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PHASE III REMEDIAL ACTION PLAN ADDENDUM

Public Involvement Plan (PIP) Meeting
Former Varian Facility (Site 3-0485)
150 Sohier Road
Beverly, Massachusetts

January 24, 2023
Beverly High School

Agenda

1. Introduction
2. Phase III Remedial Action Plan Addendum
   - Process
   - Selected Remedial Actions
3. Next Steps
4. Questions

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Generalized Massachusetts Contingency Plan (MCP) Process

Phase I: Initial Investigation
- Initial investigations
- Implement preliminary response actions where needed

Phase II: Comprehensive Site Assessment
- Determine nature and extent of contamination
- Evaluate potential risk to determine if cleanup plan is needed

Phase III: Remedial Action Plan*
- **Evaluate cleanup options based on defined criteria: effectiveness, reliability, difficulty, cost, risk, green benefit, timeliness**

Phase IV: Remedy Implementation
- Complete cleanup design and plans
- Begin treatment

Phase V: Operation and Maintenance
- Verify that cleanup continues to operate as planned
- Monitor remedy effectiveness

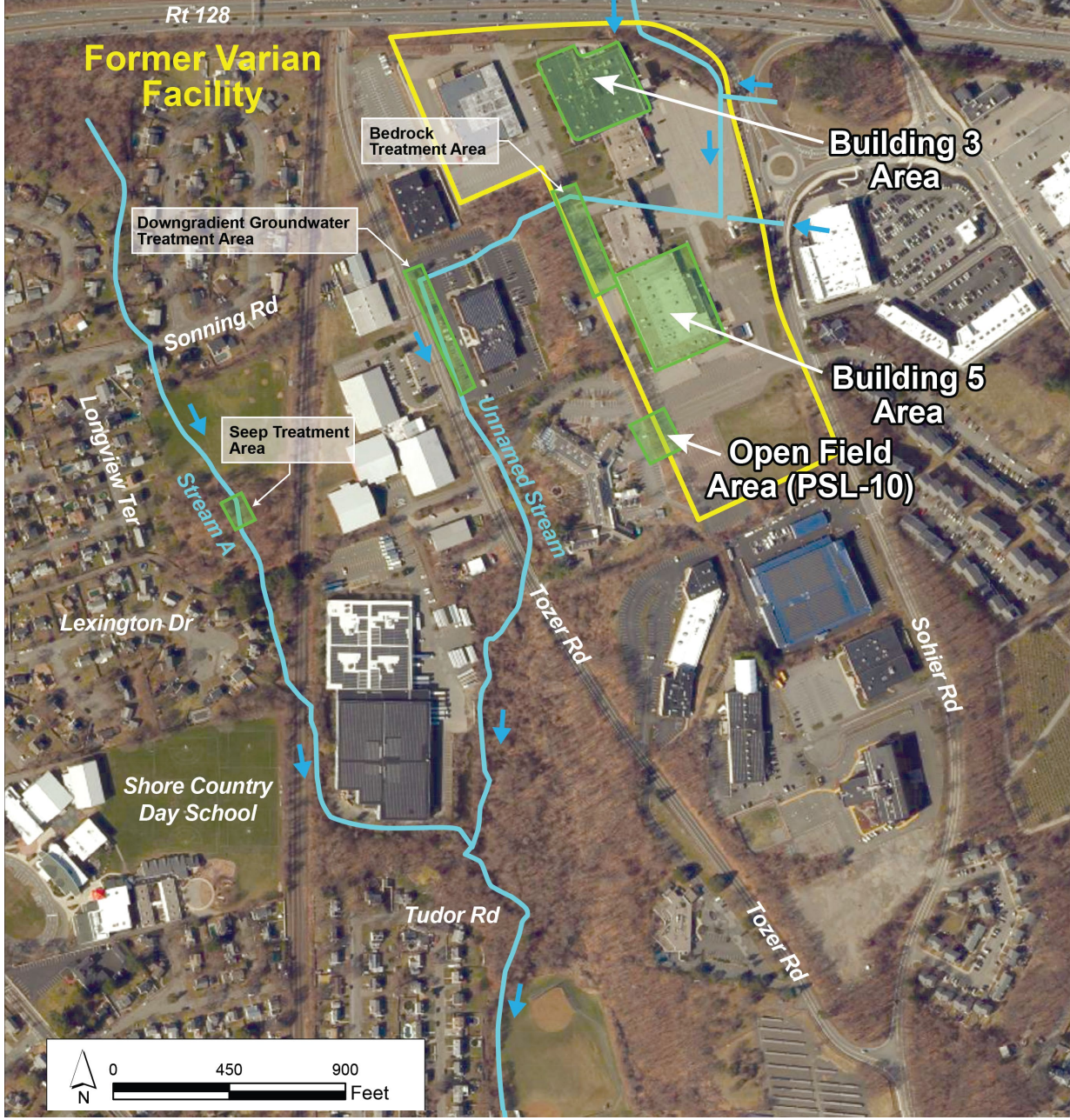
Permanent or Temporary Solution
- Determination that a site has been cleaned up to background levels, if feasible, or, if not, to levels of no significant risk.

PUBLIC INVOLVEMENT PROCESS

*** A new Phase III Remedial Action Plan has been developed based on the Revised Phase II Comprehensive Site Assessment.**

Phase II Addendum Outcome

- **No Significant Risk** for all current workers and residents*
- **Buildings 3 and 5 Areas**
  [including Potential Source Locations (PSLs) 5, 6, 7 and 11)]
  - Additional source area treatment to address dense non-aqueous phase liquid (DNAPL)
- **Bedrock**
  - Additional treatment for DNAPL likely present in bedrock between Buildings 3 and 5
- **Open Field Area (PSL-10)**
  - No indication of DNAPL and comparatively lower concentrations of VOCs, but additional groundwater treatment may be warranted
- **Downgradient Groundwater**
  - Groundwater treatment is proposed
- **Seep to Stream A**
  - Mitigation measure is proposed



* With existing SVE systems operating. Additional monitoring needed for one commercial and one residential location.

