Ms. Mary Siedlecki, Project Manager
North Carolina Department of Environmental Quality
Hazardous Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1646

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Subject:
Request for Reduction in Sampling Frequency
Ashland Raleigh Site, 1415 S. Bloodworth Street,
Raleigh, North Carolina
USEPA ID: 088 560 032

ENVIRONMENT

Date:
October 10, 2016

Contact:
Ryan Gerber, PE

Phone:
919-415-2265

Email:
ryan.gerber@arcadis.com

Our ref:
OH008000.NC29

ARCADIS G&M of North Carolina, Inc.

NC Engineering License # C-1869
NC Surveying License # C-1869

Dear Ms. Siedlecki:

On behalf of Ashland Inc. (Ashland), Arcadis G&M of North Carolina, Inc. (Arcadis) is pleased to submit this request for reduction frequency for the former Ashland chemical distribution facility (the Site) referenced in the subject line above. **Figure 1** depicts the Site layout, surrounding properties, and current monitoring well network.

Background

Arcadis submitted the final Corrective Measures Study (CMS) Report (Revision 1) for the Site to the North Carolina Department of Environment and Natural Resources, Division of Waste Management, Hazardous Waste Section (the Section) on June 19, 2012 recommending continuation of institutional controls (ICs) and monitored natural attenuation (MNA) of Site constituents of potential concern (COPCs) as the preferred final remedy for the Site (Arcadis 2012). The Section approved the CMS in a letter to Ashland dated September 14, 2012 (NCDEQ 2012).

The groundwater remedy proposed in the CMS included annual sampling of 19 monitoring wells and three surface water locations. The CMS stated that Ashland may propose a reduction in sampling frequency to biennial sampling after the 2017 annual sampling event if sufficient monitoring data is available to justify a reduction in sampling frequency.

Historic Groundwater Monitoring and Remediation

Ashland installed 46 monitoring wells (including three replacement wells where previous wells had been damaged) at the Site and in downgradient areas between 1986 and 2010 to define the horizontal and vertical extend of the groundwater plume and to monitor COPC attenuation over time. **Table 1** lists all monitoring wells at the Site along with installation date and well construction details. Ashland sampled the monitoring well network quarterly from March 1986 to October 1994, semi-annually in 1995 and from 1997 to 2011, and annually from 2012 to 2016. In total, Ashland has sampled groundwater at the Site 71 times over the 30-year monitoring period.

Several volatile organic compounds (VOCs) were initially detected at the Site at concentrations above applicable groundwater standards and identified as constituents of potential concern (COPC). Two interim remedial measures were implemented on the former Ashland Facility property including a groundwater pump and treat system and a soil vapor extraction (SVE) system. The groundwater pump-and-treat system was installed in September 1987 and the SVE system became operational in 1989. Ashland operated these remediation systems until February 1995; at that time, it was determined that the treatment systems had reached their limits of efficiency. A full-scale air sparge (AS) AS/SVE system was constructed in 2004 within the railroad corridor east of Ashland's former property and in a second area at the Apropos Holdings LLC property south of Farmer's Street. This off-site system became operational in November 2005 and operated until May 2009. The system was deemed to be ineffective and costly to operate. Therefore, the Section approved Ashland's request to deactivate and remove the SVE/AS remediation system on April 22, 2009, as part of a larger process to re-evaluate the entire remedial approach for the Site.

All COPCs have experienced significant attenuation over the 30-year monitoring period through active remediation and natural attenuation processes. **Table 2** lists historic COPCs along with current North Carolina Administrative Code Subchapter 2L Groundwater Standards (2L Standards), maximum historic concentration detected, and maximum concentration detected in 2016. Shaded rows indicate the historic COPCs have been consistently below the 2L Standards and are no longer considered COPCs at the Site.

Evaluation of the maximum and most recent COPC data presented above indicate that the majority of the COPCs have attenuated to concentrations that are currently less than 2% of their maximum detected concentrations during the 1980's. However, the primary COPC, tetrachloroethene (PCE), is currently present at 21% of its maximum historic concentration and has exhibited slower attenuations rates than the other COPCs. Cis-1,2-dichloroethene and vinyl chloride have increased in concentration over time, but these COPCs are purely biological dechlorination byproducts of PCE and TCE and were not released to soil and groundwater during facility operations. The presence of these COPCs in groundwater is a positive indication that PCE and TCE are degrading in the groundwater plume. 1,1-dichloroethene has also exhibited slightly slower attenuation in groundwater (currently at 5.1% of historic maximum concentration); however, 1,1-dichloroethene is a degradation byproduct of 1,1,1-trichloroethane and its continued presence in groundwater is likely partially attributable to the ongoing degradation of 1,1,1-trichloroethane over time. Conclusions from the COPC attenuation evaluation are that PCE remains the most persistent COPC in the groundwater plume and is considered the primary COPC at the Site.

The most recent groundwater sample results for PCE in shallow saprolite and partially weathered rock aquifer zones from March 2016 (Arcadis 2016) are depicted in **Figures 2** and **3** and a cross-sectional view through the approximate centerline of the plume is depicted on **Figure 4**. The extent of the groundwater plume is well delineated by the existing monitoring well network and complete attenuation of PCE has been achieved in the shallow aquifer (location MW-26) prior to its likely discharge into Walnut Creek. Additionally, historic surface water sampling in Walnut Creek indicates that COPCs have consistently been below applicable surface water standards.

Plume Stability Evaluation

Concentrations of primary COPCs (PCE and TCE) along with degradation compounds (cis-1,2-dichloroethene and vinyl chloride) in seventeen monitoring across the extent of the groundwater plume, from source areas (MW-1, MW-3S, MW-5, and MW-7S) to the most downgradient well (MW-26) are depicted over time on **Figures 5** through **22**. Evaluations of the plume stability and concentration trends are summarized as follows:

<u>Monitoring Wells Exhibiting Steadily Decreasing Concentrations</u>

- MW-8(R) (Figure 10), located on the Apropos Holding property downgradient of the Site has had some moderate COPC fluctuations between 1995 and 2008, but has exhibited steady attenuation of PCE and TCE since 2008.
- MW-8D(R) (Figure 11), located on the Apropos Holding property downgradient of the Site had repeating significant fluctuations of COPCs between years 1995 and 2008 but has exhibited significant and very steady attenuation of COPCs from 2009 to 2016.
- MW-12D (Figure 12), located on the Apropos Holding property downgradient of the Site has exhibited very steady and significant attenuation of COPCs over the extent of the monitoring period with only a few periods of minor fluctuations.
- MW-23BR (Figure 19), the bedrock well installed in 2010 in the downgradient wetland, had a temporary concentration spike in March 2011 but otherwise has had very stable to decreasing concentrations since September 2011.

