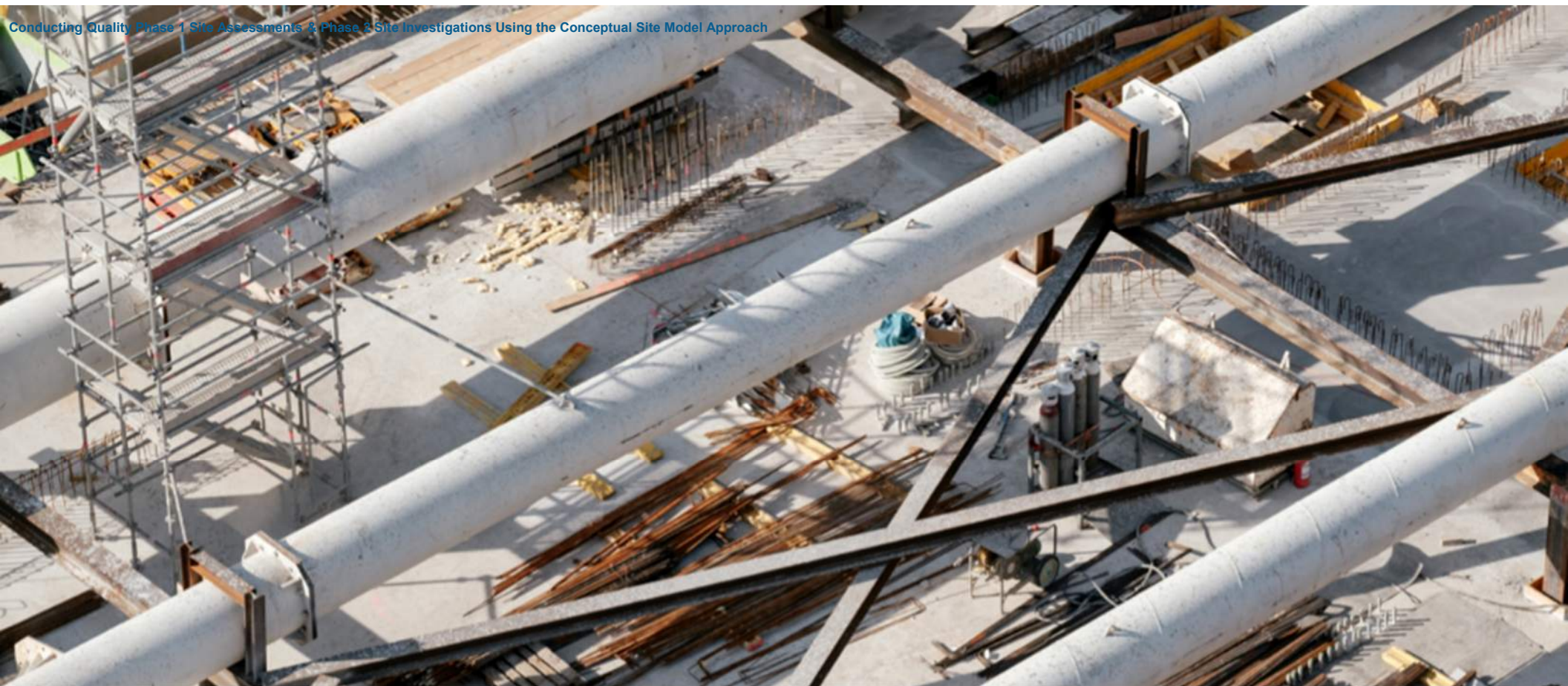




**Tighe&Bond**

**Quality Site Assessments & Investigations  
Using the  
Conceptual Site Model Approach**



Conducting Quality Phase 1 Site Assessments & Phase 2 Site Investigations Using the Conceptual Site Model Approach

# CONDUCTING QUALITY SITE ASSESSMENTS

Using the Conceptual Site Model (CSM) Approach

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Project Manager





# CONTENT

ASTM Phase I ESA and NHDES Initial Site Characterization

# WHAT IS A CONCEPTUAL SITE MODEL (CSM)

## Develop the Initial CSM

“The CSM is a site-specific description of how contaminants entered the environment, how they have been and may be transported within the environment, and routes of exposure to human and environmental receptors...”

