sediment	Ingestion Dermal Inhalation	Recreator, Ecological Receptor	
		Buried Water Line	Ingestion Dermal	Resident and/or Worker	
		Buried Utility Line	Inhalation of Indoor Air	Indoor Resident and/or Worker	

Data Gaps:

Recommendations:

Footnotes:

1. Ecological Receptors (e.g. plants and animals) can be added as a separate line associated with surface soil but it is not common for PTC sites.
2. Construction worker covers excavations conducted for building construction, utility installation and repair, as well as residents planting trees, etc.
3. Standard or RBSL exceedence are a complete pathway to a receptor, which is state water (or groundwater).
4. Indoor Air is the exposure medium for a potential or known vapor intrusion setting where a resident or an employee of a business may breathe petroleum vapor from the release.

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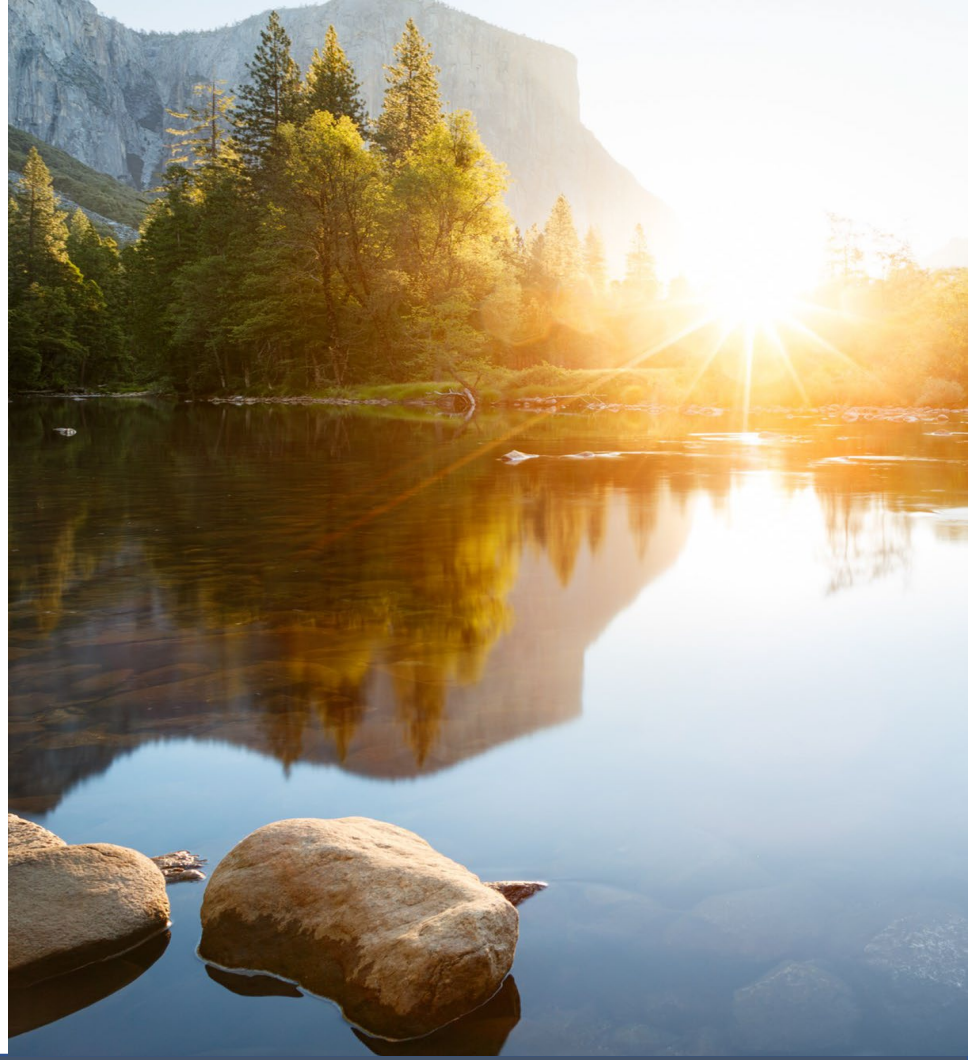
CSM Update Stages

