



Nyanza Chemical Superfund Site

Update for Ashland Board Of Health

April 12th, 2016



Presentation Objectives

- My background:
 - Life-long Massachusetts resident (Metrowest)
 - 23 years in the environmental field
 - EPA Project Manager since 2007 (Nyanza - Sudbury River)
 - Currently manage 4 Superfund site
- EPA has a long history on this site (dating back to 1980).
- Will try my best to answer your questions.
- The goal of this meeting is just to **share information** and update the Board and residents with what we've been up to last few years.
- No agenda, no proposals



Historical Overview

- Nyanza Chemical originally operated on a 35-acre parcel located at the end of Megunko Road in Ashland.
- Nyanza operated from 1917 to 1978 manufacturing textile dyes and dye intermediates.



Historical Overview

- 1980 Superfund Legislation is enacted.
- 1983 – “Nyanza Chemical Waste Dump” added to the National Priorities List (or “NPL”).
- 1993 – Responsible Parties “cash-out” – pay 13 million



NYANZA

**Offers for WOOL—COTTON
SYNTHETIC and MIXED FIBERS
a complete line of
ANILINE and ALIZARINE COLORS**

ANTHRANOL Chrome colors for wool.
METAMINE Acid colors for wool.
MILLING FAST Neutral or weak acid dyeing colors for wool, good fastness to light and fulling.
NYAGENE Developed colors for cotton, rayon and other vegetable fibers.
NYALITE Direct colors for vegetable fibers of superior light fastness.
NYANCET Dyestuffs for acetate silk or celanese and Nylon.
NYANTHRENE Vat colors for cotton and rayon.
NYANZA Direct colors for the dyeing of vegetable fibers.
NYAPERM Direct colors for vegetable fibers which when aftertreated with Nya-Permol render shades of vat color fastness.
NYASOL Metallized colors for wool characterized by exceptional fastness properties.
NYANZOL Oxidation colors for the dyeing of fur skins.
NUTRACHROME Colors for wool applied by the Metachrome process yielding shades of excellent all-around fastness.
PARANOL FAST Direct colors for vegetable fibers of excellent light fastness.
VEGAN Union colors for the dyeing of mixed fibers of cotton or wool yielding solid shades of good fastness.

TEXTILE CHEMICALS
IMMERSOL Synthetic wetting-out and levelling agents in the dyeing of cotton and wool.
LANALBINE Protective agent in the dyeing of wool, silk and other animal fibers.
MELLOSTRINE Water-proofing compound for the treatment of cotton, rayon and other vegetable fibers.
NUTROSAN Synthetic detergents for the scouring of wool.
NYAPON Synthetic detergents of sulfonated fatty alcohols.

• call or write for technical data or information:

NYANZA Color & Chemical Company, Inc.
109 WORTH STREET • NEW YORK 13, N. Y.

FACTORIES:
CHEMICAL MANUFACTURING CO., ASHLAND, MASS. NEW BRUNSWICK CHEMICAL CO., NEWARK, N. J.

BRANCHES:
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Historical Photo Analysis

(1938, 1952, 1957, 1963, 1970, 1973, 1979, 1981)



PHOTO 2 NYANZA SEPTEMBER 5, 1952 APPROX SCALE 1:4,200



EPA Operable Units (OUs)

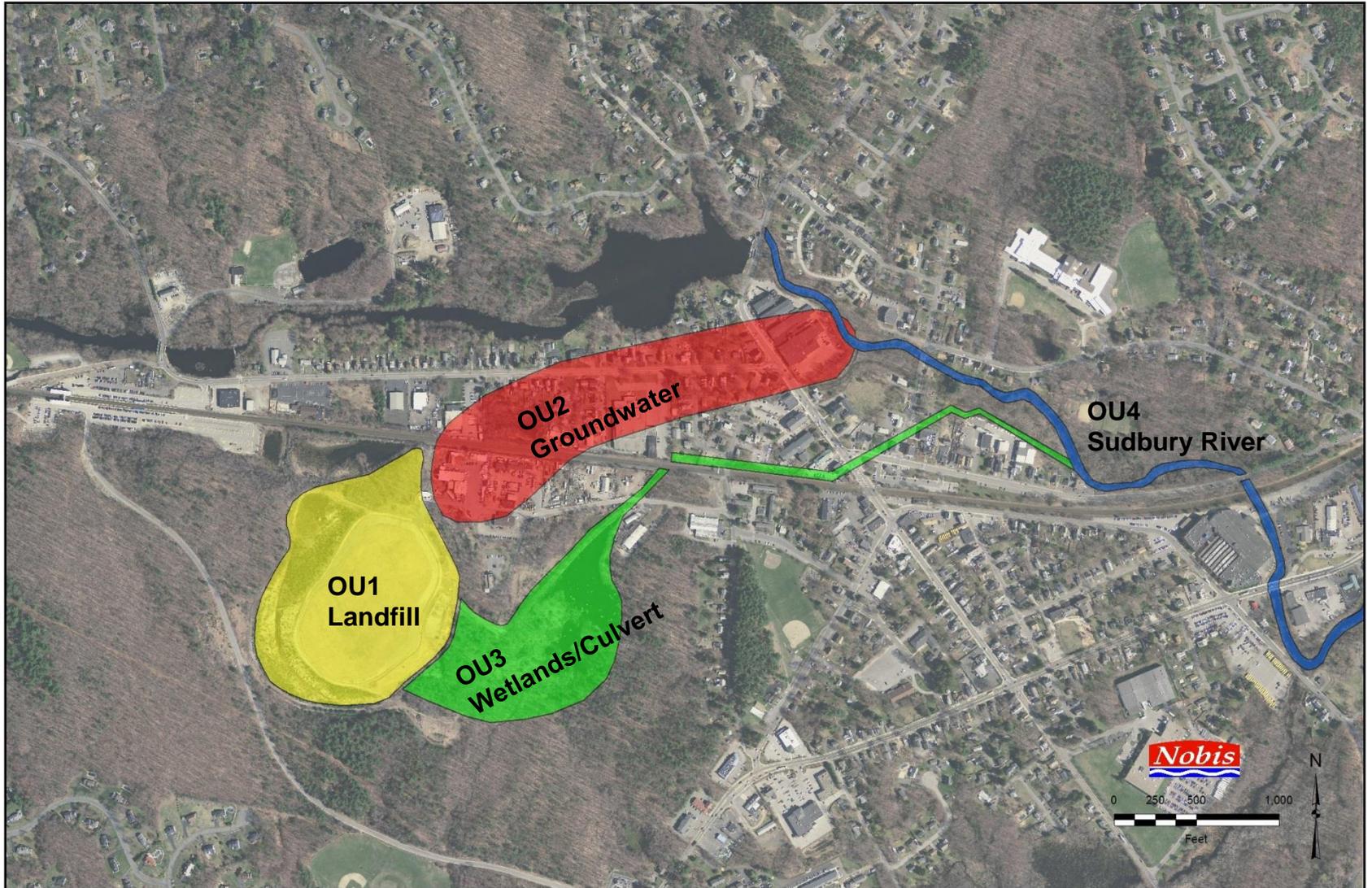
Nyanza Chemical Site currently consists of four **Operable Units** (or “OUs”):

- OU1 - On-site soil remediation/capping (**complete**)
- OU2 - Groundwater contamination/Indoor Air (on-going)
- OU3 - Eastern Wetlands/Trolley Brook (**complete**)
- OU4 – Sudbury River (on-going)