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Phase III Remedial Action Plan Process

Understanding “Cleanup” under the MCP

Cleanup is complete when a condition of No Significant Risk exists and a Permanent Solution has been achieved.

When feasible, the property should be restored to the conditions that would have existed if the property had never been contaminated.

- **No Significant Risk** means no pollutants present a significant risk of harm to health, safety, public welfare, or the environment currently and during any foreseeable period of time.
- A **Permanent Solution** is achieved when measure(s) attain a level of control of each pollutant such that there will be no significant risk or damage to health, safety, public welfare, or the environment during any foreseeable period of time.
- The MCP allows for **Temporary Solutions** which eliminate substantial hazards until a Permanent Solution is achieved.

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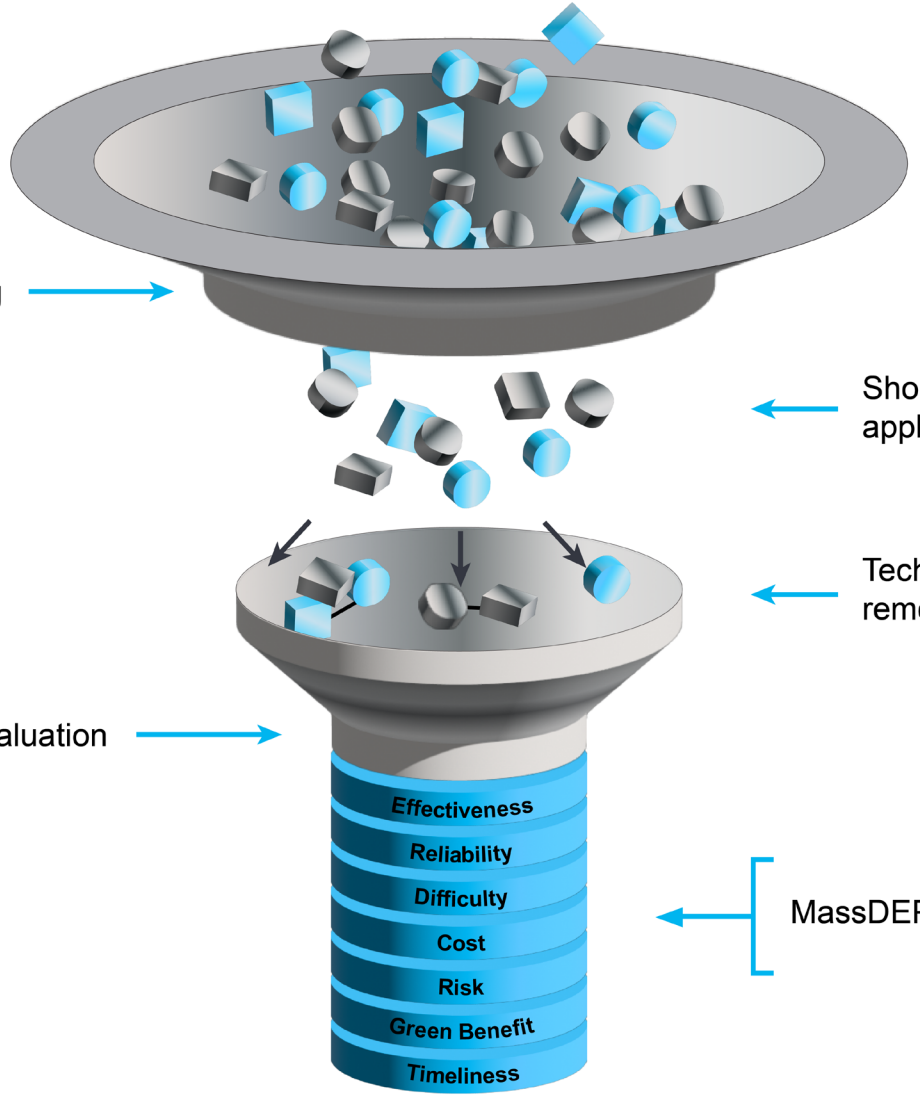
MassDEP Process for Selecting Treatment Alternatives in Phase III

For Each Proposed Treatment Location



Potential technologies

Initial screening

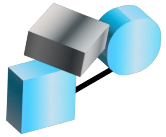
Shortlist of available and applicable technologies

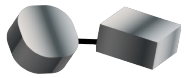
Technologies bundled into remedial alternatives

Detailed evaluation

MassDEP screening criteria

Ranked Remedial Alternatives

1. 

2. 

3. 

