Agenda
September 11, 2017
NWIRP/Northrop Grumman Groundwater Quarterly Coordination Meeting

1. Introductions

2. U.S. Navy Update

a. Additional contaminant/plume delineation

b. Sentinel/Outpost monitoring well program results

c. GM-38 update

d. Status of RE-108 Area & Interim Hot Spot Conveyance System (Phase I RE-108)

1) RE-108 / Phase 1 RE-108 schedule
2) Recovery Well (RE-137) pumping test update
3) Property acquisition for RE-108 treatment system (wells, conveyance, treatment, and discharge)
4) Possible use of BWD Plant 6 & comparison to RE-108 scenarios
   - *I.* Pumping wells
   - *II.* Treatment system
   - *III.* Property
5) Possible Re-Use of Treated Water from BWD Plant 6 for Public Water Supply
6) Update Phase I RE-108 design

e. Update on Navy reporting to Congress per the Water Infrastructure and Investment Act

f. Community Outreach Activities

1) April 5, 2017 RAB Meeting

3. Northrop Grumman Update

a. Status of ONCT and BPCP Groundwater Containment Systems

b. Hydraulic Effectiveness Evaluation

c. Status of RW-21 Area

1) RW-20 installation
2) Conveyance piping, treatment system, and discharge status
3) Schedule

d. Community Outreach Activities

1) NG/NYSDEC development of community outreach materials, as needed, for future NG work

4. U.S. Navy and Northrop Grumman Coordination

a. Recent activities related to project coordination

b. Coordination on RE-108 hot spot work – Possible RE-108 modeling assistance

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5. Bethpage Water District Plant 6 Update

a. Plant 6 upgrade project

6. NYSDEC Update on Status of efforts regarding Chapter 543 of the Laws of 2014

a. Evaluation of options relative to the groundwater plume associated with the former Navy/Grumman Bethpage facility – and next steps following the HDR report

b. Three major components:

1) VPB drilling/Monitoring Well Installation
2) Groundwater Flow Modeling
3) Feasibility Study

c. October 2017 Outreach

7. NYSDEC Report on Radiological Investigations

8. Follow-Up Items From Previous Meetings:

a. Navy to provide an analysis of cost and time to implement differences associated with treating groundwater at BWD Plant 6 versus treating groundwater at the GM-38 treatment plant

b. Include the influence of BWD Well 6-2 into the Northrop Grumman presentation of the groundwater trend data.

9. Next Quarterly Meeting Date, Location, and Adjournment

a. Bring calendars to select dates for next quarterly meeting

NWIRP / Northrop Grumman Groundwater Quarterly Coordination Meeting

2nd Quarter 2017

Northrop Grumman Offices, NY

	Name	Organization	Email Address	Phone Number	Sign-In
1	Michael Boufis	Bethpage Water District, Superintendent	mboufis@bethpagewater.com	(516)931-0093	
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NWIRP / Northrop Grumman Groundwater Quarterly Coordination Meeting

2nd Quarter 2017

Northrop Grumman Offices, NY

	Name	Organization	Email Address	Phone Number	Sign-In
21	Ralph Atoria	South Farmingdale WD, Commissioner	ratoria@sfwater.com	(516) 250-3089 (516) 249-3330	
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29	~~Catherine McCabe~~	U.S. EPA	McCabe.Catherine@epa.gov		
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NAVFAC
Naval Facilities Engineering Command

NAVY UPDATE
QUARTERLY PROGRESS MEETING
SEPTEMBER 11, 2017

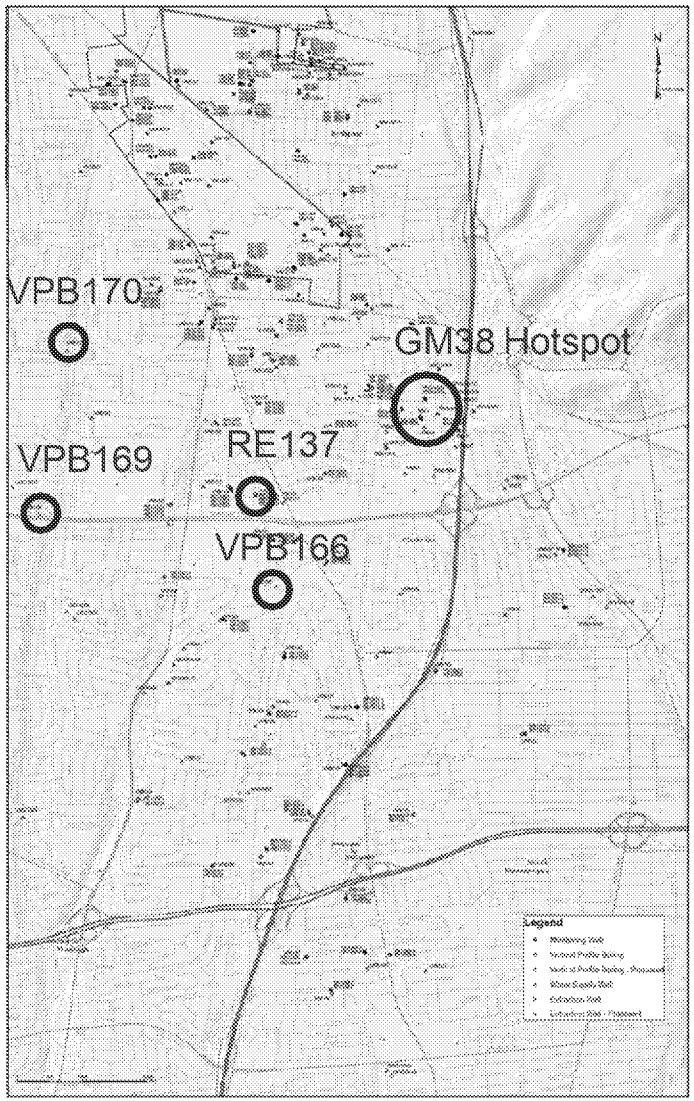
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK

AGENDA

- Navy Drilling/Monitoring Program Overview – Current Status
- GM38 Area Hotspot Treatment System
- RE108 Area Hotspot Treatment System, Phase I and II

NAVY PROGRESS OVERVIEW – CURRENT STATUS

- Drilling program – Ongoing
  - Currently at VPB166 Location
  - VPB169, 170 completed
- Quarterly groundwater monitoring
  - RE108 and Outpost Wells
- Operation and monitoring of the GM38 Hotspot Treatment System
  - 1,000 gallons per minute (gpm) system, currently evaluating potential for shutdown in near future
- Pre-Design activities for the RE108 Hotspot Treatment System
  - RE 137 pumping test evaluation
  - Phase I Design Report – Internal review and contractor procurement underway



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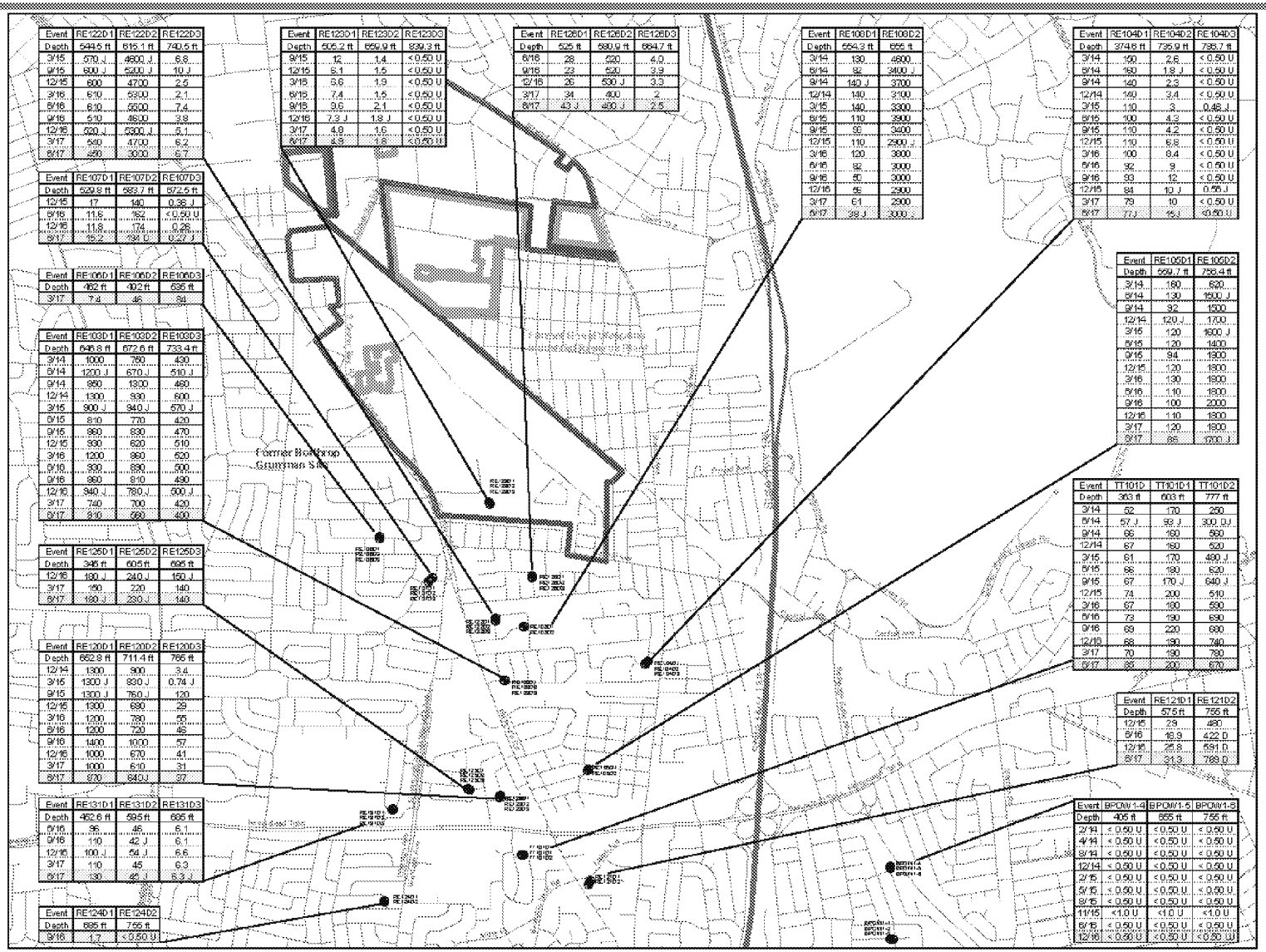
QUARTERLY GROUNDWATER SAMPLING
NORTHERN WELLS - TCE



Event	RE122D1	RE122D2	RE122D3
Depth	544.5 ft	615.1 ft	740.5 ft
3/15	570 J	4600 J	6.8
9/15	600 J	5200 J	10 J
12/15	600	4700	2.5
3/16	610	5300	2.1
6/16	610	5500	7.4
9/16	610	4600	3.8
12/16	590	5300 J	6.1
3/17	640	4700	5.2
6/17	490	3000	5.7

Event	RE107D1	RE107D2	RE107D3
Depth	529.8 ft	589.7 ft	672.5 ft
12/15	17	140	0.38 J
3/16	11.5	152	< 0.50 U
12/16	11.5	174	0.26
6/17	15.2	194 D	0.27 J

Event	RE106D1	RE106D2	RE106D3
Depth	462 ft	492 ft	635 ft
3/17	7.4	46	84

Event	RE103D1	RE103D2	RE103D3
Depth	646.8 ft	672.6 ft	733.4 ft
3/14	1000	760	430
6/14	1200 J	670 J	510 J
9/14	950	1300	460
12/14	1300	930	600
3/15	900 J	940 J	570 J
6/15	810	770	420
9/15	980	830	470
12/15	930	820	510
3/16	1200	960	520
6/16	930	890	500
9/16	960	910	490
12/16	940 J	780 J	500 J
3/17	740	700	420
6/17	910	860	490

Event	RE125D1	RE125D2	RE125D3
Depth	345 ft	605 ft	695 ft
12/15	190 J	240 J	150 J
3/17	190	220	140
6/17	190 J	230 J	140

Event	RE120D1	RE120D2	RE120D3
Depth	662.8 ft	711.4 ft	765 ft
12/14	1300	900	3.4
3/15	1300 J	830 J	0.74 J
9/15	1300 J	750 J	120
12/15	1300	690	29
3/16	1200	780	55
6/16	1200	720	45
9/16	1400	1000	57
12/16	1000	670	41
3/17	1000	610	31
6/17	970	840 J	37

Event	RE131D1	RE131D2	RE131D3
Depth	462.6 ft	595 ft	695 ft
6/16	96	45	6.1
9/16	110	42 J	6.1
12/16	100 J	54 J	6.6
3/17	110	45	6.3
6/17	130	45 J	6.3 J

Event	RE124D1	RE124D2
Depth	695 ft	755 ft
9/16	1.7	< 0.50 U

Event	RE123D1	RE123D2	RE123D3
Depth	505.2 ft	659.9 ft	839.3 ft
9/15	12	1.4	< 0.50 U
12/15	6.1	1.5	< 0.50 U
3/16	9.6	1.9	< 0.50 U
6/16	7.4	1.5	< 0.50 U
9/16	9.6	2.1	< 0.50 U
12/16	7.3 J	1.9 J	< 0.50 U
3/17	4.9	1.6	< 0.50 U
6/17	4.9	1.6	< 0.50 U

Event	RE126D1	RE126D2	RE126D3
Depth	525 ft	680.9 ft	864.7 ft
6/16	28	520	4.0
9/16	23	520	3.9
12/16	26	530 J	3.3
3/17	34	400	2
6/17	43 J	480 J	2.5

Event	RE108D1	RE108D2
Depth	554.3 ft	655 ft
3/14	130	4800
6/14	92	3400 J
9/14	140 J	3700
12/14	140	3100
3/15	140	3300
6/15	110	3900
9/15	95	3400
12/15	110	2900 J
3/16	120	3000
6/16	92	3000
9/16	85	3000
12/16	95	2900
3/17	61	2900
6/17	39 J	3000

Event	RE104D1	RE104D2	RE104D3
Depth	374.6 ft	735.9 ft	785.7 ft
3/14	150	2.6	< 0.50 U
6/14	180	1.8 J	< 0.50 U
9/14	140	2.3	< 0.50 U
12/14	140	3.4	< 0.50 U
3/15	110	3	0.46 J
6/15	100	4.3	< 0.50 U
9/15	110	4.2	< 0.50 U
12/15	110	5.6	< 0.50 U
3/16	100	8.4	< 0.50 U
6/16	92	9	< 0.50 U
9/16	93	12	< 0.50 U
12/16	84	10 J	0.55 J
3/17	79	10	< 0.50 U
6/17	77 J	15 J	< 0.50 U

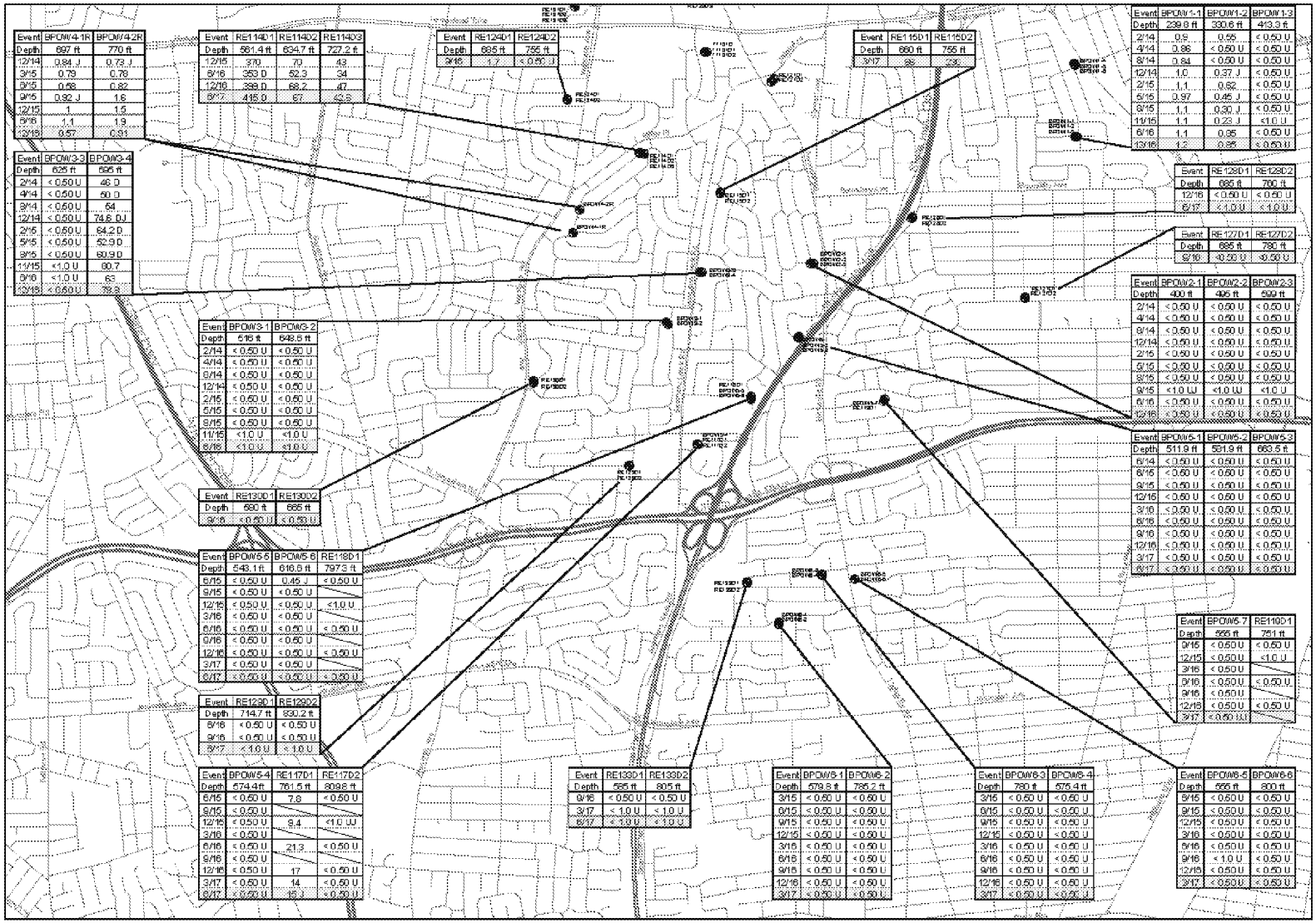
Event	RE105D1	RE105D2
Depth	559.7 ft	735.4 ft
3/14	180	620
6/14	130	1500 J
9/14	92	1500
12/14	120 J	1700
3/15	120	1600 J
6/15	120	1400
9/15	94	1900
12/15	120	1800
3/16	130	1900
6/16	110	1800
9/16	100	2000
12/16	110	1800
3/17	120	1900
6/17	85	1700 J

Event	TT101D	TT101D1	TT101D2
Depth	363 ft	603 ft	777 ft
3/14	52	170	250
6/14	57 J	93 J	300 DJ
9/14	66	160	590
12/14	67	160	620
3/15	61	170	490 J
6/15	66	190	620
9/15	67	170 J	640 J
12/15	74	200	510
3/16	67	190	590
6/16	73	190	690
9/16	69	220	680
12/16	68	190	740
3/17	70	190	780
6/17	65	200	670

Event	RE121D1	RE121D2
Depth	57.5 ft	755 ft
12/15	29	480
6/16	16.9	422 D
12/16	21.8	591 D
6/17	21.3	769 D

Event	BPOW1-4	BPOW1-5	BPOW1-6
Depth	405 ft	655 ft	755 ft
2/14	< 0.50 U	< 0.50 U	< 0.50 U
4/14	< 0.50 U	< 0.50 U	< 0.50 U
8/14	< 0.50 U	< 0.50 U	< 0.50 U
12/14	< 0.50 U	< 0.50 U	< 0.50 U
2/15	< 0.50 U	< 0.50 U	< 0.50 U
5/15	< 0.50 U	< 0.50 U	< 0.50 U
8/15	< 0.50 U	< 0.50 U	< 0.50 U
11/15	<1.0 U	<1.0 U	<1.0 U
6/16	< 0.50 U	< 0.50 U	< 0.50 U
12/16	< 0.50 U	< 0.50 U	< 0.50 U

QUARTERLY GROUNDWATER SAMPLING
SOUTHERN WELLS – TCE



Event	BPOW4-1R	BPOW4-2R
Depth	697 ft	770 ft
12/14	0.84 J	0.73 J
3/15	0.79	0.79
6/15	0.58	0.82
9/15	0.92 J	1.6
12/15	1	1.5
6/16	1.1	1.9
12/16	0.57	0.91

Event	RE114D1	RE114D2	RE114D3
Depth	561.4 ft	634.7 ft	727.2 ft
12/15	370	70	43
6/16	353 D	52.3	34
12/16	338 D	68.2	47
6/17	415 D	67	43.5

Event	RE124D1	RE124D2
Depth	685 ft	755 ft
9/16	1.7	< 0.50 U

Event	RE115D1	RE115D2
Depth	660 ft	755 ft
3/17	85	230

Event	BPOW1-1	BPOW1-2	BPOW1-3
Depth	239.9 ft	330.6 ft	413.3 ft
2/14	0.9	0.55	< 0.50 U
4/14	0.86	< 0.50 U	< 0.50 U
8/14	0.84	< 0.50 U	< 0.50 U
12/14	1.0	0.37 J	< 0.50 U
2/15	1.1	0.52	< 0.50 U
5/15	0.97	0.45 J	< 0.50 U
8/15	1.1	0.30 J	< 0.50 U
11/15	1.1	0.23 J	<1.0 U
6/16	1.1	0.35	< 0.50 U
12/16	1.2	0.35	< 0.50 U

