

### 1. SITE HISTORY

- Asphalt manufacturing site
- QA/QC testing per ASTM methods
- Utilized chlorinated solvents in lab
- Solvent used through circa 1984
- TCE groundwater impacts up to 16,000 µg/L
- Impacts extend to depths of 160+ feet
- Remediation during active site operation

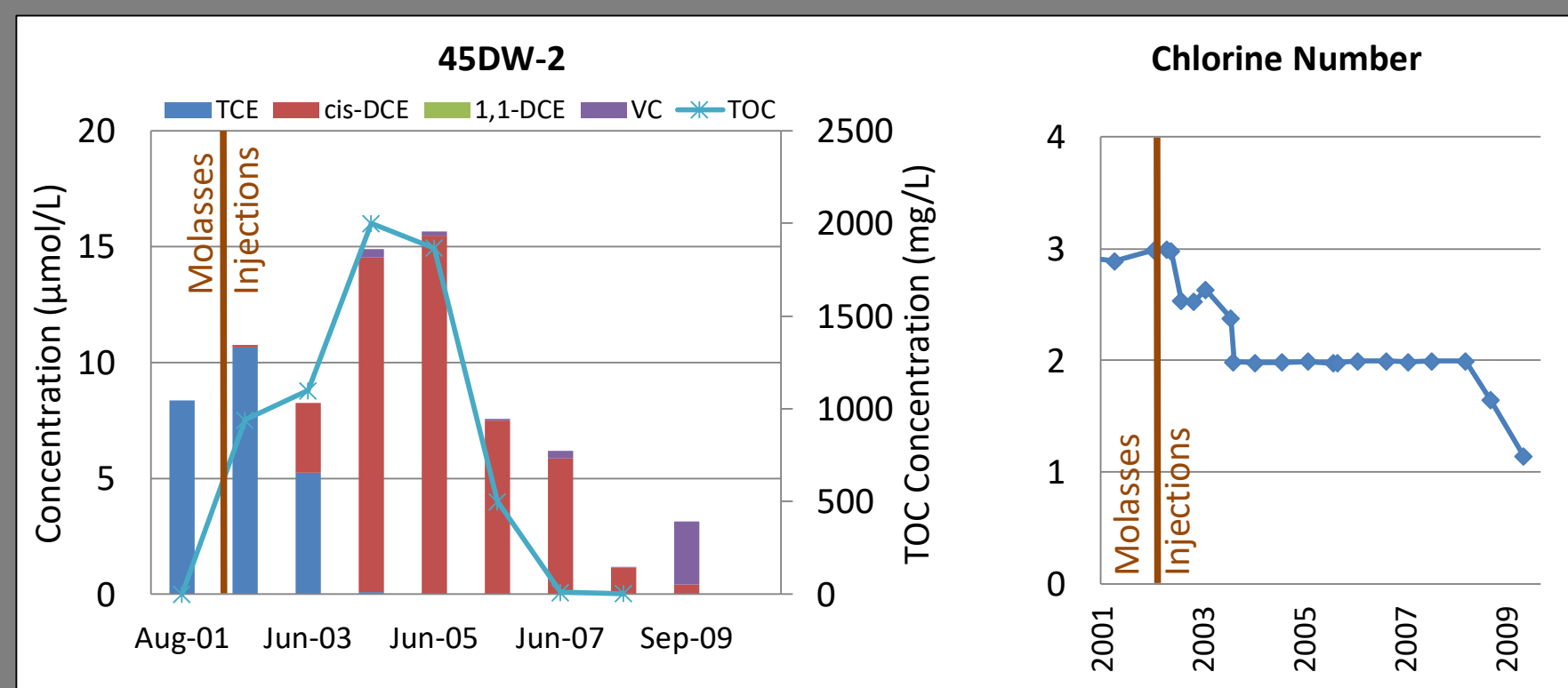


### 2. REMEDIAL TECHNOLOGY

- Groundwater treatment via bioremediation
- Injections to target source area and a downgradient barrier
- Permanent network of 9 injection wells
- Injection wells screened at varying depths up to 115 ft bls
- Monitor groundwater over 35+ events with network of 29 wells
- Option for supplemental polishing events if needed