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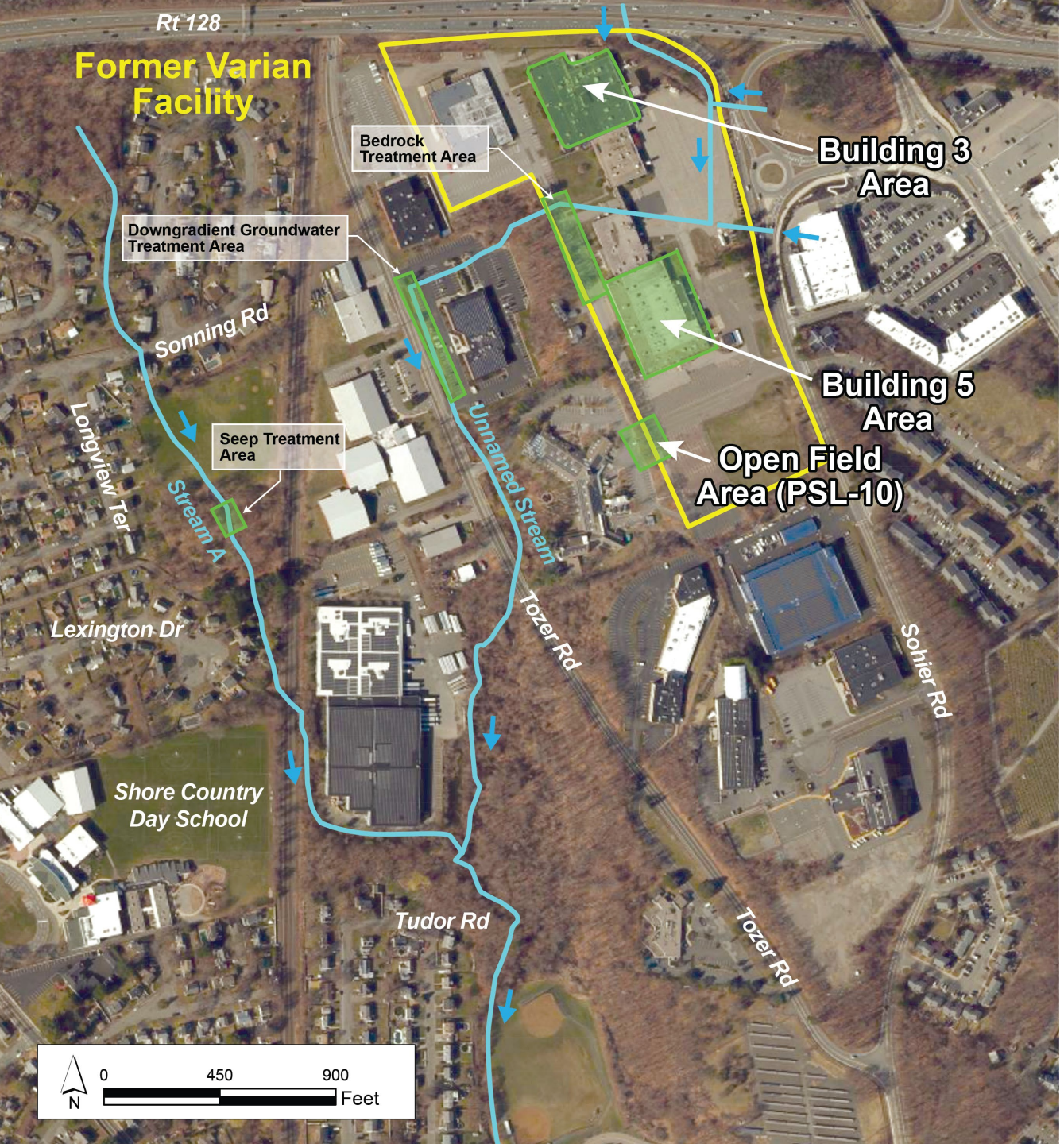
Remedial Action Objectives

- **Source Elimination/Control**
  - Sources of contamination are eliminated, or eliminated to the extent feasible and controlled
- **Migration Control**
  - Groundwater plumes and VOC vapors in the unsaturated zone are stable or contracting
- **Dense Non-Aqueous Phase Liquid (DNAPL)**
  - DNAPL is removed to the extent feasible
- **Groundwater**
  - VOC concentrations in groundwater are reduced to achieve or approach background conditions to the extent feasible

Selected Remedial Actions



Locations of Proposed Remedial Actions

- Building 3 source area overburden (includes PSLs 5, 6, and 11)
- Building 5 source area overburden (includes PSL-7)
- Bedrock
- Open Field (PSL-10) source area
- Downgradient groundwater and seep

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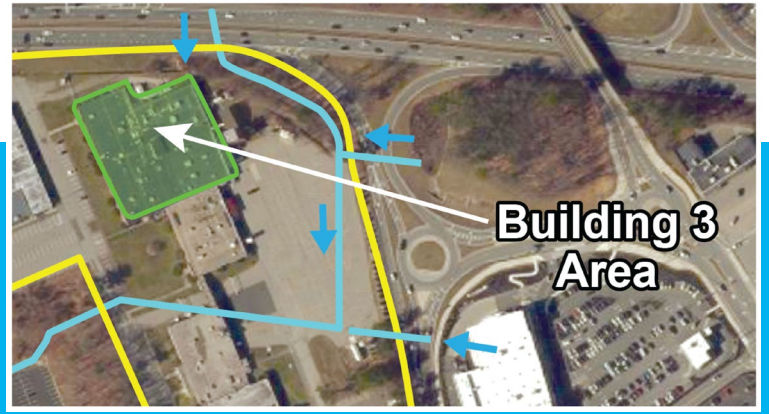
Building 3 Source Area Overburden



Selected Treatment:

- ❖ **In situ thermal treatment**
- ❖ **In situ bioremediation polish**
- ❖ **Continued soil vapor extraction**

- ➢ Determined to be the most effective, reliable, and timely for removing VOCs in the overburden
  - – Thermal treatment is effective for treating DNAPL, high percentage of mass removal possible
  - – Angled and vertical drilling
  - – Target overburden, including deep overburden
- ➢ Bioremediation will harness the benefits of the heat from thermal treatment (microbes are more effective) and drive continued reductions in contaminant concentrations
- ➢ The current soil vapor extraction system will continue to protect current workers until remedial objectives are attained

Other alternatives evaluated:

- In situ thermal treatment with building access, followed by in situ bioremediation polish, and continued soil vapor extraction
- In situ chemical oxidation without building access, followed by in situ bioremediation polish, and continued soil vapor extraction

