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Public Meeting for Former Varian Facility

150 Sohier Road
Beverly, Massachusetts
June 7, 2023

Documents Available for Public Comment (June 8 - June 27, 2023)

- Revised Phase III Remedial Action Plan
- Phase IV Remedial Implementation Plan, Part 1

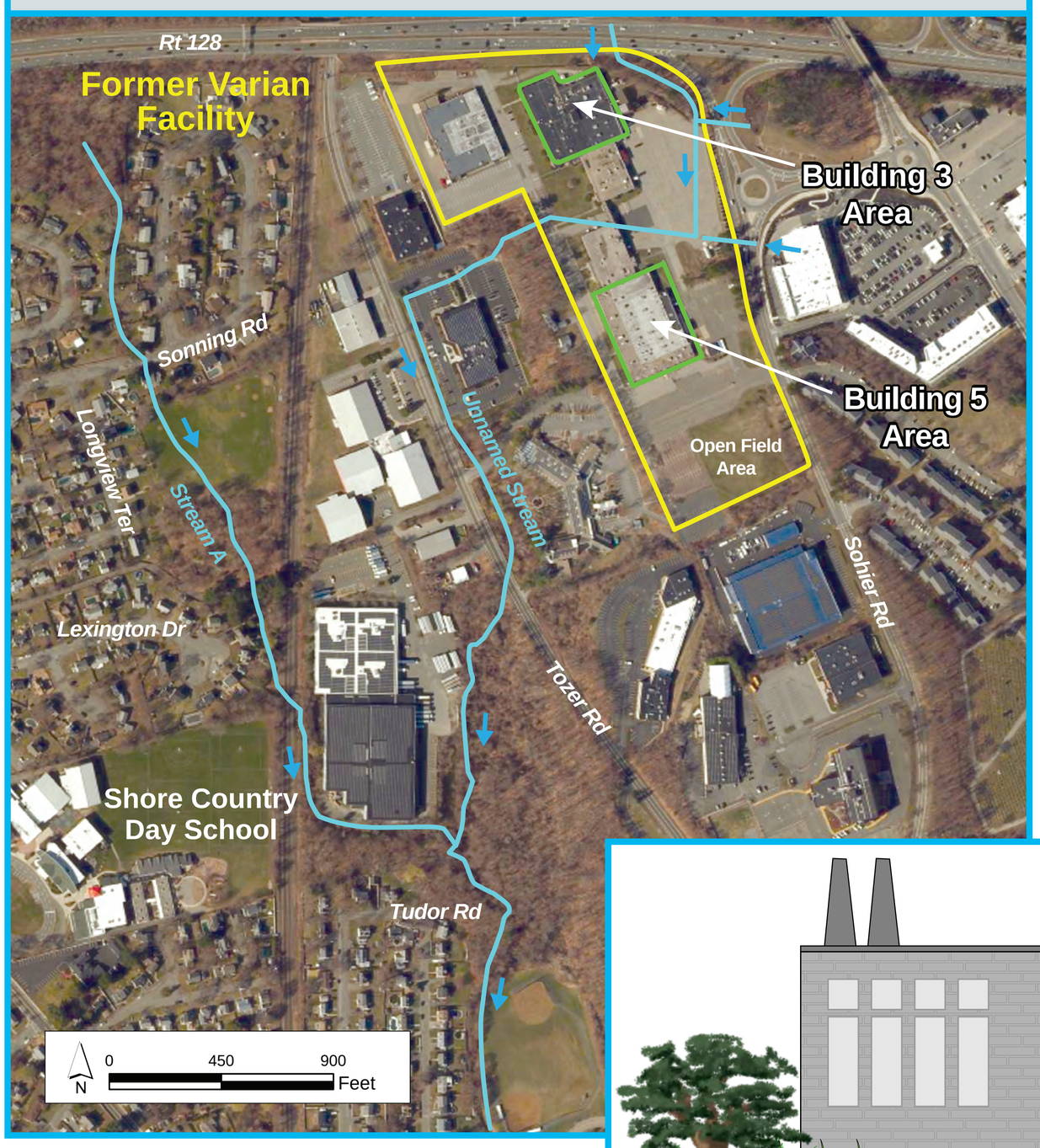
To submit public comments:

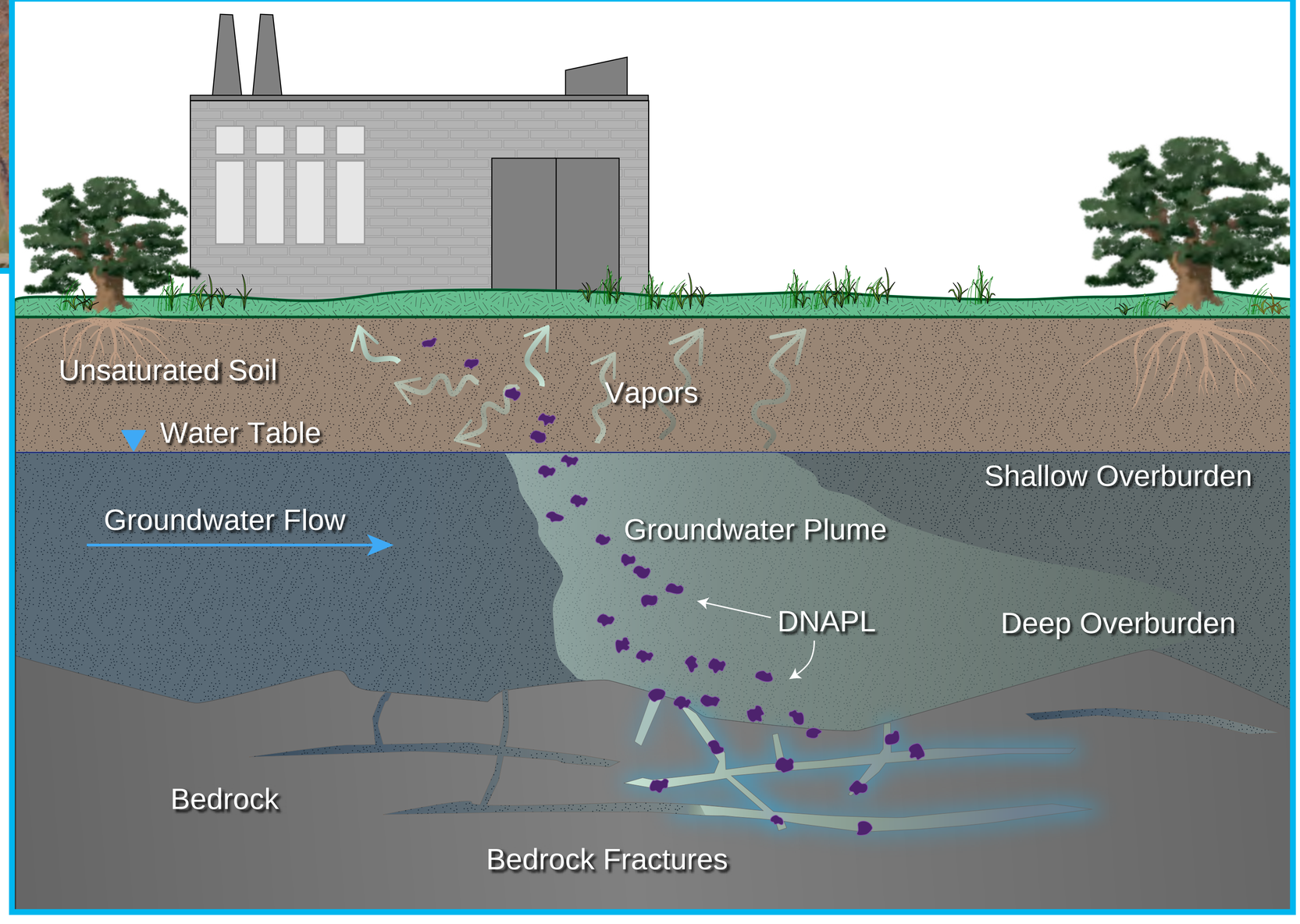
- Scan: the QR code
- Email: Raymond.Cadorette@jacobs.com
- Jacobs Solutions, Attn: Raymond Cadorette,
  120 St. James Avenue, 5th Floor, Boston, MA 02116
- Comment Forms: available here at the welcome table