Event	BPOW3-3	BPOW3-4
Depth	625 ft	695 ft
2/14	< 0.50 U	46 D
4/14	< 0.50 U	50 D
8/14	< 0.50 U	54
12/14	< 0.50 U	74.6 DJ
2/15	< 0.50 U	64.2 D
5/15	< 0.50 U	52.9 D
8/15	< 0.50 U	60.9 D
11/15	<1.0 U	60.7
6/16	<1.0 U	63
12/16	< 0.50 U	78.3

Event	RE129D1	RE129D2
Depth	685 ft	760 ft
12/16	< 0.50 U	< 0.50 U
6/17	<1.0 U	<1.0 U

Event	RE127D1	RE127D2
Depth	695 ft	790 ft
9/16	< 0.50 U	< 0.50 U

Event	BPOW2-1	BPOW2-2	BPOW2-3
Depth	400 ft	495 ft	599 ft
2/14	< 0.50 U	< 0.50 U	< 0.50 U
4/14	< 0.50 U	< 0.50 U	< 0.50 U
8/14	< 0.50 U	< 0.50 U	< 0.50 U
12/14	< 0.50 U	< 0.50 U	< 0.50 U
2/15	< 0.50 U	< 0.50 U	< 0.50 U
5/15	< 0.50 U	< 0.50 U	< 0.50 U
8/15	< 0.50 U	< 0.50 U	< 0.50 U
9/15	<1.0 UJ	<1.0 UJ	<1.0 U
6/16	< 0.50 U	< 0.50 U	< 0.50 U
12/16	< 0.50 U	< 0.50 U	< 0.50 U

Event	BPOW3-1	BPOW3-2
Depth	516 ft	648.5 ft
2/14	< 0.50 U	< 0.50 U
4/14	< 0.50 U	< 0.50 U
8/14	< 0.50 U	< 0.50 U
12/14	< 0.50 U	< 0.50 U
2/15	< 0.50 U	< 0.50 U
5/15	< 0.50 U	< 0.50 U
8/15	< 0.50 U	< 0.50 U
11/15	<1.0 U	<1.0 U
6/16	<1.0 U	<1.0 U

Event	BPOW5-1	BPOW5-2	BPOW5-3
Depth	511.9 ft	581.9 ft	663.5 ft
6/14	< 0.50 U	< 0.50 U	< 0.50 U
6/15	< 0.50 U	< 0.50 U	< 0.50 U
9/15	< 0.50 U	< 0.50 U	< 0.50 U
12/15	< 0.50 U	< 0.50 U	< 0.50 U
3/16	< 0.50 U	< 0.50 U	< 0.50 U
6/16	< 0.50 U	< 0.50 U	< 0.50 U
9/16	< 0.50 U	< 0.50 U	< 0.50 U
12/16	< 0.50 U	< 0.50 U	< 0.50 U
3/17	< 0.50 U	< 0.50 U	< 0.50 U
6/17	< 0.50 U	< 0.50 U	< 0.50 U

Event	RE130D1	RE130D2
Depth	580 ft	665 ft
9/16	< 0.50 U	< 0.50 U

Event	BPOW5-5	BPOW5-6	RE118D1
Depth	543.1 ft	616.8 ft	797.3 ft
6/15	< 0.50 U	0.45 J	< 0.50 U
9/15	< 0.50 U	< 0.50 U	
12/15	< 0.50 U	< 0.50 U	<1.0 U
3/16	< 0.50 U	< 0.50 U	
6/16	< 0.50 U	< 0.50 U	< 0.50 U
9/16	< 0.50 U	< 0.50 U	
12/16	< 0.50 U	< 0.50 U	< 0.50 U
3/17	< 0.50 U	< 0.50 U	
6/17	< 0.50 U	< 0.50 U	< 0.50 U

Event	BPOW5-7	RE119D1
Depth	555 ft	751 ft
9/15	< 0.50 U	< 0.50 U
12/15	< 0.50 U	<1.0 U
3/16	< 0.50 U	
6/16	< 0.50 U	< 0.50 U
9/16	< 0.50 U	
12/16	< 0.50 U	< 0.50 U
3/17	< 0.50 UJ	

Event	RE129D1	RE129D2
Depth	714.7 ft	830.2 ft
6/16	< 0.50 U	< 0.50 U
9/16	< 0.50 U	< 0.50 U
6/17	<1.0 U	<1.0 U

Event	BPOW5-4	RE117D1	RE117D2
Depth	574.4 ft	761.5 ft	809.8 ft
6/15	< 0.50 U	7.8	< 0.50 U
9/15	< 0.50 U		
12/15	< 0.50 U	9.4	<1.0 UJ
3/16	< 0.50 U		
6/16	< 0.50 U	21.3	< 0.50 U
9/16	< 0.50 U		
12/16	< 0.50 U	17	< 0.50 U
3/17	< 0.50 U	14	< 0.50 U
6/17	< 0.50 U	15 J	< 0.50 U

Event	RE133D1	RE133D2
Depth	585 ft	805 ft
9/16	< 0.50 U	< 0.50 U
3/17	< 1.0 U	< 1.0 U
6/17	< 1.0 U	< 1.0 U

Event	BPOW6-1	BPOW6-2
Depth	579.8 ft	785.2 ft
3/15	< 0.50 U	< 0.50 U
6/15	< 0.50 U	< 0.50 U
9/15	< 0.50 U	< 0.50 U
12/15	< 0.50 U	< 0.50 U
3/16	< 0.50 U	< 0.50 U
6/16	< 0.50 U	< 0.50 U
9/16	< 0.50 U	< 0.50 U
12/16	< 0.50 U	< 0.50 U
3/17	< 0.50 U	< 0.50 U

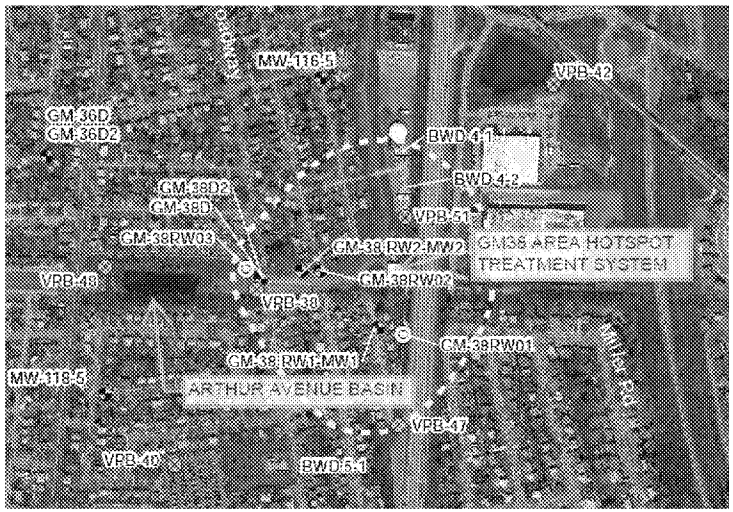
Event	BPOW6-3	BPOW6-4
Depth	780 ft	575.4 ft
3/15	< 0.50 U	< 0.50 U
6/15	< 0.50 U	< 0.50 U
9/15	< 0.50 U	< 0.50 U
12/15	< 0.50 U	< 0.50 U
3/16	< 0.50 U	< 0.50 U
6/16	< 0.50 U	< 0.50 U
9/16	< 0.50 U	< 0.50 U
12/16	< 0.50 U	< 0.50 U
3/17	< 0.50 U	< 0.50 U

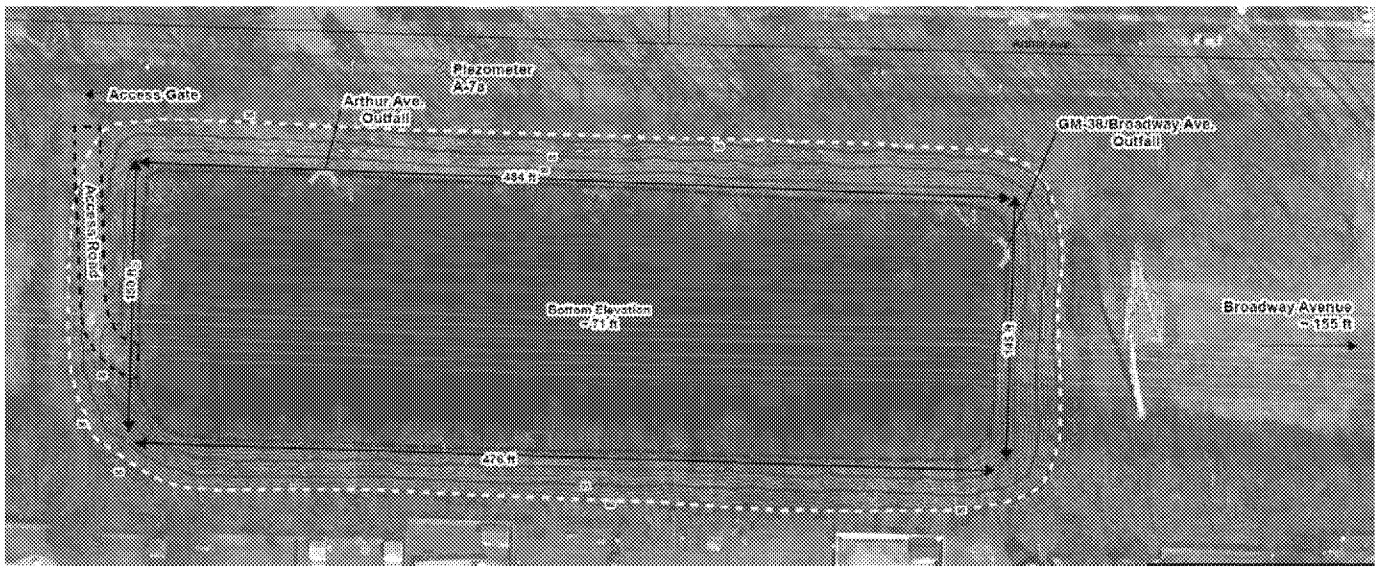
Event	BPOW6-5	BPOW6-6
Depth	555 ft	800 ft
6/15	< 0.50 U	< 0.50 U
9/15	< 0.50 U	< 0.50 U
12/15	< 0.50 U	< 0.50 U
3/16	< 0.50 U	< 0.50 U
6/16	< 0.50 U	< 0.50 U
9/16	< 1.0 U	< 0.50 U
12/16	< 0.50 U	< 0.50 U
3/17	< 0.50 U	< 0.50 U

GM38 AREA HOTSPOT TREATMENT SYSTEM

- VOC concentrations continuing to decrease, TCE currently at 100 micrograms per liter

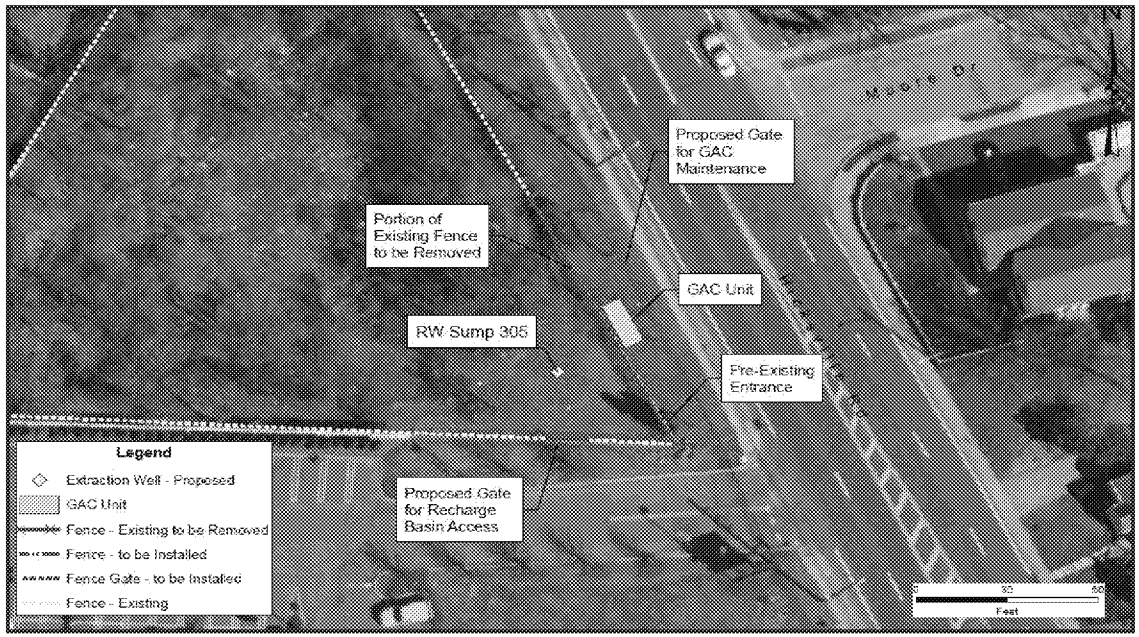
- Removal of accumulated sediment in basin #495
  - Work plan submitted to NYSDEC, Town and Nassau County
  - Concurrence received by NYSDEC
  - Waiting for responses from Town and County

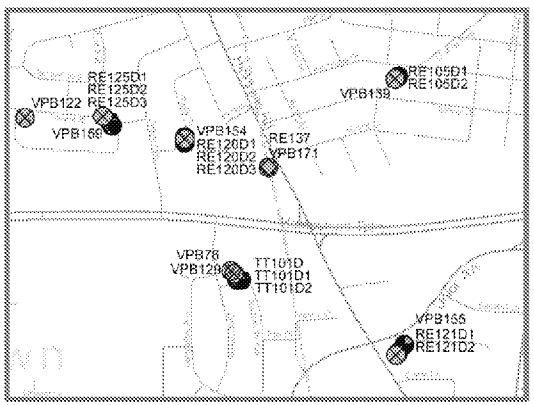




VPB 171 AND RE137 WELL PUMPING TEST

- VPB171 and a test recovery well (RE137) in Nassau County recharge basin #305, near intersection of Hicksville Road and Hempstead Turnpike
- Aquifer testing to evaluate the capture zone of the test recovery was conducted in April 2017
- Data analysis is ongoing





STATUS OF RECOVERY WELL RE137 TEST

- **Recovery Well RE137 installed for aquifer testing**
  - 12-inch diameter well, 750 feet depth below ground surface (bgs)
  - 115 feet of screen (630 – 745 feet bgs)

- **Step Testing** at 100, 200, 300 gpm performed on April 10, 2017

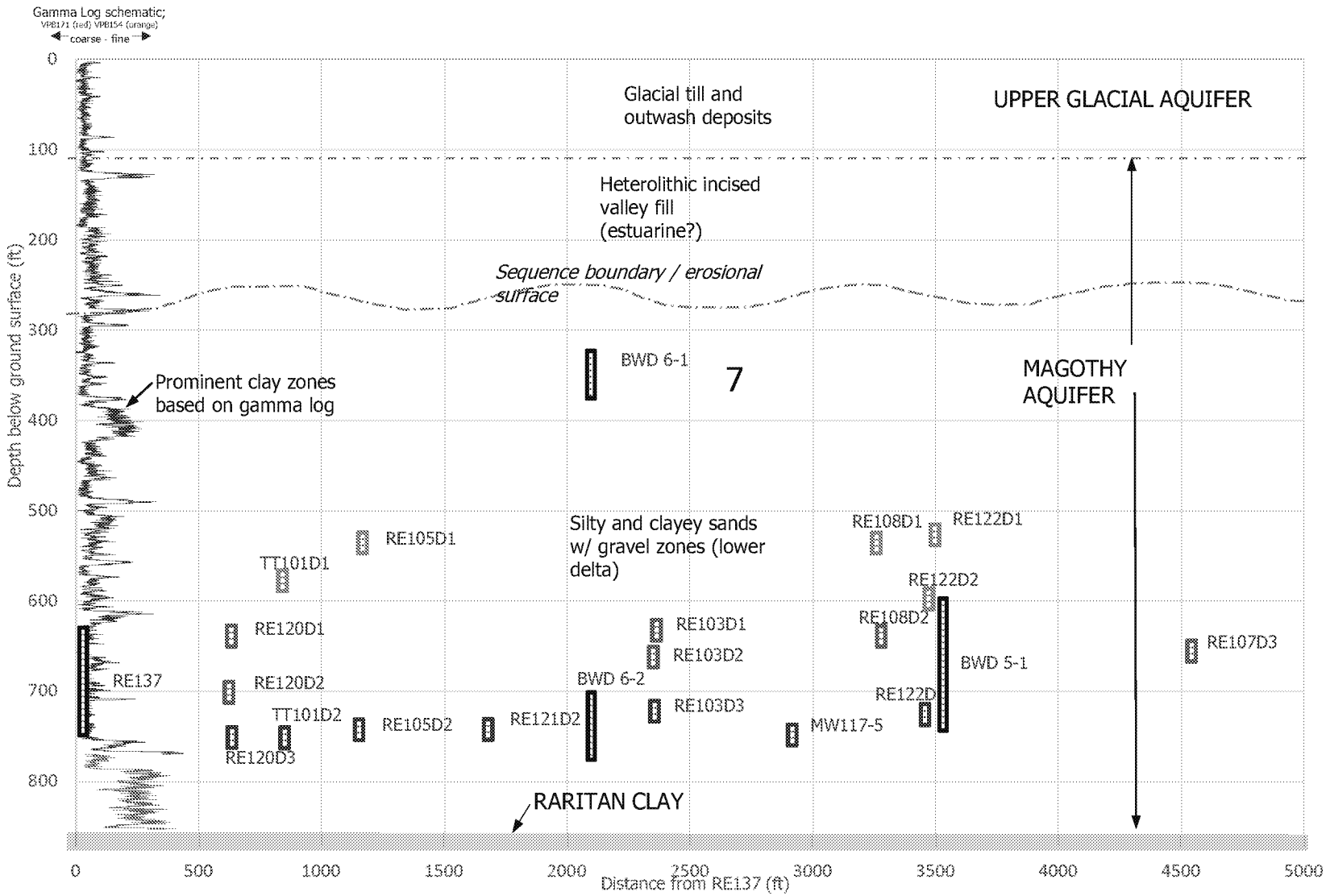
- **Constant Rate Test** conducted at average 741 gpm for 3 days
  - Water levels in monitoring wells throughout the area were evaluated
  - Total drawdown approximately 17 feet;
  - Stabilization at approximately 100 minutes

- **Capture zone** to be estimated using aquifer parameters and analytical equations

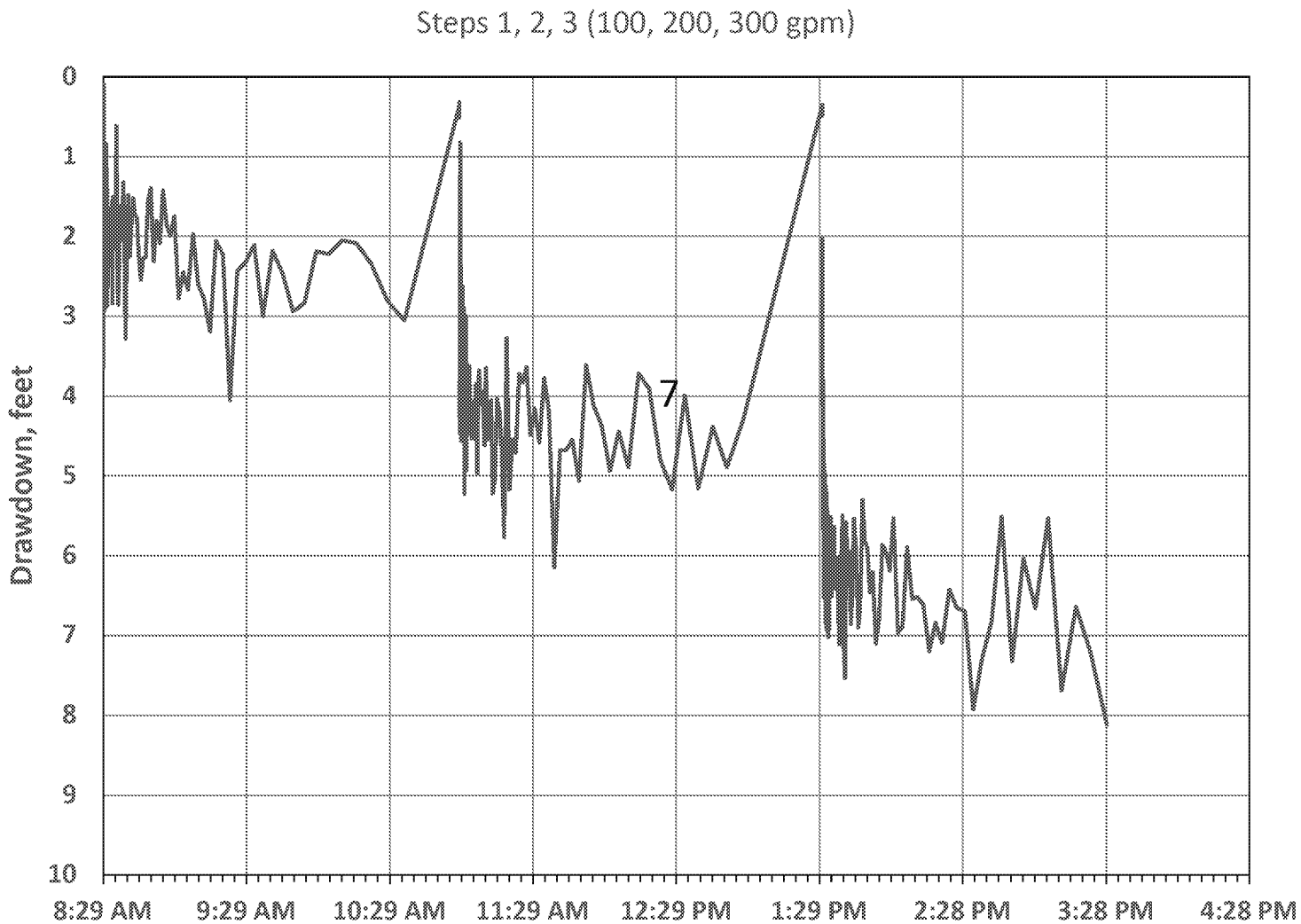
- **Modeling** is being used to predict RE137 capture zone

