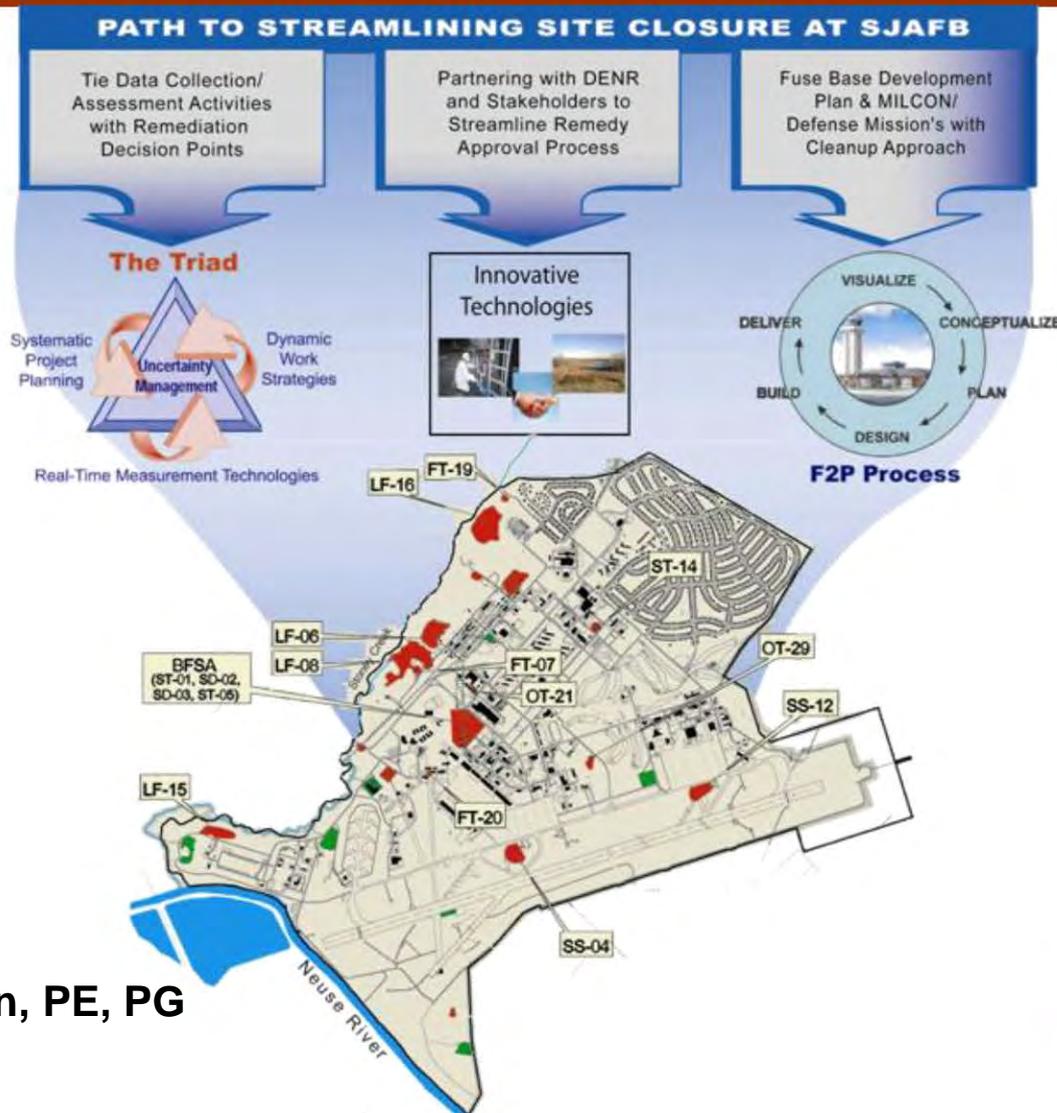


The Use of Future First Planning, the Triad, and Performance-Based Contracting to Accelerate Site Closure at Seymour Johnson AFB



Presented by:
Martin Wangenstein, PE, PG
Bay West, Inc.



Report Documentation Page

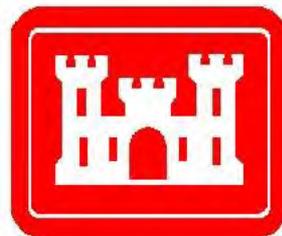
Form Approved
OMB No. 0704-0188

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1. REPORT DATE MAY 2009	2. REPORT TYPE	3. DATES COVERED 00-00-2009 to 00-00-2009			
4. TITLE AND SUBTITLE The Use of Future First Planning, the Triad, and Performance-Based Contracting to Accelerate Site Closure at Seymour Johnson AFB		5a. CONTRACT NUMBER			
		5b. GRANT NUMBER			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S)		5d. PROJECT NUMBER			
		5e. TASK NUMBER			
		5f. WORK UNIT NUMBER			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Bay West, Inc,5 Empire Drive,St. Paul,MN,55103		8. PERFORMING ORGANIZATION REPORT NUMBER			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)			
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)			
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES Presented at the NDIA Environment, Energy Security & Sustainability (E2S2) Symposium & Exhibition held 4-7 May 2009 in Denver, CO. U.S. Government or Federal Rights License					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 35	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Authors

- 🔗 Martin Wangensteen, PE, PG
– *Bay West, Inc.*
- 🔗 Frank Werner, PE
– *Seymour Johnson AFB*
- 🔗 John Cataldo, PE
– *USACE – Omaha District*
- 🔗 Megan Kari, PE
– *NewFields, LLC*



Acknowledgements



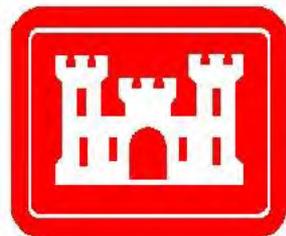
USAF/Air Combat Command

- *Margaret Patterson*
- *Bob Barrett, PE*

Seymour Johnson AFB

- *Buck Abrams, PE*

USACE – Omaha District



Teaming Partners & Subcontractors

- *SAIC*
- *URS*
- *TN&A*

NewFields

- *Kandi Brown*

NCDENR

- *Beth Hartzell*



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:

