varian
A Siemens Healthineers Company

PHASE IV REMEDIAL IMPLEMENTATION PLAN, PARTS 2 AND 3

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

November 14, 2023
Beverly Middle School
Beverly, MA

Agenda

1. Introduction
2. Project Overview and Massachusetts Contingency Plan (MCP) Process
3. Phase IV Remedy Implementation Plan, Part 2
4. Phase IV Remedy Implementation Plan, Part 3
5. Current Status of Treatment Activities
6. Next Steps
7. Questions

varian
A Siemens Healthineers Company

Project Overview and Massachusetts Contingency Plan (MCP) Process

varian
A Siemens Healthineers Company

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 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

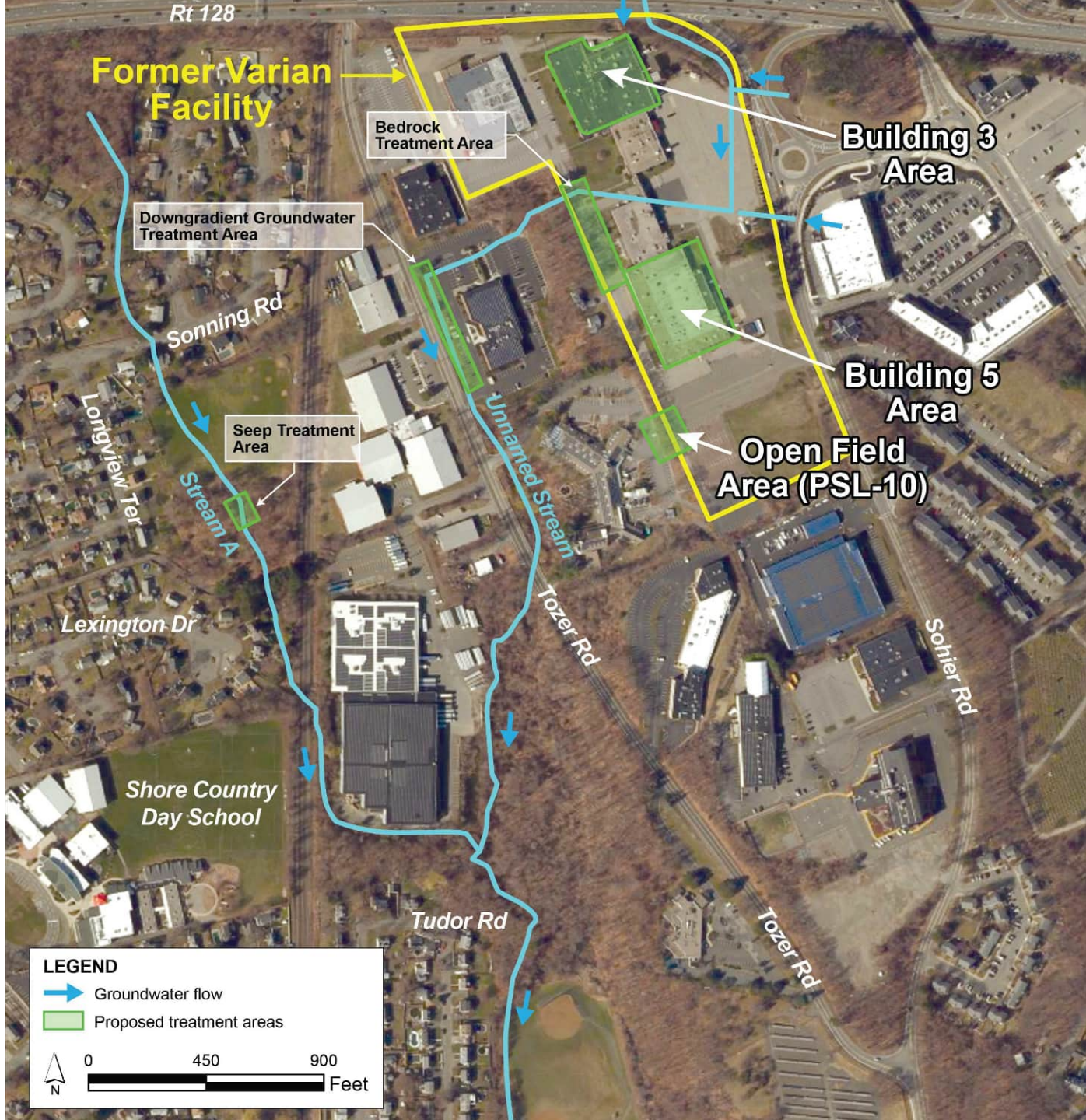
varian
A Siemens Healthineers Company

Phase II Findings

- No “Significant Risk” for all current workers and residents
- Purpose of Treatment
  - Address potential future risk
  - Source and migration control

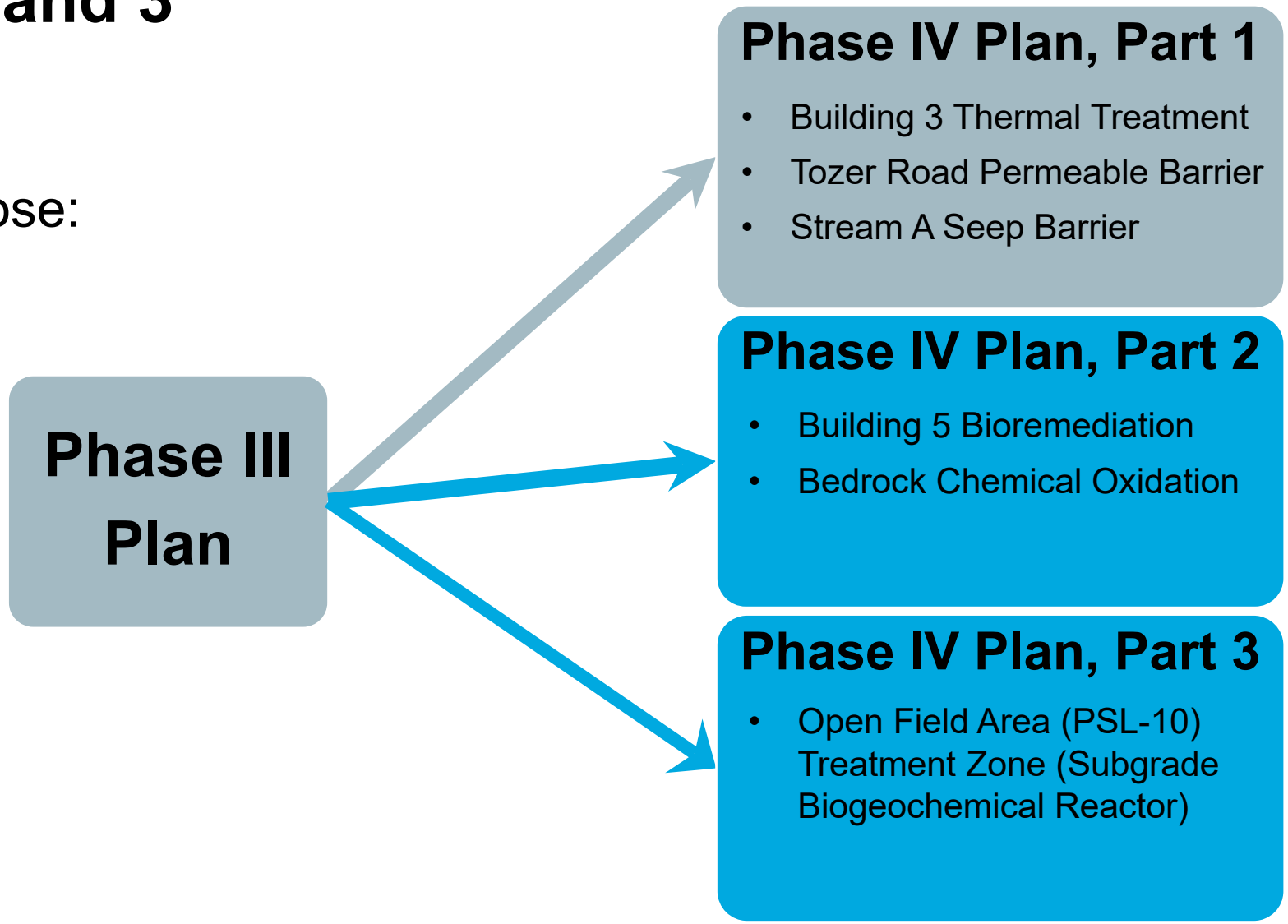
Phase III Outcomes

- Building 3 Source Area – Thermal
- Building 5 Source Area – Bioremediation
- Open Field Area (PSL-10) – Treatment Zone
- Bedrock – In Situ Chemical Oxidation
- Downgradient Groundwater Treatment Area (Tozer Road) – Permeable Reactive and Adsorptive Barrier
- Seep to Stream A – Permeable Adsorptive Barrier



Phase IV Plan, Part 2 and 3

- Phase IV Remedy Implementation Plan purpose:
  - Provide information related to design, construction, operation of the selected remedial alternative
  - Identify appropriate monitoring to be performed to verify that the selected cleanup plan meets design and performance specifications



varian
A Siemens Healthineers Company

Phase IV
Remedial Implementation Plan, Part 2

Building 5 Source Area Overburden

Selected Treatment:

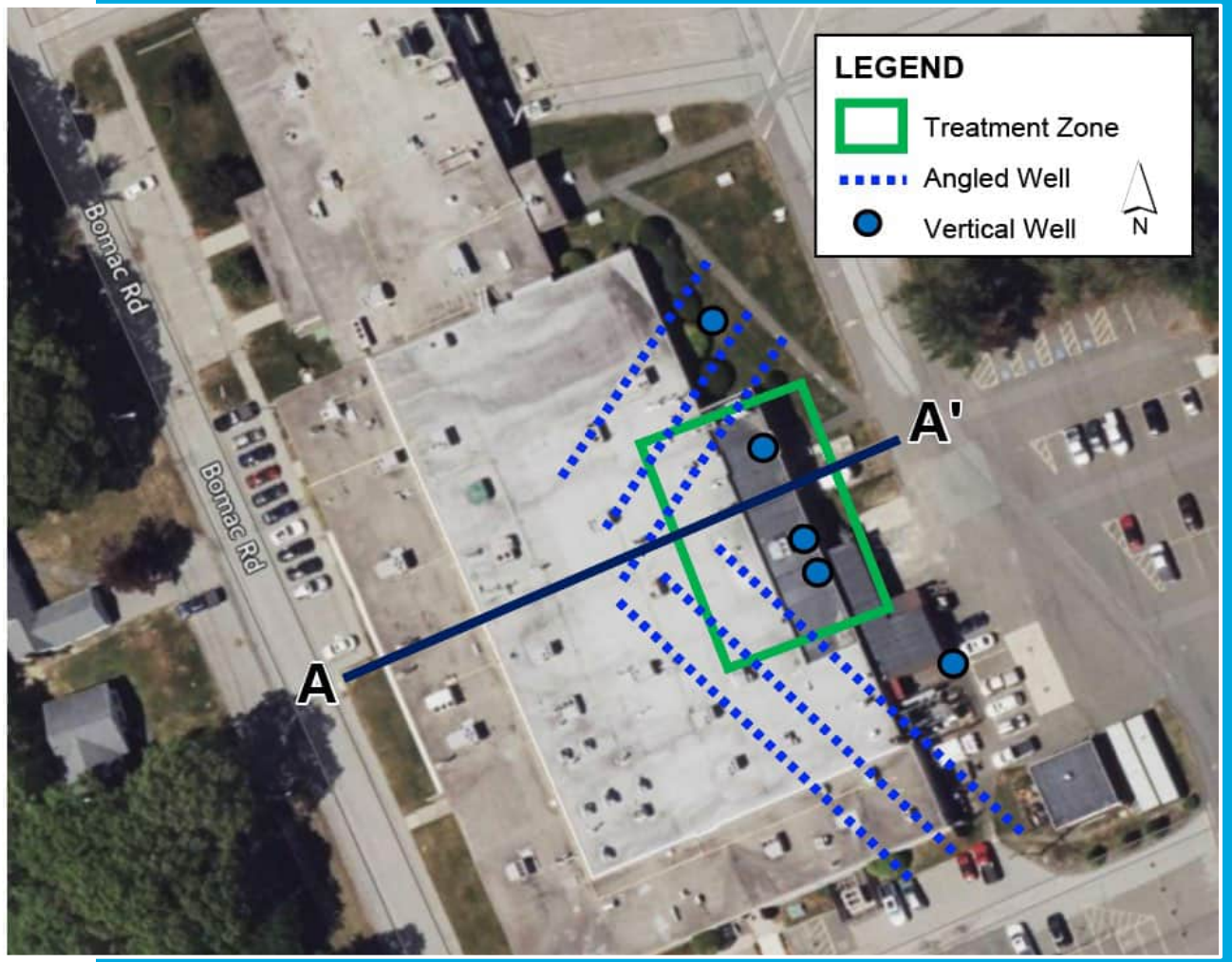
- **In situ bioremediation via enhanced reductive dechlorination**
- **Continued soil vapor extraction**

- Bioremediation
  - Involves injecting carbon amendments (like vegetable oil) that natural microbes use as a food source
  - Promotes breakdown (or “dechlorination”) of contaminants by the microbes
- Bioremediation was previously successful where applied at Building 5 and is appropriate for the contaminant concentrations beneath Building 5
- Treatment will be expanded to new locations with new application methods 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

varian
A Siemens Healthineers Company

Building 5 In Situ Bioremediation

- Components of the treatment system
  - Angled drilling will be used to access areas beneath the building from the exterior to avoid disturbing occupants
  - The angled drilling will include fans of wells to collect test data from different depths
  - Some vertical wells will also be installed inside and outside of the building
  - The new wells will refine the treatment zone and may be used for treatment
  - Additional wells will be installed to provide complete treatment

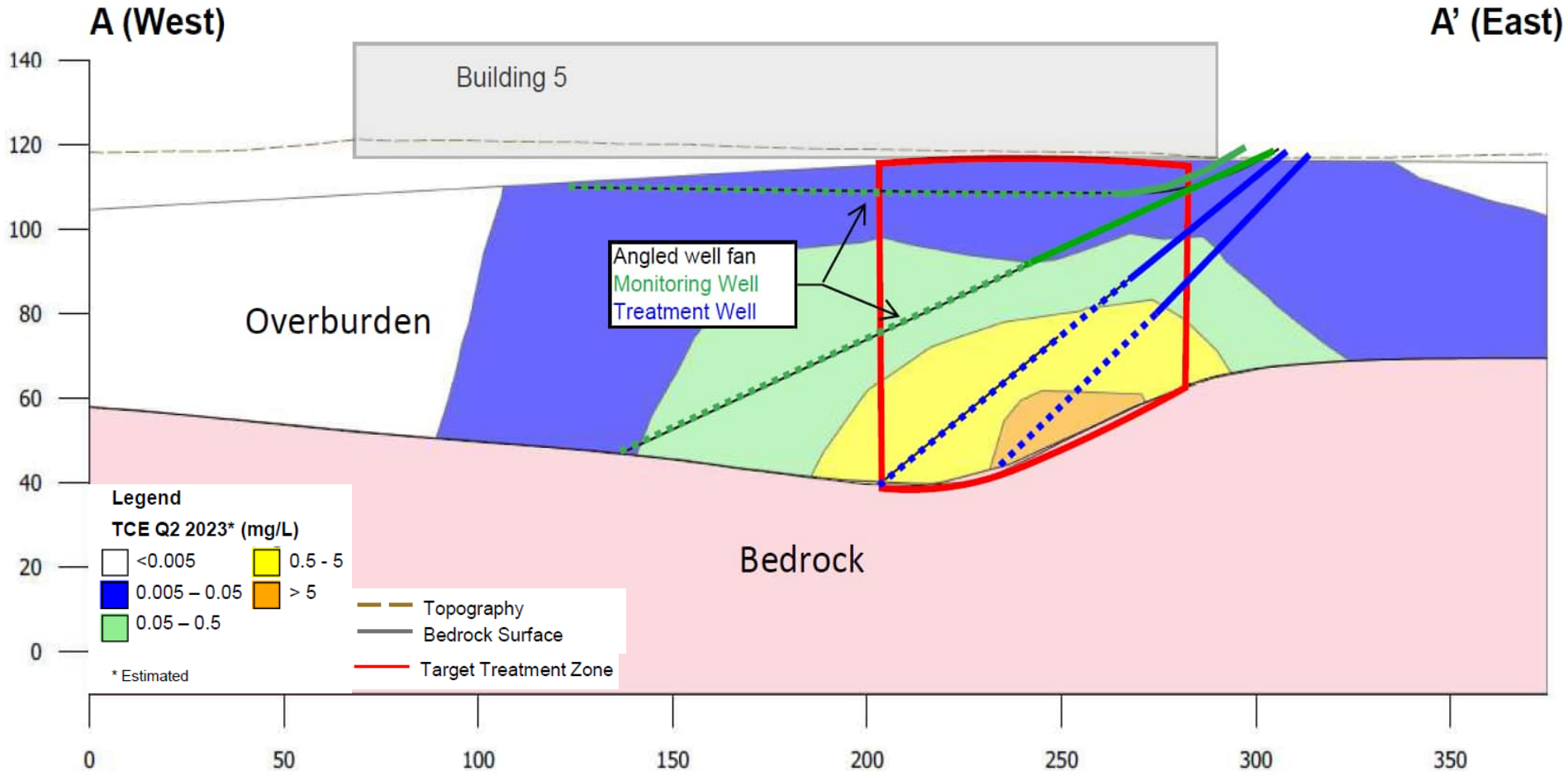


varian
A Siemens Healthineers Company

Building 5 In Situ Bioremediation

Based on test results:

- Injection depths and locations will be selected
- Additional treatment wells will be installed
- Monitoring will be conducted at wells not used for injection



Bedrock

Selected Treatment:

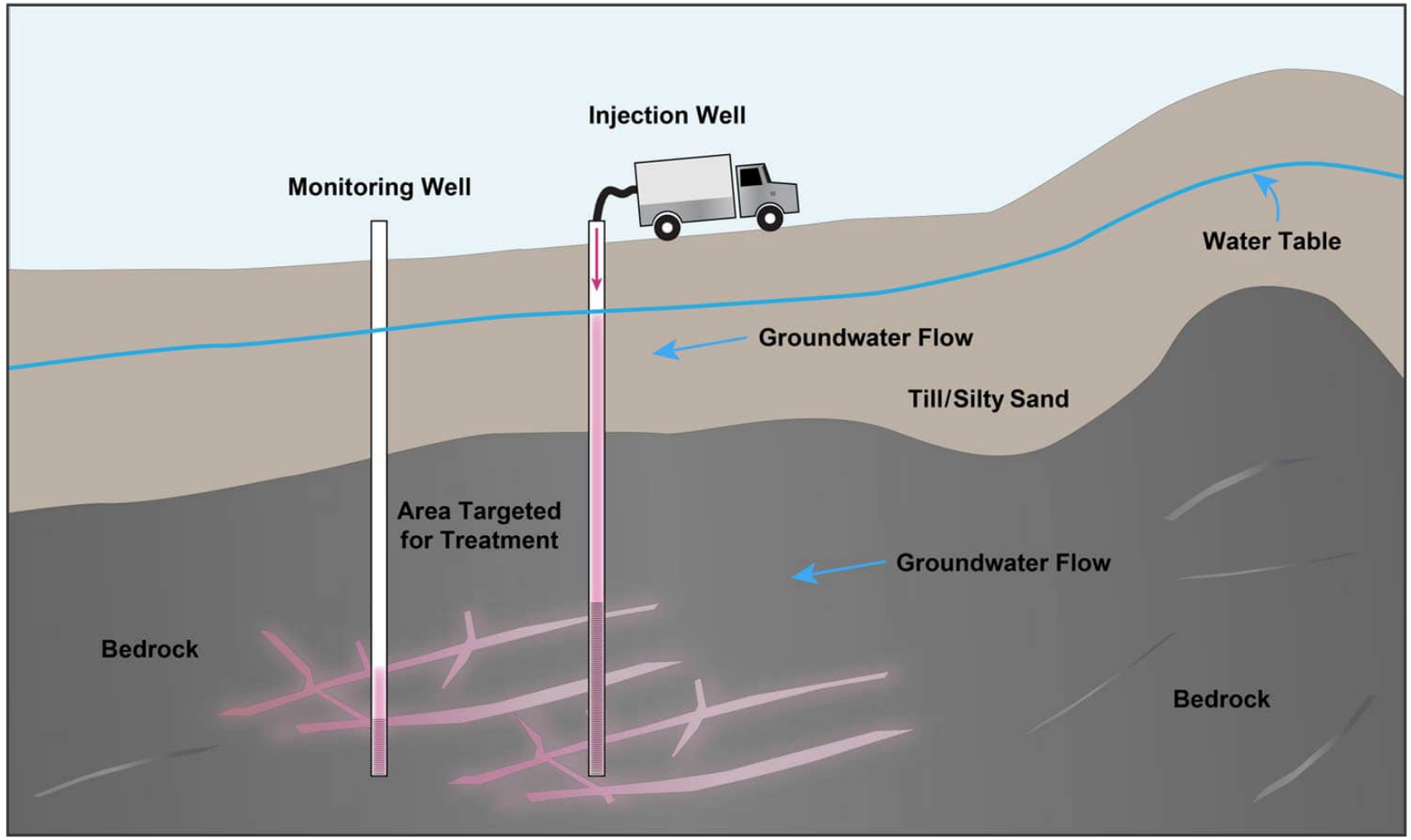
- **In situ chemical oxidation (ISCO)**

- Chemical oxidation refers to the use of oxidants to convert contaminants to non-hazardous or less toxic compounds
- 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

varian
A Siemens Healthineers Company

Bedrock In Situ Chemical Oxidation

Components of the Treatment System

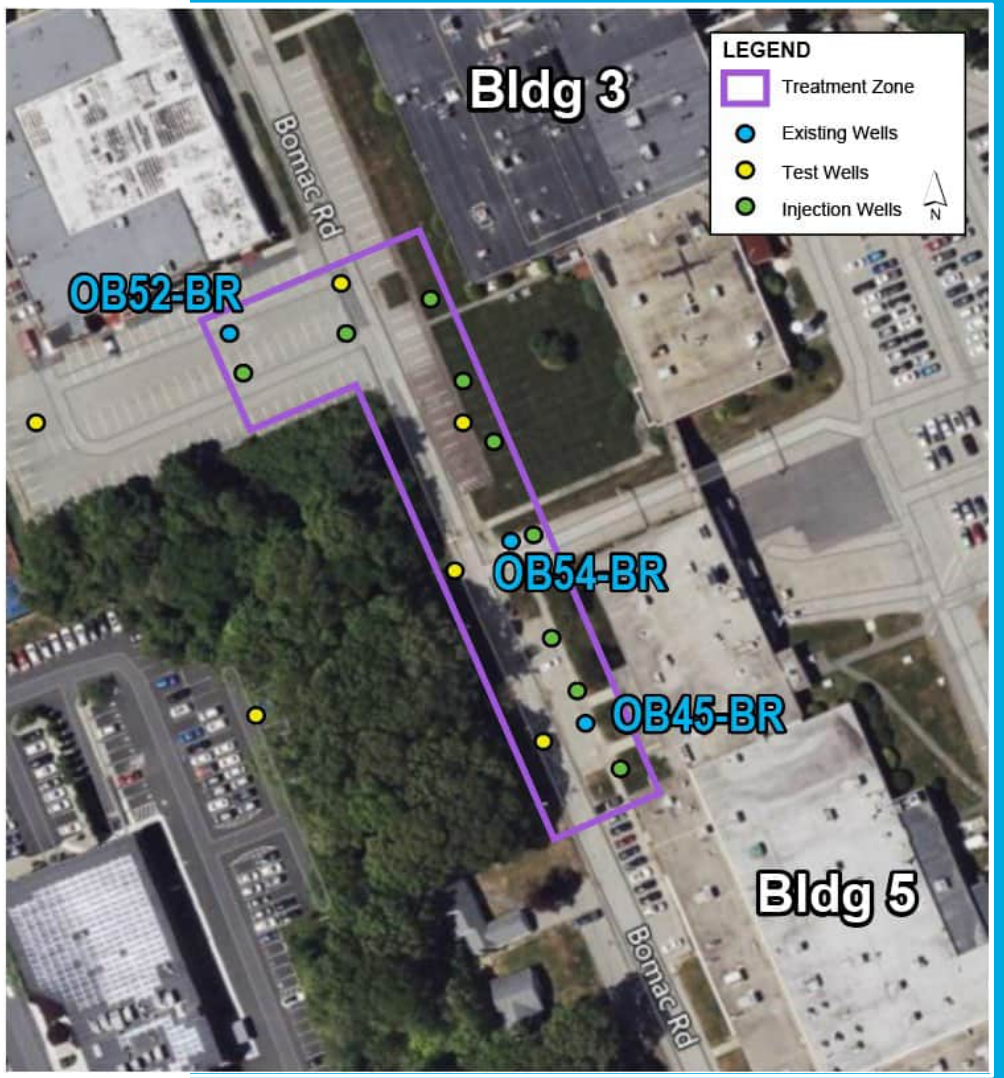


- Permanganate holding tanks and hoses
- Pumps
- Downgradient non-injection test wells
- Regular field monitoring (real time)
- Regular groundwater analytical testing

varian
A Siemens Healthineers Company

Bedrock In Situ Chemical Oxidation

- Implementation activities will include:
  - Advancing vertical borings into bedrock
  - Sampling groundwater and conducting test to confirm connections in fractures
  - Install monitoring and injection wells
  - Injection of permanganate (an oxidant) to chemically oxidize contaminants
  - Monitoring during injection



varian
A Siemens Healthineers Company

Phase IV
Remedial Implementation Plan, Part 3

Open Field Area (PSL-10)

Selected Treatment:

❖ **Permeable Treatment Zone**

- Prior treatment by in situ chemical oxidation has measurably reduced contaminant concentrations
  - Contaminant concentrations have rebounded at certain monitoring wells
  - Pre-design investigation conducted to
    - Confirm details of source area
    - Select preferred permeable treatment zone approach consistent with Phase III Plan
- Implementation of a permeable treatment zone
  - Subgrade Biogeochemical Reactor (SBGR)

varian
A Siemens Healthineers Company

PSL-10 Pre-Design Investigation

- August 2023 – soil gas survey
  - Grid based approach ~160 feet x 60 feet
  - 18 soil gas locations (2 to 5 feet depth)
- September 2023 – soil borings and monitoring well installation (5 wells)
  - Soil sampled for VOCs (8 samples)
  - Groundwater sampled for VOCs
- Results helped identify source mass in unsaturated and shallow saturated zones
- Refined remedial approach in Phase IV Plan, Part 3