- Narrative and Illustrative description

## The CSM is a Dynamic Framework for:

- Identifying and addressing data gaps and managing uncertainty
- Eliminating or controlling contaminant sources
- Developing and conducting response action strategies
- Evaluating whether response actions have achieved desired endpoints

# PHASE I COMPARISONS

## **ASTM Phase I ESA is conducted for Real Property Transactions**

**PURPOSE:** Real Property Transactions

- Gathers “soft” information on Site characteristics
- Site reconnaissance
- Public records review to identify environmental issues (Recognized Environmental Conditions [RECs])
- Interviews (User Questionnaire)
- Phase I ESA information is used to develop a CSM and developing a sampling plan (Phase II ESA)
- CSM not specifically mentioned, but lays the groundwork to start developing a CSM

## **NHDES Initial Site Characterization (ISC) – following discovery of a spill/release**

**NHDES Regulation: Env-Or 600 CONTAMINATED SITE MANAGEMENT**

**PURPOSE:** Define source, nature and extent, and potential receptors

- Following notification of a release (gw, NAPL, spill, soil)



# ASTM PHASE I ENVIRONMENTAL SITE ASSESSMENT

## • List of ASTM Guidelines:

- ASTM E 1528-14 for a Transaction Screen
- ASTM E 1527-13 for a Phase I Environmental Site Assessment (compliant with AAI req. until 12/15/23)
- ASTM E2600-10 for Vapor Encroachment Screening on Property Involved in Real Estate Transactions
- ASTM E2247 for Phase I ESAs for Forestland and Rural Property
- ASTM E 2247-16 for a Phase I ESA with All Appropriate Inquiry (AAI)

As **previously reported**, there are **key differences** between the 2013 and 2021 Standard. The 2021 Standard provides:

- revised definitions and additional instructions for "review of land title records," "property use limitations," "likely," "significant data gaps," "presumed viability," and the "level of inquiry" depending on the future intended uses of the subject property.
- that Phase Is should describe the specific features, activities, uses, and conditions which *both were and were not* present at the subject property.
- that a prior environmental site assessment may be used as guidance but *shall not* be relied upon as representative of current features, activities, uses, or conditions.
- that emerging contaminants such as PFAS can be considered for inclusion as non-scope considerations.
  - Importantly, once an emerging contaminant is defined as a hazardous substance under CERCLA, these substances must be evaluated within the scope of E1527-21.
- that an opinion should be given as to whether additional investigations may be appropriate, but that recommending a specific course of additional action *is not required and falls outside of the scope of the 2021 Standard*.