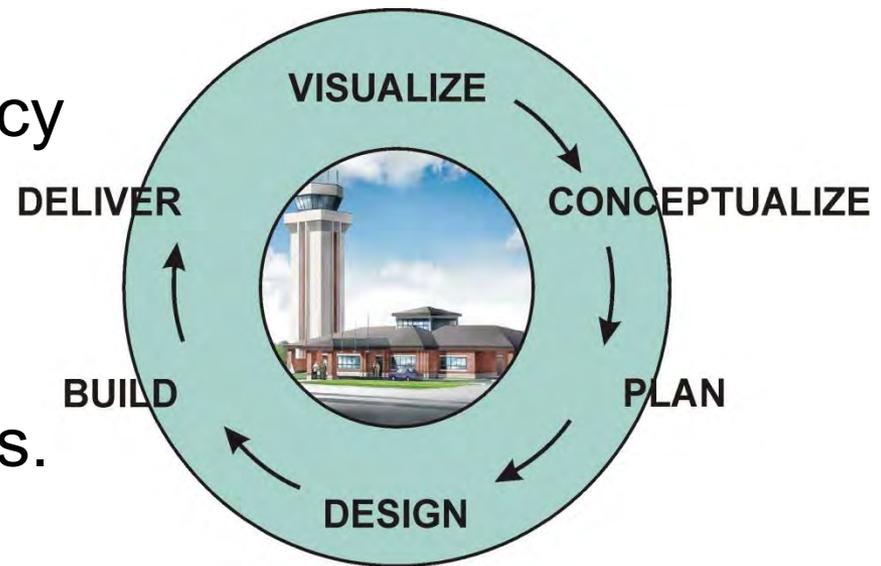
- Future First Planning
- Triad
- Innovative Technologies
- Remedial Process Optimization
- Decision-Based Partnering

Future First Planning



Future First Planning (F2P):

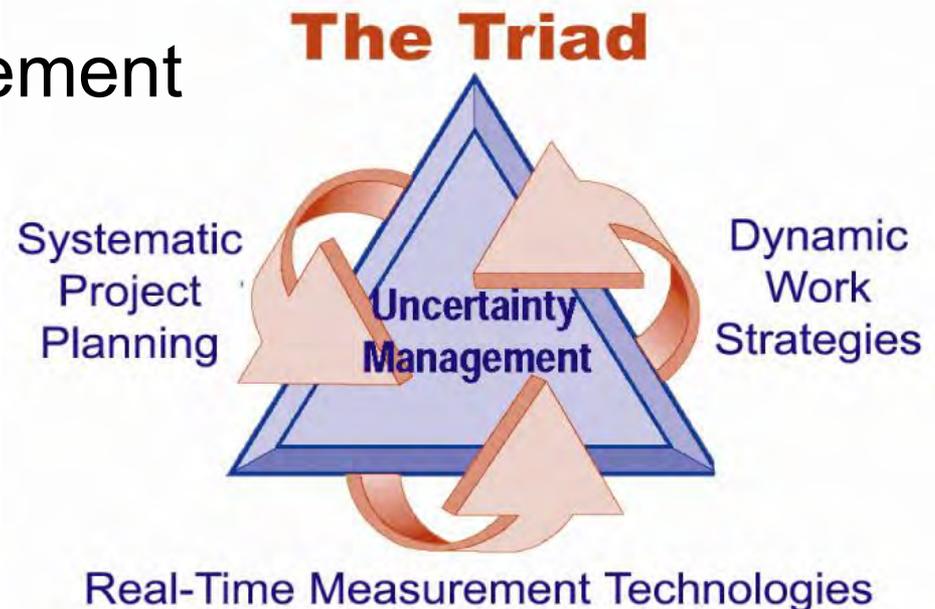
- A process that fuses Base development planning with environmental cleanup to optimize land use.
- Represents a shift in policy where environmental restoration sites are viewed as potential assets instead of liabilities.



