



PUBLIC MEETING MINUTES
Presentation of the Proposed Plan for Groundwater
Former Plum Brook Ordnance Works
Sandusky, Ohio
March 29, 2012

Attendees

Rick Meadows, USACE Huntington
Lisa Humphreys, USACE Huntington
Brad Stark, OC/USACE Huntington
Richard Pitsinger, RAB Member
David Speer, RAB Member
Frank Lytle, Community Member
Chris Stoltz, USACE Nashville

Jim Beaujon, USACE Nashville
Archie Lunsey, Ohio EPA NWDO
Paul Jayko, Ohio EPA NWDO
Tom Siard, Shaw Environmental
Steve Downey, Shaw Environmental
Mike Gunderson, Shaw Environmental
Helen Owens, TMG Services, Inc.

MEETING AGENDA

The meeting agenda was to present the USACE's Proposed Plan for Groundwater, (Covering TNT and Red Water Pond Areas) Former Plum Brook Ordnance Works, Sandusky, Ohio.

A copy of the Public Notice is presented as an attachment to these minutes.

Rick Meadows, Project Manager, USACE Huntington District opened the meeting with the introduction of the presenter and moved into the meeting agenda.

PREVIEW OF PUBLIC MEETING PRESENTATION

Mr. Tom Siard, Shaw Environmental provided a review of the presentation of the Proposed Plan. The presentation is included as an attachment to these minutes.

Mr. Siard reviewed the purpose of the meeting and the opportunity for the public to review and comment on the Proposed Plan and preferred alternative of No Further Action. Mr. Siard also advised the public comment period was initiated with the public meeting and that review period would terminate on April 30, 2012. Written comments should be directed to Rick Meadows via email or regular mail. Mr. Meadows' contact information was provided in the presentation as well as the Proposed Plan.

Copies of the Proposed Plan document were distributed to the meeting attendees and also placed in the BGSU Firelands Library. The Proposed Plan was also available on the PBOW website.

Highlights of Mr. Siard's presentation are summarized below:

- Purpose of the Groundwater Proposed Plan
- Community Involvement

- Areas of Groundwater Evaluated
- Site Locations and General Layout of PBOW
- Bedrock Groundwater Flow Direction
- Previous Investigations and Activities
- Summary of Preferred Remedial Alternative – No Further Action Alternative
- Summary and Findings of Groundwater Remedial Investigation
- Summary of Groundwater Baseline Human Health Risk Assessment (BHHRA)
- Summary of Evaluated Alternatives
- Description of Evaluated Alternatives
- Detailed Description of Preferred Alternative – Alternative GW 1
- Schedule for Implementing Preferred Alternative
- Questions/Comments

The public offered one question during the meeting – “What would cause the direction of groundwater flow to go in different directions?” Mike Gunderson, Shaw Environmental responded that this could be caused by bedrock fractures.

In closing the meeting, Rick Meadows reiterated the public comment period was from March 29, 2012 through April 30, 2012. Mr. Meadows adjourned the meeting at 7:20 p.m.

ATTACHMENTS

Public Meeting Announcement
Published in Sandusky Register March 22, 2012

TANDEM MEDIA NETWORK
ORDER CONFIRMATION

Salesperson: [REDACTED]

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Acct#: 32845
TMG SERVICES, INC.
SUITE 1
240 OLIVER STREET
ST. ALBANS WV 25177

Ad#: 277306 Status: N
Start: 03/22/12 Stop: 03/22/12
Times Ord: 1 Times Run: ****
STD 1.00 X 73.00 Words: 300
Rate: LEGAD Cost: 80.30
Class: 001 LEGALS

Contact: [REDACTED]
Phone: [REDACTED]
Fax#: [REDACTED]
Email: [REDACTED]
Agency: [REDACTED]

Descript: LEGAL NOTICE PUBLIC MEETI
Given by: *
Created: jvark 03/20/12 11:27
Last Changed: jvark 03/20/12 11:31

PUB ZONE ED TP START INS STOP SMTWTFSS
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AUTHORIZATION

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of a cancellation before schedule
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LEGAL NOTICE
PUBLIC MEETING

And
PUBLIC COMMENT PERIOD
NOTICE

The U.S. Army Corps of Engineers (USACE) Huntington District will be conducting a public meeting to present the Proposed Plan for Sitewide Groundwater (Covering TNT A, B, C, and Red Water Ponds Areas) Former Plum Brook Ordnance Works, Sandusky, Ohio.

The public meeting is scheduled for Thursday March 29, 2012 at 6:30 p.m. in the Bettcher Room located on the second floor in the Cedar Point Center on the campus of BGSU Firelands. BGSU Firelands is located at One University Drive, Huron, Ohio.

The former Plum Brook Ordnance Works (PBOW) manufactured explosives during World War II. The USACE has completed a study of groundwater associated with the TNT manufacturing areas and the Red Water Ponds areas to evaluate levels of groundwater contamination and has developed a plan to address the groundwater contamination.