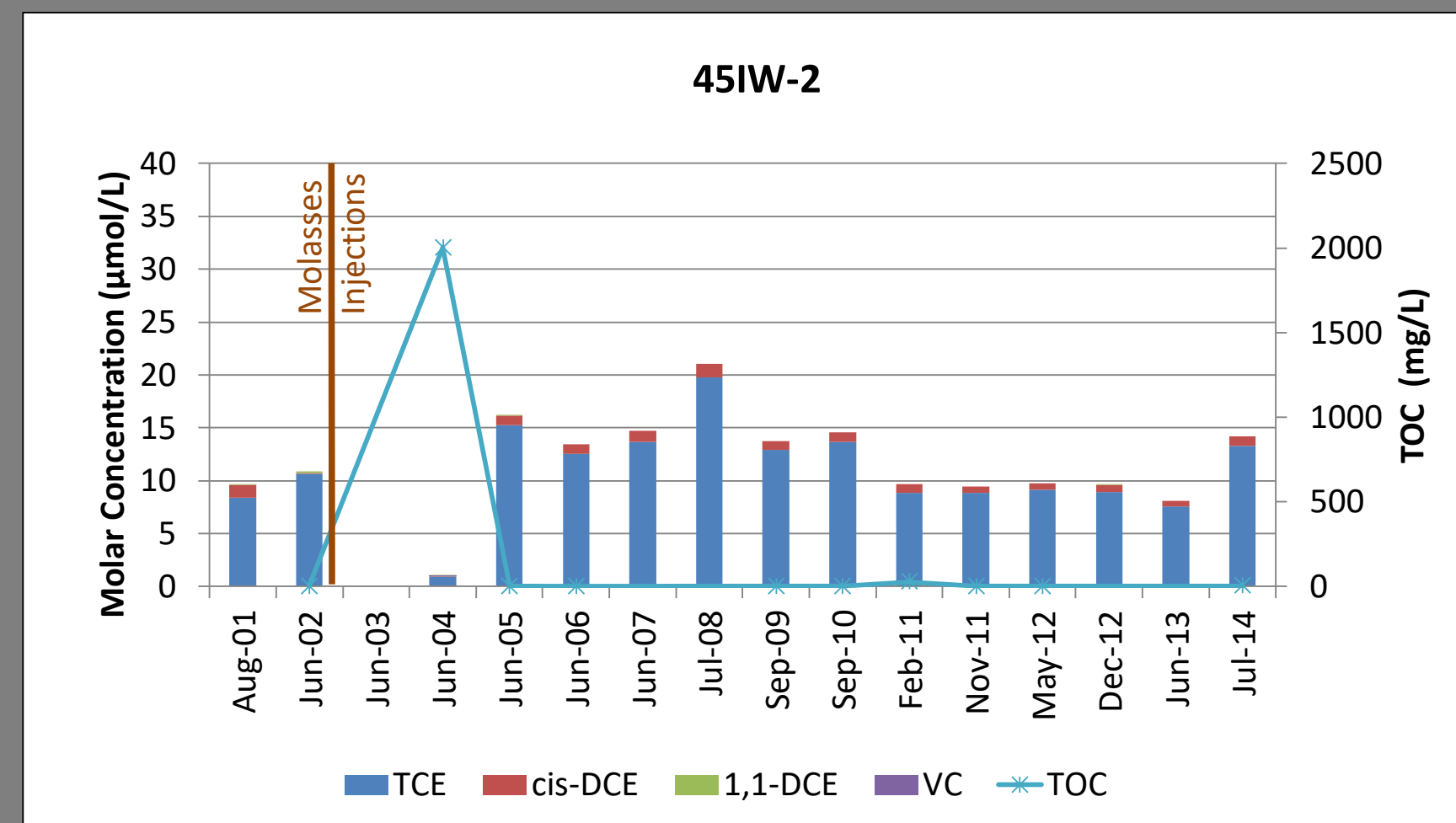
### 3. MOLASSES INJECTIONS

- 15 Injection events over one year (2002-2003)
- Injected 20,000 gallons of a dilute molasses solution
- 10% molasses V/V
- Resulted in 12.5% pore volume displacement
- Buffered with sodium bicarbonate



### 4. NEED FOR GSR REMEDY

- Successful elimination of contaminant mass with molasses
- TCE mass reduction of 90% (calculated with MAROS)
- Future degradation was carbon limited
- Areas still contained TCE and required additional remediation
- Need low cost alternative to degrade remaining mass



### 5. SUSTAINABLE SOLUTION

- Pepsi Bottling Ventures utilizes HFCS in products
- Expired drinks returned and segregated based on sugar content
- Containers are crushed and recycled
- Capture high sugar liquid for re-use and adjust pH
- High sugar liquid is used for bioremediation injections
- Injectate is distributed into permanent well network



