DCS
AMERICAS
Design and Consulting Services

FORMER TRW MICROWAVE SITE

Current Site Status and Upcoming Field Work

August 12, 2022

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Meeting Agenda and Objectives

1. Introductions
2. Brief review of site background and status
3. Remedial / Vapor Intrusion Activities
4. Upcoming Additional Vapor Sampling Activities

Image from Google

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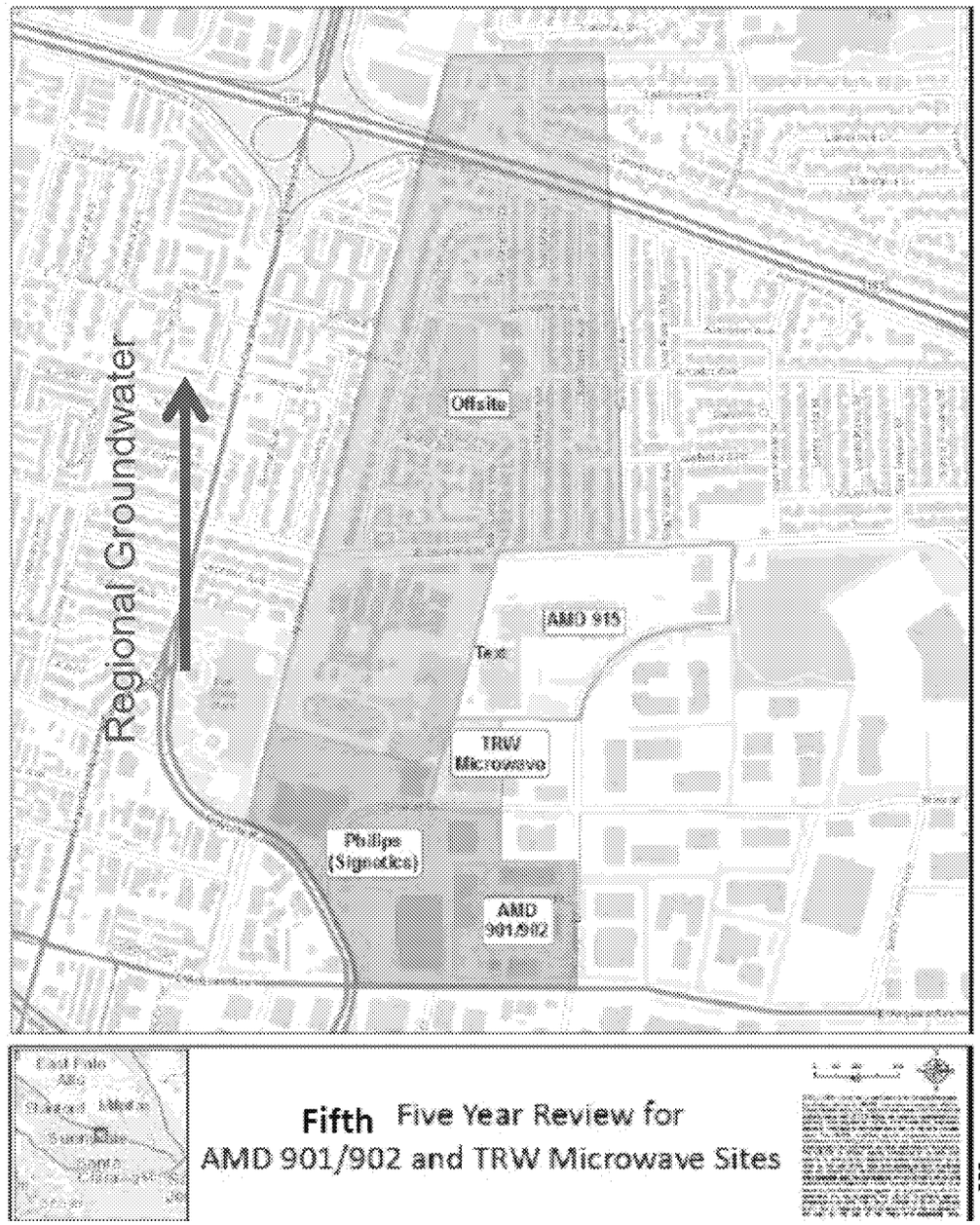
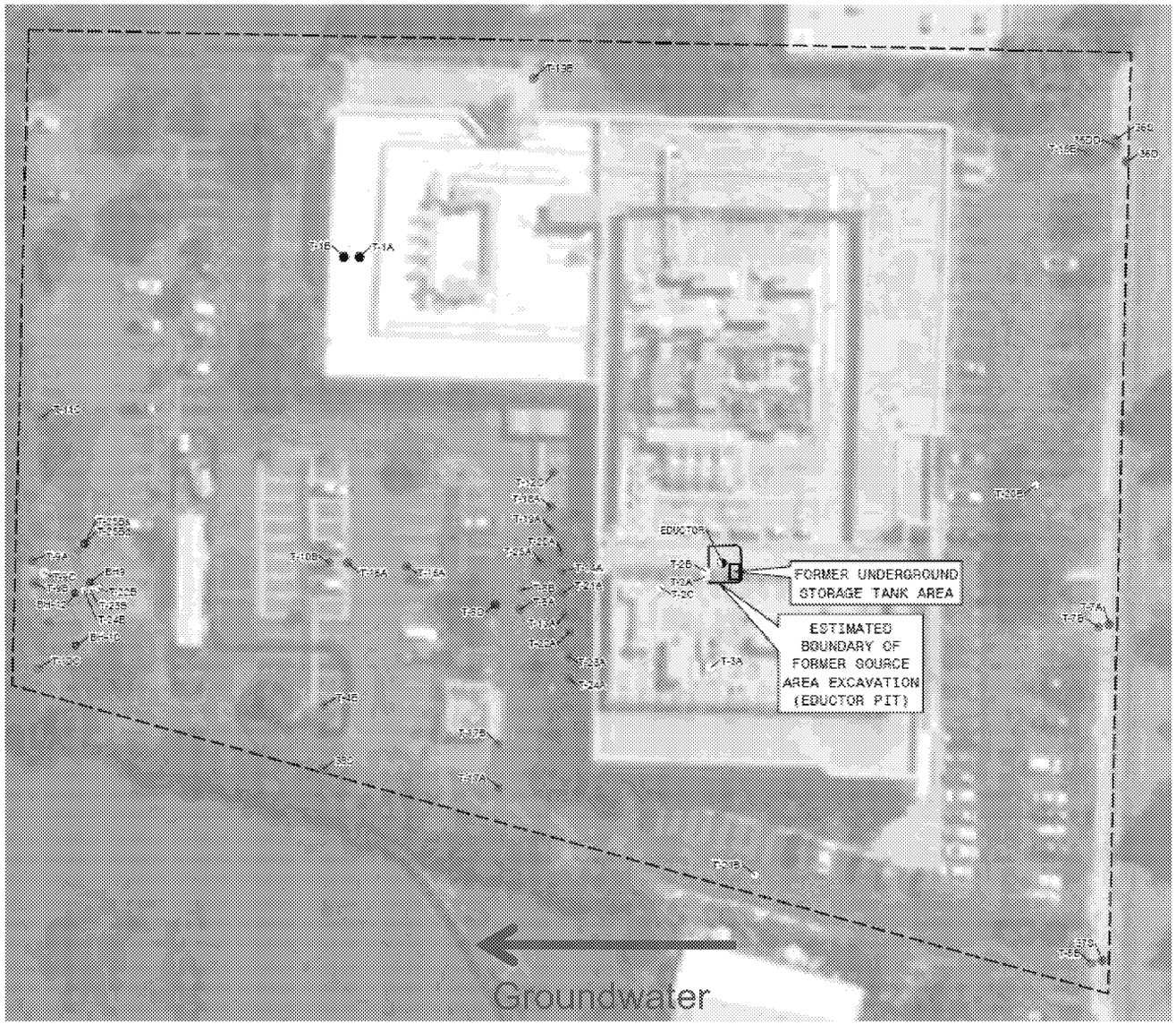
Regional Setting and Nearby Releases