The proposed alternative to address the groundwater is No Further Action (NFA) and is presented in the Proposed Plan. Copies of the Proposed Plan will be available at the meeting, BGSU Firelands Library, and will be posted on the USACE Huntington District's website at www.lrh.usace.army.mil/projects/current/derp-fuds/pbow

The USACE Huntington District encourages you to comment on the proposed plan during the 30-day Public Comment Period from March 29, 2012 through April 30, 2012.

Written comments may be submitted by mail, postmarked no later than April 30, 2012 to the following address:

Mr. Richard Meadows
CELRH-PM-PP-P
USACE Huntington District
502 Eighth Street
Huntington, West Virginia 25701
(304) 399-5388
Email Richard.L.
Meadows@USACE.army.mil

Public comments received during this period will be considered in the final decision-making process for the Sitewide Groundwater (Covering Areas TNT A, B, C and the Red Water Ponds areas) at the former Plum Brook Ordnance Works, Sandusky, Ohio.

For more information, please contact Mr. Meadows.
March 22, 2012

Public Meeting Presentation

Proposed Plan for Groundwater, (Covering TNT and Red Water Pond Areas) Former Plum Brook Ordnance Works, Sandusky, Ohio

Public Meeting

Tom Siard

Risk Assessor

Shaw, Environmental and Infrastructure, Inc.
Knoxville, TN

29 March 2012



US Army Corps of Engineers
BUILDING STRONG



Purpose of the Groundwater Proposed Plan

- Present the Preferred Alternative proposed for groundwater
- Provide for public comment



Community Involvement

- The Proposed Plan is made available to the public for a 30-day review and comment period
- At the end of the 30-day review period (30 April 2012), all comments will be:
 - ▶ included in the Responsiveness Summary of the Groundwater Decision Document,
 - ▶ documented in the administrative record (AR),
 - ▶ evaluated for consideration in final selection of alternative
- Selected response action will be documented in the Groundwater Decision Document