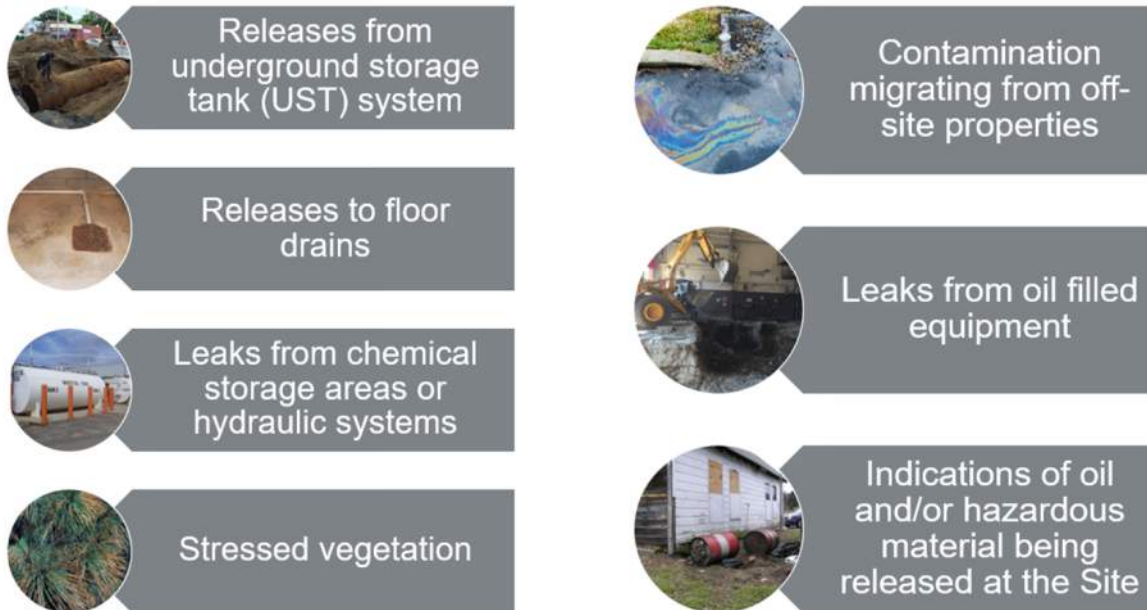
Source: Winston & Strawn LLP, 1/26/23

# ASTM PHASE I ESA (CONT'D)

## Scope:

- Site reconnaissance visit
- Review historical information
- Interview people familiar with past and present operations (fill out questionnaire)
- Review online data sources (NHDES OneStop)
- Review Federal, State, and local files (incl. historical society)
- Phase I ESA information is used to develop an initial CSM for sampling plan design (Phase II)

## RECOGNIZED ENVIRONMENTAL CONDITIONS



# NHDES INITIAL SITE CHARACTERIZATION (ISC)

## What is Important to include

- **Conducting the ISC (*Env-Or 605.08*)**
  - Initial reporting of the release / spill condition
  - Summary of source, location, estimated quantity of spill, response actions taken
  - Determine nature and extent
  
- **Writing the ISC Report (*Env-Or 605.09*)**
  - Six sections:
    - Site information
    - Sample data summary
    - Field logs (test pits, boring logs, MW construction)
    - Receptor survey (within 500' of the site)
    - Previous reports/sample data not already on file
    - Summary of findings





# SOURCES OF INFORMATION

The Phase I Process

# INFORMATION SOURCES – PHASE I

## Private Records

- Past site assessment report, UST closure reports
- Facility as-built drawings
- Safety Data Sheets for what hazardous substances are used
- Waste handling records (disposal documents)
- Process diagrams/schematics

## Public Records

- Ownership records
- Newspaper articles, historical society
- Municipal offices and records
- State databases – NHDES OneStop
- State Geologist Office – maps
- Google





# PHASE I

## What is Important

- **ASTM specifies which records to review**
  - Research Property back to 1940
  - Not a “one size fits all” situation
  - It is up to the Env. Professional to decide which records deserve detailed analysis based on site-specific conditions
  - Focus on records that will materially affect CSM development
- **NHDES ISC Report**
  - Initial reporting of the release / spill condition
  - Summary of source, location, estimated quantity of spill, response actions taken
  - Determine nature and extent
  - Follow the prescribed format for the ISC report, *Env-Or 605.09*





# DEVELOPING THE INITIAL CSM

The Phase I Process

# RECOGNIZED ENVIRONMENTAL CONDITIONS



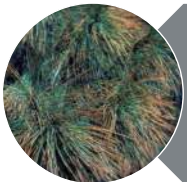
Releases from underground storage tank (UST) system



