Meeting Title		Document Number	Revision
NWIRP Bethpage AOC 22 NYSDEC Meeting Minutes		**ES040003**	**A**
		Project Name	
		NWIRP Bethpage Closed-Loop Bioremediation Pilot Demonstration	
Author	Meeting Date	Project Number	
Dan Lohavanijaya	**03/16/2004**	**N47408-04-C-7505**	

			Attendance Record				
Name	Title	Affiliation	03/16				
Dan Lohavanijaya	Project Manager	ARUSI	X				
Edmundo Uribe	Senior Engineer	ARUSI	X				
David Peskin	Senior Engineer	Locus	X				
Jim Colter	Remedial Project Manager	EFANE	X				
Mark Leipert	Remedial Technical Manager	EFANE	X				
Al Taormina	Facility Manager	J.A. Jones	X				
Steven Scharf	Project Engineer	NYSDEC	X				
Nick Acampora	Environmental Program Specialist	NYSDEC	X				

cc: Mark Bittner – Locus Technologies
Tim McEntee – NFESC
Paulette Peterson – NAVFACCO
Michael Reynoso – ARUSI

Meeting Objective

This was the initial meeting between the project team, including AR Utility Specialists, Inc. (ARUSI), Locus Technologies, Inc., and Naval Facilities Engineering Command, Engineering Field Office Northeast (EFANE), and the New York State Department of Environmental Conservation (NYSDEC). The objectives of the meeting were as follows:

- Overview and introduction of ARUSI and Locus.
- Introductory presentation of the closed-loop bioremediation system.
- Discuss project background, approach, and milestones.

Discussion Points

- The presentation slides given during the meeting are attached.
- Regarding circulation of vapor in the closed loop system, NYSDEC commented on the need to control soil gases to avoid intrusion into physical structures, or migration within the proximity of the railroad tracks south of AOC 22.
- Regarding the biotreatment additives to be used at the site, NYSDEC commented on the importance of controlling additive migration, especially in outlying treatment wells.
- Regarding the utilization of Fenton's Reagent, NYSDEC commented that the reaction needs to be properly managed and controlled. ARUSI will control the distribution of the chelated iron and hydrogen peroxide, and will work in small areas, one area at a time.
- The above concerns raised by NYSDEC should be addressed in the Work Plan / Health and Safety Plan (WP / HASP). The WP / HASP drafts are to be distributed to NYSDEC via EFANE. Steven Scharf, Nick Acampora, and Jim Harrington are the key people at NYSDEC who are interested in reviewing the work plan.
- The WP / HASP should include the Material Safety Data Sheets for the biotreatment additives.

Follow Up Action Items

The following follow up action items were noted during the meeting:

Required Action		Responsible	Due Date
1	Provide copies of the draft Work Plan and Health and Safety Plan to the NYSDEC	D. Lohavanijaya via J. Colter	

THE CLOSED-LOOP *IN SITU* BIOREMEDIATION SYSTEM

Agenda

- Company Overview
- The Closed Loop In-Situ Bioremediation System
  - Description
  - Operation
  - Additives
  - Case Studies
  - Advantages
- NWIRP Bethpage AOC 22 Project Overview
- Questions and Discussion

Proprietary

ARUSI Company Overview

- Multi-Disciplined Environmental, Construction Management, Engineering and Design Firm
- 8(a) Certified Minority Owned and Operated with a Proven Track Record of Success
- Formed in 1987 and Have Completed Over $50 Million in Projects of Varying Scopes
- Headquartered in Phoenix, Arizona with Offices in Various Locations in the Southwest
- 2-Time Recipient of the Outstanding Minority Business Achievement Award from the City of Phoenix
- Selected as the Grand Canyon Minority Supplier of the Year in 2002

Proprietary

Locus Company Overview

- Highly Innovative ENR 200 Environmental Consulting and Engineering Firm
- Locus specializes in:
  - Consulting
  - Design
  - Construction
  - Information Management
  - Automation Services
- Headquartered in Walnut Creek, California with Offices throughout California, in Phoenix AZ, Boston MA, Asheville NC, and Paris France