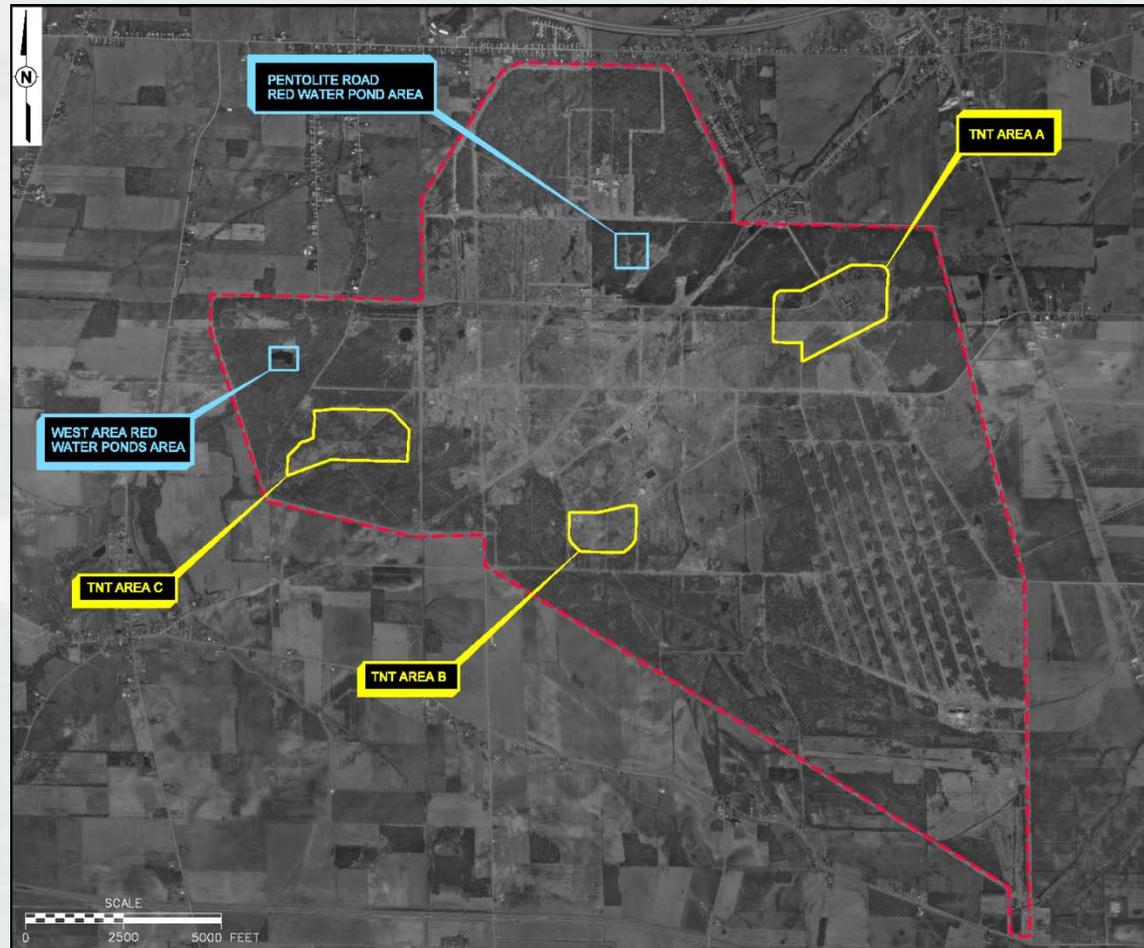


Areas of Groundwater Evaluated

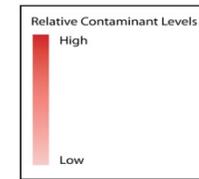
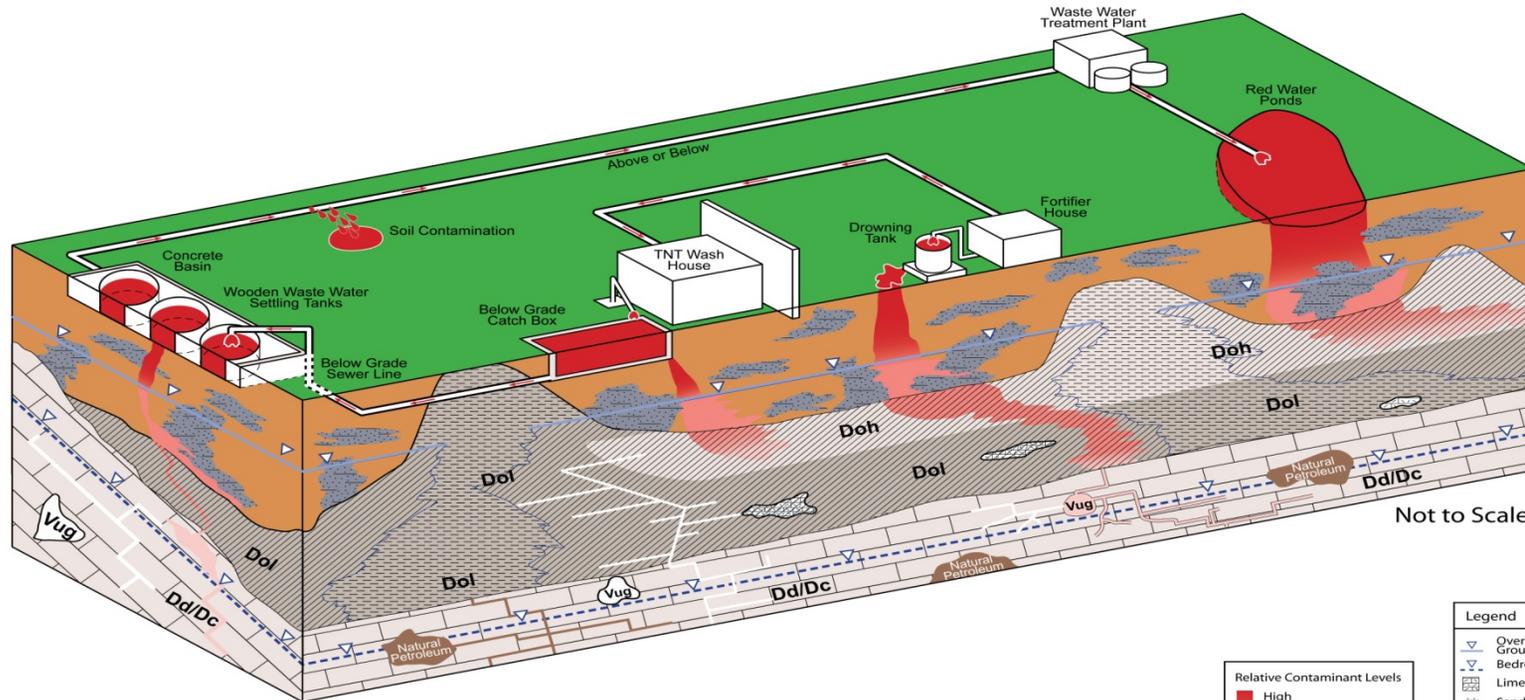
- TNT Area A (TNTA)
- TNT Area B (TNTB)
- TNT Area C (TNTC)
- Pentolite Road Red Water Pond Area (PRRWP)
- West Area Red Water Ponds Area (WARWP)