- Initial Response Actions
- Remedial Investigation
- Cleanup
- Monitoring

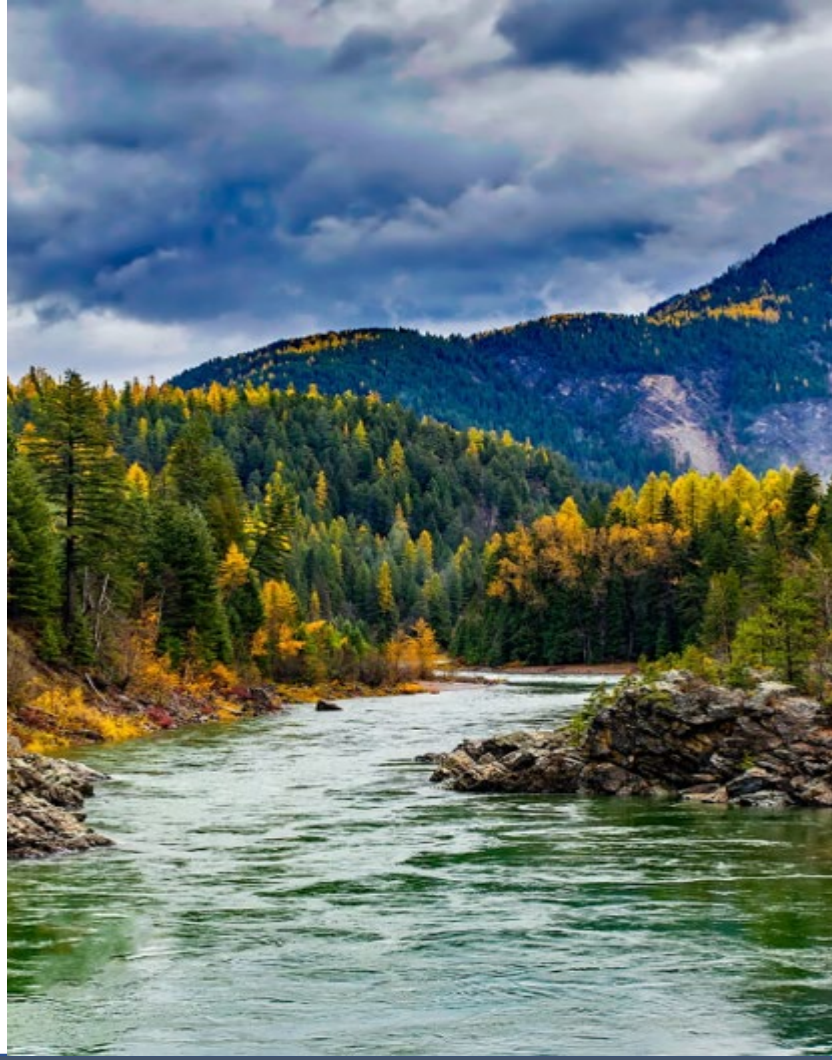


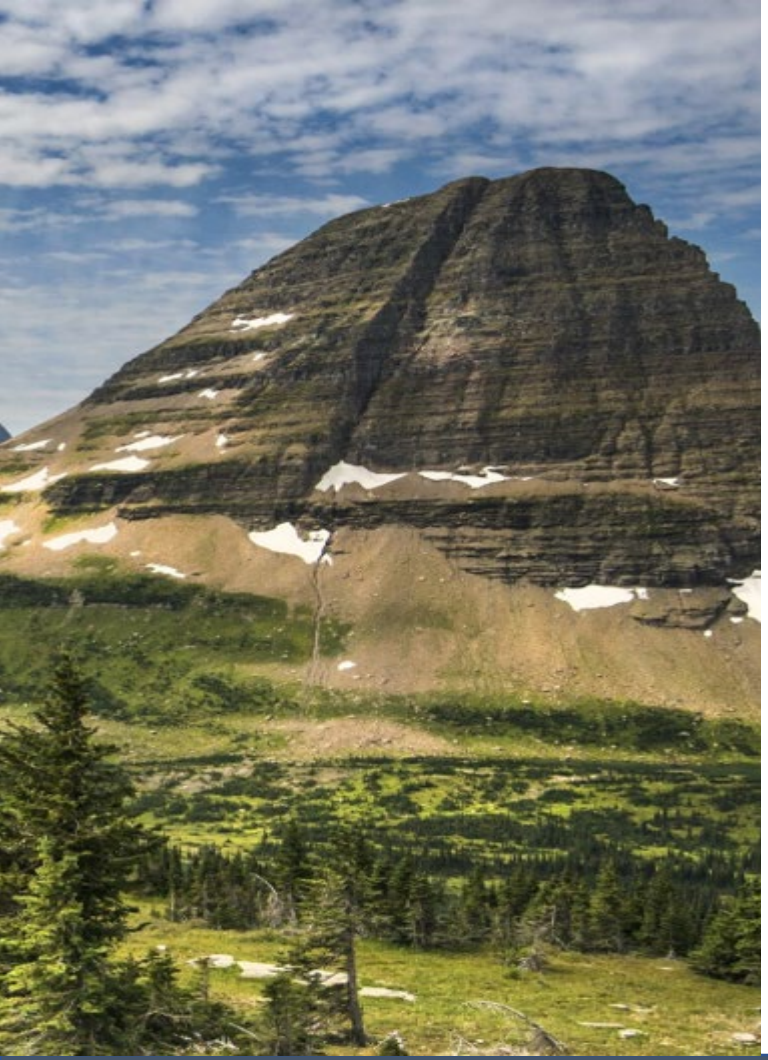
Initial Response Actions

- This is where you start creating the CSM, so include as much information, which is initially available, as possible

Remedial Investigations (RI)

- Use RIs to identify as much information as possible for the CSM and to guide cleanup activities.
- Most of the CSM should be completed at this time.