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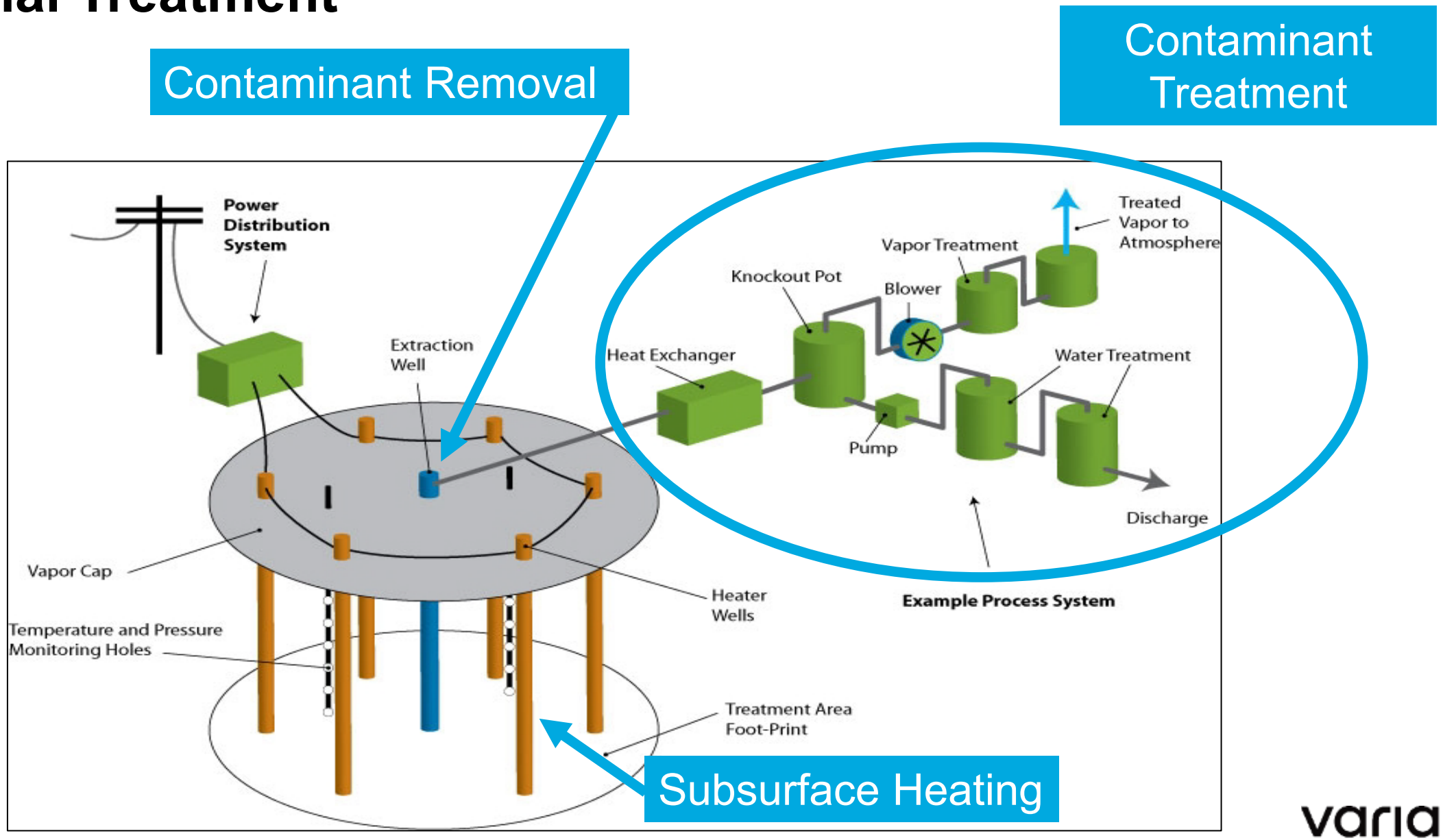
Thermal Treatment



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Building 5 Source Area Overburden

Selected Treatment:

- ❖ **In situ bioremediation**
- ❖ **Continued soil vapor extraction**

- ➢ Building 5 area has significantly lower VOC concentrations and mass than Building 3 area with significantly less evidence of DNAPL
- ➢ In situ bioremediation offers the best balance of effectiveness and cost and has been implemented successfully in the Building 5 area
  - Installation of injection wells
  - Adaptive design philosophy
- ➢ The current soil vapor extraction system will continue to protect current workers until remedial objectives are attained

Other alternatives evaluated:

- In situ thermal treatment without building access and continued soil vapor extraction
- In situ chemical oxidation without building access and continued soil vapor extraction