Environmental Site History

- Used since the 1950s as an industrial manufacturing facility
- Solvent releases occurred due to historical chemical handling and disposal practices, resulting in migration to soil and groundwater
- Trichloroethene (TCE) and perchloroethene (PCE, also known as tetrachloroethene) are industrial solvents that are heavier than water and have low solubility when mixed with water
  - TCE and PCE are often referred to as “volatile organic compounds” (VOCs)

Main Release Areas





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Massachusetts Contingency Plan Process for Evaluating Remedial Alternatives under Phase III

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

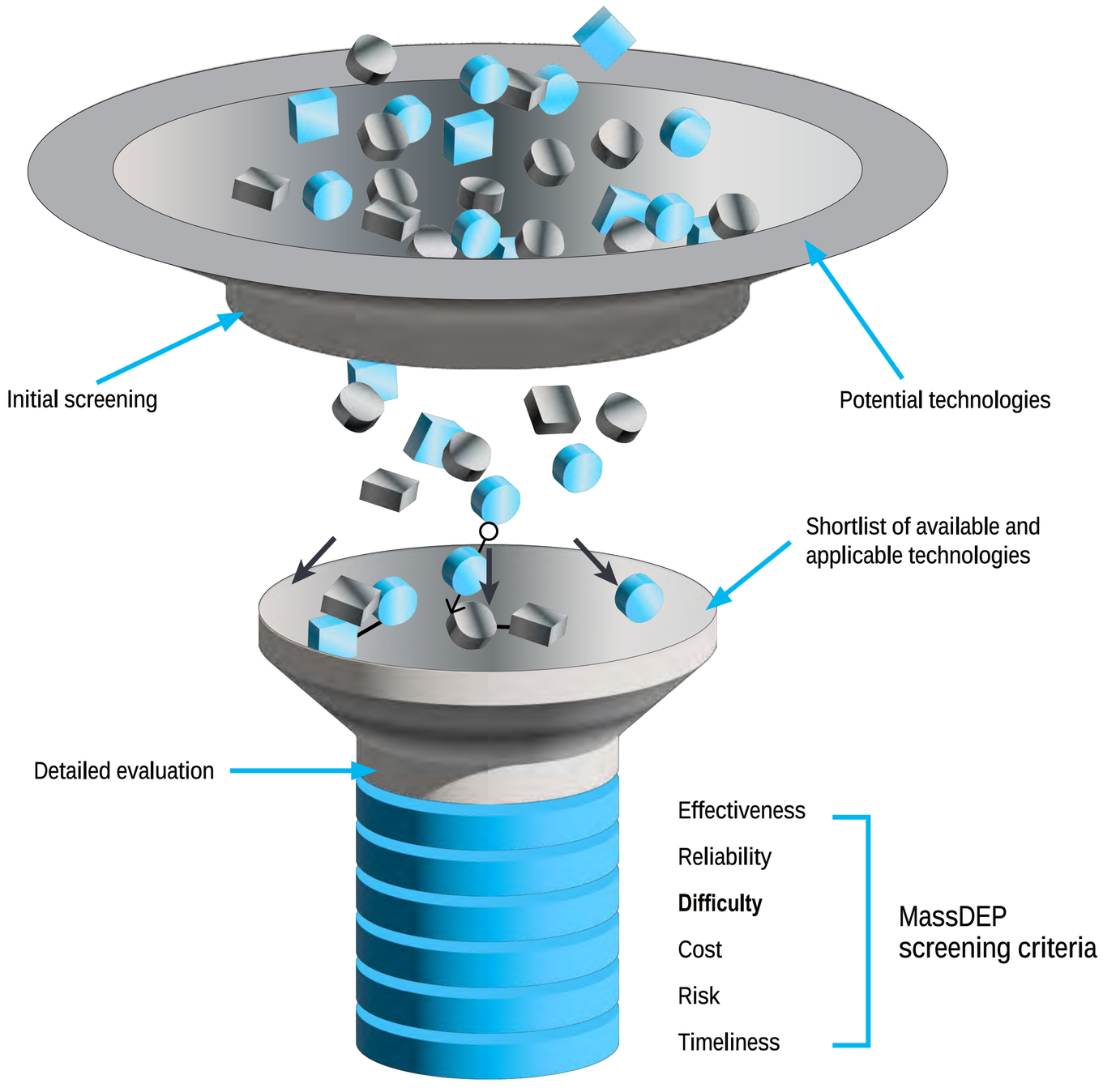
Phase III: Remedial Action Plan
- **Evaluate cleanup options using MCP criteria: effectiveness, reliability, difficulty, cost, risk, and timeliness**

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

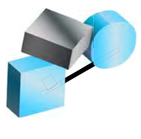
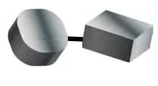
Permanent or Temporary Solution Statement
- Determination that remedial measures, when implemented, will maintain a temporary or permanent solution

PUBLIC INVOLVEMENT PROCESS



- Initial Screening – evaluates potential technologies against site-specific conditions to produce a short-list of available and applicable technologies
- Remedial Alternatives – applicable technologies are grouped as appropriate into remedial alternatives
- Detailed evaluation – alternatives are evaluated, scored, and ranked using MCP-established criteria

Ranked Remedial Alternatives

1. 
2. 
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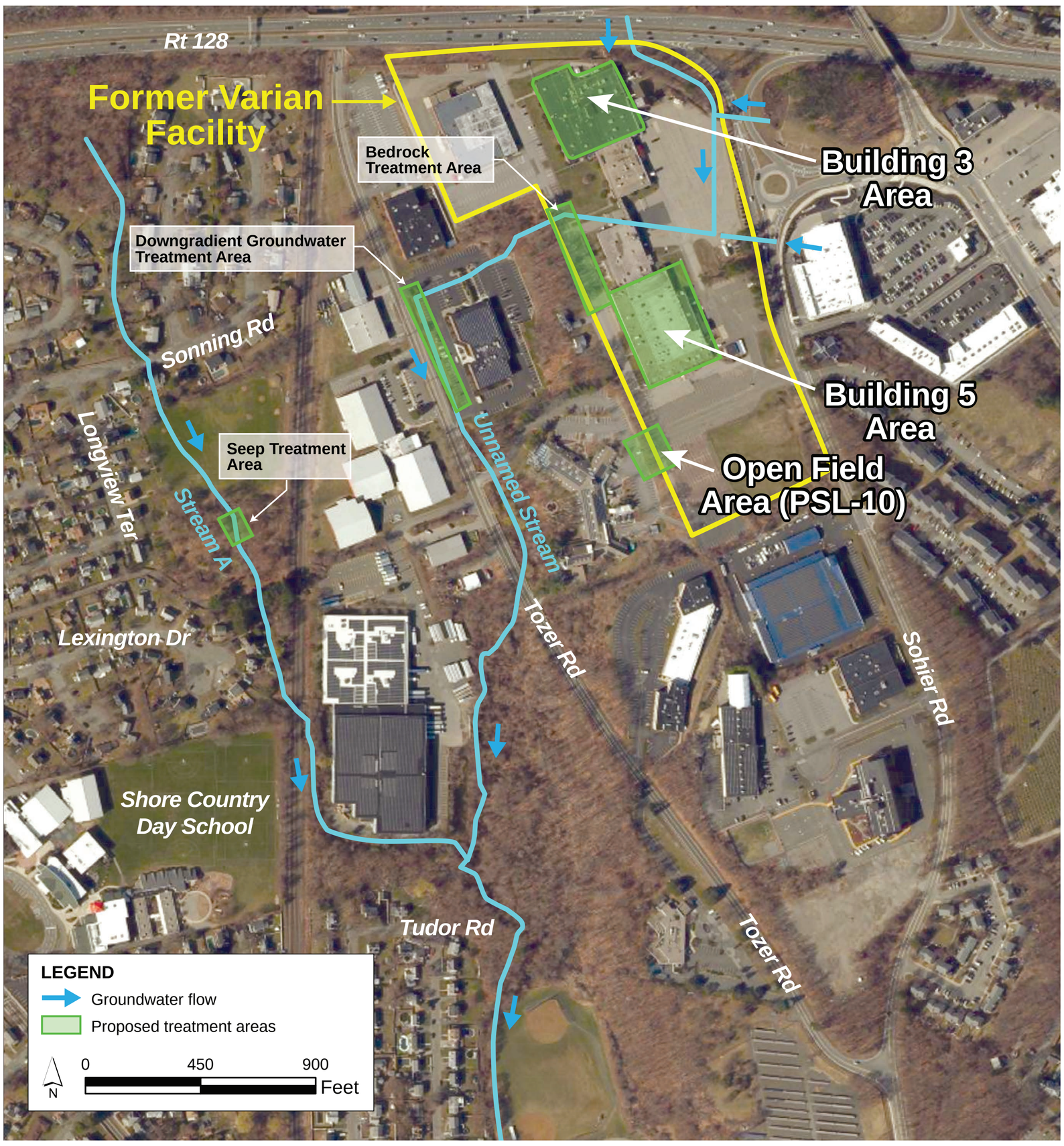
Remedial Action Objectives and Proposed Treatment Locations

