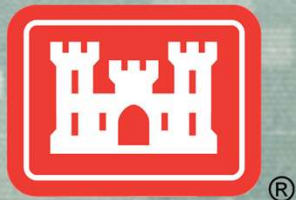


Luckey Project Site

Formerly Utilized Sites Remedial Action Program (FUSRAP)

Beryllium Health and Safety Committee
Fall 2017 Meeting
Las Vegas, NV

Michael W. Polek
USACE Buffalo District



US Army Corps of Engineers
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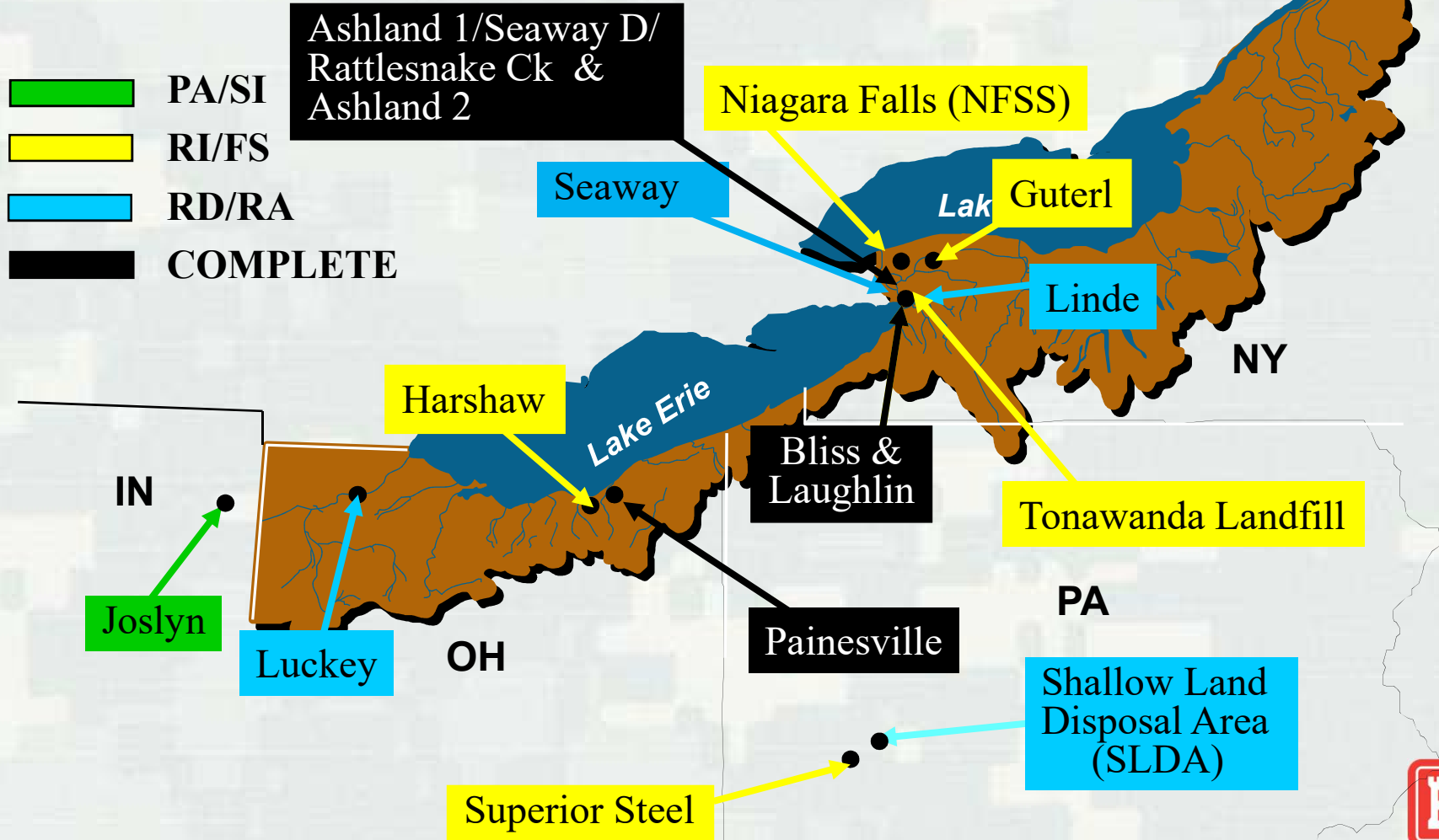
Presentation Overview

- Site/Project History
- Nature and Extent of Contamination
 - Groundwater
 - Soil
 - (buildings)
- Challenges / Technologies being Implemented
- Current Issues



FUSRAP Overview

Great Lakes and Ohio River Division

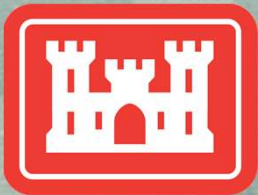


FUSRAP Investigation History at Luckey Site

1992	DOE designates Luckey Site into FUSRAP
1997	USACE becomes lead agency for Luckey Site
2000	Remedial Investigation Report
2003	Feasibility Study & Proposed Plan
2006	Record of Decision for Soils Operable Unit
2008	Record of Decision for Groundwater Operable Unit
2011	Volume Uncertainty Reduction Investigation Report
2000 to Date	Annual groundwater sampling
2016-2017	Remediation Contract Award and Mobilization



Beryllium Safety Team (BeST)



