Cleveland Flats Renaissance

Sustainable Remedial Solutions

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&

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Ohio Brownfields Conference
January 2011

URS
Cleveland, Ohio

URS Corporation - Ohio

Five offices: 660 employees

4 Ohio VAP Certified Professionals

- **Engineers**
- **Geologists**
- **Risk Assessors**
- **Chemists**
- **Grant Specialists**

Supporting groups include:

- **Urban / Master Planning**
- **Landscape Arch/Green Infrastructure**
- **Ecological Services**
- **Site Civil Design**
- **Asbestos Services**
- **Demolition/Construction Mgmt**

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Presentation Focus

Cost-effective & evolutionary remedial solutions for a project changed by the real estate market crash

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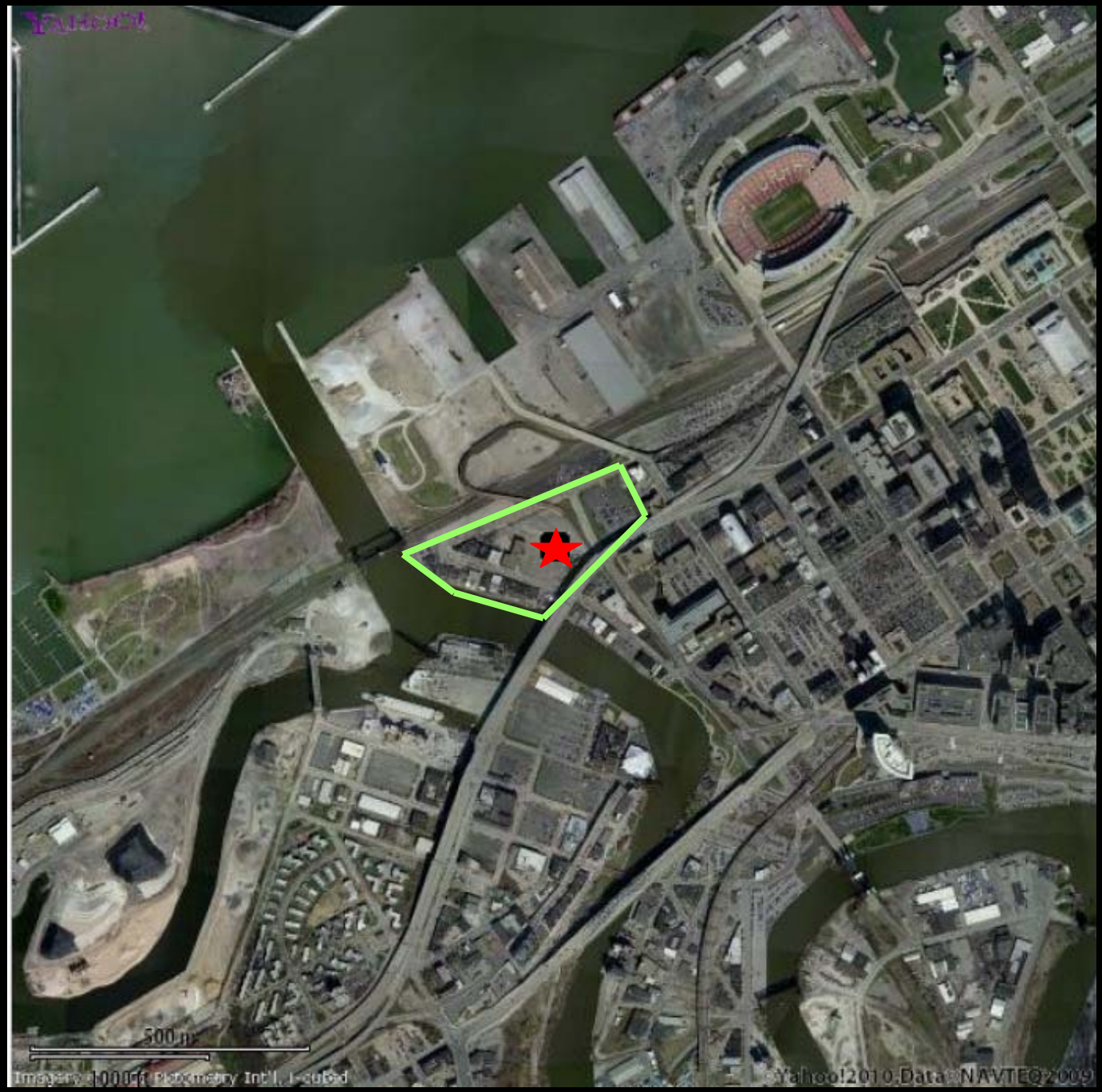
500 m
Imagery ©2009 Pictometry Int'l, i-cubed
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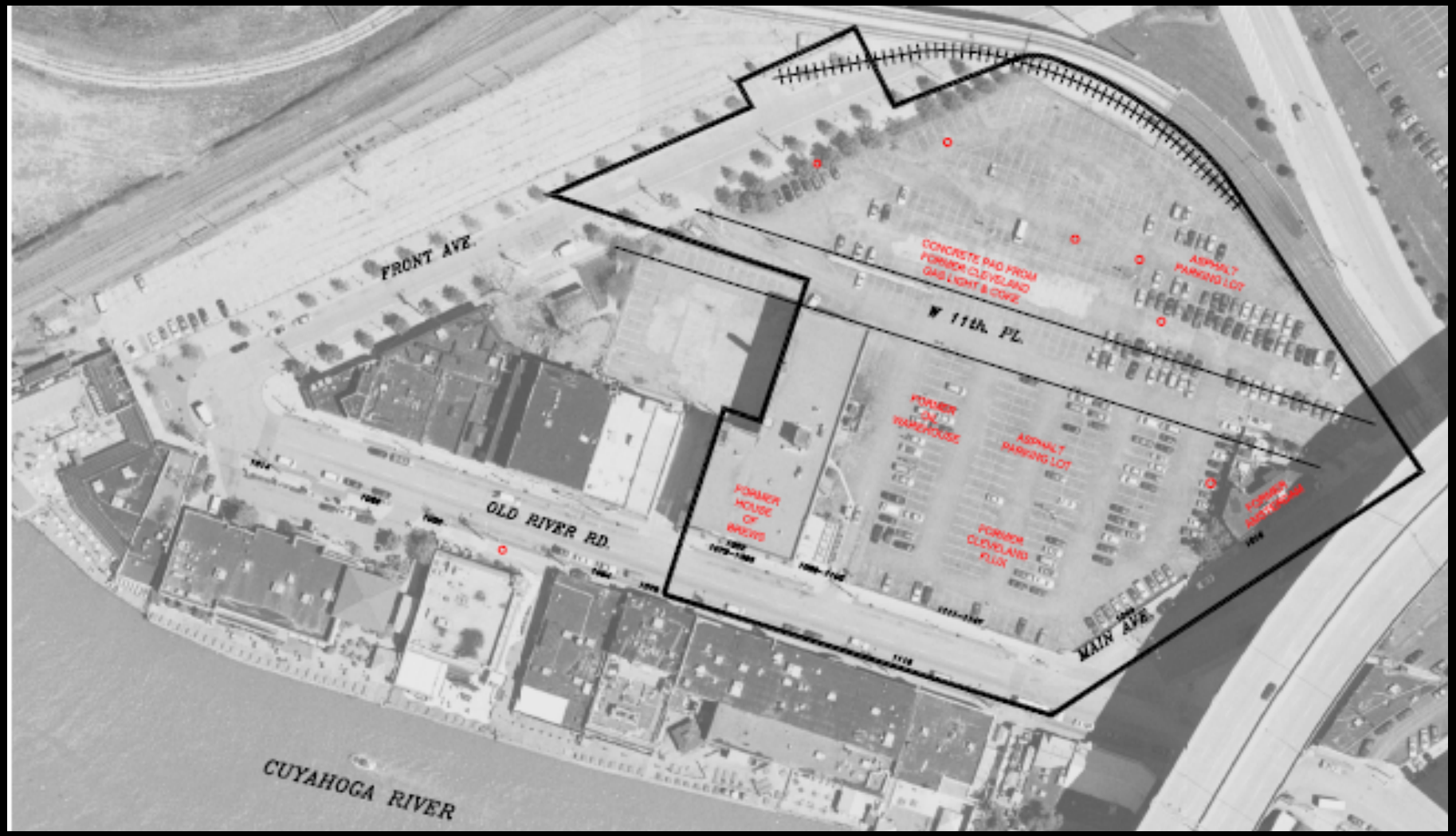
Project Area