Releases to floor drains



Leaks from chemical storage areas or hydraulic systems



Stressed vegetation



Contamination migrating from off-site properties



Leaks from oil filled equipment



Indications of oil and/or hazardous material being released at the Site



# CONCEPTUAL SITE MODEL (CSM) – PHASE I

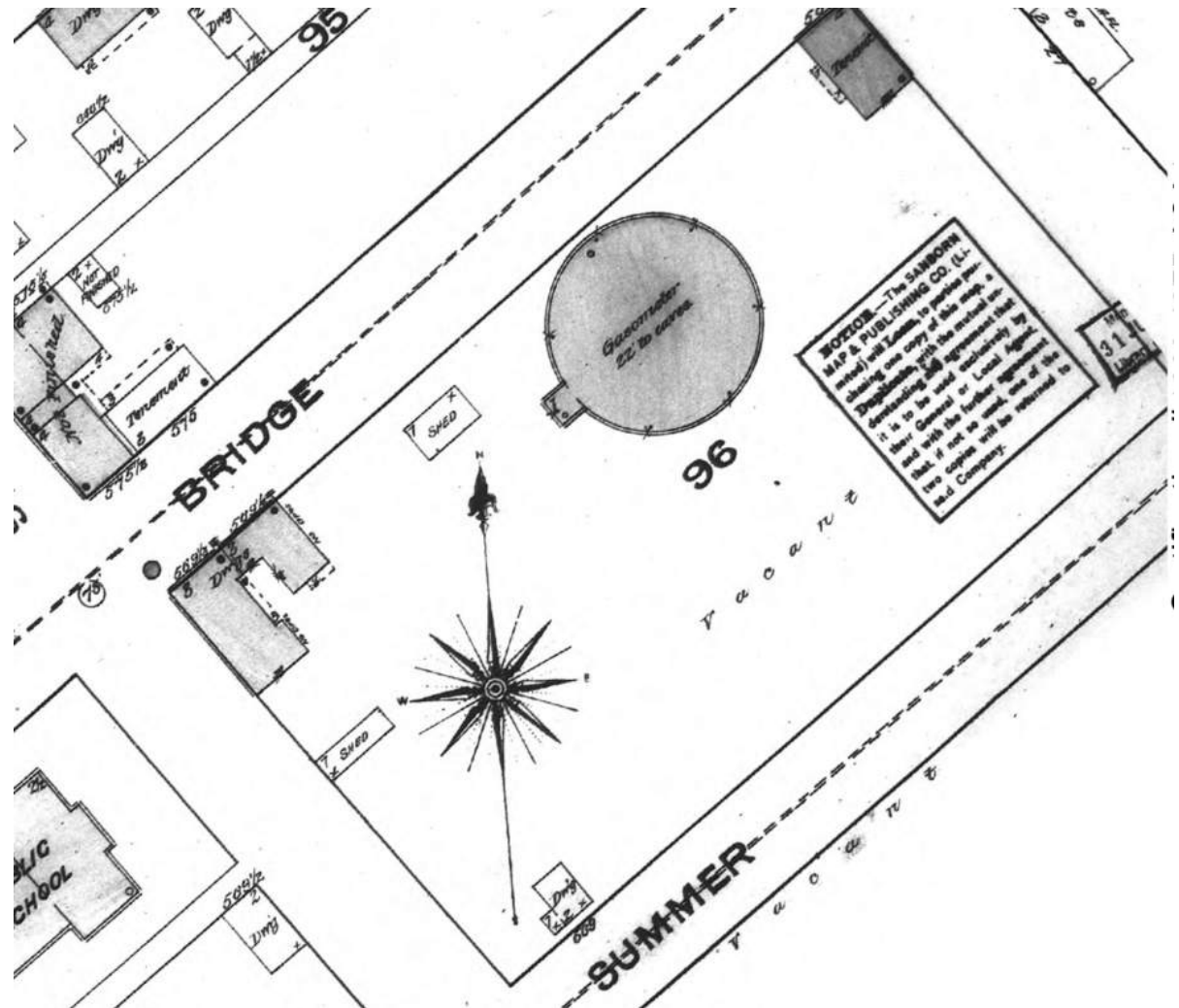
## Known Information

### – From Observations:

- Chemical storage and use
- Manufacturing processes
- Cracks, voids, penetrations
- Staining
- Presence of human/environmental receptors

### – From Records:

- As-built drawings
- Floor drains
- Septic systems
- MSDS/SDS
- UST tightness testing
- Sanborn Fire Insurance Maps
- Analytical Data (sometimes available)