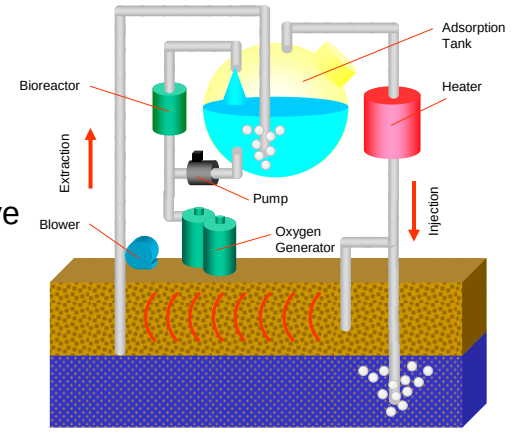
Company Overview

Who we serve:

The Closed-Loop *In-Situ* Bioremediation System

System Description

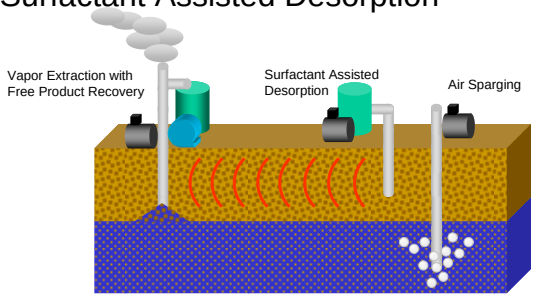
- In Situ Bioremediation
- Utilizes Indigenous Microorganisms
- Creates a Subsurface Environment Conducive to Biodegradation of Contaminants
- Continuous Monitoring of the Environment Using Above Ground Bioreactor



The Closed-Loop *In-Situ* Bioremediation System

System Description

- Combines Proven Technologies:
  - Vapor Extraction with Free Product Recovery
  - Air Sparging
  - Surfactant Assisted Desorption



The Closed-Loop *In-Situ* Bioremediation System

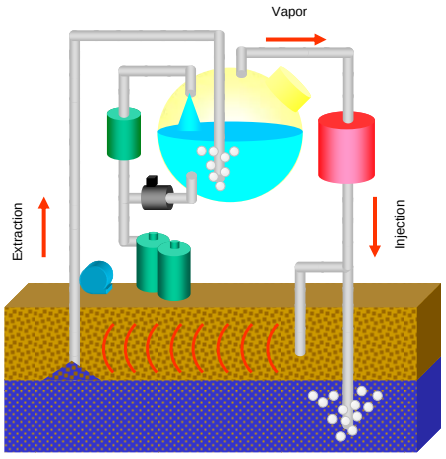
System Operation

Liquid media is recirculated through the bioreactor. O2 and nutrients are added to promote growth of desired microorganisms.

Soil vapor is sparged into the adsorption tank

Soil vapor is extracted from Subsurface bioreactor

Prior to starting the system, Any existing free product is recovered



Vapor containing the desired microorganism, moisture, nutrients and heat exits the adsorption tank

Nutrients, heat, and surfactant are added and injected into the subsurface environment

A subsurface bioreactor Is created and maintained.

Vapor from the above-ground Bioreactor oxygenates the groundwater and volatizes the contaminant