- **Data analysis** expected to be completed in November

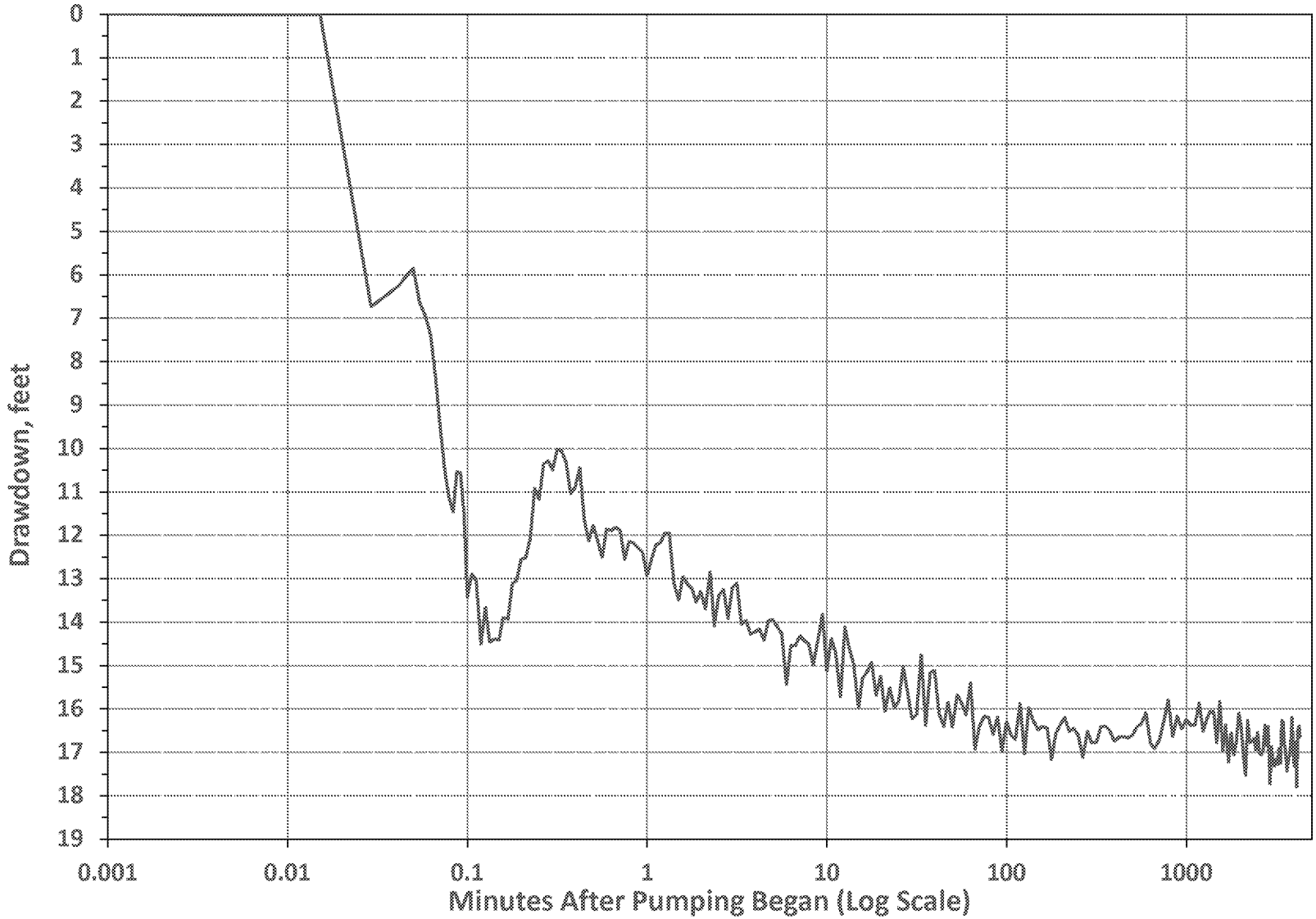
HYDROGEOLIGIC CONCEPTUAL SITE MODEL FOR RE137 AREA – SPATIAL DISTRIBUTION OF OBSERVATION WELLS



WELL RE137 WATER LEVEL DRAWDOWN STEP PUMPING TEST, APRIL 10, 2017



WELL RE137 WATER LEVEL DRAWDOWN
CONSTANT RATE PUMP TEST, APRIL 11, 2017



RE108 HOTSPOT

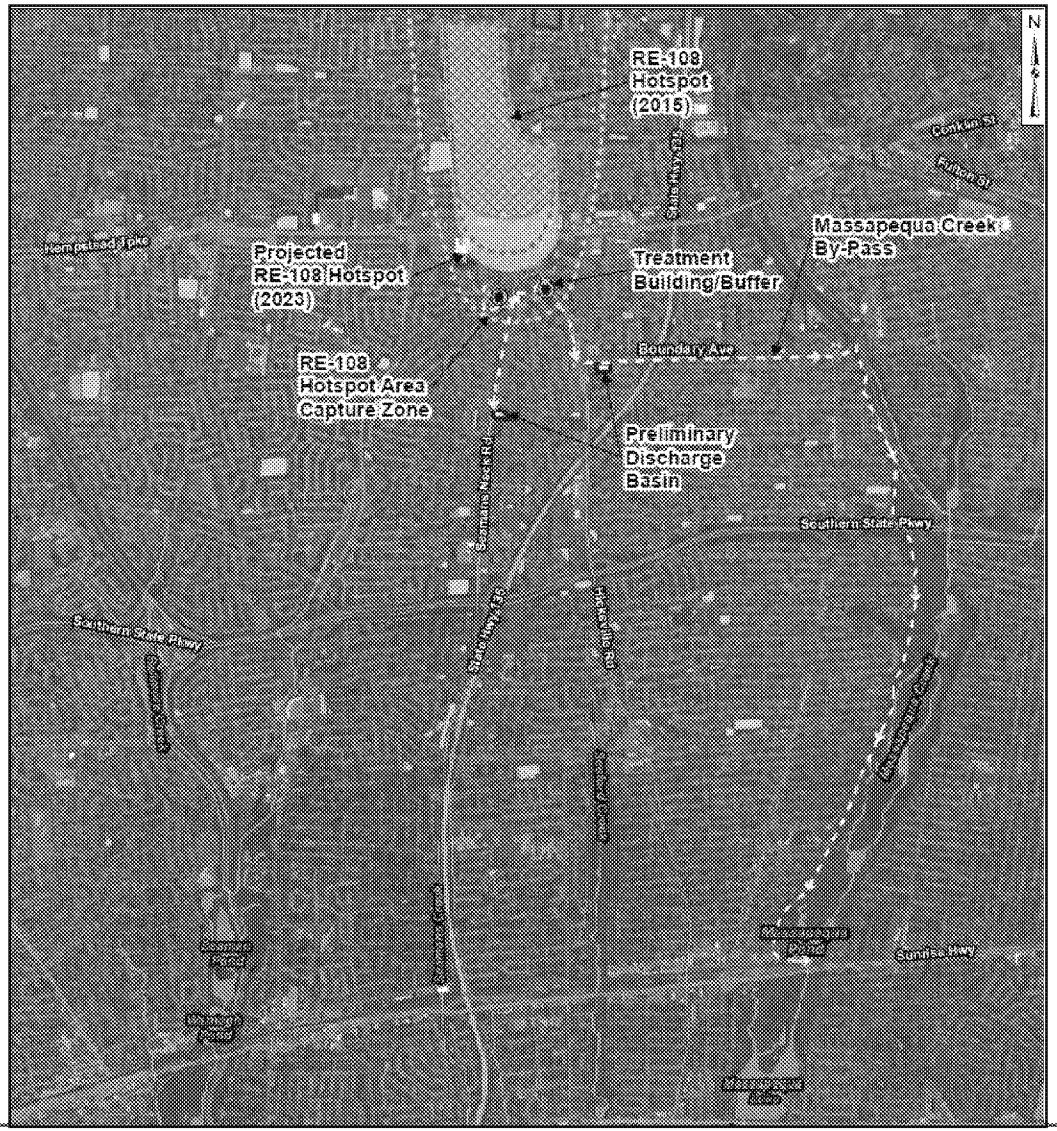
- Phase I System to address concentrated northern half of the plume
- Phase II System to address southern portion of the plume

PHASE I RE108 AREA HOTSPOT CONVEYANCE SYSTEM

- Install a single extraction wells (550 to 650 feet bgs) in the middle of the hotspot
- Calculated groundwater extraction rate: 400 gpm, design for 300 to 500 gpm
- Run 0.7 to 0.9 mile along existing utility corridor to RW-3 (or GM38)
- Use excess capacity at GM38 Hotspot Treatment System to treat groundwater
- Based on property access requirements, design and construction could be completed in approximately 1.3 years
- Operation would reduce RE108 Hotspot migration rate

PHASE II RE108 AREA HOTSPOT

- Extraction Wells south of Hempstead Turnpike (ahead of the plume)
- To minimize risk to community, treatment system should be in proximity to extraction wells
- Treated discharge to basins or surface water
- When groundwater and drinking water standards are promulgated for 1,4-dioxane, treatment and/or discharge requirements will be addressed



RE108 HOTSPOT SYSTEM PHASE II PATH FORWARD

- Preliminary design activities underway, including pumping and basin recharge testing planned for 2017. Critical design issues are:
  - Finalize extraction rates
  - Identify discharge location(s)
- Design Report – December 2017
- Property access, treatment plant location and utility easements ongoing, 1 to 3 years estimated
- Detailed design, 1 to 1.5 years
- Construction approvals, dependent on community concerns, estimate of 0.5 year
- Construction and Startup, 1.5 years

ARCADIS Design & Consultancy for natural and built assets

Quarterly Groundwater Coordination Meeting

NYSDEC / USEPA Region 2
Northrop Grumman Systems Corporation
NAVFAC

September 11, 2017

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Northrop Grumman Discussion Topics

- Status of Northrop Grumman/Navy Cooperation
- Update on Northrop Grumman OU2 Activities
  - OU2-ONCT System OM&M/Effectiveness
- Update on Northrop Grumman OU3 Activities
  - OU3-ONCT System OM&M/Effectiveness
  - Off-Site RW-21 Project Area Groundwater Investigation/Remediation
  - Hydraulic Effectiveness Study
- Radium Water Sampling

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Status of Northrop Grumman/ Navy Cooperation

- Reviewing RE108 area data and communications
- Technical Exchange Meetings with Navy (last held on November 16, 2016)
- Northrop Grumman continues sampling additional wells installed by Navy (per Navy letters May 6, 2015 and April 3, 2017) and provides results to Navy for reporting – *Ongoing*
- Review of Navy data and incorporation into 2016 annual report and OU2-ONCT evaluation

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OU2 ACTIVITIES

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Update on Northrop Grumman OU2 Activities

- OU2-ONCT System OM&M
- OU2-ONCT System Effectiveness

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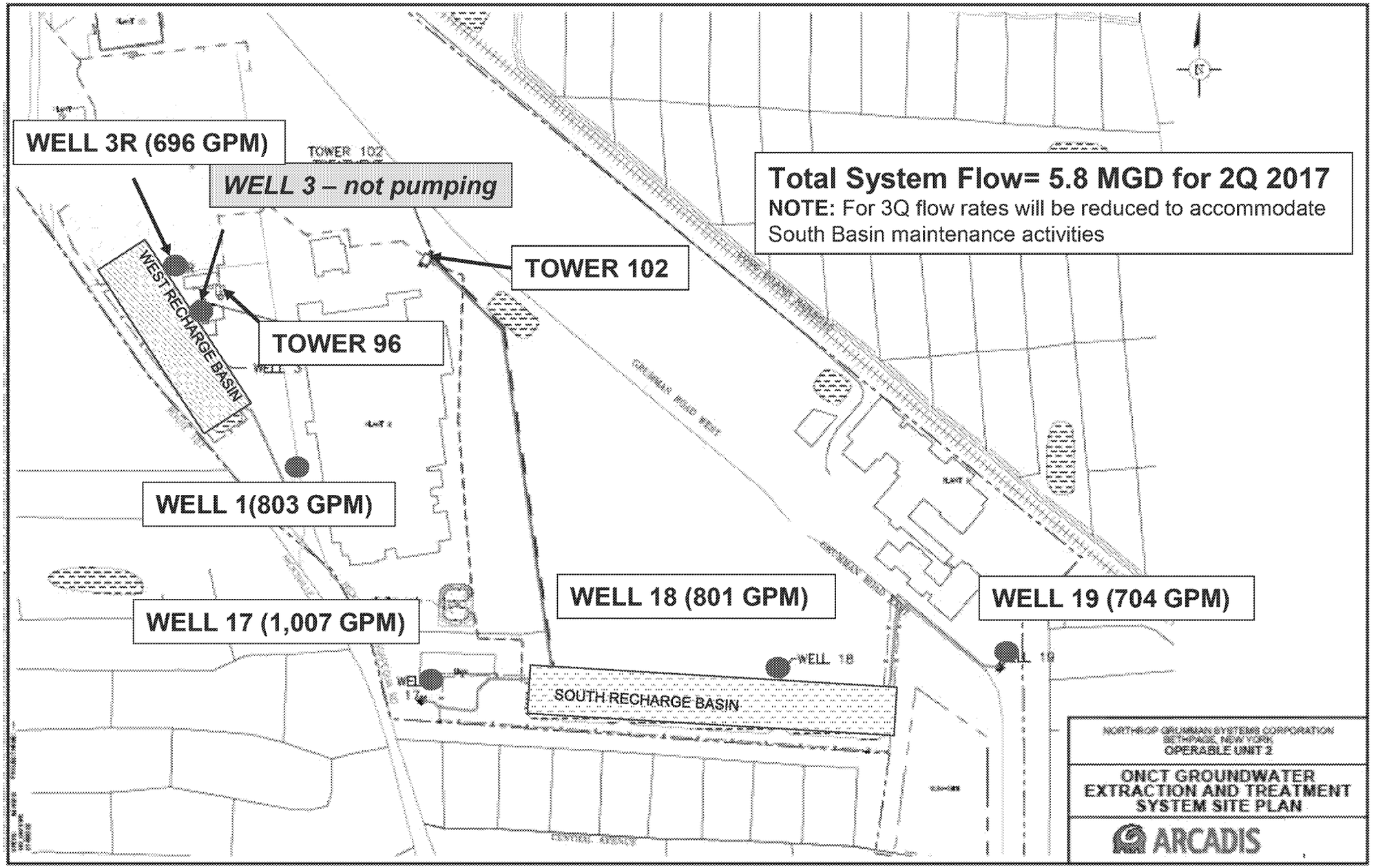

OU2-ONCT System OM&M

- Uptime & Performance for 2Q 2017

  - **T96 System: >99% uptime**

	% Uptime	% Design Flow Volume
• Well 1:	99.7	100
• Well 3R:	99.7	99

  - **T102 System: >99% uptime**

	% Uptime	% Design Flow Volume
• Well 17:	99.3	100
• Well 18:	99.1	132
• Well 19:	98.6	99

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OU2-ONCT System OM&M – cont'd

- Downtime due to routine maintenance activities
- >99.9% treatment efficiency, discharge is compliant
- Cumulative Mass Removal
  - ~ 202,000 lbs VOCs removed from start up of OU2-ONCT System in 4Q 1998 through 2Q 2017

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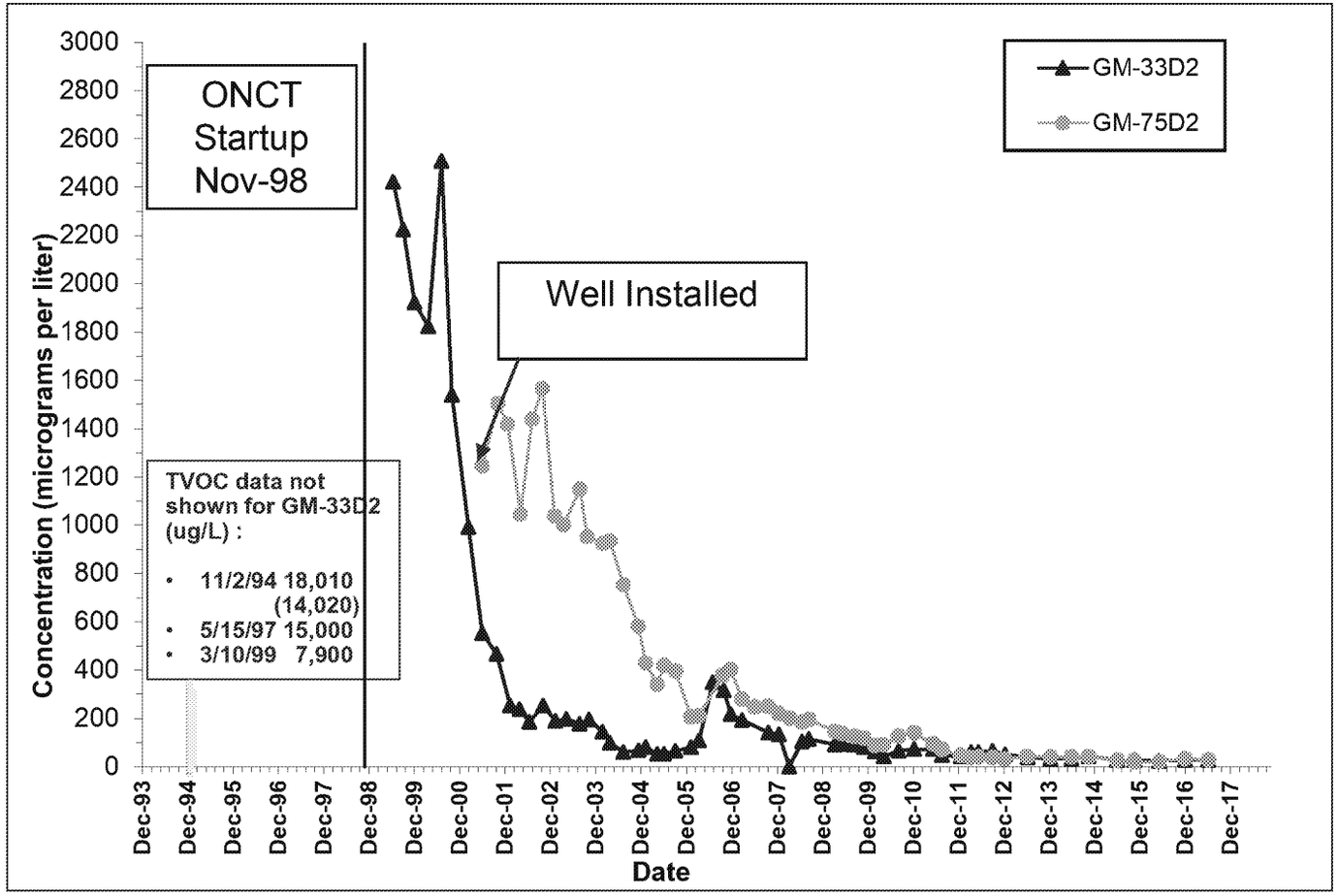
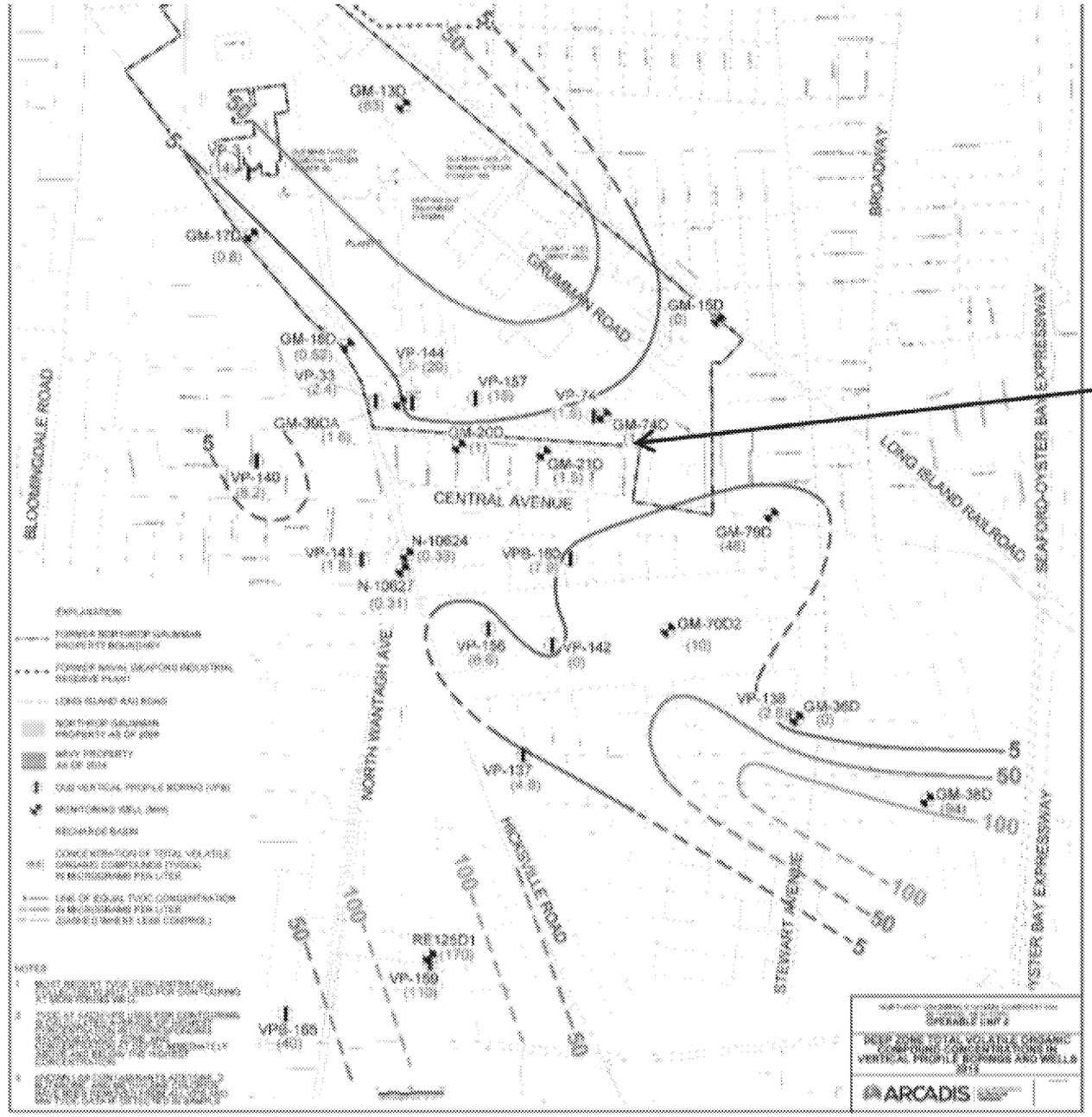
TVOC Trends at/Downgradient of OU2 ONCT