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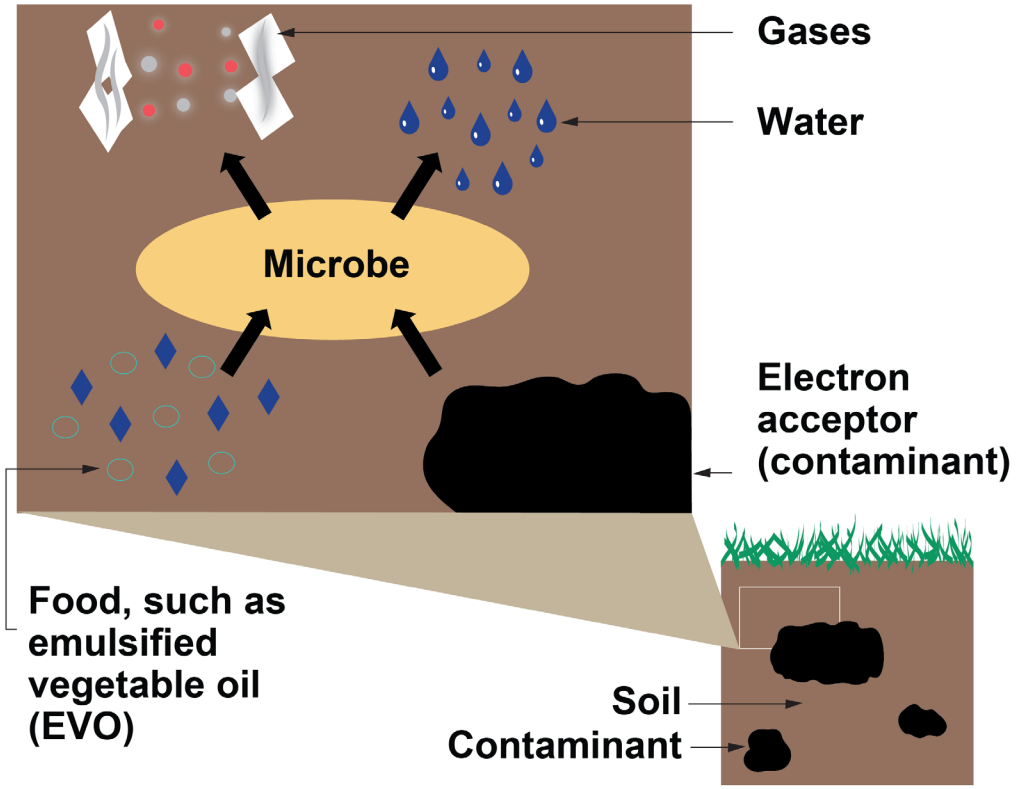
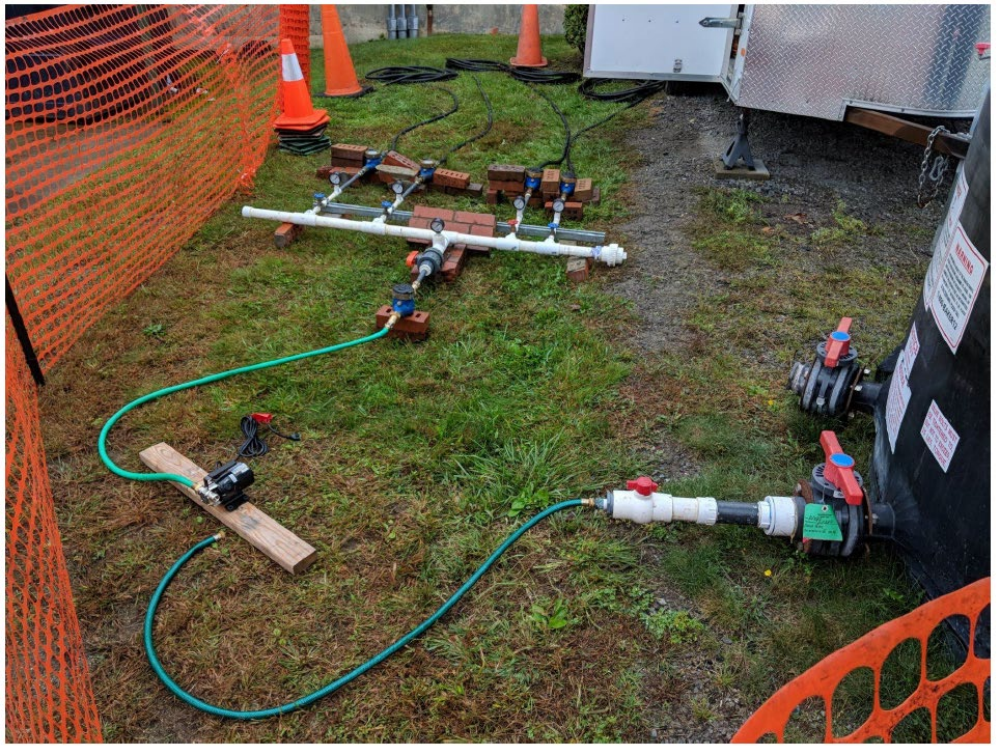
In Situ Bioremediation



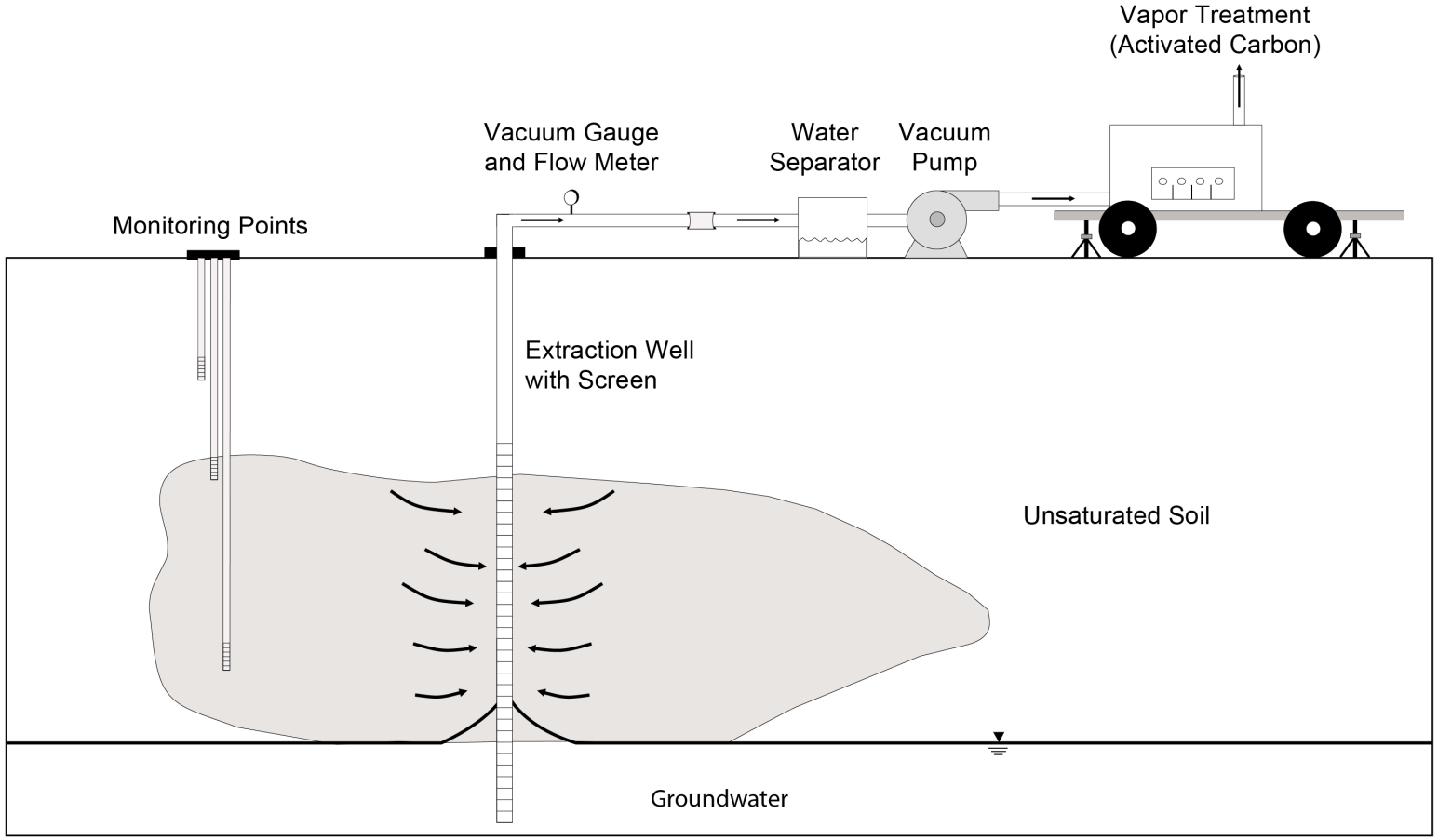
In bioremediation, microbes consume nutrients and contaminants, and release gases and water.