CORF Area



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Project Timeline

2005 $3M CORF

2007 $4M RLF - Cuyahoga County DOD

2008 Phase I Remedy Implementation

Project Shut Down

2009 Enter VAP MOA due to County financing

Project Redrawn

2010 Complete NFA with Interim Remedy

2011 Complete Final Remedy & CORF NFA

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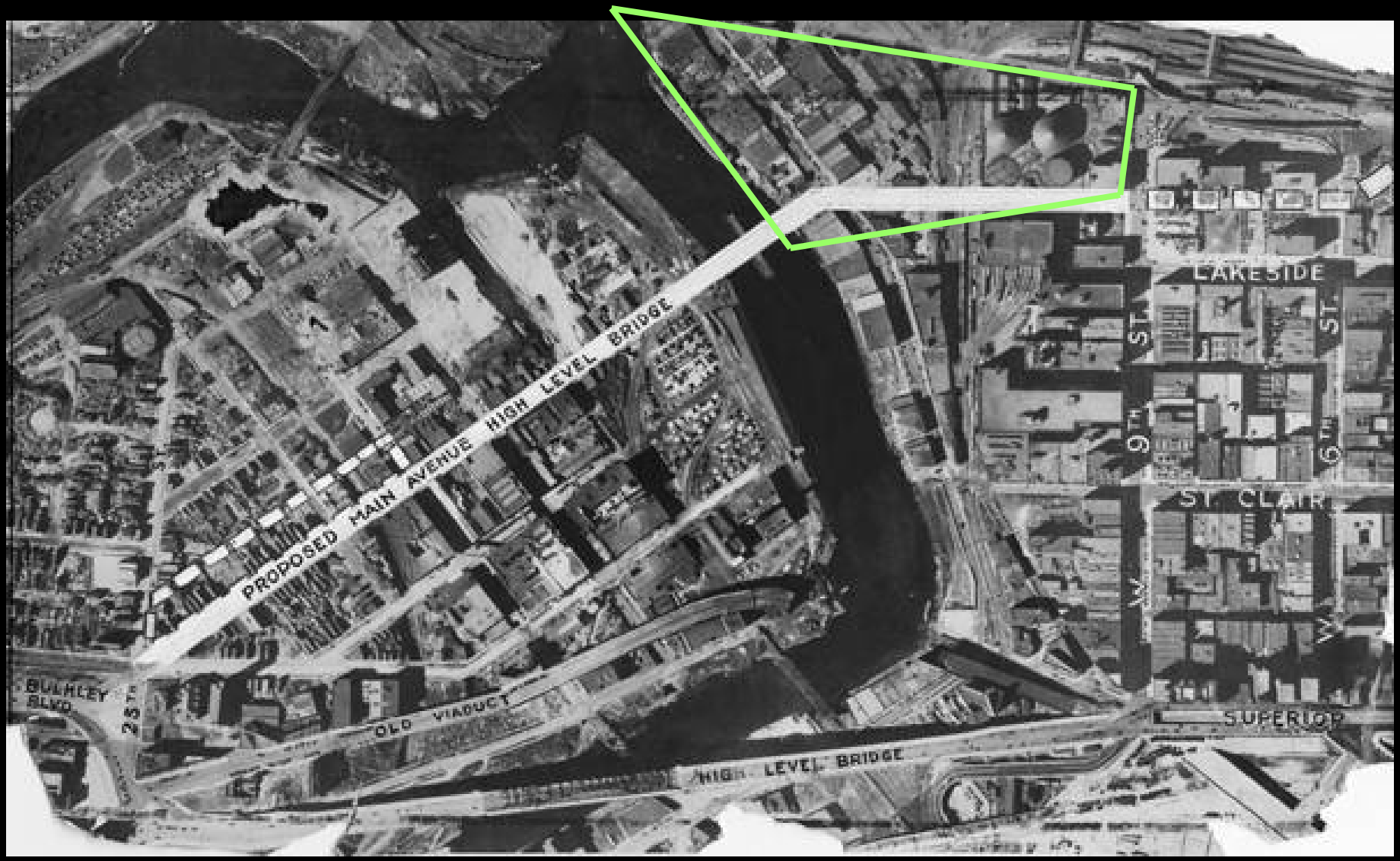
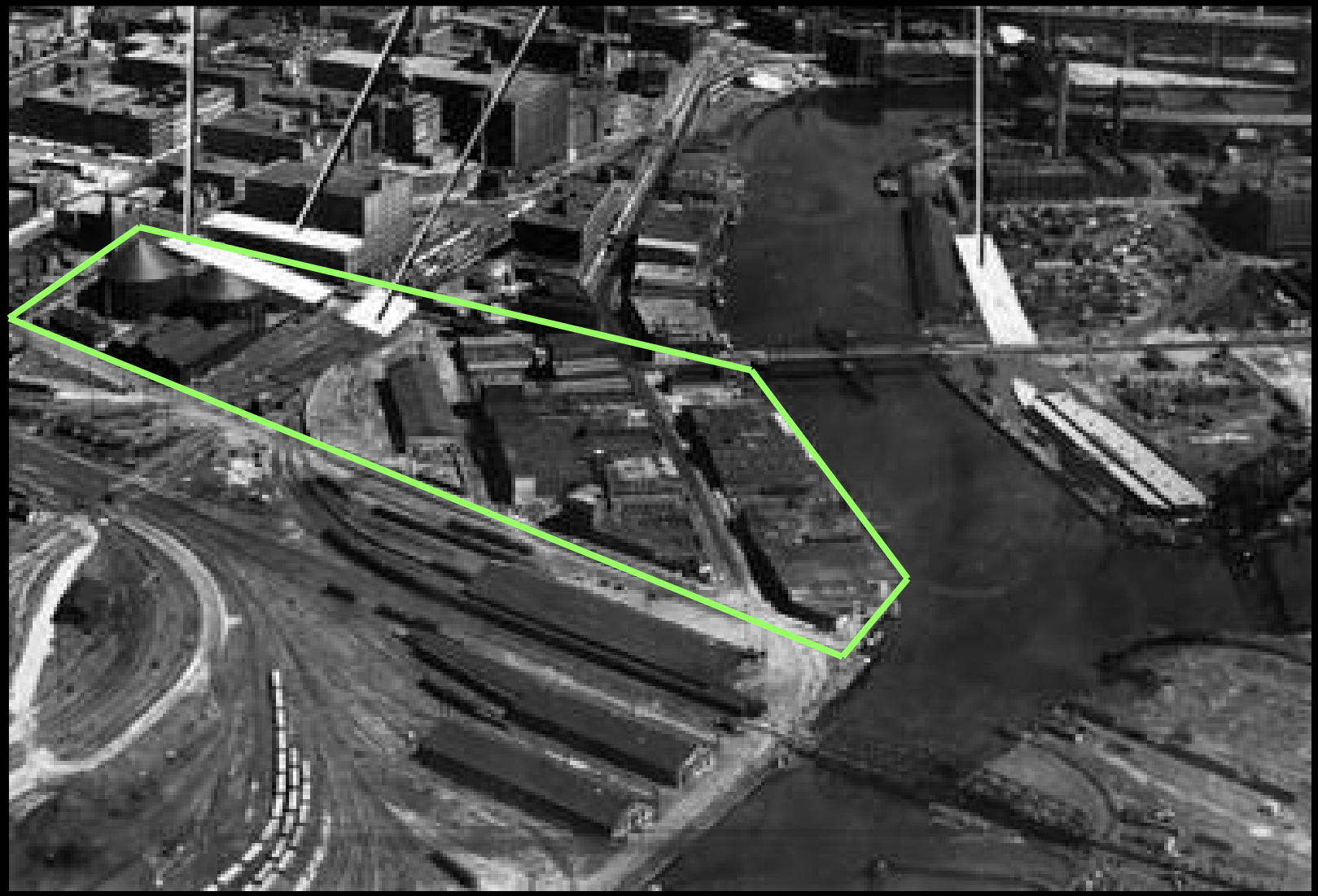
Historical Land Uses

- **Manufactured gas plant (1850s)**
- **Fishing/warehousing**
- **Metal working**
- **Plating operations**
- **Coke handling**
- **Truck terminal**
- **Nightclubs & restaurants**
- **Surface parking**

credit: Cleveland Memory Project



credit: Cleveland Memory Project



credit: Cleveland Memory Project

Diet Coke

AVAILABLE
DICK'S

FOR LEASE
FOR LEASE
JIMMY'S

LARRY FLYNT'S
HUSTLER CLUB
ELAND.COM
ALS

credit: Forum Architects

credit: Forum Architects

credit: Forum Architects

credit: Forum Architects

credit: Forum Architects

VAP Phase I Assessments – ’05-’10

VAP Phase II Assessments – ’05 -’10

- 92 Soil Borings
- 35 Monitoring Wells
- 5 Surface Water Samples from Cuyahoga River
- 13 Test Pits

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Remedy Process

Step 1 – Initial Phase

- Asbestos abatement & building demolition
- Remove & replace unsuitable soil (fill, solvents)
- Locate & remove 5 USTs
- Remove, stabilize, & dispose residual coal tar

