Remediation of Space Launch Complex 15, CCAFS, Florida

- TCE was the primary COC
- Other COC were VC, PCE and DCE
- Freon 113, not a COC, was the major chemical species present
- TCE and Freon 113 concentrations indicated potential for DNAPL, defined as large volumes >1% of solubility
- Volume = 48,000 yd³ in two locations at depths from 20' to 55'

Pretreatment Analyses Overview

- TCE soil concentrations were detection limit (DL) to 500 mg/Kg
- TCE groundwater concentrations were 10,000 to 750,000 ug/l
- Freon 113 soil concentrations were up to 4,500 mg/Kg
- Freon 113 groundwater concentrations as high as 450,000 ug/l
- Other COC present in notable quantities, e.g. VC and both DCE

Cost of the Remediation

- The Subcontractor Remediated ~ 48,000 cubic yards for $4.05 million.
  This includes site preparation, mobilization and demobilization, waste disposal, O & M, etc.

- Remediation Cost ~ $80 per cubic yard.

Post Treatment Analyses Overview

- All soil TCE concentrations were at the detection limit (DL) of 0.100 mg/Kg
- Over 80% of TCE groundwater concentrations were at the DL of 1 ug/l
- Total soil Cl- VOC concentrations were at DL of 0.100 mg/Kg with two exceptions of 0.140 mg/Kg and 0.120 mg/Kg
- Over 90% of the total groundwater Cl- VOC concentrations were at the DL of 1 ug/l.

Total Cost of Project

- Cost was $7.16 million or $149.25 per cubic yard.
- Cost included all Prime Contractor and sub contractors costs.
- This does not include any preparatory work, e.g. CMS, Remedial Investigation or Air Force Management costs.
**Overview of Large Diameter Auger Technology**

- Measures and records operational parameters like, auger depth, off gas FID and GC, offgas flow, steam, air, iron flows, temperatures, etc.
- Provides real time operational information for in field remediation decisions and control of treatment variables.
- Data sent to off site for storage and analysis and for real time review.
- Thermally removed mass is calculated from GC analysis and flow data.

**Details of Gas Processing System**

- Off gas is saturated with H₂O and contains up to 25,000 ppm VOC at 1200 CFM flow.
- Off gas temperature varies from 70 F to 180 F; downhole temperature varies from 70 F to 230 F.
- Need to remove dust and water for proper functioning of Flameless Thermal Oxidizer (FTO) or granular activated carbon.
- Offgas cooled to 90 F and < 90 % RH; requires cooling capacity up to 1.7 MMBTU/H.

**Key Features**

- Remediation occurs in-situ; there is no removal of soil to the surface.
- Active mixing of treatment reagents into soil insures entire volume contacts reagents.
- Vaporized contaminants are moved to the surface by air and are captured or destroyed.
- Can combine several treatment processes or reagents into a single operation.
- Operates to depths of >80 feet.

**Operational Considerations**

- Operates to depths of >80 feet.
- Active mixing of treatment reagents into soil insures entire volume contacts reagents.
- Remediation occurs in-situ; there is no removal of soil to the surface.
- Vaporized contaminants are moved to the surface by air and are captured or destroyed.
- Can combine several treatment processes or reagents into a single operation.
- Operates to depths of >80 feet.

**Data Acquisition System (DAS)**

- Measures and records operational parameters like, auger depth, off gas FID and GC, offgas flow, steam, air, iron flows, temperatures, etc.
- Provides real time operational information for in field remediation decisions and control of treatment variables.
- Data sent to off site for storage and analysis and for real time review.
- Thermally removed mass is calculated from GC analysis and flow data.

**LDA Thermal Is Very Effective**

- Removes 90% to 98% of VOC.
- Removes 50% to 90% of SVOC.
- Removal appears to be “Pseudo” first order.
- Long treatment time is required for high percentage removal by thermal.

**Real Time Operational Data**

**Combining Thermal & ZVI Reduces Costs Significantly**

- Thermal removal time is reduced.
- Finely powdered iron (ZVI) is inexpensive and easy to install.
  *Iron continues to react with chlorinated contamination after equipment leaves.*
- Result: About 50% cost reduction with over 99.9% removal.
Our mission is to be a leading environmental and contracting organization driven by a culture of genuine caring for the needs of our customers, our people and our society. Our commitment is to deliver quality, integrity, creativity and responsiveness on every project, whether large or small, simple or complex. Our people form relationships with our clients built on mutual trust and respect, which brings out the best in us.

FECC is a multi-disciplinary environmental services company specializing in: Industrial and Hazardous Waste Management, Site Remediation, Spill Response, Demolition, Remedial Field Services, Technical and Regulatory Compliance Services, and Tank Management.

FECC prides itself on our customer service and our professional quality of work. FECC has been in business since 1989, and has successfully excavated, transported, and/or disposed of over one (1) million tons of hazardous, TSCA, petroleum and industrial waste. FECC has also treated more than 80,000 cubic yards of highly contaminated soil in-situ using LDA (Large Diameter Auger) with thermal, air, and powdered iron.

In addition, FECC has removed over 500 USTs and installed numerous ASTs and USTs. Our experience ranges from small short term projects to large soil and groundwater remediation projects. FECC can also provide spill response and clean up services.