- Philips, AMD, and Northrop Grumman (the Triple Site) share responsibility for the management and remediation of the co-mingled groundwater plume, the Off-Site Operable Unit (OOU).
- VOC-Impacted sites within 1,000 feet of TRW Microwave site:
  - Advanced Micro Devices (AMD) Buildings 901/902
  - Philips Semiconductors (Philips; formerly Signetics) Buildings 811
  - Philips 815 and 440
  - AMD Building 915
- USEPA is the lead agency for the Triple Site, but Philips has historically been under a different regulatory program.



Site Layout



LEGEND

- A-ZONE MONITORING WELL
- B1-ZONE MONITORING WELL
- B2-ZONE MONITORING WELL
- B3-ZONE MONITORING WELL
- B4-ZONE MONITORING WELL
- EDUCTOR - DESTROYED 2014
- NEWLY INSTALLED MONITORING WELL
- MONITORING WELL - DESTROYED 2014
- MONITORING WELL - DESTROYED 2004
- MONITORING WELL - DESTROYED OCTOBER 2019
- PROPERTY BOUNDARY

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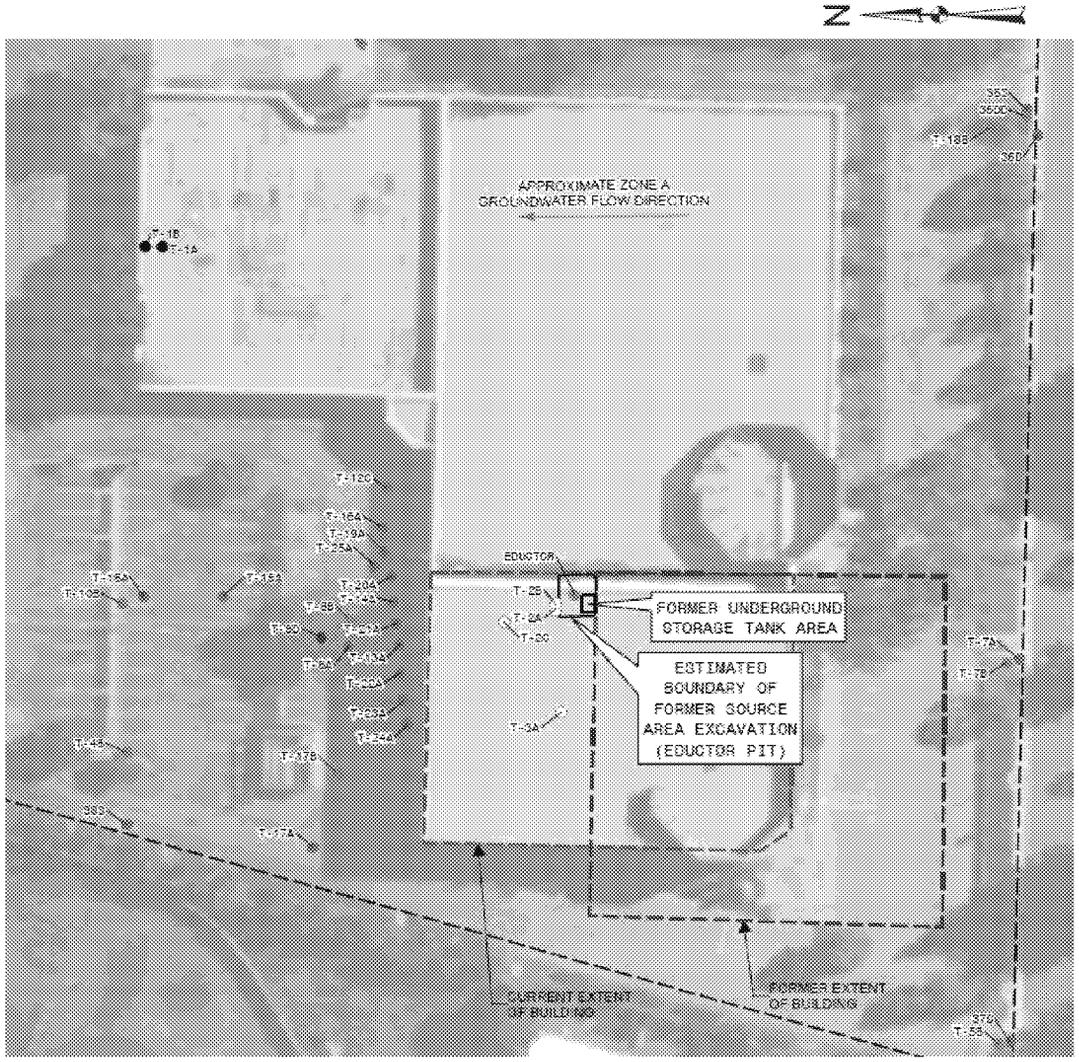
Operational History

Ownership and Operations

- 1968 – 1974: Aertech Industries assembled and tested microwave and semiconductor components
- 1974: TRW Inc. acquired the site
- 1987: FEI Microwave purchased the site
- 1993: Microwave ends manufacturing activities
- 1995 – 2000: Site acquired by Stewart Associates and leased to Diablo Research corporation
- 2001 – 2003: Building remodeled, including construction over the former location of the underground storage tank
- 2001 – 2014: Site unoccupied
- 2014 – 2015: Building redeveloped
- 2015 – Present: Site leased by Apple