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Remedy Process – cont'd

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Remedy Process – cont'd

Remedy Process – cont'd

Step 1 – Initial Phase

New Infrastructure

- Storm sewers
- Sanitary sewers & pump station
- Anti-seep collars

Planned Infrastructure

- Building slabs / pavement
- Vapor barriers / vent systems

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Remedy Process – cont'd

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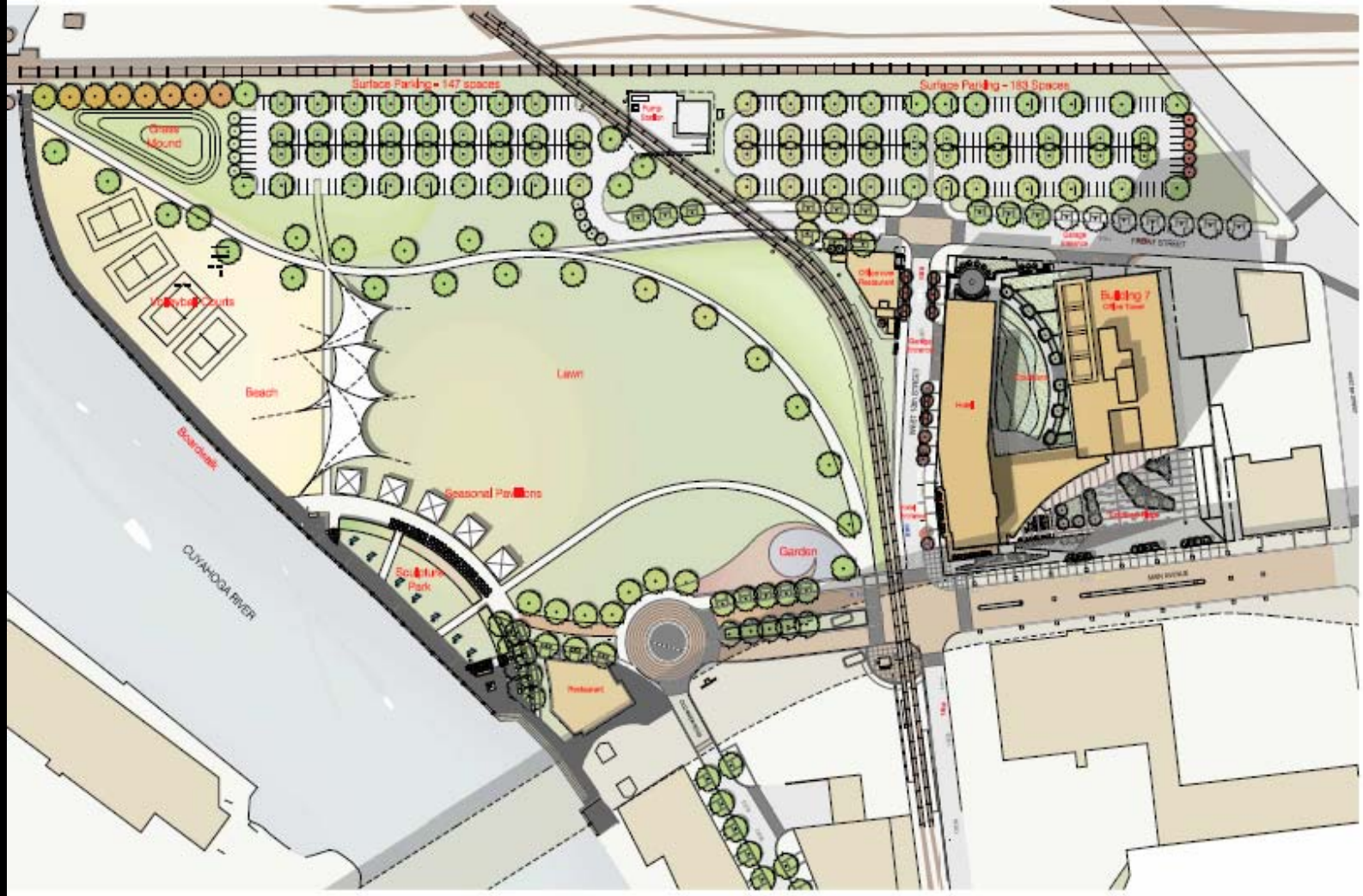
Remedy Process – cont'd

credit: Forum Architects



Master Plan - Phase I

July 22, 2009

FLATS EAST BANK CLEVELAND

THE WOLSTEIN GROUP

FAIRMOUNT PROPERTIES

FORUM Architectural Services, LLC

Market Downturn → Redesign

- 1 Office Building & Hotel
- Lots of greenspace
- Surface parking
- Prepare for future development

credit: Forum Architects

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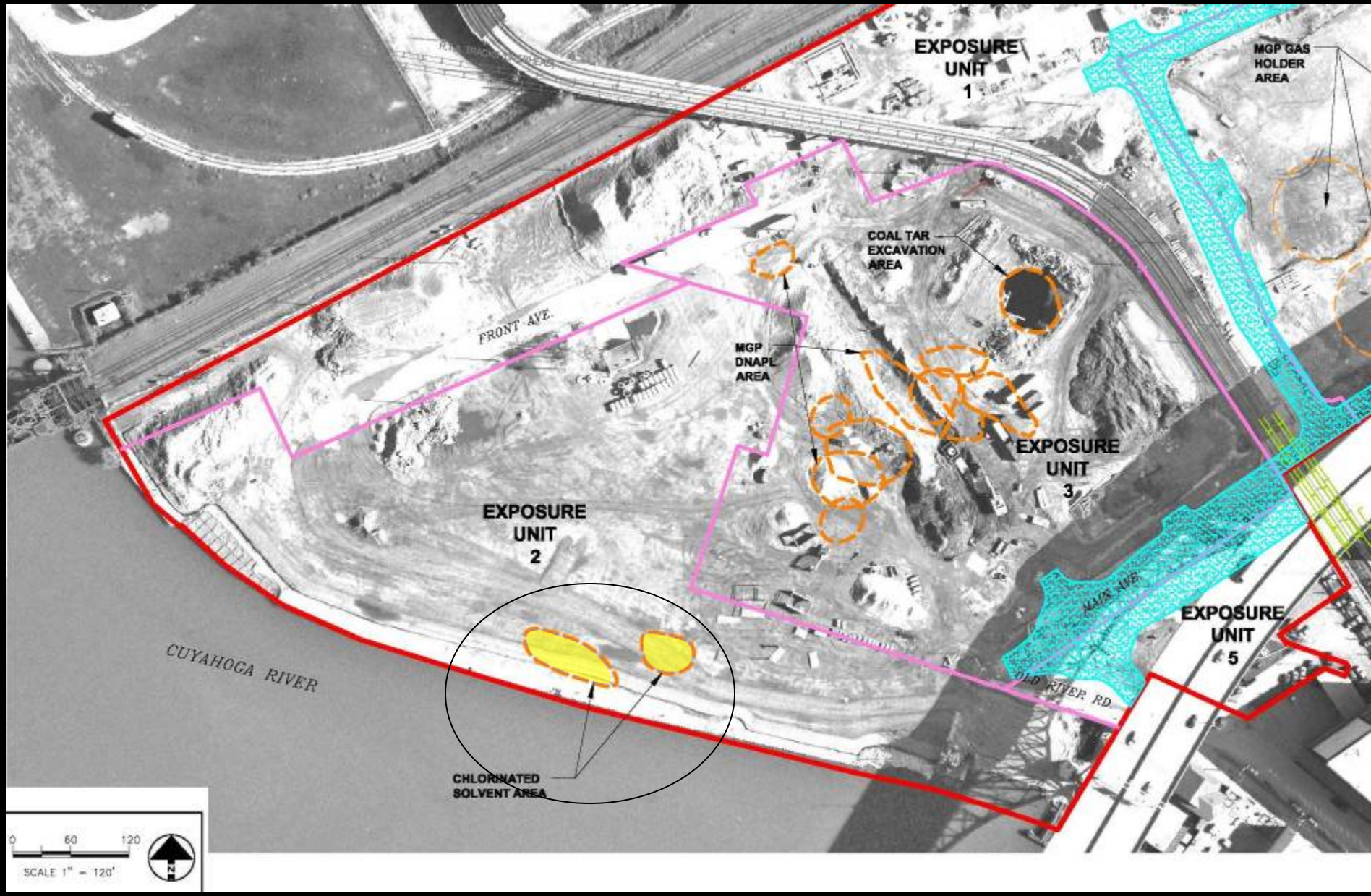
Remedy Process