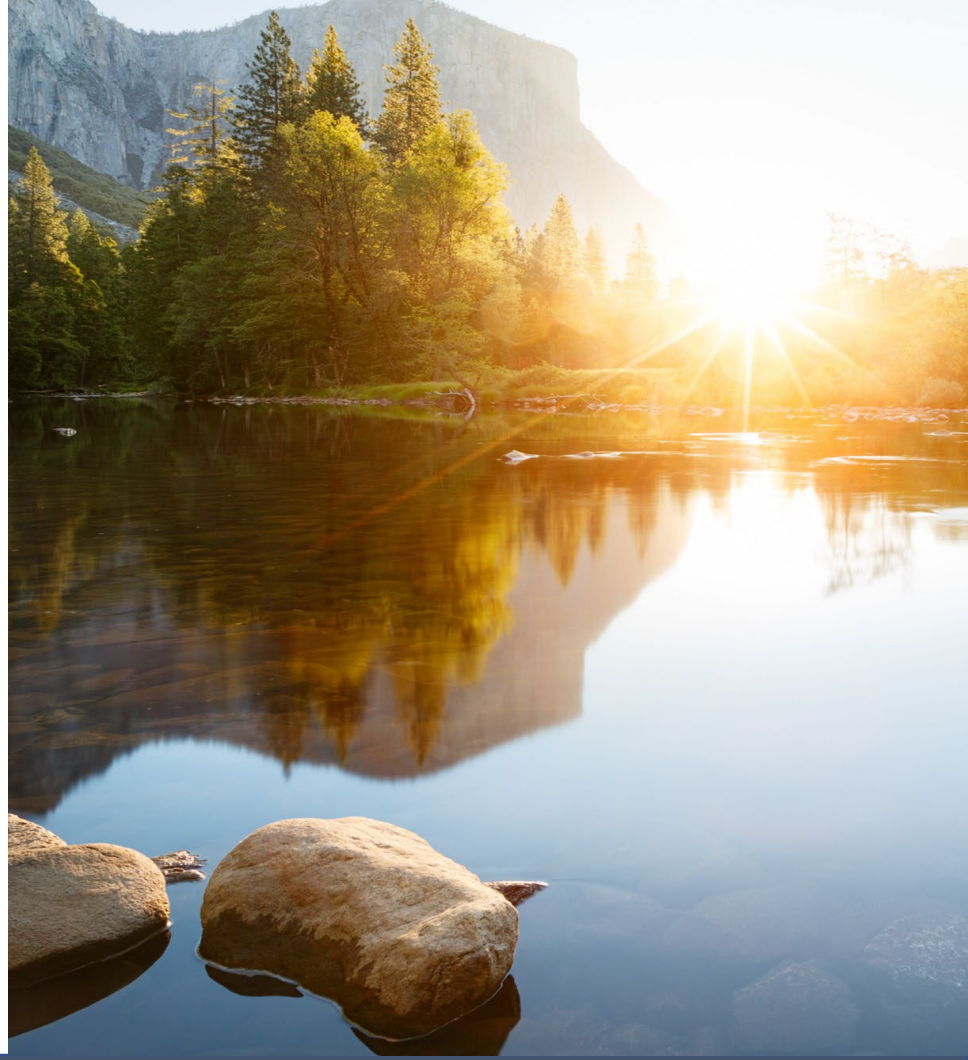


Cleanup

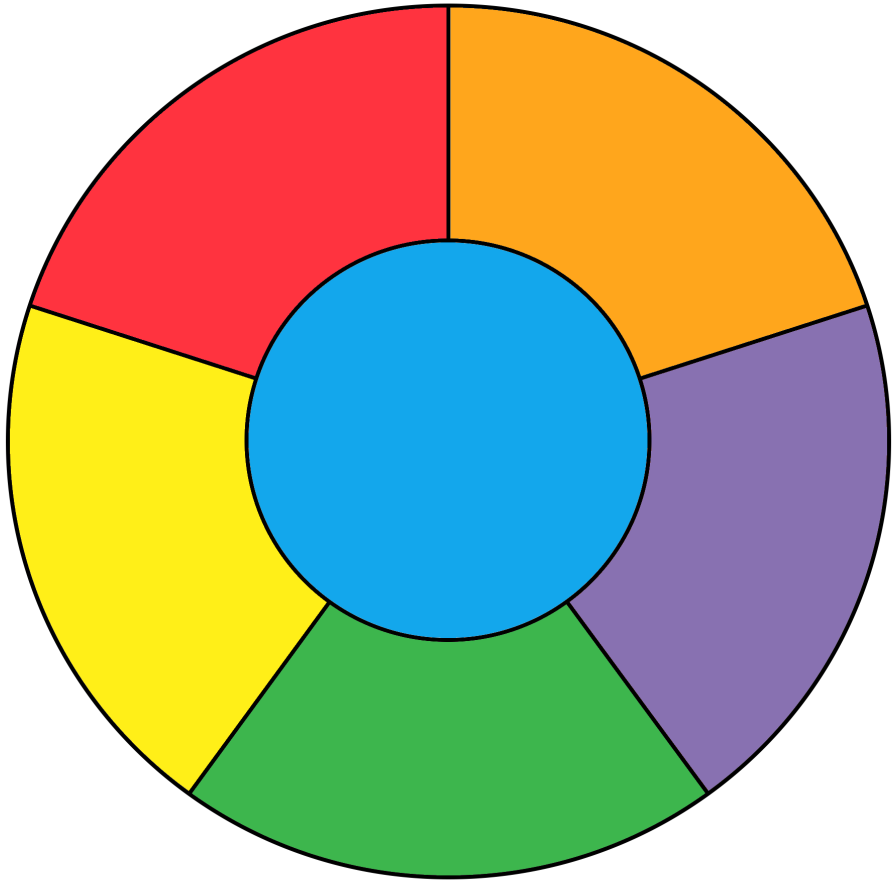
- Unless it is an emergency response, cleanup should be conducted with a CSM which is as complete as possible.
- After cleanup, update the CSM with new sampling data to obtain a current overview of the release.

Monitoring

- Monitoring should be performed once the CSM is complete and any remediation has been performed.
- Usually, monitoring does not supply any additional data for the CSM and only serves to assess the release for closure.