Site Locations



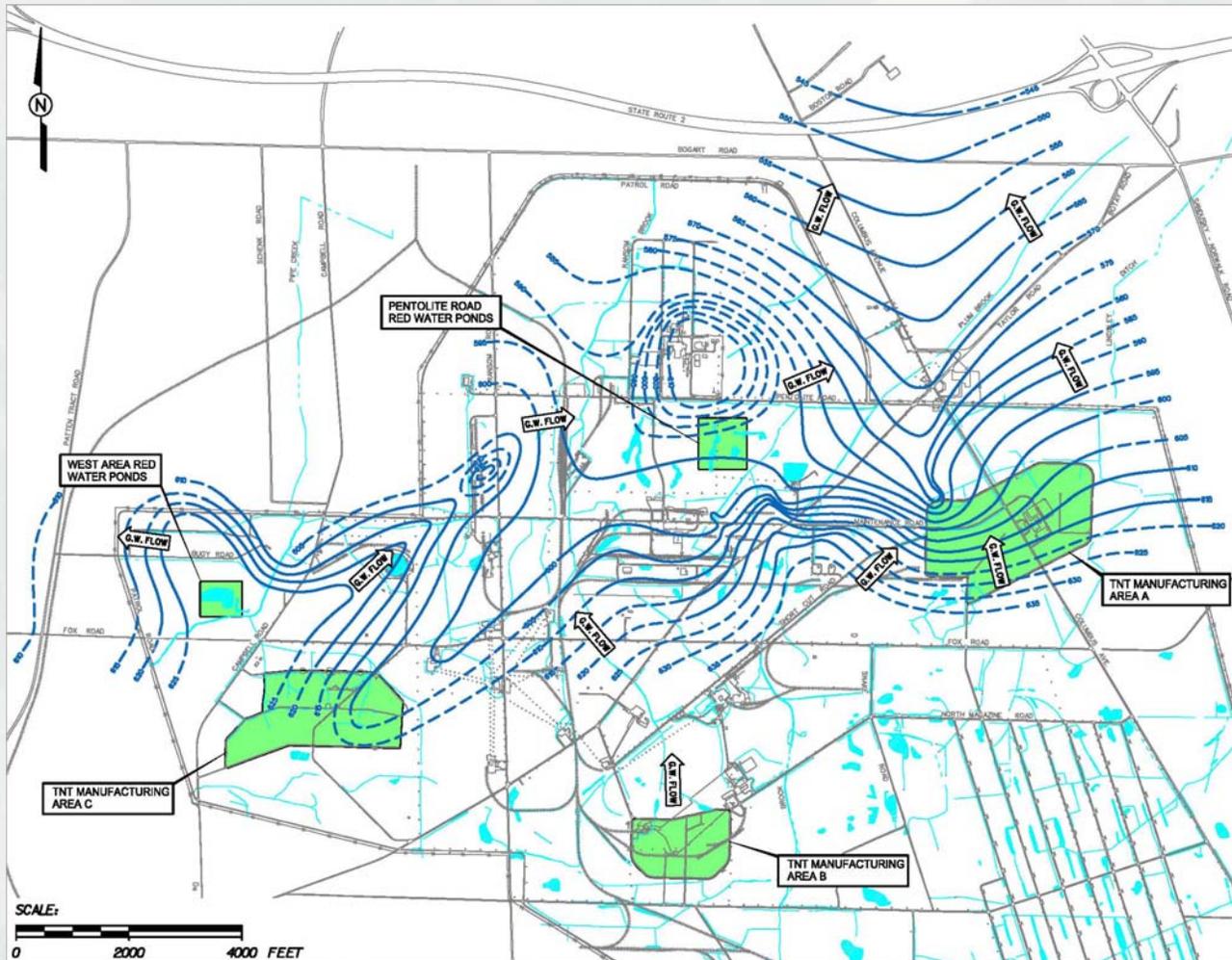
Generalized PBOW Conceptual Diagram



Legend	
	Overburden/Shale Groundwater
	Bedrock Groundwater
	Limestone Lense
	Sandy Silt/Sandy Clay Lense
	Silt/Clay/Shale Fragments
	Weathered Shale
	Doh - Ohio Shale
	Dol - Olenangy Shale (Prout and Olenangy Shale Members)
	Dd - Delaware Limestone
	Dc - Columbus Limestone



Bedrock Groundwater Flow Direction



Previous Investigations & Activities

- Decontamination Activities at TNT Areas (1945 – 1963)
- Red Water Pond Area Investigations (1977 – 1991)
- Preliminary Assessment (1991)
- Site Inspection Report (1994)
- TNT Areas Site Investigation and Focused Remedial Investigation at the Red Water Ponds (1997)
- Site-Wide Groundwater Monitoring/Investigation/Monitoring Reports (1996, 1997, and 1998)
- Risk Assessment/Direct-Push Investigation of Red Water Pond Areas (2001)
- Groundwater Data Summary/Evaluation Reports (2003, 2005)
- TNTB Soil NTCRA Activities (Completed 2007)
- PRRWP Soil NTCRA Activities (Completed 2009)
- TNTC Soil Remediation Activities (Ongoing)
- TNTA Soil Remediation Activities (Ongoing)
- Additional PRRWP Soil Remediation (Anticipated)



Summary of Preferred Remedial Alternative

- No Further Action (NFA)
 - ▶ Includes:
 - Soil-based source area actions (under other projects)
 - Conditions exist that are conducive to natural attenuation of nitroaromatic explosives in groundwater
 - No current exposure to on-site groundwater
 - Poor quality renders the bedrock groundwater non-potable
 - Poor quality and low yield renders overburden groundwater non-potable and/or not available
 - ▶ USACE position: No legal driver to take action specific to groundwater