Step 2 – Interim Phase

- Need NFA to secure financing
- Remediate for current receptors only (construction worker, Cuyahoga River)
- In-Situ Chemical Reduction: Groundwater treatment adjacent to river
- Delineate DNAPL & monitor groundwater
- Maintain perimeter fence


EXPOSURE UNIT 1
MGP GAS HOLDER AREA
COAL TAR EXCAVATION AREA
FRONT AVE.
MGP DNAPL AREA
EXPOSURE UNIT 3
EXPOSURE UNIT 2
MAIN AVE.
EXPOSURE UNIT 5
CUYAHOGA RIVER
OLD RIVER RD.
CHLORINATED SOLVENT AREA
0 60 120
SCALE 1" = 120'
N

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In-Situ Chemical Reduction (ISCR)

- Designed & implemented to degrade chlorinated organics & metals in groundwater
  - TCE, cis-DCE, VC, and Cr(VI)
- Aquatic Life Criteria (OMZA) Cuyahoga River exceeded
- Groundwater impacts from ~ 8 to 15 feet
- Total area of ~7,000 ft^2
  - Area A: ~3,000 ft^2 & Area B: ~4,000 ft^2
- ISCR completed using direct push injection
  - EHC-M®
  - Sodium Sulfite
  - Calcium Propionate

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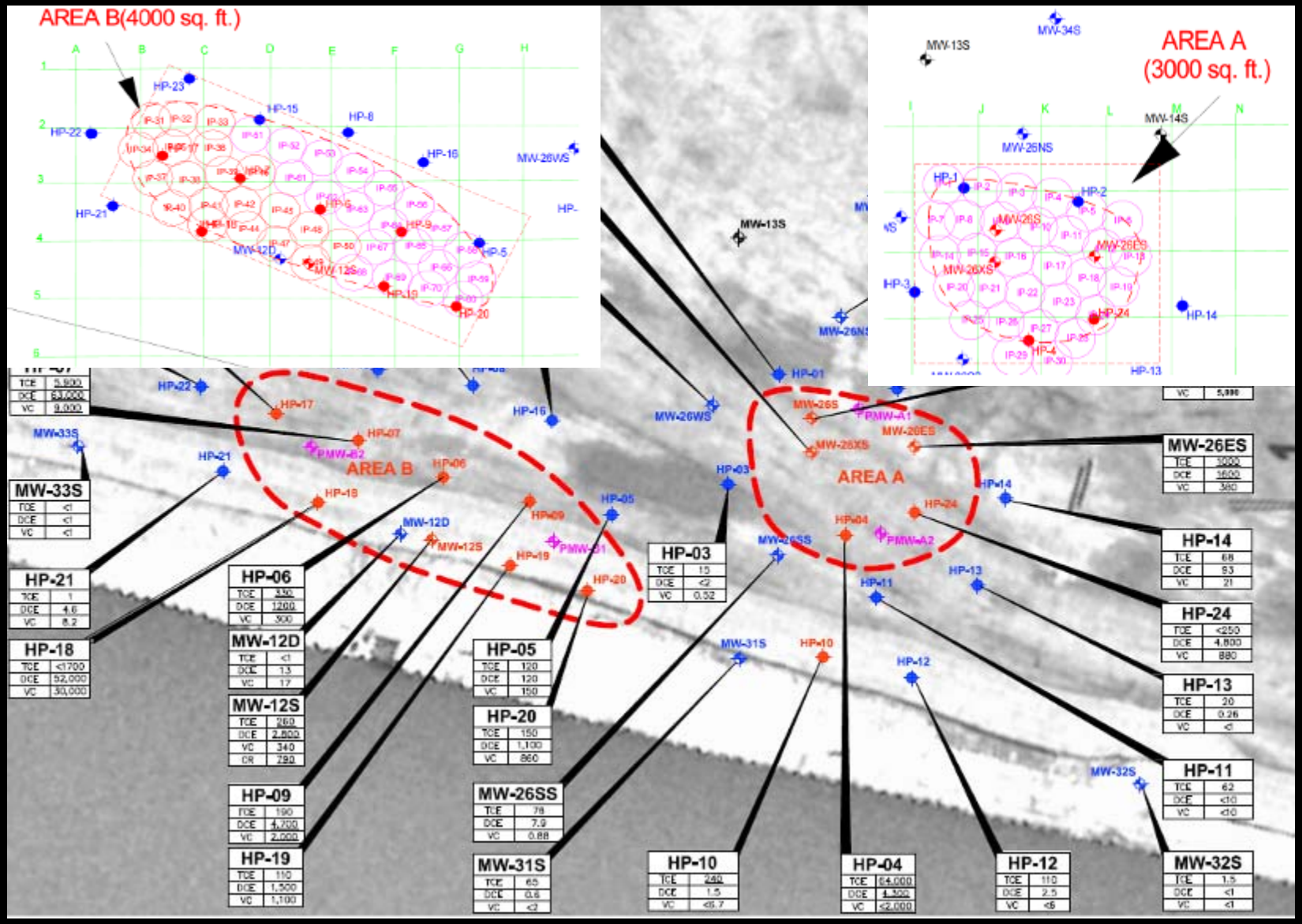
In-Situ Chemical Reduction