* **Complete** ≠ no continued involvement or activity

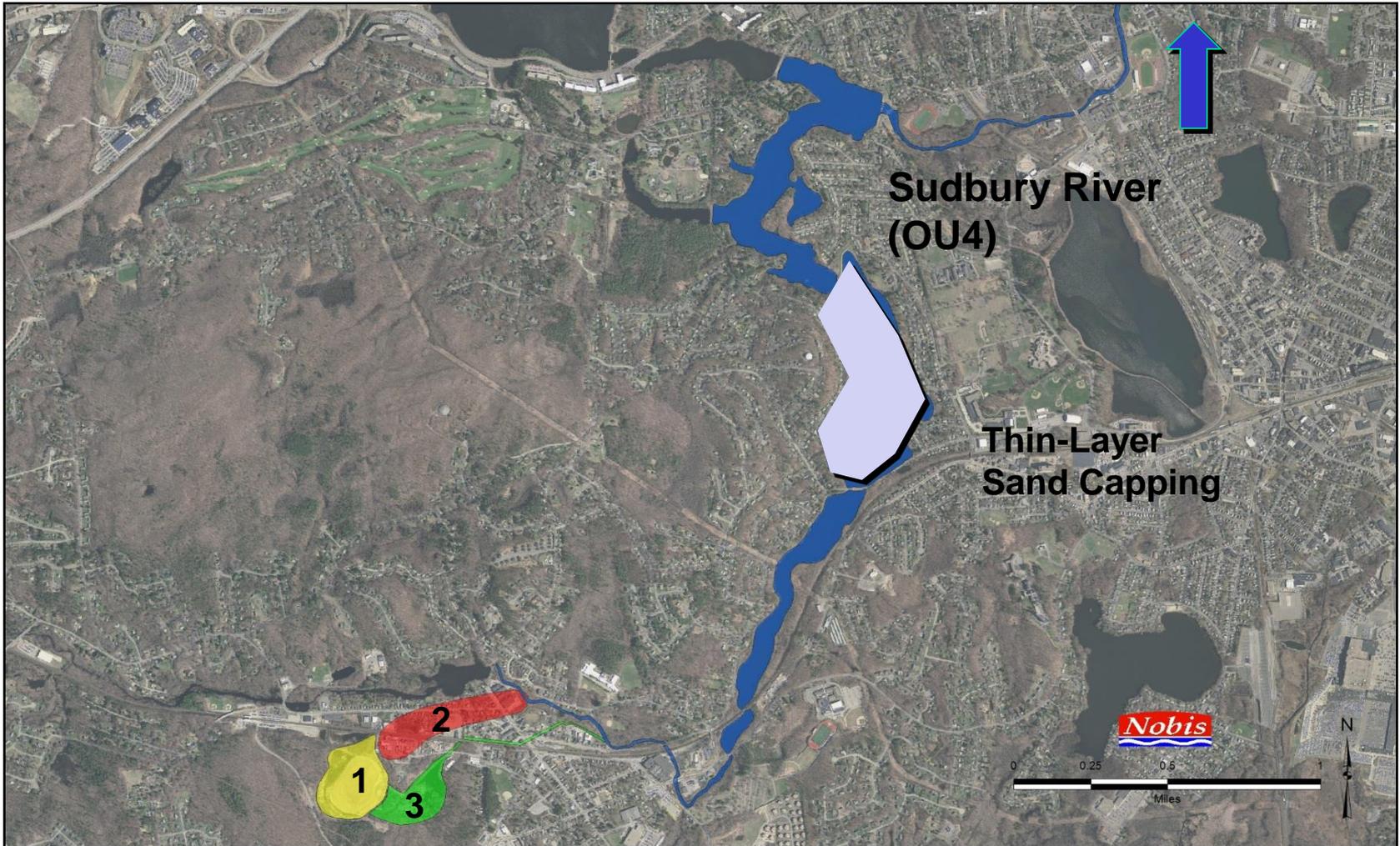


Nyanza Operable Units (OUs)



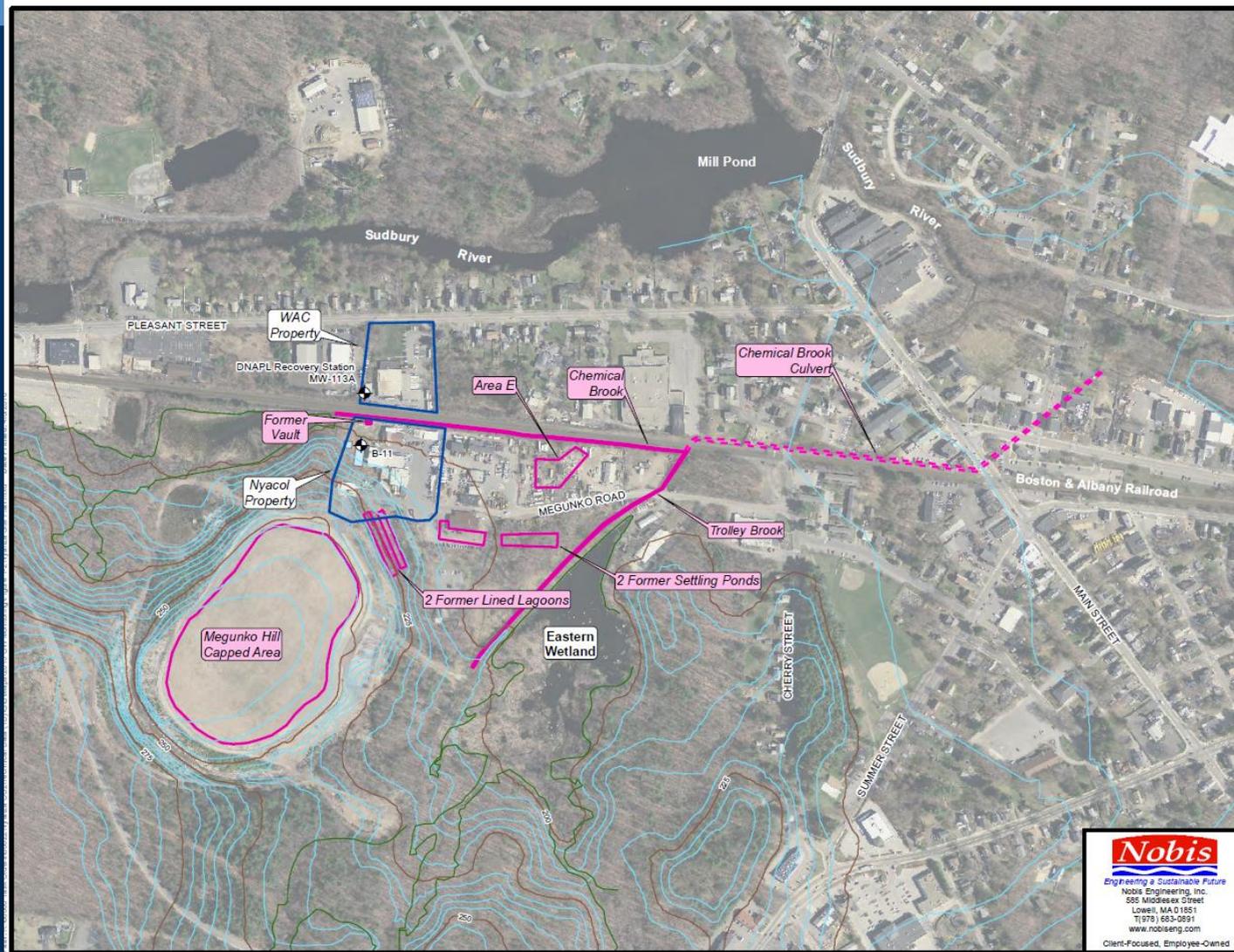


Operable Unit Map





Site Features (2016)

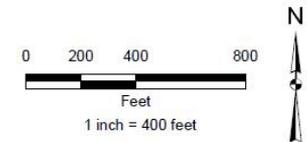


Notes:

1. This site plan was created from a site plan titled "Base Mapping and Well Survey" by A-Plus Construction, Dated September 25, 2012.
2. Contours were interpolated from 3 meter contours obtained from the MassGIS website.
3. Horizontal Datum is in reference to the North American Datum of 1983 (NAD83).
4. Vertical Datum is in reference to the North American Vertical Datum of 1988 (NAVD88).
5. Potential DNAPL Sources from Figures 2 and 4 in Shaw (2004).
6. Locations of site features depicted hereon are approximate and given for illustrative purposes only.

Legend

- ◆ DNAPL Treatment System Wells
- Wetland Delineation Line
- 25 Foot Contour
- 5 Foot Contour
- Potential DNAPL Source



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FIGURE 1-2

SITE PLAN
 NYANZA CHEMICAL WASTE DUMP
 SUPERFUND SITE - OPERABLE UNIT II
 ASHLAND, MASSACHUSETTS

PREPARED BY: JH	CHECKED BY: JV
PROJECT NO. 80022	DATE: APRIL 2016



OU1 (Cap) / OU3 (Wetlands)

- OU1 (cap) was completed in 1991
- OU3 (Eastern Wetland/culvert) completed in 2001
- Long-term “Maintenance” conducted by State (i.e., MassDEP)
 - Bi-annual inspections, samples, and (as necessary) repairs (e.g., fence, animal burrows, signage, etc..)