Treatment Area	Primary Proposed Treatment	Objective	Status
Potential Source Location (PSL) 10 (Open Field Area)	In situ chemical oxidation *or* permeable treatment zone	To address elevated VOC concentrations remaining in the overburden	Alternate remedy proposed in Revised Phase III
Building 5 (including PSL 7)	Additional expanded in situ bioremediation treatment	To address elevated VOC concentrations remaining in the overburden	Additional information provided in Revised Phase III
Bedrock	In situ chemical oxidation treatment using new techniques	To address elevated VOC concentrations, indicative of dense non-aqueous phase liquid (DNAPL) in bedrock between Buildings 3 and 5	Additional information provided in Revised Phase III
Building 3 (including PSLs 5, 6, and 11)	Additional source area treatment using thermal remediation	To address DNAPL in the overburden	Remedy advanced to Phase IV, Part 1
Downgradient Groundwater (Tozer Road)	Permeable barrier treatment	To limit downgradient migration of VOCs in groundwater	Remedy advanced to Phase IV, Part 1
Seeps to Stream A	Adsorptive barrier treatment	To limit potential seep-related contribution of VOCs to the stream	Remedy advanced to Phase IV, Part 1



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Open Field Area (PSL–10)

Selected Treatment:

- In situ chemical oxidation
- Permeable treatment zone

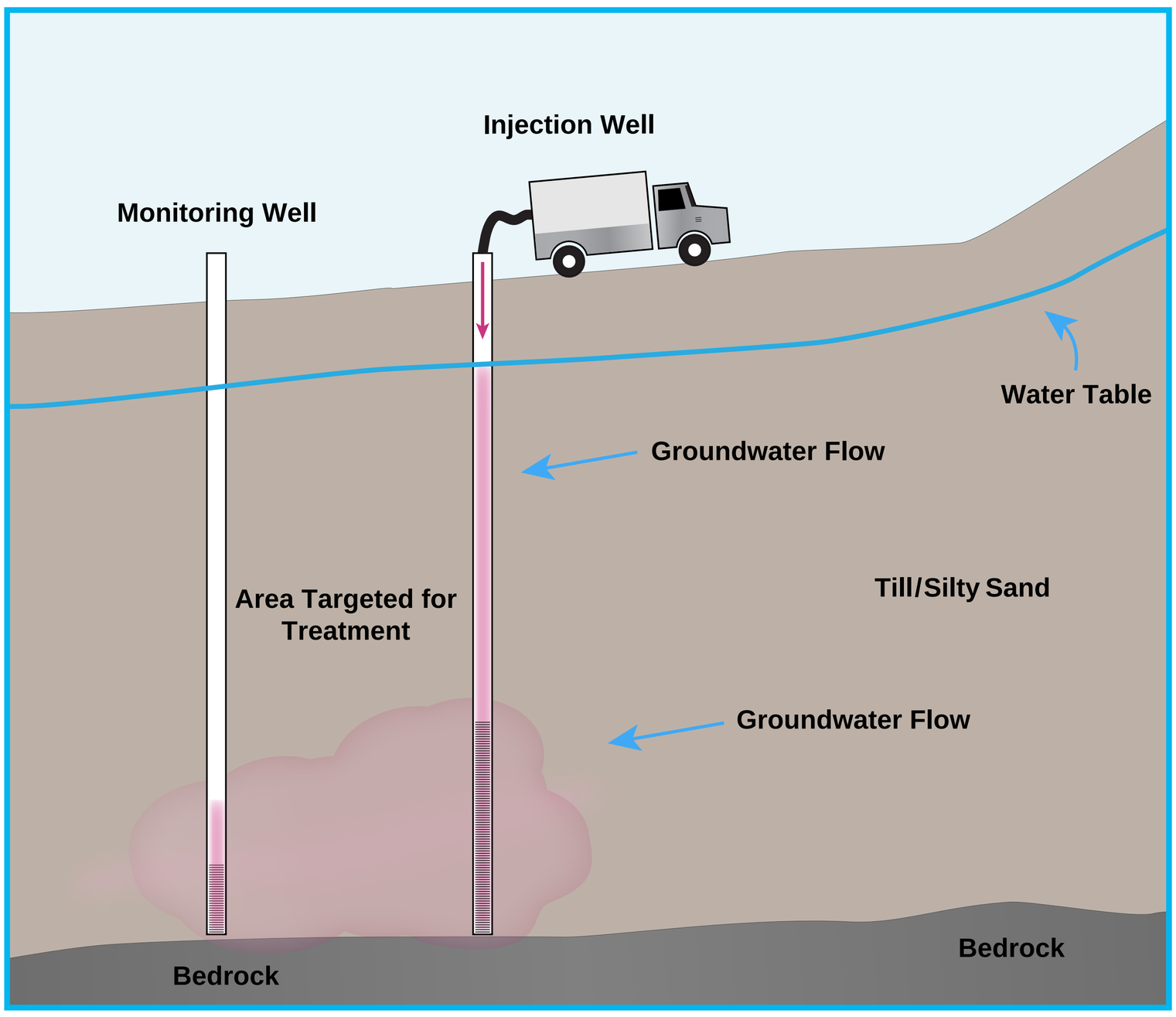
- **More active remedy proposed after receipt of public comments and additional groundwater monitoring data**
  - **Original draft Phase III proposed monitored natural attenuation**

Other alternatives evaluated:

- Monitored natural attenuation

- Prior treatment has measurably reduced contaminant concentrations
  - VOC concentrations have rebounded in one monitoring well (CL10-DO)
- Similar evaluation scores for in situ chemical oxidation and permeable treatment zone
- Permeable treatment zone may be:
  - Permeable adsorptive zone, which uses injected granular activated carbon to capture VOCs, *and/or*
  - Permeable reactive zone, using a reactive material such as zero-valent iron
- Pre-design investigations will be conducted to confirm the final treatment to be implemented