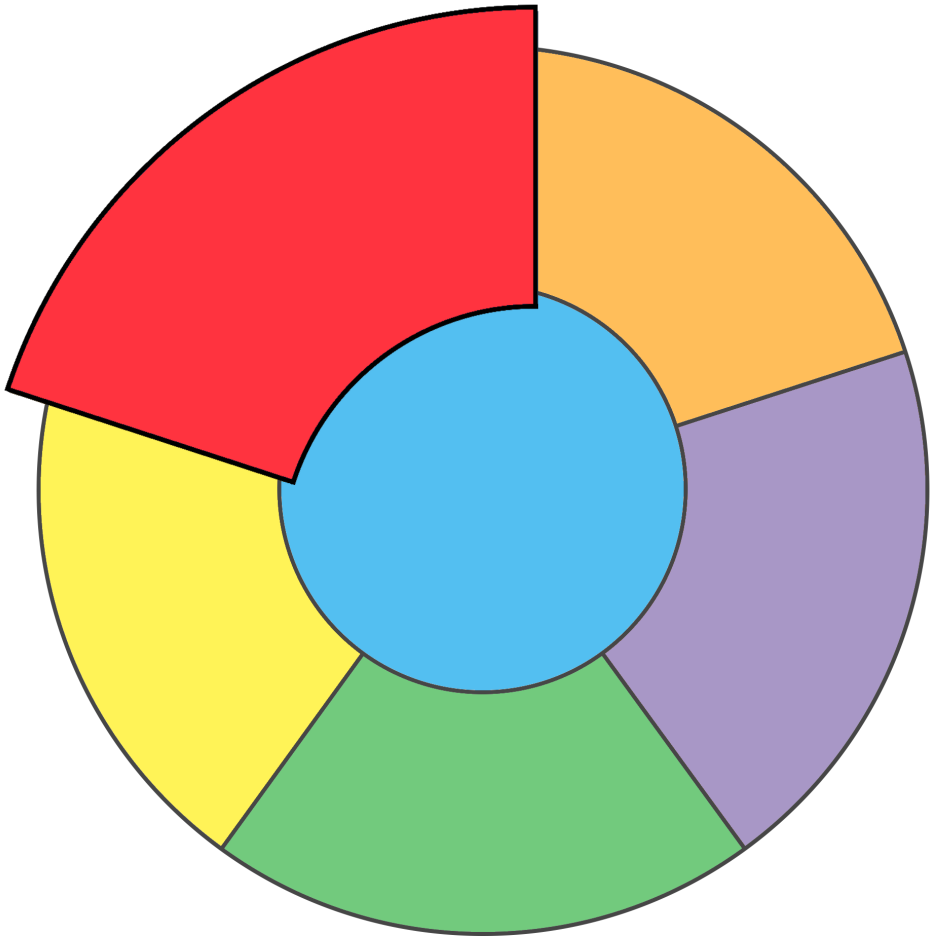


A Graphical Guide to CSM Completion



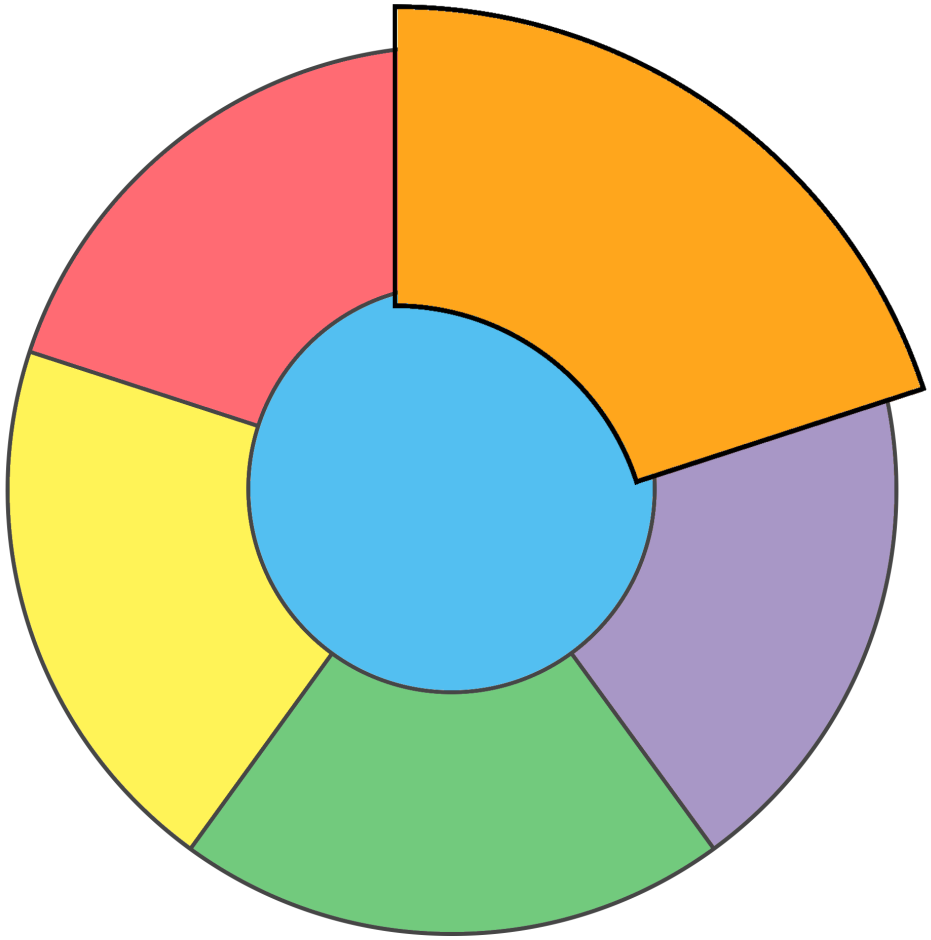
CSM – Areas of Investigation

- Completed CSMs must sufficiently identify the following areas:
  - Soil
  - Groundwater
  - Vapors
  - Site Conditions