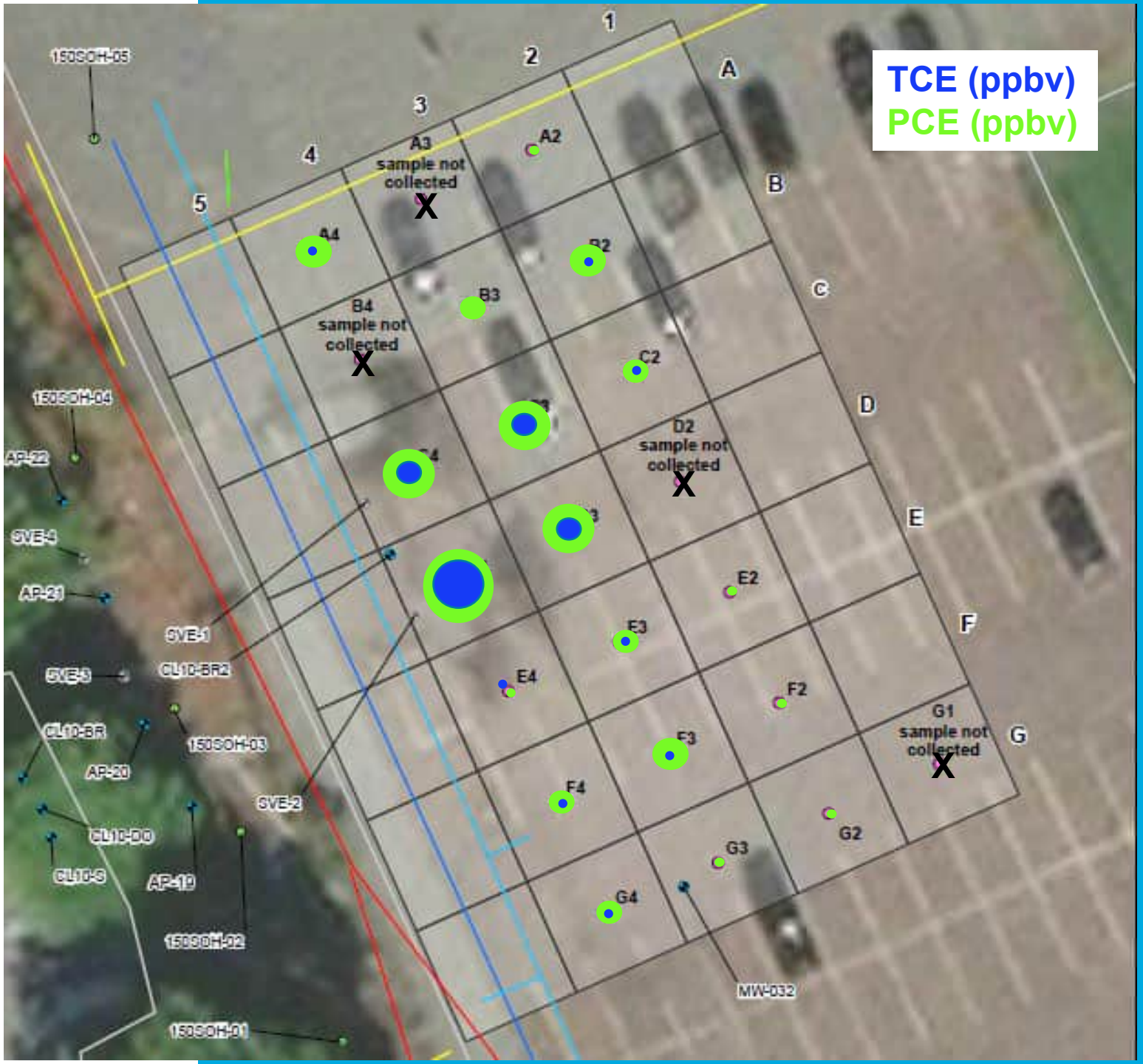
varian
A Siemens Healthineers Company

PSL-10 Investigation

Soil Gas Results (ppbv)

X Data not collected

PCE	Conc. (ppbv)	TCE
	1-99	
	100-999	
	1,000-9,999	
	10,000-100,000	
	>1,000,000	



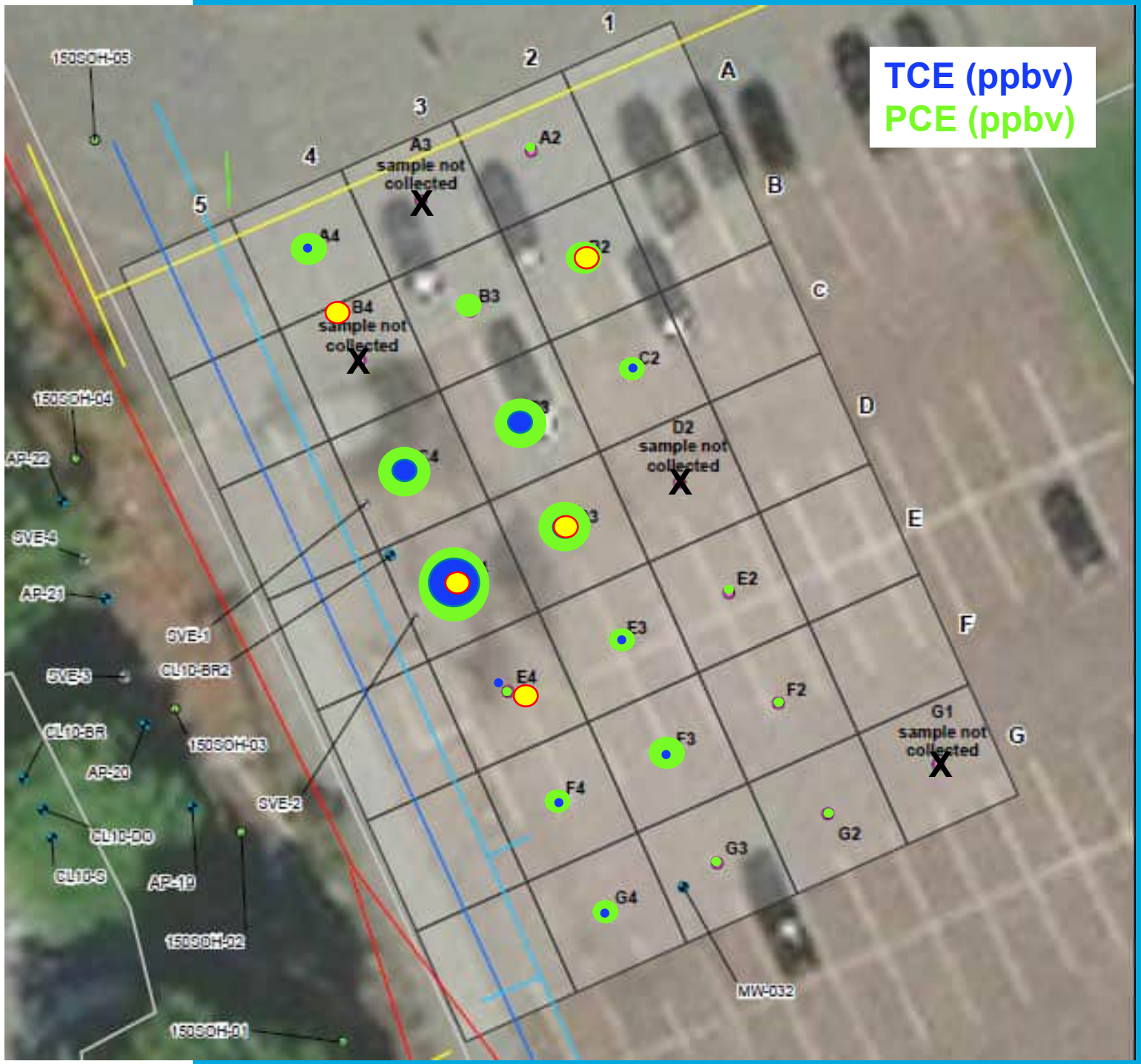
PSL-10 Investigation

Monitoring Well Installation

X Data not collected

PCE	Conc. (ppbv)	TCE
	1-99	
	100-999	
	1,000-9,999	
	10,000-100,000	
	>1,000,000	

Soil boring/monitoring well (installed September 2023)