<u>Monitoring Wells Exhibiting Stable Concentrations</u>

- MW-1 (Figure 5), located in a source area at the Site, has had generally steady PCE and TCE concentrations since 1997 with PCE ranging approximately between 2,000 to 7,000 µg/L and TCE ranging between approximately 50 and 600 µg/L, except for one sampling event in 2010 when all COPCs were at non-detectable concentrations.
- MW-3 (Figure 6) located near the southern Site boundary experienced moderate concentration fluctuations between 1986 and 2003, but has remained fairly steady since 2003 with some slight attenuation of PCE and TCE over time.
- MW-3D (Figure 7) located near the southern Site boundary had experienced increasing and unsteady concentrations from 1986 to 2003, but has remained fairly steady since 2003 with some slight attenuation of PCE and TCE over time.
- MW-5 (Figure 8), located in a source area along the railroad tracks to the east of the Site, has had generally steady COPC concentrations since 1995 with two brief periods in 2002 and 2009 of

significant concentration dips. Generally, PCE concentrations have ranged between 15,000 and 85,000 µg/L since 1995.

- MW-7 (Figure 9) located near the center of the Site experienced a temporary dip in PCE concentrations from approximately 2007 to 2010, possibly due to operation of the AS/SVE system from 2005 to 2009; however, PCE concentrations increased from 2010 to 2016, returning to average concentrations detected from 2004 to 2007. Although there have been recent increases in PCE concentrations, the overall trends are steady with gradual increases and decreases over time.
- MW-14OB (Figure 13) located in the downgradient portion of the plume has exhibited generally steady PCE concentrations since 2008.
- MW-22, shallow well located in the mid-portion of the plume has had non-detectable COPC concentrations during each sampling event since 2007. MW-22 had only one initial detection of PCE at 1.2 µg/L after the well was installed in 2006. COPC concentrations at MW-22 were not graphed.
- MW-23 (Figure 17), installed in 2010 and located in the downgradient wetland, had a significant drop in concentrations in September 2011, but has remained generally stable from 2013 to 2016.
- MW-25 (Figure 21), easternmost well located in the downgradient portion of the plume has exhibited generally steady PCE concentrations between 2 and 8 µg/L since 2010.
- MW-26 (Figure 22), the most downgradient well installed in 2010 in the wetland, had significant decreases in PCE and TCE concentrations in September 2011 and has remained at very low (i.e., less than 5 µg/L) to non-detected concentrations since 2011.

<u>Monitoring Wells Exhibiting Unstable Concentrations</u>

- MW-14TZ (Figure 14), deep well located in the downgradient portion of the plume exhibited increasing PCE concentrations from 2006 to 2011 and deceasing PCE concentrations since 2011. Overall, no long term trends are discernable in the data.
- MW-16OB (Figure 15), shallow well located along the western edge of the mid portion of the plume exhibited deceasing PCE concentrations from 2002 to 2013 (only four data points) but has had a short-term increasing trend in PCE concentrations during 2015 and 2016. Overall, no long term trends are discernable in the data.
- MW-18BR (Figure 16), a bedrock well located near the center point of the groundwater plume, has exhibited moderate fluctuations since 1997, with PCE concentrations ranging from 180 to 22,000 µg/L with no consistent overall concentration trends.
- MW-23D (Figure 18), a deep well located in the downgradient wetland, experienced steadily increasing COPC concentrations from 2010 to 2014, but has had slightly decreasing concentrations trends during the last two sampling events.
- MW-24 (Figure 20), westernmost well in the downgradient wetland, experienced increasing COPC concentrations from 2011 to 2013, and PCE has fluctuated between 29 and 170 µg/L since 2013. Cis-1,2-dichloroethene has increased steadily since 2011 indicating that rates of reductive dechlorination of TCE may be increasing over time.

CONCLUSIONS

Conclusions from evaluation of 30 years of groundwater monitoring data is that the groundwater plume has achieved stability in its overall size and extent and that COPC concentrations on average across the plume are attenuating, although PCE is attenuating more slowly than other COPCs. Some monitoring wells have fluctuating COPC concentrations over time which is typical for most groundwater plumes as a result of variations in rainfall from year to year; however, no wells appear to exhibit a sustained increasing COPC concentration trends in the groundwater plume. Additionally, the farthest downgradient wells indicate that PCE is attenuating to non-detectable concentrations prior to discharge into Walnut Creek.

RECOMMENDATIONS

Arcadis recommends that the periodic monitoring of the groundwater should be reduced to biennial sampling events for both groundwater and surface water after the scheduled 2017 sampling event based on the generally decreasing or stable COPC concentrations observed over the 30 years of groundwater monitoring. The sampling and analysis plan should otherwise remain the same with 19 monitoring wells gauged and sampled and 3 surface water samples collected every 2 years. This proposed reduction in the frequency of the monitoring events will not result in any increased risks to human health or the environment as no evidence of sustained COPC increases have been observed in any portions of the groundwater plume over the monitoring period.

Sincerely,

Arcadis G&M of North Carolina, Inc.

Ryan M. Gerber, PE
Project Engineer

David M. Wilderman, PG
Principal Geologist

Copies:

Trey Richardson – Ashland, Inc.

Enclosures:

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Figure 9. MW-7 Primary Constituent Concentrations Over Time
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Figure 11. MW-8D/8DR Primary Constituent Concentrations Over Time
Figure 12. MW-12D Primary Constituent Concentrations Over Time
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Figure 16. MW-18BR Primary Constituent Concentrations Over Time
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Figure 19. MW-23BR Primary Constituent Concentrations Over Time
Figure 20. MW-24 Primary Constituent Concentrations Over Time
Figure 21. MW-25 Primary Constituent Concentrations Over Time
Figure 22. MW-26 Primary Constituent Concentrations Over Time

References:

ARCADIS, 2012. Corrective Measures Study (Revision 1), Former Ashland Inc. Chemical Distribution Facility, Raleigh, North Carolina. June 19.

ARCADIS, 2016. March 2016 Annual Groundwater Monitoring Report, Former Ashland Inc. Chemical Distribution Facility, Raleigh, North Carolina. June 8.

NCDEQ, 2012. Letter to Ashland Inc., Re: Corrective Measures Study Report, Former Ashland Distribution Facility, September 14.

Table 1. Well Construction Details
Former Ashland Raleigh Site, 1415 S. Bloodworth Street, Raleigh, North Carolina