In Situ Chemical Oxidation



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Proposed Treatment for Building 5 Source Area Overburden

Selected Treatment:

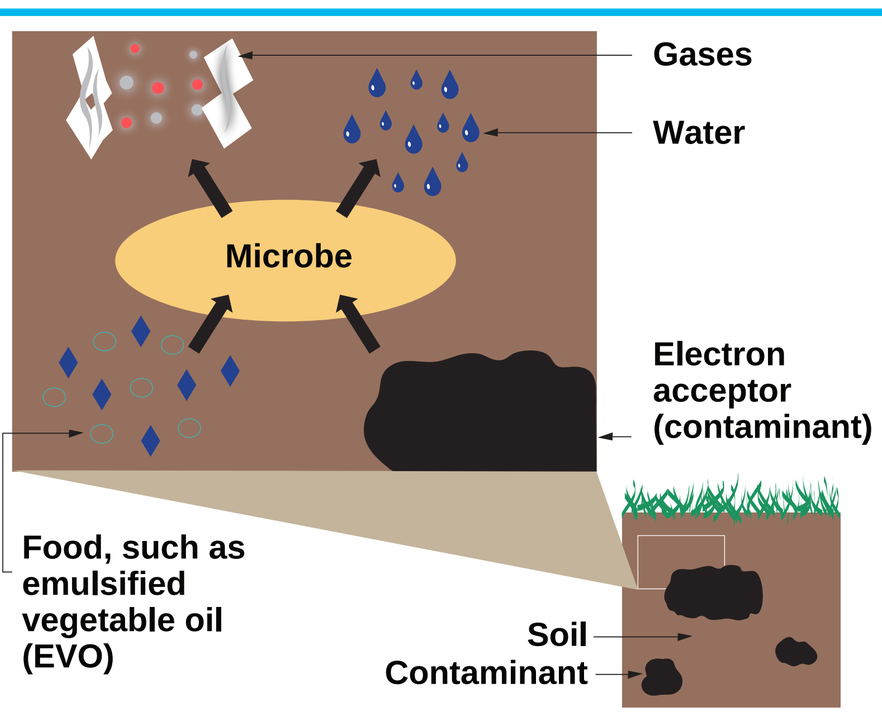
- In situ bioremediation
- Continued soil vapor extraction

- In situ bioremediation (ISB) is the most appropriate technology based on the magnitude of the VOC concentrations
- ISB was previously successful at Building 5; treatment will be expanded to new locations and will use new application methods (e.g., high-pressure or pulsed injections) to address deep overburden beneath the building
  - Adaptive implementation approach - enables treatment approach to be modified or further expanded
  - Green benefits
- The current soil vapor extraction system will continue to protect current workers until remedial objectives are attained

Other alternatives evaluated:

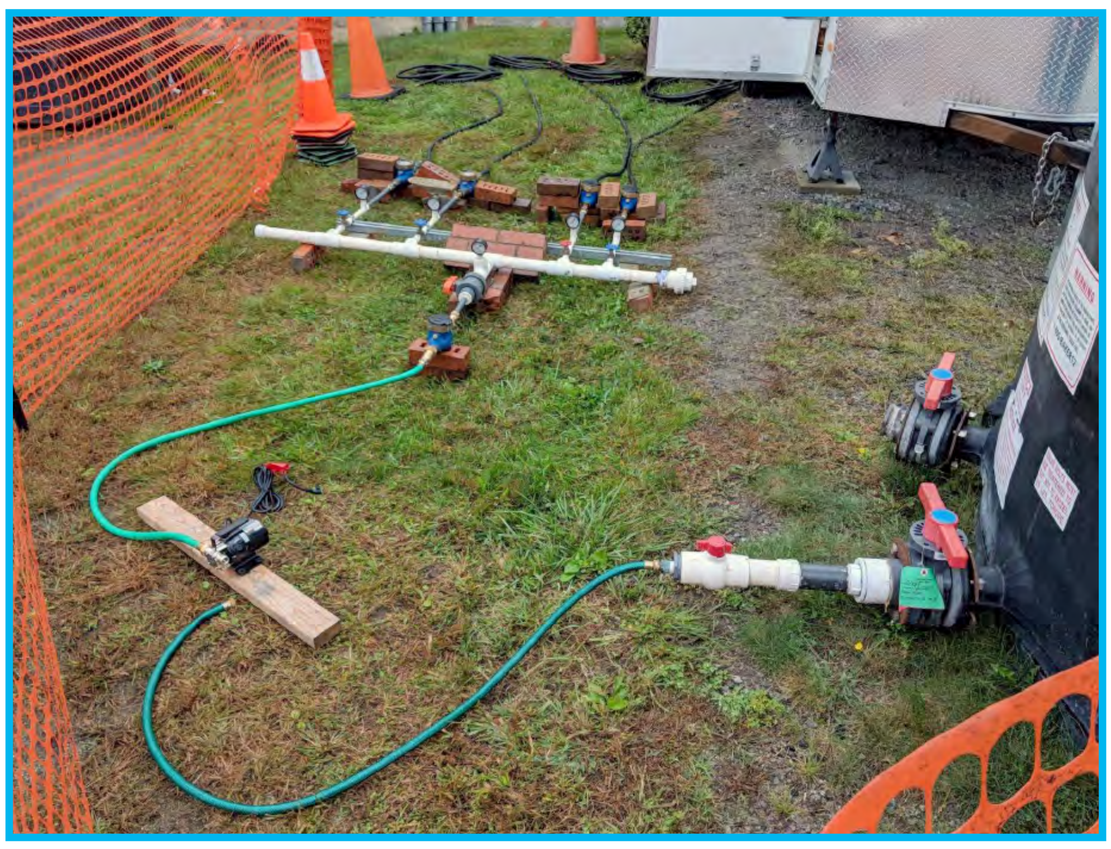
- In situ thermal treatment without building access and continued soil vapor extraction
- In situ chemical oxidation without building access and continued soil vapor extraction

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



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Proposed Treatment for Bedrock

Selected Treatment:

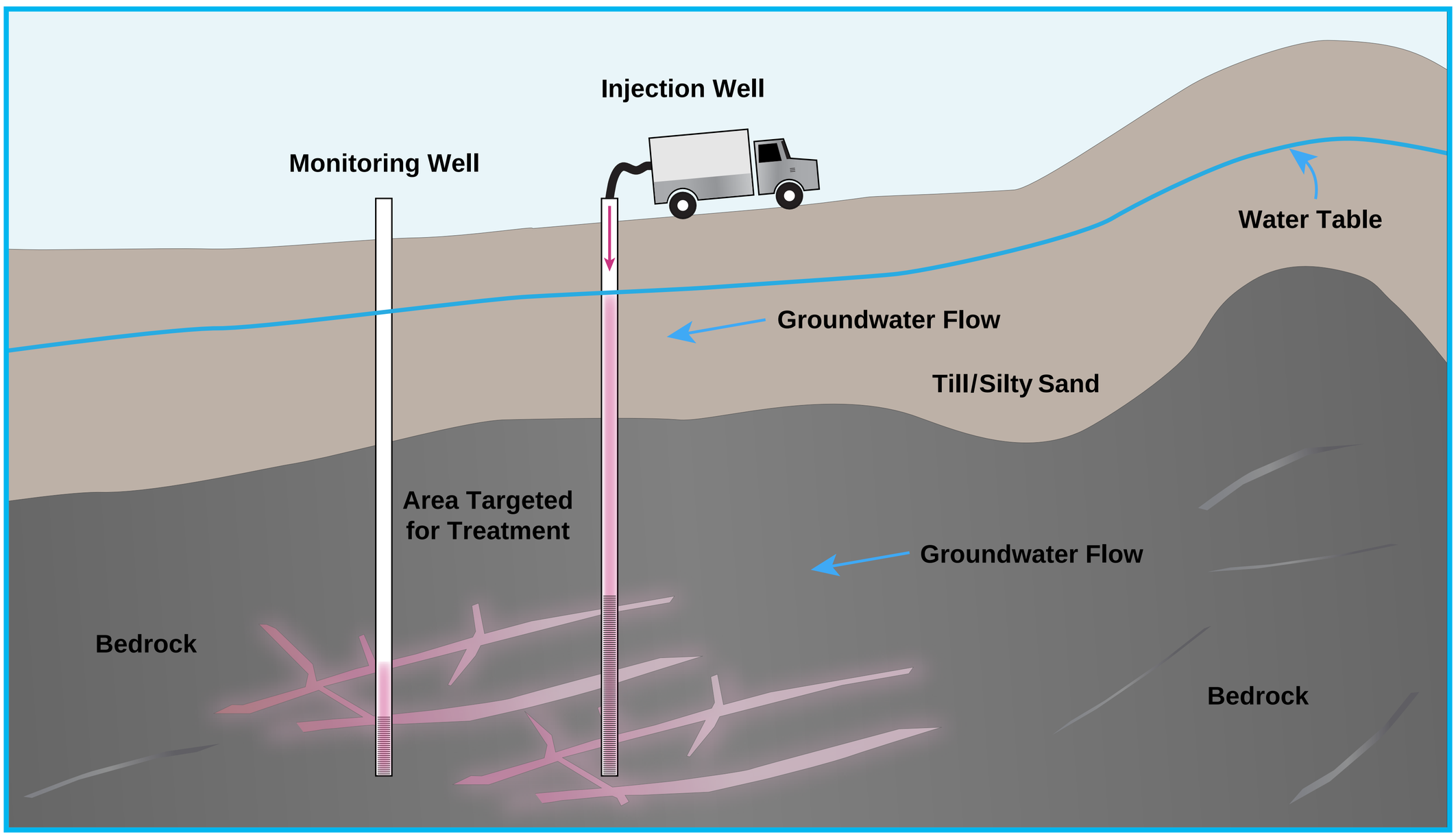
- In situ chemical oxidation

- Elevated VOC concentrations are found in potentially isolated bedrock fractures with the possible presence of DNAPL
- In situ thermal remediation alternative was added as a potential treatment alternative and evaluated
  - Effectiveness limited in bedrock fractures - thermal treatment requires capture of VOC vapors and water
  - In situ chemical oxidation destroys VOCs in place - better suited to bedrock fractures
- In situ chemical oxidation selected given elevated groundwater concentrations and potential presence of DNAPL
  - Treatment will use new application methods (e.g. push/pull injection)
  - Increased post-injection monitoring period to verify long-term remedy effectiveness

Other alternatives evaluated:

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

In Situ Chemical Oxidation



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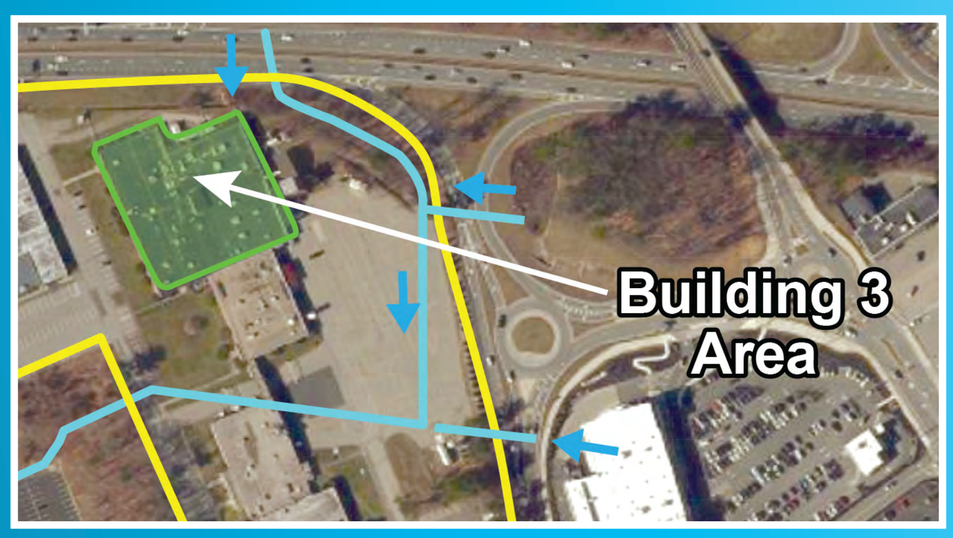
Proposed Treatment for Building 3 Source Area Overburden

Building 3 Source Area Overburden

Selected Treatment:

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

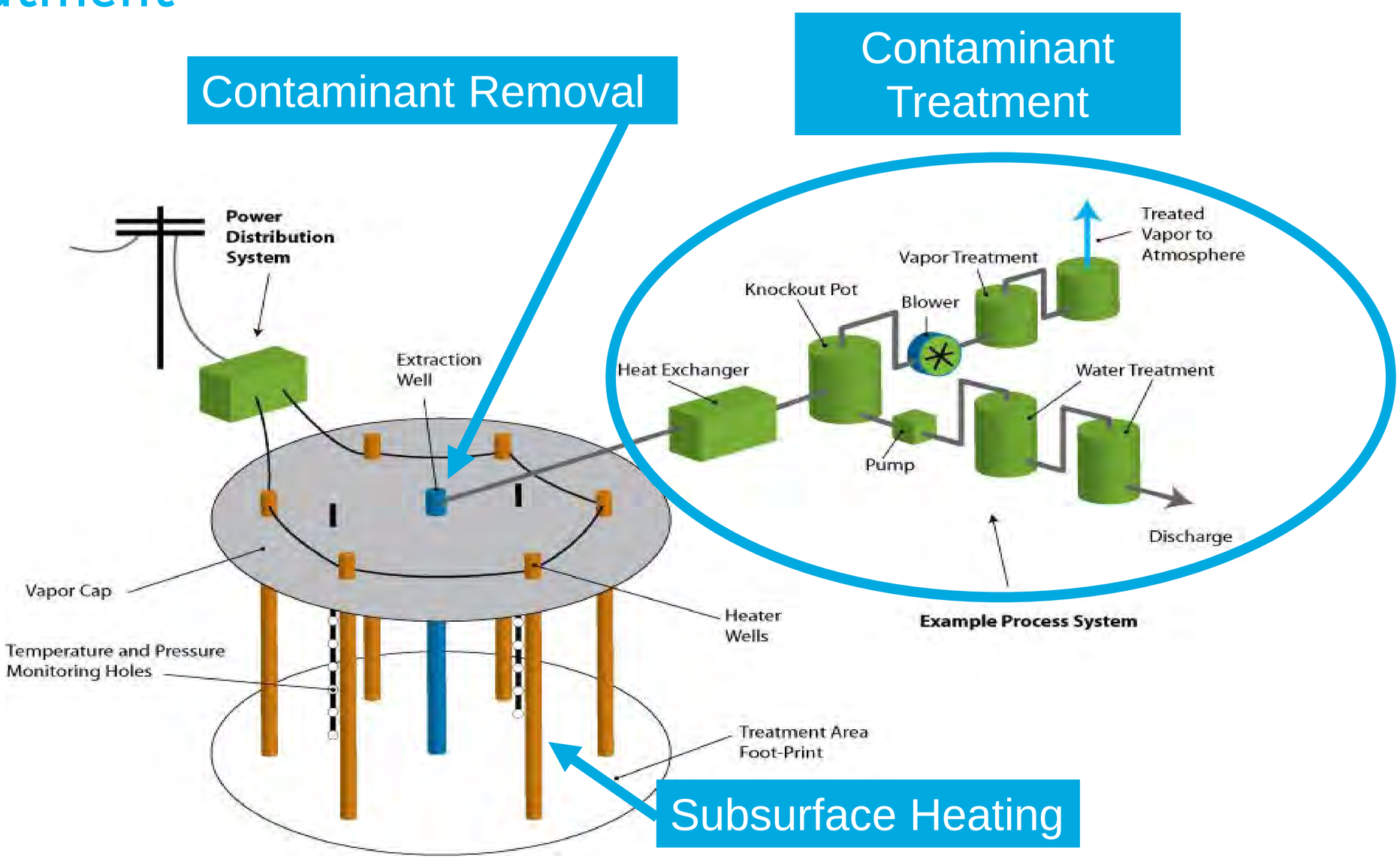


- Determined to be the most effective, reliable, and timely for removing VOCs in the overburden
  - Thermal treatment is effective for treating DNAPL, high percentage of mass removal possible
  - Angled and vertical drilling
  - Target overburden, including deep overburden
- Bioremediation will harness 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

