

Large Diameter Auger Excavation and Enhanced Bioremediation Using **CHITOREM®**

Former Dixie Cleaners
Jacksonville, FL

2016 Waste Site Cleanup Section Contractor Workshop
Matt Crews, PE





Former Dixie Cleaners – Site Information

- Location: 1931 Blanding Boulevard, Lakeshore Plaza, Jacksonville, Florida
- Facility Identification Number: 169500772
- Drycleaning activities took place from 1956-1995 (PCE)
- Former drycleaner space currently occupied by a church
- Site generally surrounded by commercial properties



Former Dixie Cleaners – Jacksonville, FL





Assessment Information

Contamination Assessment Report – ABB Environmental Services (December 1997)

■ Site Geology

- Silty fine grained sand from ground surface to 18 feet bgs
- Clayey fine grained sand from 18 to 30 feet bgs
- Limestone from 30 to 32 feet bgs
- Stiff clay below 32 feet bgs

■ Site Hydrogeology

- Depth to groundwater – Less than 2 feet bgs
- Groundwater flow – East-southeast towards the Ortega River (0.6 mi)

■ Areas of Concern

- Beneath building slab in the vicinity of former drycleaning equipment
- Suspected breach in sanitary sewer line from building to lift station on easement east of the site



Assessment and Remedial Activities

Activity	Date
Contamination Assessment Report	December 1997
Remedial Action Plan	December 1999
HRC® Injection Event 1	April 2000
HRC® Injection Event 2	April 2002
Supplemental Site Assessment	November 2002
HRC-X® and Bioaugmentation Event	May 2004
Shallow Interior Excavation, Passive Ventilation Well Installation, and EOS® Injection Event	September 2005
Intermediate Zone pH Adjustment	April 2006
Additional Injection Well Installation	December 2009
EOS® AquaBupH™ Injection Event	January 2010
DPT Assessment	May 2011
Interim Source Removal Work Plan	June 2011
Annual Groundwater Monitoring	2011-2015



Remedial Observations

- Reductive dechlorination processes were occurring within the surficial aquifer at a much more rapid pace than would occur under natural conditions
- With the exception of the remaining source areas, PCE & TCE have substantially degraded at the site
- cis-1,2-DCE & VC continued to accumulate when the available carbon source is depleted, and degraded when a carbon source was supplied
- Total VOC results indicated substantial mass reduction in the shallow (5 to 15 feet bgs) and deep zones (25 to 30 feet bgs).
- Reductive dechlorination was also occurring in intermediate zone (15 to 25 feet bgs), but at a slower rate
- Downgradient migration of the plumes in each surficial zone had stalled