Summary of Groundwater RI

- Remedial Investigation (RI) Groundwater
 - ▶ Groundwater investigation based on data from 1997 thru 2002
 - ▶ 60 bedrock well samples from 5 sites and downgradient
 - ▶ 59 overburden well samples from 5 sites
 - ▶ 58 overburden direct-push samples (mostly PRRWP/WARWP)
 - ▶ Analyzed for explosives, metals, PCB/pest, SVOCs, VOCs, other parameters
- Direct-Push Investigation at TNT Areas in 2002
 - ▶ 135 Direct-push groundwater samples planned for overburden groundwater
 - ▶ After first 32 DP locations, 26 were dry and 2 others could not be analyzed for planned suite
 - ▶ Direct-push effort was abandoned



Findings of Groundwater RI (cont'd)

- There is no current exposure to on-site groundwater
- Overburden groundwater does not provide adequate yield
- Bedrock groundwater has naturally poor quality
 - ▶ Natural petroleum hydrocarbons
 - Recently active petroleum/natural gas fields in Erie County (Columbus and Delaware limestone)
 - Over 2/3 of wells exceed drinking water level for natural benzene
 - Up to 14 feet of petroleum product in groundwater monitoring well
 - ▶ Emissions of hydrogen sulfide gas (H₂S)
 - Nuisance odors
 - Potential adverse health effects at high concentrations
 - Reacts with water to form sulfuric acid, damaging pipes, well materials, pumps, and fixtures



Effects of Hydrogen Sulfide Gas on Steel



Findings of Groundwater RI (cont'd)

- Upgradient background groundwater is not suitable for potable use based on exceedances of Safe Drinking Water Regulations (SDWR) for chloride, iron, sulfate, manganese, sodium, and dissolved solids.
- Only 5 wells were found within 1 mile of PBOW
 - ▶ Only use was for irrigation
 - ▶ None of these wells contained nitroaromatics
- Conditions that are conducive to the breakdown of nitroaromatics are present in limestone groundwater
 - ▶ Dissolved $O_2 < 1$ mg/L
 - ▶ Oxidation-reduction potential ≤ 0.0
 - ▶ Breakdown products co-occur with presence of nitroaromatics in the limestone bedrock groundwater
 - ▶ Petroleum hydrocarbons may stimulate anaerobic biodegradation



Findings of Site Groundwater RI (cont'd)

- Only low, sporadic detections of nitroaromatics have been observed in bedrock groundwater
 - ▶ WARWP Area: 2,4-DNT detected twice in SVOC analysis (16 and 19 $\mu\text{g/L}$); six other results were nondetect for 2,4-DNT
 - ▶ PRRWP Area: 2,4-DNT and 2,6-DNT were detected only once (1998), each at the same low concentration (0.89 $\mu\text{g/L}$); 11 other results were nondetect for both DNTs.
 - ▶ TNTA : 2,4-DNT and 2,6-DNT each detected once (0.49 $\mu\text{g/L}$ and 3.6 $\mu\text{g/L}$); 11 other results for each were nondetect
 - ▶ TNTB and TNTC: No site-related chemicals detected in bedrock groundwater



Summary of Groundwater Baseline Human Health Risk Assessment (BHHRA)

- Only bedrock groundwater was evaluated quantitatively
- Overburden groundwater samples were used to model effect on bedrock groundwater
 - ▶ Both overburden wells and direct-push samples were used
 - ▶ Concentrations in direct-push samples are likely biased high
 - ▶ Groundwater model includes effects from residual soils (which contribute little to groundwater contamination)
 - ▶ Overburden GW contamination contributed much more to future bedrock GW concentrations than did soil contamination.
- Use of groundwater as tap water was assumed for future resident, worker, and off-site resident



Summary of Site Groundwater BHHRA (cont'd)

- Comparison of BHHRA Results: Site-Related to Non-Site-Related Risks/Hazards (assuming household tap use)

PBOW Site	Percent of Non-Cancer Hazard to Resident		Percent of Cancer Risk to Resident	
	Site-Related	Non-Site-Related	Site-Related	Non-Site-Related
TNTA	<i>0.6%</i>	<i>99.4%</i>	1.7%	<i>98.3%</i>
TNTB	0.0%	<i>100%</i>	0.0%	<i>100.0%</i>
TNTC	0.0%	<i>100%</i>	0.0%	<i>100.0%</i>
PRRWP Area	0.3%	<i>99.7%</i>	0.3%	<i>99.7%</i>
WARWP Area	<i>93.3%</i>	<i>6.7%</i>	<i>53.3%</i>	<i>46.7%</i>
Downgradient Areas	0.4%	<i>99.6%</i>	7.5%	<i>92.5%</i>

Bold/shaded italics – unacceptable risk per NCP (ILCR>1x10⁻⁴) or unacceptable hazard (HI>1);
Italics (only) – unacceptable risk per OEPA (ILCR>1x10⁻⁵)