Monitoring Well	Date of Installation	TOC Elevation (ft msl)	Total Depth (ft bls)	Screened Interval (ft bls)	Screen Mid-Point (ft bls)	Northing* (ft)	Easting* (ft	Casing Diameter & Material	Notes
MW-1	02/1986	260.56	28.5	18.5 - 28.5	23.5	732406.33	2108582.89	2-inch sst	
MW-2	02/1986	256.98	28.5	18.5 - 28.5	23.5	732205.30	2108580.66	2-inch sst	
MW-2D	02/1986	257.50	73.5	63.5 - 73.5	68.5	732207.57	2108578.99	2-inch sst	
MW-3	02/1986	260.44	33.5	23.5 - 33.5	28.5	732201.16	2108743.20	2-inch sst	
MW-3D	02/1986	260.92	71.0	61.0 - 71.0	66.0	732203.62	2108741.28	2-inch sst	
MW-4	02/1986	256.25	30.5	20.5 - 30.5	25.5	732712.91	2108580.76	2-inch sst	
MW-5	02/1986	257.41	28.5	18.5 - 28.5	23.5	732373.63	2108772.31	2-inch sst	
MW-6	02/1986	260.37	28.5	18.5 - 28.5	23.5	732578.97	2108776.24	2-inch sst	
MW-7	02/1986	259.95	28.5	18.5 - 28.5	23.5	732384.00	2108694.44	2-inch sst	
MW-7D	02/1986	260.09	69.8	59.8 - 69.8	64.8	732381.69	2108694.23	2-inch sst	
MW-8	10/1987	251.55	27.0	17.0 - 27.0	22.0	732045.98	2108779.93	2-inch PVC	Abandonded in 2008
MW-8R	08/2008	252.92	27.0	17.0 27.0	22.0	732045.98	2108779.93	2-inch PVC	
MW-8D	10/1987	251.38	59.3	49.3 - 59.3	54.3	732046.13	2108777.04	2-inch sst	Abandonded in 2008
MW-8DR	08/2008	252.89	54.0	44.0 54.0	49.0	732046.13	2108777.04	2-inch PVC	
MW-9D	06/1993	251.65	62.5	57.5 - 62.5	60.0	732113.58	2108458.19	2-inch PVC	
MW-11D	06/1993	249.38	55.0	50.0 - 55.0	52.5	731907.09	2108761.57	2-inch PVC	Abandonded in 2008
MW-11DR	08/2008	250.33	37.0	27.0 - 37.0	32.0	731907.09	2108761.57	2-inch PVC	
MW-12TZ	10/1997	246.94	59.0	44.0 - 59.0	51.5	732002.84	2108912.44	4-inch PVC	
MW-12D	06/1993	244.45	34.6	29.6 - 34.6	32.1	731981.45	2108935.54	2-inch PVC	
MW-12BR	10/1997	248.40	170.0	160.0 - 170.0	165.0	731976.41	2108911.40	2-inch PVC	
MW-13D	06/1993	260.22	75.1	70.1 - 75.1	72.6	732313.13	2108658.89	2-inch PVC	
MW-14OB	10/1997	225.71	21.0	11.0 - 21.0	16.0	731312.97	2109123.79	2-inch PVC	
MW-14TZ	10/1997	226.80	35.0	33.0 - 35.0	34.0	731309.90	2109096.27	2-inch PVC	
MW-15OB	01/1998	225.38	24.0	14.0 - 24.0	19.0	NA	NA	2-inch PVC	
MW-15TZ	02/1998	225.43	45.0	43.0 - 45.0	44.0	NA	NA	2-inch PVC	
MW-16OB	10/1997	237.85	21.0	11.0 - 21.0	16.0	731600.91	2108722.01	2-inch PVC	
MW-16TZ	11/1997	237.44	47.0	45.0 - 47.0	46.0	731572.94	2108697.31	2-inch PVC	
MW-16BR	10/1997	243.52	85.0	70.0 - 85.0	77.5	731546.63	2108734.29	2-inch PVC	
MW-17OB	10/1997	224.30	16.0	6.0 - 16.0	11.0	731256.12	2108629.50	2-inch PVC	
MW-17TZ	10/1997	225.65	50.0	45.0 - 50.0	47.5	731265.12	2108587.76	2-inch PVC	
MW-18TZ	10/1997	229.98	35.0	33.0 - 35.0	34.0	731607.86	2109273.97	2-inch PVC	
MW-18BR	10/1997	239.40	85.0	75.0 - 85.0	80.0	731616.03	2109015.69	4-inch PVC	
MW-19	10/1997	232.89	17.0	7.0 - 17.0	12.0	731591.52	2109171.82	2-inch PVC	
MW-20	10/1997	223.85	20.0	5.0 - 20.0	12.5	731350.97	2109290.89	2-inch PVC	
MW-20D	05/2006	222.38	45.0	35.0 - 45.0	40.0	731364.62	2109294.11	2-inch PVC	Well Log NA
MW-20BR	05/2006	222.08	83.0	73.0 - 83.0	78.0	731344.93	2109315.55	2-inch PVC	Well Log NA
MW-21	05/2006	238.75	25.0	15.0 - 25.0	20.0	731611.20	2108958.87	2-inch PVC	Well Log NA
MW-22	05/2006	232.47	25.0	15.0 - 25.0	20.0	731651.26	2109234.59	2-inch PVC	Well Log NA
MW-22D	05/2006	232.57	43.0	33.0 - 43.0	38.0	731658.75	2109249.61	2-inch PVC	Well Log NA
MW-22BR	05/2006	232.65	108.0	98.0 - 108.0	103.0	731652.26	2109243.97	2-inch PVC	Well Log NA
MW-23	09/2010	222.33	21.0	11.0 - 21.0	16.0	731135.17	2109290.82	2-inch PVC	
MW-23D	09/2010	221.77	61.0	51.0 - 61.0	56.0	731140.03	2109285.02	2-inch PVC	
MW-23BR	09/2010	222.00	84.0	74.0 - 84.0	79.0	731129.88	2109285.15	2-inch PVC	
MW-24	09/2010	222.91	21.0	11.0 - 21.0	16.0	731040.71	2109219.90	2-inch PVC	
MW-25	09/2010	221.85	23.0	13.0 - 23.0	18.0	731279.47	2109473.81	2-inch PVC	
MW-26	09/2010	222.28	23.0	13.0 - 23.0	18.0	730946.33	2109290.57	2-inch PVC	