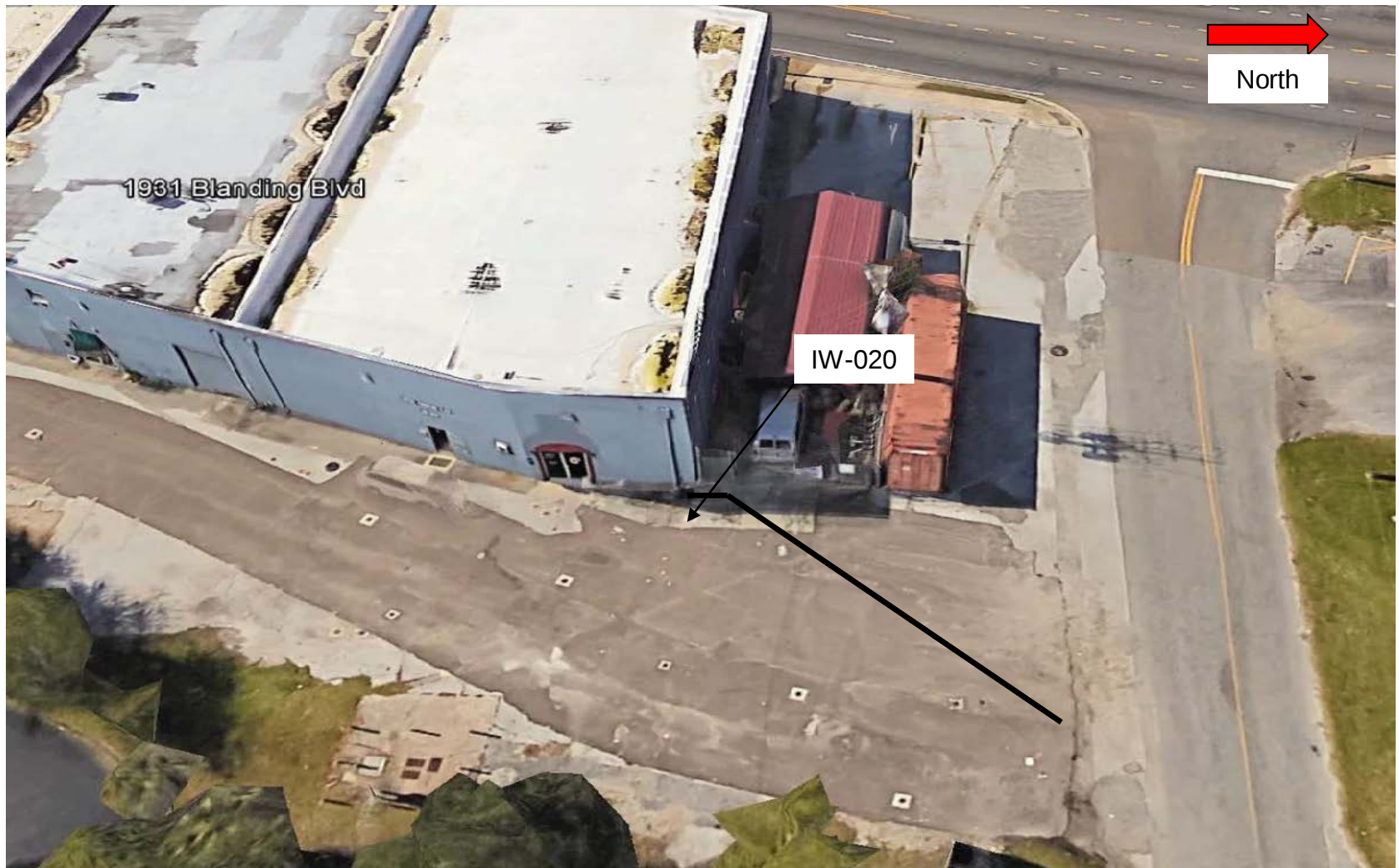


New Source Area Identified

- December 2009 - Seven new injection wells (IW014 to IW020) installed in the intermediate zone of surficial aquifer (screened ~15 to 25 feet bgs) to increase areal coverage of enhanced bioremediation injections
- Soil samples collected for lab analysis at the bottom of each injection well for VOC analysis (~25 feet bgs)
- PCE, TCE, cis-1,2-DCE, and VC above leachability SCTLs
- PCE soil concentration of 26 mg/kg at IW020
- PCE groundwater concentration of 110,000 µg/L at IW020
- Concentrations in soil and groundwater at IW020 were highest to date at the site
- New source area identified in the vicinity of IW020, which was located adjacent to storm drain near back door of former drycleaner
- January 2010 - EOS® AquaBupH™ injection event