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

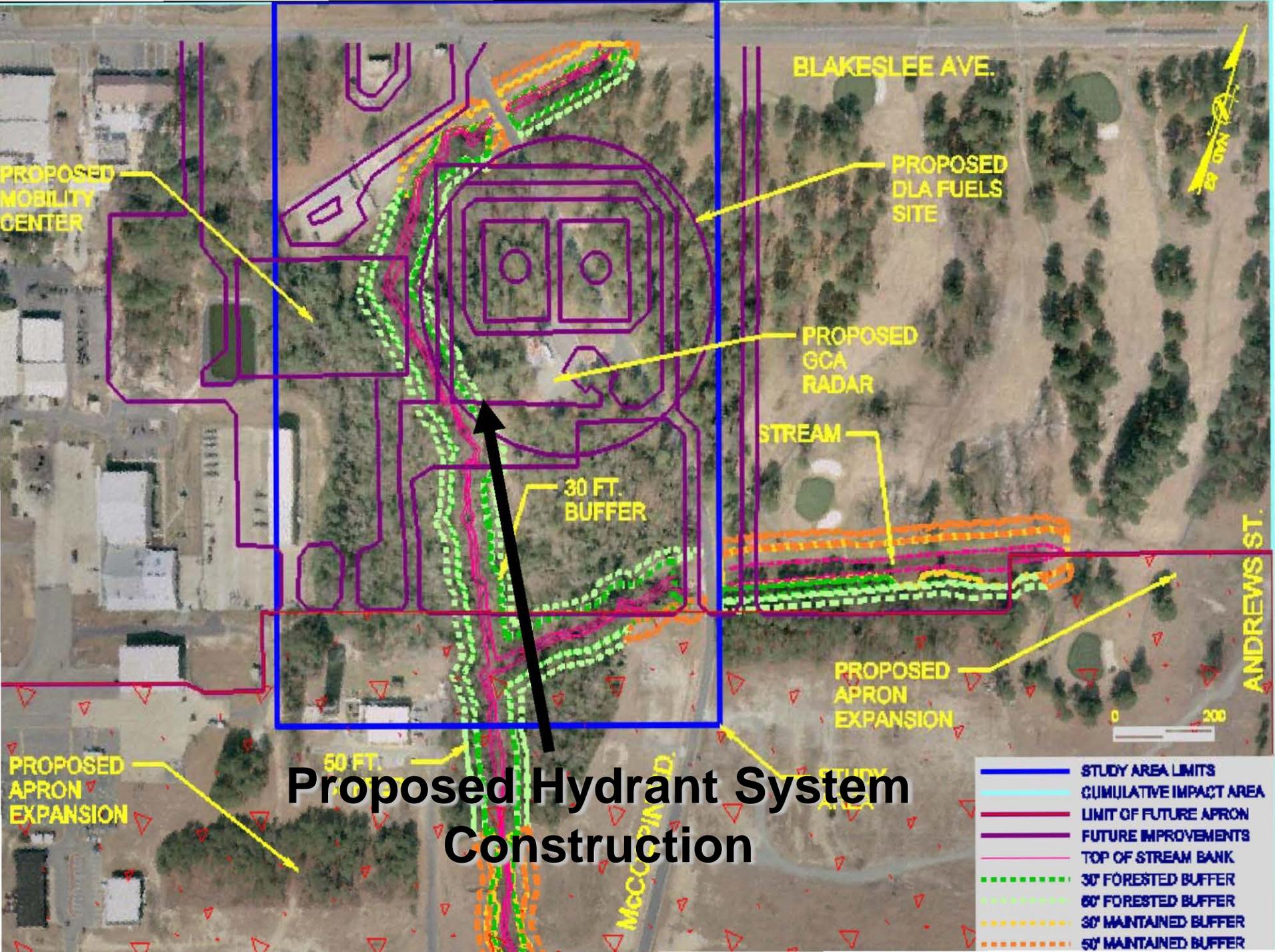


Overview

- 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

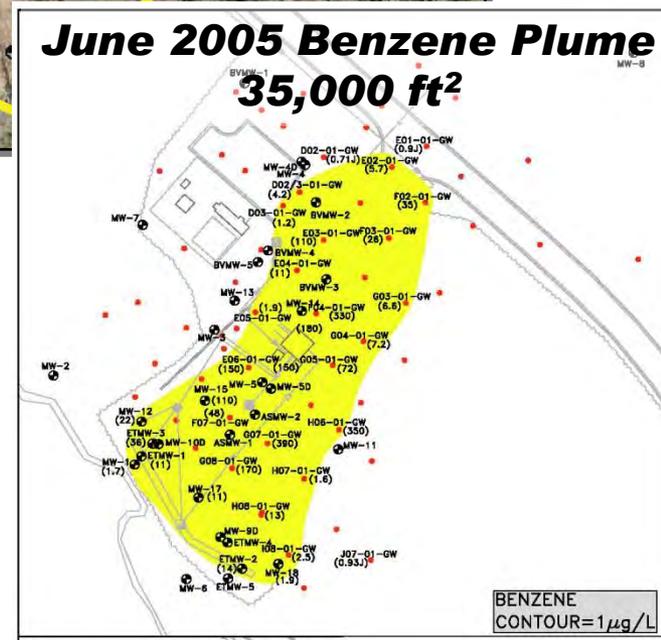
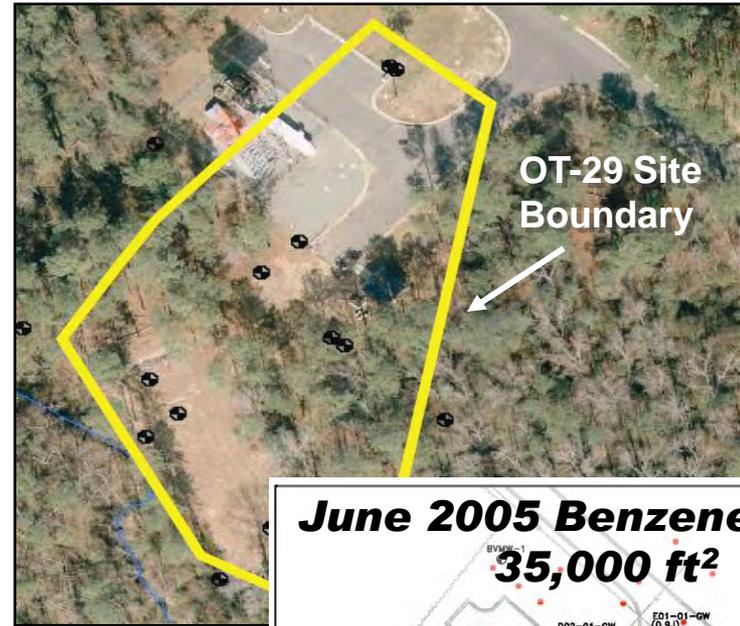
- Biosparge/biovent wells & groundwater extraction trench
- Projected cleanup >20 yrs