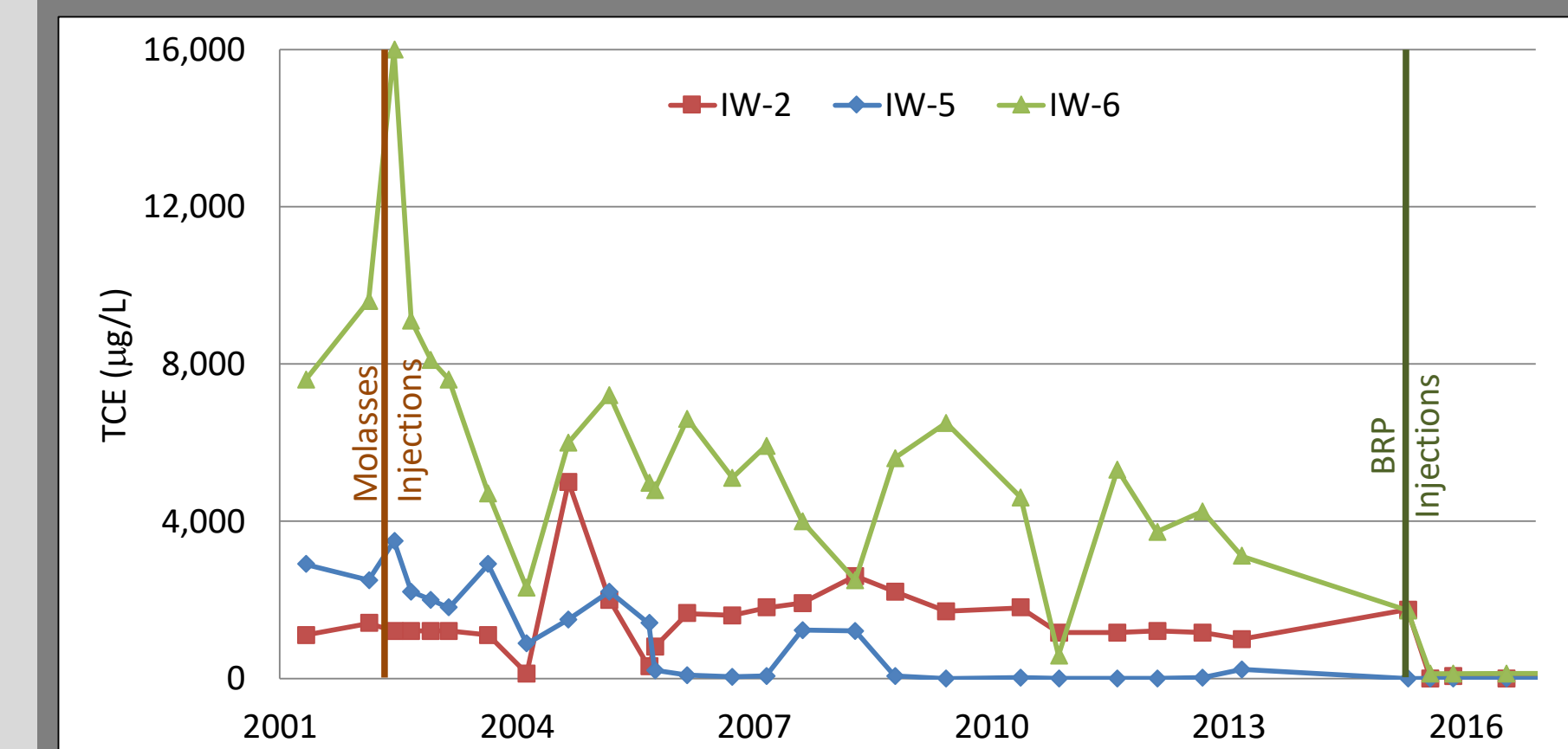
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### 6. SUSTAINABLE BENEFITS

- Economic
  - Decreased remediation costs
  - PBV savings on POTW disposal
- Community/Social Impacts
  - Reduce wastewater load for City of Raleigh
  - Minimize receptor risk
- Environmental Impacts
  - Waste minimization of expired beverages
  - Expedited groundwater clean-up

### 7. BRP PERFORMANCE

- Injection of 2,500 gallons in 2015
- Sodium bicarbonate buffer at 0.4 lbs/gallon
- TCE reduced an additional 93% after BRP injections



### 8. SUMMARY

- Molasses injections were successful in reducing TCE mass
- Aquifer conditions were favorable for polishing
- Lacked cost effective carbon substrate to expedite remediation
- BRP was a lower cost alternative with sustainable benefits
- Total chlorinated ethene reduction of 88%
- Site is on track for expedited closure