OU2 (Groundwater)

- 1991 – **Interim** Clean-up Decision
 - Pump and Treat System (planned operation for 5 years)
 - Monitoring
 - Land use controls/restrictions
- 1994 (Treatment System Design)
 - System never constructed due to levels of contamination (i.e., pure product or “NAPL”)



NAPL (= Industrial, Process Waste)



NAPL = Non-Aqueous
Phase Liquid





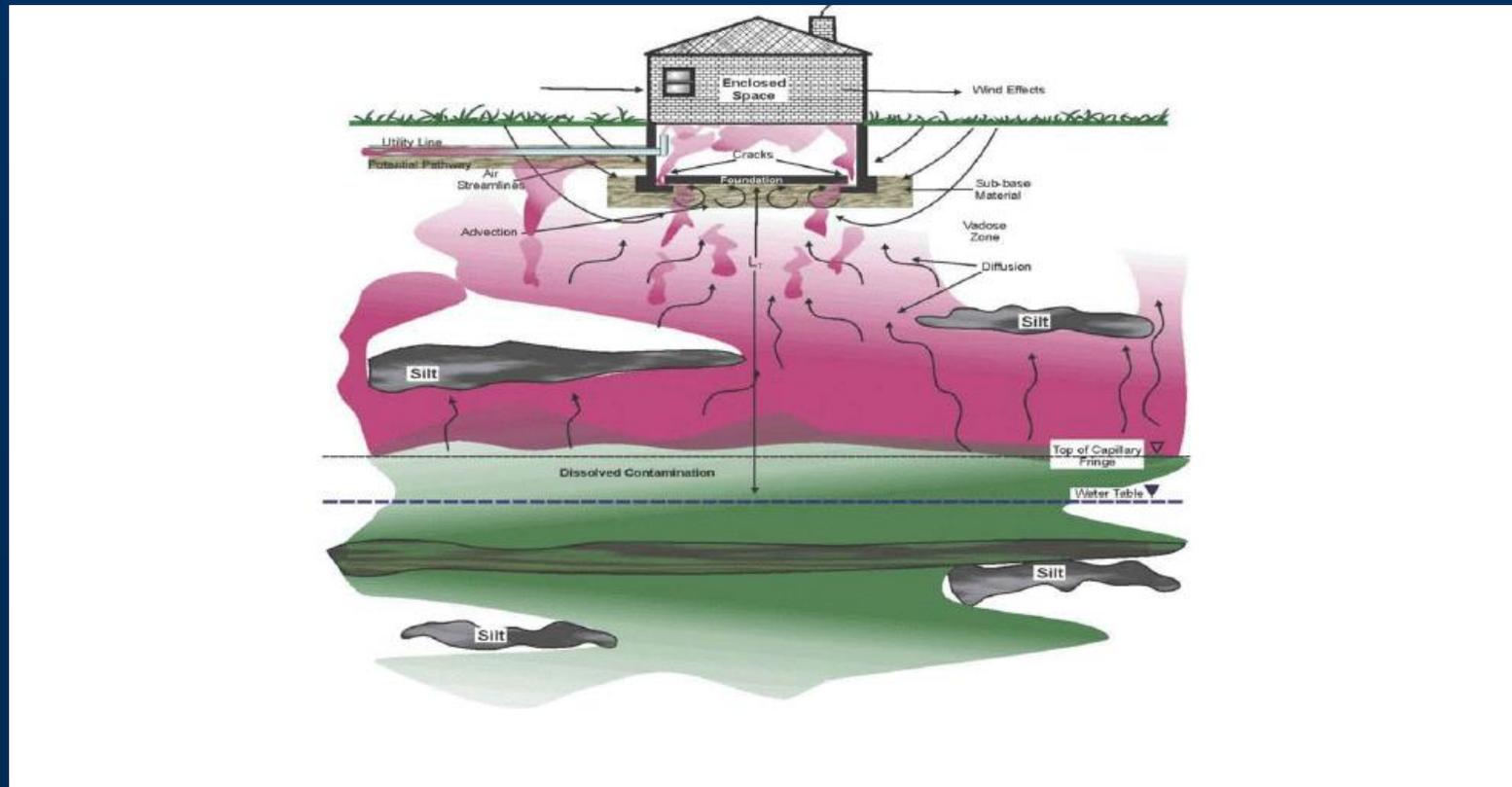
Compounds in NAPL

Chemical	Percent of Total
1,2 Dichlorobenzene	30.9%
Nitrobenzene	28.0%
1,4 Dichlorobenzene	10.6%
Chlorobenzene	10.3%
Trichloroethene (TCE)	3.5% (35,000 ppm)
1,3 Dichlorobenzene	2.8%
1,2,4 Trichlorobenzene	2.4%
Petroleum hydrocarbons	11.5%



What is Vapor Intrusion (VI)

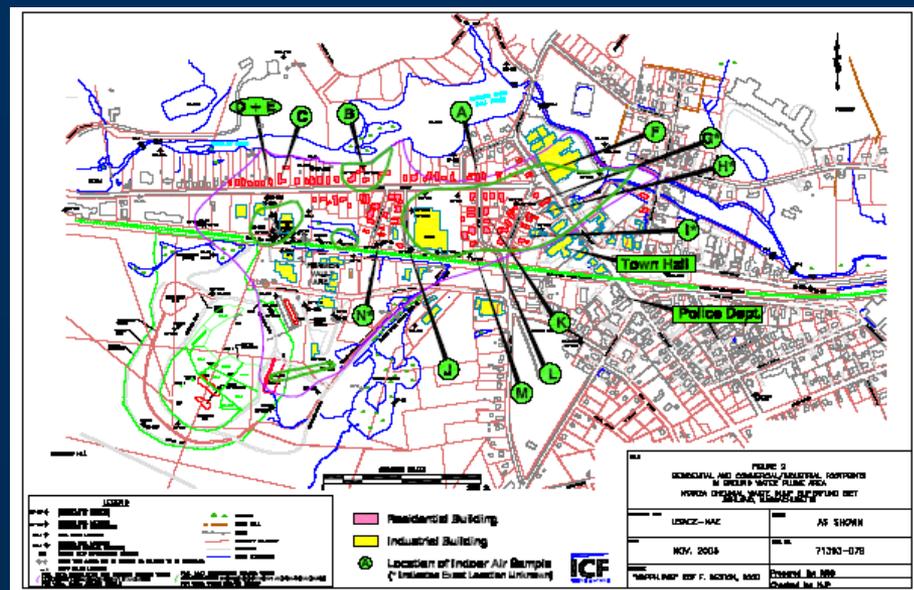
The migration of volatile chemicals (such as **TCE**) from the subsurface into overlying buildings.





Vapor Intrusion (VI) Studies

- 1990, 1998, 2004
 - Conducted Indoor air monitoring
 - Compounds such as **TCE** have:
 - High vapor pressure
 - Low toxicity values
 - Can breakdown into other toxic volatiles





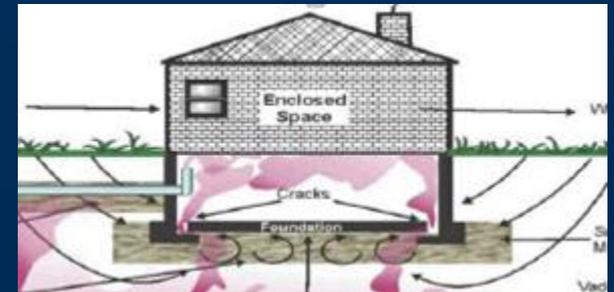
Explanation of Significant Difference (ESD)

- ESD used to modified the Interim GW Remedy
- ESD signed (2006) calls for:
 1. Installing Vapor Mitigation system
 2. DNAPL Recovery Systems (up to 20) to recover NAPL
 3. Supplemental VI Evaluation(s), as needed
 4. Groundwater Monitoring Program