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June 10, 2016

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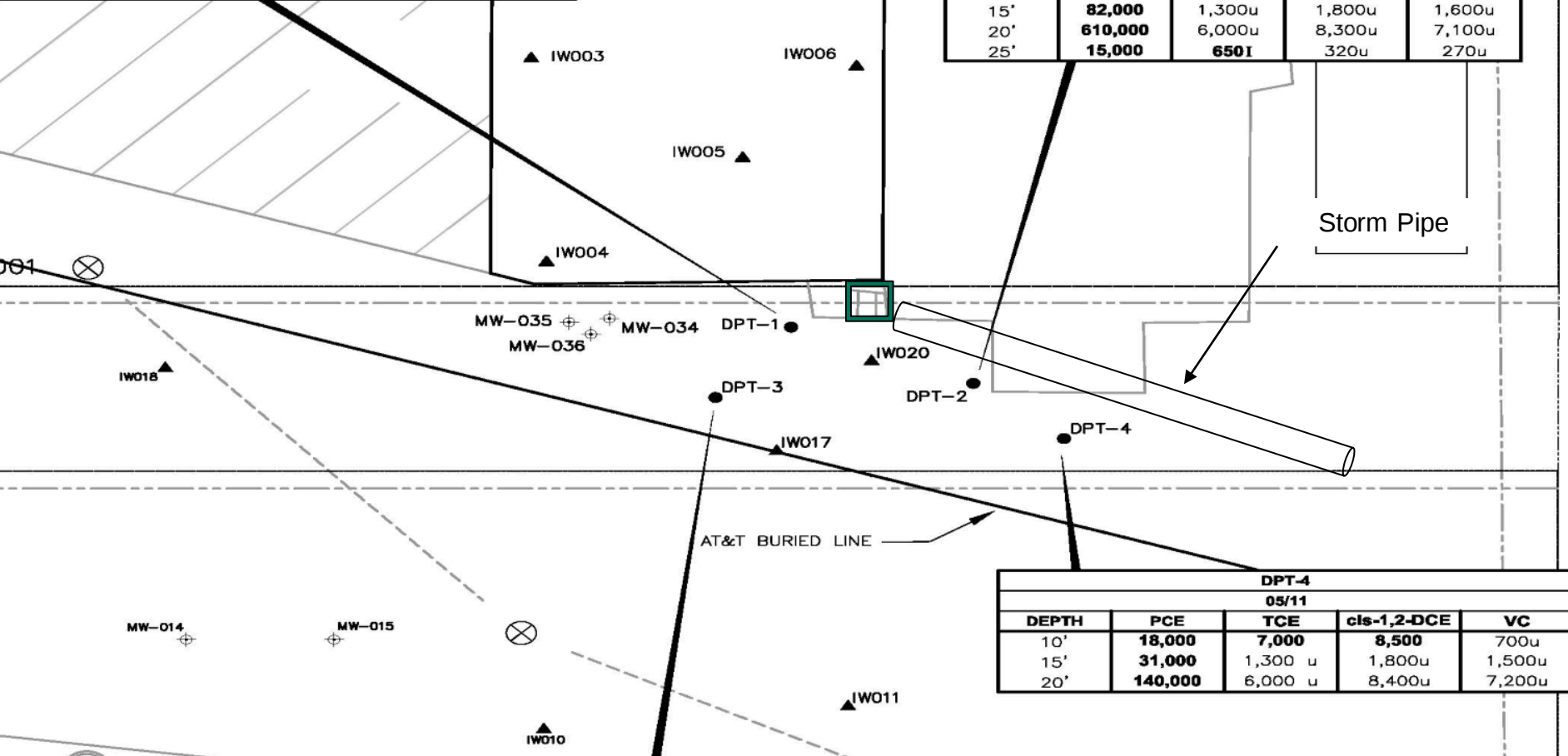
May 2011 DPT Assessment

- Performance monitoring associated with the January 2010 EOS® AquaBupH™ injection event indicated effective reductive dechlorination in non-source area wells
- VOC concentrations increased at IW020
- PCE and TCE rebound in shallow and intermediate zone wells located along the storm drain
- Recommend interim source removal in the vicinity of IW020
- DPT assessment for horizontal limits of ISR
- Most significant VOC impacts between 15 and 20 feet bgs; DNAPL observed at two locations along storm drain pipe (~18 feet bgs)



DPT-1 05/11				
DEPTH	PCE	TCE	cis-1,2-DCE	VC
5'	13,000	1,400	2,100	730u
10'	3,400	1,400I	9,600	1,300 I
15'	34,000	2,300	1,400I	770u
20'	1.9I	1.5I	3.5	1.2 I

DPT-2 05/11				
DEPTH	PCE	TCE	cis-1,2-DCE	VC
5'	19,000	4,400	12,000	940
10'	6,400	700	6,000	74u
15'	82,000	1,300u	1,800u	1,600u
20'	610,000	6,000u	8,300u	7,100u
25'	15,000	650I	320u	270u



DPT-3 05/11				
DEPTH	PCE	TCE	cis-1,2-DCE	VC
10'	140u	120u	1,900	450
15'	790u	660u	42,000	790u
20'	75u	63u	170	130

DPT-4 05/11				
DEPTH	PCE	TCE	cis-1,2-DCE	VC
10'	18,000	7,000	8,500	700u
15'	31,000	1,300 u	1,800u	1,500u
20'	140,000	6,000 u	8,400u	7,200u

