

# PROJECT HIGHLIGHT

**CLIENT:** Former Dry Cleaners

**LOCATION:** Sunnyvale, CA

**TECHNOLOGY:** Pneumatic Fracturing and Atomized Liquid Injection

**LITHOLOGY:** Interbedded fine-grained materials

**CONTAMINANTS:** PCE

## PNEUMATIC FRACTURING AND ATOMIZED LIQUID INJECTION AT A HIGH TRAFFIC SITE

### Site Information

This impacted site was located in a busy downtown shopping area that was included in a time-critical downtown redevelopment plan, which aimed to revitalize the town center into a vibrant shopping, working and entertainment complex. The aggressive redevelopment plan required an accelerated implementation schedule. Cascade selected in situ remediation using zero-valent iron (ZVI) as the remedy to address PCE contamination from historical releases. Because of the challenges of

working in a highly visible downtown shopping area, Cascade interfaced closely with the engineering consultant, developer, property owners, and municipality on issues such as schedule, traffic rerouting, security, construction noise, utilities, etc. Our activities included:

- Repositioning of equipment during light traffic hours with minimum productivity loss and disruption to local commerce
- Rotation of field personnel to provide a continuous work schedule over a 10-week period, to meet the required schedule

### Approach

Cascade injected ZVI at 56 locations, targeting depths between 30 to 60 ft bgs. Approximately 12,000 lbs of micro-scale ZVI were injected per point. A total of 672,000 lbs of ZVI powder were injected during the 10-week project.

Cascade implemented an integrated pneumatic fracturing and ZVI emplacement approach. We injected in 3-foot intervals, isolated by pneumatic packers. Pneumatic fracturing preceded ZVI injection at each location to increase bulk permeability and develop flow paths. The fracturing initiation pressure ranged between 100 and 300 psig while the ZVI injection pressures were typically less than 200 psig after fracturing. Approximately 1,200 lbs of ZVI was injected into each 3-foot interval.

Cascade frequently relocated the drilling setup and equipment to decrease the implementation footprint, thereby minimizing the impact to local businesses and inconvenience to residents. Additionally, we minimized drill cuttings while advancing injection boreholes.



*Downtown Sunnyvale, California*

### Results

Post-injection groundwater sampling results in the “hottest” well showed a 94% reduction in PCE three months after the completion of the injection activities, from a baseline of 1,800 µg/L to 170 µg/L. The project was completed on budget, within the allotted schedule, and without incident.