- GM-33D2
  - >99% reduction from historical maximum
- GM-75D2
  - >99% reduction from historical maximum
- Decrease in VOCs indicates ONCT effectiveness
- VOC Sources to these wells have been cut off

These improvements in groundwater quality have occurred because of hydraulic control of the on-site plume



PLUME BIFURCATION IS OCCURING INDICATING OU2-ONCT SYSTEM EFFECTIVENESS

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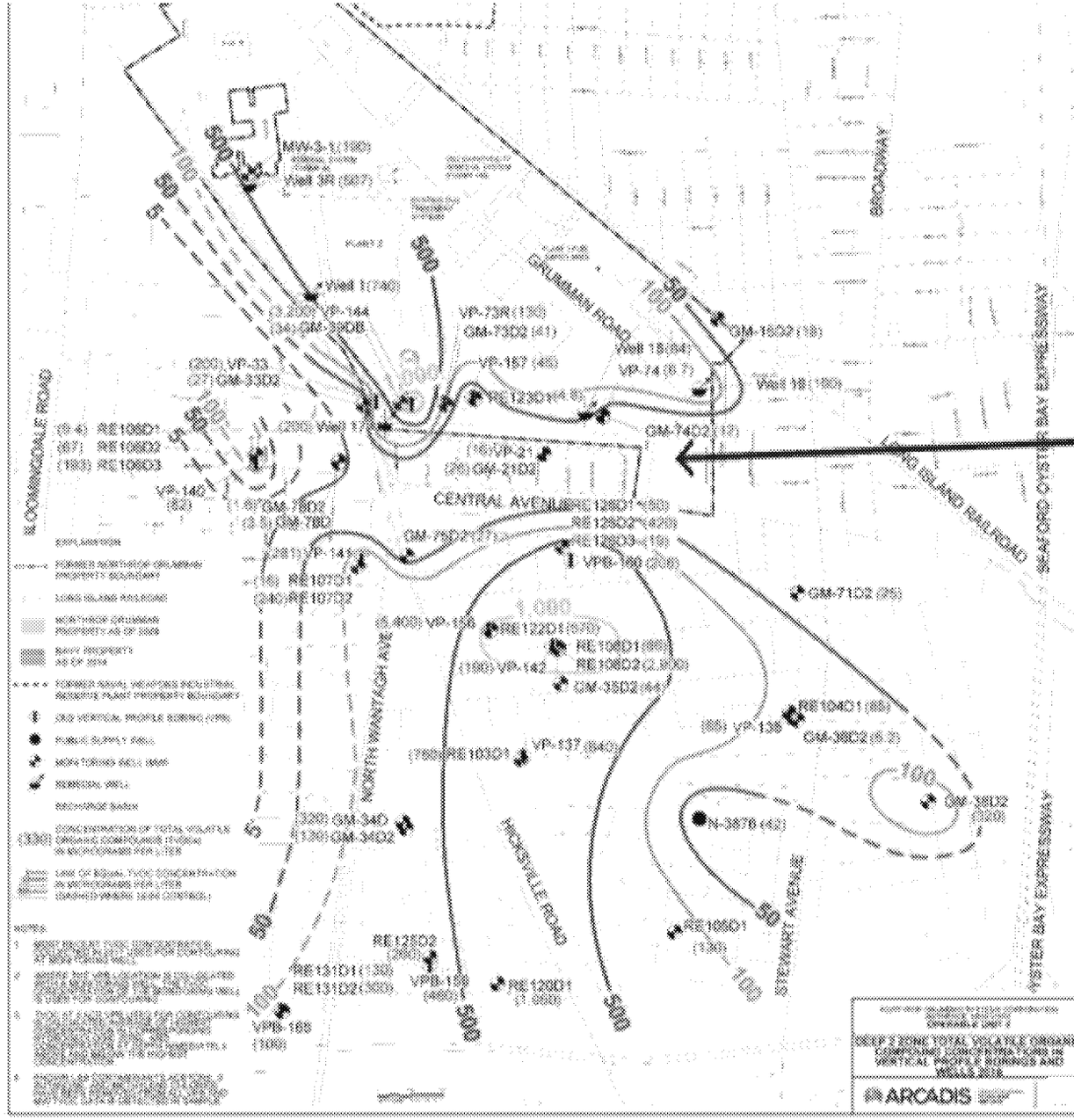
TVOCs in Deep Zone



PLUME BIFURCATION IS OCCURING INDICATING OU2-ONCT SYSTEM EFFECTIVENESS

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TVOCs in Deep 2 Zone

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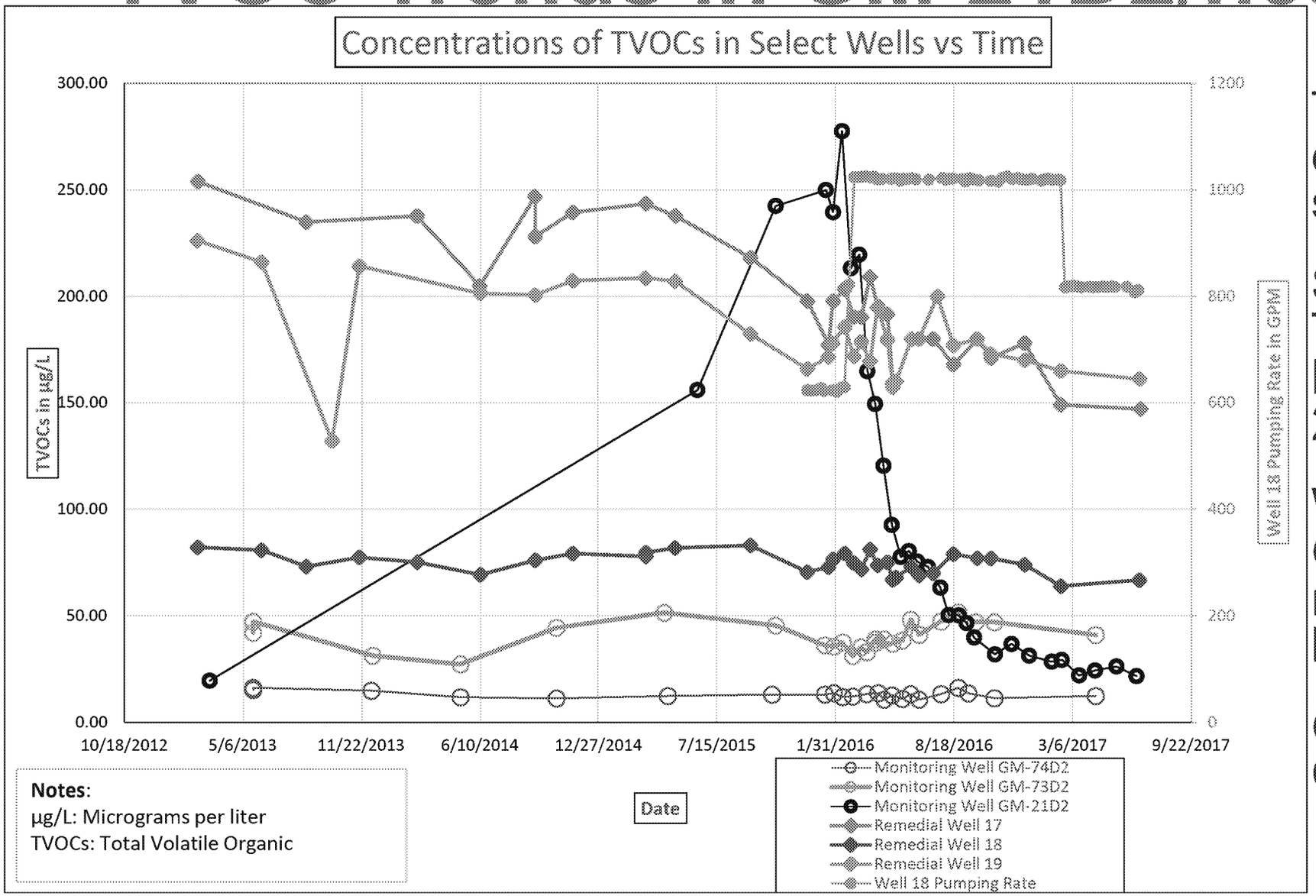
TVOC Trends in GM-21D2/nearby wells

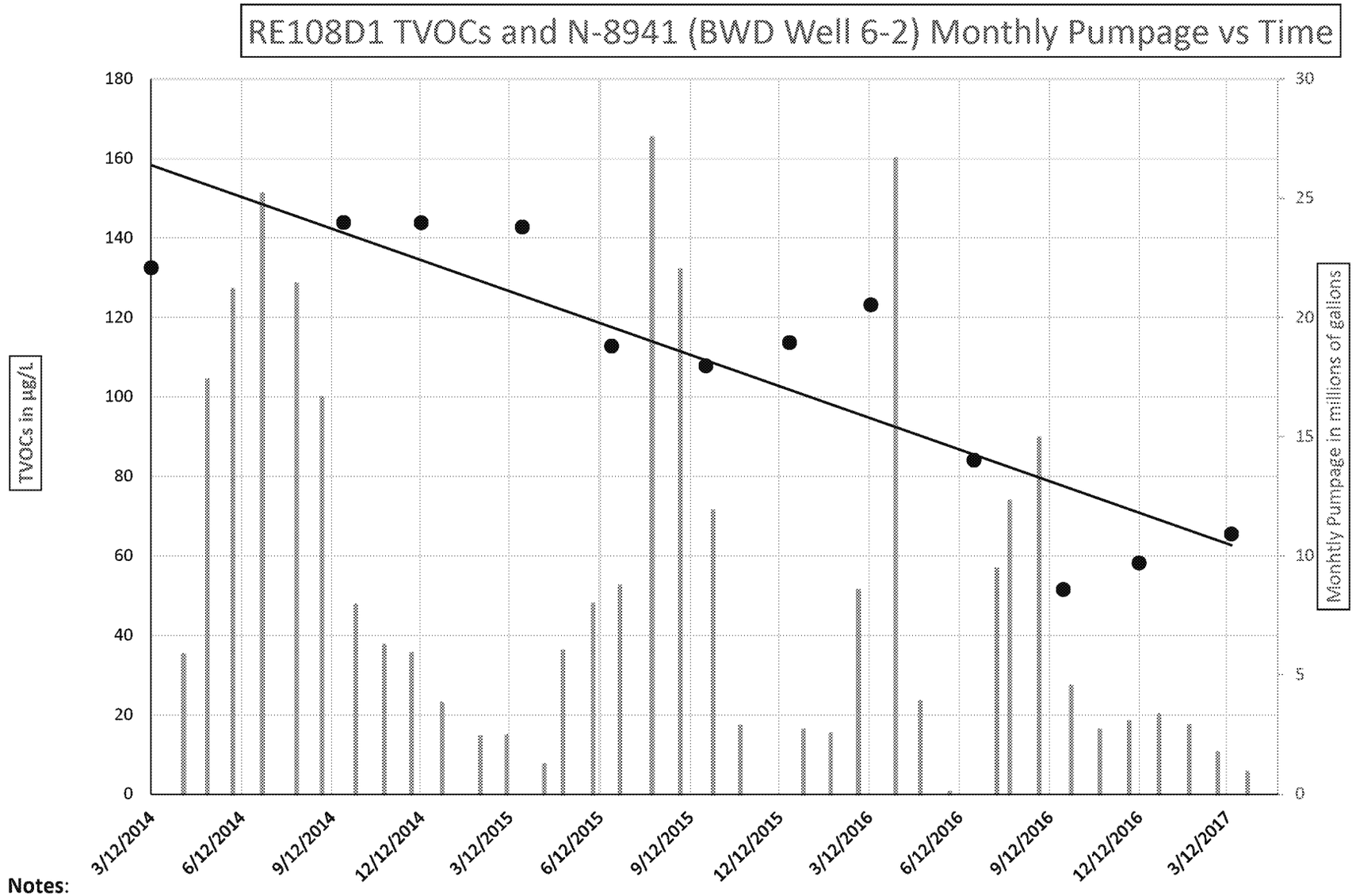


TVOCs in GM-21D2 continuing to decrease since February 2016

Since October 2016, TVOCs in GM-21D2 beginning to stabilize at 2013 levels

Water Quality Changes in GM-21D2 inconsistent with nearby wells and are localized

GM-21D2 within OU2 ONCT capture zone



Declining trend of TVOCs at RE-108D1 well location

Notes:
µg/L: Micrograms per liter

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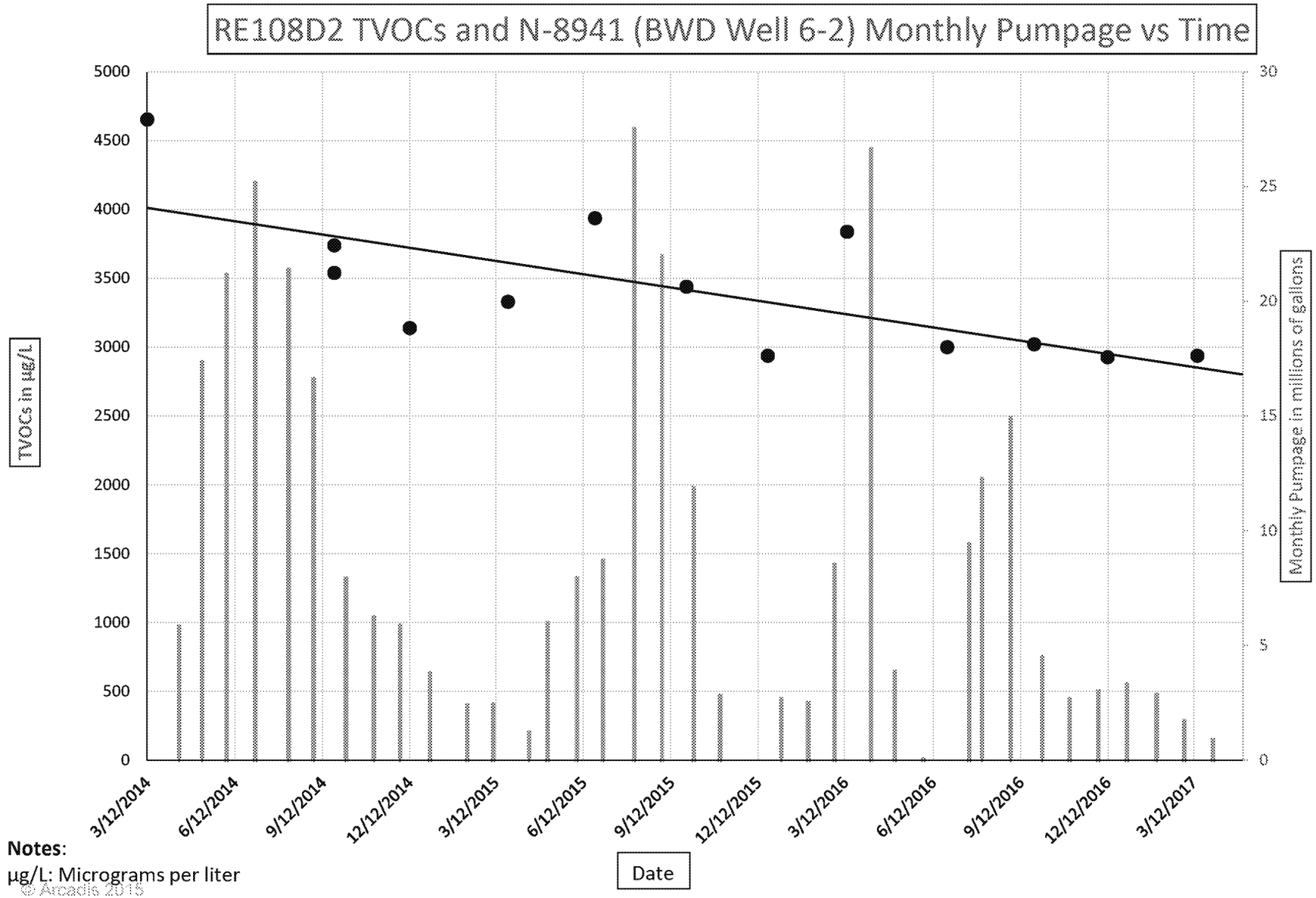

Declining trend of TVOCs at RE-108D2 well location

Notes:
µg/L: Micrograms per liter

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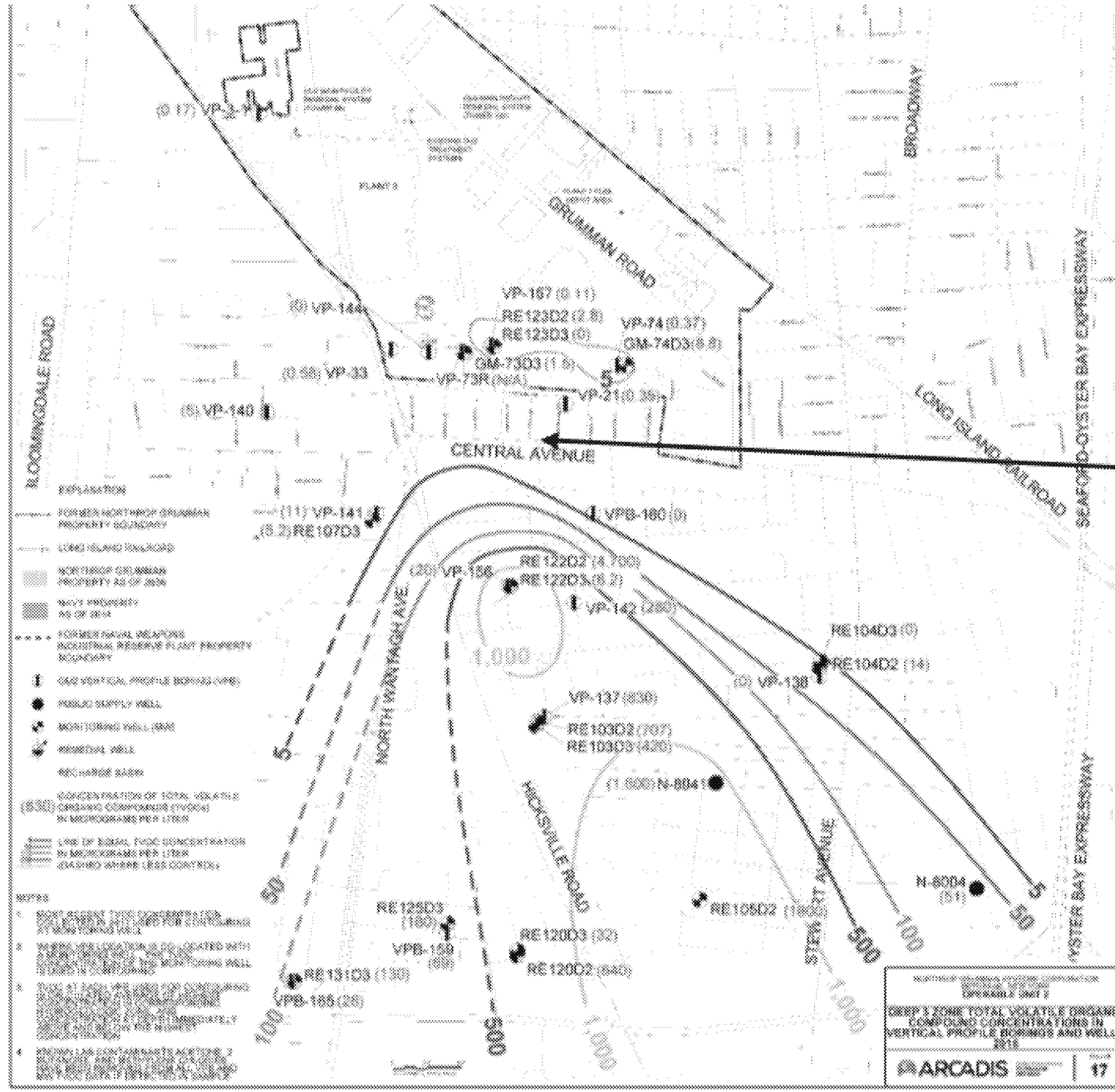