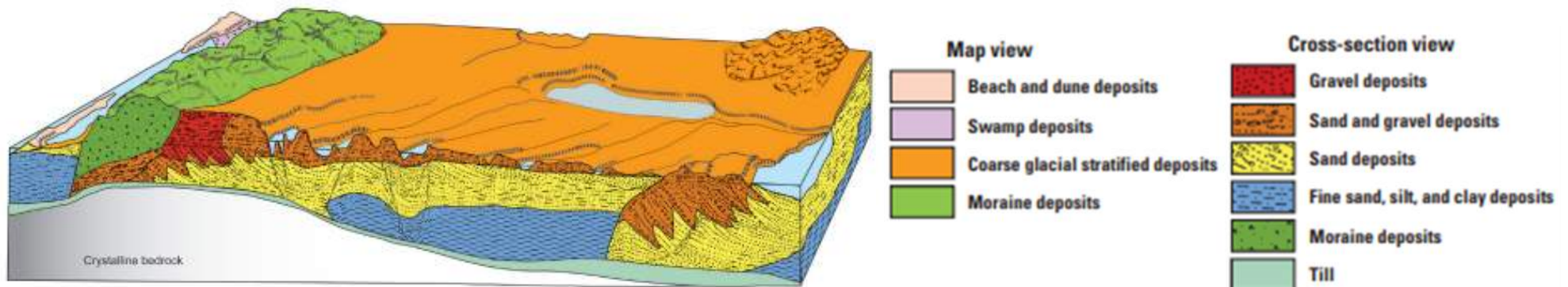
Source: The Sanborn Library, LLC



# RECORDS REVIEW – PHASE I

## Physical Setting (Current Mapping, Site Reconnaissance)

- Establishes general use of the property and adjacent property uses
- Population density and human receptors
- Sensitive environmental receptors
- Site use
- Site geology
- Topography
- Hydrogeology



Source: USGS *Surficial Geologic Map of the Heath-Northfield-Southwick-Hampden 24-Quadrangle Area in the Connecticut Valley Region, West-Central Massachusetts* (Janet R. Stone and Mary L. DiGiacomo-Cohen)