OT-29 Cleanup Strategy

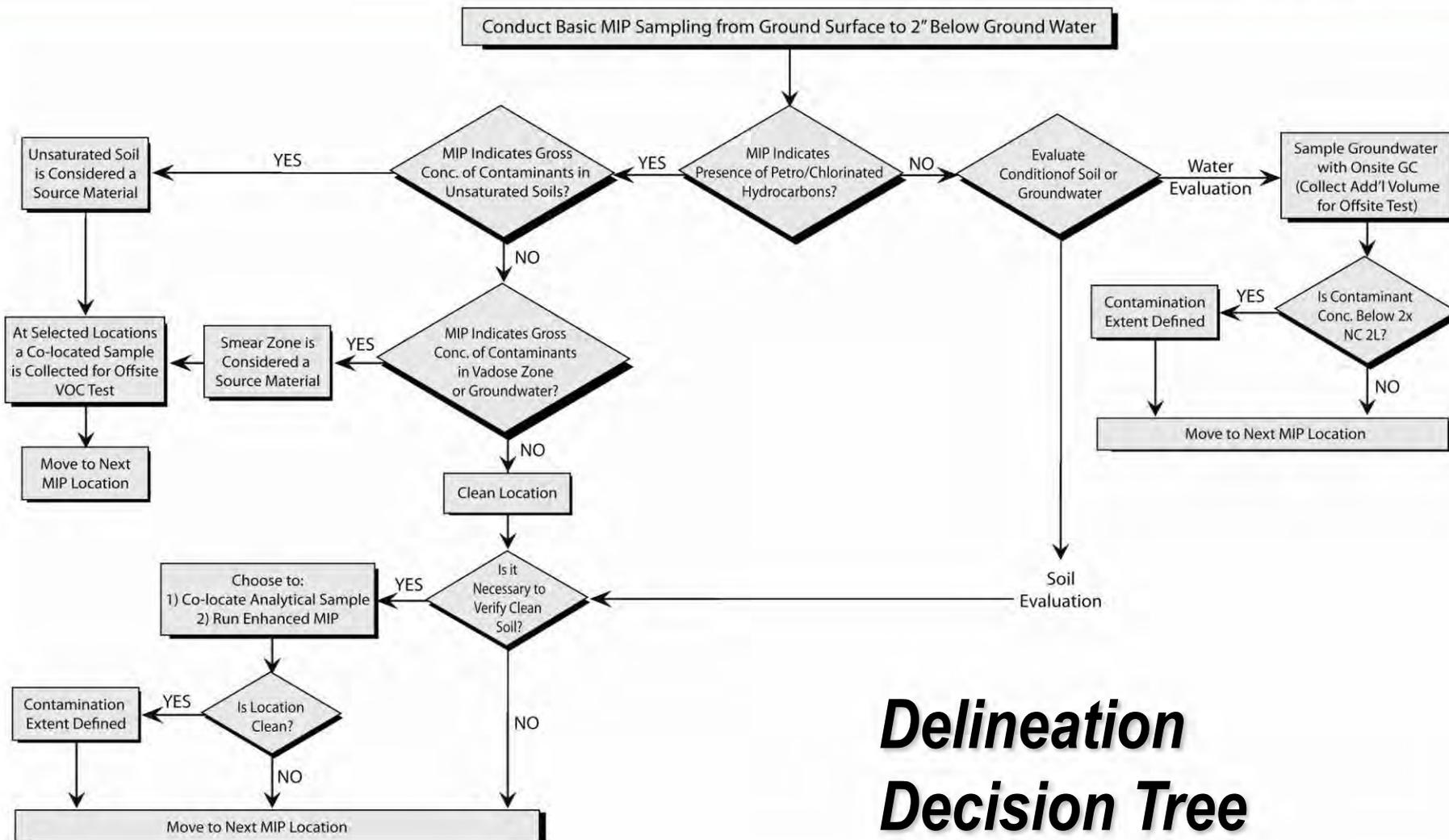


- Site characterization utilizing the Triad
- Removal of residual LNAPL using surfactant flush and recovery
- Excavation of contaminated soils
- Groundwater treatment through chemical oxidation events



OT-29

Dynamic Work Strategies



***Delineation
Decision Tree***

OT-29

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



OT-29

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



OT-29

“Hot Spot” Excavation



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



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

OT-29

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

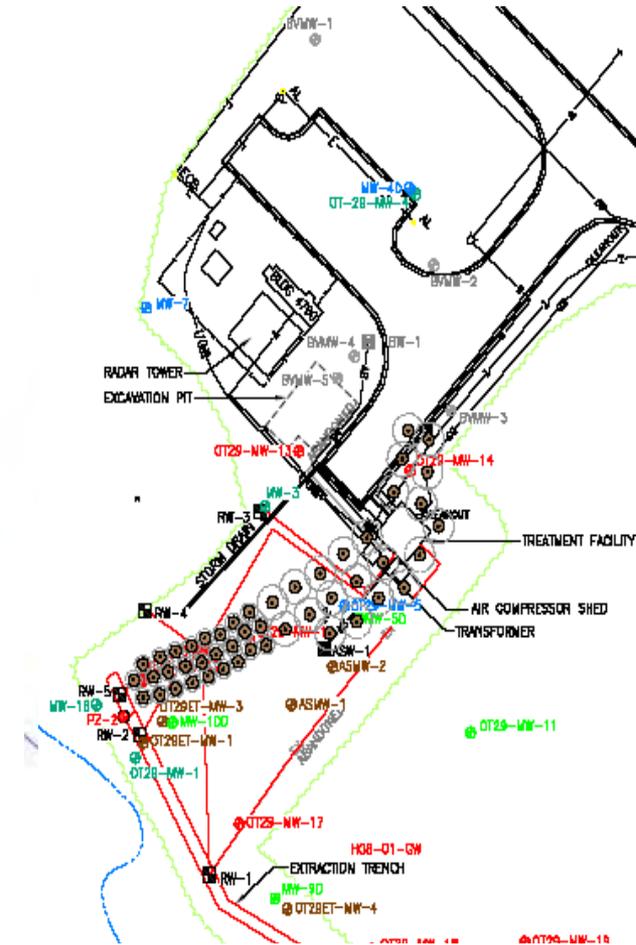
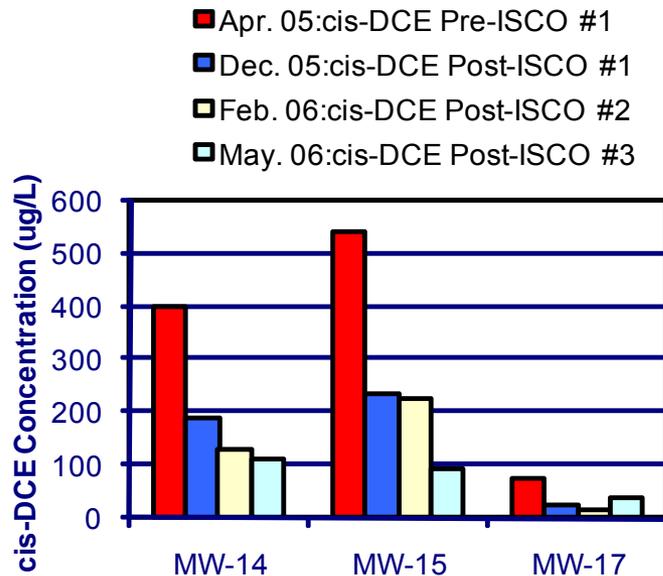
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In Situ Chemical Oxidation