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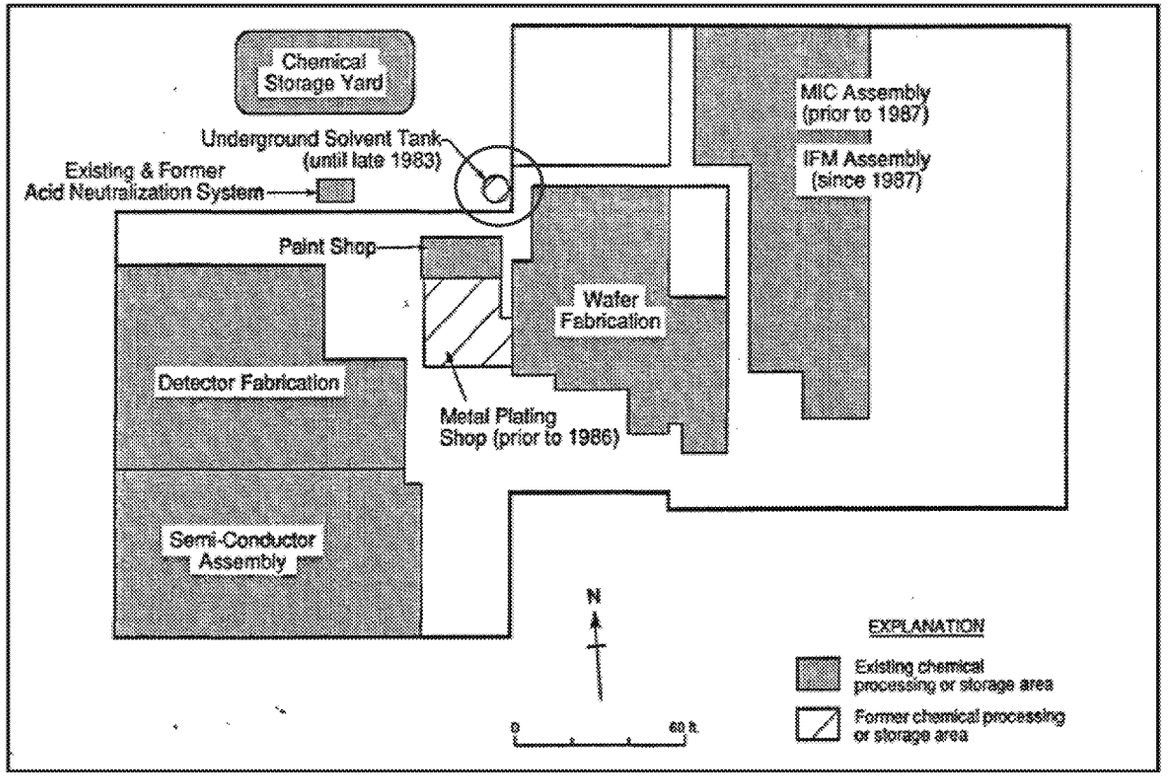
Previous Chemical Usage

Chemical Use

- 1968 – 1993 TCE and other industrial solvents used
- 1970 – 1982 Waste solvent stored in UST (considered the source area)
- 1968 – 1984 Ammonia gas and acid neutralization system operated (not associated with contamination at the site)



Adapted from the Record of Decision (USEPA 1991)

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Regulatory History

- Site is managed under the CERCLA process
- Regulatory oversight was previously delegated to the Water Board and a cleanup order (Order No. 91-103) was issued in 1984
- ROD was approved in 1991: ROD included TRW, AMD, Philips, and the OOU. Remedy for each site was pump and treat.
- P&T operated 1985 to 2001. Was turned off because pulling contamination on to the site. Cessation of P&T and transition to in situ remediation was supported by the Water Board.
- Focused Feasibility Study was submitted to the Water Board and USEPA in May 2011 but never finalized.
- USEPA took over the lead agency role August 7, 2014.
- Five Year Review prepared by USACE in September 2014; responses led to a need for an updated CSM and using ESS.
- Most recent Five Year Review prepared by USACE in September 2019.

2019 FYR Summary

- Previous in-situ remedies and institutional controls at TRW and AMD sites are providing protectiveness.
- Existing 1992 covenant and agreement for TRW site prohibits use of groundwater, using the site as a daycare, or excavation of soils without prior approval of the Regional Board until cleanup levels stated in the ROD are achieved.
- Points to extensive environmental sequence stratigraphy (ESS) work done at TRW site as beneficial to the CSM and understanding of contaminant migration.
- Passive sub-slab system at TRW site adequately mitigates potential indoor air issues based on 2015 sampling.
- Acknowledges that achieving cleanup goals with the presence of upgradient sources (specifically Philips) would be difficult.
- Identified recommendations from USACE:
  - Select a revised remedy which incorporates long-term stewardship measures for the current vapor intrusion mitigation measures in place, as well as addresses potential vapor intrusion in the event of future land use changes.
  - Revised soil and groundwater remedy should be selected, as the remedy selected in the ROD is no longer operating.

2019 FYR – Identified TRW CSM as Model for Surrounding Sites

Northrup Grumman, the company responsible for the TRW Site, updated their Conceptual Site Model and detailed the depositional environment of alluvial deposits in the Triple Site area[2]. Numerous hydrostratigraphic units (HSU) were identified within A, B1, and B2 Zones. These hydrostratigraphic units have not been projected or identified to any significant extent beyond the TRW Site. Permeable channel deposits representing hydrostratigraphic unit preferred pathways have been identified in the A and B1 Zones at the Signetics Site.

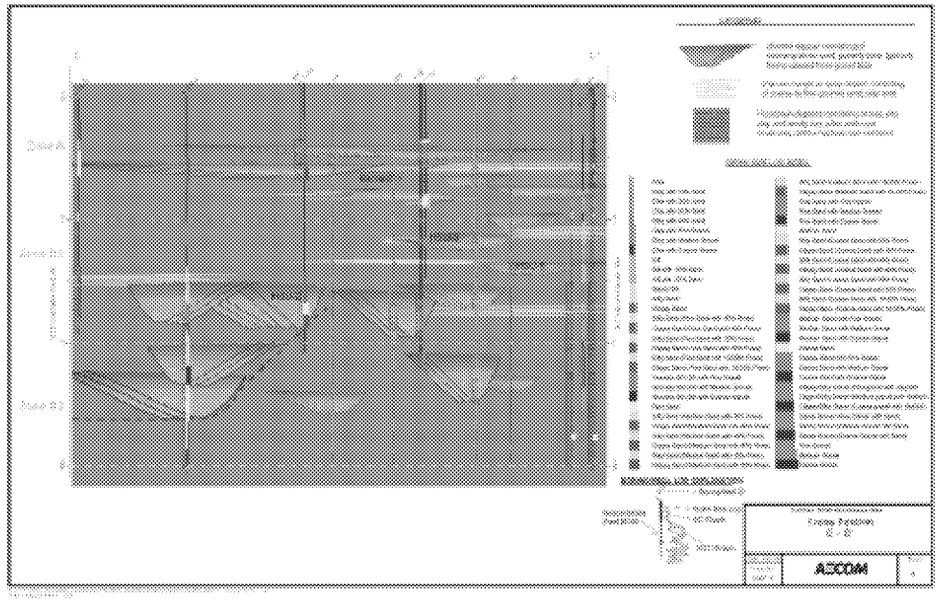

Figure 4. Cross-Section Showing hydrostratigraphic units in the A, B1, and B2, Zones Beneath the TRW Site

[2] A Conceptual Site Model is comprehensive graphical and written summary of what is known or hypothesized about environmental contamination at a site. It provides a platform for evaluating the data gaps and related uncertainty associated with site history and operations; geology, hydrogeology and hydrology; contaminant sources, release mechanisms and fate and transport; potential receptors and exposure pathways.