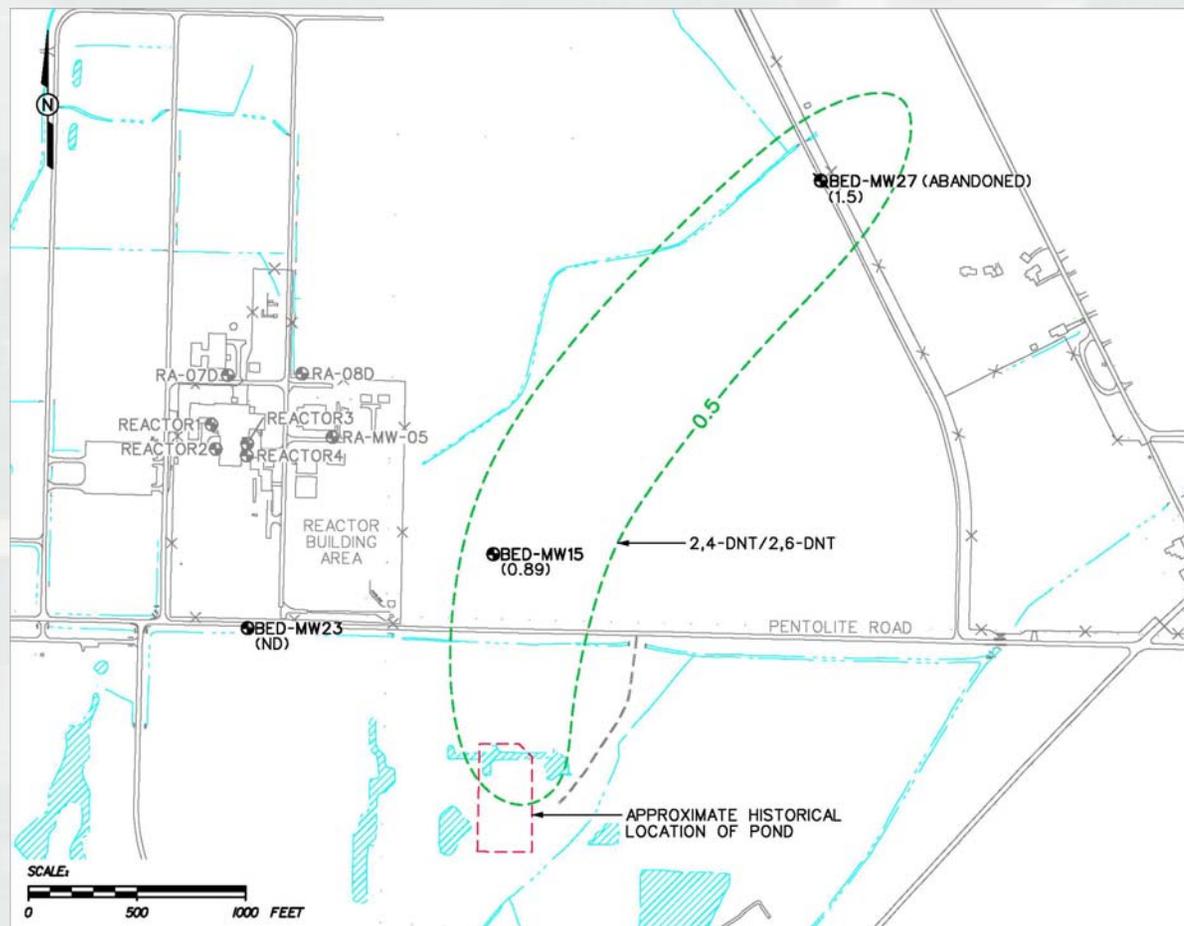


Summary of Site Groundwater BHHRA (cont'd)