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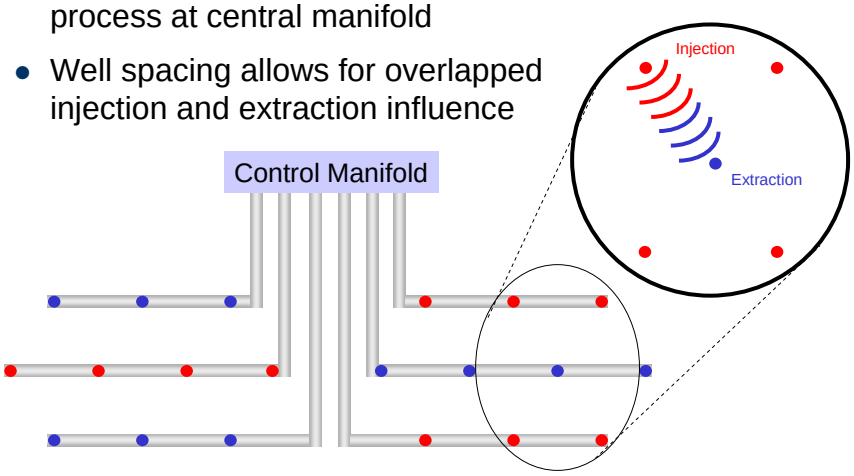
The Closed-Loop *In-Situ* Bioremediation System

System Operation

- Control of injection and extraction process at central manifold
- Well spacing allows for overlapped injection and extraction influence



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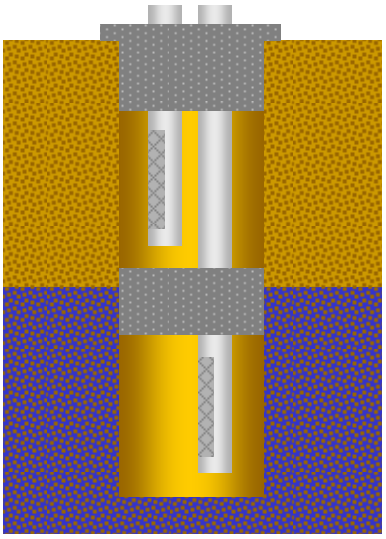
The Closed-Loop *In-Situ* Bioremediation System

System Operation

- Nested injection and extraction wells
- Targets treatment at a precise depth
- Accounts for heterogeneous soil strata



The Closed-Loop *In-Situ* Bioremediation System

The Biotreatment Additives

- Meta-Boost^{SM} – Enhances the metabolic rate of bacteria
- Nitro-Boost^{SM} – Provides nitrogen, phosphorus, and other nutrients
- Desorb-A^{SM} – Foam surfactant that emulsifies adsorbed hydrocarbons, transports nutrients, oxygen, and microorganisms
- Deep-Treat^{SM} – Provides an oxygen rich environment, removes competitive microorganisms
- All additives are completely biodegradable

The Closed-Loop *In-Situ* Bioremediation System

Meta-Boost ^{SM}

- Metabolic and growth stimulator for bacteria
- Promotes bacteria reproduction
- Contains slow release carbons (humic and fulvic acids) and alkaloids
  - Slow release carbons provide a ready food source to support and promote bacterial growth
  - Alkaloids promote rapid cell growth resulting in accelerated bacterial reproduction
- Completely biodegradable

The Closed-Loop *In-Situ* Bioremediation System

Nitro-Boost SM

- Nutrient solution for bacteria
- Provides nitrogen, phosphorus, and other nutrients
- Contains micro nutrients including ammonium nitrate, monoammonium phosphate
- Completely biodegradable

The Closed-Loop *In-Situ* Bioremediation System

Deep-Treat SM

- Provides an oxygen rich environment, removes competitive microorganisms
- Contains hydrogen peroxide and mineral water
- Variable H_2O_2 concentration for different applications:
  - Fenton's Reagent – 5-20% H_2O_2 concentration with chelated iron
  - Oxigenating the subsurface – 2 ppm H_2O_2 concentration
  - Removing biomass build-up – 3% H2O2 concentration
- Completely biodegradable

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The Closed-Loop *In-Situ* Bioremediation System

Key Ingredient

- Key ingredient in additives derived from Leonardite deposit aged 75 million years
- Optimum quality due to unique geologic history
- 12% Humic Acid
- 2-3% Fulvic Acid

Sealed Rock Cap Covering Humic Deposit

Humic Shale Deposit

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The Closed-Loop *In-Situ* Bioremediation System