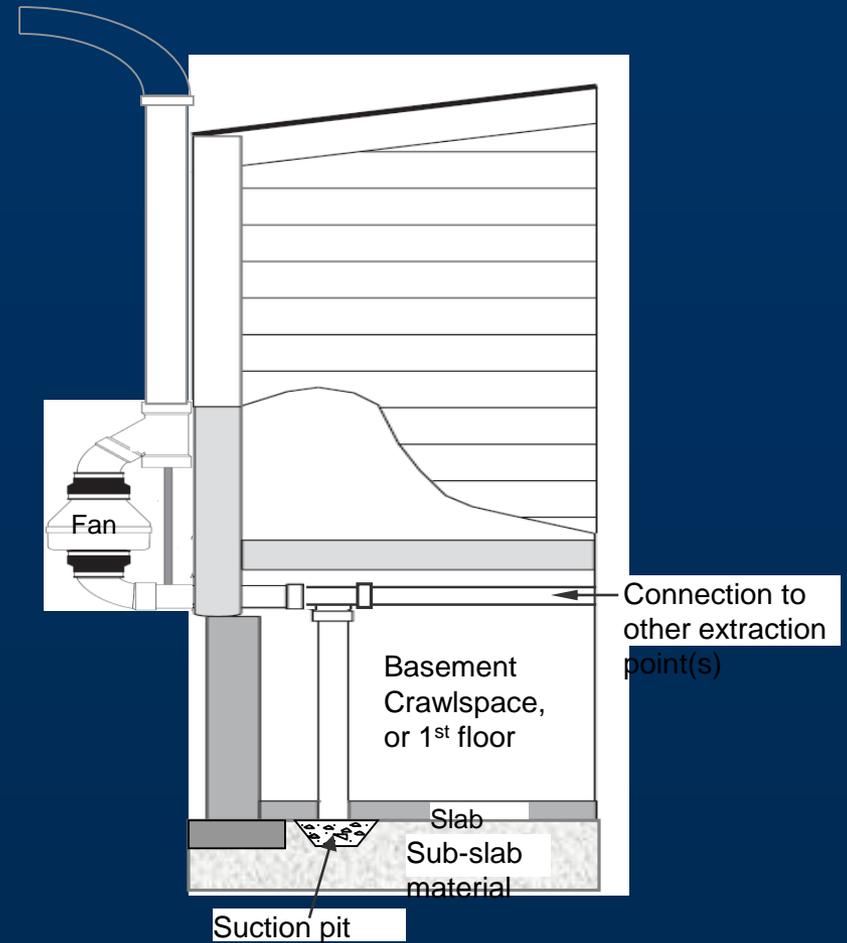
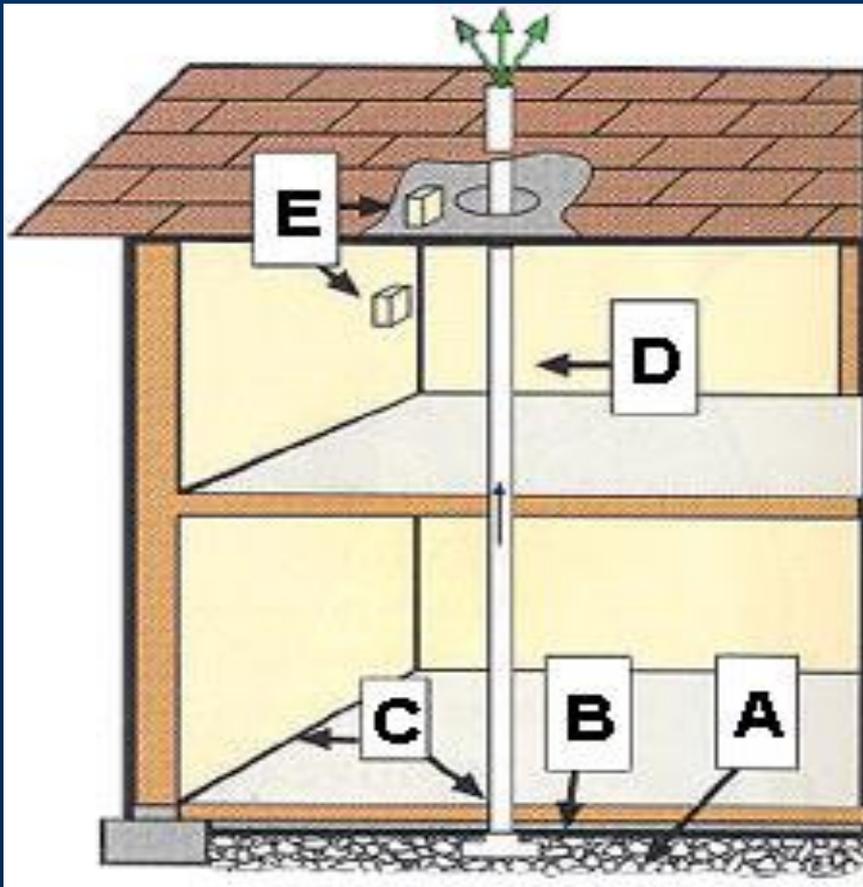


1. Vapor Mitigation Systems

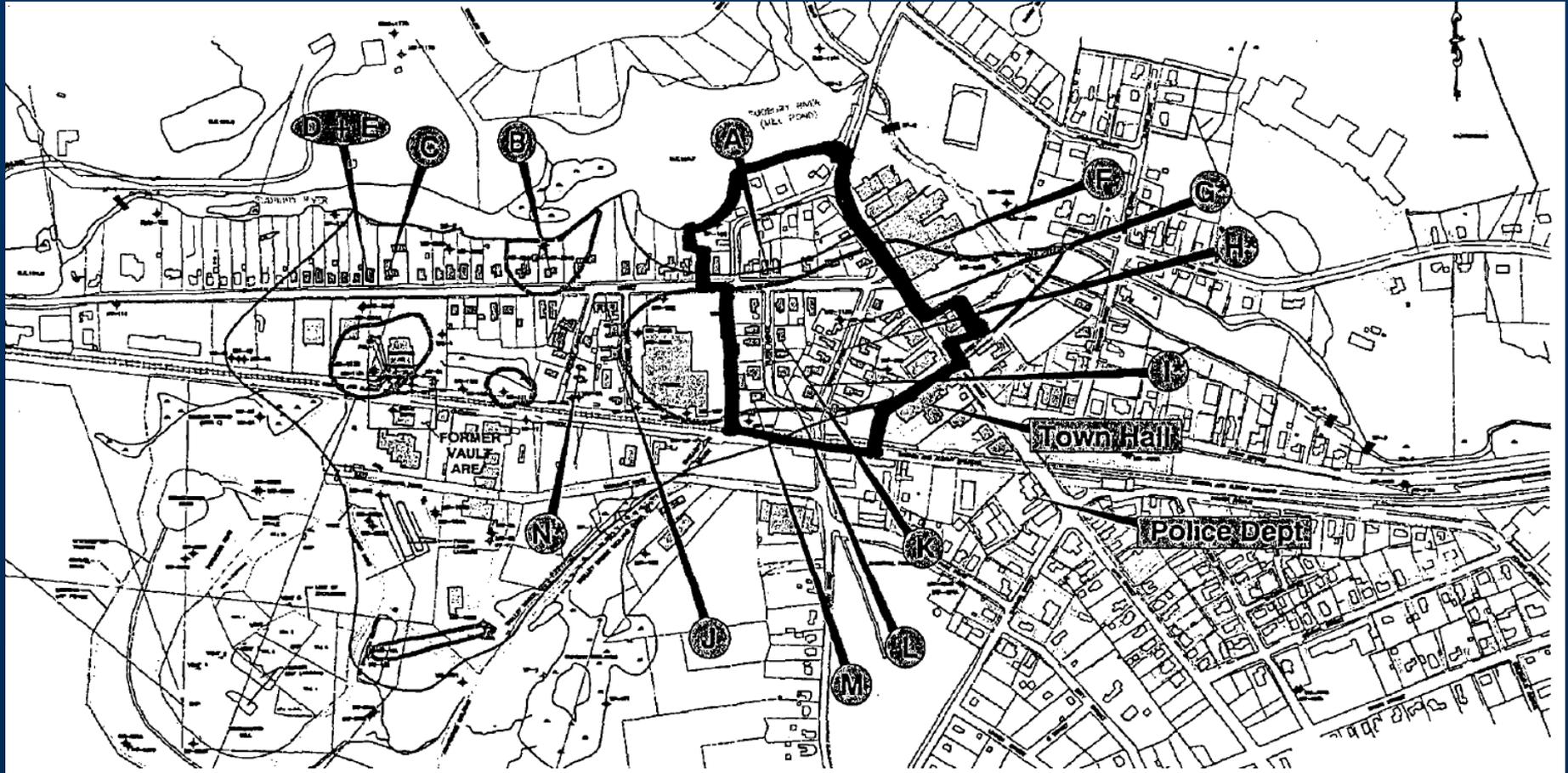
- 41 systems installed in 2007
- Nearly identical to a Radon system
- Prevents vapors from entering indoors by reducing the pressure below structure
- Post-construction, MassDEP:
 - performs annual inspection
 - conduct maintenance
 - make repairs