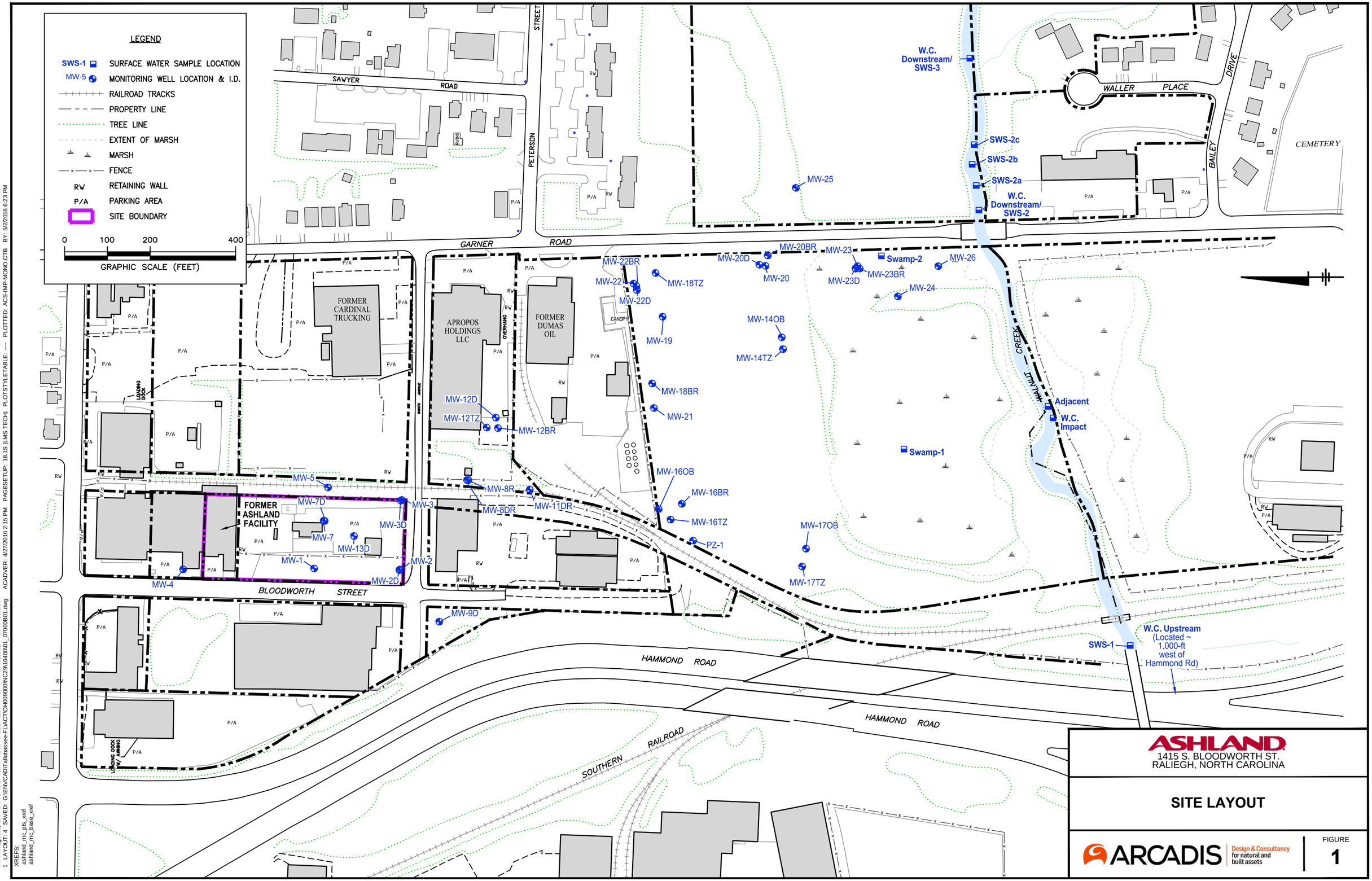
Notes

*	Northing and Easting based on North American Datum (NAD) 83.
ft	Feet
ft msl	Feet above mean sea level.
ft bls	Feet below land surface.
NA	Not available.
sst	Stainless Steel
PVC	Poly-Vinyl Chloride

Table 2. Summary of Groundwater COPCs
Former Ashland Raleigh Site, 1415 S. Bloodworth Street, Raleigh, North Carolina

COPC	2L Groundwater Standard (µg/L)	Maximum Historic Concentration Detected (Well Location, Year) (µg/L)	Maximum 2016 Concentration Detected (Well Location) (µg/L)	2016 Percentage of Maximum Concentration (Percent)
Carbon Tetrachloride	0.3	4,300 (MW-6, 1986)	28 (MW-23)	0.65%
1,1-Dichloroethane	6	25,000 (MW-5, 1986)	200 (MW-7)	0.80%
1,1-Dichloroethene	350	7,800 (MW-6, 1986)	400 (MW-7)	5.10%
Cis-1,2-Dichloroethene[1]	70	4,900 (MW-7, 2016)	4,900 (MW-7)	100%
Methylene Chloride	5	1,400,000 (MW-3D,1987)	ND	~0%
Toluene	600	140,000 (MW-7S, 1987)	ND	~0%
Tetrachloroethene (PCE)	0.7	200,000 (MW-5, 1986)	42,000 (MW-5)	21%
1,1,1-Trichloroethane	200	77,000 (MW-5, 1986)	1,200 (MW-7)	1.60%
Trichloroethene (TCE)	3	140,000 (MW-5, 1986)	2,400 (MW-7)	1.70%
Vinyl Chloride[1]	0.03	160 (MW-26, 2014)	140 (MW-26)	88%

Notes:
COPC - Constituent of Potential Concern
2L Groundwater Standard - The North Carolina Administrative Code Subchapter 2L Groundwater Standards
µg/L - micrograms per liter
ND – Not Detected
1 – cis-1,2-dichloroethene and vinyl chloride were not released at the Site; these COPCs are generated in groundwater as a byproduct of biological dechlorination of PCE and TCE.
Shaded rows indicate that the constituent has not beet detected aboe the 2L Groundwater Standard during recent events and is no longer considered a COPC at the Site



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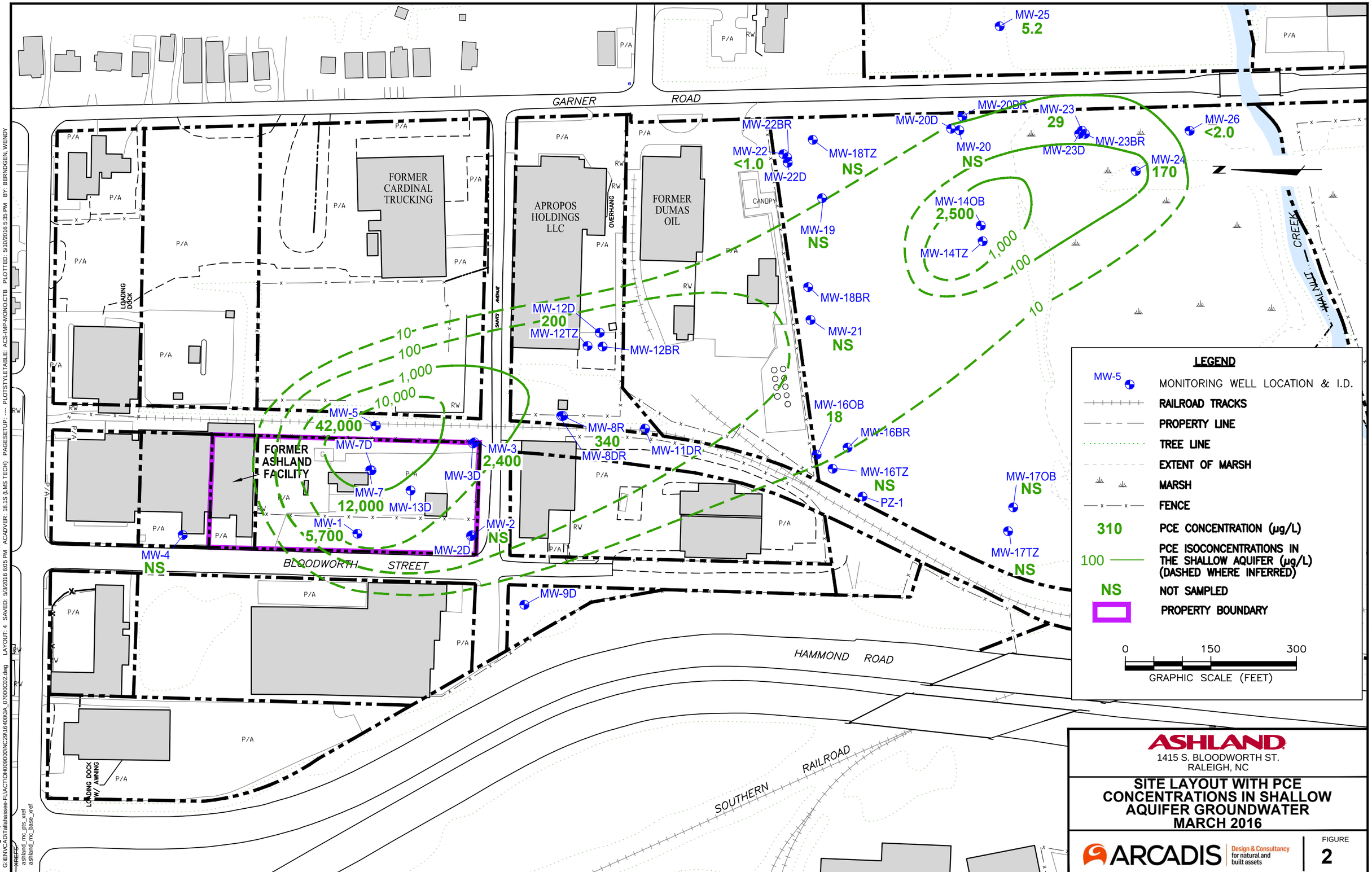