# CONCEPTUAL SITE MODEL (CSM) – PHASE I

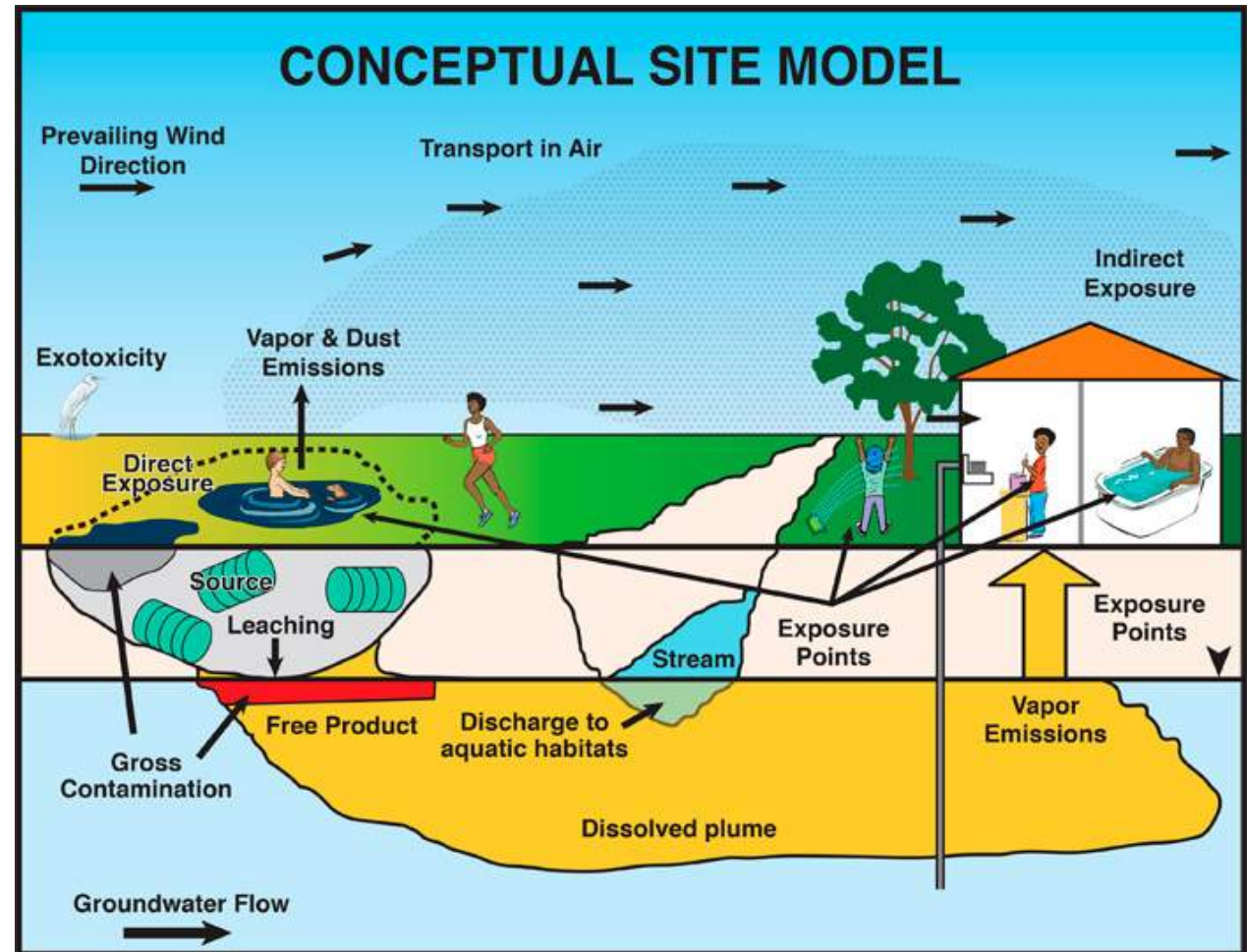
## EPA

“The Conceptual Site Model (CSM) is an iterative, ‘living representation’ of a site that summarizes and helps project teams visualize and understand available information”

- Temporal (time-related)
- Iterative
- Living Model
- Guides assessment
- Informs cleanup objectives
- Exposure pathways

A CSM is continually “redeveloped” using:

- Known Information
- Hypothesized Information



Source: Interstate Technology Regulatory Council (ITRC) *TPH Risk Evaluation at Petroleum-Contaminated Sites*

# CONCEPTUAL SITE MODEL (CSM) – PHASE I

## What Makes a Good CSM? (Follow the state CSM guidance)

### – Adequate Site Characterization: How, When, What, and Where

- Source magnitude
- Contaminants of concern and source(s) identified
- General contaminant behavior discussed and hypothesized in CSM
- Site physical characteristics
- Extent of release
- Potential exposure pathways identified
- Preferential pathways contemplated
- Potential receptors are identified

### – Refined with New Information

- New data means time to update CSM
- Discussion of data is incorporated
- CSM assumptions are refined each report
- Confounding sources discussed as needed (indoor air)
- Discuss deviations from CSM and implications





# EXAMPLES OF COMMON CONTAMINANTS

Characteristics, Fate and Transport

# COMMON CONTAMINANTS

## Volatile Organic Compounds (VOCs)

- Organic solvents (chlorinated or not)
- Gasoline/light petroleum distillates

## Semi-Volatile Organic Compounds (SVOCs)

- Petroleum (TPH, EPH, PAHs)
- PCBs
- Explosives

## Metals

- RCRA 8: arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver
- Additional: antimony, beryllium, copper, nickel, thallium, vanadium, zinc

## PFAS

- Fire-fighting foam (AFFF)
- Plastics/non-stick coating manufacturing

# COMMON CONTAMINANTS AND SOURCES

## Semi-Volatile Organic Compounds (SVOCs)

- Facility fuel tanks (USTs, ASTs), automotive waste oil, machine/cutting oils, hydraulic fluid
- Electrical transformers, substations, degraded or incinerated building materials
- Explosives (nitroaromatics – TNT, etc.)
- Chemical engineering residues/additives
- Coal gasification (former MGP sites)
- Pesticide and herbicide production, preparation and storage