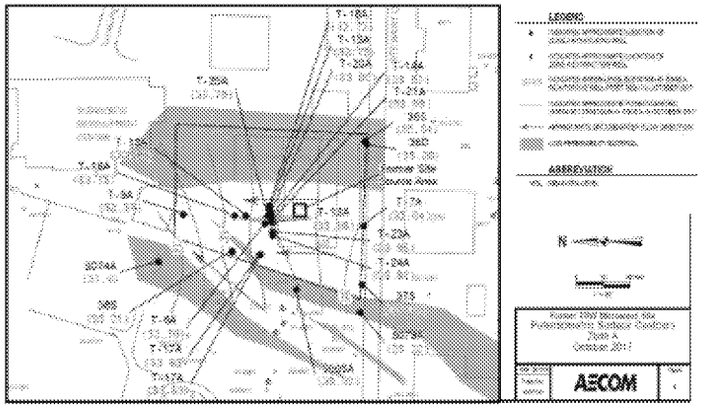

Figure B-13. TRW A Aquifer Zone hydrostratigraphic units Showing Channelized Flow Patterns and Groundwater Contours (note figure orientation)

Furthermore, there is a wide gap in in the level of detail and accuracy of the Conceptual Site Model for the Offsite OU and the TRW Site, which should be narrowed to be able to achieve greater success in mass removal, leading to aquifer restoration and mitigation of risks to human health and the environment. The Conceptual Site Model needs to be updated to account for the preferred transport pathways of the fluvial depositional environment known to exist in the region. The Conceptual Site Model update should include the following activities: regional pre-remediation hydraulic gradients should be estimated; a detailed review of lithologic changes from boring logs should be conducted; permeability zones should be identified and identified thicknesses; detailed cross-sections that map out high permeability zones should be constructed; and new subsurface chemical and stratigraphic data should be assimilated where appropriate.

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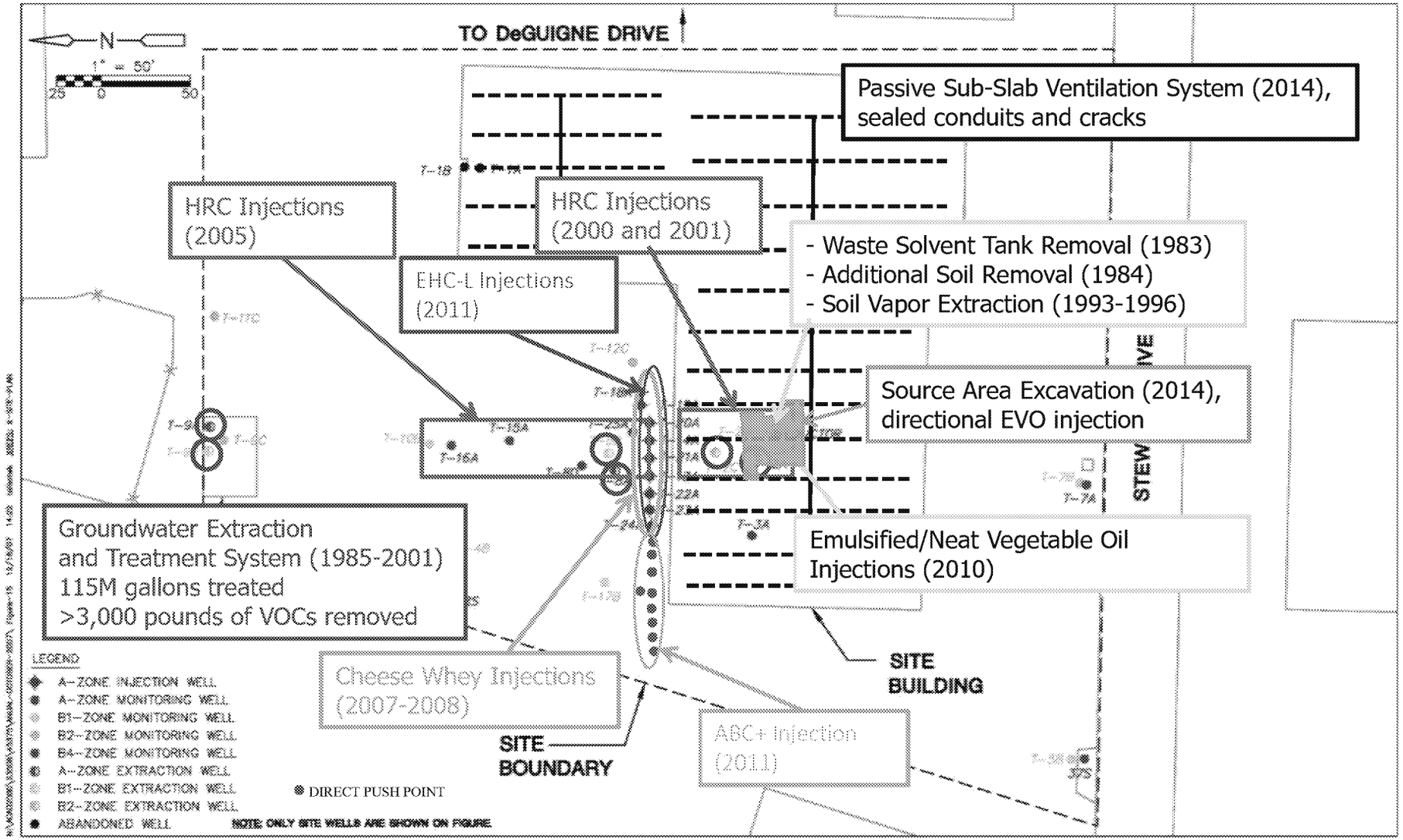
Previous Remedial Activities



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Enhanced Anaerobic Biodegradation (EAB) Program