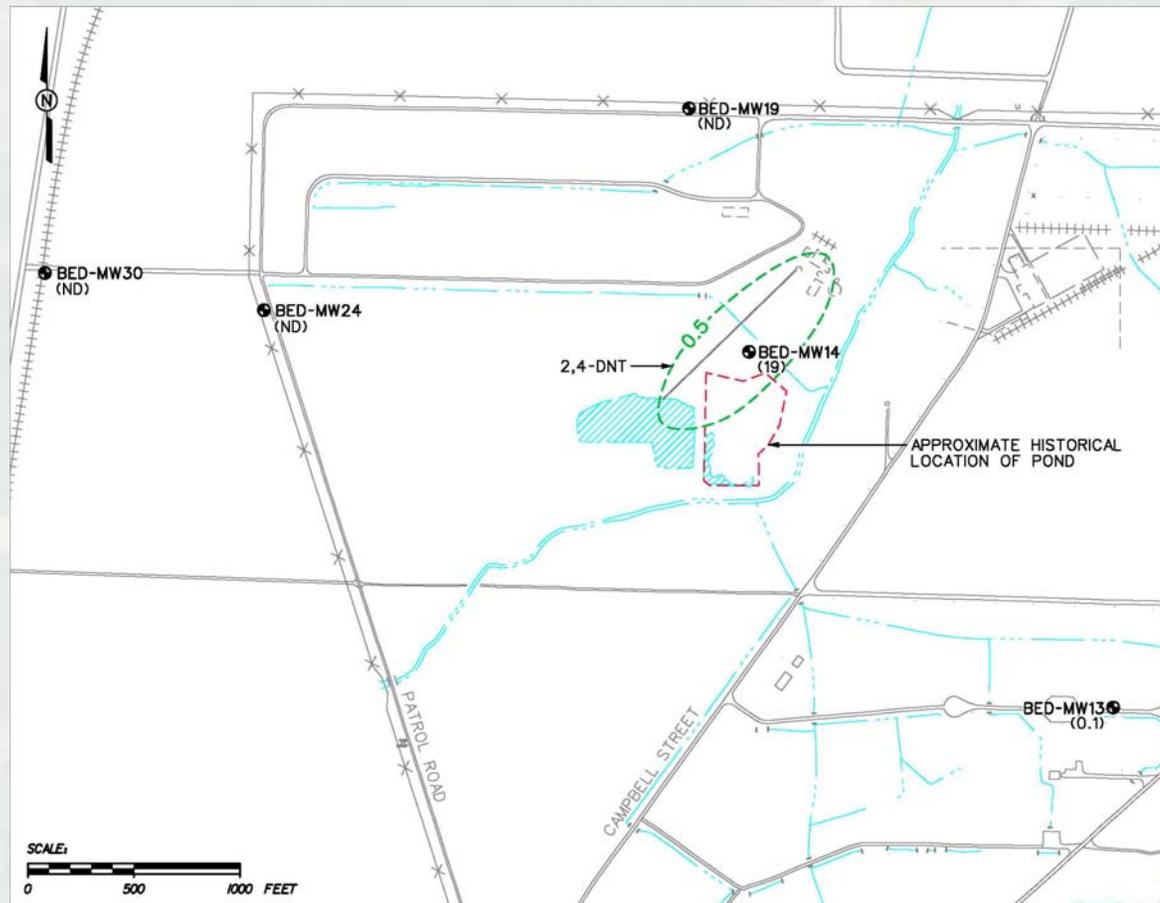
- Site-Related “Risk-Drivers” in Limestone Bedrock Groundwater
 - ▶ TNTA – 2,4-DNT and 2,6-DNT
 - ▶ TNTB – None
 - ▶ TNTC – None
 - ▶ PRRWP Area – 2,4-DNT and 2,6-DNT
 - ▶ WARWP Area – 2,4-DNT, 4,6-dinitro-2-methylphenol, nitrate, and 3-nitroaniline
- At all sites except WARWP, the human health risks were overwhelmingly associated with naturally occurring chemicals in groundwater.



2,4-DNT/2,6-DNT Plume in PRRWP Limestone Bedrock Groundwater



2,4-DNT Plume in WARWP Limestone Bedrock Groundwater



Summary of Evaluated Alternatives

- Alternative GW-1 – No Further Action
- Alternative GW-2 – GW Monitoring, Monitored Natural Attenuation, and Institutional Controls
- Alternative GW-3 – In Situ Enhanced Bioremediation/ Pump and Treat for Mitigation/Protection of Limestone Bedrock GW, Monitoring and Institutional Controls
- Alternative GW-4 – ISEB/P&T for Mitigation/Protection of *Overburden/Shale and* Limestone Bedrock GW, GW Monitoring and Institutional Controls
- Alternative GW-5 – GW Monitoring and/or Institutional Controls



Alternative GW-1 Details

- No Further Action
 - ▶ Required by NCP as baseline for comparing other alternatives
 - ▶ Includes source removal associated with soil-based actions for TNTA/B/C and PRRWP Area (under other projects)
 - Groundwater quality should improve over time due to soil removal
 - Approximately 38,000 cubic yards (CY) of contaminated soil has been removed or is planned for removal from the three TNT areas
 - Approximately 8,000 CY of contaminated soil has been removed from the PRRWP under the NTCRA
 - Approximately 28,000 CY of additional contaminated soil is anticipated for soil remediation at the PRRWP



Alternative GW-1 Details (continued)

- No Further Action (cont'd)
 - ▶ Because the groundwater is naturally of poor quality:
 - It is not and will not reasonably be used as a potable source
 - If used, site-related risks/hazards are dwarfed by naturally occurring risks/hazards (except at WARWP)
 - ▶ Cost: None directly resulting from GW-1. (Note that the soil-based actions are estimated to cost more than \$20M when complete.)



Alternative GW-2 Details

- GW Monitoring, Monitored Natural Attenuation, and Institutional Controls
 - ▶ No additional active remediation
 - ▶ Monitored natural remediation program would be designed to verify that reducing conditions in limestone bedrock effectively prevent/mitigate GW contamination
 - ▶ Groundwater use restrictions (institutional controls)
 - Would apply only to contaminated areas
 - In place as long as groundwater exceeds remedial goals (RG) (listed on Table 3 of the Proposed Plan)
 - May be difficult to implement on NASA facility



Alternative GW-2 Details (cont'd)

- Contaminant Monitoring Program
 - ▶ 29 additional wells and 4 existing wells to monitor sites and downgradient areas
 - ▶ Monitored annually as long as groundwater exceeds RGs
- Cost: \$4.3M (2012 dollars)