In-Situ Chemical Reduction

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In-Situ Chemical Reduction

In-Situ Chemical Reduction

- Performance monitoring included:
  - 6 monitoring wells – 3 per Area
  - 6 rounds of sampling (Baseline & 5 post ISCR events)
    - Baseline – September 2009
    - Round 1 – October 2009
    - Round 2 – November 2009
    - Round 3 – December 2009
    - Round 4 – February 2010
    - Round 5 – May 2010
- Parameters
  - Geochemistry (DO, ORP, pH, Temp, Conductivity, Fe^{+2})
  - VOCs (TCE, cis-DCE, VC)
  - Dissolved gases (methane, ethane, ethene)
  - Metals (Cr(VI))
  - Inorganics (nitrate, sulfate, chloride)
- Results compared to Aquatic Life Criteria

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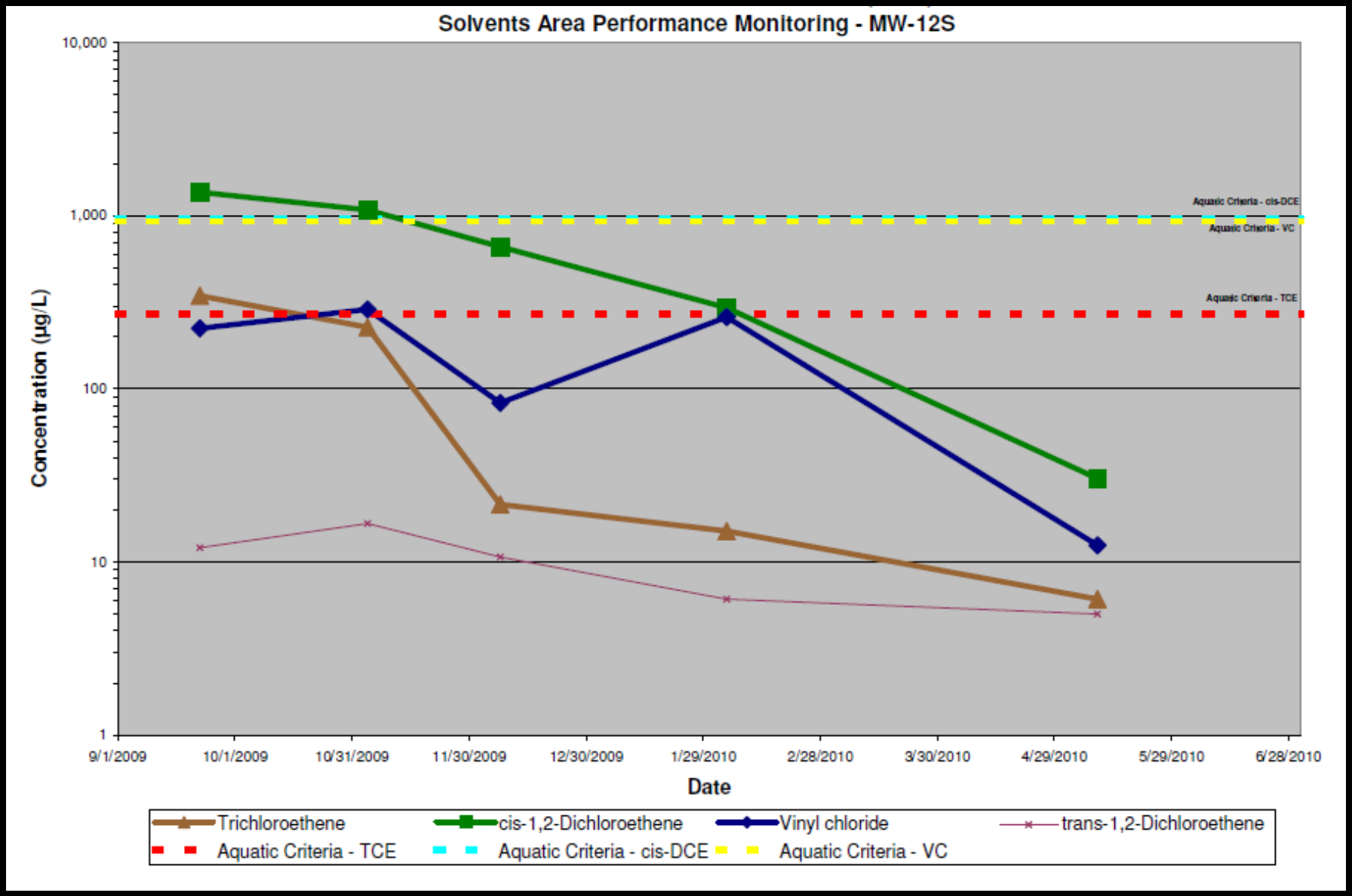
Solvents Area Performance Monitoring - MW-12S
10,000
1,000
100
10
1
Concentration (µg/L)
Aquatic Criteria - cis-DCE
Aquatic Criteria - VC
Aquatic Criteria - TCE
9/1/2009
10/1/2009
10/31/2009
11/30/2009
12/30/2009
1/29/2010
2/28/2010
3/30/2010
4/29/2010
5/29/2010
6/28/2010
Date
Trichloroethene
cis-1,2-Dichloroethene
Vinyl chloride
trans-1,2-Dichloroethene
Aquatic Criteria - TCE
Aquatic Criteria - cis-DCE
Aquatic Criteria - VC