June 10, 2016



Golder Associates
Jacksonville, Florida

FILE No. **0332613DU2-S002**

PROJECT No. **033-2613** REV. **0**

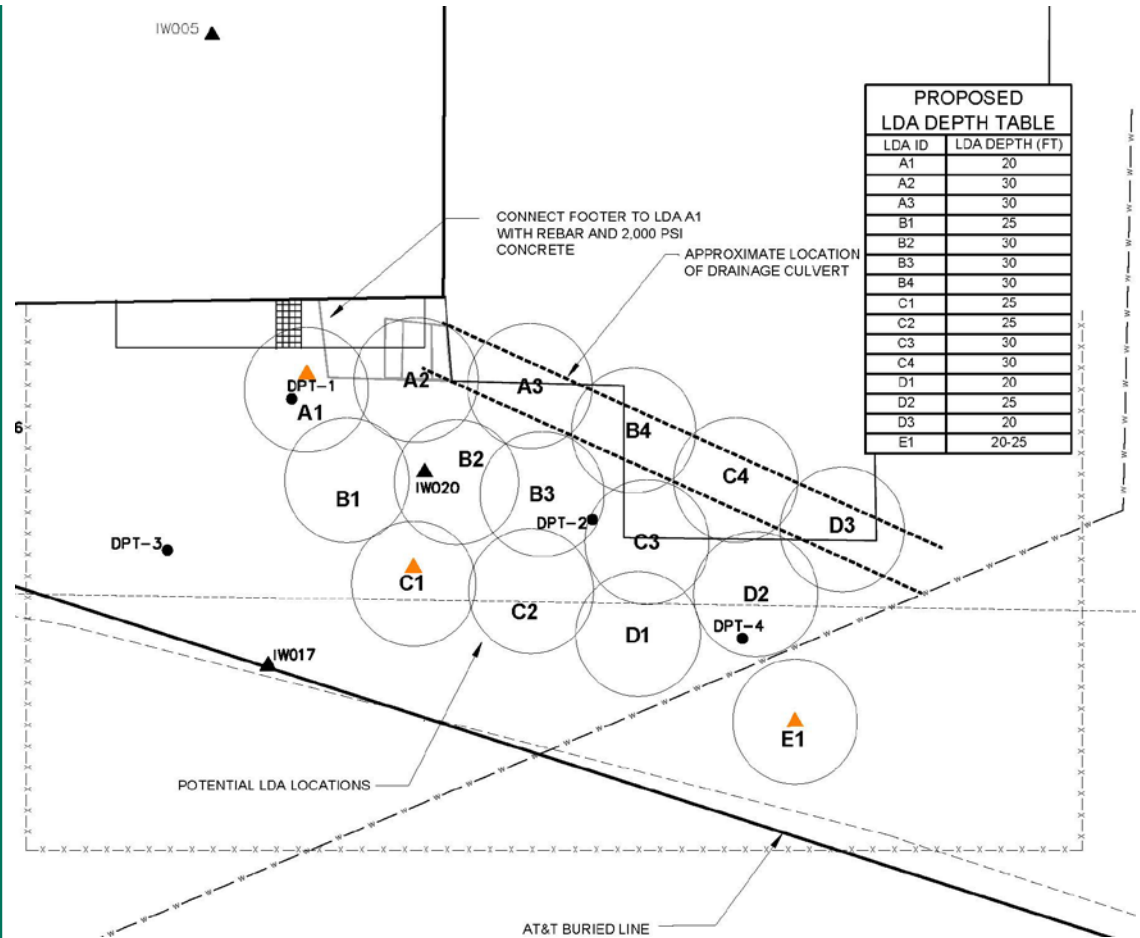


Proposed LDA Boring Locations

Interim Source Removal Work Plan (June 2011)

Details

- Excavation using LDAs as conventional methods not feasible given site constraints and proposed depth
- 15 locations
- Approximate 30x15 square foot area
- 20 to 30 foot depth
- Waste disposal estimates based on DPT assessment
- 3 downgradient injection wells with CHITOREM® component
- Estimated cost ~\$300K





Funding

- Due to the estimated cost to implement the ISR, the funding was split over two fiscal years
- In June 2015, FDEP approved the first half of the work
 - Pre-construction activities (access, utility locate, kick-off meeting)
 - LDA excavation, injection well installation, and site restoration
- The remaining portion was approved in December 2015
 - Hazardous and non-hazardous waste disposal
 - Laboratory
 - Reporting