1. Vapor Mitigation System



1. Vapor Mitigation Systems





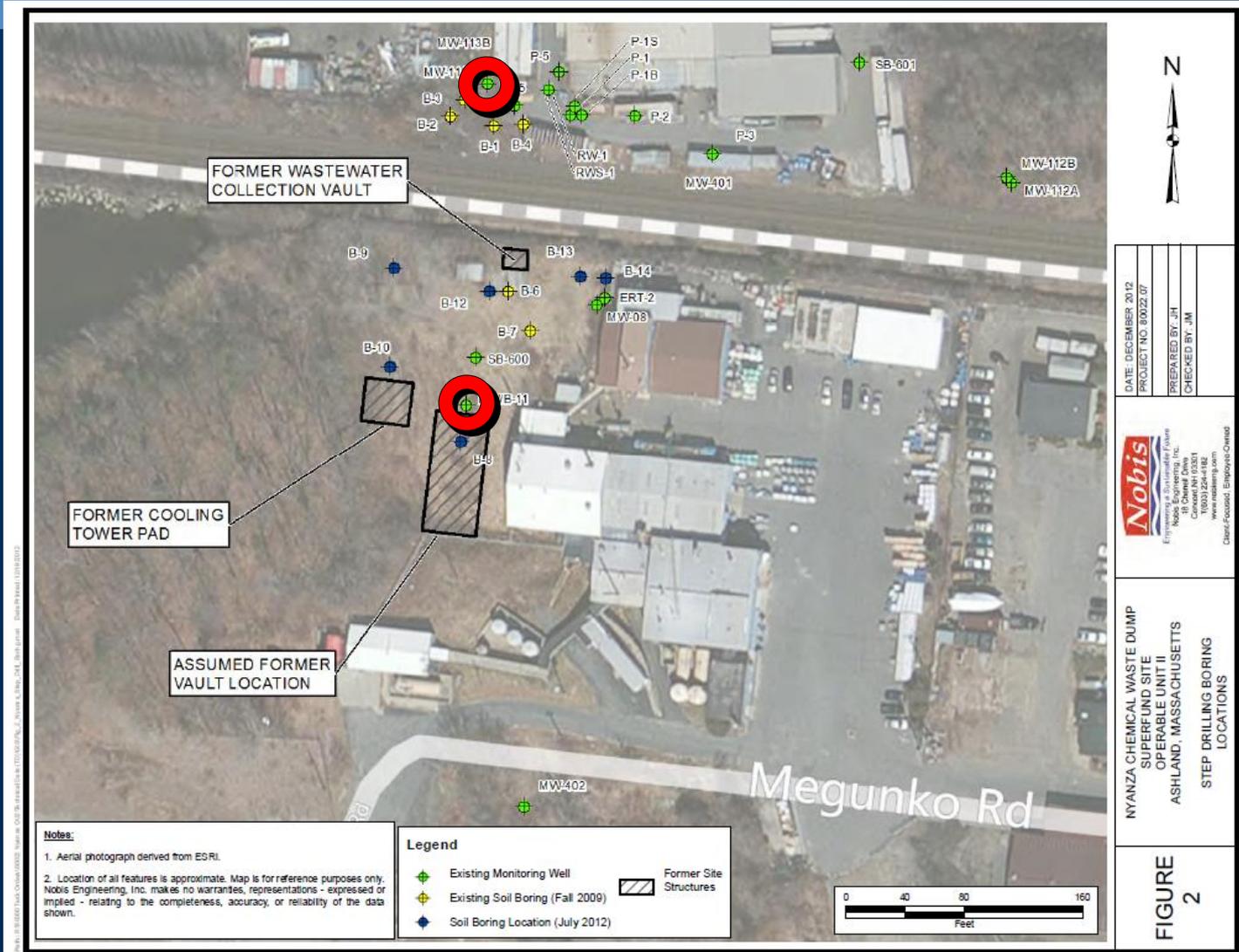
2. NAPL Extraction Systems

- Conduct multiple drilling programs to located NAPL (2009, 2012)
- Borings advanced 15' into bedrock
- NAPL no longer easily identified/located
- Identify two (2) locations with recoverable NAPL





2. NAPL Extraction Systems



DATE: DECEMBER 2012
PROJECT NO: 80022 07
PREPARED BY: JH
CHECKED BY: JM

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**NYANZA CHEMICAL WASTE DUMP
 SUPERFUND SITE
 OPERABLE UNIT II
 ASHLAND, MASSACHUSETTS
 STEP DRILLING BORING
 LOCATIONS**

**FIGURE
 2**



2. NAPL Extraction Systems

- Two (2) extraction systems constructed
 - Soil boring BW-11 (Nyacol property near vault)
 - MW-113 (Worcester Air Conditioning)
- Operational since September 2013
- NAPL (i.e., “product”) accumulates and a pump runs ~1x per day to transfer material to enclosed storage tank.



2. NAPL Extraction Systems



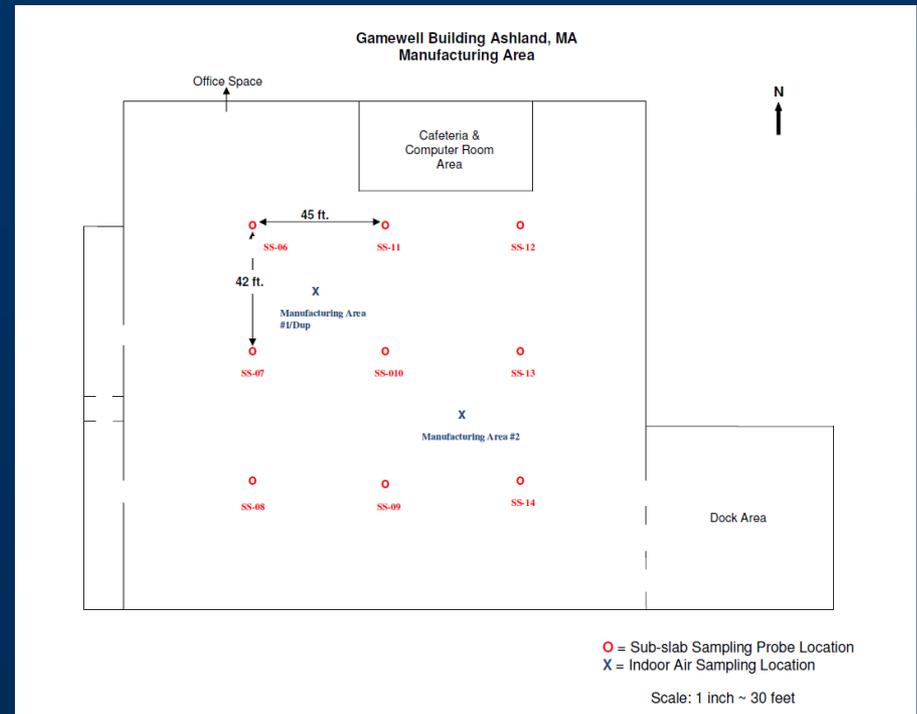


3. Supplemental VI Assessments

- EPA conducted indoor assessments at:
 - 48 Cherry Street (2013)
 - 60 Pleasant Street (2014/2015)
 - 148 Pleasant Street (2015)
- Installed sub slab soil gas probes
 - Collected 8/24 hour time-weighted samples
- Commercial properties use different exposure assumptions
- Complete Pathway? (GW → Soil Gas → Indoor Air)



3. Supplemental VI Assessments



No new mitigation systems required.



4. Groundwater Monitoring

- Conduct a comprehensive (site-wide) monitoring program
- Samples collected 2x per year for 4 years
 - From 2012 -2015
 - Evaluate changes in dissolved-phase plume
- Natural Processes in GW:
 - Dilution
 - Migration
 - Break-down (attenuate)
- Draft Report available on website



4. Groundwater Monitoring

- Monitoring the Dissolved-phase plume
 - This is different than NAPL
- Physical properties of contaminants
 - Density (sink or float)
 - Solubility (movement with groundwater)
 - Toxicity (varies significantly)
- Shallow groundwater (i.e., overburden) versus Bedrock layers