Thermal Treatment



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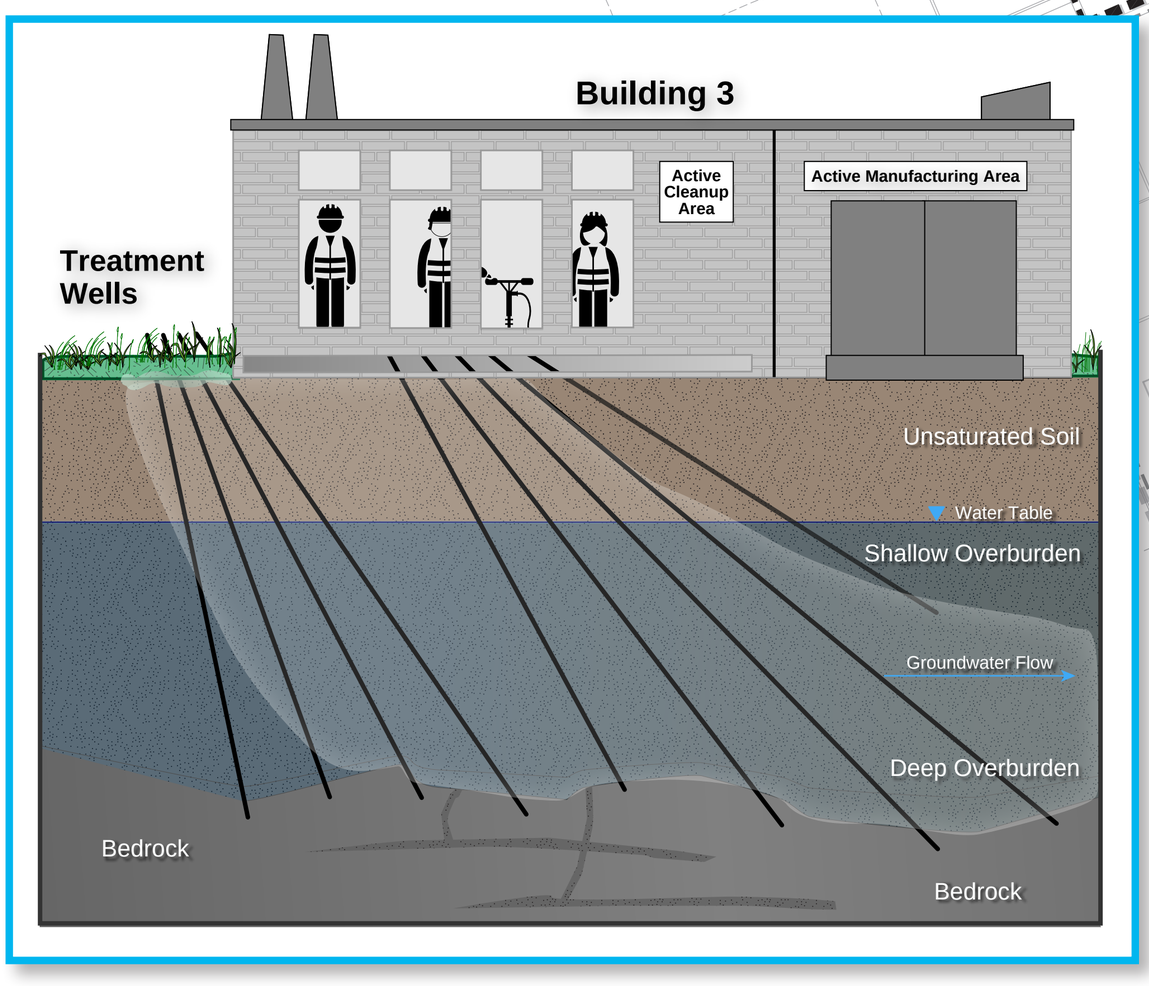
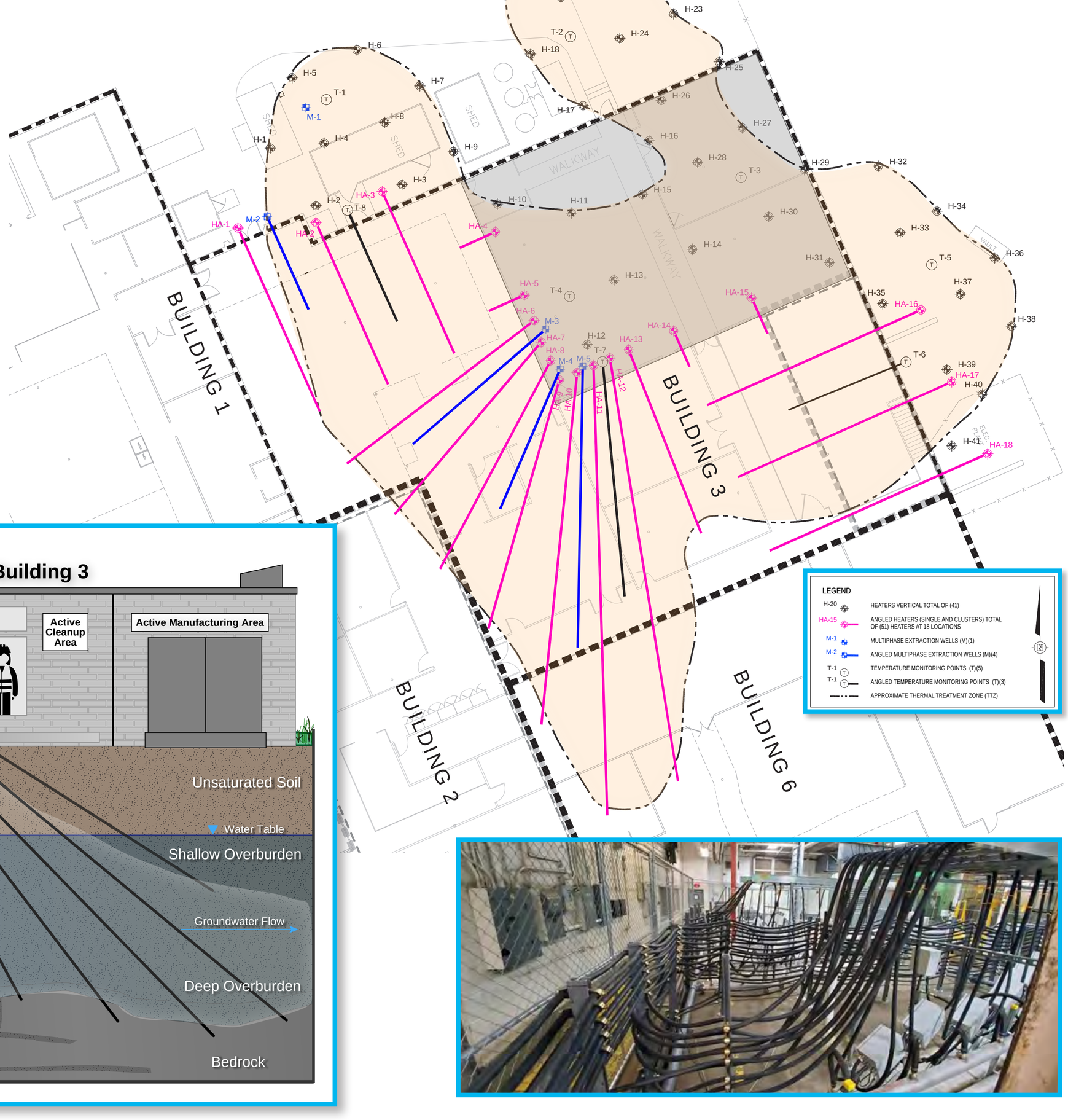
Building 3 Thermal Treatment Site-Specific Considerations