PLUME BIFURCATION IS OCCURING INDICATING OU2-ONCT SYSTEM EFFECTIVENESS

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TVOCs in Deep 3 Zone

Groundwater Monitoring

- Summary of 1,4-dioxane results for 2Q-2017 by Hydrogeologic Zone (73 wells sampled)

Shallow	ND - 13.7
Intermediate	0.69-6.73
Deep	0.1-15.2
Deep 2	ND - 24.2
Deep 3	ND - 4.34

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OU3 ACTIVITIES

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Update on Northrop Grumman OU3-ONCT Activities

- OU3-ONCT System OM&M
- OU3-ONCT System Effectiveness
- Off-Site RW-21 Project Area
- Hydraulic Effectiveness Study

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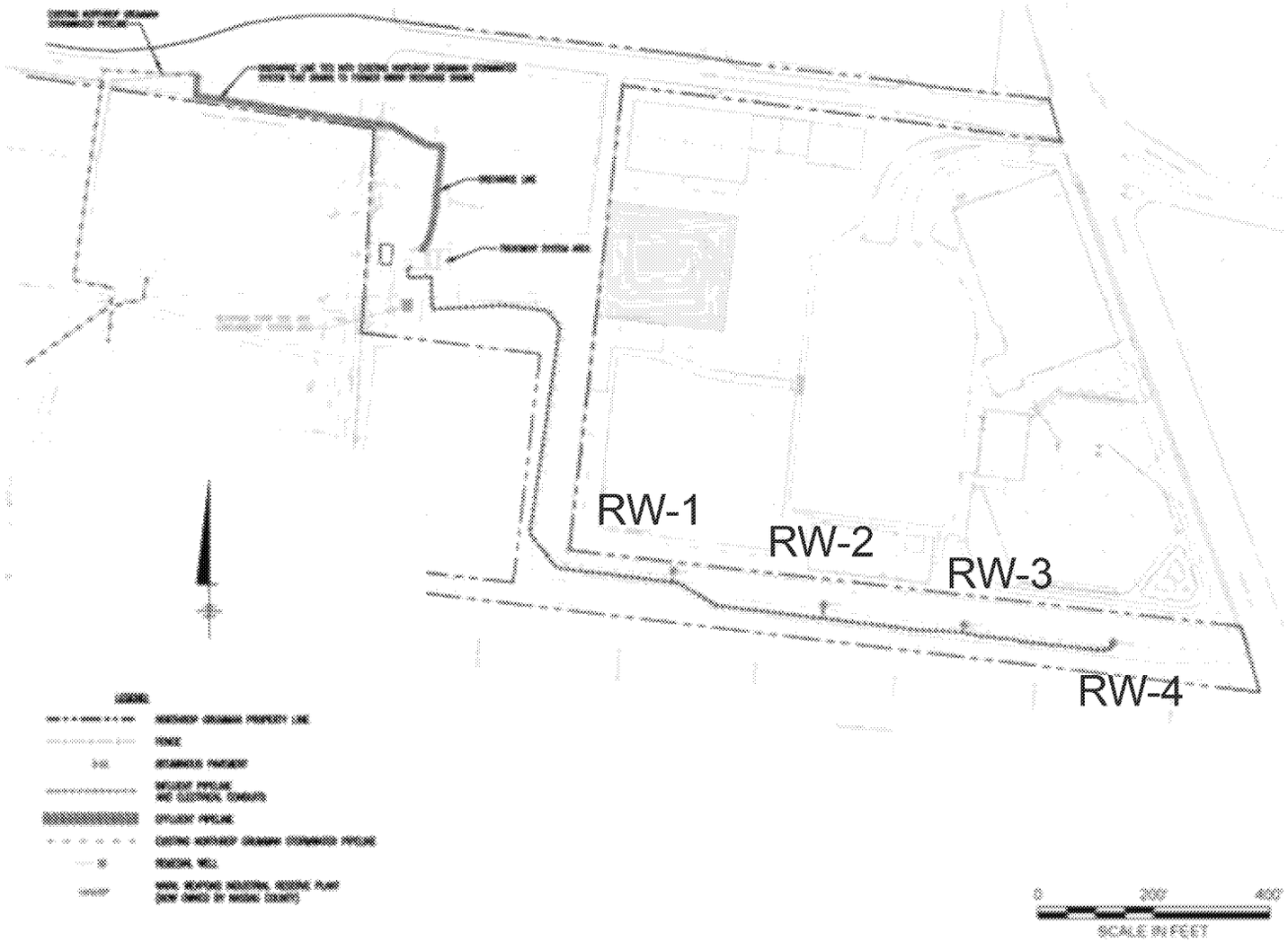
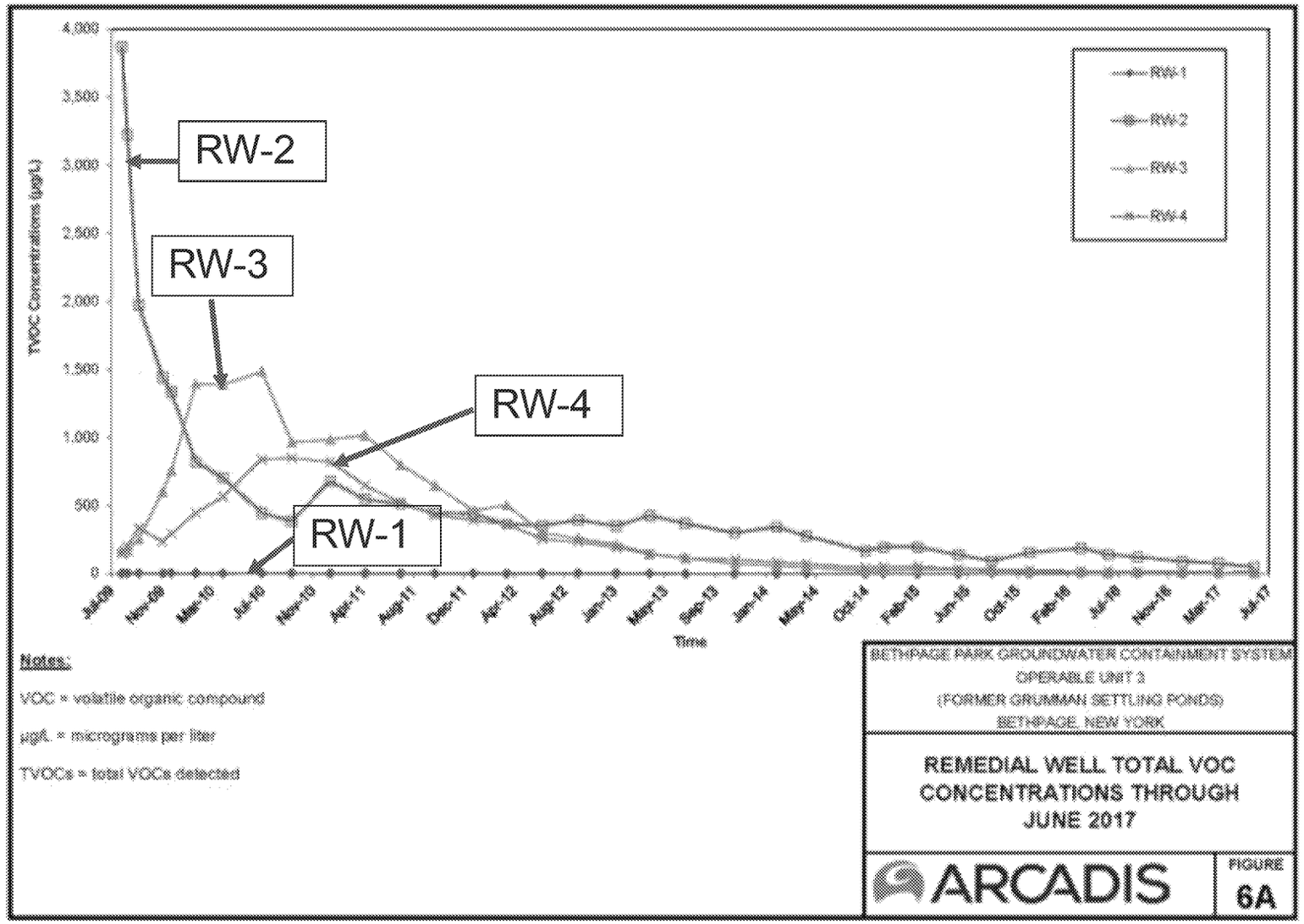
OU-3 ONCT OM&M



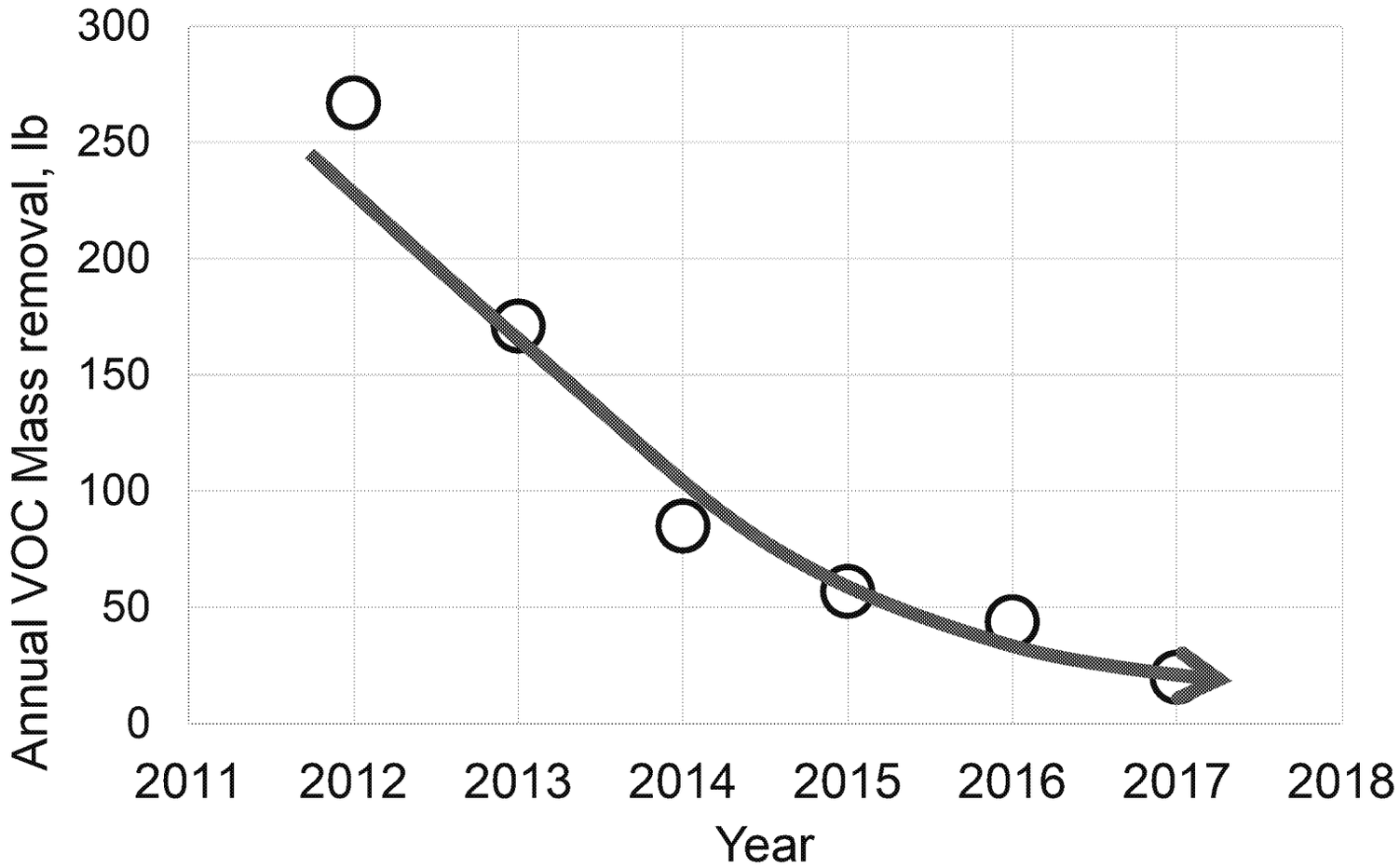
- Uptime & Performance (2Q 2017)
  - 98.8% uptime
  - ≥99% treatment efficiency
- Cumulative Mass Removal
  - 2,165 lbs VOCs removed from start up of System in 3Q 2009 through 2Q 2017

TVOC Trends OU3 ONCT Remedial Wells



- RW-1
  - VOCs ND in influent
- RW-2
  - >98% reduction from historical maximum
- RW-3
  - No VOCs above MCLs
- RW-4
  - No VOCs above MCLs

VOC Mass Removal OU3 ONCT Remedial Wells



- Steady decreases in VOC mass recovery reflect improving groundwater quality at Park
- Concentrations beneath the Park have declined 99% from historical levels
- Peak groundwater concentrations have declined from greater than 300,000 ppb to less than 1,000 ppb
- Wells are less than 1,000 ppb since 2013

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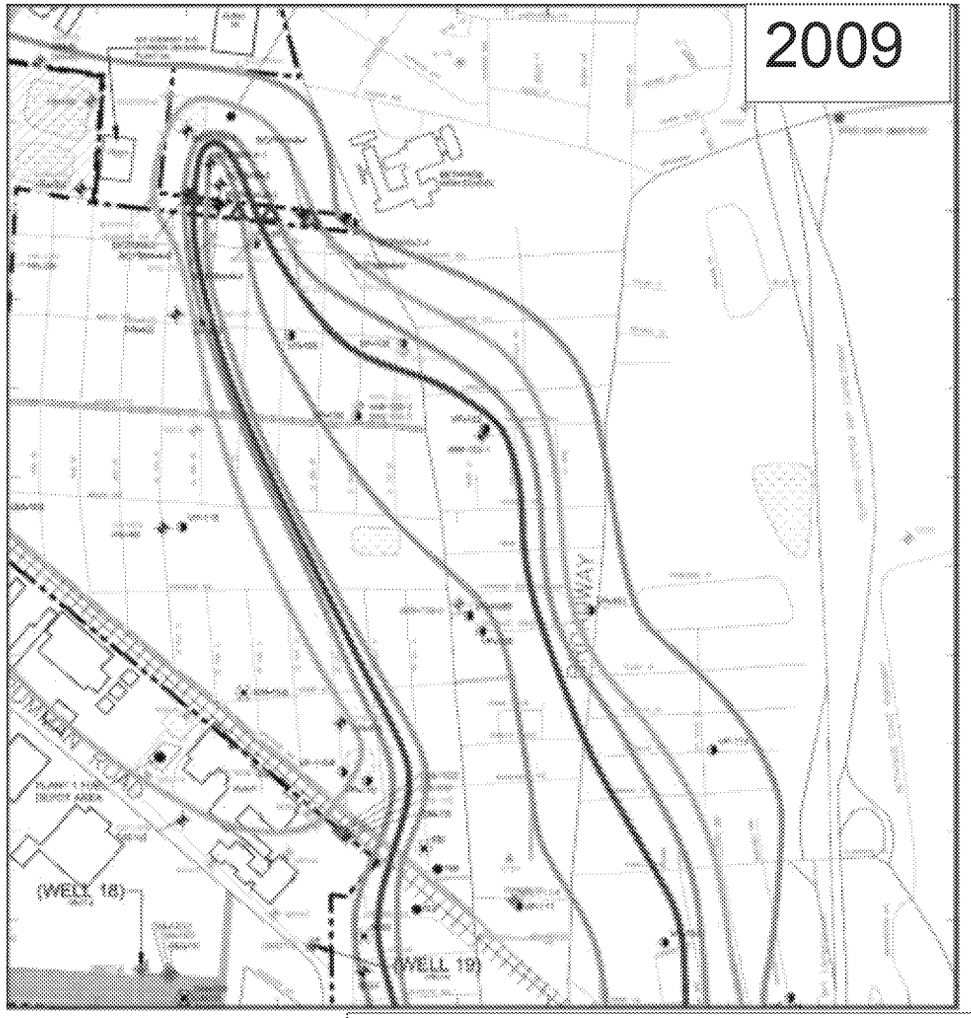
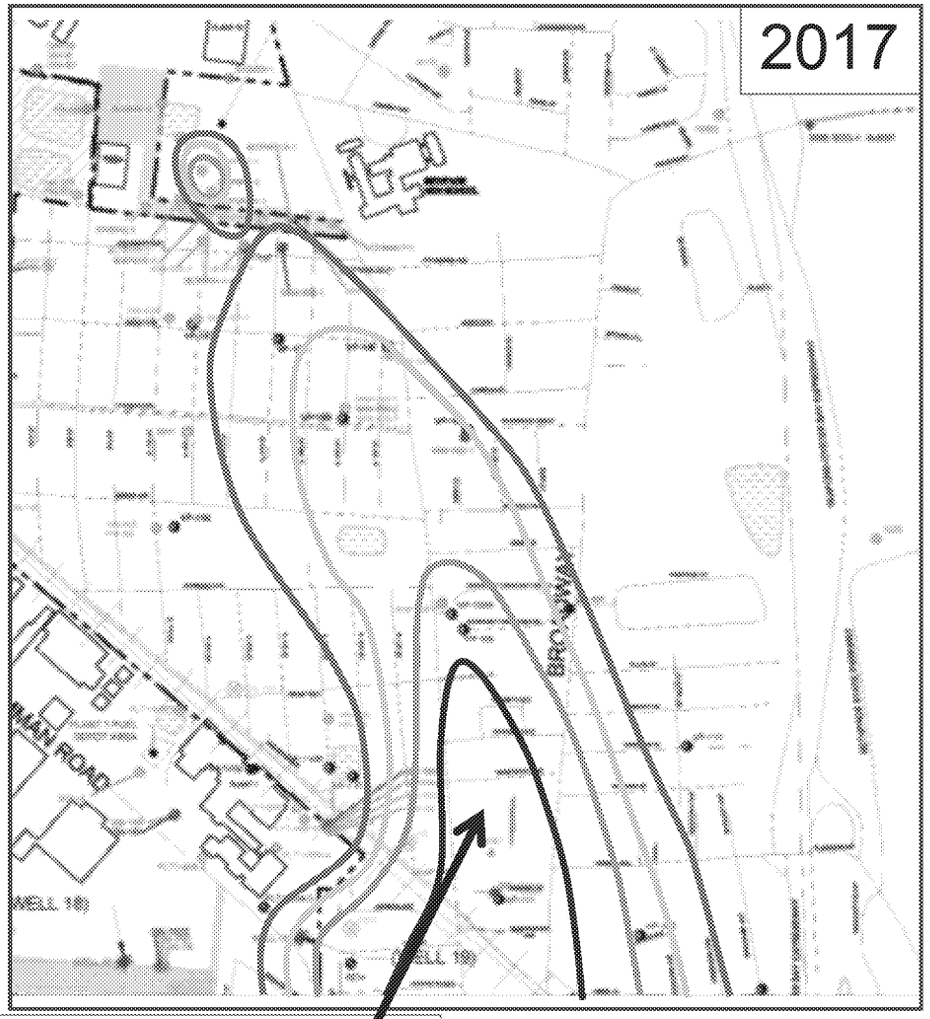
Plume Near Park





- Groundwater concentrations beneath the Park have declined 99% from historical levels
- Plume has separated from Park since mass flux was stopped
- Significant improvements in downgradient groundwater quality

5 ppb
50 ppb
500 ppb
1,000 ppb
5,000 ppb

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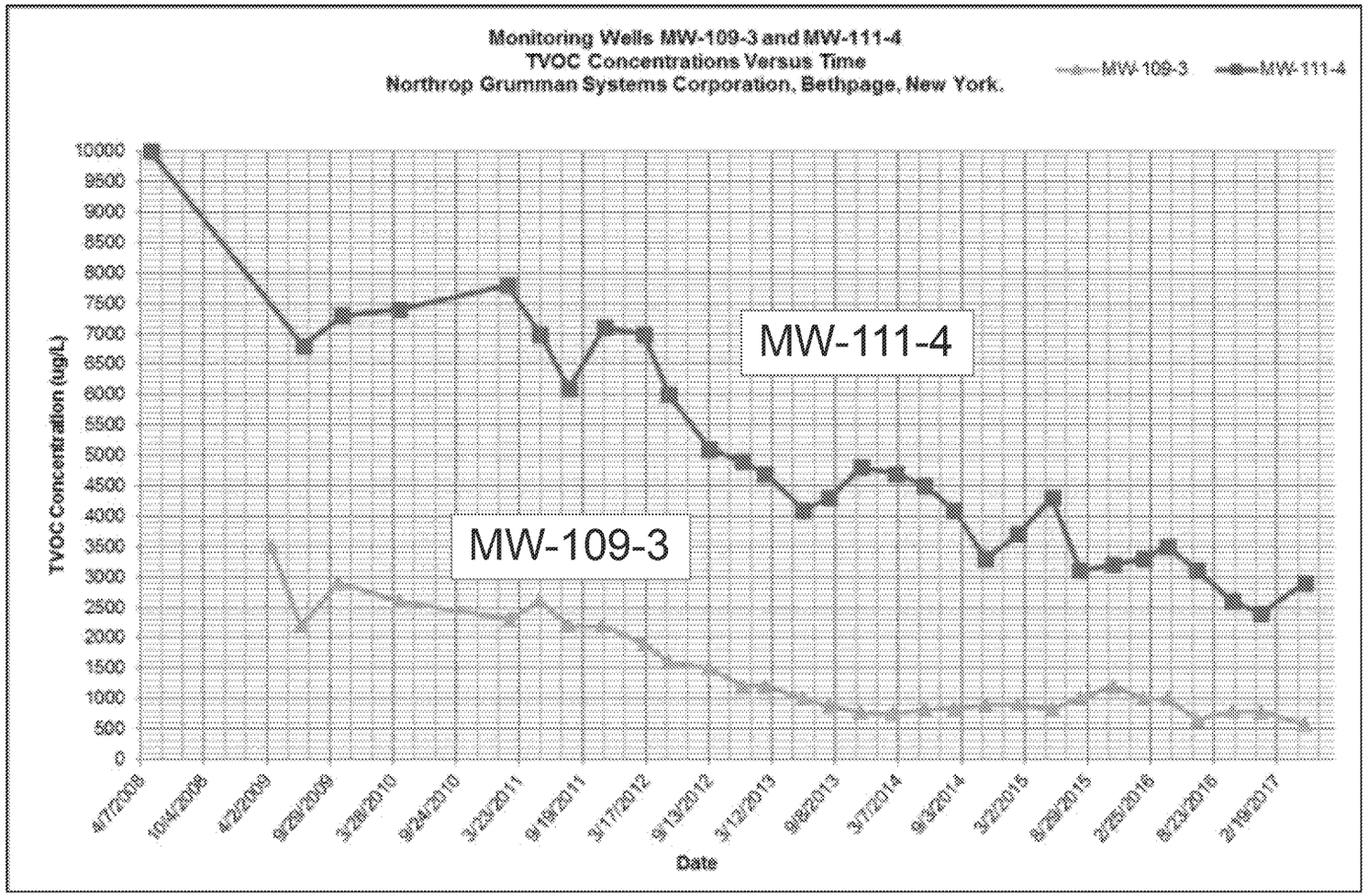
5000 ppb contour is now north of LIRR tracks;
1000 ppb contour is now 3,600 feet south of it's 2009 location.