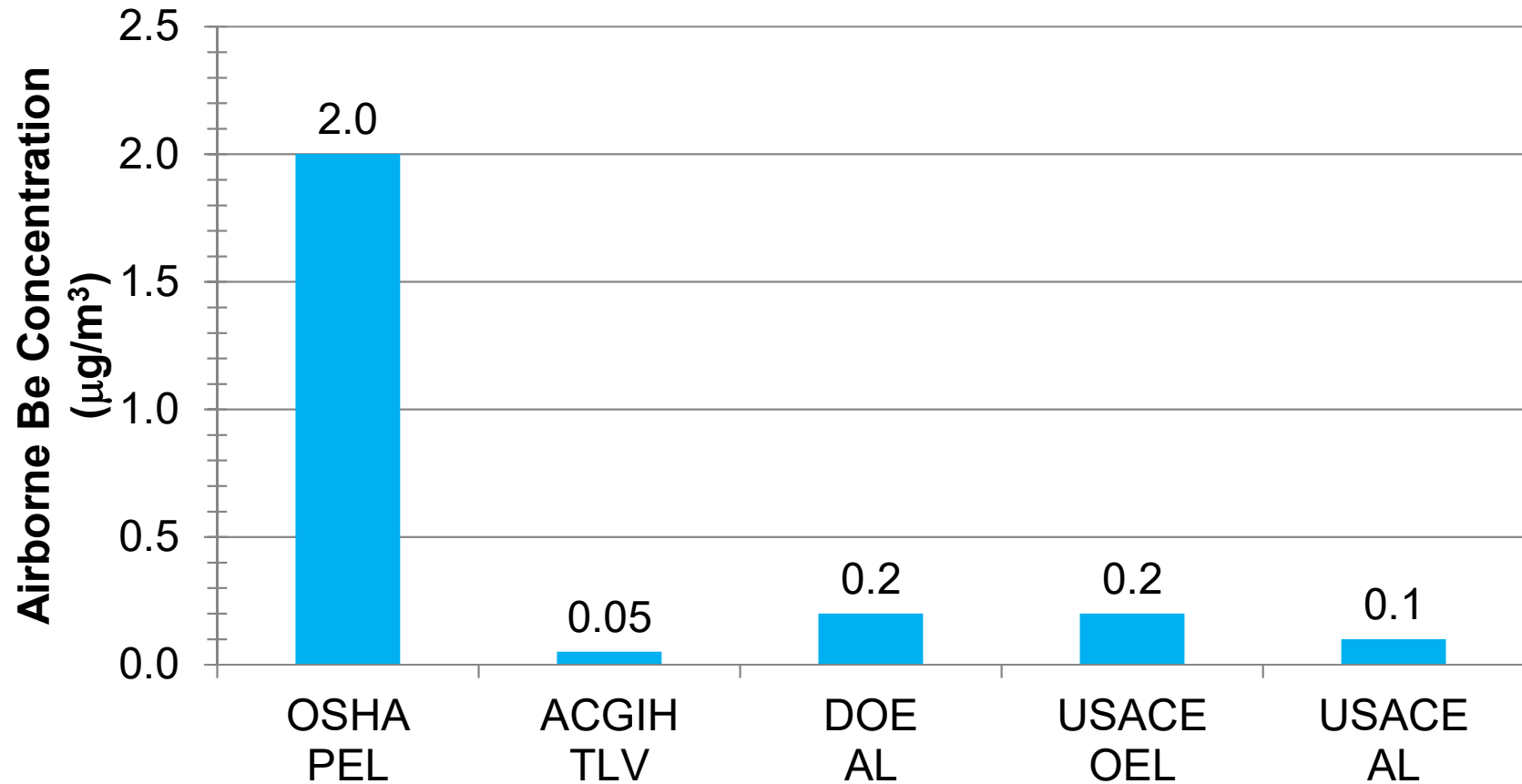
US Army Corps of Engineers
Buffalo District
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Develop CBDPP

- Applies to all USACE Buffalo District beryllium projects
- Covers USACE Buffalo District employees
- Overarching requirements for beryllium protection
 - ▶ Exposure monitoring, exposure minimization practices, work permits and postings, medical surveillance and removal, training requirements
- Implementation through Site Safety and Health Plans for individual projects
 - ▶ Site and activity-specific exposure and hazard assessments
 - ▶ Define engineering and administrative controls and PPE for USACE site activities