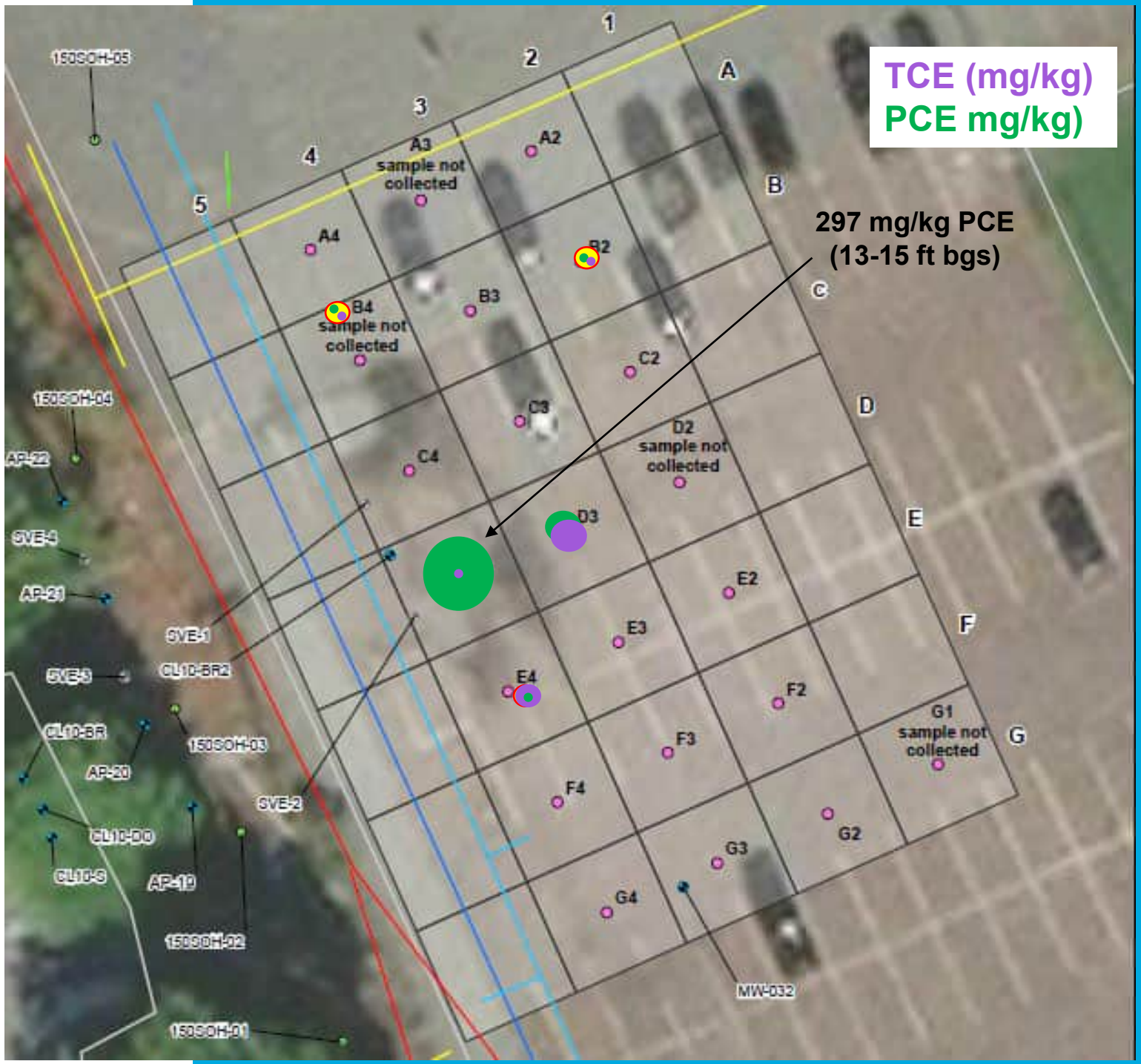
PSL-10 Investigation

Soil Sampling Results (mg/kg)

X Data not collected

PCE	Conc. (mg/kg)	TCE
•	ND-0.1	•
	0.1-1	●
●	1-10	●
	10-100	
●	>100	

Soil boring/monitoring well (installed September 2023)



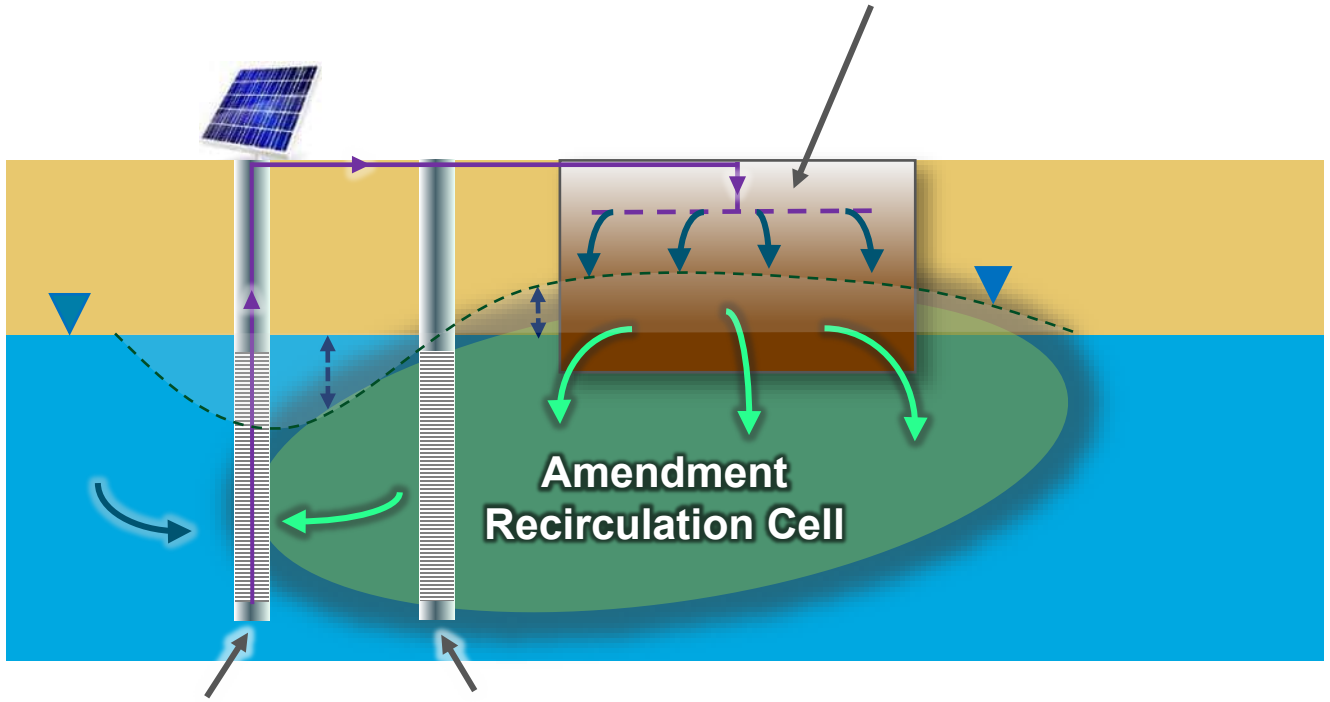
PSL-10 Remedy: SBGR

- Subgrade Biogeochemical Reactor (SBGR)
- Source area and groundwater treatment
  - Partial excavation of contaminant source area
  - Backfill with a mixture of gravel and other amendments (contaminant specific)
  - Recirculate contaminated groundwater through the SBGR (preferably using solar power)
- Contaminant removal occurs through three mechanisms
  - Physical removal
  - Biological degradation
  - Chemical degradation

varian
A Siemens Healthineers Company

Typical SBGR Construction

Subgrade Biogeochemical Reactor (SBGR) is filled with gravel and in-situ treatment amendments (site-specific and based on contaminant)



Extraction Well

Monitoring Well (or Amendment Injection Well, Optional)

Excavation/Backfill

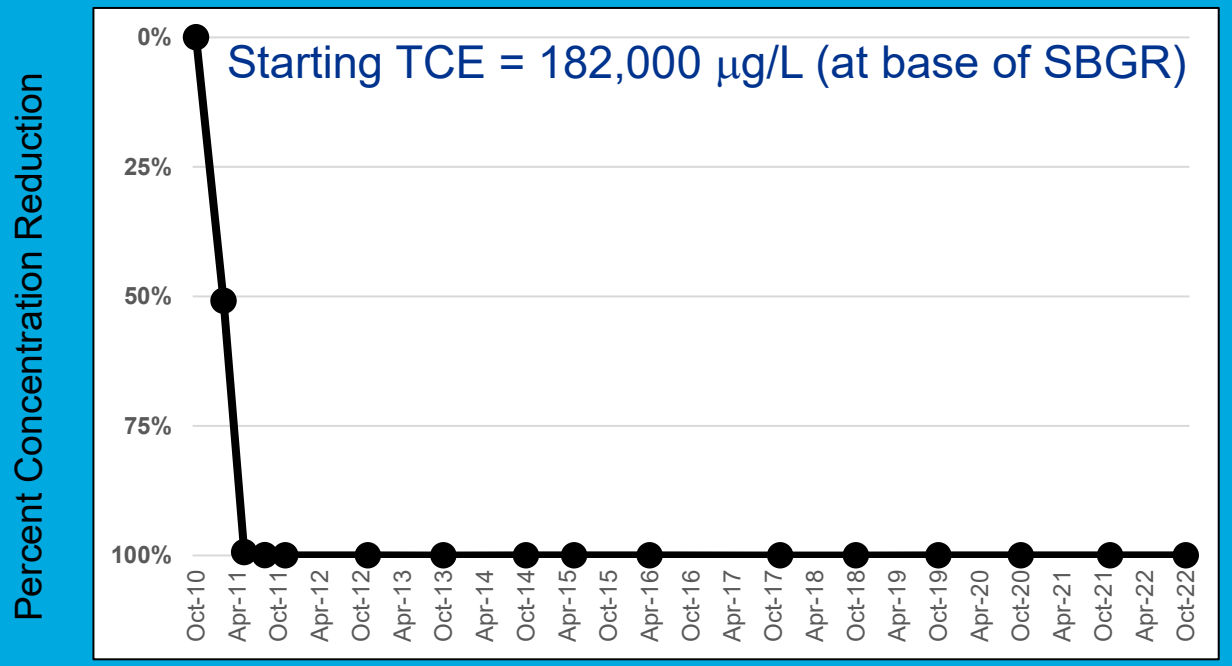
Infiltration Pipe Installation

varian
A Siemens Healthineers Company

Travis Air Force Base, CA

Total VOC Removal (TCE + daughter products)

