

The Use of Future First Planning, the Triad, and Performance-Based Contracting to Accelerate Site Closure at Seymour Johnson AFB



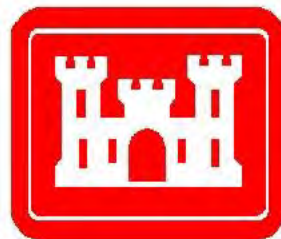
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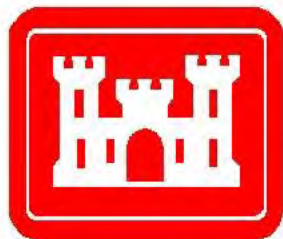
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Contract Overview



SITE NAME	SITE CLOSURE DEADLINE	CURRENT STATUS
F-15 Ramp	MAY 2010	<i>SITE CLOSURE DEC 2008</i>
Radar Tower Site	MAY 2010	REMEDIAL ACTION OPERATIONS
Bulk Fuel Storage Area (BFSA)	DEC 2010	REMEDIAL ACTION OPERATIONS
	DEC 2010	<i>SITE CLOSURE MAY 2006</i>
	DEC 2010	<i>SITE CLOSURE MAY 2006</i>
	DEC 2010	REMEDIAL ACTION OPERATIONS
KC-135 Ramp	DEC 2010	REMEDIAL ACTION OPERATIONS
BX Service Station	NOV 2011	<i>SITE CLOSURE FEB 2007</i>
Fire Training Area No. 3	NOV 2011	REMEDIAL ACTION OPERATIONS
Fire Training Area No. 1	NOV 2011	<i>SITE CLOSURE JULY 2007</i>
Fire Training Area No. 2	DEC 2010	<i>SITE CLOSURE OCT 2006</i>
Old Entomology Shop	DEC 2010	<i>SITE CLOSURE DEC 2008</i>
Landfill No. 4	DEC 2010	<i>SITE CLOSURE NOV 2007</i>
Landfill No. 1	DEC 2010	<i>SITE CLOSURE NOV 2007</i>
Landfill No. 2	NOV 2011	<i>SITE CLOSURE NOV 2007</i>
Landfill No. 3	NOV 2011	<i>SITE CLOSURE NOV 2007</i>

Regulatory Framework



 Regulatory oversight performed through three NCDENR regulatory programs:

- Underground Storage Tank (UST) Program:
*SS-04, SS-12, ST-14 and
BFSA (ST-01, SD-02, SD-03, ST-05)*
- Inactive Hazardous Sites Branch (IHSB) Program:
FT-07, FT-19, FT-20, OT-21, OT-29
- RCRA Program (Landfill) Sites:
LF-06, LF-08, LF-15, LF-16

Exit/Closure Strategy



Exit/Closure Strategy Based on a Marriage of:

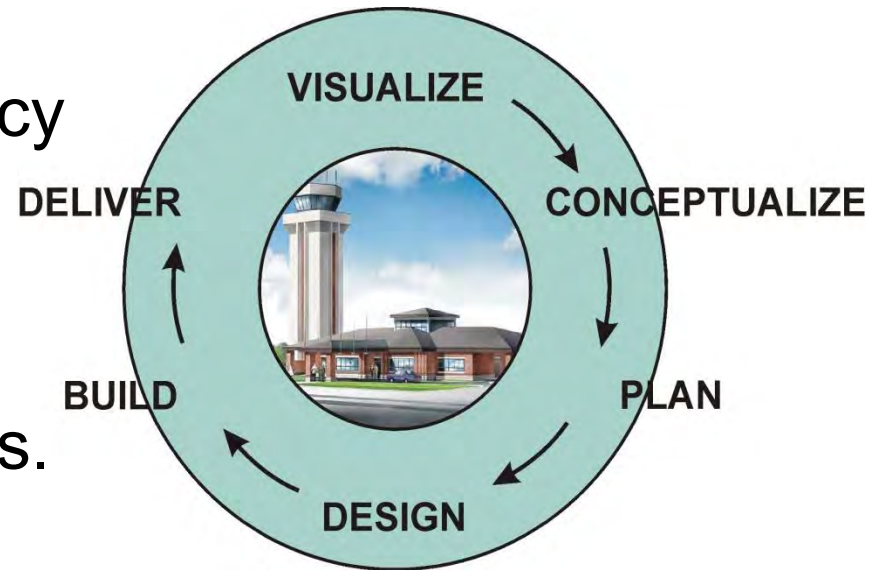
- Future First Planning
- Triad
- Innovative Technologies
- Remedial Process Optimization
- Decision-Based Partnering

Future First Planning



Future First Planning (F2P):