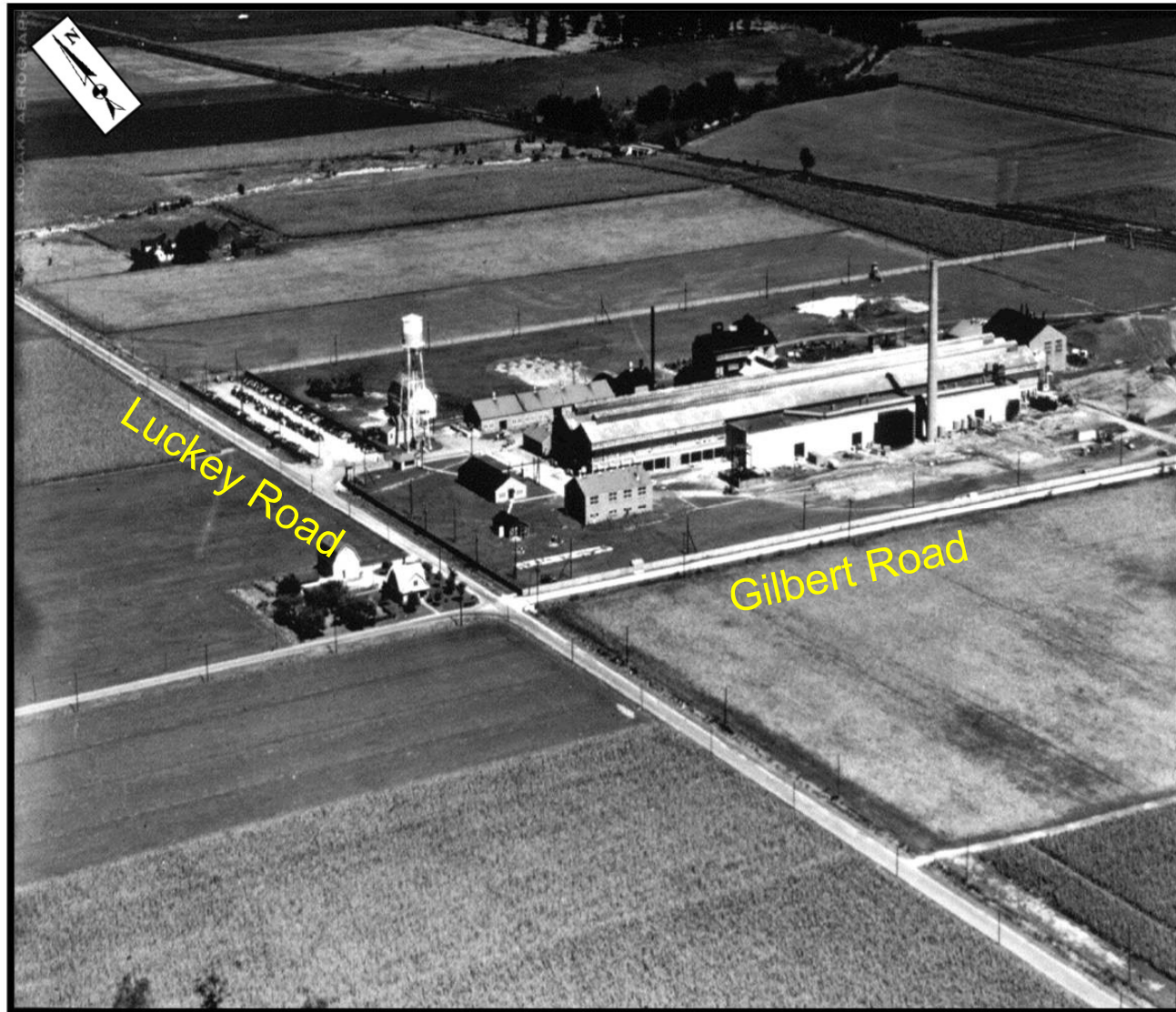
Exposure Limits at That Time



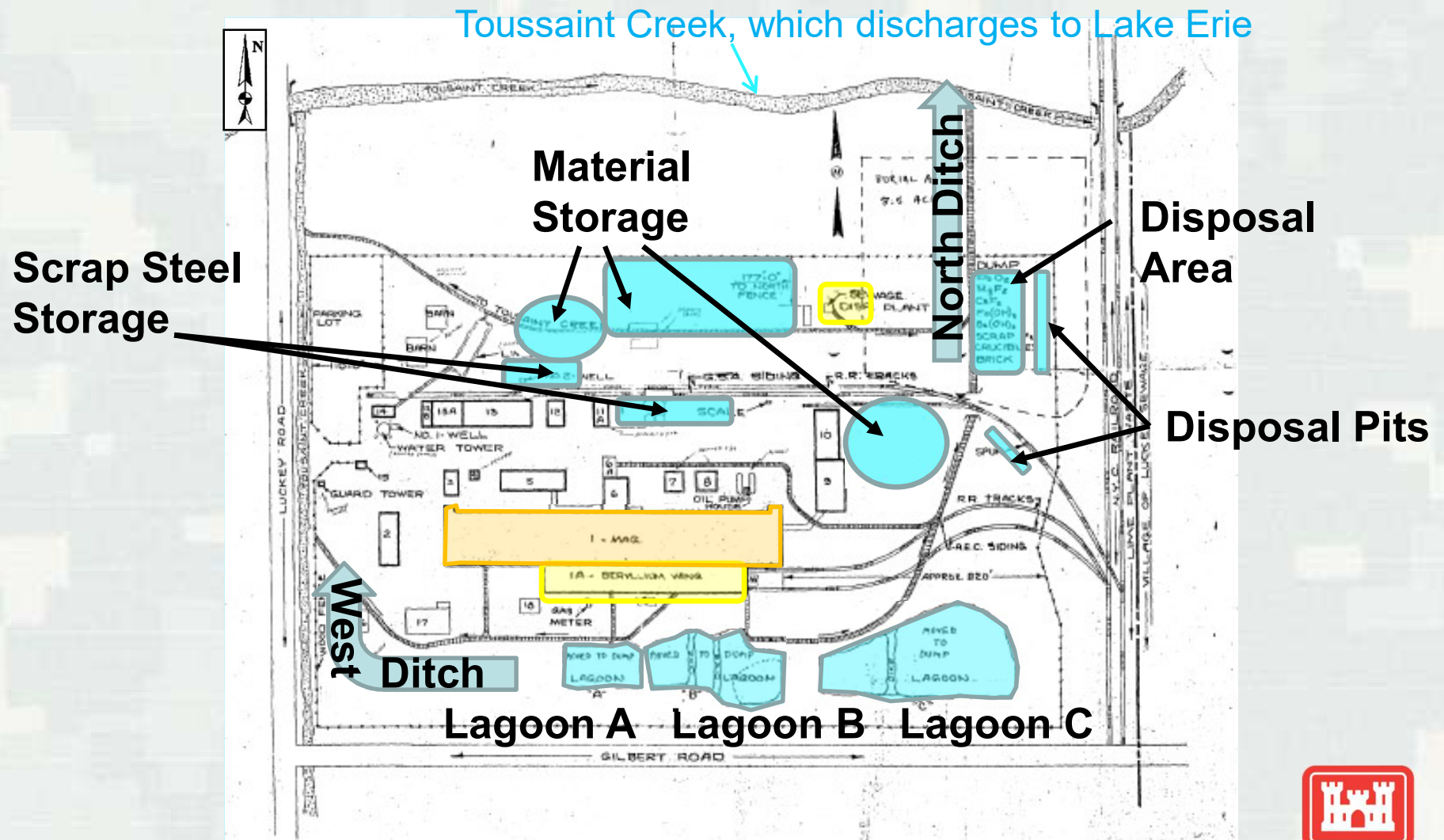
* Limits are all based on 8-hour time weighted average concentration