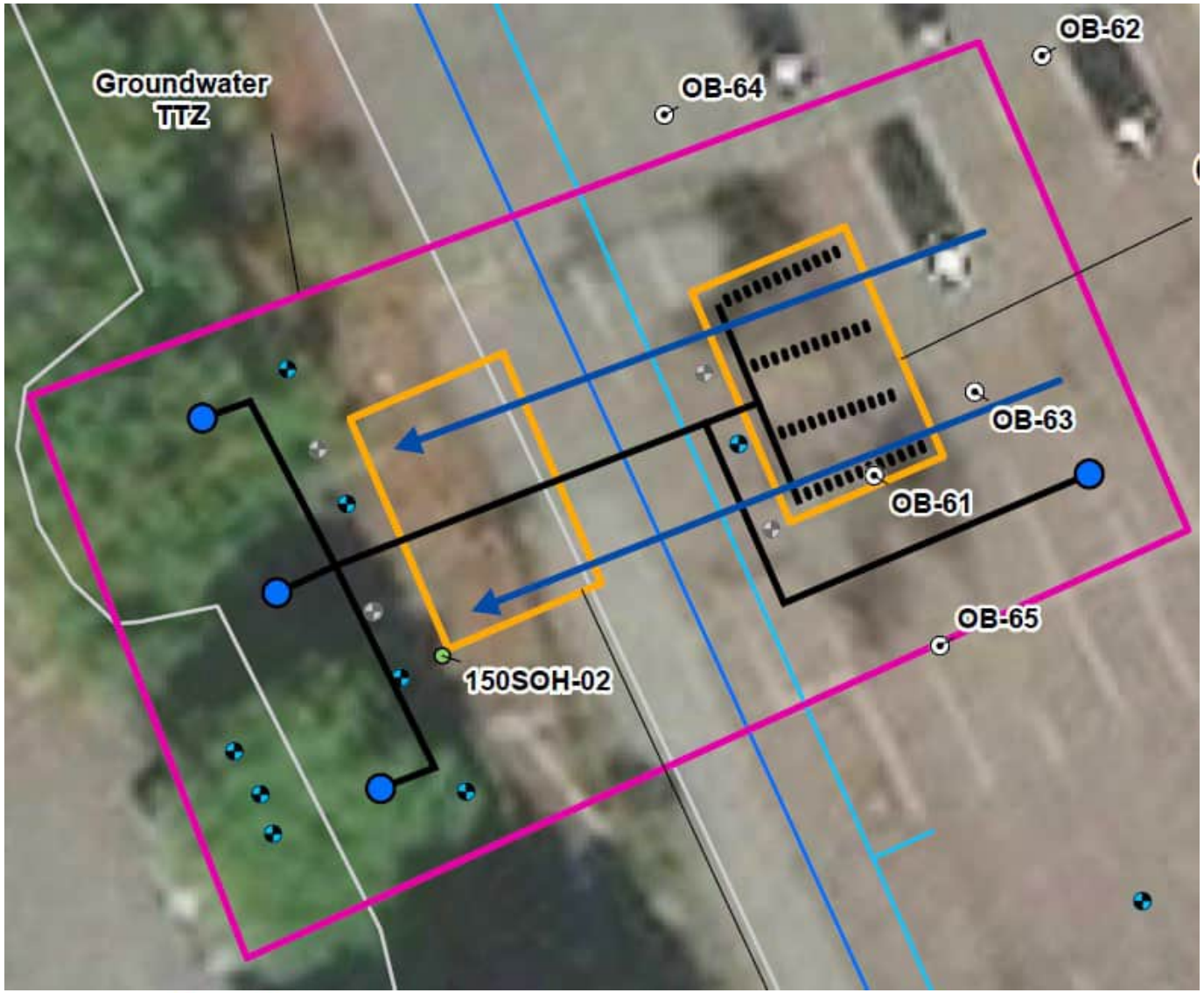
Site SS016



Distance:	Below SBGR	25 feet	100 feet
Percent Total VOC Reduction	>99%	>97%	>94%

varian
A Siemens Healthineers Company

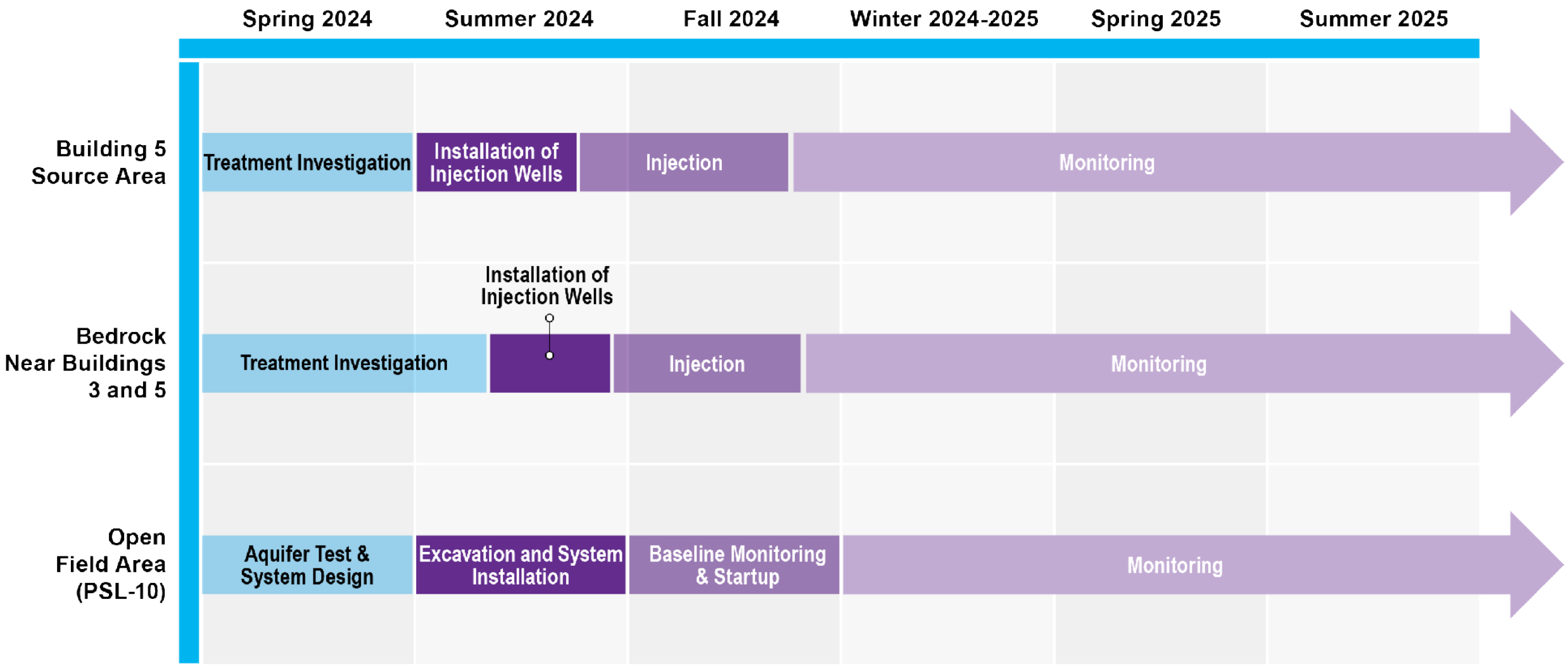
PSL-10 Remedy Implementation



- Up to two excavation areas (~30 ft x 20 ft) with contaminated soil disposal offsite
- East excavation into the top of groundwater; backfilled with organic amendments to support microbial community growth
- Installation of four groundwater extraction wells and piping recirculation system
- Monitoring well system to monitor groundwater levels and VOC concentration reductions