- The Building 3 source area is below an active commercial manufacturing operation
  - Selected facility activities will be relocated for CPI to continue manufacturing operations during construction and treatment
  - Treatment components will temporary occupy a stockroom in the building during construction and treatment
- Contamination will be accessed by fans of heaters, wells, and sensors installed at various angles from outside the building and inside CPI's existing components stockroom
  - The indoor treatment area is only accessible through a northeast corner of Building 3
  - Heating requires vertical and angled equipment installation
  - 92 subsurface heaters are estimated
  - Heating equipment will be placed 13 to 17 feet apart
- The soil vapor extraction system will continue to operate





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PFAS Sampling Plan

Why Sample for Per- and Polyfluoroalkyl Substances (PFAS)?

- **No known or suspected health risk associated with PFAS at the Beverly site**
- Need to consider for thermal treatment design if present
- Needed for permitting

What are PFAS?

- A family of manufactured chemicals wide used since the 1950s in many common household products
- An emerging contaminant found globally in air, water, soil, animals, plants, and people
- Persistent in the environment
- People are most likely to be exposed to these chemicals by consuming PFAS-contaminated water or food, using products made with PFAS, or breathing air containing PFAS.

Carpets

Non-stick cookware

Cosmetics

Food packaging

Furnishings

Outdoor gear

Clothing

Adhesives and sealants

Protective coating

Carpets cleaning products

Carseats

Firefighting foam

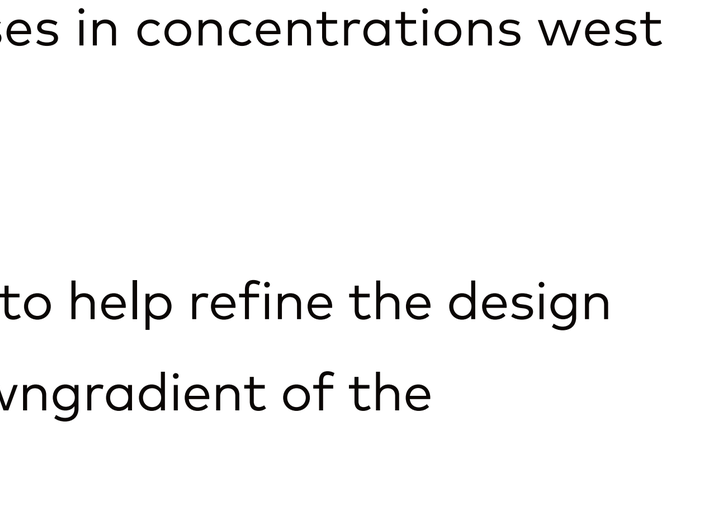
PFAS Sampling Plan

- Plan has been posted on MassDEP's website as an attachment to the Phase IV Remedial Implementation Plan, Part 1
- Will test in VOC source areas where treatment is planned (Building 3, Building 5, PSL-10) and upgradient sources (e.g., historical Beverly Landfill)
- Will sample groundwater at several depths and well locations in each area
- Will test for 40 PFAS

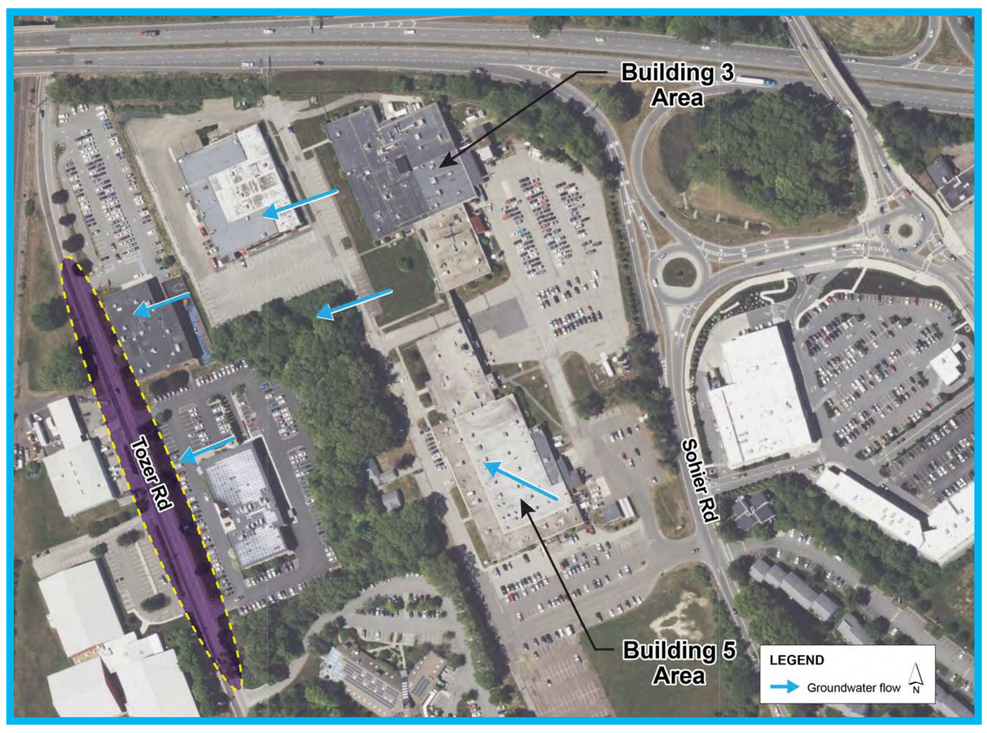
Proposed Treatment for Downgradient Groundwater