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

OT-29

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

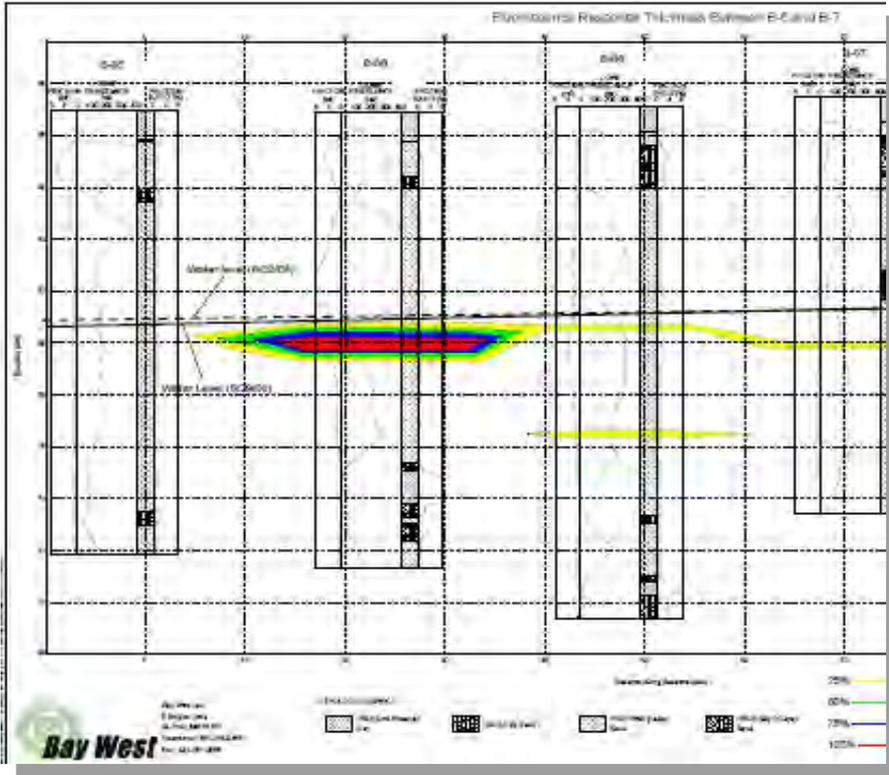
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Real Time Data Collection