TVOC Trends Downgradient of Park



- MW-109-3
  - 83% reduction since 2009
- MW-111-4
  - 71% reduction since 2008
- Shows effect of Park groundwater system in improving groundwater quality downgradient of Park

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RW-21 Project Area Overview

ARCADIS

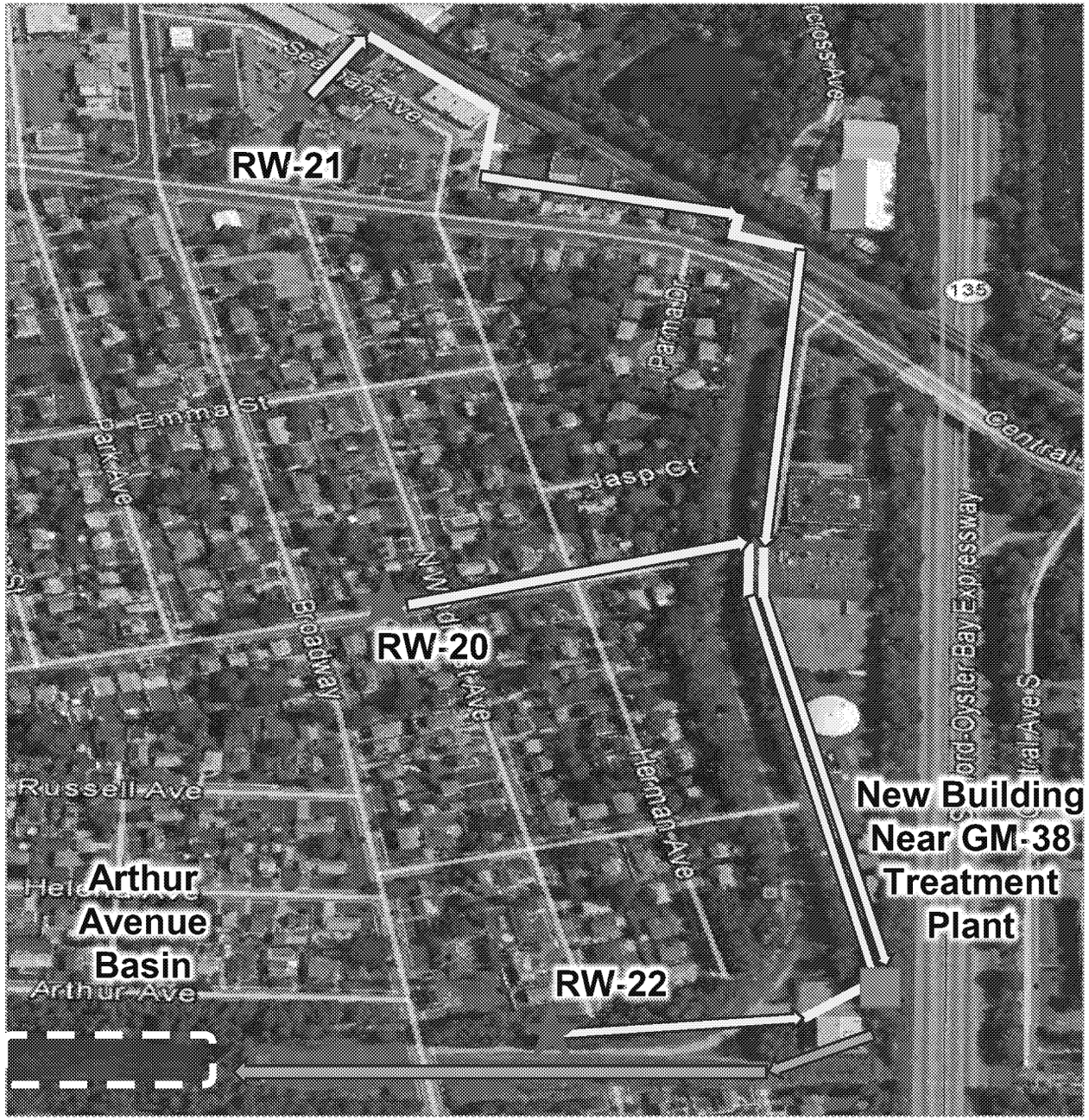
★ NYSDEC- approved, TOB permitted well

Proposed treatment building

Proposed buried water line and flow direction

Existing Navy GM-38 buried treated water line and flow direction

Other discharge options are being evaluated



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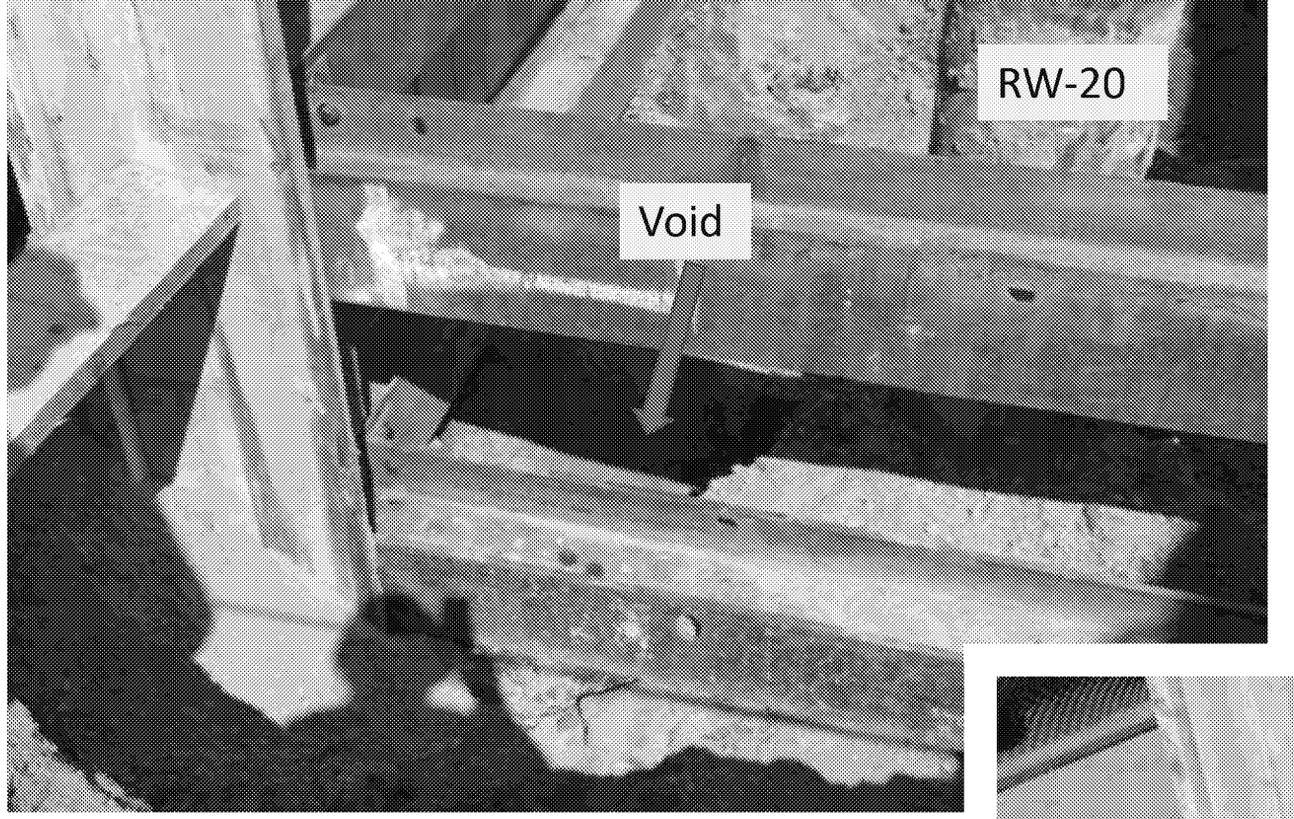
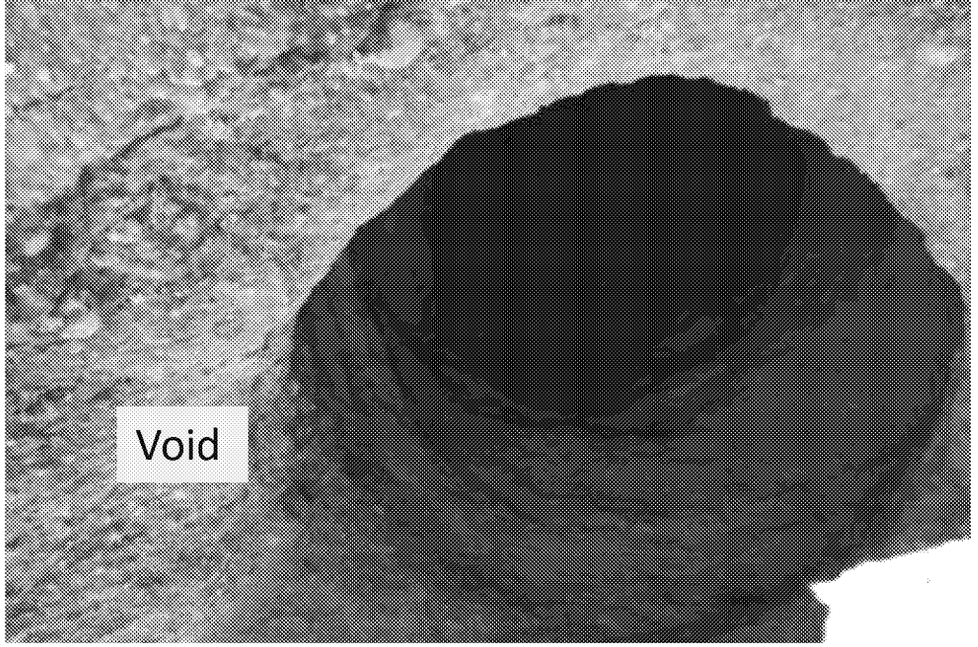

RW-20
Void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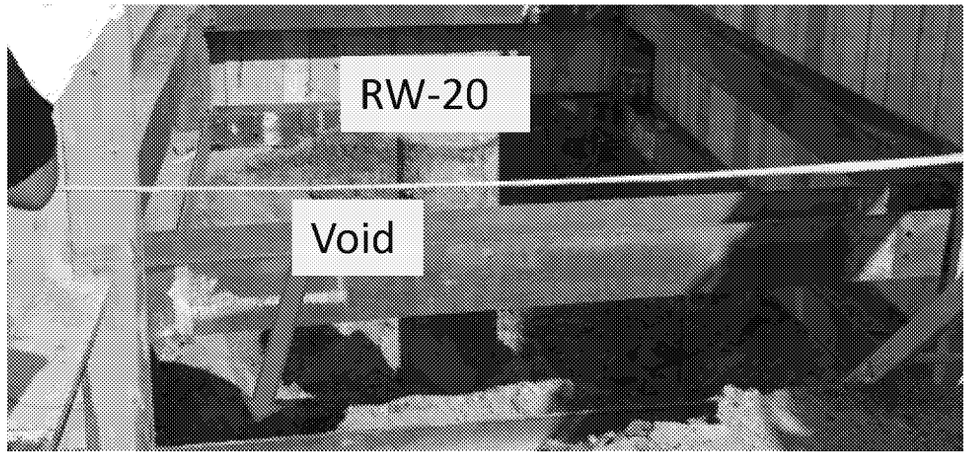
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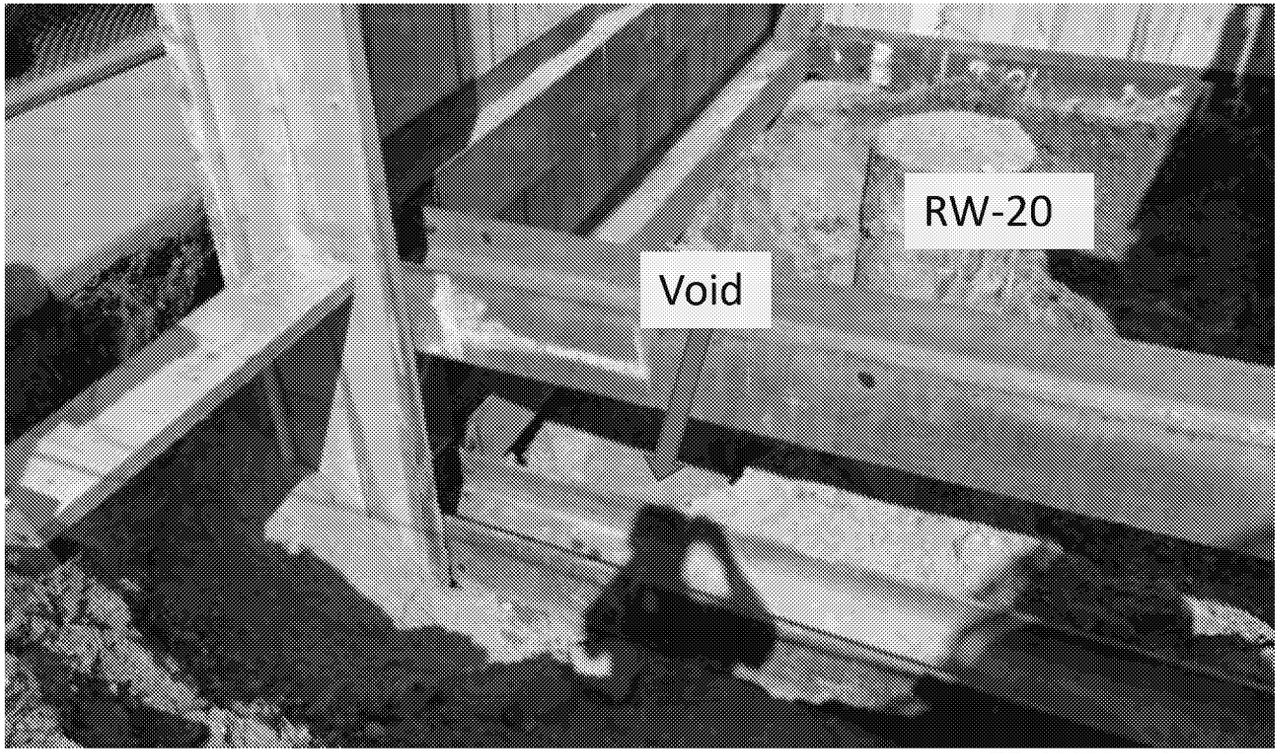
RW-20
Void

RW-21 Area Potential Discharge Options

- NYSDOT Basin south of Levittown Fire Department
- NCDPW Basin northwest of BWD Plant 6
- Bethpage State Park Golf Course – new basin
- Portion of utility corridor running north from the proposed treatment plant - shallow wells

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Additional OU3 Activities (RW-21 Area Groundwater)

- Continue to communicate with residents and Town of Oyster Bay regarding upcoming work
- VPBs 13, 14, 15 and 16 drilled and sampled
- MW 13, 14, 15 and 16 installed, developed and sampled
- Remedial Wells RW-20, RW-21 and RW-22 installed and developed

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Additional OU3 Activities

- Hydraulic Effectiveness Study
  - Inspected two offsite wells, plan to abandon and replace
  - Install Monitoring Wells as Phase I
  - Drill additional Vertical Profile Borings contingent on monitoring well results
  - Contractor selected, work being scheduled

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RADIUM WATER SAMPLING

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Radium Water Sampling

- As requested by NYSDEC
  - Sampled OU2 and OU3 ONCT system effluents (mid August 2017)
  - Sampled RW-21 Project Area Recovery Wells RW-20, RW-21, and RW-22 (late August 2017)
  - Sampled RW-21 Project Area Monitoring Wells MW-1, MW-9 and MW-14 (late August 2017)
  - Results expected 6 weeks after sampling

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NEW YORK STATE OF OPPORTUNITY | Department of Health

USGS

HDR

Update on Engineering Investigation and Feasibility Study (FS)

U.S. Navy and Northrop Grumman Bethpage Facility Sites

September 11, 2017

THREE MAJOR COMPONENTS:

1) Drilling Program

2) Groundwater Modeling

3) Feasibility Study/Detailed Engineering Analysis

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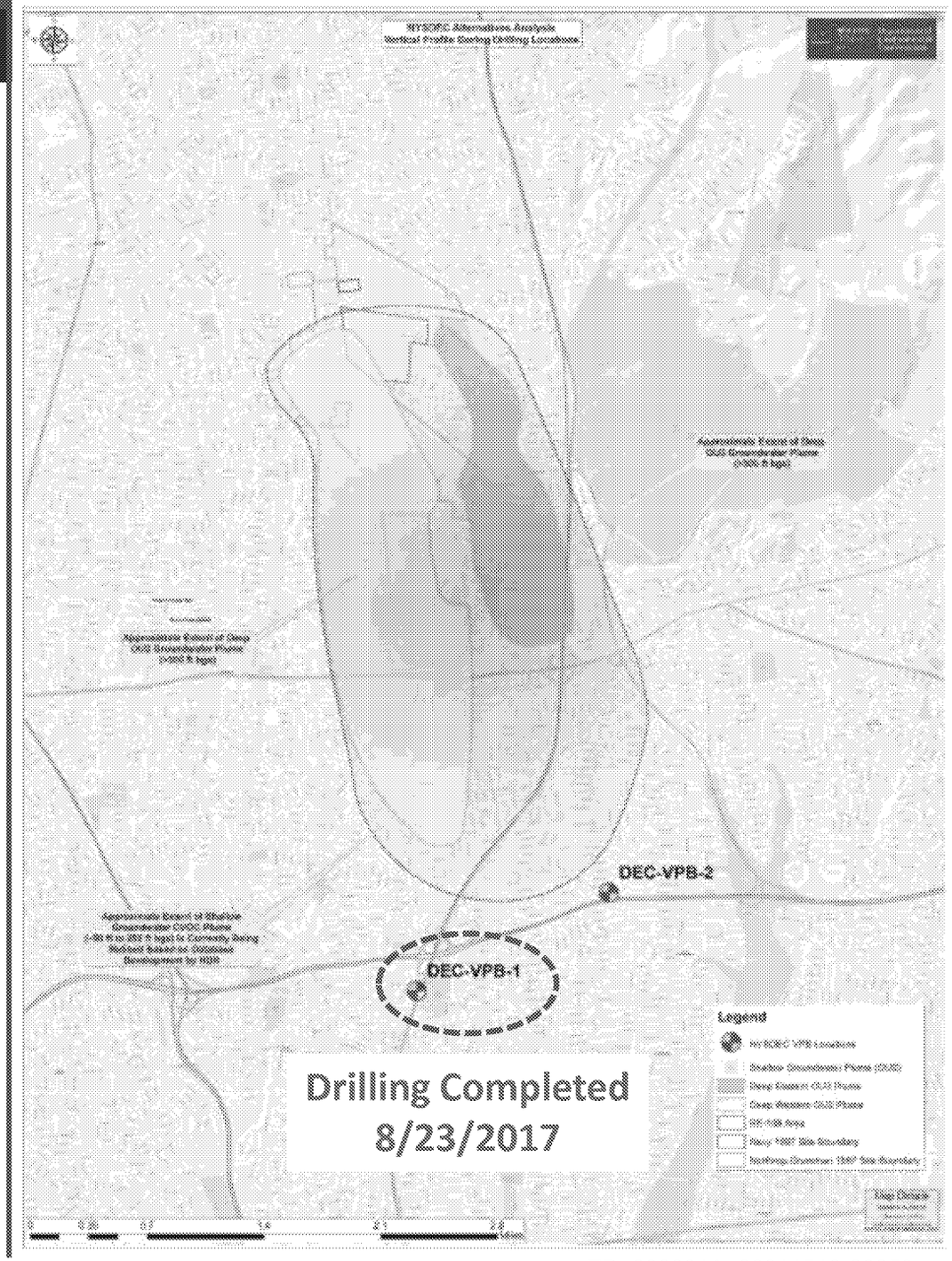
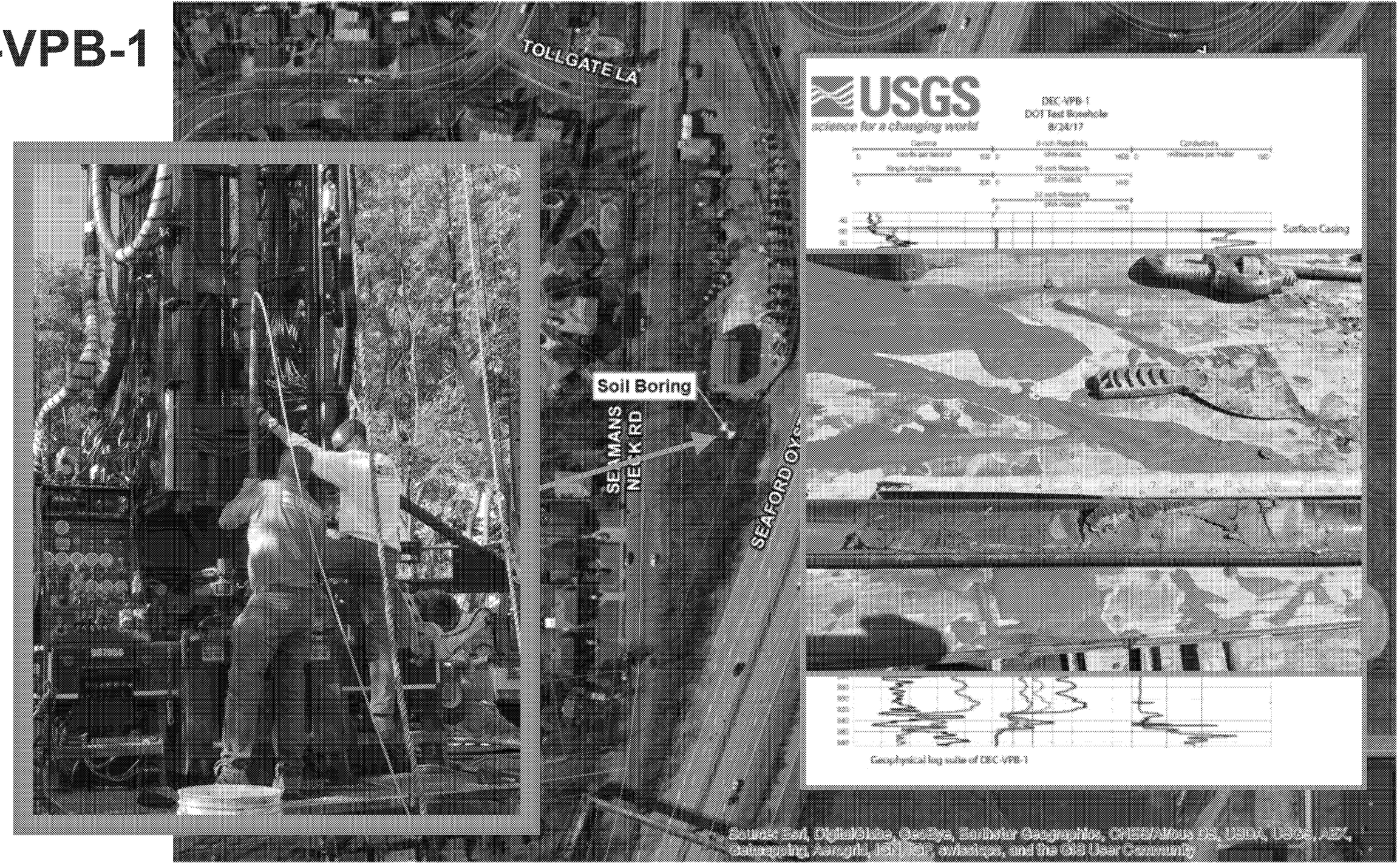
1) Drilling Program