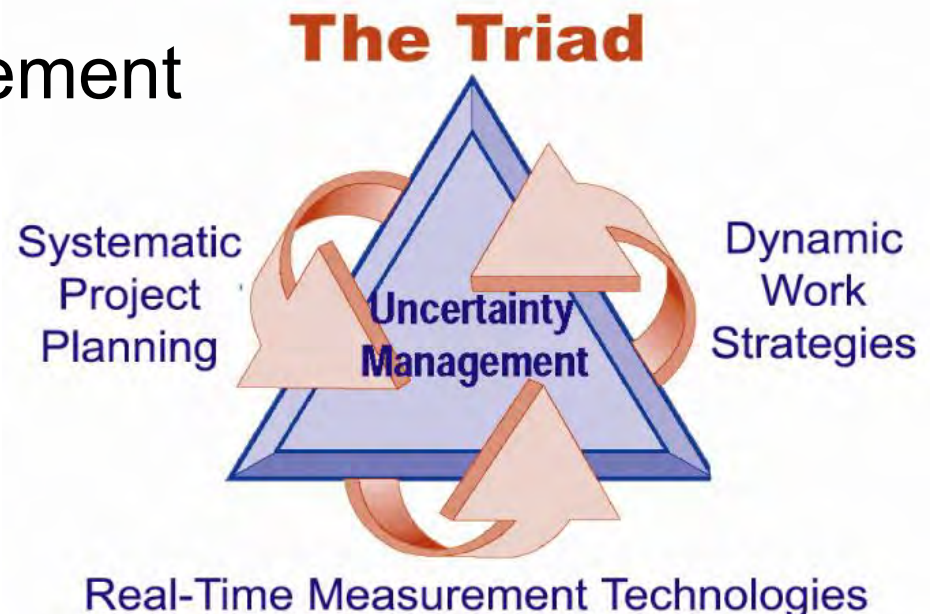
- A process that fuses Base development planning with environmental cleanup to optimize land use.
- Represents a shift in policy where environmental restoration sites are viewed as potential assets instead of liabilities.



The Triad

Uncertainty Management through the Triad:

- Systematic Project Planning
- Dynamic Work Strategies
- Real Time Measurement Technologies



SJAFB Triad Elements



Systematic Project Planning:

- Developed preliminary Conceptual Site Model (CSM) using data from past investigations
- Evaluated real time analytics and feasibility of use based on anticipated in-field decisions
- Incorporated potential remediation approaches into data collection techniques
- *Cost savings realized through reduced mobilizations*

SJAFB Triad Elements (cont.)



Dynamic Work Strategies:

- Decision Trees allowed in field decision-making, preventing equipment down-time and reducing fixed-lab costs
- Flexible work plan allowed changes to occur when the CSM changed
- *Iteratively updating the CSM and continuously adapting the investigative strategy helped to reduce uncertainty and allow for full characterization of the site*

Real Time Measurement Technologies:

- Real time data used to update the CSM throughout the investigation for continuous use to direct additional data collection
- Electronic data (*CPT data, stratigraphic logs, LIF data*) produced/transmitted daily and posted to Bay West's web site for access/review by Client
- *Real Time Measurement allowed the Team and stakeholders to make informed, quantitative site decisions while in the field*