- More than 10 years of active EAB programs:
  - October 2000 – Injected HRC into former source area Zone A and Zone B1
  - June 2001 – Additional HRC injections into Zone A and Zone B1
  - August 2005 – Additional HRC injections downgradient of the source area
  - 2007-2008 – Injection of cheese whey into Zone A wells downgradient of the source area
  - October 2010 – Injection of emulsified vegetable oil (EVO) into the source area
  - November 2010 – Injection of neat soybean oil into the source area
  - November 2011 – Injection of EHC-L into Zone A wells and ABC+ into Zone A and Zone B1
  - December 2014 – Injection of EVO under building footings in the vicinity of the source area
- Previous CSIA analysis at the site confirmed EAB successfully caused degradation of COCs
- Presence of daughter products (cDCE, VC, ethene) confirmed complete degradation and removal of contaminant mass

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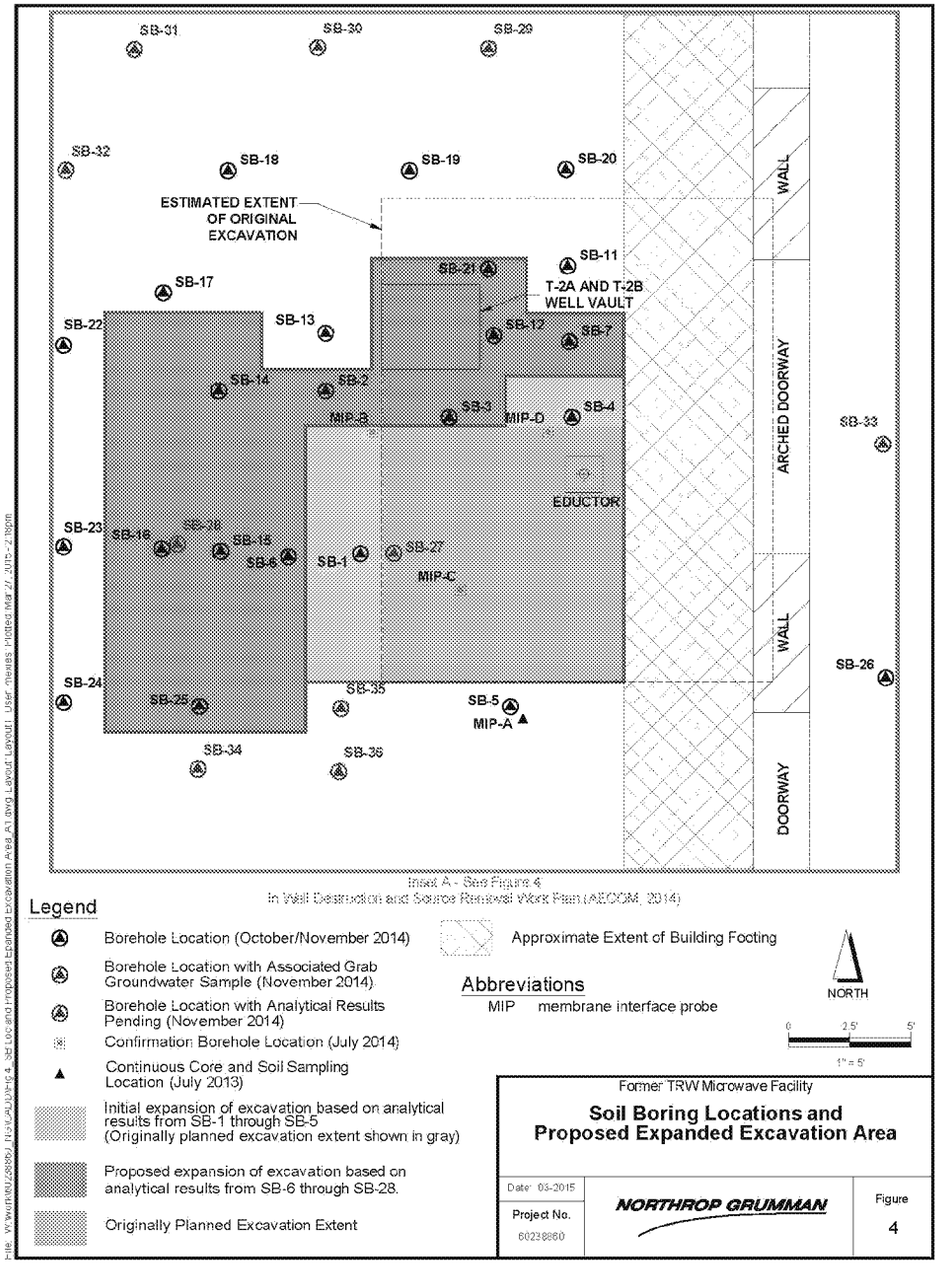
Source Area Excavation Extent

- Excavation extent guided by soil boring results
- Hydropunch was used to correlate soil concentrations with groundwater concentrations
- Excavated soil correlated with:
  - TCE > 150 ug/L in groundwater
  - cDCE > 250 ug/L in groundwater
  - There are similar to concentrations coming onsite from upgradient
- 2014 excavation extent was significantly larger than the 1984 excavation
- Removed approximately 400 cubic yards of soil



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Source Area Excavation

Breaking up concrete for expanded excavation activities

Large diameter auger

Extent of the excavation area (fitted with rebar after excavation activities complete) looking north with vent risers for the passive sub-slab vapor collection system in the foreground

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Vapor Intrusion – Historical Activities

- December 2013 – VI evaluation showed that TCE was present inside the building between 6.8 µg/m^3 to 7.7 µg/m^3
- August/September 2014 – Proactively installed a passive sub-slab ventilation system underneath the site building to mitigate any potential VI
- November 2014 – Destroyed wells inside building to eliminate pathway
- April 2015 – Sealed concrete slab cracks/penetrations, elevator shaft, and space between walls
- May 2015 - Performed VI sampling event to evaluate post-mitigation conditions and confirmed mitigation measures sufficiently effective
- December 2015 – AECOM on behalf of Apple Inc., performed post-renovation confirmation VI sampling to confirm mitigation measures remain effective.