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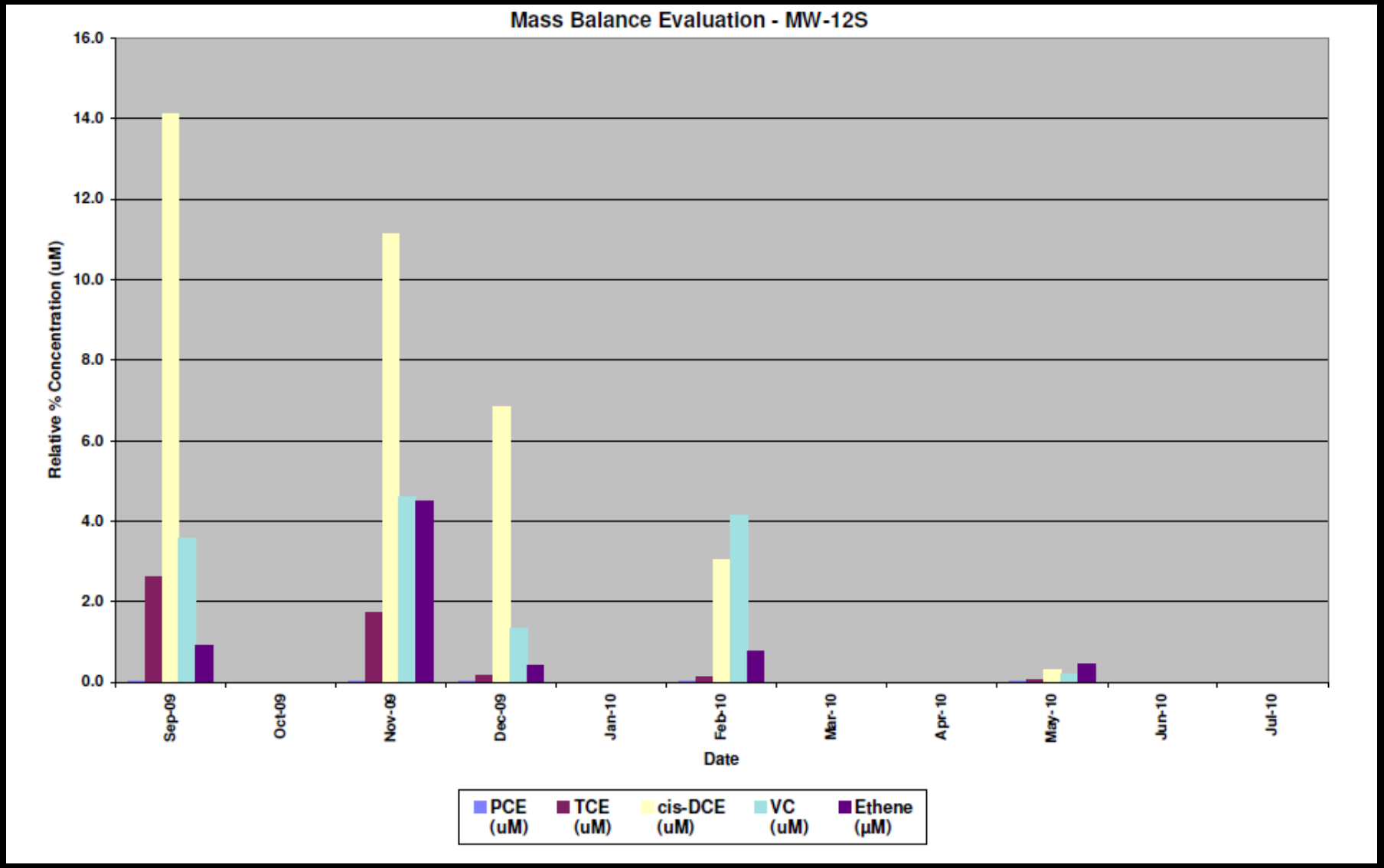
Mass Balance Evaluation - MW-12S
Relative % Concentration (uM)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10
Jul-10
Date
PCE (uM)
TCE (uM)
cis-DCE (uM)
VC (uM)
Ethene (µM)

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In-Situ Chemical Reduction

- Field parameters indicate geochemical conditions promote reductive dechlorination
  - DO < 1 mg/L
  - ORP at significantly negative values
  - pH: 6 to 8 (optimum range)
  - Groundwater temperature varied seasonally
- Observed increases in Fe^{+2}
- Elevated TOC in treatment areas proves effective distribution of ISCR materials
- Monitoring indicated chlorinated organics below OMZA
- VOC progression from parent product through daughter products to end products (i.e., ethene)
- Average 90% concentration reduction

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DNAPL Delineation

- Tar-specific Green Optical Scanning Tool (TarGOST®)
- 54 TarGOST® locations: 0 to 45 feet
- Identified free produce zones and top of underlying clay
- Identified 2 types of free product
  - MGP
  - Diesel/hydrocarbons
- Evaluated potential remedial options
  - In-situ chemical oxidation (ISCO)
  - Excavation & disposal
  - Product recovery/pumping