Source: Adapted from Community Guide to Bioremediation (USEPA, 2021)
https://semspub.epa.gov/work/HQ/401583.pdf

Soil Vapor Extraction

- Process of extracting VOCs as vapor from soil by vacuum
- Vapors are captured for carbon treatment as needed



Adapted from Guidance on SVE Optimization (USAF, 2001)
https://clu-in.org/download/contaminantfocus/dnapl/Treatment_Technologies/SVE-optimization.pdf

Bedrock

Selected Treatment:

❖ **In situ chemical oxidation**

- High VOC concentrations are found in potentially isolated bedrock fractures with the possible presence of DNAPL
- In situ chemical oxidation selected given the high groundwater concentrations and potential presence of DNAPL

Other alternatives evaluated:

- In situ chemical reduction using sulfidated microscale zero valent iron
- In situ bioremediation

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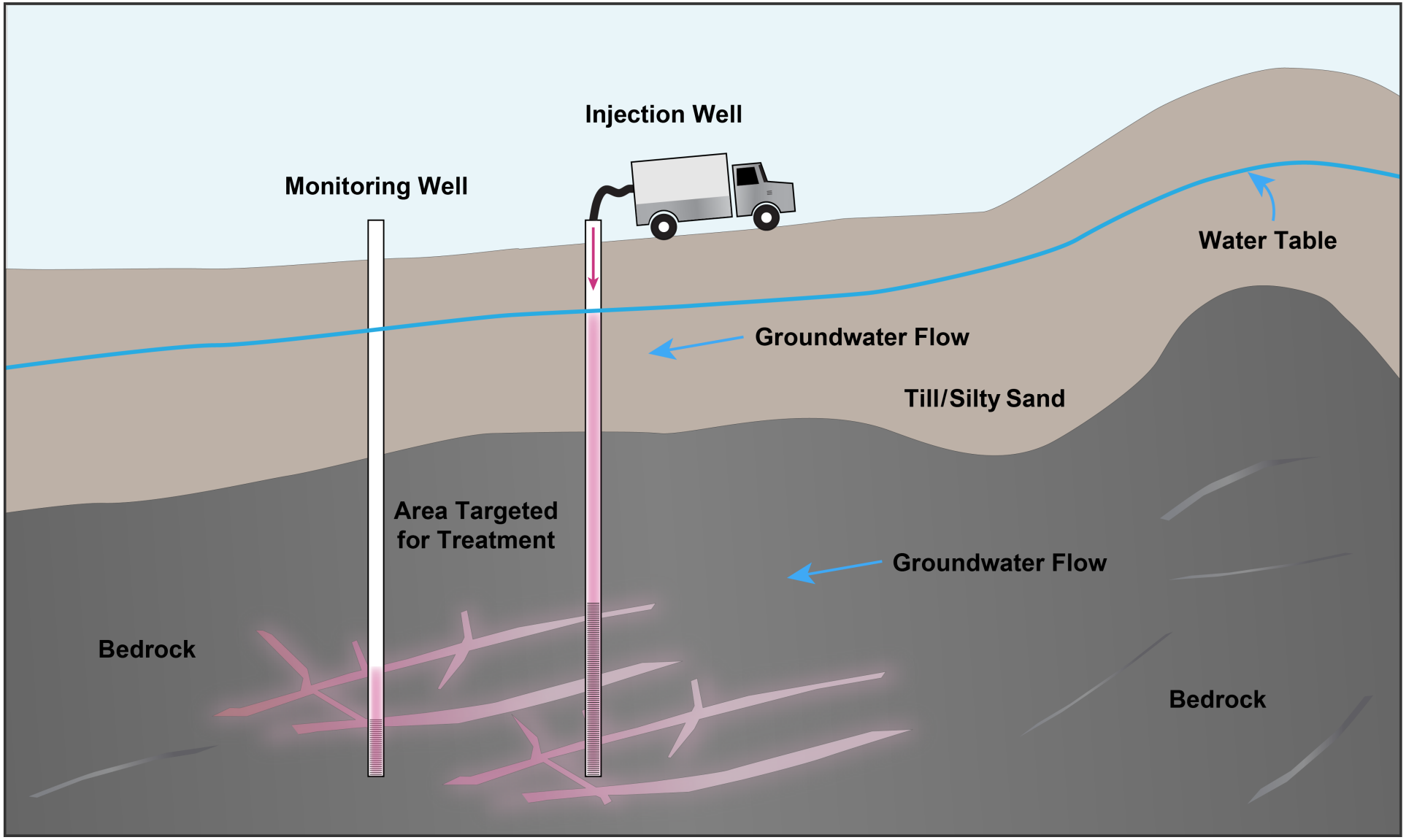
In Situ Chemical Oxidation