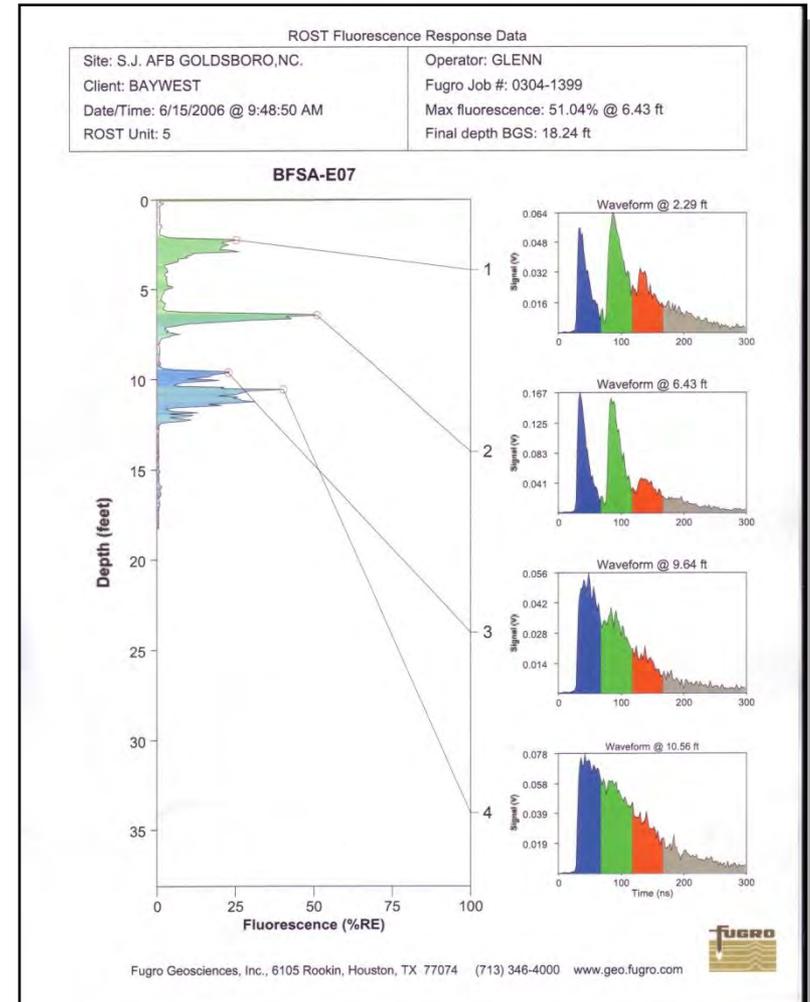


BSFA

Data Rendering



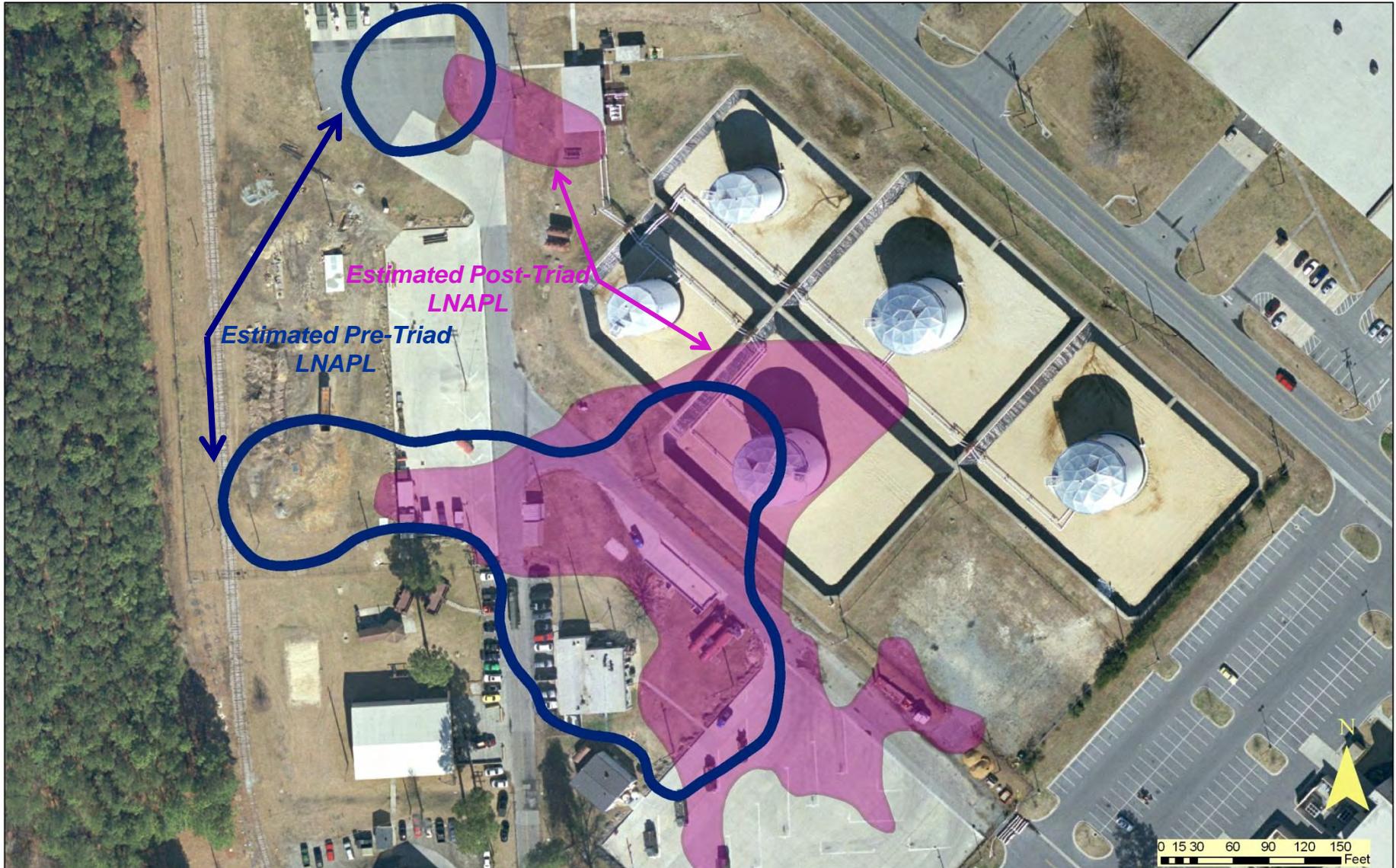
CPT & LIF Data



ROST Data

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

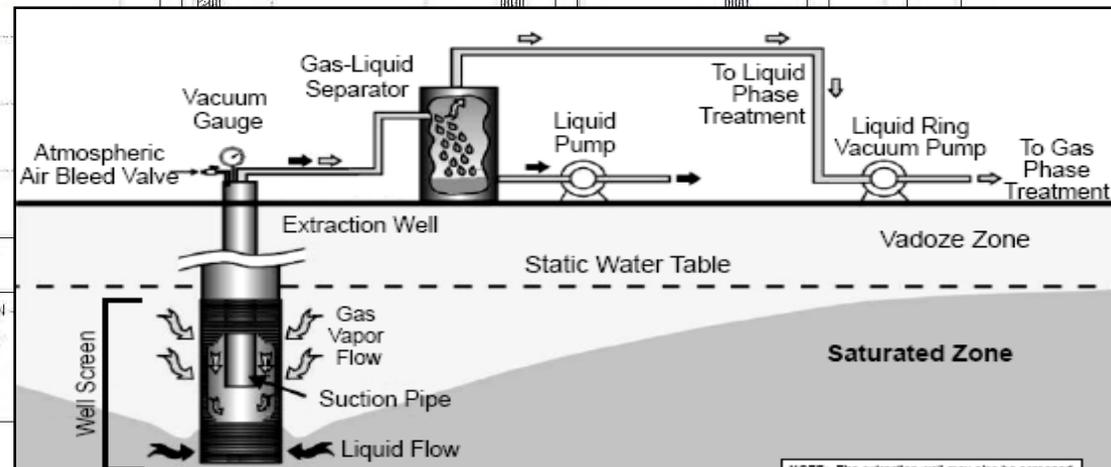
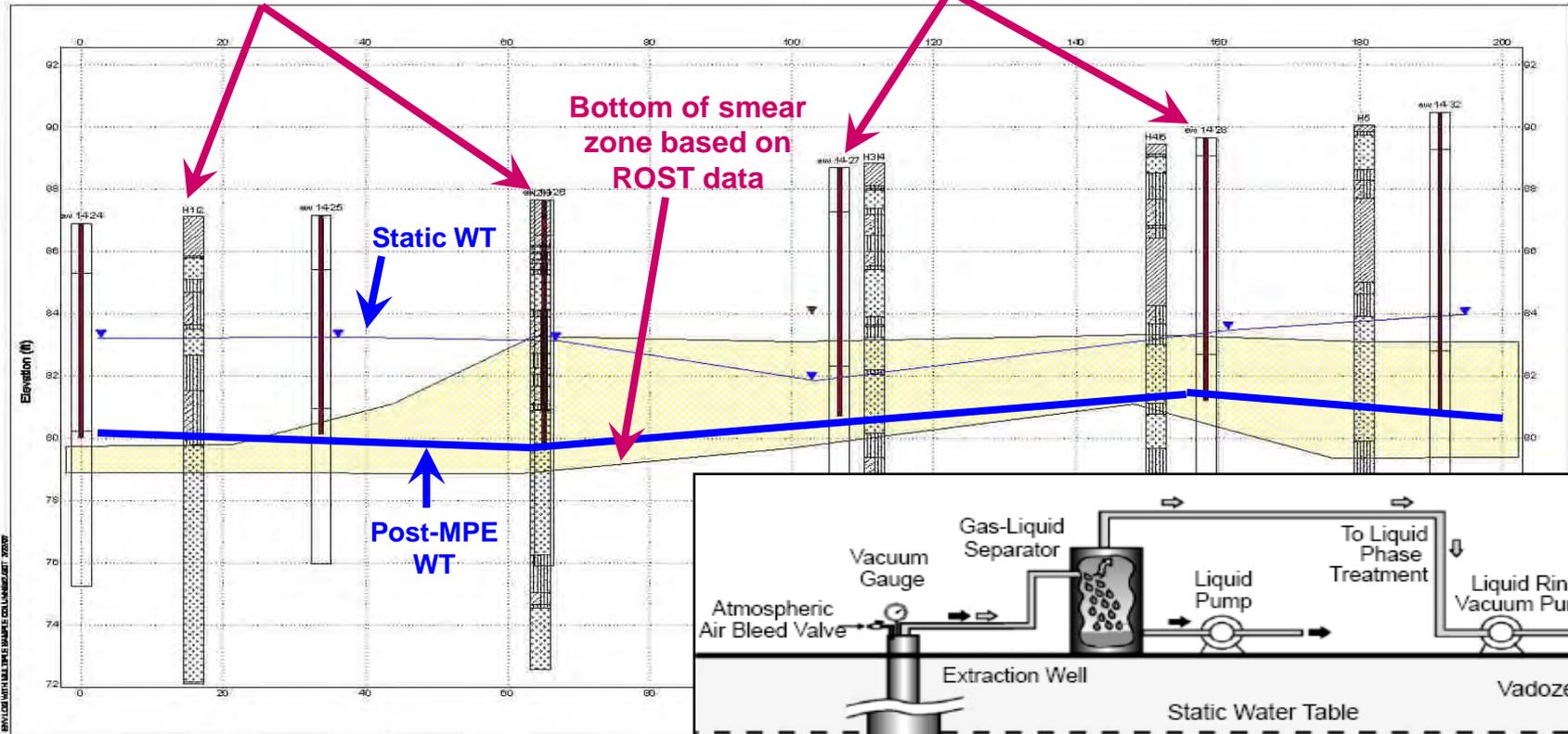
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System Enhancement



ROST Point, used to locate contamination and evaluate soil characteristics

Extraction well point installed based on ROST data



NOTE: The extraction well may also be screened above the saturated zone for treatment of the vadose zone.

BayWest, Inc.
5 Empire Drive
St. Paul, MN 55103
Telephone: 651-291-0456
Fax: 651-291-0099