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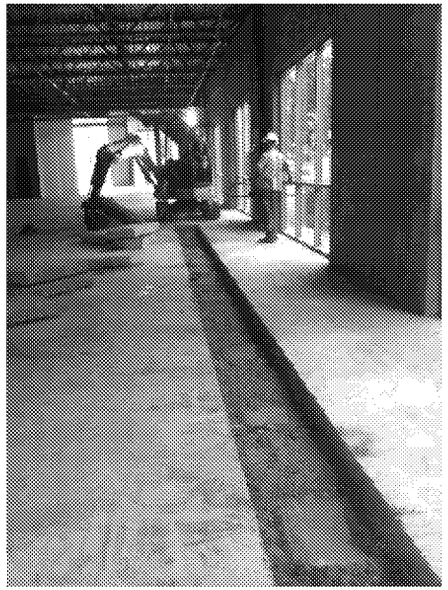
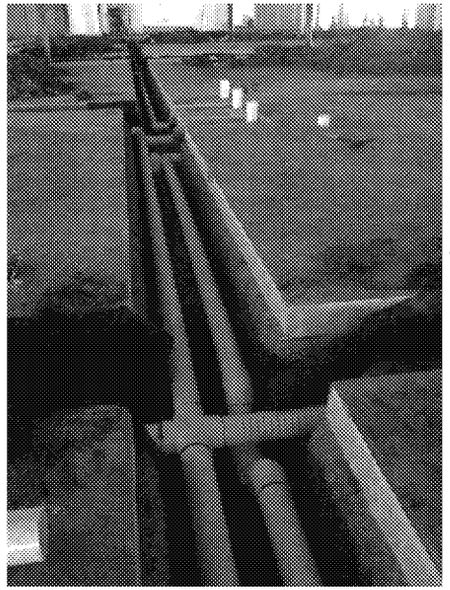
Vapor Intrusion – Historical Activities

Passive Sub-Slab Ventilation System Installation

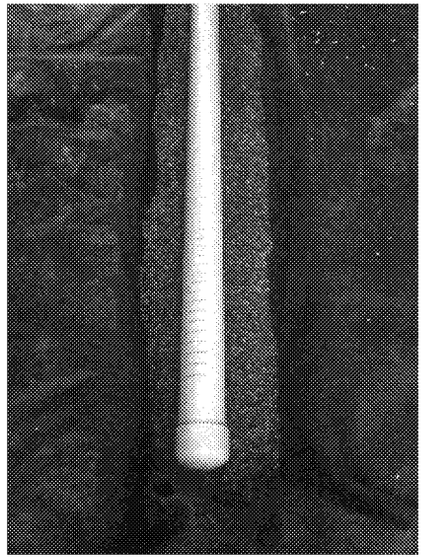


Vapor collection trench lined with geotextile fabric, backfilled with pea gravel, and installed slotted pipe

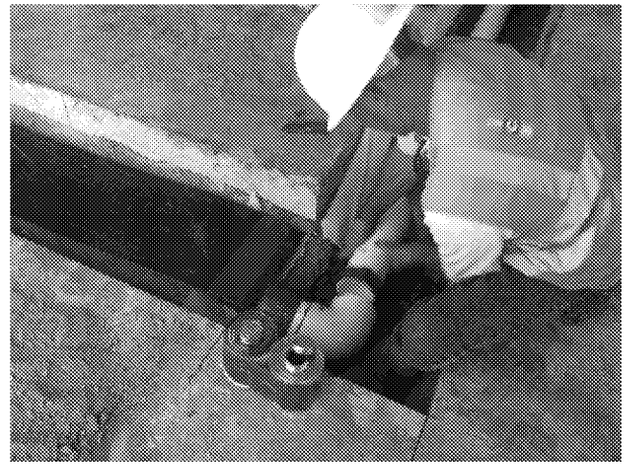


Slotted vapor collection piping connected to solid header pipes leading to vent risers

Capped end of slotted pipe installed in vapor collection trench



Geovent (installed in place of slotted pipes where not enough clearance was available for pipes) being connected to pipe header



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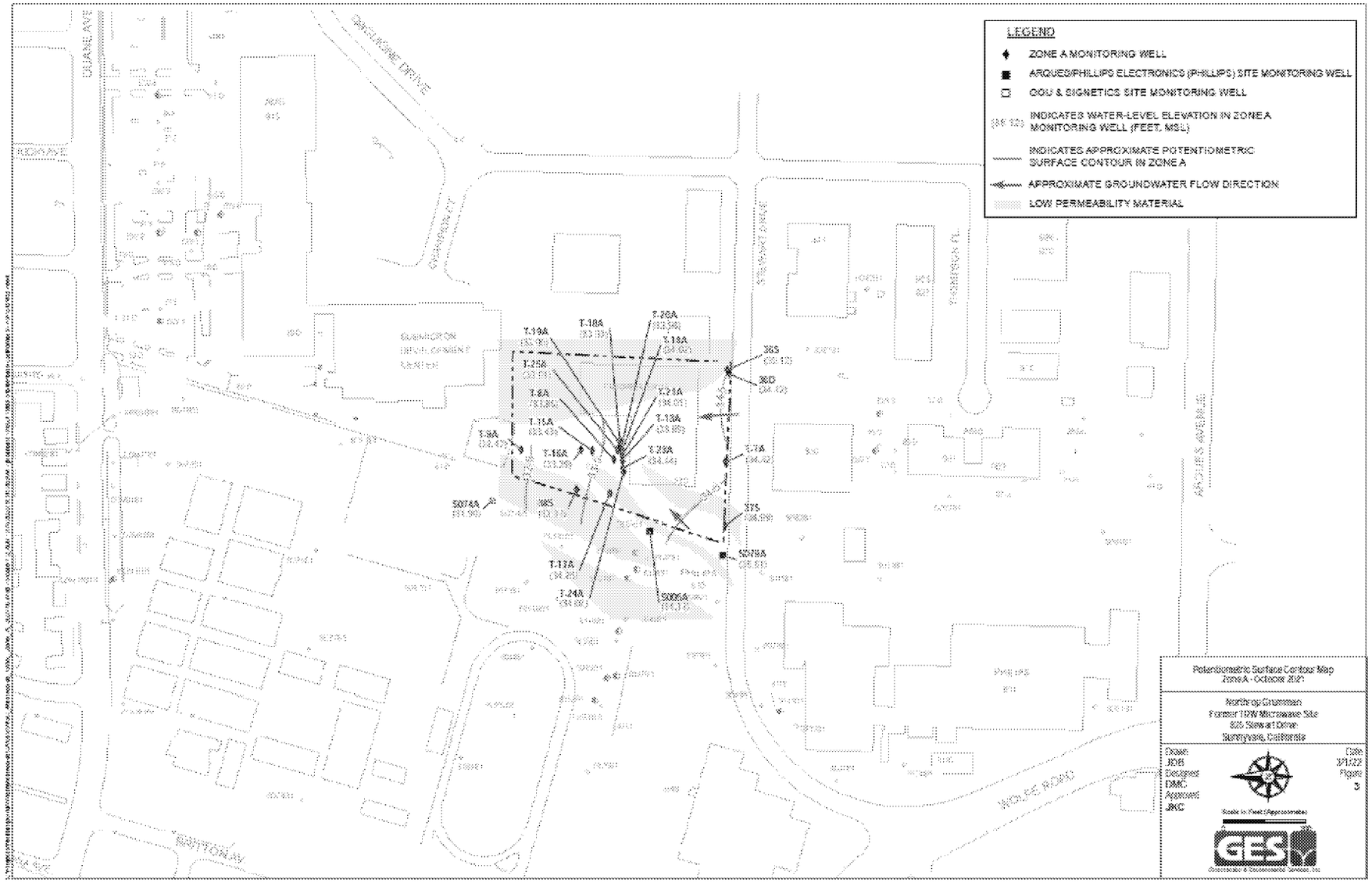
Current Groundwater Conditions