varian
A Siemens Healthineers Company

Milestones* – Phase IV Parts 2 and 3



*NOTE: Estimated schedule, subject to change

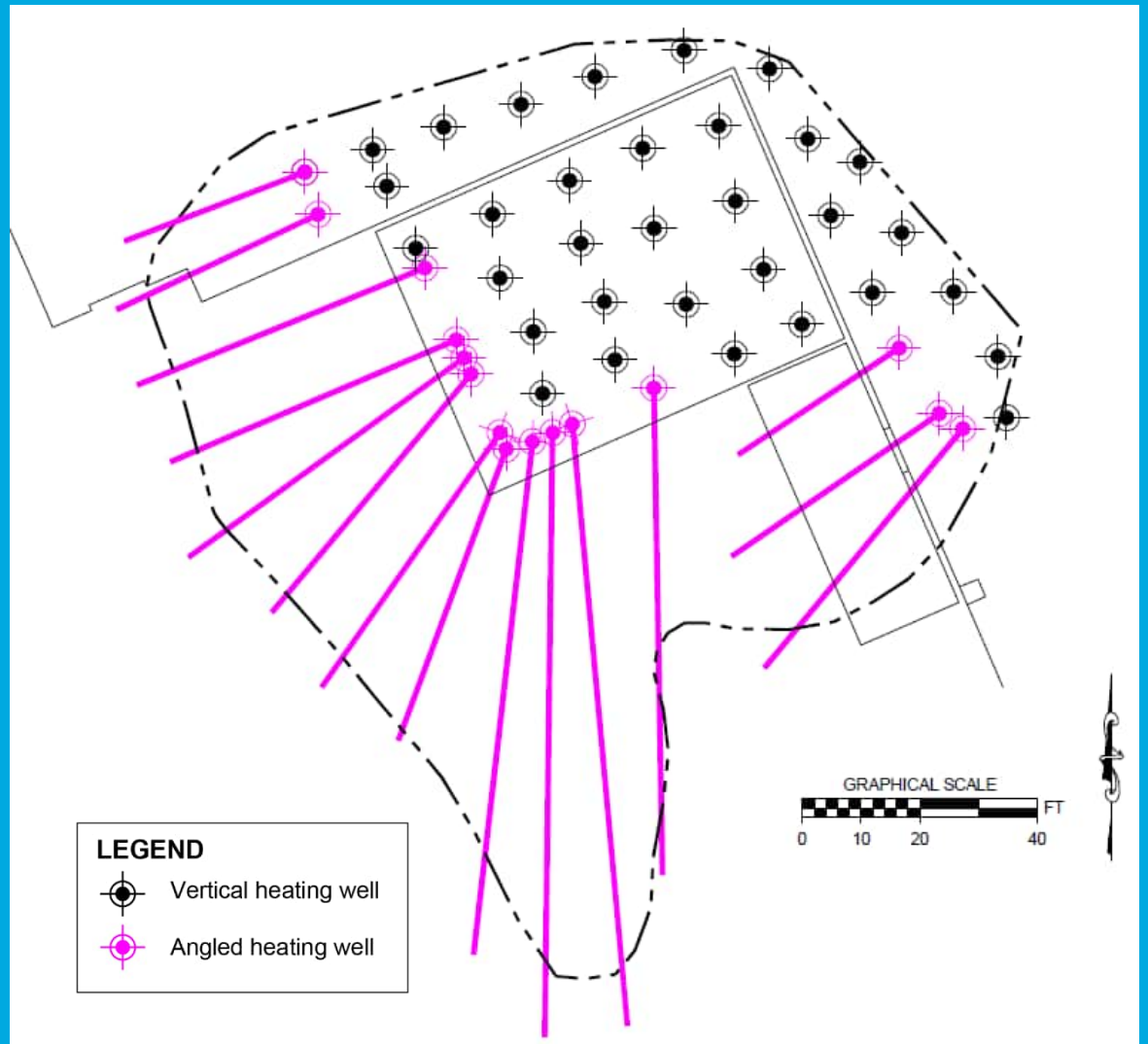
varian
A Siemens Healthineers Company

Status of Current Treatment Activities

Building 3 Thermal Treatment

- Design and planning efforts are underway on multiple aspects of the thermal treatment system
  - TerraTherm has been contracted to provide thermal treatment services
  - A detailed briefing was provided to CPI personnel
  - Supplemental borings were advanced to finalize the target treatment area
  - Design of a new primary power service to support remediation is ongoing
  - Renovations to CPI facilities to provide stockroom access are in progress

Building 3 Thermal Treatment

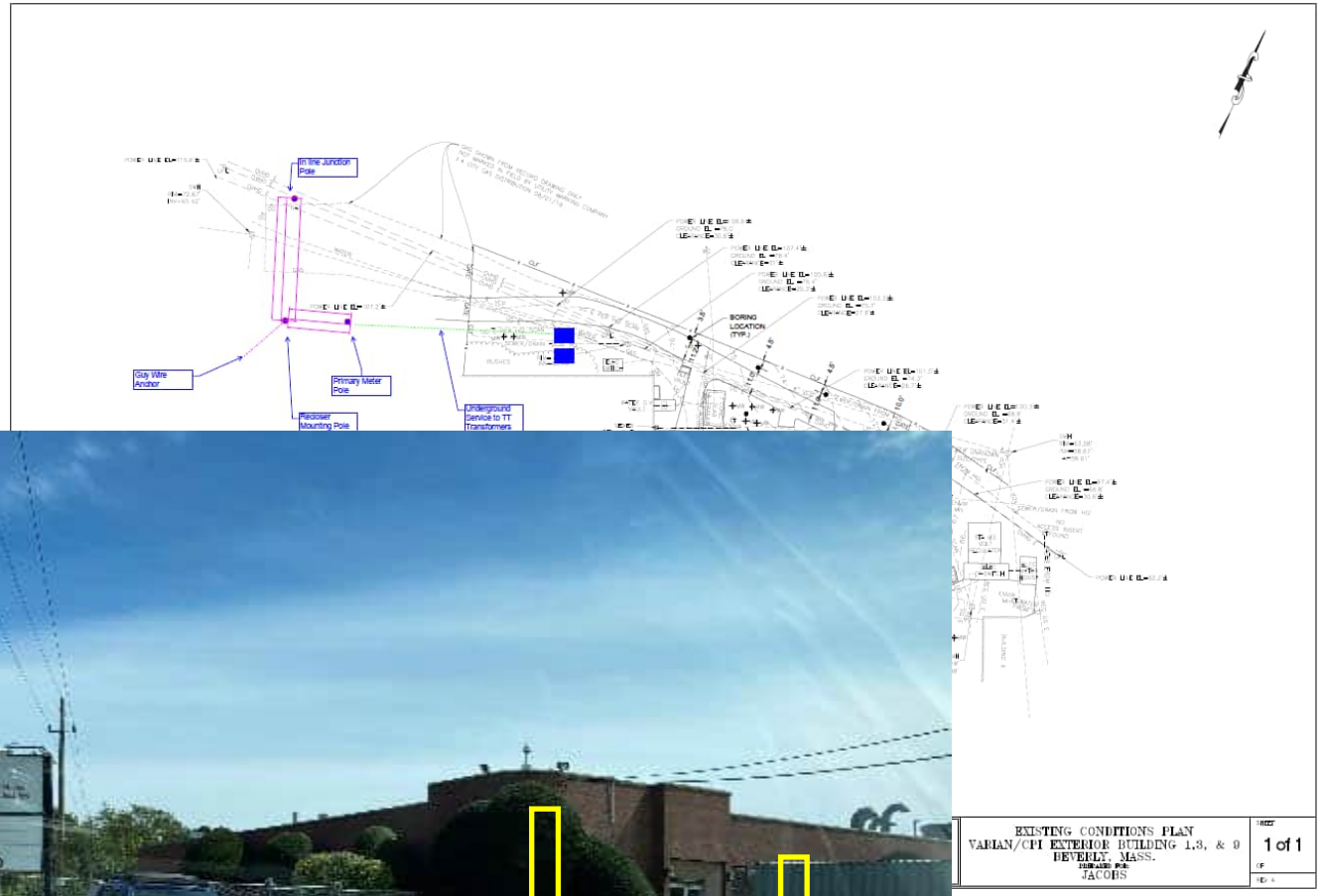


- Two additional soil borings advanced to bedrock north of Building 3 to confirm northern boundary of thermal treatment zone
- Soil data and utility information is being used to design the well field locations and the angles of the heating wells

varian
A Siemens Healthineers Company

Primary Power Service

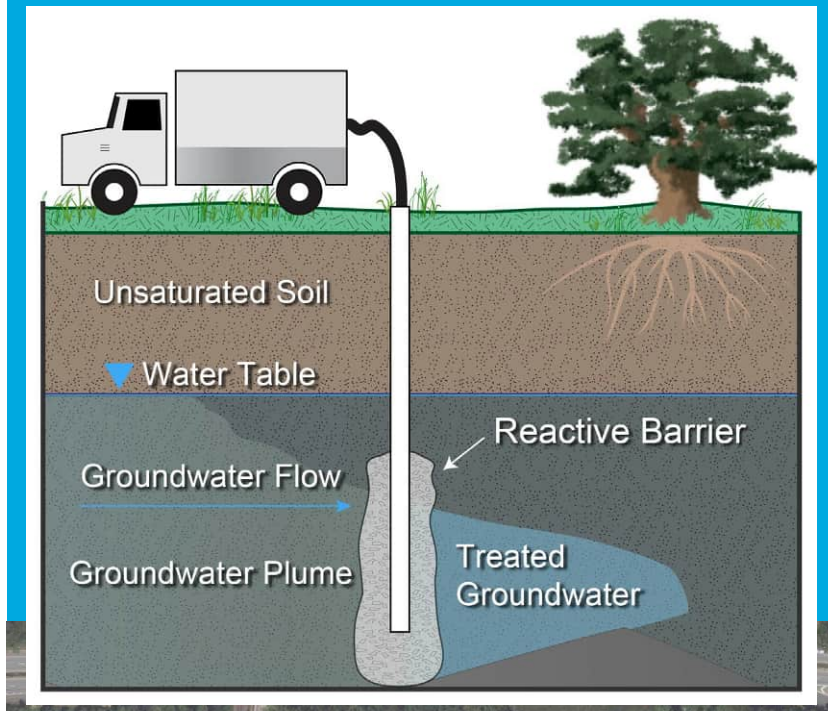
- National Grid representatives engaged for on-site meeting
- Requires installation of three new poles installed outside work area
- Subsurface utility clearance survey underway
- Updated mapping under development to support final design by National Grid