OT-29

Former Radar Tower Site

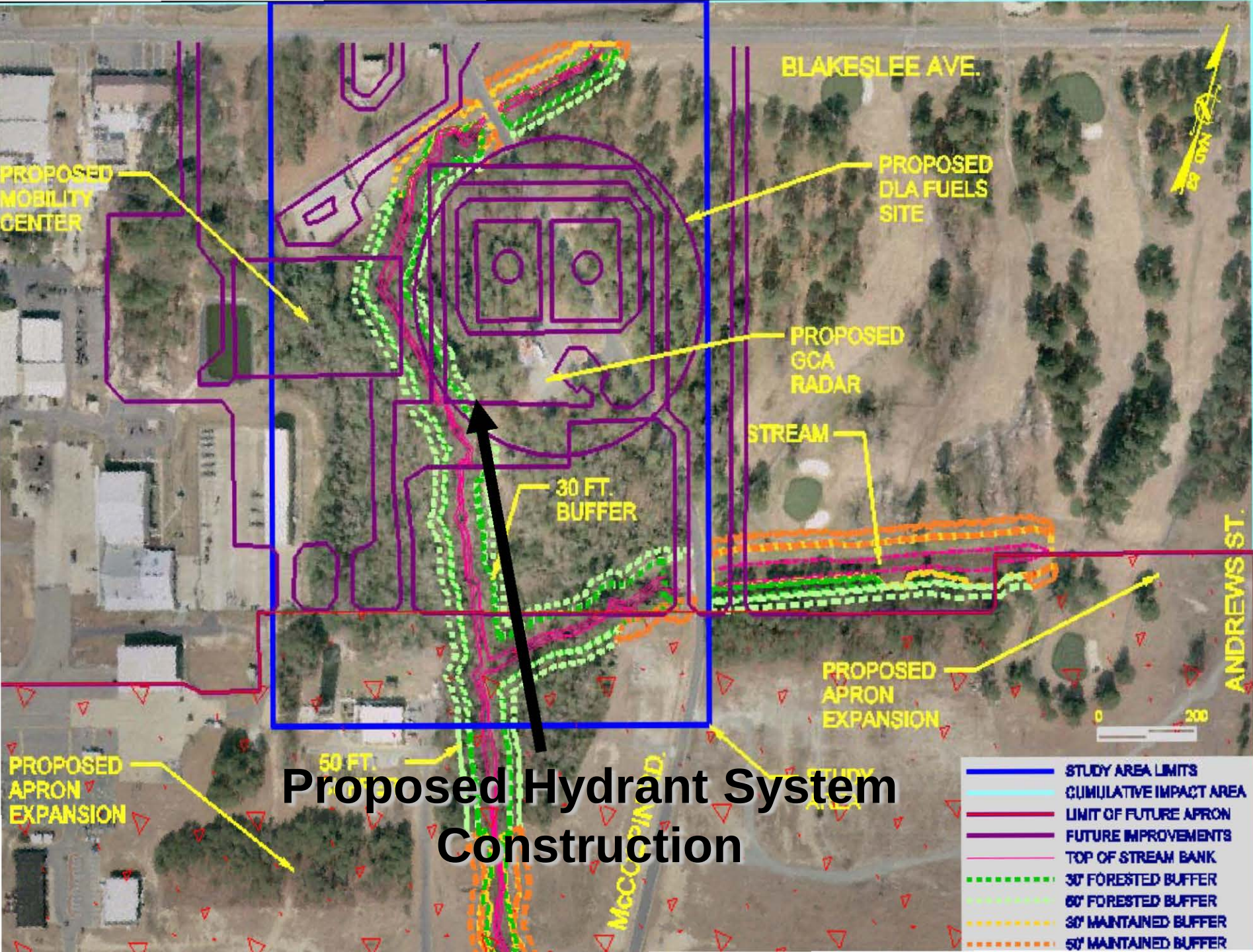


Overview

- Pending Mission Critical fuel hydrant system
- Mixed plume of petroleum hydrocarbons and chlorinated hydrocarbons
- Original system installed as Interim Remedial Action
- 1998 construction completed and system started

Original System

- Biosparge/biovent wells & groundwater extraction trench
- Projected cleanup >20 yrs

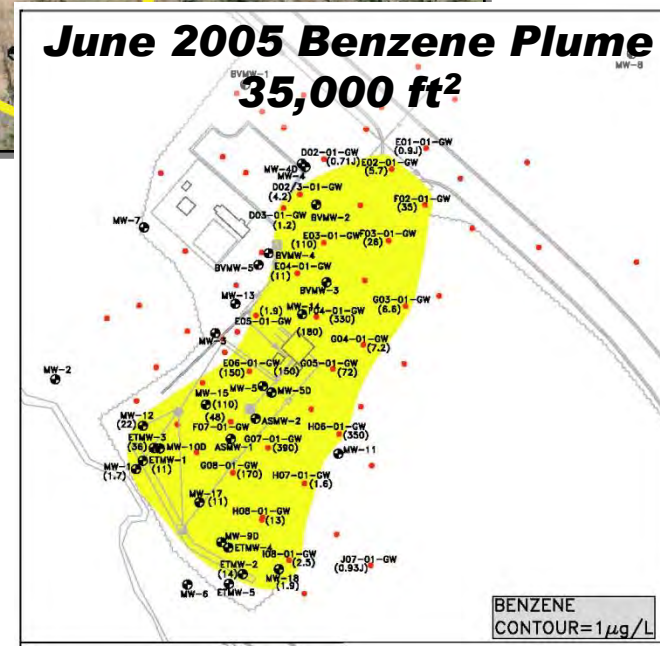
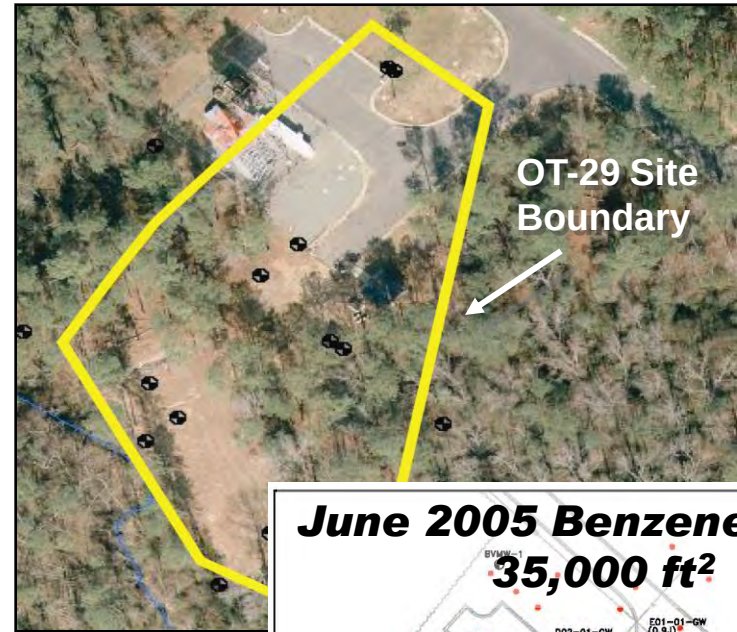