Interim Source Removal Activities

- January 18, 2016 – Mobilization and site preparation



LDA Rig



Asphalt and Concrete Removal



Health and Safety

- Site specific health and safety plan
- Daily job safety briefings
- Work zones and equipment fenced each day





Interim Source Removal Activities



Storm drain and pipe removal



Test hole location



Interim Source Removal Activities



Surface Casing



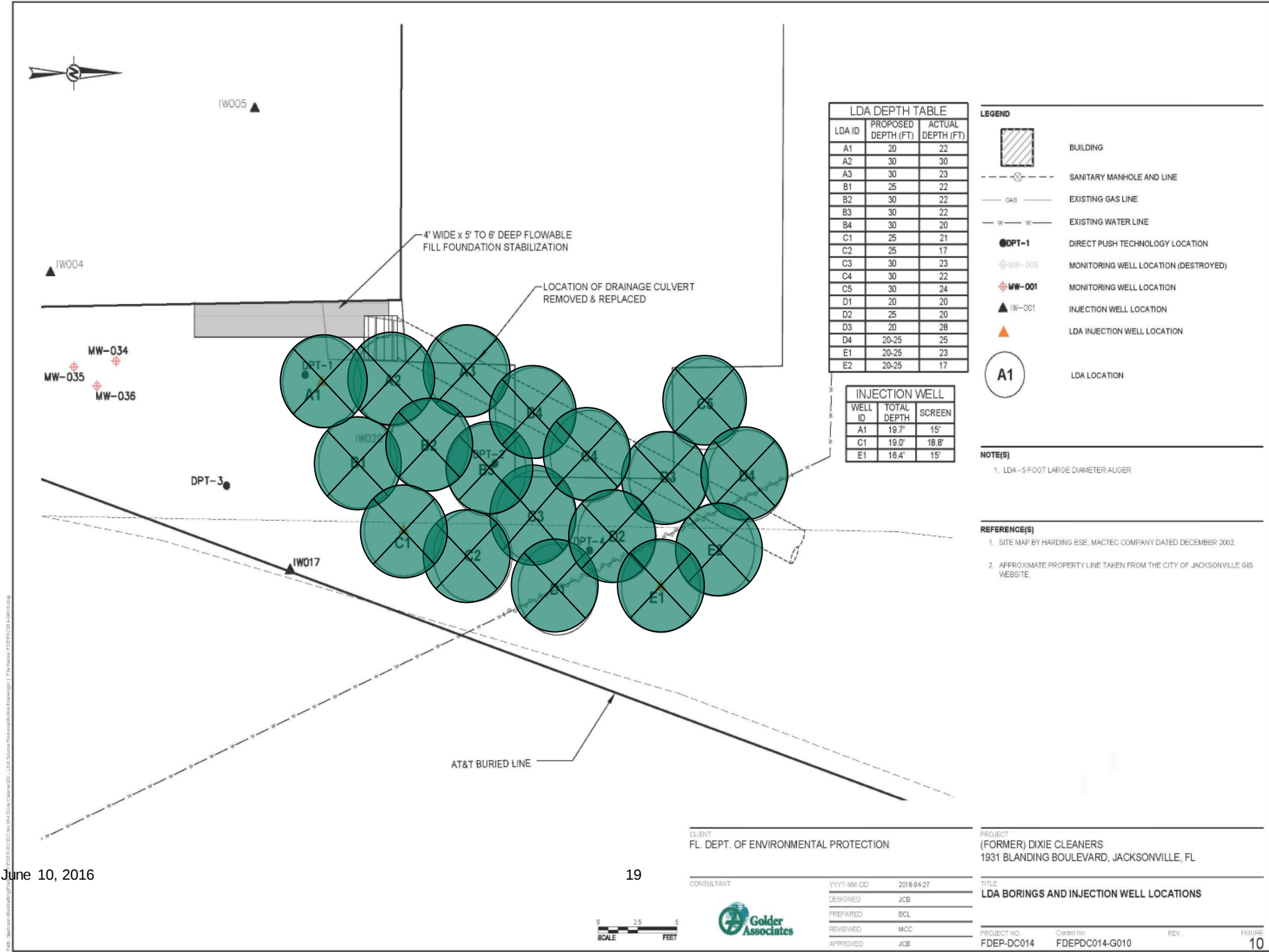
LDA advanced within casing



Interim Source Removal Activities

- LDA borings were advanced in a staggered fashion so that the flowable backfill had sufficient curing time (~48 hours)