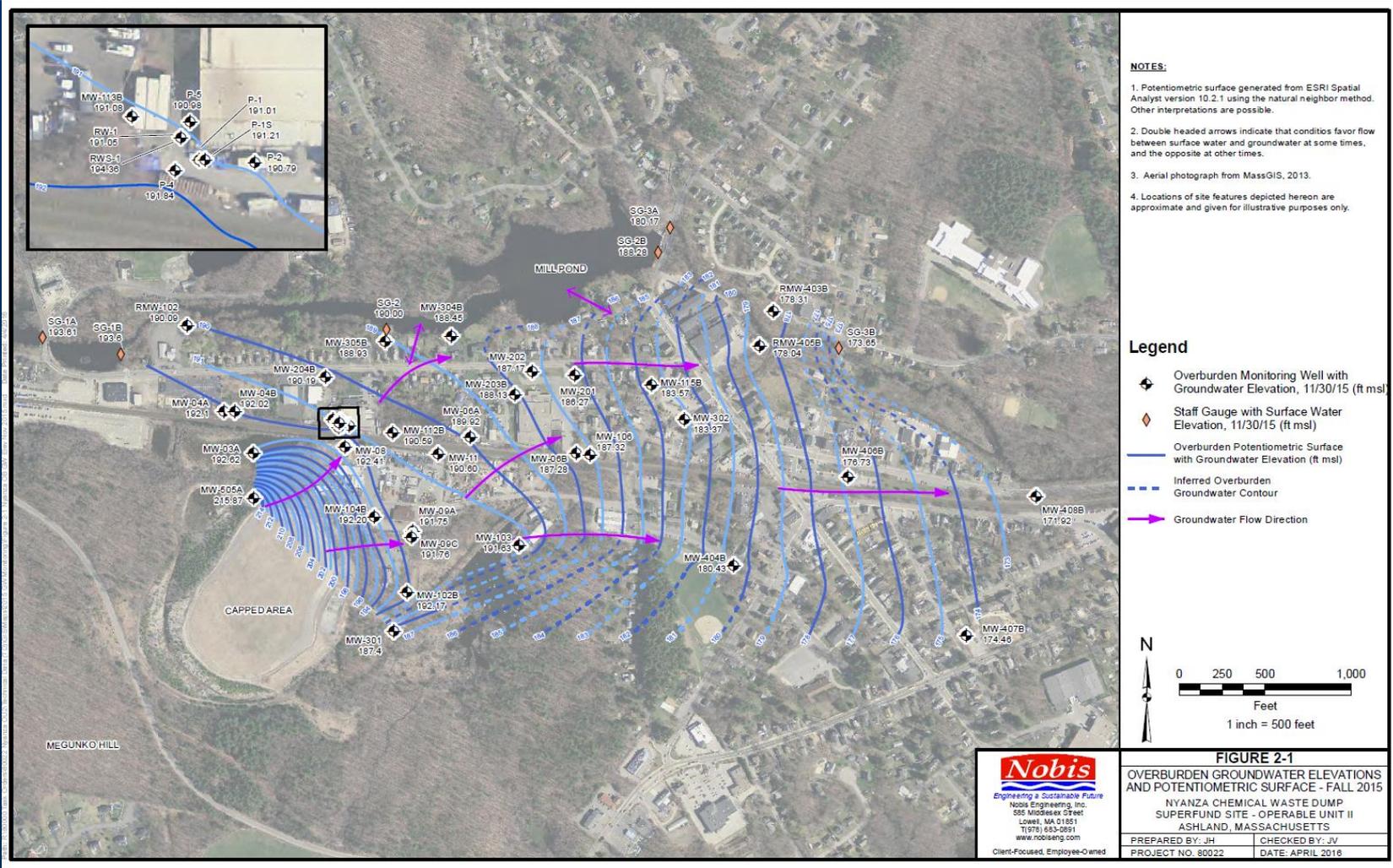


4. Groundwater Monitoring

- Contamination in Bedrock present many unique challenges:
 - Bedrock fractures (degree and orientation)
 - Difficult to characterize
 - Difficult to remediate
 - Different **Level of Risk (typically no VI)**