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Cleanup Strategy

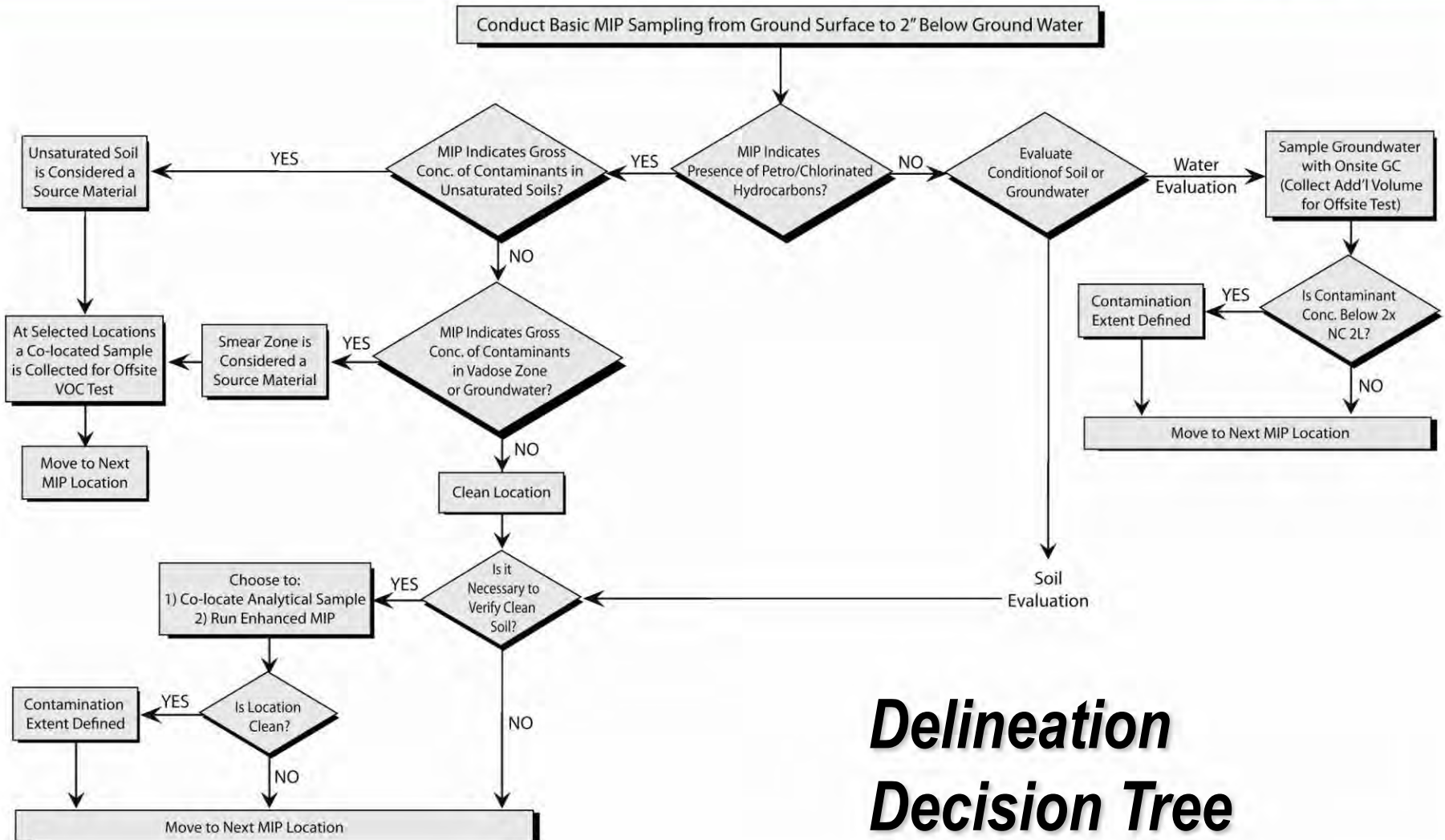


- Site characterization utilizing the Triad
- Removal of residual LNAPL using surfactant flush and recovery
- Excavation of contaminated soils
- Groundwater treatment through chemical oxidation events



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Dynamic Work Strategies



Delineation Decision Tree

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Characterization Actions Performed