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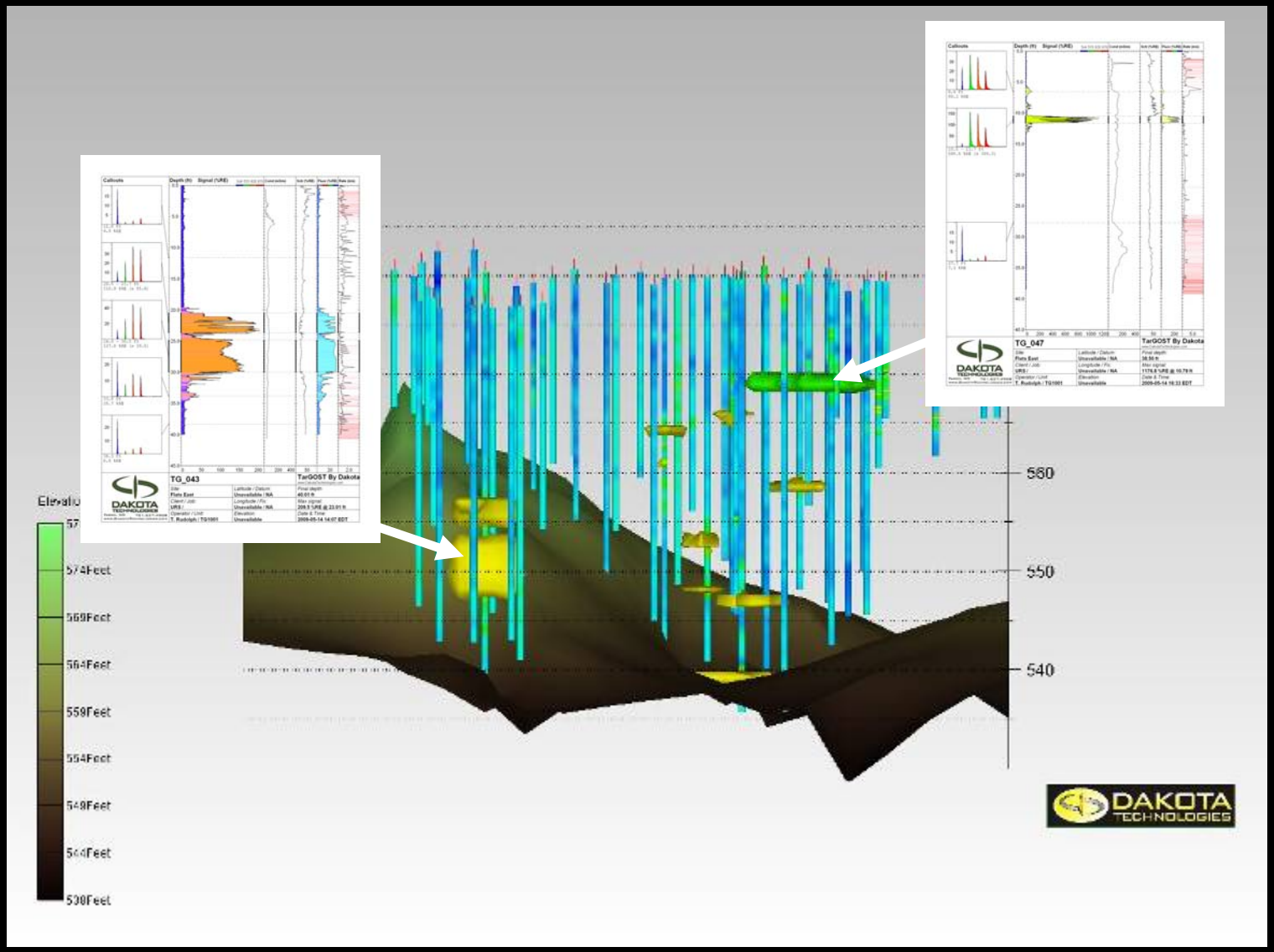
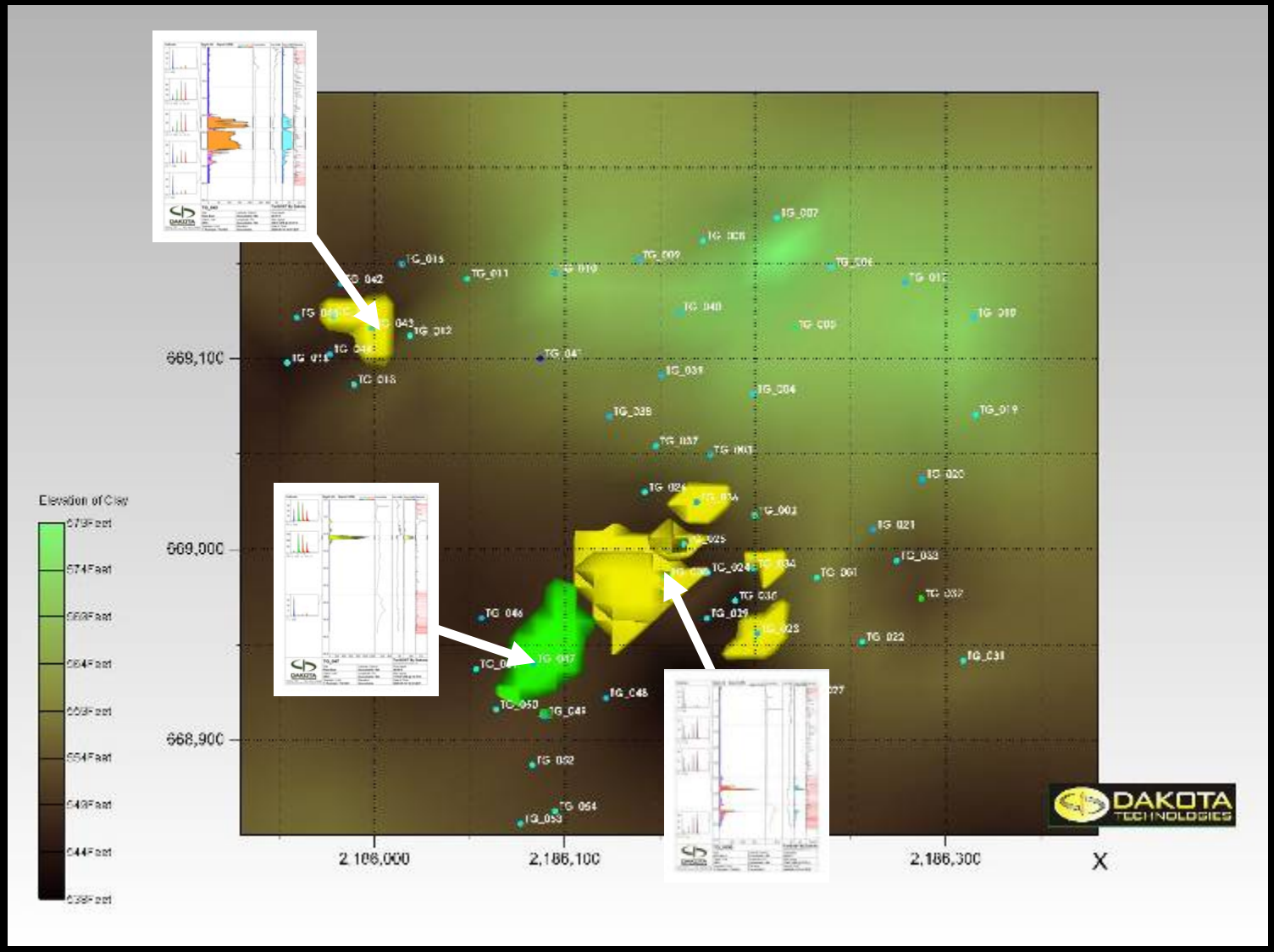
Tar GOST ®


TG_043
TarGOST By Dakota
TG_047
TarGOST By Dakota
DAKOTA TECHNOLOGIES
560
550
540
574Feet
569Feet
564Feet
559Feet
554Feet
549Feet
544Feet
539Feet
DAKOTA TECHNOLOGIES

Tar GOST ®


Elevation of Clay
669,100
669,000
668,900
2,186,000
2,186,100
2,186,300
X
DAKOTA
TECHNOLOGIES

Remedy Process

Step 3 – Final Phase

- 2’ soil cover in green space
- Vapor barrier beneath building
- DNAPL treatment – Chem Ox
- Complete coal tar removal
- Remove fence

Project Status

May 2010: Property-wide NFA
- November 2010: NFA Addendum
- Interim remedy: fence, monitoring & RMP
- O&M Plan & Agreement

December 2010: Financing in place - Building 7 & adjoining hotel

January 2011: Construction start-up

December 2011: Final remedy complete
- CORF NFA
- Update existing O&M Plan & Agreement

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Lessons Learned

- Be flexible working with developers
- Make sure everyone is aware of public financing obligations
- Consider interim remedy in financing strategy
- Don’t underestimate former MGP sites

Questions?

credit: Forum Architects