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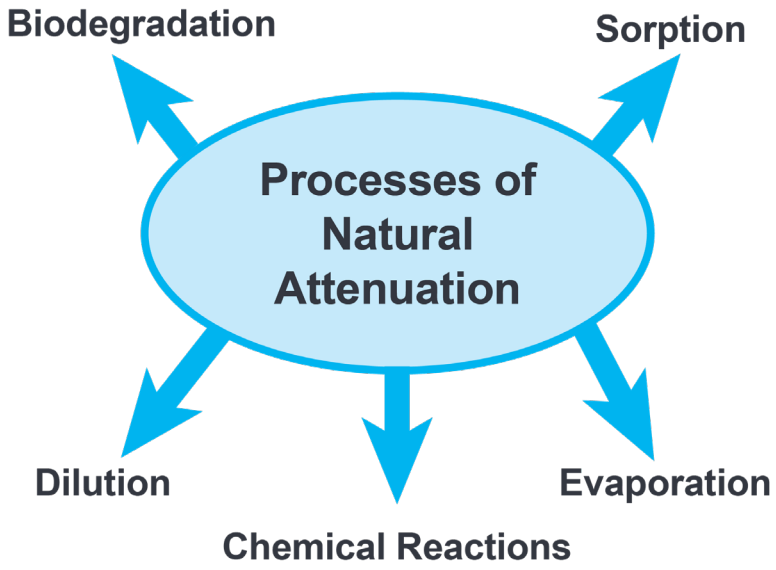
Open Field Area (PSL-10)

Selected Treatment:

❖ **Monitored Natural Attenuation**

- Lower VOC concentrations and contaminant mass present relative to Buildings 3 and 5 source areas
- Prior treatment has measurably reduced contaminant concentrations
  - VOCs have rebounded in one monitoring well
- Ongoing assessment will be expanded to determine whether natural attenuation can successfully achieve the remediation objectives
  - If appropriate, one of the other two alternatives will be applied to provide a benefit downgradient
  - Selected approach allows adaptive design philosophy



Other alternatives evaluated:

- In situ chemical oxidation
- Colloidal activated carbon permeable adsorptive barrier

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Downgradient Groundwater and Seep

Selected Treatment:

- ❖ **Sulfidated Microscale Zero Valent Iron Permeable Reactive Barrier – Tozer Road**
- ❖ **Granular Activated Carbon Permeable Adsorptive Barrier – Seep Areas**

- **Tozer Road:** A permeable reactive barrier will reduce VOC levels along the groundwater flow pathway, resulting in decreases in concentrations west and south of Tozer Road
  - A sulfidated micro zero valent iron permeable reactive barrier is more cost effective than another alternative (colloidal activated carbon permeable adsorptive barrier)
- **Seep:** A granular activated carbon permeable adsorptive barrier (reactive core mat) for the seep will capture contaminants before discharge to the stream
- The final product selection (including, possibly, a combination) will be completed as part of final design

Other alternatives evaluated:

- Colloidal activated carbon permeable adsorptive barrier with granular activated carbon permeable adsorptive barrier for seeps
- Monitored natural attenuation