- Membrane Interface Probe Characterization
 - 55 points analyzed
 - MIP enabled determination of source area and extents

➤ Rapid Analysis

- Soil and groundwater samples used to correlate data with MIP
- PID headspace analysis performed on potentially contaminated soil



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Surfactant Injection

Field Activities:

- Installed temporary injection points within targeted LNAPL area based on Triad results
- Injected 10,000 gal of 1.6% non-ionic surfactant (1,250 gal/well)
- Used MMPE to recover surfactant and >700 gal of petroleum product
- Work completed in 2 weeks



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“Hot Spot” Excavation



***TCE Source Removal
Adjacent to Radar Tower***

- Source removal of 2,000 tons of impacted soil
- Excavation extents based on Triad delineation results – soil removed from 2 areas



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Biopile Construction



Actions Completed:

- Constructed biopile to treat petroleum/VOC-impacted soil on-site
- Biopile actively vented and moisture content managed
- Highly-impacted soil amended with approx 1,000 gal hydrogen peroxide (12 wt %) & tilled
- Beneficial reuse of cover material for local landfill following treatment



	NCDENR Unrestricted (mg/kg)	Jan. 2005 (mg/kg)	Oct. 2005 (mg/kg)
Benzene	0.006	0.003	ND
Toluene	7.3	0.5	ND
Ethylbenzene	0.24	5.14	0.002
Xylenes	5	31.9	0.03
Aliph. C5-C8	72	659	28
Aliph. C9-C18	3,260	484	910
Aliph. C19-C36	--	271	71
Arom. C9-C22	34	819	355

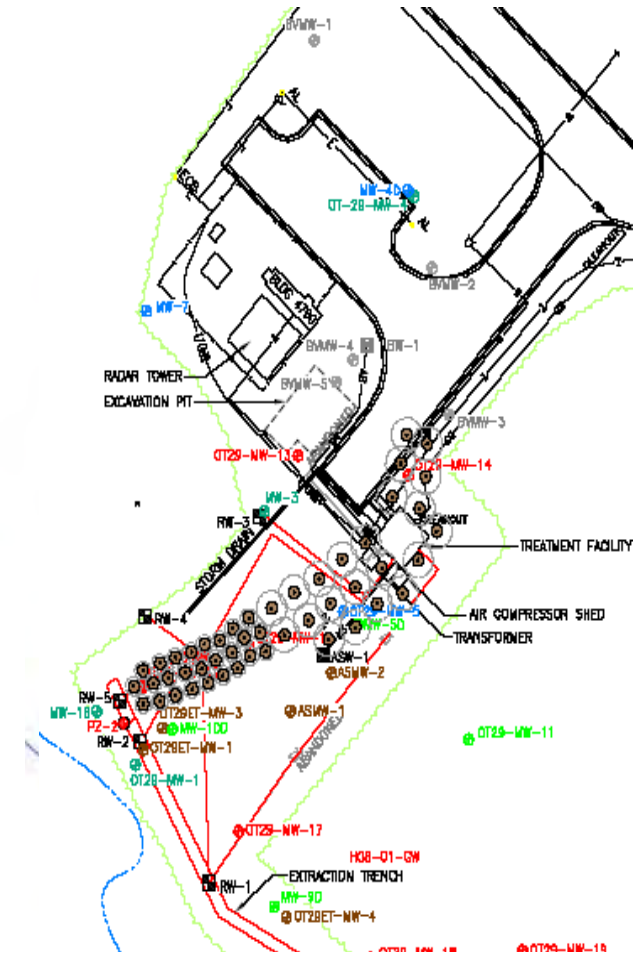
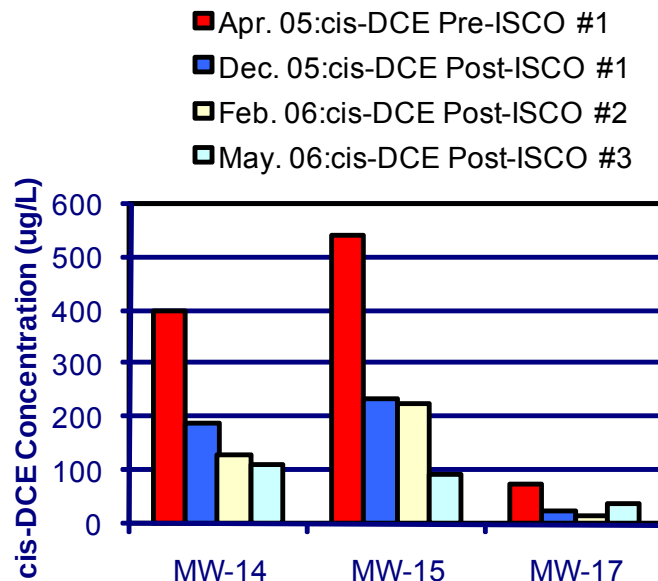
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In Situ Chemical Oxidation