  - Remediation



CSM – Soil

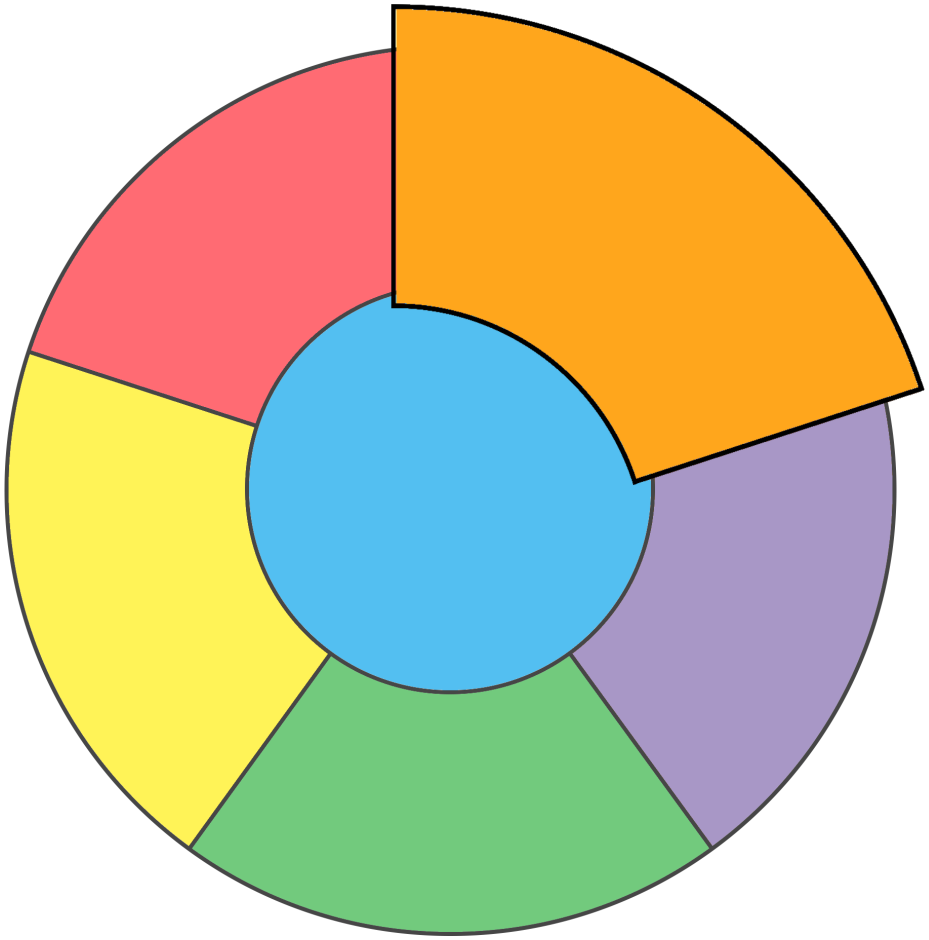
- Soil exposure media consists of:
  - Surface Soil (<2’)
  - Subsurface Soil (>2’)
  - Sediment
- Example soil exposure pathways:
  - Dermal (direct contact)
  - Ingestion
  - Non-vapor inhalation