- Two Locations – Southern Area
- Areas with Data Gaps
- Drilling Completed at DEC-VPB-1
- Drilling to Raritan Clay
- Downhole Geophysics by USGS
- Grab Groundwater Sampling
- Completed as Monitoring Wells



DEC-VPB-1

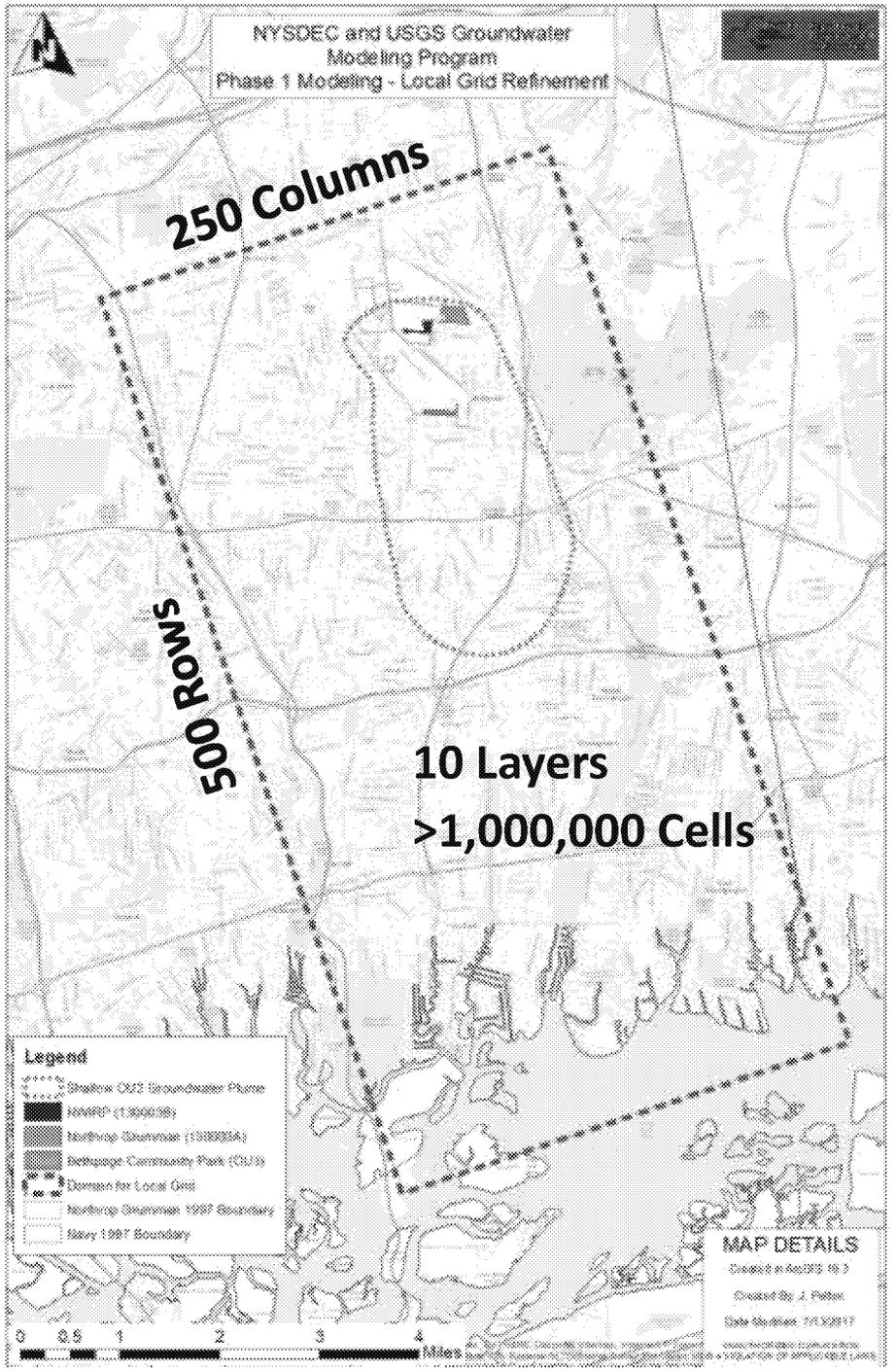

TOLLGATE LA
Soil Boring
SEAMANS NECK RD
SEAFORD OYS
USGS
science for a changing world
DEC-VPB-1
DOT Test Borehole
Surface Casing
Geophysical log suite of DEC-VPB-1
Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

DEC-VPB-2

N ALBANY AVE
N CENTRAL DR
DANIEL RD N
MARGARET RD
N NANCY PL
Town of Oyster Bay Recharge Basin
N RUTHERFORD AVE
Soil Boring
WILLIAM RD
N PARK DR
SOUTHERN STATE PKWY
SOUTHERN STATE PKWY
BRIARWOOD RD
N POPLAR ST
S PARK DR
WOOD AVE
WEBSTER AVE
N PARK AVE
N CENTRAL AVE
Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

2) MODELING PROGRAM

- Partnership with USGS
- <u>2 Major Components:</u>
  1. Groundwater Database Development – Plume Shells
  2. Groundwater Flow Modeling
     - Phase 1 Modeling (underway)
     - Phase 2 Modeling



Groundwater Quality Database Development

Data assembled from:

1. NYSDEC EIMs
2. U.S. Navy
3. Northrop Grumman
4. Nassau County

Database Statistics

Total Number of Records:	180,242
Number of Wells:	320
Number of Borings:	152
Number of Groundwater Samples:	4,235
Positive TCE Results:	1,981
Date Range:	June 2000 to June 2017

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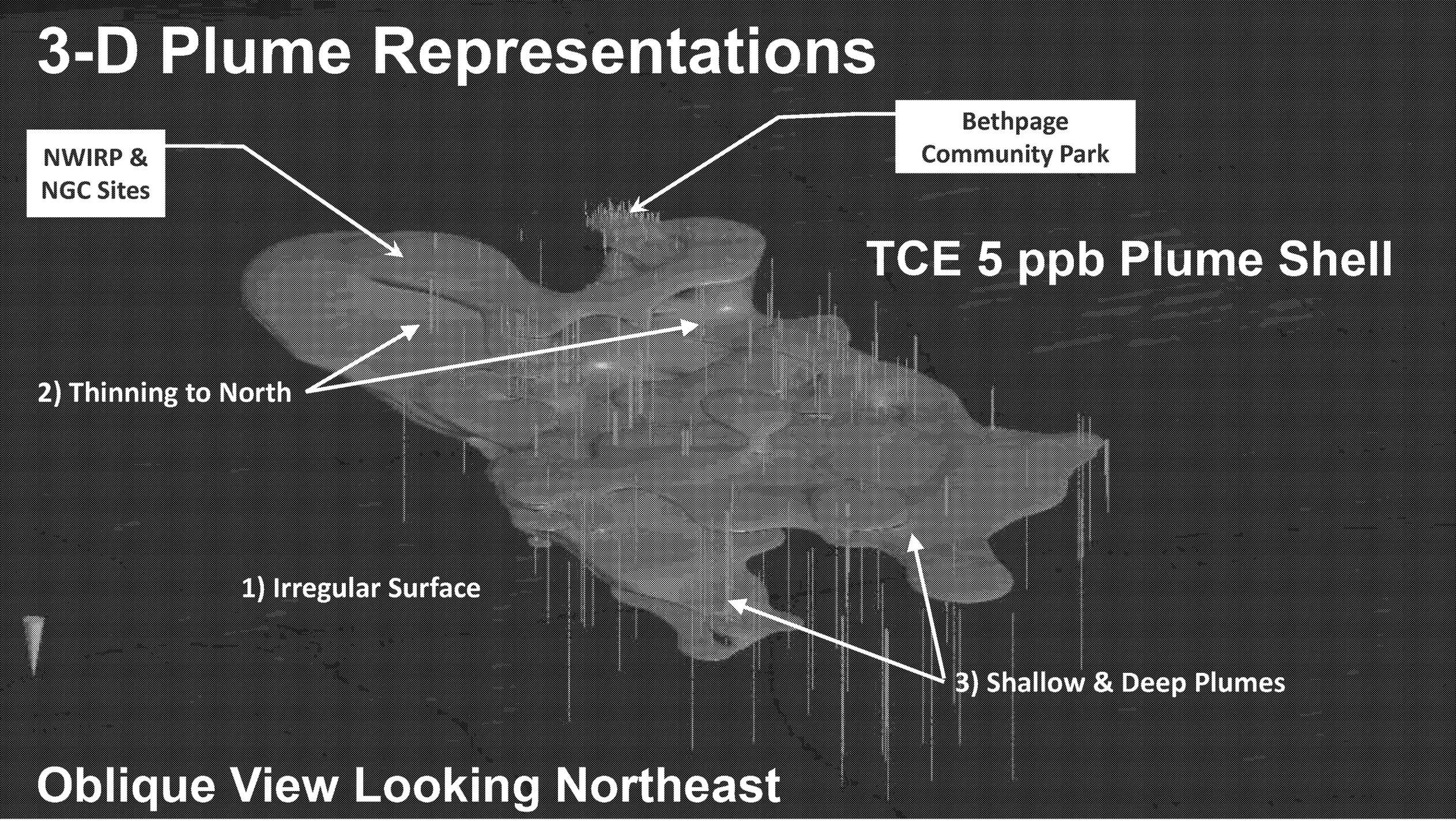
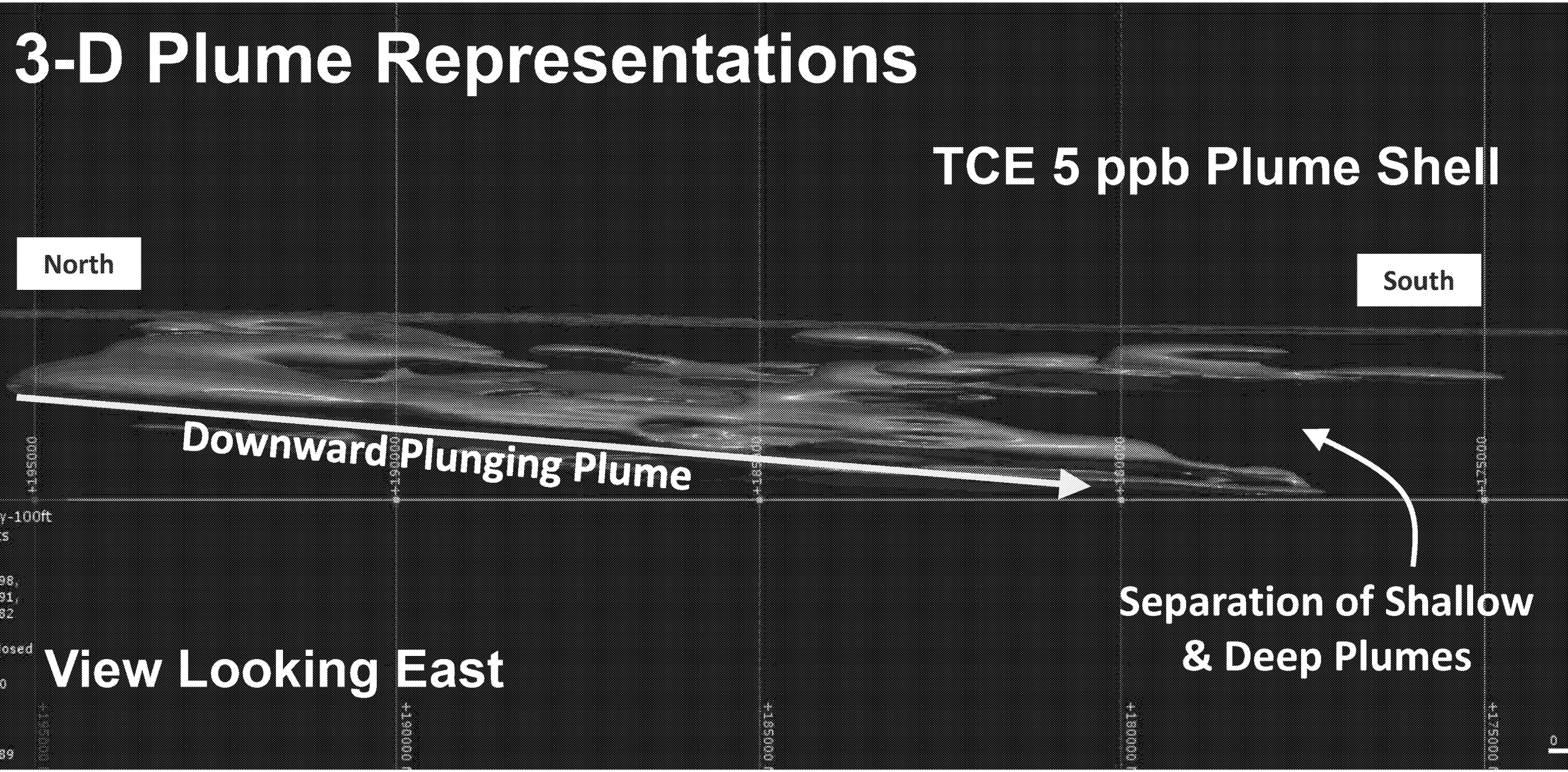
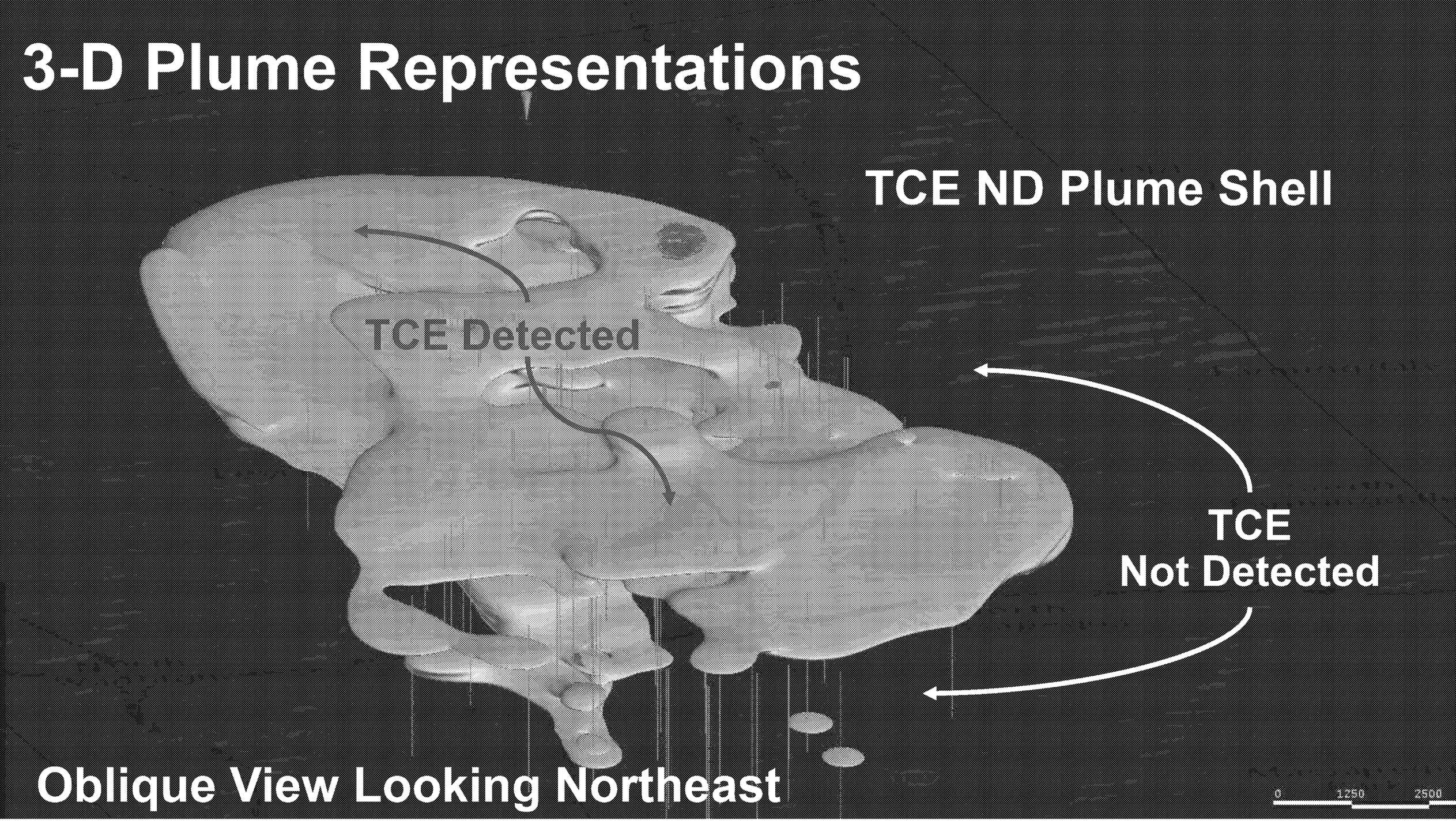
3-D Plume Representations