EXTRACTION WELL CROSS SECTION

USCS Low Plasticity Clay USCS Silty Sand

Product level 2/14/07 Water Level 2/14/07

BFSA

Extraction Well and Manifold Pipe



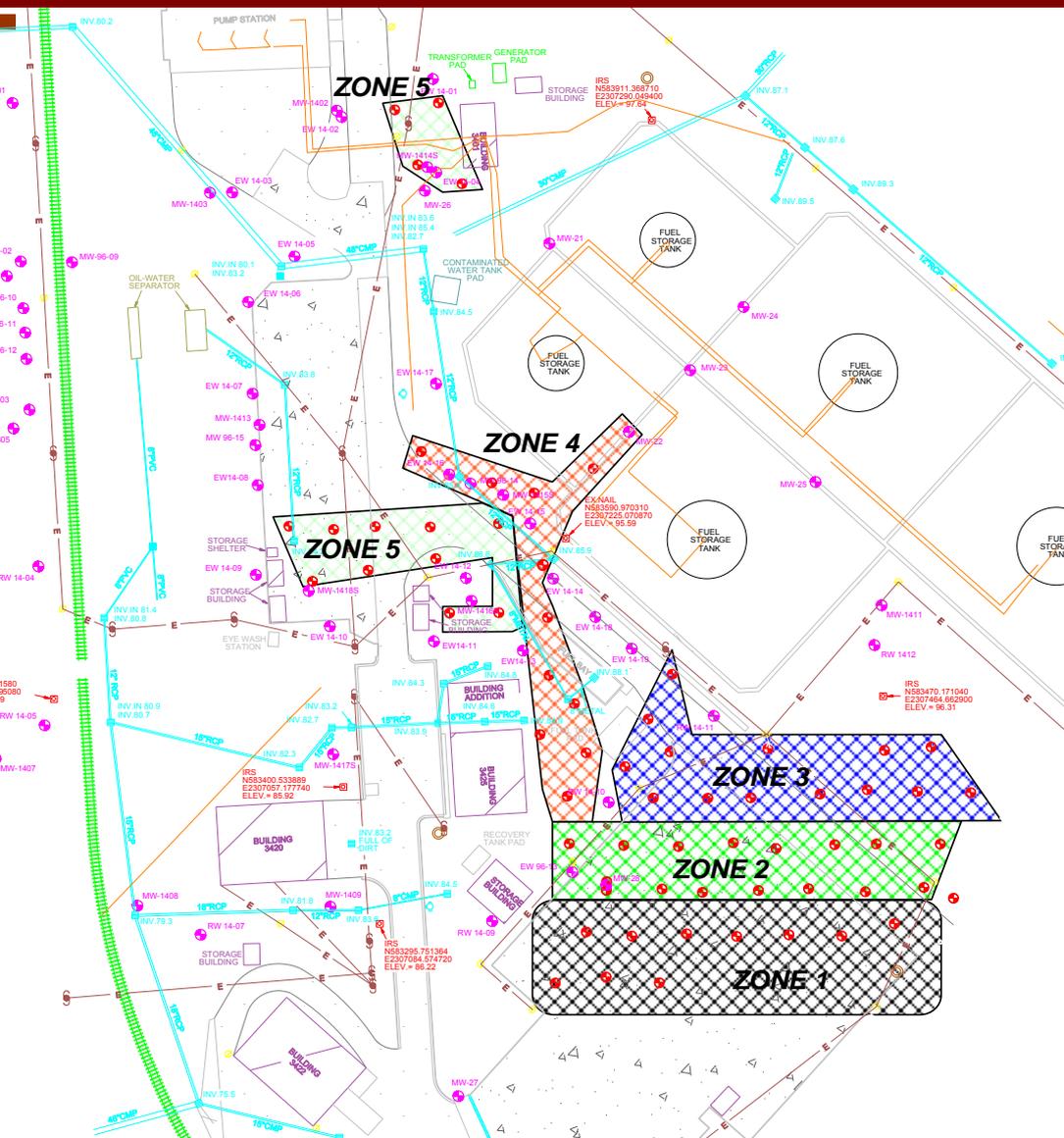
Isolation/
Bypass Valve

Air Velocity Site Tube

Well Field
Operation Valve

BFSA

Treatment Zone Configuration



Trailer Manifold Piping



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MPE Trailer System



To Building
O/W Separator

From Extraction
Zones

BFSA

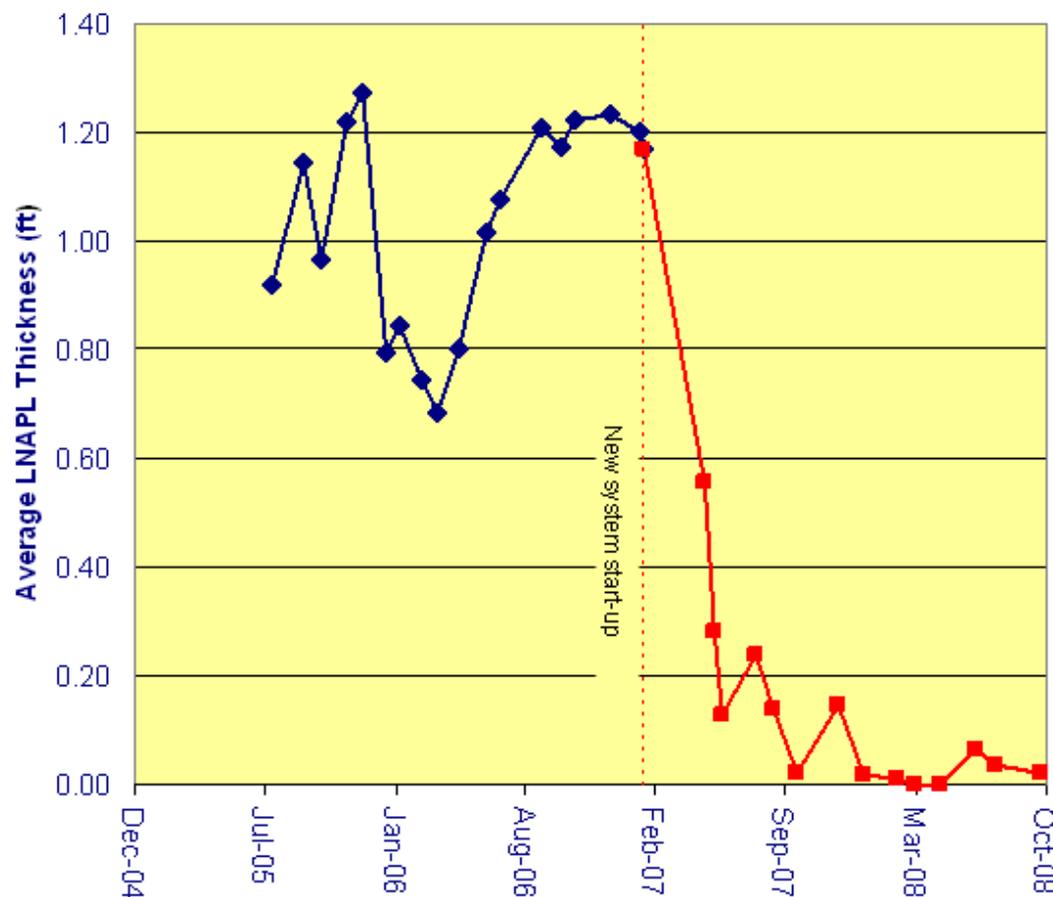
Current Status



- 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

Average LNAPL Thickness

MW-1414S, MW-1415S, MW-1416S, MW-96-14, RW-14-10, MW-22, MW-28



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

Presented by:

Martin Wangensteen, PE, PG

Bay West, Inc.

Direct: 651-291-3475

Cell: 651-341-3265

martyw@baywest.com