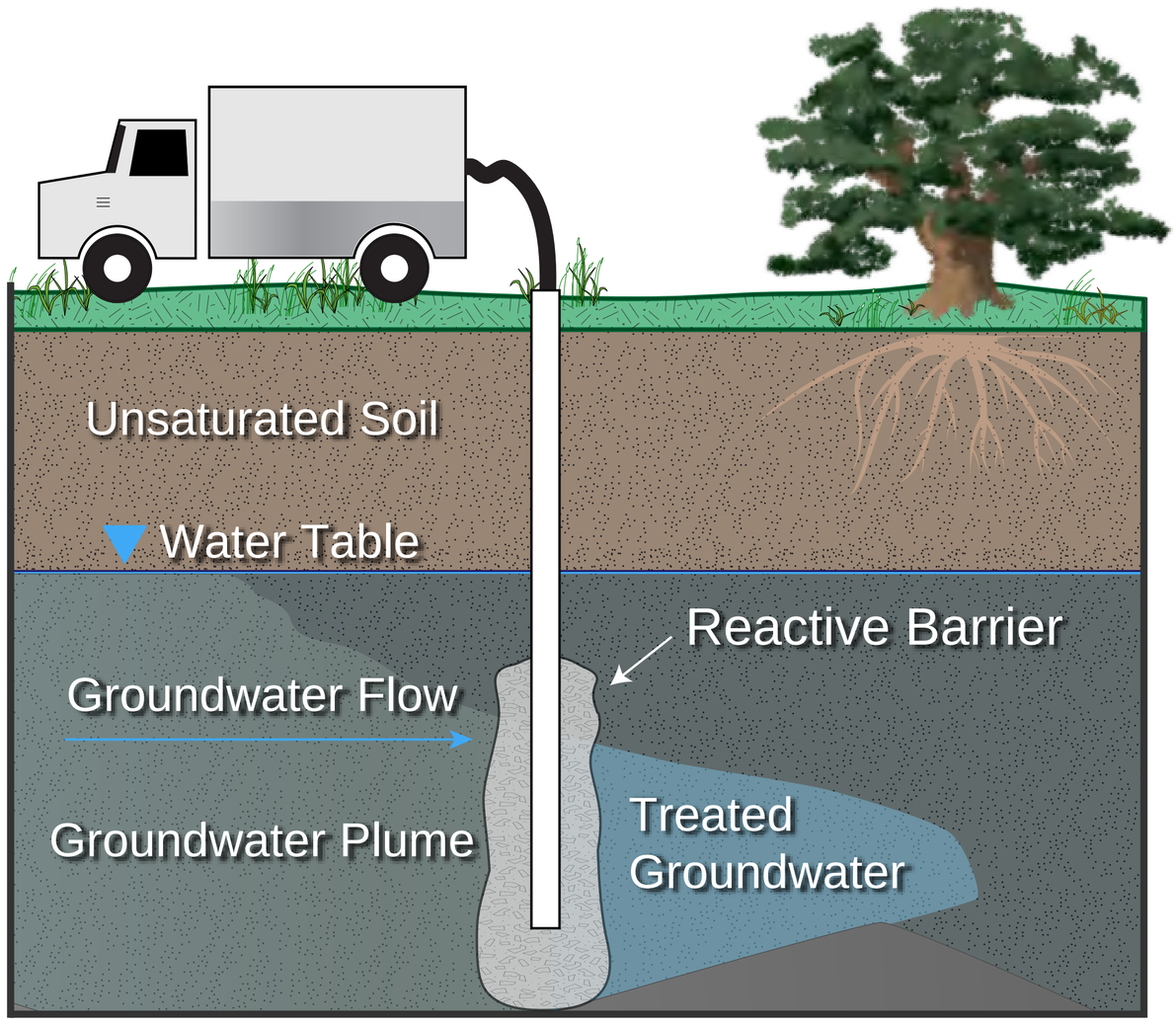
Selected Treatment:

- Permeable reactive *and/or* adsorptive barrier along Tozer Road



- Installation of a permeable reactive and/or adsorptive barrier using sulfidated microscale zero-valent iron and colloidal activated carbon to reduce VOC levels along the groundwater flow pathway, resulting in decreases in concentrations west and south of Tozer Road
- Remedial activities will include:
  - Investigation to provide additional high-resolution data to help refine the design
  - Installation of new monitoring wells upgradient and downgradient of the treatment area
  - Baseline groundwater sampling
  - Injection of treatment amendments to form a permeable treatment zone
  - Monitoring during injection
  - Post-remediation monitoring to assess performance





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Proposed Treatment for Stream A Seeps

Selected Treatment:

- Granular activated carbon permeable adsorptive barrier – Stream A Seep Area

- Three layers of a permeable, granular activated carbon core mat to intercept each of two identified seeps and capture contaminants before water discharges to the stream
- Wetland Permitting with Beverly Conservation Commission
  - Notice of Intent submitted May 2, 2023
  - Conservation Commission hearing held on May 16, 2023
  - Wetland permit issued on May 17, 2023

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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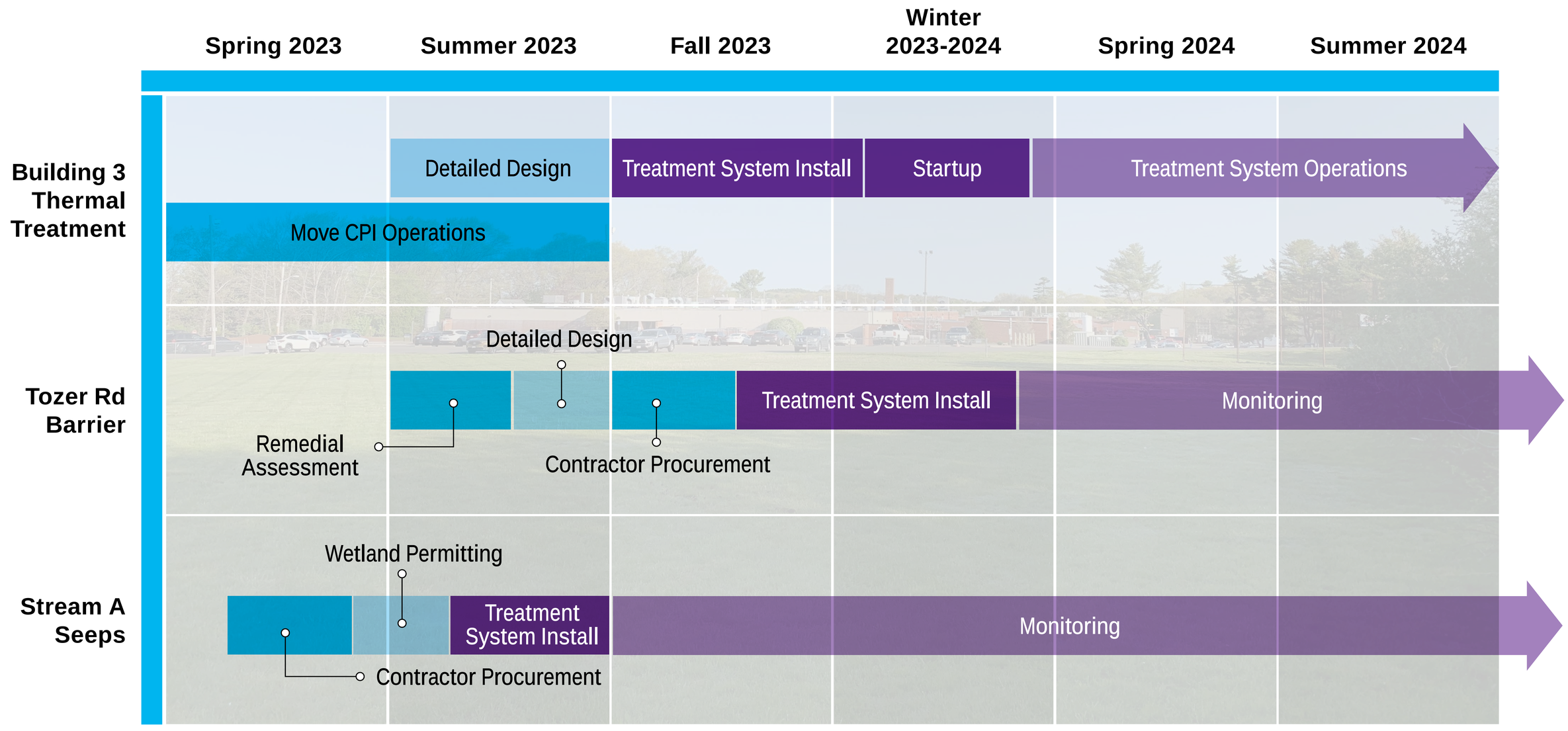
Milestones



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Conceptual Site Model

- Site investigators develop conceptual site models (CSMs) to portray contaminant sources, migration and exposure pathways, and receptors
- CSMs periodically evolve as new data are collected
- Two aquifers:
  - **Overburden aquifer** (shallow and deep) - groundwater flows through pores between the grains in silt, sand, and gravels
  - **Bedrock aquifer** - groundwater flows in fractures
  - Majority of groundwater flow is in the overburden aquifer