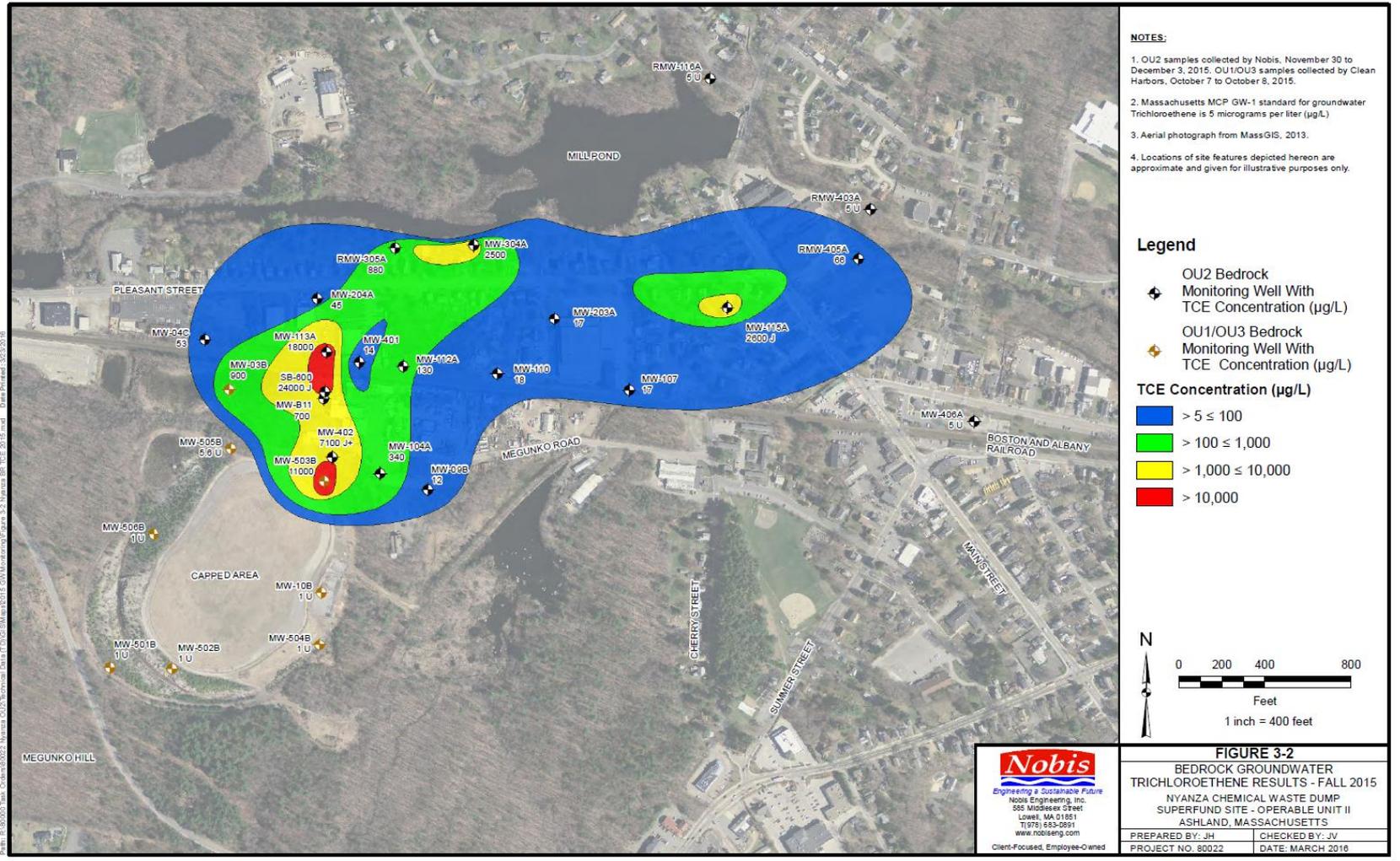


Figures from Groundwater Report

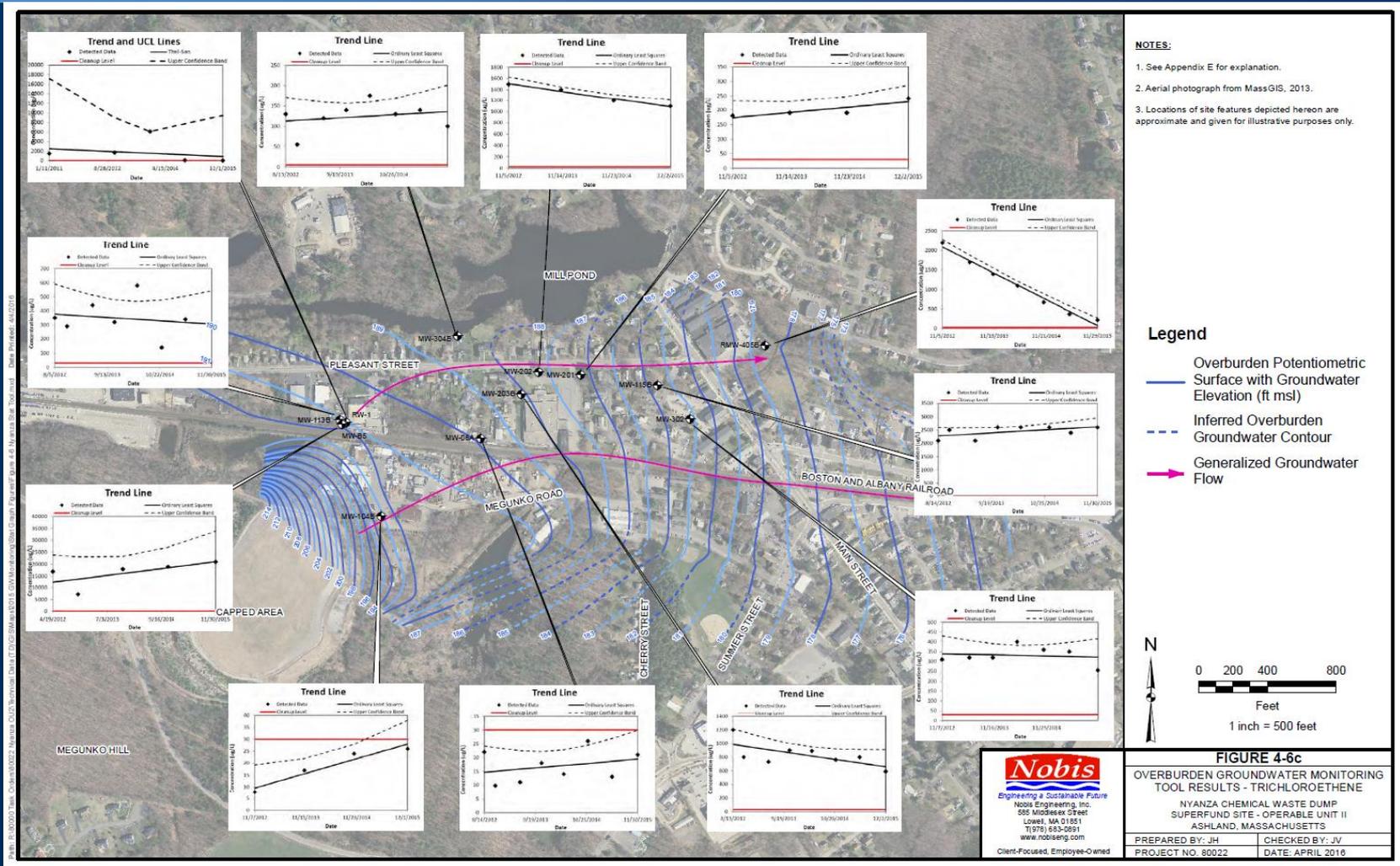




Figures from Groundwater Report

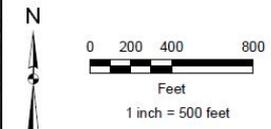


TCE Trends in Shallow Groundwater



- NOTES:**
1. See Appendix E for explanation.
 2. Aerial photograph from MassGIS, 2013.
 3. Locations of site features depicted hereon are approximate and given for illustrative purposes only.

- Legend**
- Overburden Potentiometric Surface with Groundwater Elevation (ft msl)
 - Inferred Overburden Groundwater Contour
 - Generalized Groundwater Flow



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FIGURE 4-6c
 OVERBURDEN GROUNDWATER MONITORING TOOL RESULTS - TRICHLOROETHENE
 NYANZA CHEMICAL WASTE DUMP SUPERFUND SITE - OPERABLE UNIT II
 ASHLAND, MASSACHUSETTS

PREPARED BY: JH	CHECKED BY: JV
PROJECT NO. 80022	DATE: APRIL 2016



Groundwater (OU2) Summary

- Indoor air risks are being mitigated with existing VI systems
- EPA continues to evaluate need for additional Vapor mitigations Systems
- Currently operating 2 Wellhead Extraction system
- Plume appears “stable” - with little change over 4 years studied.

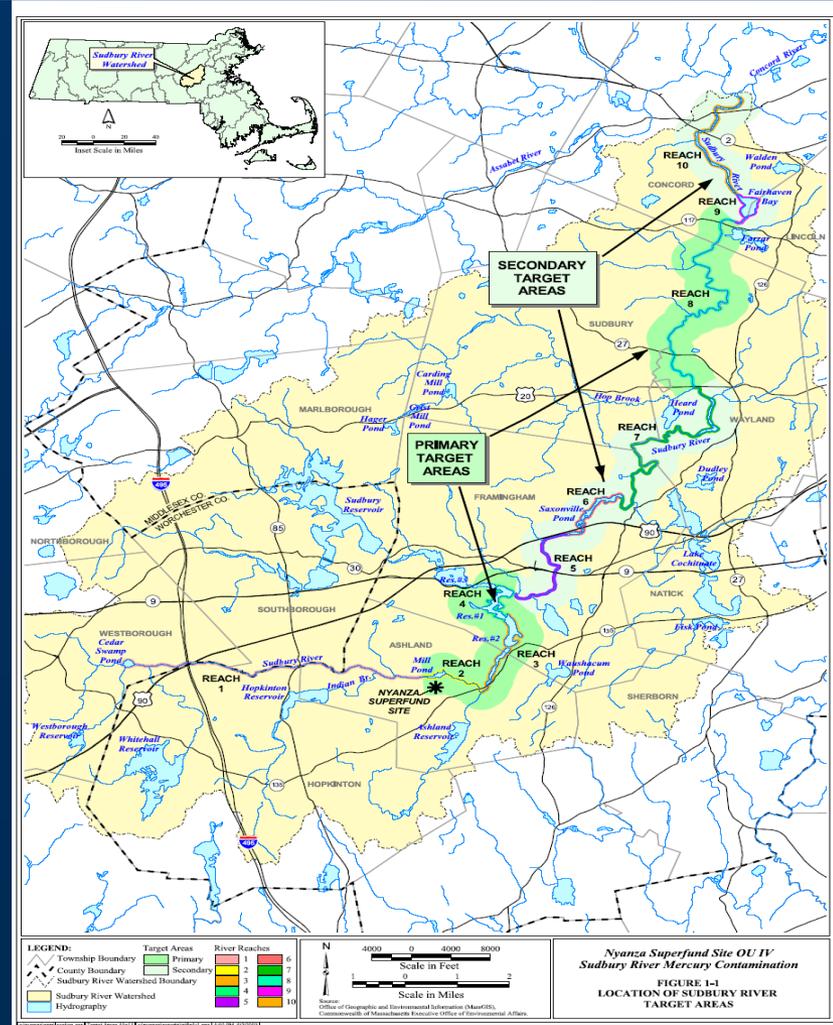
- Final Remedy decision is still needed.



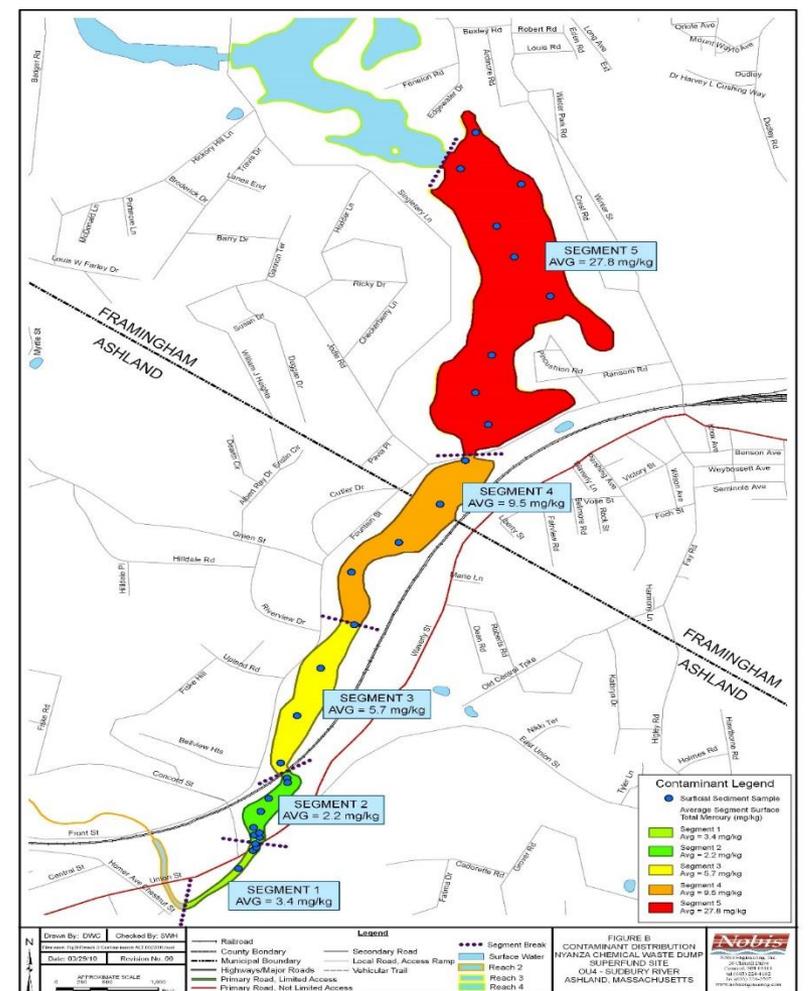
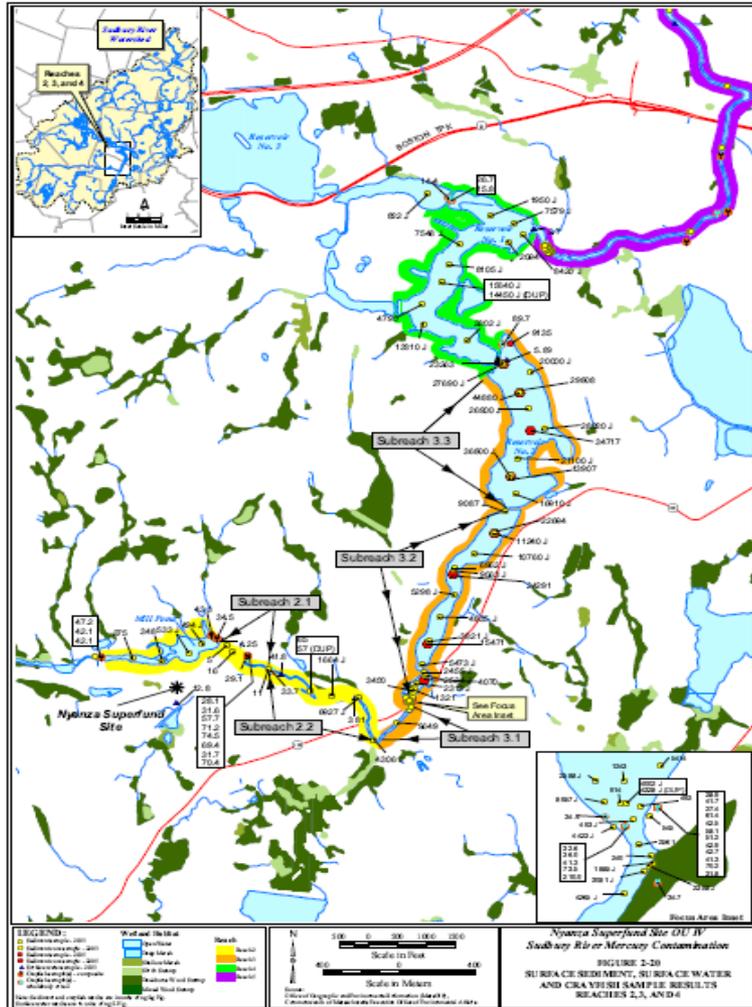
Break - Questions on Groundwater (OU2)?