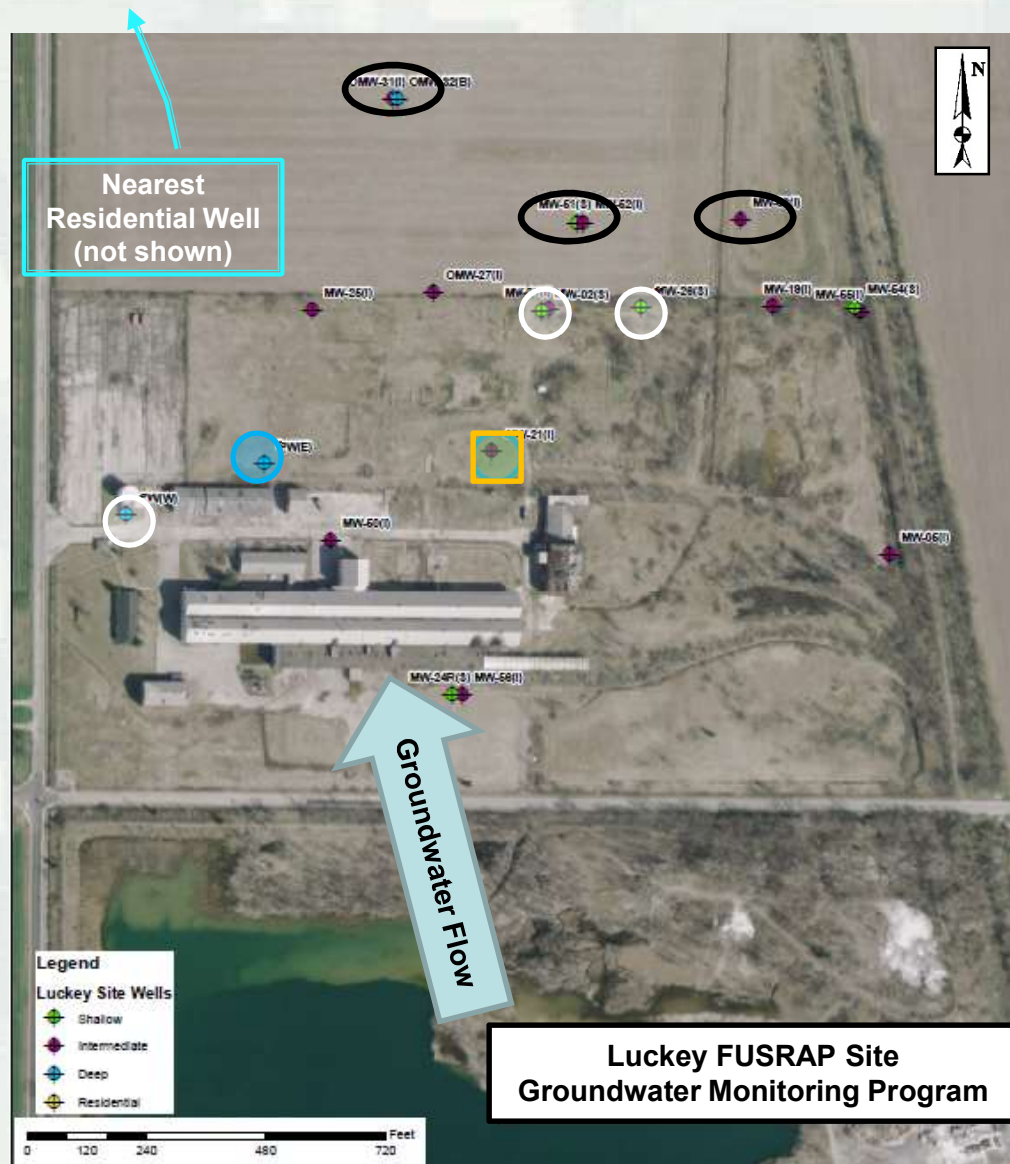
Luckey Site circa 1950's



Luckey Site Drawing – 1956



Groundwater Monitoring



- Annual Sampling Program
- 17 to 21 Wells
- Three water bearing zones
- Beryllium, uranium, and lead
- Geochemical analytes
- Verifies minimal transport
- Current conditions protective of groundwater resources
- Groundwater remedy relies on soil Remedial Action



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Summary Statistics for Groundwater Contaminants