CSM – Water

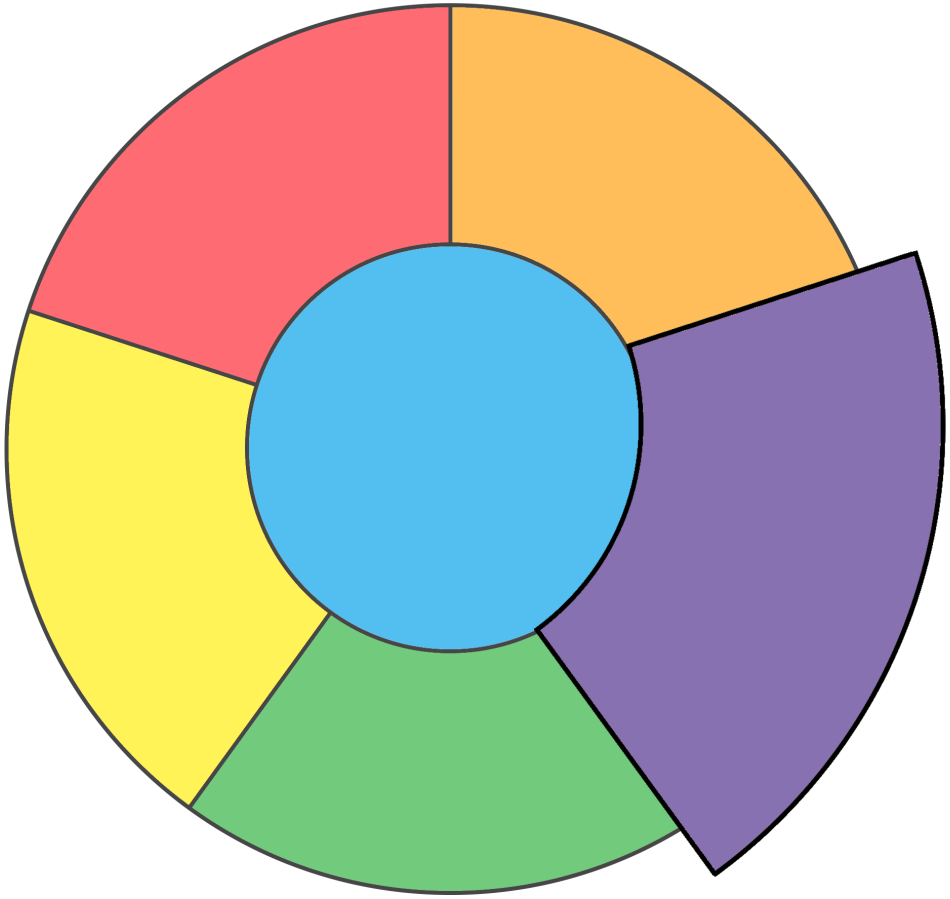
- Water exposure pathways consist of:
  - Groundwater*
  - Surface water*
  - Domestic wells
  - Permeation of water lines
  - Irrigation supplies

*Note that Groundwater and Surface Water are not considered receptors, but contamination present in them can cause exposure to other receptors.