ASHLAND
1415 S. BLOODWORTH ST.
RALEIGH, NC

SITE LAYOUT WITH PCE CONCENTRATIONS IN SHALLOW AQUIFER GROUNDWATER MARCH 2016

ARCADIS Design & Consultancy for natural and built assets

FIGURE 2

CITY: Augusta, GA DIV/GROUP: ENV DB: A. Warren LD: PIC: PM: D. Willis TM: G Adams
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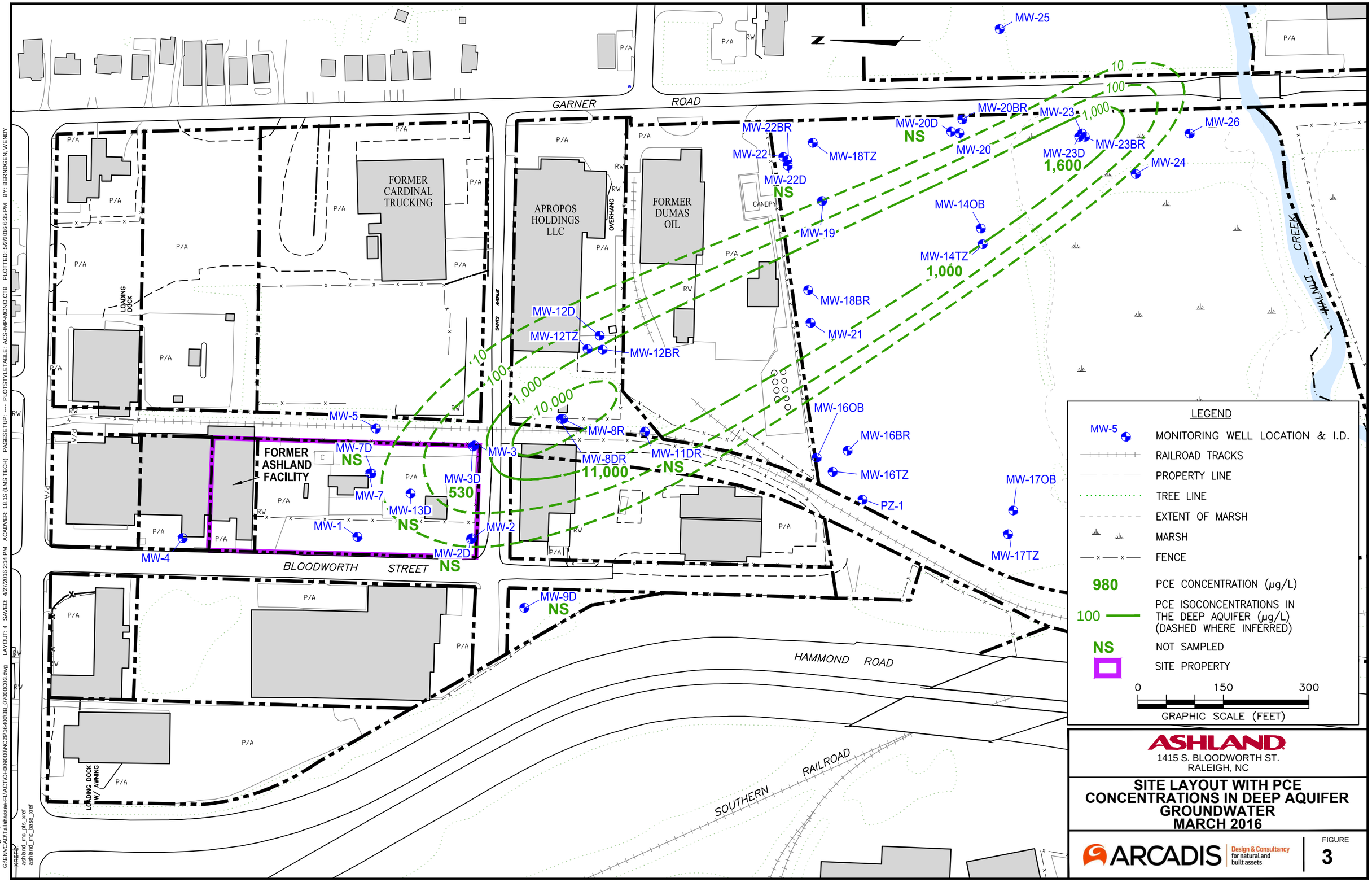
GARNER ROAD
BLOODWORTH STREET
HAMMOND ROAD
SOUTHERN RAILROAD
HALLIT CREEK
FORMER CARDINAL TRUCKING
APROPOS HOLDINGS LLC
FORMER DUMAS OIL
FORMER ASHLAND FACILITY
LOADING DOCK
OVERHANG
SAWYER AVENUE
CANOPY
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MW-25
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MW-16BR
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10
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LEGEND
MW-5 MONITORING WELL LOCATION & I.D.
RAILROAD TRACKS
PROPERTY LINE
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EXTENT OF MARSH
MARSH
FENCE
980 PCE CONCENTRATION (µg/L)
100 PCE ISOCONCENTRATIONS IN THE DEEP AQUIFER (µg/L) (DASHED WHERE INFERRED)
NS NOT SAMPLED
SITE PROPERTY
0 150 300
GRAPHIC SCALE (FEET)
ASHLAND
1415 S. BLOODWORTH ST.
RALEIGH, NC
SITE LAYOUT WITH PCE CONCENTRATIONS IN DEEP AQUIFER GROUNDWATER
MARCH 2016
ARCADIS Design & Consultancy for natural and built assets
FIGURE
3
CITY: Augusta, GA DIV/GROUP: ENV DB: A. Warren LD: PIC: PM: D. Willis TM: G Adams
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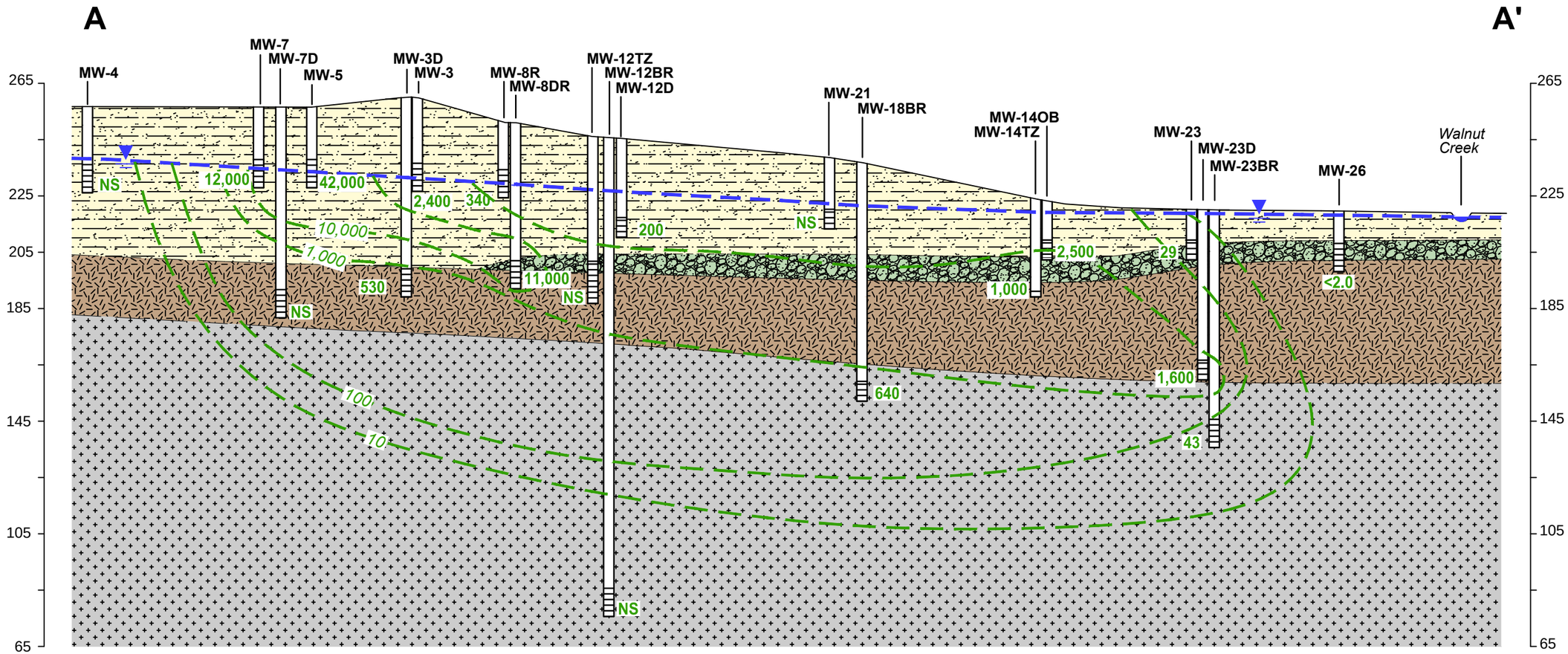