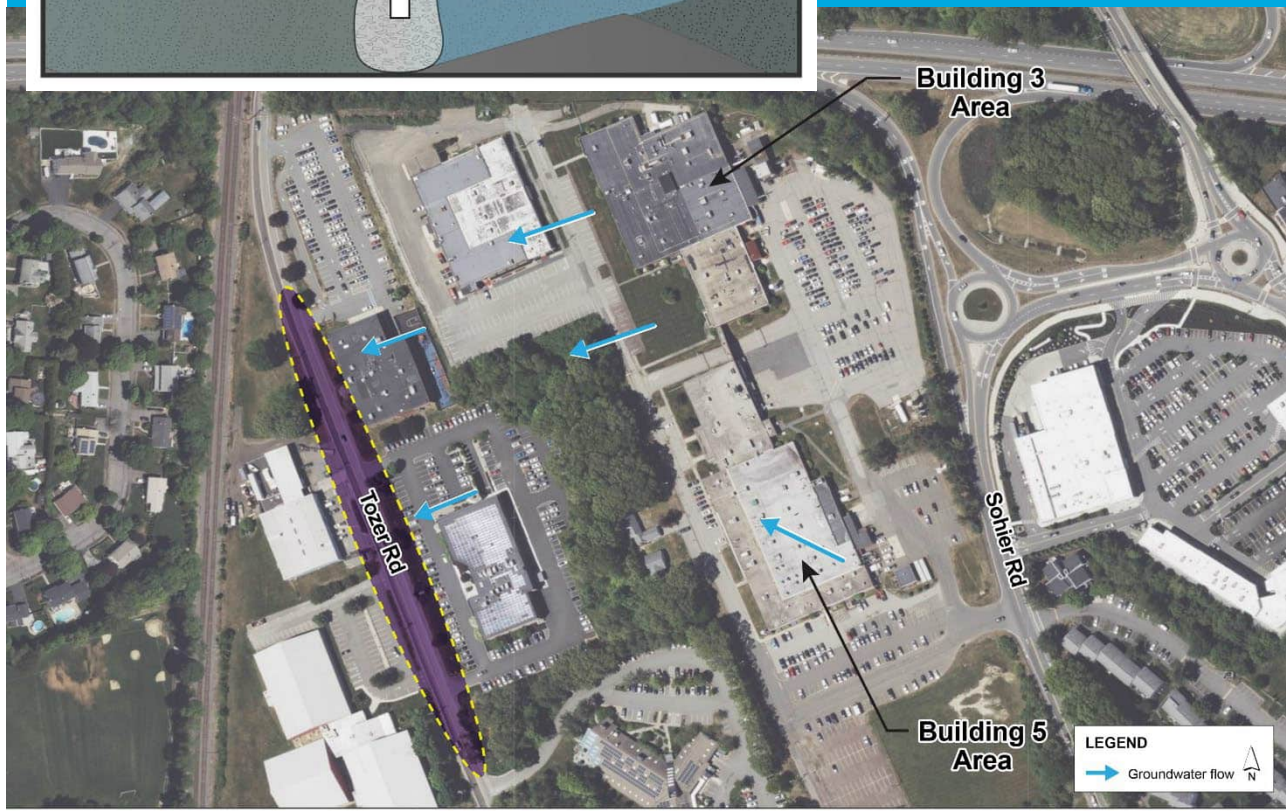


varian
A Siemens Healthineers Company

Tozer Road Groundwater Treatment Barrier

- Installation of a permeable reactive and adsorptive barrier using sulfidated microscale zero-valent iron and colloidal activated carbon
- Remedial activities will include:
  - Investigation to provide additional high-resolution data and soil and groundwater data to help refine the design
  - Installation of new monitoring wells upgradient and downgradient of the treatment area
  - Baseline groundwater sampling
  - Injection of amendments to form a permeable treatment zone
  - Monitoring during injection
  - Post-remediation monitoring to assess performance



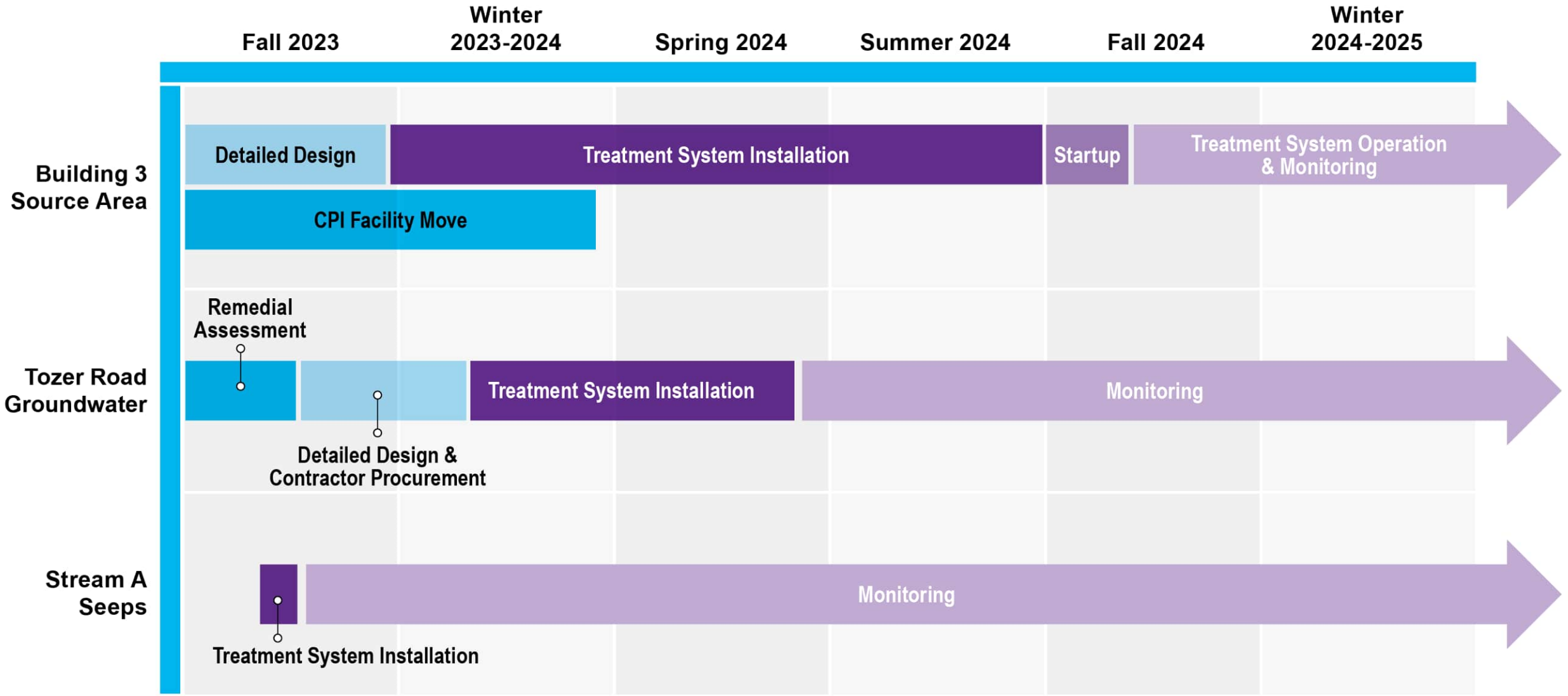


Stream A Mat Installation

- Installation completed
  - Designed to intercept and capture contaminants before water discharges to the stream
  - Installation included erosion controls to protect the stream during construction
  - Mats are covered to limit washout and tampering
  - Monthly inspections will be completed for the first six months
  - Additional inspections following major rain event will also be completed

varian
A Siemens Healthineers Company

Milestones* – Current Treatment Activities



*NOTE: Estimated schedule, subject to change

varian
A Siemens Healthineers Company

Documents for Public Review

- Documents Available for Public Review
  - Phase IV Remedy Implementation Plan, Part 2
  - Phase IV Remedy Implementation Plan, Part 3
- Hard copy:
  - Beverly Public Library Reference Desk
- Online:

  Part 2:

  https://eeaonline.eea.state.ma.us/EEA/FileViewer/FileViewer.aspx?fileEncryptionId=hiibdbgj

  Part 3:

  https://eeaonline.eea.state.ma.us/EEA/FileViewer/FileViewer.aspx?fileEncryptionId=ijihafdj

Public Comment Period Nov 15 – Dec 4

- Complete comment sheet at welcome table
- Submit comments to Raymond Cadorette
  - Online: https://beverlysitecleanup.com/public-involvement
  - Email: Raymond.Cadorette@jacobs.com
  - Mail: Jacobs Solutions
    Attn: Raymond Cadorette
    120 St. James Avenue, 5th Floor
    Boston, MA 02116
- Please comment on:
  - Phase IV Remedy Implementation Plan, Part 2
  - Phase IV Remedy Implementation Plan, Part 3

varian
A Siemens Healthineers Company

Questions

varian
A Siemens Healthineers Company

varian

A Siemens Healthineers Company