Actions Completed:

- ISCO Bench Scale Tests (modified Fenton's)
- 3 ISCO events w/287 injection points and approx 75,000 gal oxidizer/catalyst over



**ISCO #3 Locations
Apr 2006**

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Current Status



- Site remediation activities completed with no impact to the mission-critical fuel hydrant system construction
- Awaiting NCDENR concurrence on No Further Active Remediation Status
- Cleanup timeframe reduced from 20+ years to 4 years
- Projected Savings to Government in excess of \$1.5M

Bulk Fuel Storage Area (BFSA) **Bay West**

Setting:

- 400,000-gal jet fuel (JP-4) release (>50,000 gal in subsurface requiring cleanup)
- Estimated 29,000 ft² LNAPL plume
- Estimated 395,000 ft² dissolved plume
- Legacy treatment system installed in 1998



BFSA

Cleanup Strategy



-  Optimize legacy treatment system to maximize performance prior to design and installation of updated recovery system
-  Perform Triad-based characterization to expedite plume definition
-  Design, install, and operate enhanced recovery system

BSFA

Triad LIF/CPT ROST Investigation



- 🔍 Rapid Optical Screening Tool (ROST) used for simultaneous collection of LIF and CPT data
- 🔍 Data collection provided integrated 3D investigation and mapping of LNAPL and smear-zone vadose soils
- 🔍 9-day field effort with collection of 98 borings with minimal disturbance to AF mission
- 🔍 Decision Tree utilized to direct field activities