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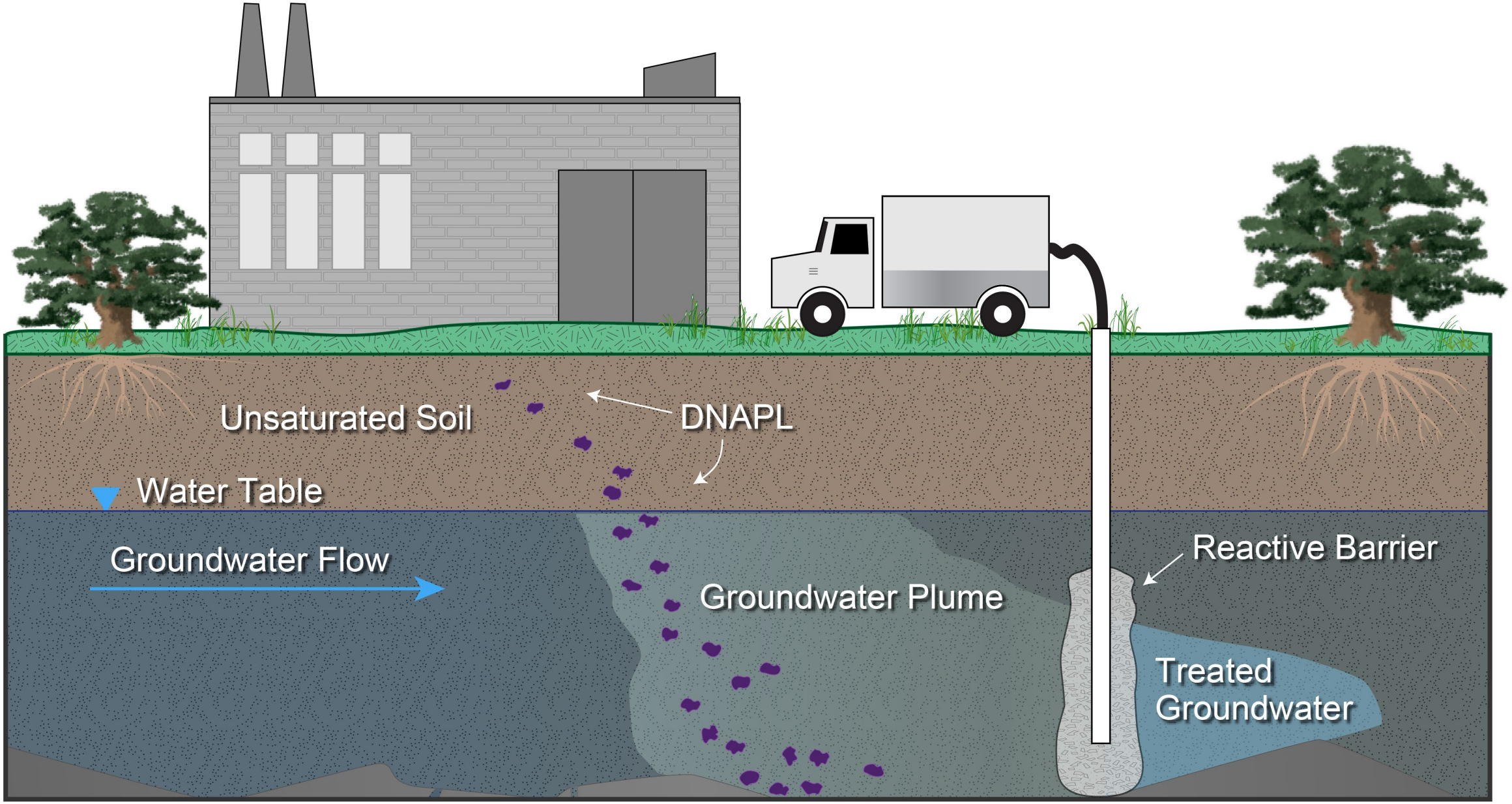
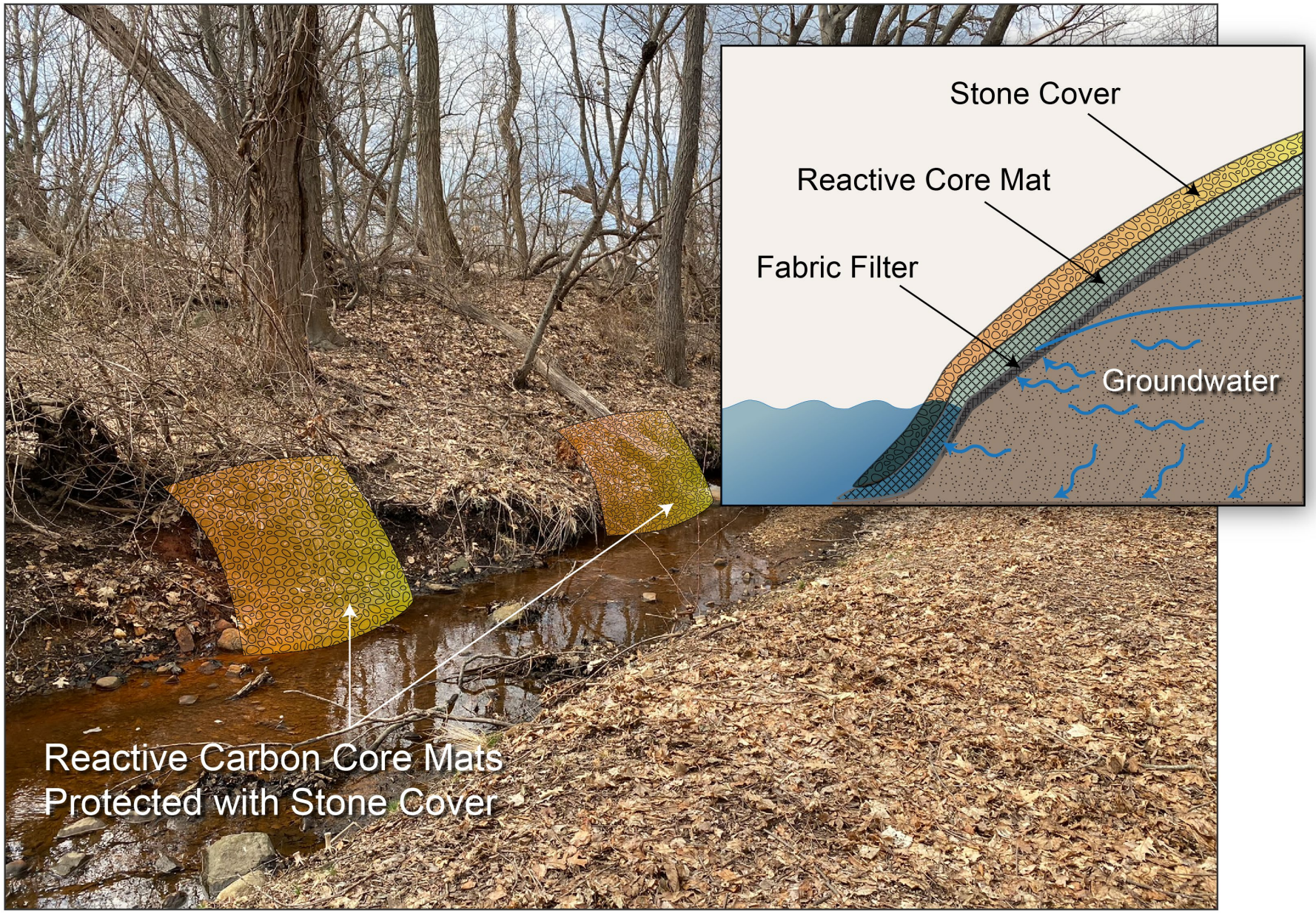
Permeable Reactive Barrier



Permeable Adsorptive Barrier



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Next Steps

Next Steps

Draft Phase III Remedial Action Plan

Available for public review

- Public meeting – tonight
- 20-day public comment period (January 25 – February 14)
- Respond to public comments

Modified Phase III Remedial Action Plan

Draft Phase IV Remedy Implementation Plan
(Building 3 thermal treatment, Tozer Rd barrier, seep barrier)

- Phase IV content dependent on results of current public comment period
- To be submitted **March 17**
- **May** – public meeting, public comment period

To View Phase III RAP

- **Beverly Public Library**
  - **Reference Desk**
    32 Essex Street
    Beverly, MA 01915
    (978) 921-6062 x 2120
  - **Hours:** Mon-Thu 9:00 a.m. – 9:00 p.m.
    Fri-Sat 9:00 a.m. – 5:00 p.m.
    Sun 1:00 p.m. – 5:00 p.m.
- **Online:**

  https://eeaonline.eea.state.ma.us/EEA/fileviewer/Default.aspx?formdataid=0&documentid=717608

To Submit Written Comments

- Complete comment sheet at welcome table
- Submit comments to Raymond Cadorette
  - Online: https://beverlysitecleanup.com/public-involvement
  - Email: Raymond.Cadorette@aptim.com
  - Mail: 150 Royall Street
    Canton, MA 02021

For More Information

- Sign up for mailing list on sign-in sheets at the welcome table
- Visit https://beverlysitecleanup.com

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Questions

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