Alternative GW-3 Details

- ISEB/P&T for Mitigation/Protection of Limestone Bedrock GW, Monitoring, Institutional Controls
 - ▶ 4,600 ISEB injection points, delivering 1.0 million pounds of emulsified oil in 12 overburden/shale areas
 - High natural sulfate may increase costs and decrease efficiency
 - ▶ P&T in limestone unit GW underlying WARWP and PRRWP Areas
 - Until RGs are met for site-related contaminants
 - Much of effort/cost is to remove non-site-related contaminants from the effluent to meet regulations
 - The naturally occurring chemicals are expected to rebound



Alternative GW-3 Details (cont'd)

- ▶ Includes Institutional Controls and Monitoring Components of GW-2
 - Groundwater use restrictions (institutional controls)
 - Installation of additional wells
 - Monitoring for site-related contaminants
 - Would apply only to contaminated areas
 - In place as long as groundwater concentrations exceed RGs in limestone unit
- ▶ Cost: \$24.1 M (2012 dollars)



Alternative GW-4 Details

- ISEB/P&T for Mitigation/Protection of Limestone Bedrock *and Overburden/Shale* GW, Monitoring, Institutional Controls
 - ▶ 8,200 ISEB injection points, delivering 1.9 million pounds of emulsified oil in 27 overburden/shale areas
 - Until cleanup goals are met for site-related contaminants
 - High natural sulfate increases costs and decreases efficiency
 - ▶ P&T in limestone unit GW underlying WARWP and PRRWP Areas
 - Until cleanup goals are met for site-related contaminants
 - The naturally occurring chemicals are expected to rebound



Alternative GW-4 Details (cont'd)

- ▶ Includes Institutional Controls and Monitoring Components
 - Groundwater use restrictions (institutional controls)
 - Installation of additional limestone bedrock *and overburden/shale* wells
 - Monitoring for site-related contaminants
 - Would apply only to contaminated areas
 - In place as long as groundwater concentrations exceed RGs in limestone *and shale units*
 - ICs and monitoring until cleanup goals are met in limestone *and overburden/shale* units.
- ▶ Cost: \$29.6M (2012 dollars)



Alternative GW-5 Details

- Groundwater Monitoring and/or Institutional Controls
 - ▶ No active remediation
 - ▶ Monitoring Program
 - 15 new downgradient wells
 - Sampled for contaminants every 5 years for 30 years
 - Perform 5-year reviews
 - ▶ Provides additional information beyond NFA
 - Groundwater monitoring would further evaluate the potential for the migration of groundwater contamination off site
 - May add a specific legal restriction to prevent groundwater use
 - ▶ Cost: \$1.9M - \$1.4 M GM/ \$0.5 M IC (2012 dollars)



Preferred Alternative Description – Alternative GW-1

- No Further Action

- ▶ Includes source removal associated with soil-based actions for TNTA/B/C and PRRWP Area (by other projects)
- ▶ Concentrations of site-related contaminants will likely decrease over time, especially after sources are removed
- ▶ The vast majority of risk/hazard is associated with naturally occurring, non-PBOW-related chemicals
- ▶ Because the groundwater is naturally of poor quality it is not and will not reasonably be used as a potable source



Preferred Alternative Description – Alternative GW-1

- No Further Action (cont'd)
 - ▶ The overburden groundwater is of insufficient yield for use
 - ▶ The vast majority of risk/hazard is associated with naturally occurring, non-PBOW-related chemicals
 - ▶ Thus, No Further Action is protective currently and likely into the foreseeable future



Remedial Performance of Preferred Alternative

- Alternative GW-1 is protective of human health and the environment
- Complies with Applicable or Relevant and Appropriate Requirements (ARARs)
- The soil removals at TNTA/B/C and PRRWP should result in a permanent reduction of toxicity and mobility of contaminants
- Introduces no risk to the community or environment during implementation
- Is technically & administratively implementable
 - ▶ No engineering or regulatory restrictions prevent implementation
 - ▶ No amendments or equipment are required



Preferred Alternative Schedule/Costs

■ Schedule

- ▶ Alternative GW-1 requires no implementation
- ▶ The status of the soil actions, which have the side benefit of source removal actions with respect to groundwater, are as follows:
 - TNTB – complete
 - TNTC – ongoing
 - TNTA – ongoing
 - PRRWP Area – NTCRA is complete; additional action is at FS

■ Costs

- ▶ No costs are directly associated with the GW NFA
- ▶ An estimated >\$20M will be required for soil cleanup which represent GW source removal



Questions/Comments????

- Questions on Presentation
- Written Public Comments
 - ▶ All written public comments and responses will be included in the Responsiveness Summary
 - ▶ Comment Period tonight through 30 April 2012
- Mail written comments to:
 - ▶ U.S. Army Corps of Engineers, Huntington District
Attn: CELRH-PM-PP-P (Mr. Rick Meadows)
502 8th Street
Huntington, WV 25701
- Email written comments to:
 - ▶ Richard.L.Meadows@usace.army.mil
- We want to know your concerns