BSFA

Real Time Data Collection

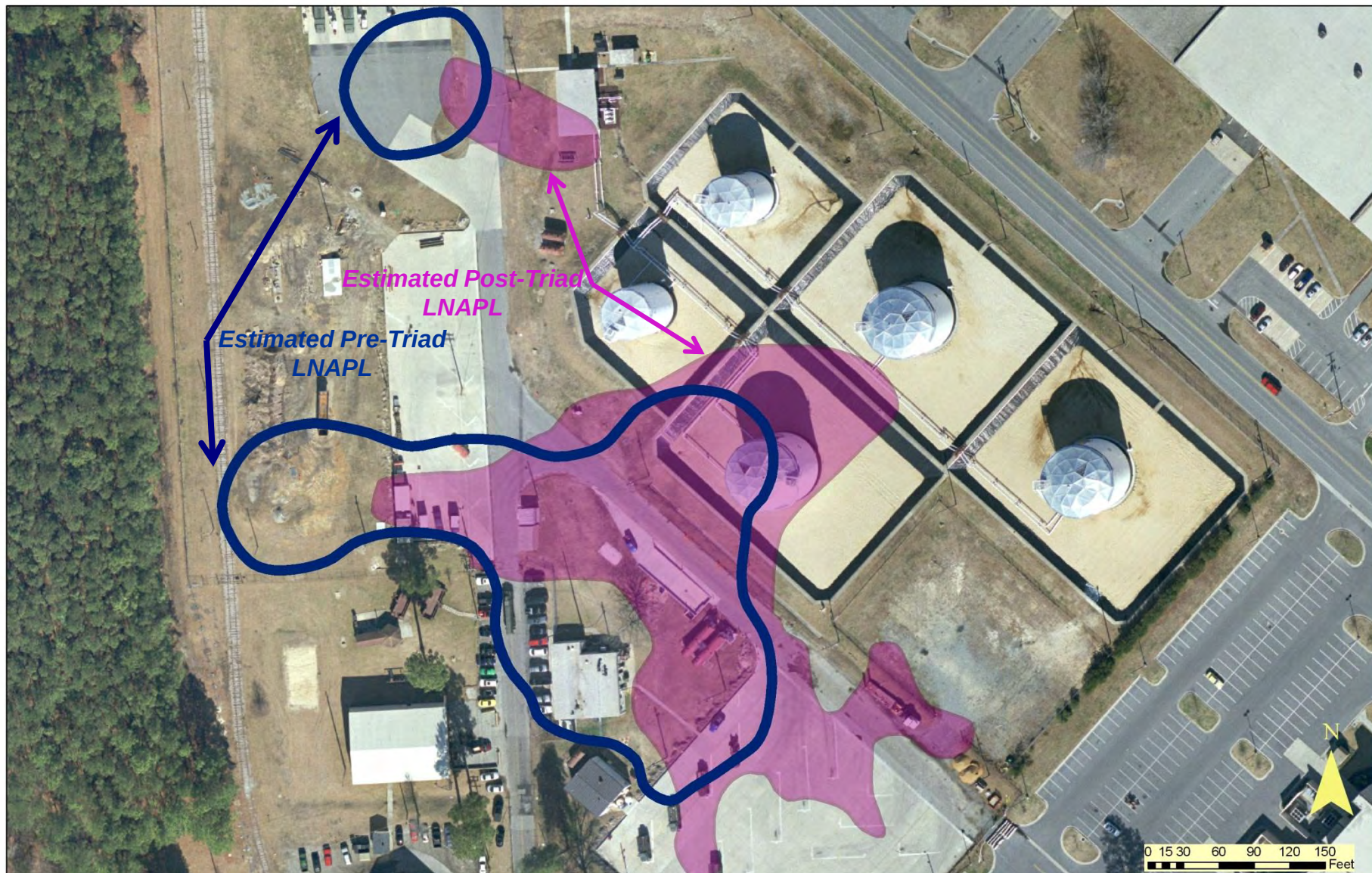


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BFSA

Updating the Conceptual Site Model



BFSA

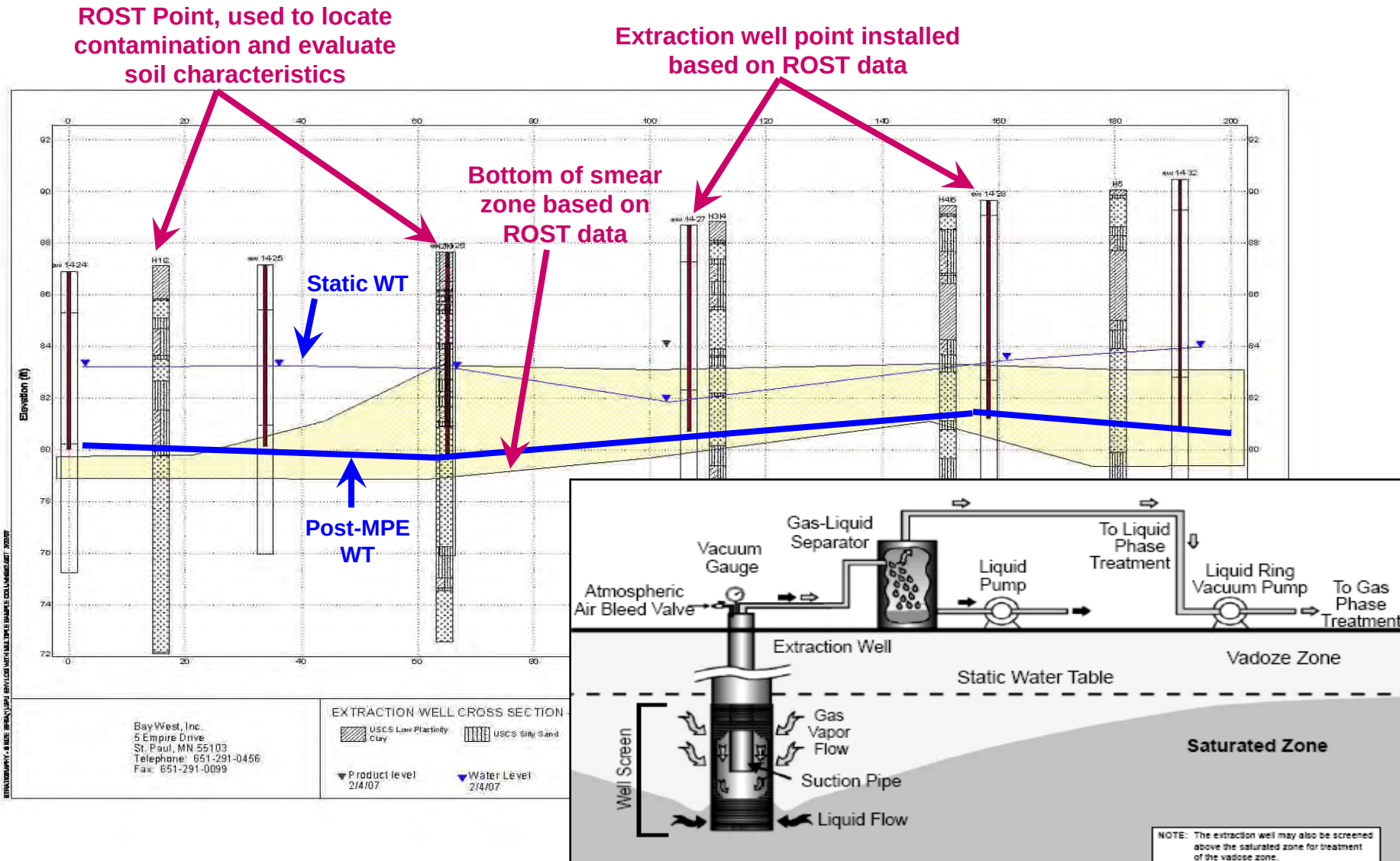
Treatment System Expansion



- 🔧 Installation of 65 MPE wells in target areas identified during the Triad investigation
- 🔧 Horizontal drilling and installation of system piping (~3,000 linear ft) to minimize impact to high-traffic, mission critical site area
- 🔧 Installation/Integration of 650-cfm extraction skid to increase recovery volume as estimated from the 3D site models

