

# ABOUT SEQUOIA

- True turn key insitu remediation specialists
- Pilot testing and feasibility studies
- System design and manufacturing
- Installation and earthworks
- Operations and maintenance
- Research and development



# PRESENTATION OUTLINE

- **Why Use Insitu Chemical Injection Techniques?**
- **Delivery Methods**
  - ❖ **Direct Push or Geoprobe**
  - ❖ **Sequoia Screw Pile Isolation System**
  - ❖ **Standard Wells - Sequoia Isolation Injection System**
- **Mixing/Injection System**
- **Distribution Header and Monitoring System**



# WHY USE INSITU CHEMICAL INJECTION TECHNIQUES?

## ➤ Cost Effective

- ❖ Bioremediation enhancements like oxygenation can be extremely economic
- ❖ Injectant can be applied under buildings, roadways, and piping thereby eliminating infrastructure replacement costs



# WHY USE INSITU CHEMICAL INJECTION TECHNIQUES? – Con't

## ➤ **Less Disruptive**

- ❖ **In and out - Screw pile or direct push leaves little evidence behind**
- ❖ **Onsite activity lasts for days not months or years**
- ❖ **Work around buildings or other infrastructure with little or no interference**



# WHY USE INSITU CHEMICAL INJECTION TECHNIQUES? – Con't

## ➤ Flexible

- ❖ Combination of techniques can treat co-mingled plumes
- ❖ Addresses both hot spot and low level contamination issues
- ❖ Variety of Contaminants
- ❖ Surgical remediation
  - ❖ Deep plumes with small vertical extent
  - ❖ Bedrock with fracture flow
  - ❖ High permeable zones within low permeable matrix



# WHY USE INSITU CHEMICAL INJECTION TECHNIQUES? – Con't

## ➤ Rapid Treatment

- ❖ Chemical oxidation can work quickly

## ➤ Destruction vs transfer

- ❖ Remediation completed at site instead of transferring problem to another location



# WHY IMPROVE THE PROCESS?

- **Chemical short circuiting**
  - ❖ Around the injection pipe
  - ❖ In other areas of the site eg: old wells
- **Chemical mixing**
  - ❖ Operator Health and Safety Issues
  - ❖ Ensure complete mixing
- **To understand where injectant is going**
- **Safety Improvements**



# DELIVERY METHODS

## ➤ Direct Push or Geoprobe

- ❖ Best for bottom up not top down
- ❖ Short Circuiting can occur
- ❖ Limited in cobbly soils

## ➤ Sequoia Screw Pile - Innovation

- ❖ Designed and manufactured by Sequoia
- ❖ Isolation System – no short circuiting
- ❖ Best option for top down injections

## ➤ Into existing wells - Innovation

- ❖ Drop tube assembly
- ❖ Isolation packer assembly







# Screw Pile Injection System

- Quick and simple to install
- Pressurized packer system for annular sealing – reduction of liquids to surface
- No cuttings are produced
- Angle drilling or limited access friendly (<8')



## Angle Installation



## Vertical Installation





Injection Screw Pile



Packer Assembly



# Existing Wells

- Isolation system with drop tube to decrease well sedimentation
- Internal gripping mechanism to eliminate wellhead popping off during injection



# DRY CHEMICAL MIXING SYSTEM

- Hydraulically powered, variable speed – quiet operations
- Venturi (vacuum) mixing – airborne dust control
- Flexibility – (1) mixing and (1) injection pump
- Inject up to 70 L/min up to 150 psi
- Two tanks for chemical mixing (multiple chemicals)





# Distribution Logging System

- Designed to provide real time data wirelessly to operator – flow rate, total flow, wellhead pressure
- High pressure and low pressure alarms
- Data logging capable
- Operator can adjust injection rate to suit each injection wellhead acceptance







# SUMMARY

- Sequoia has taken an innovative approach to increase success during chemical injection projects
- Learn from previous mistakes, make changes, and improve the process
- Listen to our field operators to improve health and safety of our equipment