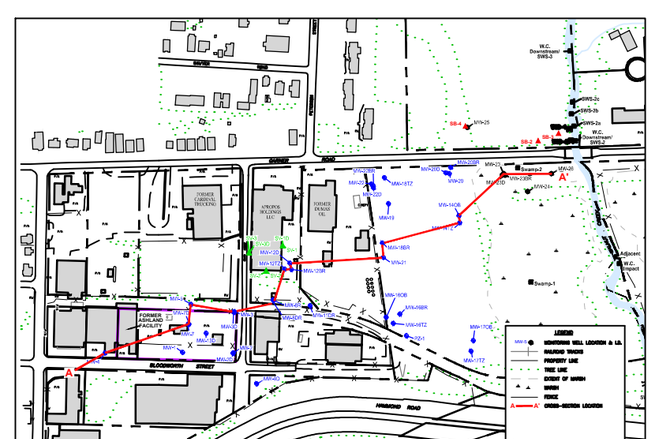
Legend:

- Well Casing
- Well Screen
- Water Level Elevation
- Fine Sand, Silt and Clay
- Alluvial Sand and Gravel
- Partially Weathered Rock
- Competent Bedrock
- 710 PCE Concentrations (µg/L)
- 1,000 PCE Isoconcentrations (µg/L) (Dashed Where Inferred)
- NS Not Sampled

Note: Dashed where inferred, based on data from historical sampling events.

0 160' 320'
HORIZONTAL SCALE

0 40' 80'
VERTICAL SCALE



INSET SCALE 1"=600'