LDA DEPTH TABLE		
LDA ID	PROPOSED DEPTH (FT)	ACTUAL DEPTH (FT)
A1	20	22
A2	30	30
A3	30	23
B1	25	22
B2	30	22
B3	30	22
B4	30	20
C1	25	21
C2	25	17
C3	30	23
C4	30	22
C5	30	24
D1	20	20
D2	25	20
D3	20	28
D4	20-25	25
E1	20-25	23
E2	20-25	17

INJECTION WELL		
WELL ID	TOTAL DEPTH	SCREEN
A1	19.7'	15'
C1	19.0'	18.8'
E1	16.4'	15'

LEGEND

 BUILDING

 SANITARY MANHOLE AND LINE

 EXISTING GAS LINE

 EXISTING WATER LINE

 DPT-1 DIRECT PUSH TECHNOLOGY LOCATION

 MW-005 MONITORING WELL LOCATION (DESTROYED)

 MW-001 MONITORING WELL LOCATION

 IW-001 INJECTION WELL LOCATION

 LDA INJECTION WELL LOCATION

 A1 LDA LOCATION

NOTE(S)

1. LDA - 5 FOOT LARGE DIAMETER AUGER

REFERENCE(S)

1. SITE MAP BY HARDING ESE, MACTEC COMPANY DATED DECEMBER 2002.

2. APPROXIMATE PROPERTY LINE TAKEN FROM THE CITY OF JACKSONVILLE GIS WEBSITE.



Interim Source Removal Activities

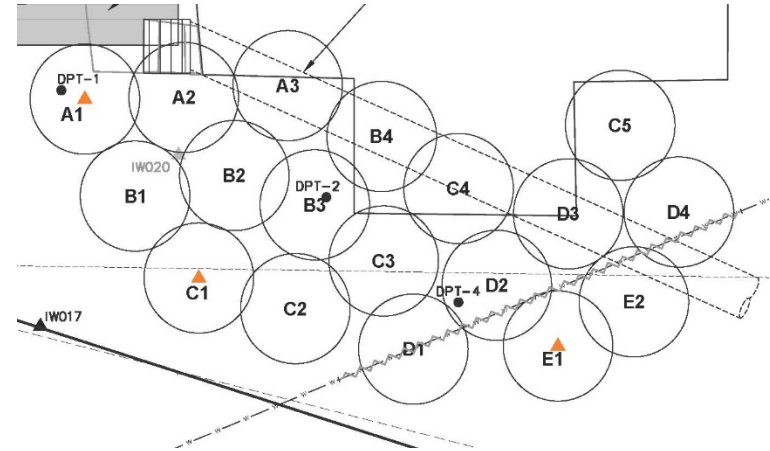
- Apparent DNAPL observed entering the sidewalls of LDA boring location D-3 at a depth of ~22 feet bgs
- Boring located along storm drain pathway
- Three additional LDA borings were added; one north (D-4), one northwest (C-5), and one northeast (E-2)





Injection Well Installation

- Injection wells installed in A-1, C-1, and E-1 boreholes
- 15 feet of screen (4-inch diameter)
- Total depths from ~17 to 20 feet bgs
- 330 pounds of CHITOREM[®] per well boring





Site Restoration

- Affected utilities repaired or replaced
- ~5,500 square feet of asphalt
- Concrete ramp replaced
- Monitoring well pads raised





LDA Excavation Summary

- 18 total LDA borings excavated from 1/20/16 to 2/5/16
- Excavated depths ranged from 17 to 30 feet and depended on borehole stability
- Cumulative depth of the 18 LDA boreholes was 401 feet
- 3 injection wells installed along downgradient edge of excavation area
- Approximately 323 cubic yards of flowable fill
- Affected utilities were repaired or replaced
- Approximately 5,500 square feet of asphalt were replaced



Field Screening of Excavated Soils

- Minimize disposal costs by segregating suspected hazardous and non-hazardous waste into separate roll-off containers
- Field screening conducted on each lift (~1-2 feet of soil) with an OVA-PID meter