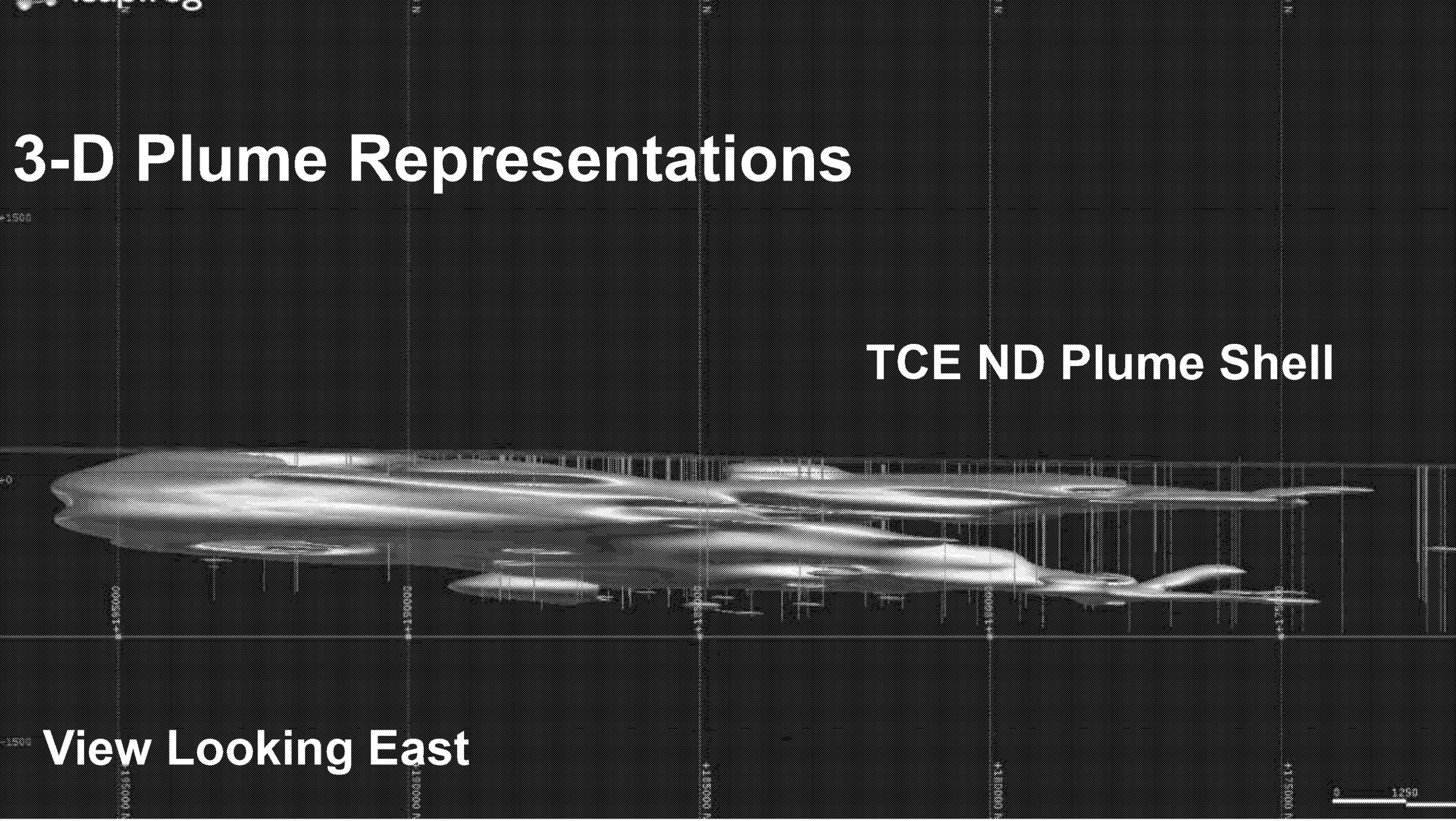
3-D Plume Representations



3-D Plume Representations



3-D Plume Representations



Update on Scenarios Being Provided to USGS for Phase I Modeling

No Further Action ⟶ **Full Containment**

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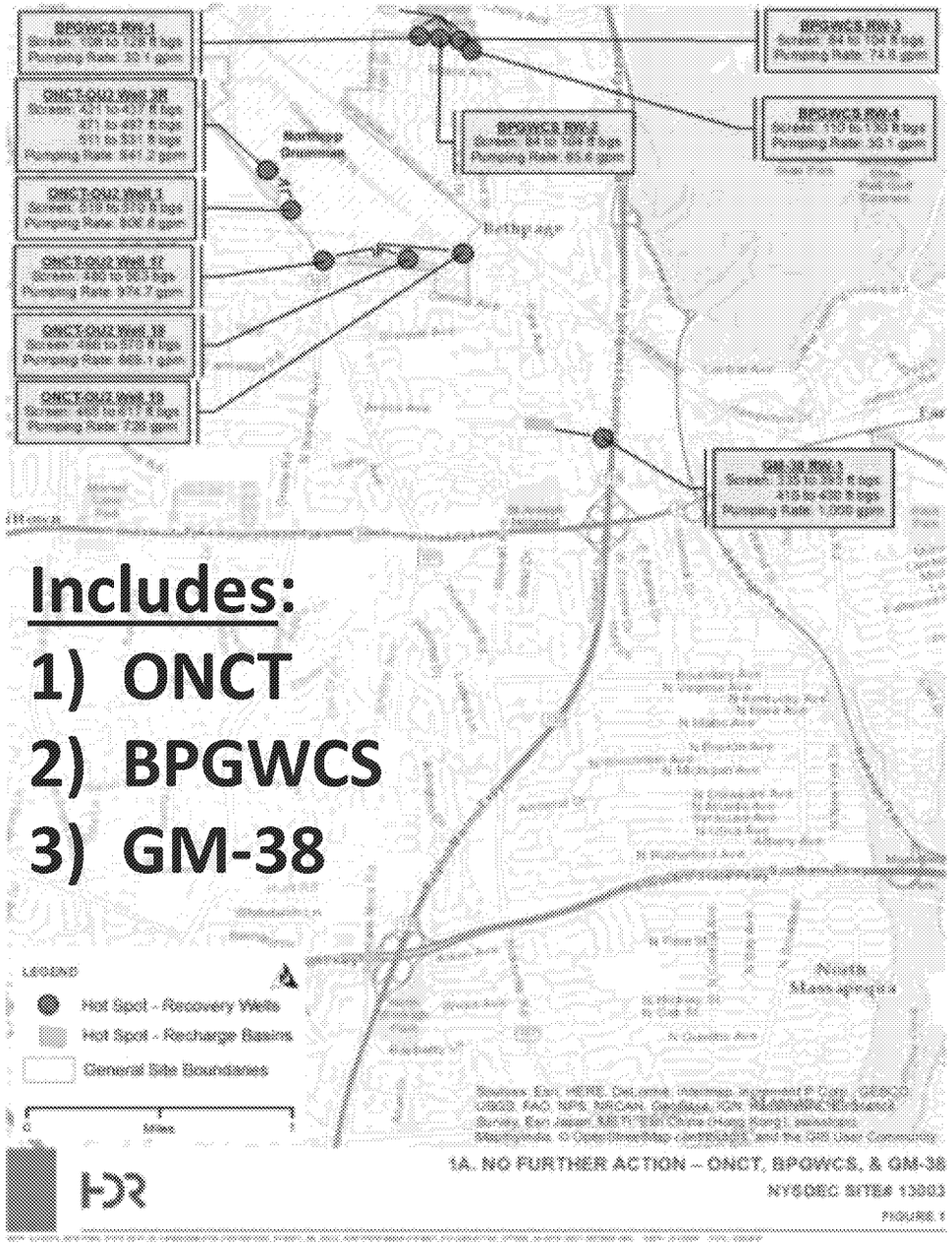
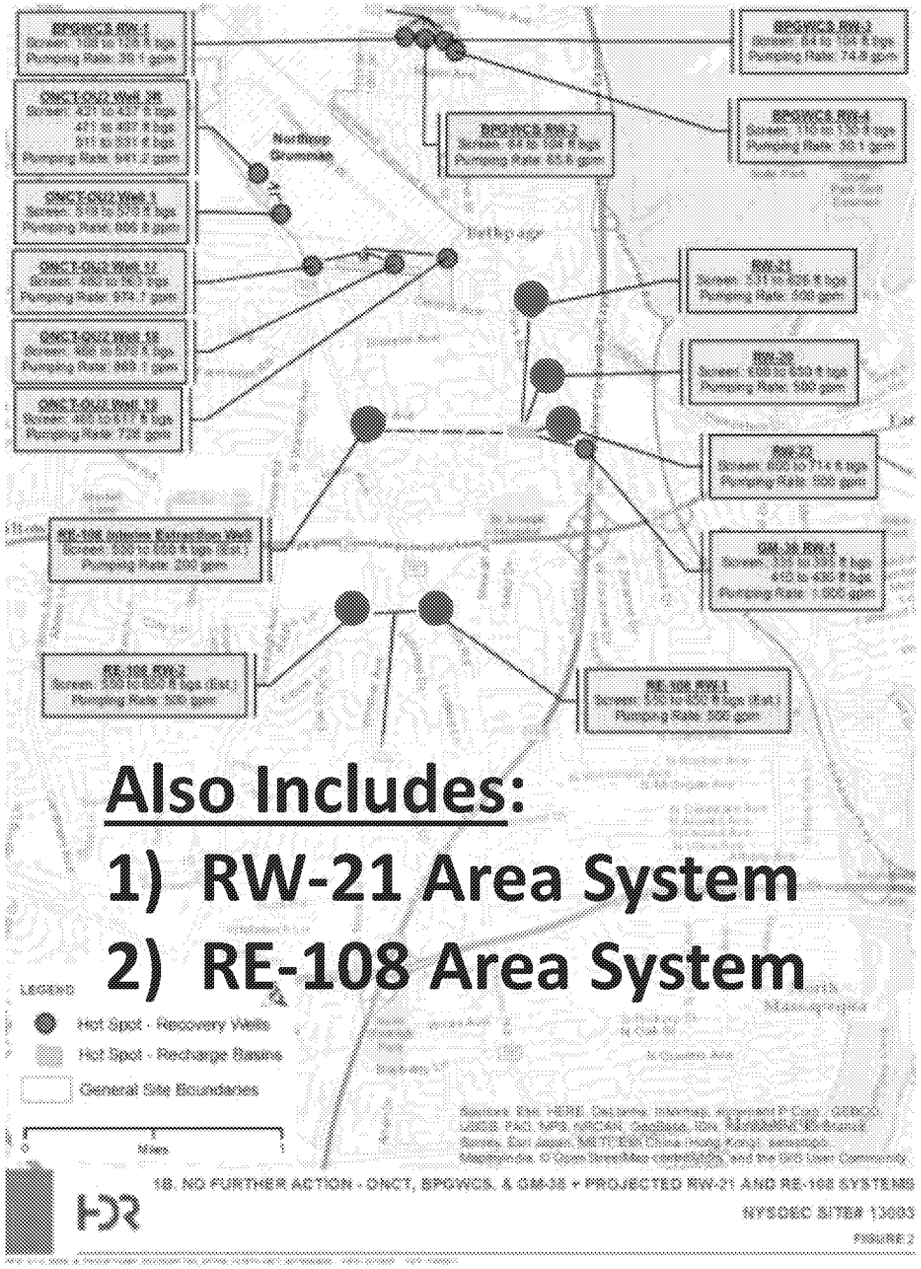
Remedial Option Scenarios 1A & 1B (No Further Action Scenarios)





Remaining Anticipated Scenarios

1. Hydraulic Containment COCs to SCGs
2. Hydraulic Containment to ND (Full Plume Containment)
3. Plume Mass Remediation
4. Aquifer Flushing with Injection Wells

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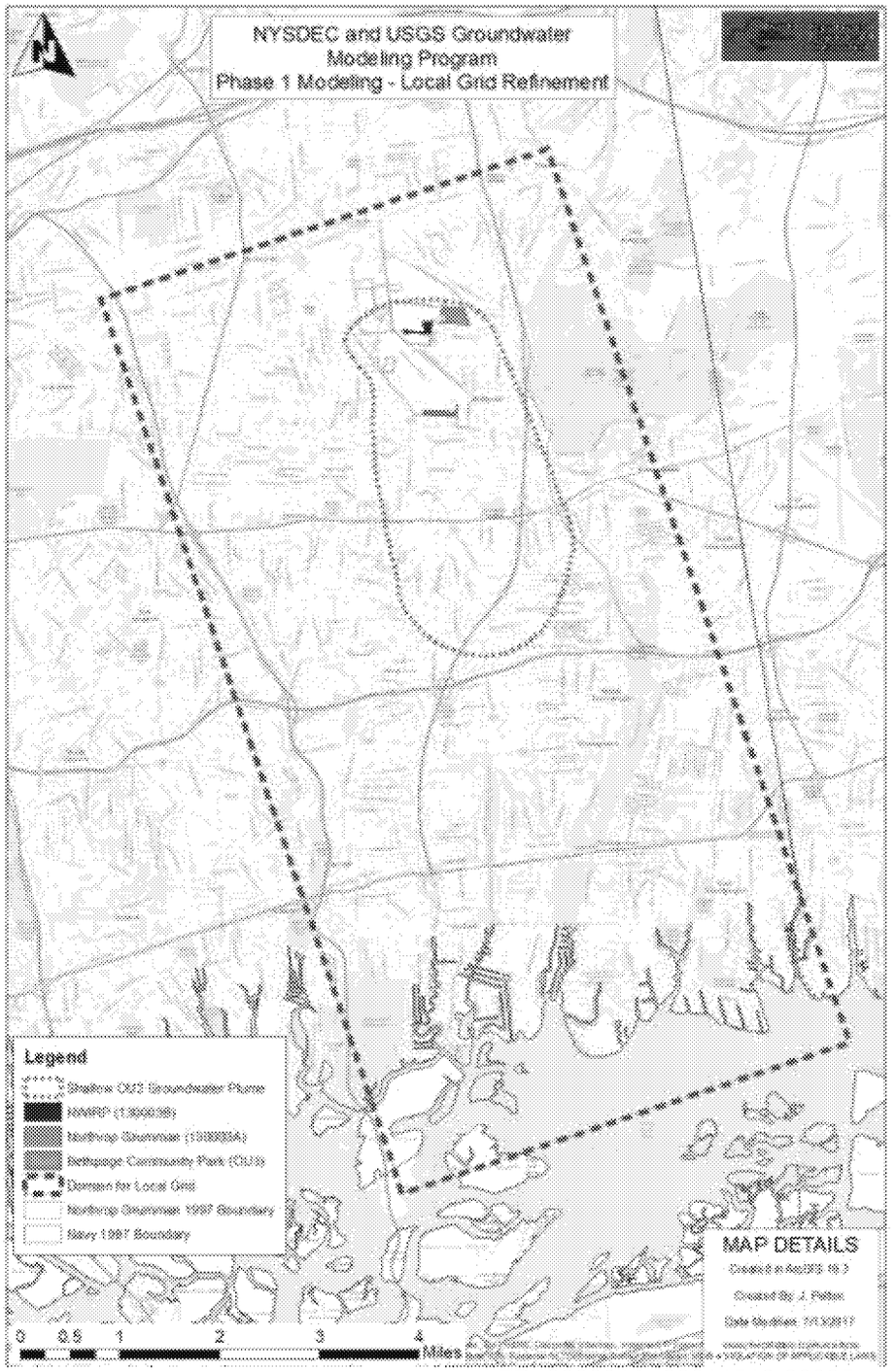
3) FS / ALTERNATIVES ANALYSIS

- Report Currently Being Written
- Draft Technical Memorandums Being Prepared (FS Sections)
  1. RAOs and COCs Memo
  2. Technology Screening Memo
- Met with NCDPW, DOW, F&W, USGS



Site Related Contaminants of Concern and Chemical Specific SCGs

Contaminant of Concern	CAS #	OU2 ROD	OU3 ROD	PWSCP	GW Plume FS	NYSDEC Part 703.5 Class GA (µg/l)	NYSDEC TOGS 1.1.1 (µg/l)	NYSDOH Part 5, Subpart 5-1 (µg/l)	Federal MCLs (µg/l)	Federal MCLG (µg/l)	Lowest SCG (µg/l)
1,1,2,2-Tetrachloroethane	79-34-5			X	X	5	5	5	NS	NG	5
1,1,1-Trichloroethane	71-55-6	X	X	X	X	5	5	5	200	200	5
1,1,2-Trichloroethane	79-00-5		X	X	X	1	1	5	5	3	1
1,1-Dichloroethane	75-34-3	X	X	X	X	5	5	5	NS	NG	5
1,1-Dichloroethene	75-35-4	X	X	X	X	5	5	5	7	7	5
1,2-Dichloroethane	107-06-2	X	X	X	X	0.6	0.6	5	5	0	0.6
1,2-Dichloropropane	78-87-5		X		X	1	1	5	5	0	1
Chloroform	67-66-3		X	X	X	7	7	NS	NS	70	7
cis-1,2-Dichloroethene	156-59-2		X	X	X	5	5	5	70	70	5
Dichlorofluoromethane	75-43-4		X		X	5	5	NS	NS	NG	5
Dichlorodifluoromethane	75-71-8		X		X	5	5	5	NS	NG	5
Tetrachloroethene	127-18-4	X	X	X	X	5	5	5	NS	0	5
Toluene	108-88-3		X		X	5	5	5	1000	1000	5
trans-1,2-Dichloroethene	156-60-5		X	X	X	5	5	5	70	100	5
Trichloroethene	79-01-6	X	X	X	X	5	5	5	5	0	5
1,1,2-Trichloro-1,2,2,-trifluoroethane	76-13-1		X	X	X	5	5	NS	NS	NG	5
Vinyl chloride	75-01-4	X	X		X	2	2	2	2	0	2
Carbon disulfide	75-15-0			X	X	60	NS	NS	NS	NG	60
Carbon tetrachloride	56-23-5			X	X	5	5	5	5	0	5
Chlorobenzene	108-90-7			X	X	5	5	5	100	100	5
1-4 Dioxane	123-91-1				X	NS	NS	50 (see notes)	NS	NG	0.67 (see notes)
Chromium	7440-47-3		X		X	5	50	100	100	100	5
Iron	7439-89-6		X		X	300	300	300	NS	NG	300
Nickel	7440-02-0		X		X	100	100	state MCL	NS	NG	100

Notes:
NS- No designated standard
NG- No designated goal
NYSDOH Part 5, Subpart 5-1 designates a maximum concentration of 50 ug/l for 1-4 Dioxane as a unspecified organic compound
Criteria based on a 10-6 lifetime excess cancer risk screening level in tap water, (EPA, 2013C)

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Key Evaluations Included in FS

1) Capture of Plume/s
2) Landward Migration of Freshwater-Saltwater Interface
3) Yield of Nearby Community Water Supplies
4) Discharge to Nearby Surface Water Streams & Ultimately South Oyster Bay
5) Discharge to Recharge Basins and/or Injection Wells
6) Discharge to Local Pollution Control Plants
7) Discharge for Beneficial Re-Use

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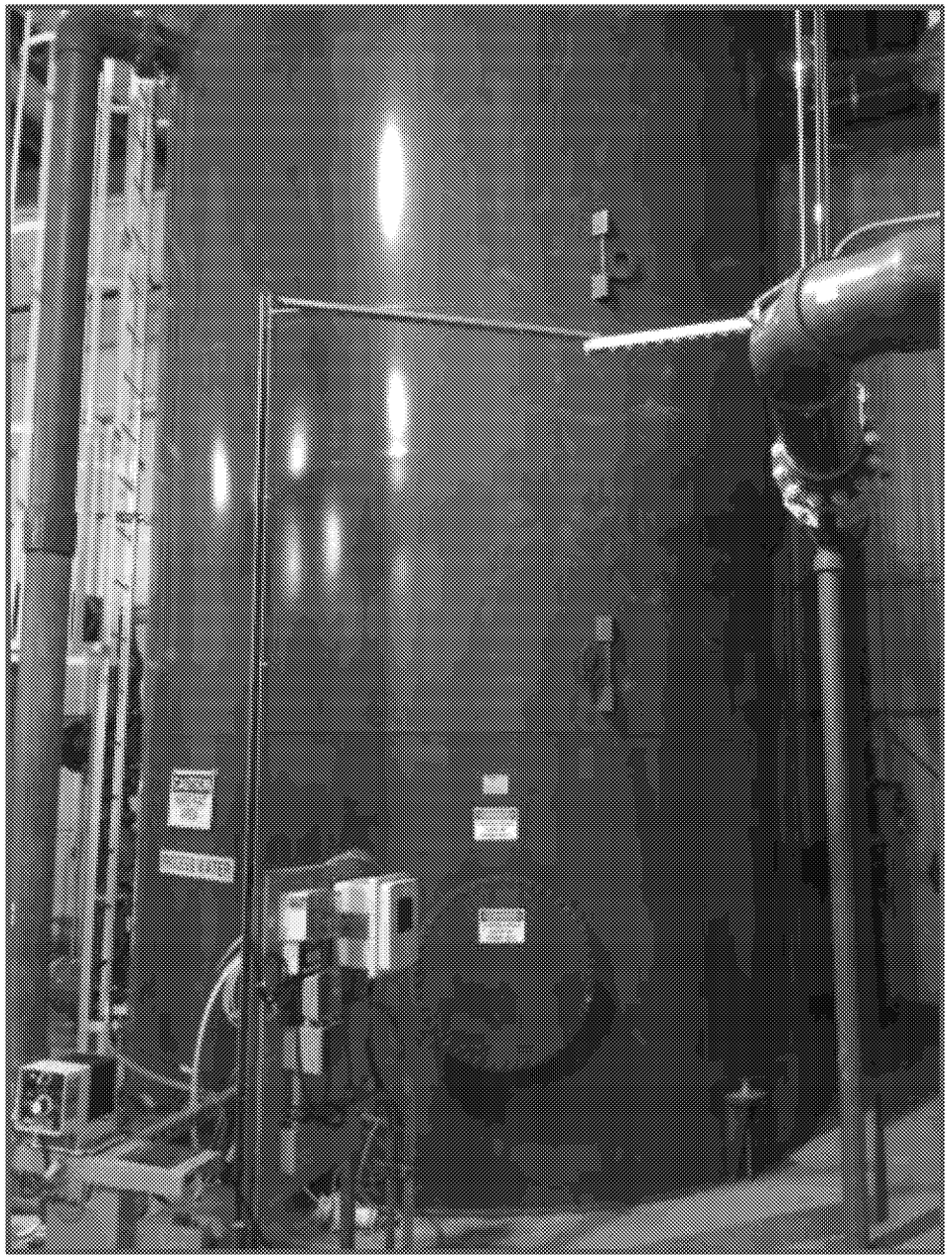
Next Steps

1) Continue Phase 1 Modeling

2) Late October Public Meeting

3) December Public Meeting

4) ~Mid-2018 FS/PRAP Public Meeting