ASHLAND
1415 S. BLOODWORTH ST.
RALEIGH, NC

GEOLOGIC CROSS SECTION A - A'
PCE CONCENTRATION (µg/L)
MARCH 2016

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4

CITY: Augusta, GA DIV/GROUP: ENVCAD DB: A. Saul LD: A. Saul PIC: PM: TM: LYR: ON=*;OFF=*REF*
G:\ENVCAD\Tallahassee-FL\ACT\OH009000\NC29\16400\04_07000C04.dwg LAYOUT: 4 SAVED: 5/6/2016 11:14 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACS-IMP-MONO.CTB PLOTTED: 5/6/2016 11:41 AM BY: BERNDGEN, WENDY
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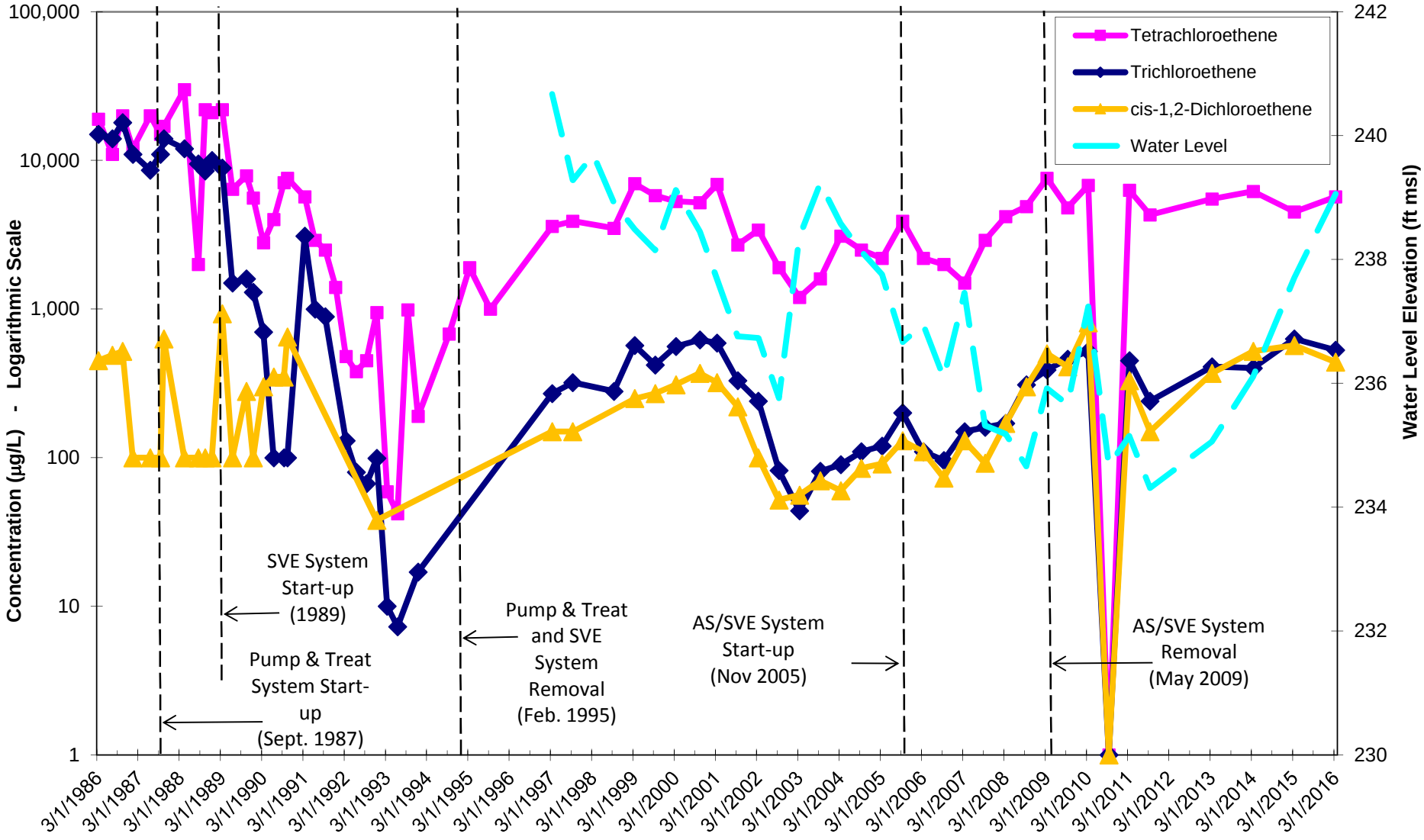
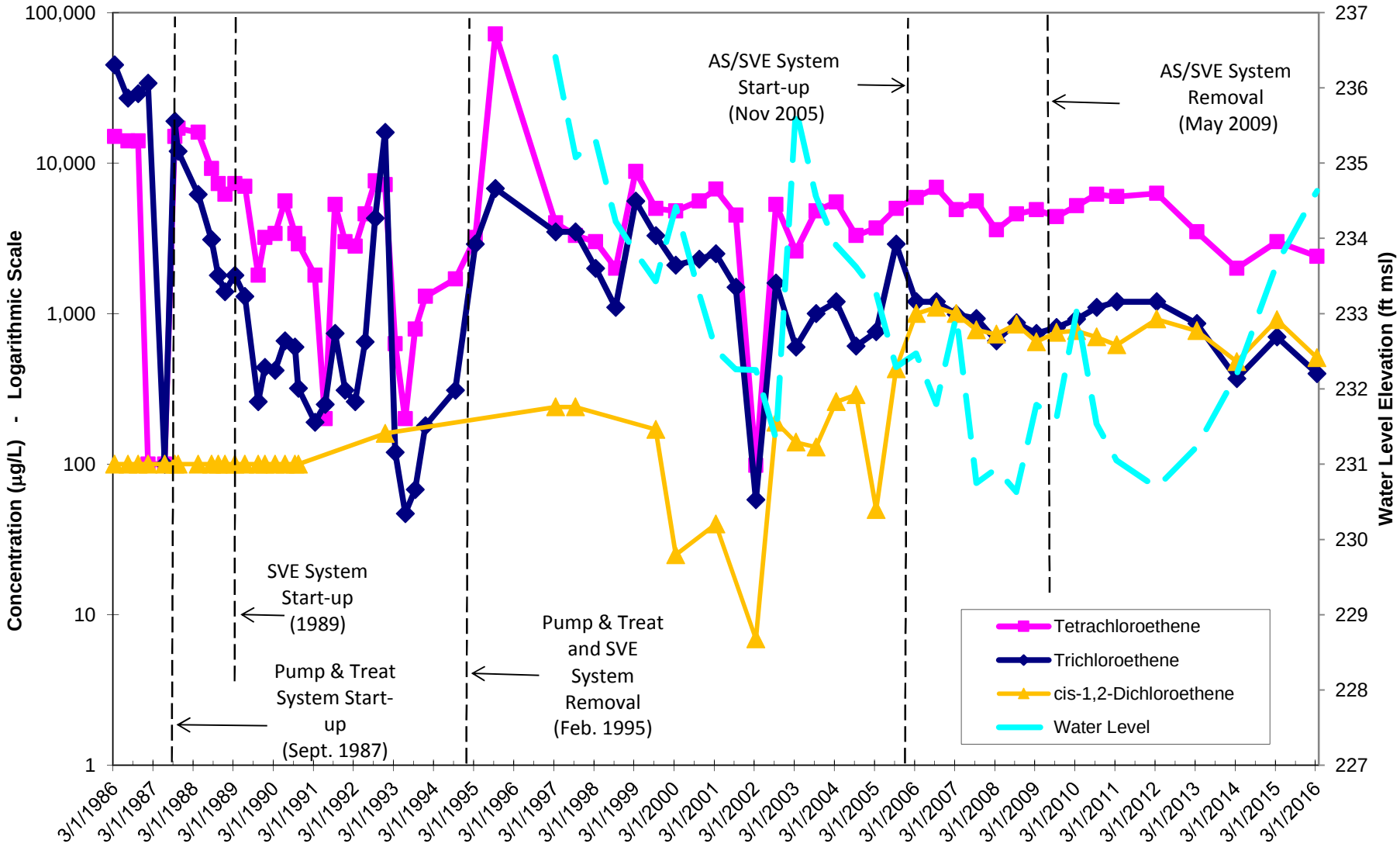
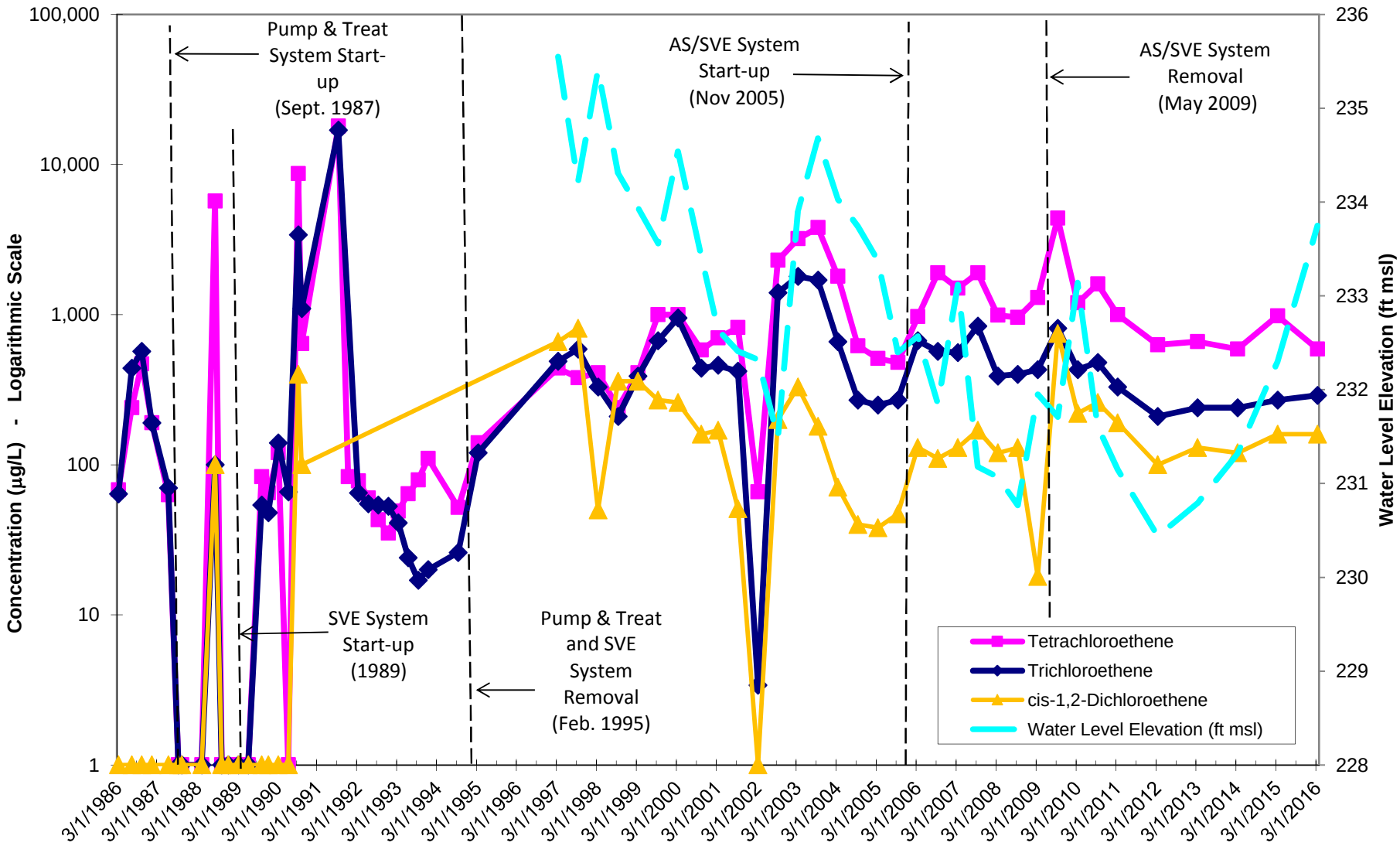
ashland_mc_base_and_secondary_color-FULL DESCRIPTION.jpg