## Volatile Organic Compounds (VOCs)

- Industrial manufacturing (degreasing)
- Military bases, drycleaners
- Gasoline stations
- Woodworking facilities (furniture stripping)
- Brake and carburetor cleaners



# COMMON CONTAMINANTS AND SOURCES

## Metals

- Electroplating (chromium [III, VI], nickel, zinc)
- Firing ranges (antimony, lead)
- Machining (chromium, vanadium)
- Paint manufacturing (lead)
- Mining, smelting (all)
- Coal combustion powerplants/boiler rooms (arsenic, lead, mercury, vanadium)

## PCBs

- Substations and switchyards
- Electrical utility headquarters/work centers
- Transformer manufacturing facilities (G&E)
- Construction waste: dumped/degraded or incinerated building materials
- Transformers
- Caulking, paint, gasket manufacturing

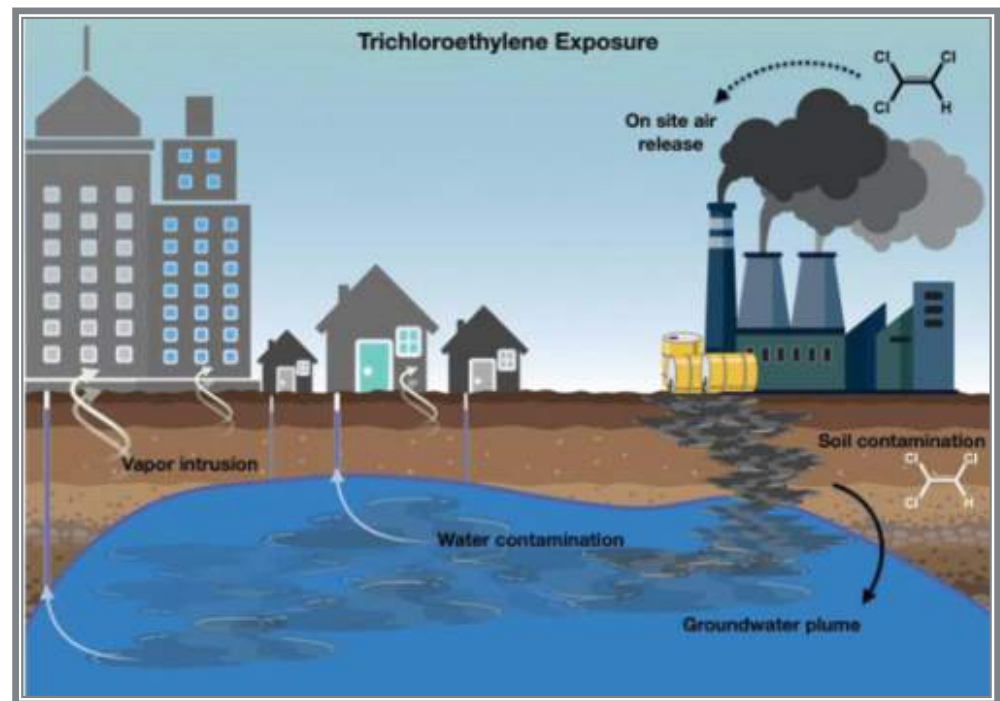
# COMMON CONTAMINANTS – FATE & TRANSPORT AND EXPOSURE

## Physical Characteristics

- CSM should include physical and chemical factors for each substance being assessed
- Not all contaminants behave similarly in the environment (or at the same site)
- Include known/anticipated contaminant behavior in the environment

## Contaminant Characteristics

- Mobility
- Density
- Solubility
- Volatility
- Toxicity
- Persistence
- Bioaccumulation



Source: University of Rochester Medical Center: *Common Drycleaning Chemical Linked to Parkinson's Disease*

## LESSON LEARNED



### **Sometimes you need to look close .... Real close!**

- No records of a UST
- Tank was under a mature tree
- No exposed piping in the basement or foundation walls
- Identified a steel pipe penetrating from within a tree



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**Questions?**