Parameter	Detection Frequency	Minimum Value	Minimum Location #	Maximum Value	Maximum Location #	Average Value	Background	Background Exceed	MCL ***	MCL Exceed	MCL Exceed / Total Samples (%)	Units
Beryllium	73/291	0.15 B	MW-25(I)	170	MW-26(S)	4.72	0.79	51/73	4	39/73	13.4	µg/L
Beryllium (Filtered)	46/257	0.17 B	MW-24(S)	137	MW-26(S)	3.53	--	46/46	4	21/42	8.2	µg/L
Lead	123/282	1.4 B	MW-19(I)	48.5	MW-21(I)	4.53	7.2	33/123	15	15/123	5.3	µg/L
Lead (Filtered)	86/257	1.5 B	MW-14(S)	46.2	MW-21(I)	3.67	1.8	74/86	15	10/86	3.9	µg/L
Uranium, total *	245/291	0.11	MW-39(B)	389.86	MW-24(S)	11.48	4.23 **	71/245	30	13/245	4.5	µg/L

NOTES:

* Where total uranium values were absent, total uranium values were calculated by using the equation (U-238 value x 2.046/0.677) resulting in a total uranium value in µg/L.

** The total uranium background value was calculated by converting the U-238 background value (1.4 pCi/l) using the equation above.

*** MCL = USEPA Maximum Contaminant Level (ARAR-based cleanup goal) and includes the lead Action Level for treatment.

Well designators: S = Shallow Zone, I = Intermediate Zone, B = Deep Bedrock Zone

-- Non-Detect



Good Soil Characteristics

- Grain size in soils
 - ▶ Gravel 4%
 - ▶ Sand 25%
 - ▶ Silt 32%
 - ▶ Clay 39%

} 71% Fines
- Average soil porosity 30%
- Kd for Be used in GW model = 8000 L/kg for fines and 62 L/kg in sand/gravels

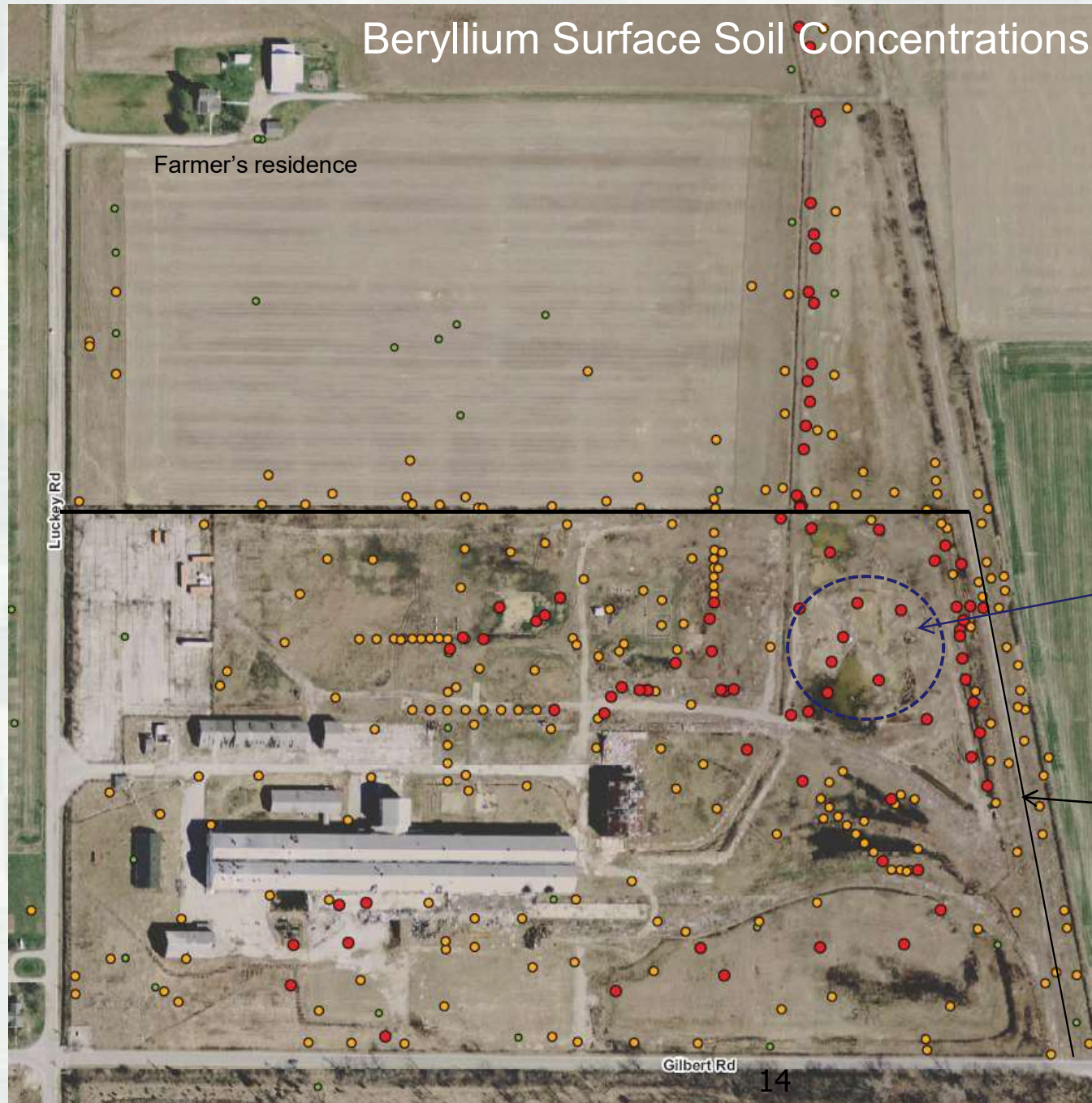


Clean Up Criteria

- Be – 131 mg/kg (bkgd 1.1)
- Lead - 400 mg/kg (bkgd 23.2)
- Ra226 – 2 pCi/g + bkgd (bkgd 2.97) = 4.97
- Th230 – 5.8 pCi/g + bkgd (bkgd 3.2) = 9.0
- U234 – 26 pCi/g + bkgd (bkgd 2.9) = 28.9
- U238 – 26 pCi/g + bkgd (bkgd 6.85) = 32.85