- Sampling is performed annually, generally in October, and coordinated with other Operable Units within the Triple Site
- Groundwater flow is generally to the north, but follows preferential pathways (refer to ESS CSM)
- Impact to the Site from off-site sources continues
- Concentrations have been generally stable or decreasing in recent years

Zone A Monitoring Wells



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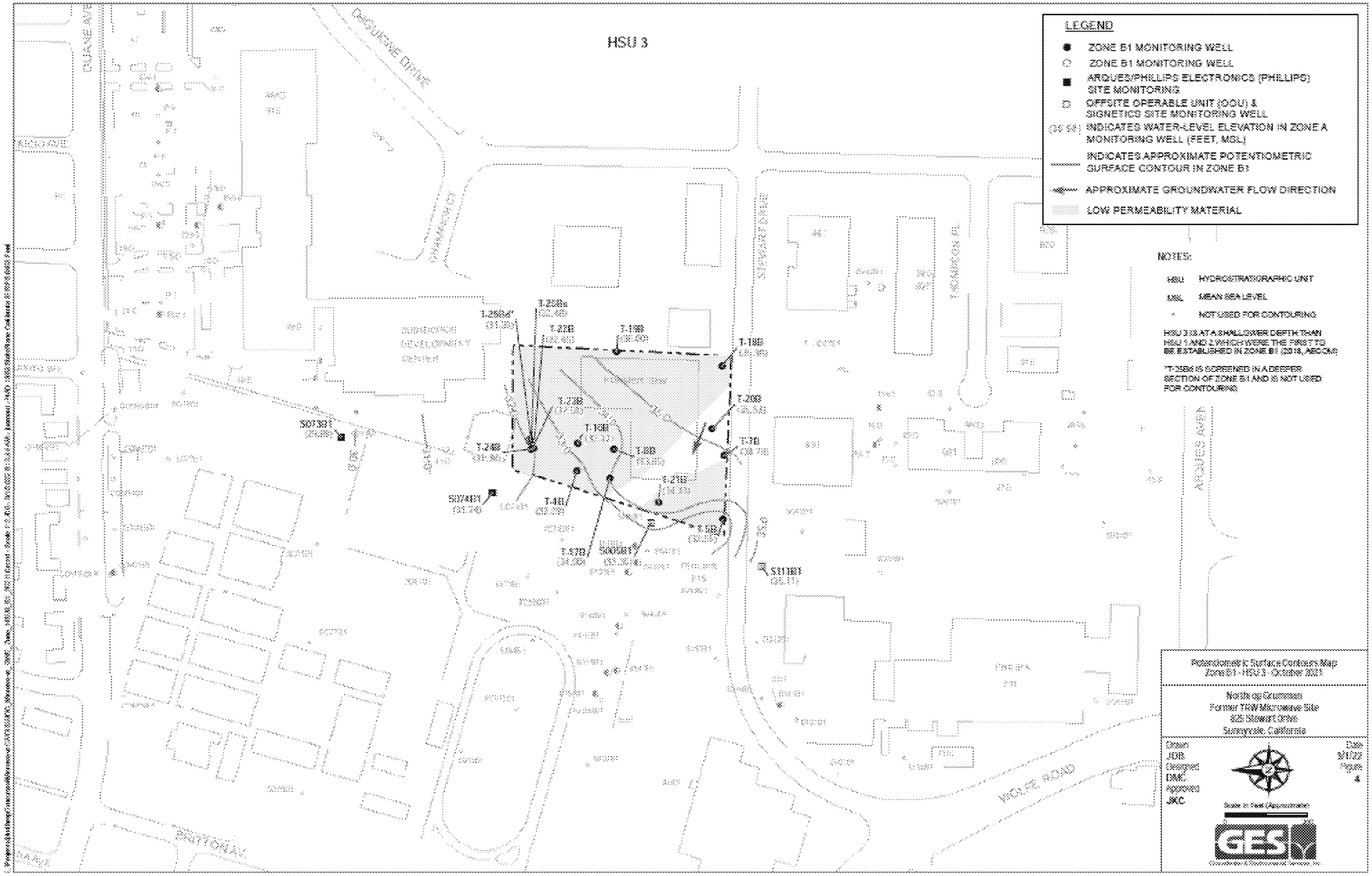
Zone B1-HSU3 Monitoring Wells



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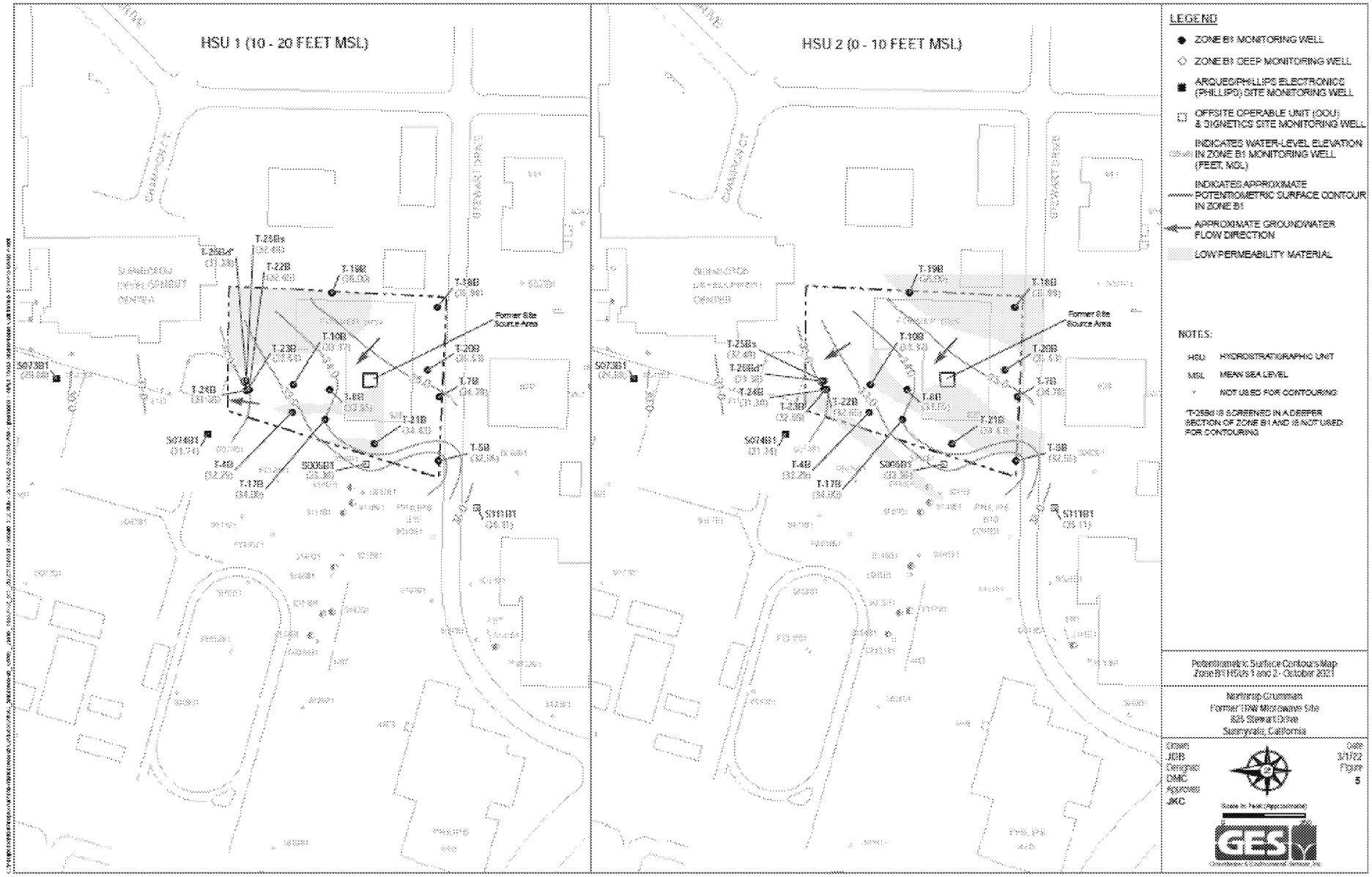
Zone B1-HSU1 and HSU2 Monitoring Wells