BFSA

System Enhancement



BFSA

Extraction Well and Manifold Pipe



Isolation/
Bypass Valve

Air Velocity Site Tube

Well Field
Operation Valve

Bay West



BFSA

MPE Trailer System



To Building
O/W Separator

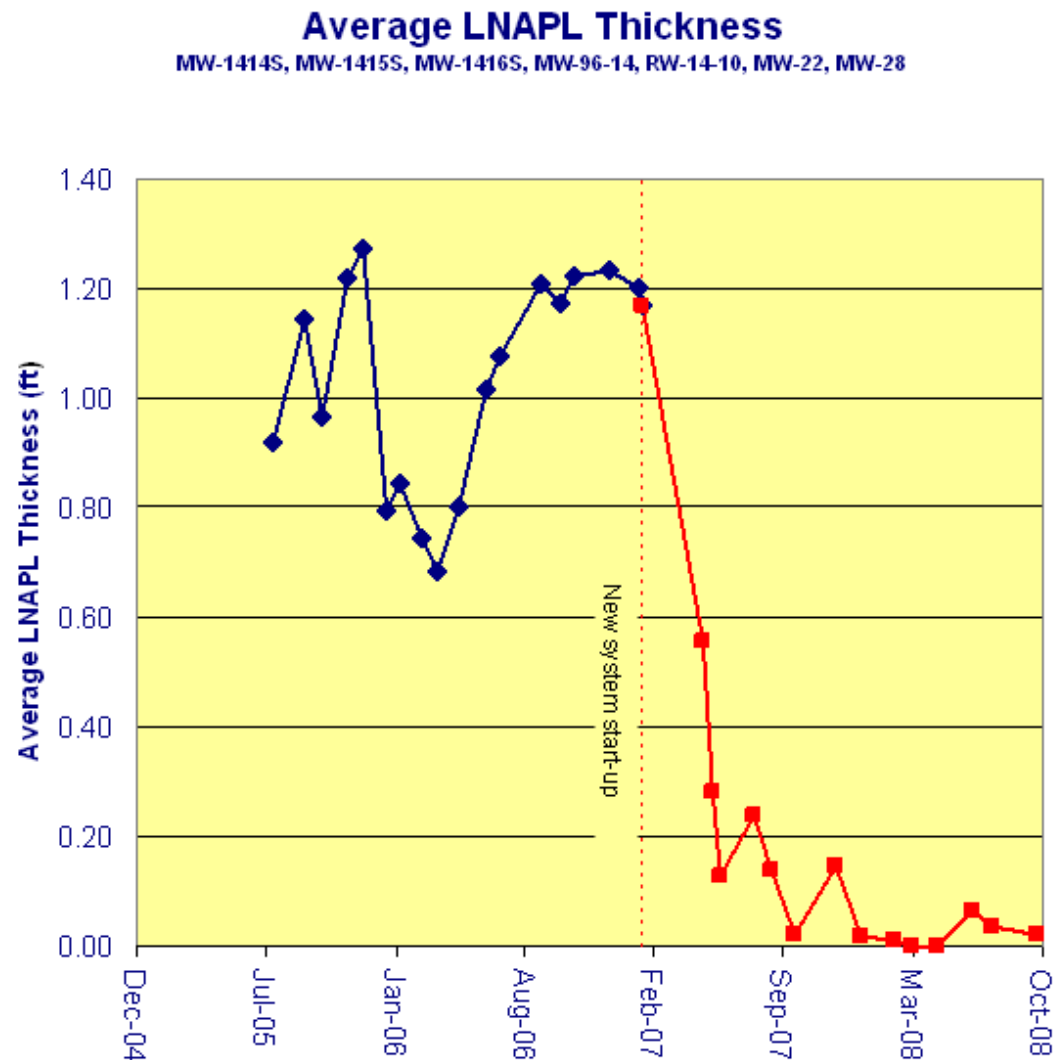
From Extraction
Zones

BFSA

Current Status



- MPE targeting of Triad-defined LNAPL removed approx 50,000 gal of LNAPL in 12-month period
- Cleanup timeframe estimated to be reduced from 10+ years to 3.5 years



Summary



Triad reduced:

- Number of mobilizations & fixed-base lab costs
- Field and reporting efforts
- Time to design and implement remedial action enhancements

Provided data to revise CSM reflecting:

- More accurate LNAPL distribution (vertical and horizontal)
- Soil impacts below regulatory criteria
- Role of stratigraphy in contaminant transport/recovery

Resulted in a design targeting source and “hot-spot” areas, reducing cleanup time

Thank You

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