Beryllium Surface Soil Concentrations



- Be < 1.1 ppm
- Be > 1.1 ppm
(below 131)
- Be > 131 ppm

Average beryllium concentration in surface soil in this area is ~ 3,500 mg/kg

Site boundary



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Summary Statistics for Soil Contaminants

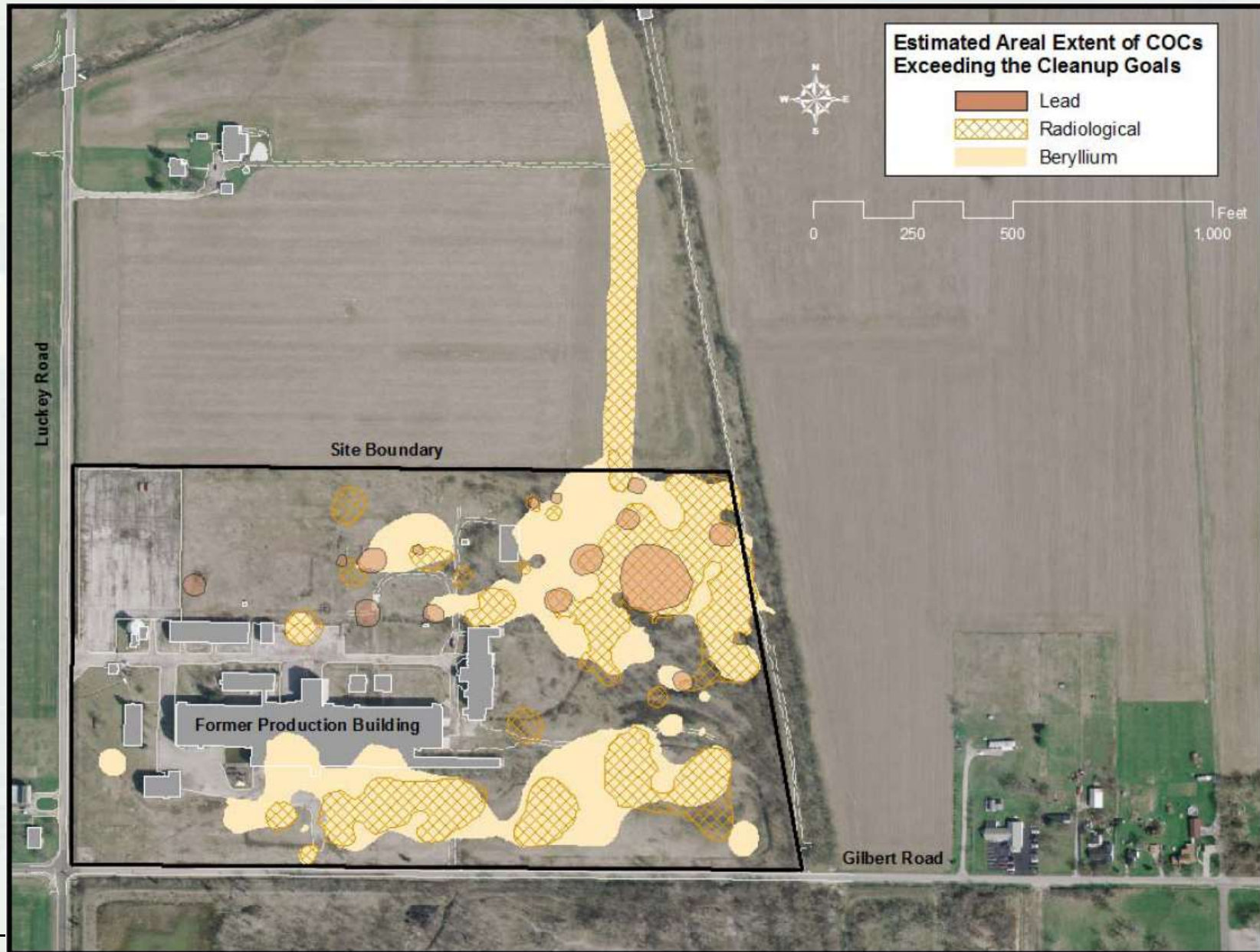
Parameter	Detection Frequency	Minimum Value	Maximum Value	Average Value	Background	Background Exceed	CG*	CG** Comp Value	CG Exceed	Units
<i>Metals</i>										
Beryllium	902/903	0.07 B	13300	227.96	1.13	547/902	131	131	126/902	mg/kg
Lead	437/438	1.1	28900 J	198.88	23.2	174/437	400	400	21/437	mg/kg
<i>Radiological Parameters</i>										
Radium-226	476/477	0.0744	4000	17.62	2.97	107/476	2	4.97	94/476	pCi/g
Thorium-230	435/440	0.162 J	88.5	4.27	3.2	66/435	5.8	9.0	45/435	pCi/g
Uranium-234	432/436	0.0967	52.3	2.9	2.61	69/432	26	28.61	6/432	pCi/g
Uranium-238	474/477	0.0977	280	6.85	2.63	107/474	26	28.63	27/474	pCi/g

