

NAS NORTH ISLAND - NAVY REGION SOUTHWEST NAVY ENVIRONMENTAL LEADERSHIP PROGRAM

CLEANUP

STEAM-ENHANCED SOIL VAPOR EXTRACTION (SVE)

LEAD ACTIVITY

Naval Air Station North Island (NAS North Island)

STATUS

Active

MISSION

To volatilize the Trichloroethylene (TCE) and enhance the reduction of mass Volatile Organic Compounds (VOCs) in the soil by the Soil Vapor Extraction (SVE) system at Installation Restoration (IR) Site 9, NAS North Island.

DESCRIPTION

Installation Restoration (IR) Site 9, NAS North Island was a former chemical waste disposal area that subjected to non-segregated dumping from the 1940's until 1968. This area was known as the "fiery marsh" because of the estimated 32 million gallons liquid waste disposed at the site over the years. Dumping into unlined pits continued from 1968 until the mid-1970's. In order to reduce the mass VOCs in the soil a 3,000 SCFM Soil Vapor Extraction (SVE) system was installed in March 1997. The initial soil remediation by the SVE system continued for 26 months and removed over 80,000 pounds of mixed VOCs.



3000 SCFM Soil Vapor Extraction System

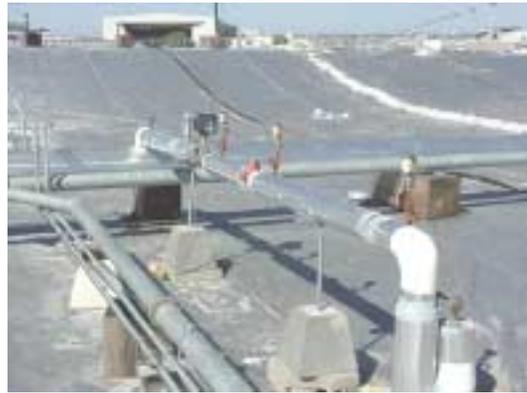
Due to a non-typical SVE response, additional investigation was conducted in 1998 and found separate phase JP-5 commingled with approximately 20 wt % Trichloroethylene (TCE). A study was conducted to evaluate options in order to volatilize the TCE from the free product thereby enhancing the VOC capture by the SVE system. The study concluded that steam injection might produce the required results (additional benefits of steam injection can be seen in the "Benefits" section).

In September 1999 a pilot scale thermal enhancement (steam injection) began using 10 product skimming/SVE wells, 3 steam injection wells, and 10 sets of 5 nested thermocouples.

The pilot scale thermal enhancement led to a number of findings:

1. Increased TCE concentration in free product via *in situ* condensation; less in vapor
2. Increased temperature in extracted FP and groundwater; less in vapor
3. Pulsing injection caused plugging of aquifer:
4. Concentrations increased from 150 ppm to over 350 ppm TCE in extracted groundwater
5. Effectively mobilized free product
6. Effectively mobilized TCE

Thermal enhancement (steam injection) was shown to be effective for IR Site 9, NAS North Island. From September 1999 to May 2000, over 14,600 pounds liquid waste removed via skimming and over 14,000 pounds removed via vapor extraction. These results indicate that the thermal enhanced SVE lead to 0.16 pounds per month per square foot. This is over 5-times more effective than the 0.031 pounds per month per square foot that resulted from non-thermal enhanced SVE.



Steam Injection Well

BENEFITS

- Volatilize TCE from free product thereby enhance the VOC capture by the SVE system
- Increase mobility of free product for skimming
- Enhance existing equipment
- Minimize additional documentation
- Reduce overall project costs
- Reduced viscosity
- Increases flow toward wells

ACCOMPLISHMENTS/CURRENT STATUS

Date	Activity
1983 to 1994	Site assessments conducted in which TCE was identified as major risk driver
MAR 1997	Navy installed 3,000 SCFM soil vapor extraction (SVE) system
MAY 1999	Pilot-scale steam injection system installed
SEP 1999 – MAY 2000	Pilot-scale steam injection operated for 9 months
May 2000	Phase I full-scale system construction of wellfield and free product skimming
JUN 2001	Phase II full-scale construction
SEP 2001	Full-scale operation

FUTURE PLAN OF ACTION & MILESTONES

Date	Activity
APR 2002	Start up full-scale SVE and steam injection
JULY 2002	Construct full-scale biological water treatment system
AUG 2002	Start integrated full-scale operation

BIBLIOGRAPHY

- Thermal Enhanced Soil Vapor Extraction and LNAPL Removal Presentation for the 5th International Symposium & Exhibition on Environmental Contamination in Central & Eastern Europe (September 12-14, 2000)
- Non-Time Critical Removal Action Installation Restoration Site 9 Presentation for the Naval Air Station, North Island NAS North Island Coronado Quarterly Team Meeting (July 18, 2001)
- Draft Wastewater Discharge Letter (October 22, 2001)

UPDATED: 02/01/02