Waste Characterization and Disposal

- Composite samples were collected from each roll-off container for total chlorinated VOC analysis on a 24-hour turnaround time and an extraction for TCLP analysis (if necessary)
- If concentrations approached 14 mg/kg for PCE, 10 mg/kg for TCE, or 4 mg/kg for vinyl chloride, the TCLP analysis for VOCs was completed
- Hazardous waste soil with chlorinated VOC concentrations greater than 10x the Universal Treatment Standard (60 mg/kg) was transported to US Ecology's facility in Belleville, Michigan for treatment and disposal
- Hazardous waste soil with chlorinated VOC concentrations less than 10x the UTS (60 mg/kg) was transported to US Ecology's facility in Belleville, Michigan for disposal without treatment
- Non-hazardous waste soil transported to the Omni Waste Facility in St. Cloud, Florida for disposal



Roll-off Sampling Results

Roll-Off ID	Contents	Date Sampled	PCE Soil Concentration (mg/Kg)	TCLP PCE (mg/L)	TCE Soil Concentration (mg/Kg)	TCLP TCE (mg/L)	VC Soil Concentration (mg/Kg)	TCLP VC (mg/L)	Waste Characterization Result
Residential SCTL			8.8	-	6.4	-	0.2	-	-
TCLP Limit			-	0.7	-	0.5	-	0.2	-
10x UTS			60	-	60	-	60	-	-
RO-002	Soil	1/20/2016	1,100	11	0.88 L	0.056 U	0.0030 U	0.047 U	Hazardous; Greater than 10x UTS
RO-003	Soil	1/20/2016	600	5.6	1.3 L	0.029 U	0.040	0.024 U	Hazardous; Greater than 10x UTS
RO-004	Soil	1/21/2016	44 V	0.76	2.4 U	0.036 U	2.9 U	0.030 U	Hazardous; Less than 10x UTS
RO-005	Soil	1/21/2016	610 V	13	6.4 U	0.17	7.7 U	0.031 U	Hazardous; Greater than 10x UTS
RO-006	Soil	1/22/2016	13	0.053	0.68 I	0.0082 I	0.65 U	0.0030 U	Non-Hazardous
RO-007	Soil	1/28/2016	440	23	9.1 U	0.51 U	11 U	0.61 U	Hazardous; Greater than 10x UTS
RO-008	Soil	1/28/2016	260	3.2	3.3 U	0.20 U	3.9 U	0.24 U	Hazardous; Greater than 10x UTS
RO-009	Soil	1/26/2016	1,400	25	14 U	0.10 I	17 U	0.048 U	Hazardous; Greater than 10x UTS
RO-010	Soil	1/26/2016	190	6.8	0.99 U	0.029 U	1.2 U	0.024 U	Hazardous; Greater than 10x UTS
RO-011	Soil	1/26/2016	960	44	9.2 U	0.14 U	11 U	0.12 U	Hazardous; Greater than 10x UTS
RO-012	Soil	2/1/2016	7.5	0.071	1.2 U	0.010 U	1.4 U	0.012 U	Non-Hazardous
RO-013	Soil	2/2/2016	300	7.0	0.85 U	0.072 U	0.71 U	0.074 U	Hazardous; Greater than 10x UTS
RO-014	Soil	2/1/2016	420	14	6.3 U	0.31 U	7.6 U	0.37 U	Hazardous; Greater than 10x UTS
RO-015	Soil	2/2/2016	37	3.0	0.84 U	0.036 U	0.69 U	0.037 U	Hazardous; Less than 10x UTS
RO-016	Soil	2/4/2016	0.21	0.019 I	0.0022 U	0.0029 U	0.0027 U	0.0020 U	Non-Hazardous
RO-017	Soil	2/4/2016	190	27	1.3 U	0.022 I	1.5 U	0.0020 U	Hazardous; Greater than 10x UTS
RO-018	Soil	2/5/2016	12	0.52	0.65	0.0029 U	0.13 U	0.0020 U	Non-Hazardous



Waste Characterization, Transport, & Disposal

- 345.19 tons of hazardous waste soil (greater than 10x the UTS)
- 61.05 tons of hazardous waste soil (less than 10x the UTS)
- 18 total truckloads for hazardous waste transport
- 125.15 tons of non-hazardous waste soil
- 4 total truckloads for non-hazardous waste transport
- Weights verified by nearby offsite scales





Next Steps

- Groundwater sampling event scheduled for summer 2016 to evaluate the effects of the LDA excavation the CHITOREM[®] application
- Continued enhanced bioremediation, based on groundwater sampling results



Questions?