*CG = Media-specific Cleanup Goal

**CG Comp Value is represented by the sum of the background and CG values for radionuclides



FUSRAP-Related Contamination in Soil



Modeled depth of excavations and post-remediation beryllium (residual) concentrations



Legend

- Residual Soil Sample > 52 ppm
 - Residual Soil Sample > 10 ppm
 - Residual Soil Sample < 10 ppm
 - Model Boundary
- Depth of Modeled Contamination (Maximum Depth)
- 1 ft
 - 2 ft
 - 5 ft
 - 6 ft
 - 20 ft

0 75 150 300
Feet

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
US Army Corps of Engineers
Buffalo District
Document Name: 122111_ResidualConc_Mo.mxd
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RESIDUAL BERYLLIUM CONCENTRATIONS AND
THE MODELED DEPTH OF CONTAMINATION

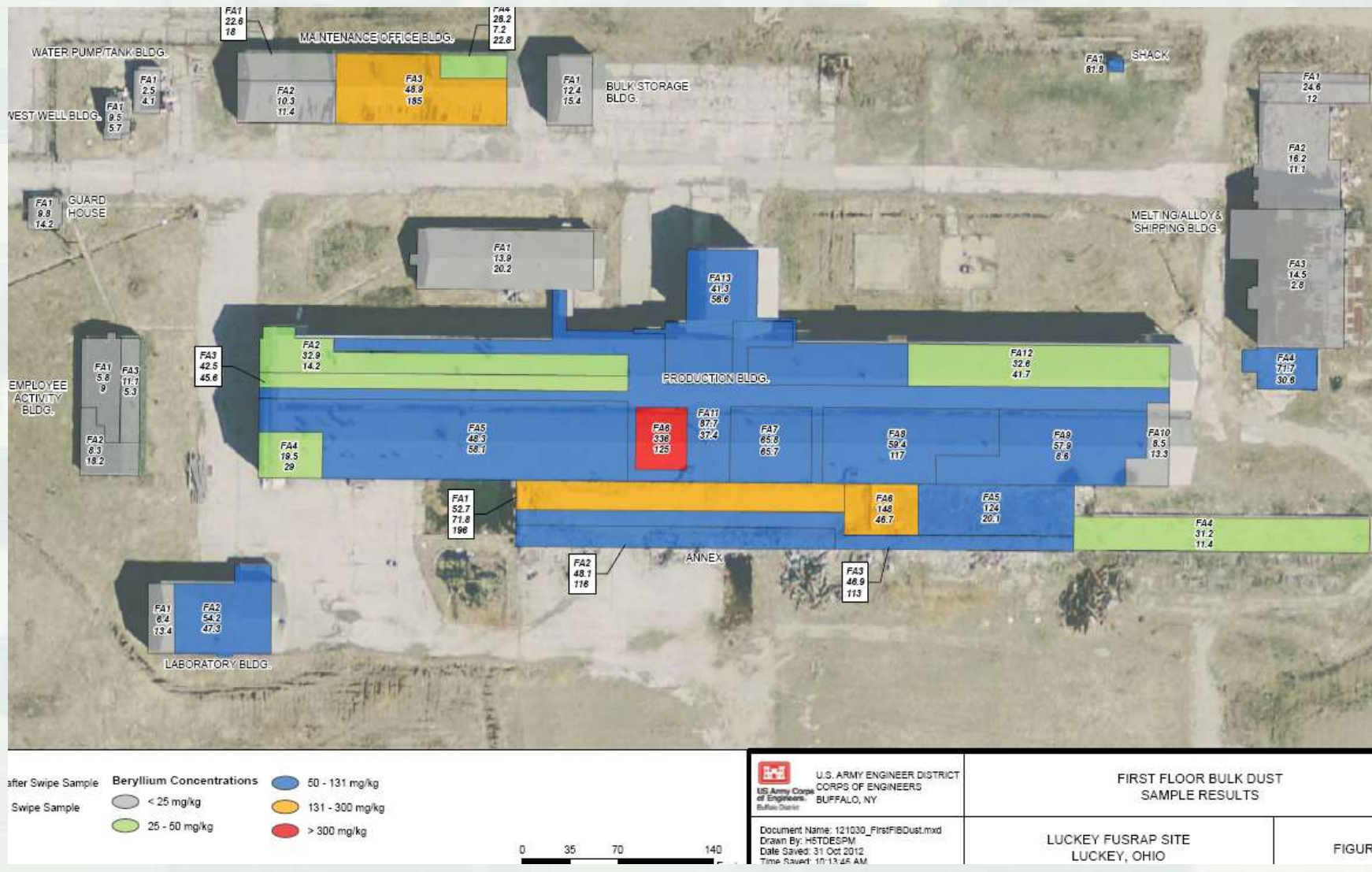
LUCKEY FUSRAP SITE
LUCKEY, OHIO

F

Luckey Site Status July 2010: Location of former Production and Annex Buildings



Be Bulk Dust Sample Results in Buildings



Beryllium Swipe Sample Results in Buildings

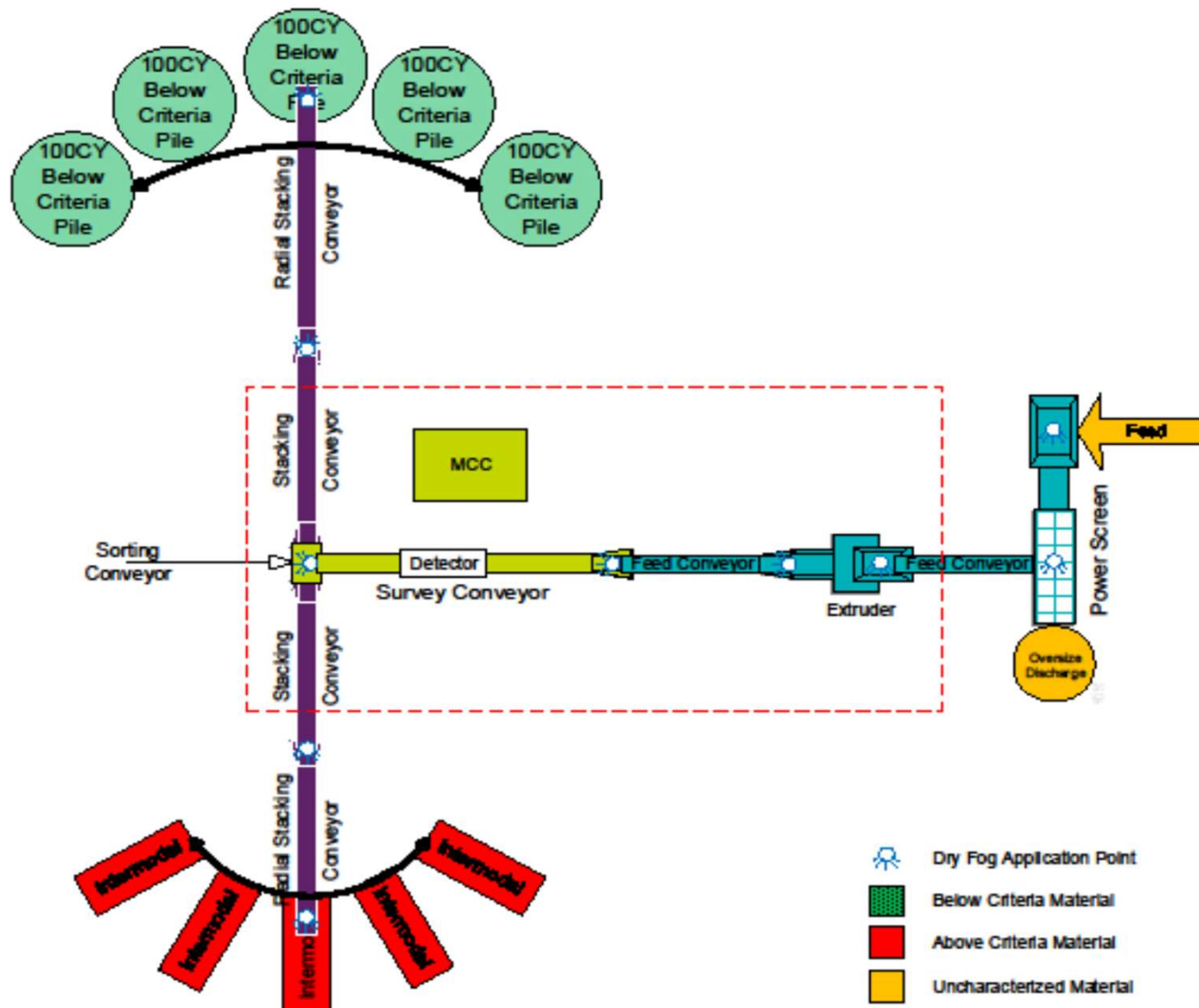


Project Challenges (adaptive management)

- Soil Sorter
- BeSMART
- LIBS / CeBr
- BeFINDER
- IC-PMS
- Hairspray
- Vacuum Samples



Waste Minimization



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Surface Contamination

- BeSMART - Anti-microbial Spray
- Surface contamination limit of 0.2 ug/100cm² (smear)
- Development of surface background