Desorb-A SM

- Biosurfactant wetting agent
- Foam surfactant that emulsifies adsorbed hydrocarbons
- Acts as the transport media for nutrients, oxygen, and microorganisms to the subsurface bioreactor
- Contains mixture of ionic and neutral surfactants including naturally generated surfactant from *pseudomonas aeruginosa* bacteria
- Completely biodegradable

The Closed-Loop *In-Situ* Bioremediation System

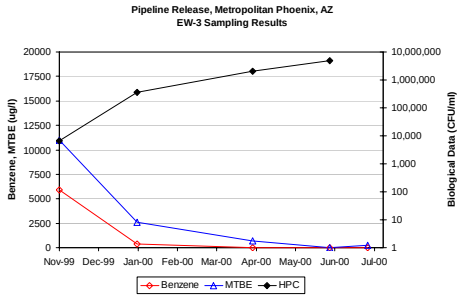
Case Study 1 – Major Pipeline Company

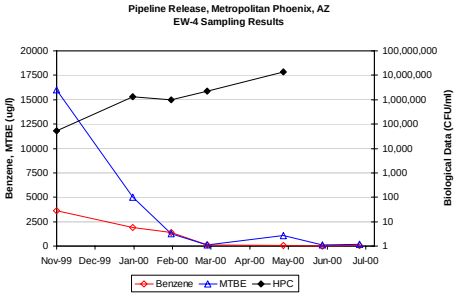
- Refined Product Pipeline Release of Gasoline with MTBE, Jet Fuel
- South of Metropolitan Phoenix, Arizona, November 1999 - July 2000

The Closed-Loop *In-Situ* Bioremediation System

Case Study 1 – Continued

- Reduction in Benzene & MTBE Over 8 Months of Operation
- Concurrent Growth of Microorganism Colonies
- Engineered Closed-Loop System Yielded Accelerated Results





The Closed-Loop *In-Situ* Bioremediation System

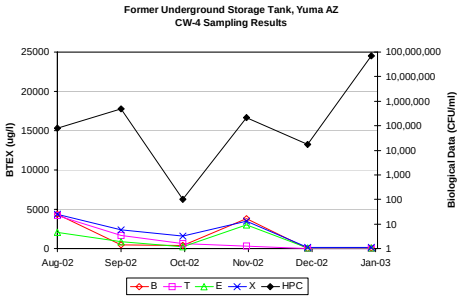
Case Study 2 – Major Oil Company

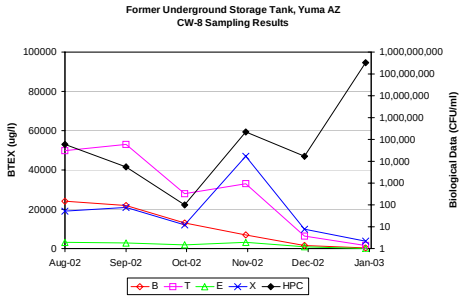
- Former Underground Storage Tank Release of Refined Gasoline and Petroleum
- Yuma, Arizona, July 2002 – March 2003

The Closed-Loop *In-Situ* Bioremediation System

Case Study 2 – Continued

- Free Product Removal in Less Than 60 Days
- Reduction in BTEX Over 5 Months of Operation
- Concurrent Growth of Microorganism Colonies
- Engineered Closed-Loop System Yielded Accelerated Results





The Closed-Loop *In-Situ* Bioremediation System

System Advantages

- Integration of Known Remediation Techniques
- Time Efficient = Cost Effective
  - Less Time On-Site for Remediation
  - Faster Return of the Property to Productivity
- Effective Remediation of Soil and Groundwater
- Closed-Loop – No Atmospheric Emissions or Effluent Streams Produced
- In-Situ Treatment – Minimizes Site Disruption