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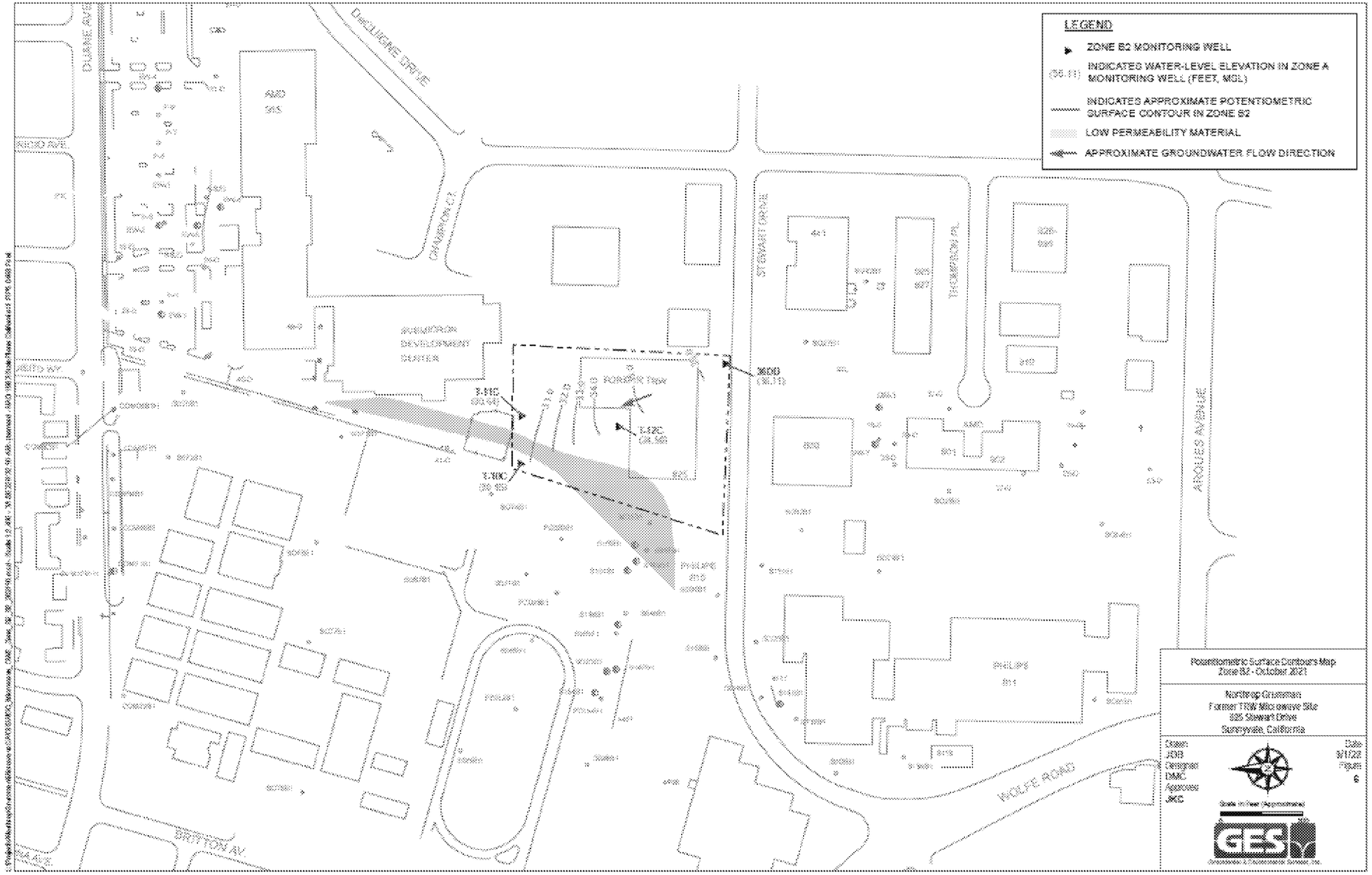
Zone B2 Monitoring Wells



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Recent Site Activities

- Site Visit with USEPA – August 12, 2021
- Submission of Passive Sub-Slab Ventilation System O&M Plan – March 31, 2022
- Evaluation of Passive Sub-Slab Ventilation System - April 15, 2022

Upcoming Site Activities

- Submit vapor sampling work plan - current due date September 19, 2022
  - Per USEPA, includes sub-slab sampling and indoor air sampling and differential pressure readings
  - Per recent correspondence from Apple, all sampling will be performed with HVAC online
- Perform annual groundwater monitoring event and passive sub-slab ventilation system visual inspection – October 2022
- Re-route roof piping for passive sub-slab ventilation system - TBD
  - Evaluating air intake information recently received from Apple and will modify locations if needed
  - Complete prior to sampling event
- Implement vapor sampling event after approval of workplan and access coordination with Apple - TBD

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QUESTIONS?