CSM – Water (Continued)

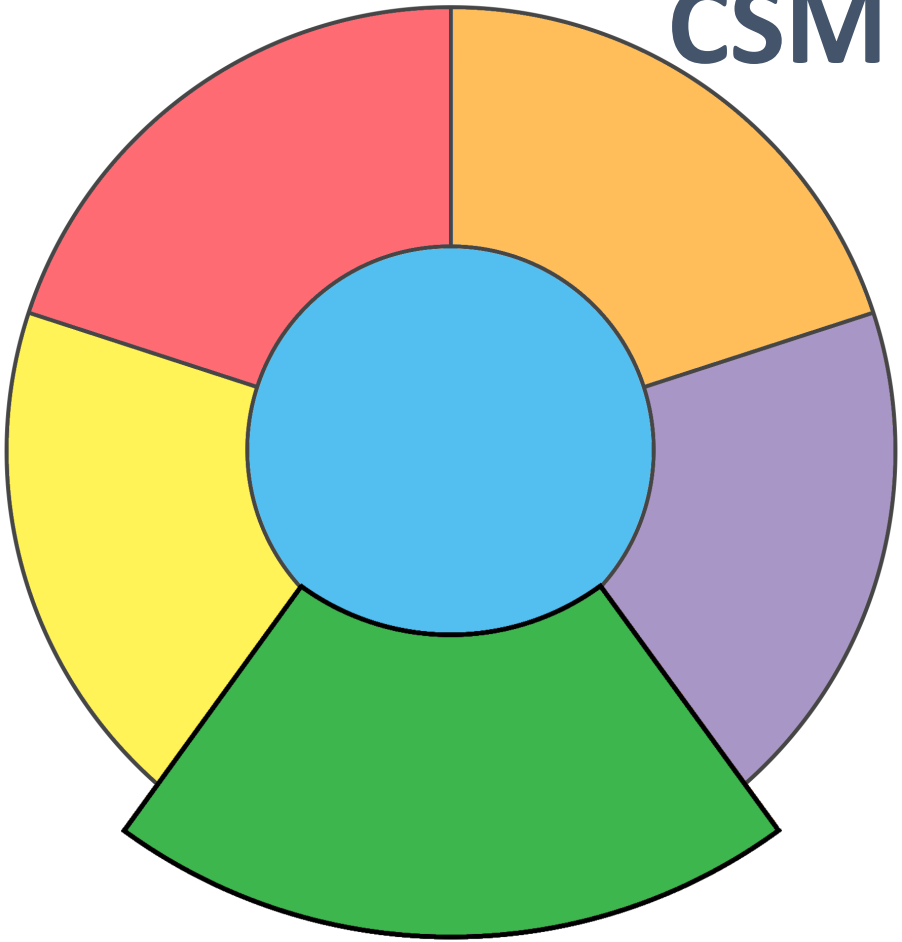
- Water exposure pathways consist of:
  - Ingestion
  - Dermal Contact



CSM – Vapors

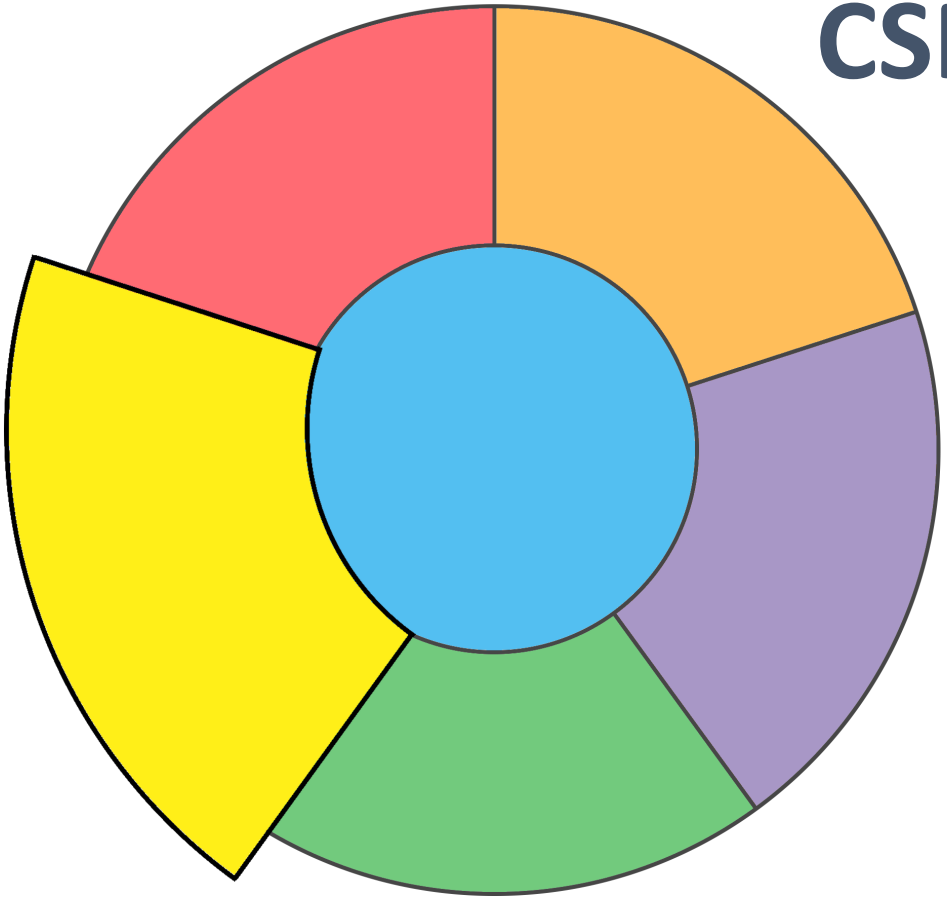
- Vapor exposure pathways consist of:
  - Subsurface soil (>2’)
  - Groundwater
  - Utility line permeation