The Closed-Loop *In-Situ* Bioremediation System

System Advantages

- Demonstrated Effectiveness vs. BTEX, MTBE and "Heavy End" Petroleum Constituents
- Adapted to Address Solvents and Perchlorates
- Accepted by NFESC Under the Innovative Technologies BAA
  - Abstract can be viewed on the DENIX website
  - Titled: "The Closed-Loop Bioreactor System for *In-Situ* Bioremediation of Contaminated Soil and Groundwater"

NWIRP Bethpage AOC 22 Project Overview

Project Background

- Former UST site located south of Plant 3.
- Investigations between 1997-2002 confirmed the presence of petroleum product in soils at 10-60 ft bgs.
- The Navy has selected an active remediation approach based on NYSDEC comments.
- The pilot project objective is mass removal of fuel oil #4 and #6 from soil between 10-60 ft bgs.
- VOC impacted groundwater at AOC 22 is being addressed separately under another project.

NWIRP Bethpage AOC 22 Project Overview

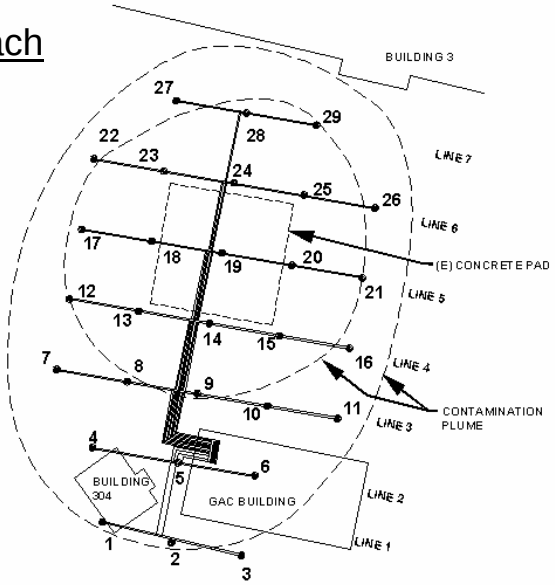
Project Approach

- Free Product Recovery (3-4 Months)
- Mobilization of Fuel Oil #6 (2 Months)
  - Surfactant application to soil above water table
  - Hydrogen Peroxide (Fenton's Reagent) oxidation below water table
- Closed-Loop Bioremediation (12 Months)
  - Creation of subsurface bioreactor
  - 12 treatment cycles, 1 month each

NWIRP Bethpage AOC 22 Project Overview

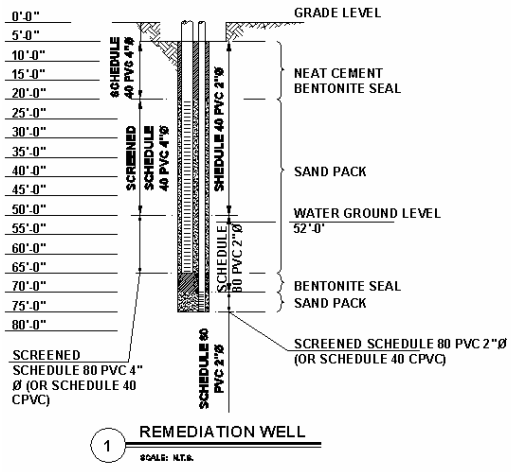
Project Approach

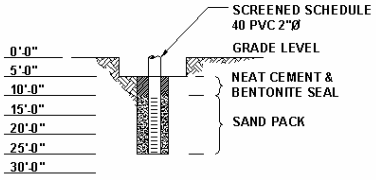
Remediation Wells and Piping Design



NWIRP Bethpage AOC 22 Project Overview

Project Approach





NWIRP Bethpage AOC 22 Project Overview

Project Milestones

Design, Plans, Permits	2/04 – 7/04
Mobilization, System Installation	7/04 – 10/04
System Operation	10/04 – 10/05
- Groundwater Sampling & Analysis	Monthly
- Soil Sampling & Analysis	Every 2 Months
Final Report / Closeout	11/05 – 3/06
Site Restoration	3/06 – 5/06

Additional Questions & Discussion