Sudbury River (OU4)

- 26 downstream river miles;
- Divided into 10 segments;
- Operable Unit was “created” in 1993 due to additional characterization and special consideration;
- Multi-agency contributions
- Many, many samples collected (sw, sed, fish, birds (blood, egg, feather), crayfish, mink



OU4 - Mercury Distribution





Ecological Assessment Update

- Ecological Risk Assessment (December 2008)
- *229 Measurement Endpoints* –
 - combination of food chain modeling results and site-specific/species-specific measurements
 - More weight given to actual measurements
- Conclusion: **No population-level ecological risk***



Human Health Assessment

- Multiple Human Health Risk Assessments (1992, 1999, 2006)
 - Mercury the only chemical of concern
 - No adverse health effects from contact or ingestion of **Surface Water** or **Sediment**
 - Health effects attributable to consumption of **mercury-contaminated fish**



Human Health Risks from Fish Consumption

Reach	Recreational Angler	
	Child	Adult
Reach 2 -	1.8	
Reach 3 – Res 2	2.1	1.2
Reach 4 – Res 1	1.3	
Reach 5		
Reach 6 - Saxonville	1.3	
Reach 7		
Reach 7 – Heard Pond		
Reach 8 – Great Meadows	1.3	
Reach 9	1.5	
Reach 10	1.4	

Mercury – Not a carcinogen. Evaluate the risk of adverse health effects.



OU4 – Sudbury River Remedy

- Remedy selected in 2010 after multiple informational meetings and public hearing.
- Combination remedy :
 1. Education/Outreach
 2. Long-term Monitoring (every ~10 years)
 3. Thin-Layer Sand Capping (portion of Res. 2)





OU4 – Remedial Design

- First step after Remedy Selection
- RD completed in May 2013
 - Contains plans and specification for constructing thin-layer sand cap
- While awaiting construction funding (2014) conducted baseline fish sampling
 - Prior estimate of risk based on fish caught in 2003
 - Baseline samples typically used to determine remedy effectiveness (before/after construction)



Reach	Recreational Angler (2003)		Recreational Angler (2014)	
	Child	Adult	Child	Adult
Reach 2 -	1.8			
Reach 3 – Res 2	2.1	1.2	1.6	0.8
Reach 4 – Res 1	1.3			
Reach 5				
Reach 6 - Saxonville	1.3			
Reach 7				
Reach 7 – Heard Pond				
Reach 8 – Great Meadows	1.3			
Reach 9	1.5			
Reach 10	1.4			

Update Risk Estimates for other Reaches – Summer 2016

Reach 3 Trend Analysis

Figure 1.1: Whole body total Hg in 3- and 4-year old (or age-equivalent) largemouth bass collected from reach 3 (Reservoir 2) in the Sudbury River

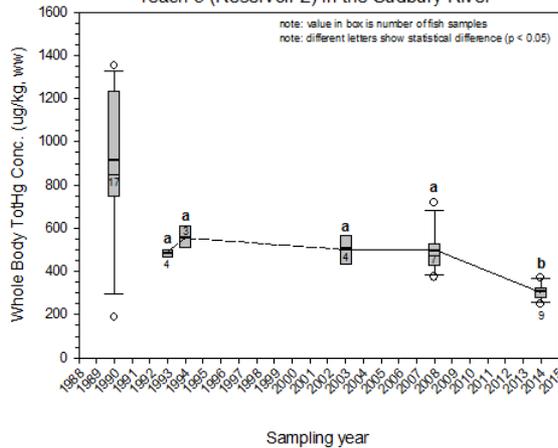


Figure 1.2: Whole body total Hg in 3- to 5-year old (or age-equivalent) largemouth bass collected from reach 3 (Reservoir 2) in the Sudbury River

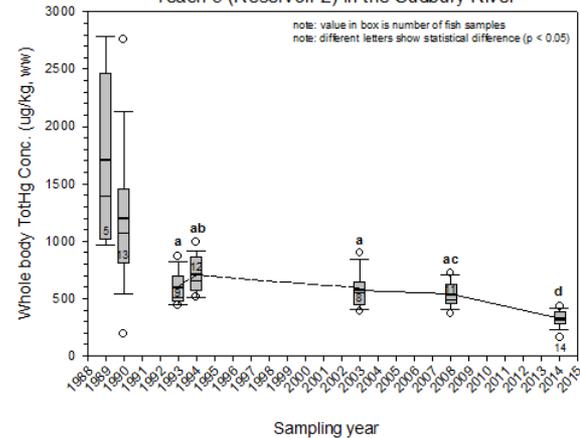


Figure 1.3: Whole body total Hg in 5- to 7-year old (or age-equivalent) largemouth bass collected from reach 3 (Reservoir 2) in the Sudbury River

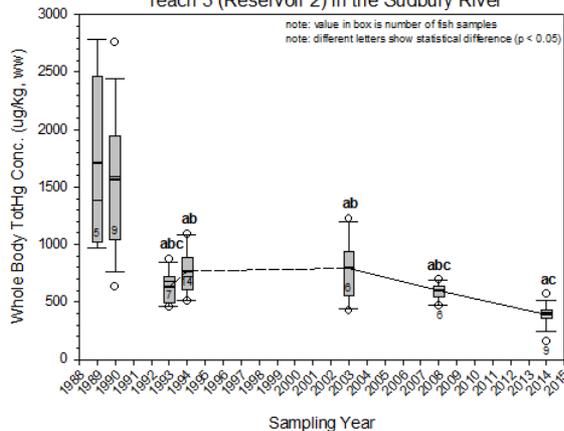
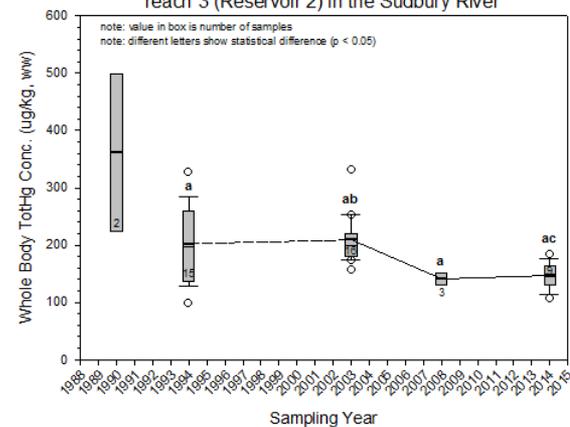


Figure 1.4: Whole body total Hg in 1- to 3-year old (or age-equivalent) yellow perch collected from reach 3 (Reservoir 2) in the Sudbury River



OU4 – Education/Outreach



Warning sign inspection annually since 2009.

Contact each town prior to inspection to solicit new locations (if any).

Send updated maps annually.



QUESTIONS