CSM – Site Conditions



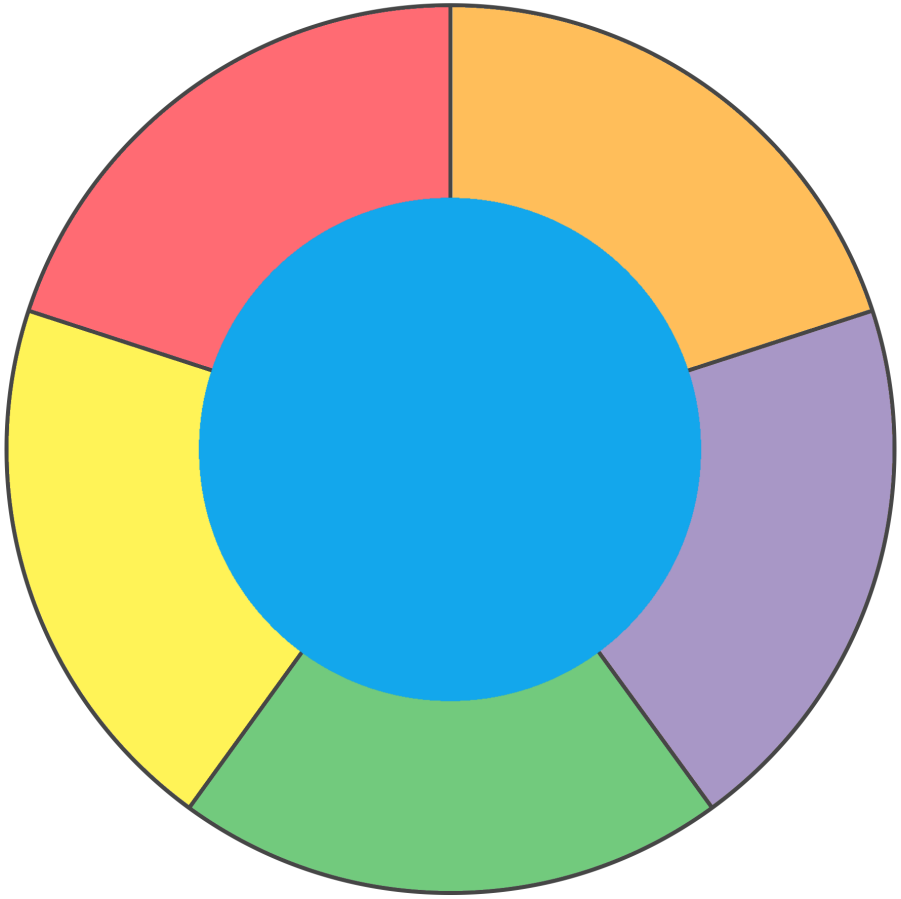
- When assessing Site Conditions, consider the following:
  - Current site use
  - Previous use
  - Presence of any petroleum equipment
  - Impacts to neighboring properties
  - Future use*

*Only immediate future use is considered, e.g. if there is an active plan of rezoning Facility.



CSM – Remediation

- If remediation has been performed, appropriate sampling and analysis should be done to assess any remaining exposure pathways.
- This still will require monitoring soil, water, and vapors; but will aid in reducing exposure pathways.



A Complete CSM

- If all sections are adequately addressed the CSM is complete and closure of the release may be considered.

Recap – Receptor Exposure Routes

Dermal Contact

- Groundwater
- Surface soil
- Subsurface soil
- Sediments
- Domestic water supplies
  - Groundwater
  - Surface water
  - Subsurface soil

Inhalation

- Surface soil dust/vapors
- Utility line permeation
  - Surface/subsurface soil
  - Groundwater
- Subsurface soil
- Indoor Air
  - Subsurface soil
  - Groundwater

Ingestion

- Surface soil
- Subsurface soil
- Surface water
- Groundwater

Questions?