Real Time Soil Characterization

- Super Tech Packs (Rad and non-rad)
 - ▶ LIBS
 - 3 second laser shot – full spectral analysis
 - Detection limits below clean-up criteria
- CeBr3
 - ▶ Great resolution no temp problems
 - ▶ Can quantify our RAD to below clean-up limits



(near) Real-Time Swipe Analysis for Releases

- BeFINDER – 2 hour analysis vs lab 24 hour analysis
- Equipment, personnel, exposure assessments.



Large Sample Capability with Fast Turn Around Time

- IC/PMS
 - ▶ Very low detection levels
 - ▶ 180-200 samples per day
 - ▶ 24 hour TAT standard, rush – Same Day



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Worker Exposure

- Hairspray application



Non-Solid Surfaces

- Vacuum Samples
 - ▶ 100 cm²
 - ▶ Loaded on filter
 - ▶ Clothing, vehicles, potentially any surface



USACE Issues

- Does the weathering of beryllium in the environment or presence of soil decrease the toxicity/bioavailability of beryllium significantly?
 - How is particle size affected by presence of soil and/or weathering in the environment?
 - Should we adjust air monitoring techniques for airborne beryllium-contaminated soil, depending on any reduction in bioavailability?
- How to implement a fully protective CBDPP
 - In the absence of 10 CFR 850/851 worker protections
 - BeLPT - Sensitizations / Borderlines
- Develop a rationale for potentially raising surface contamination limits.