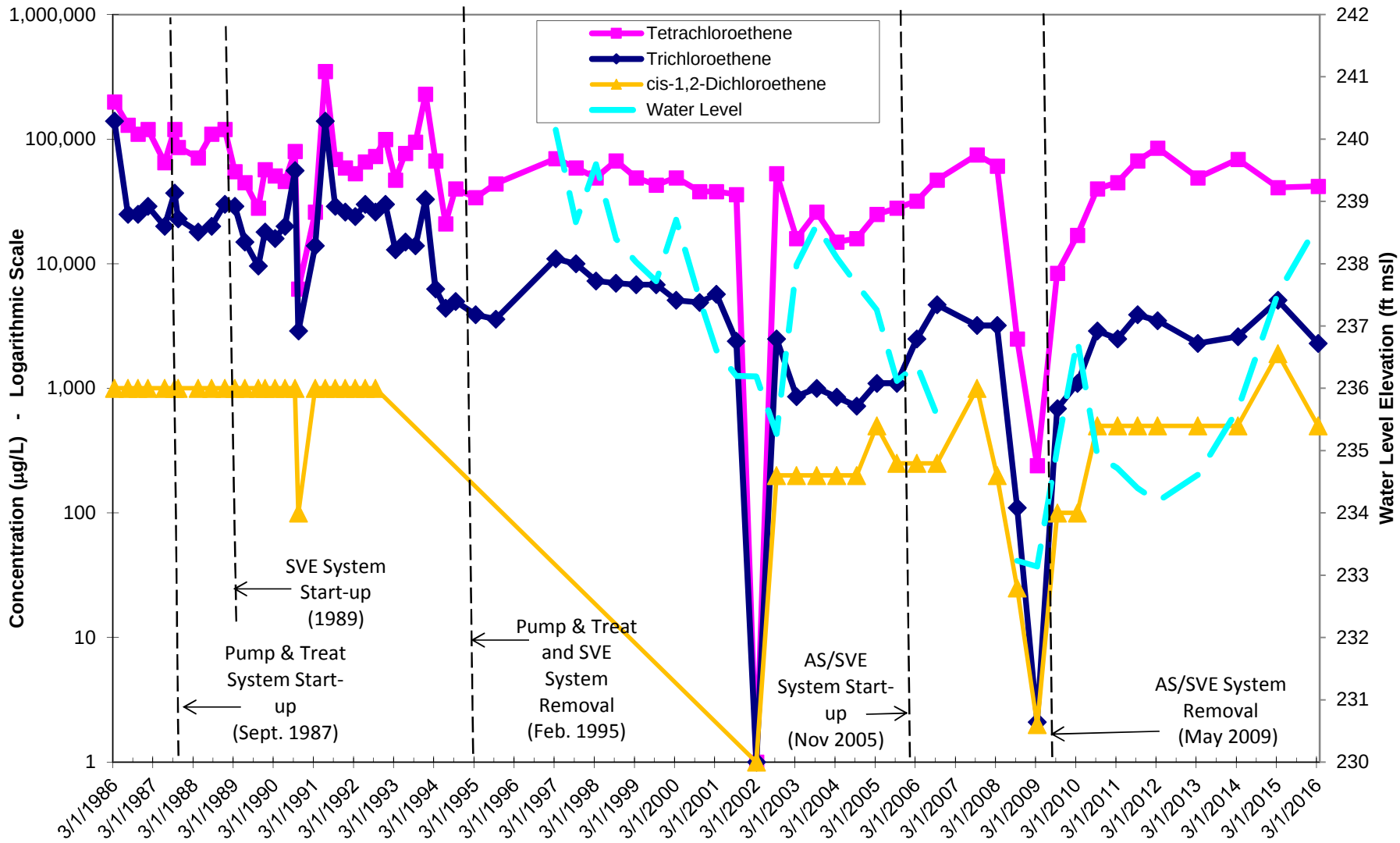
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-1 Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE **5**



ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-3 Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **6**

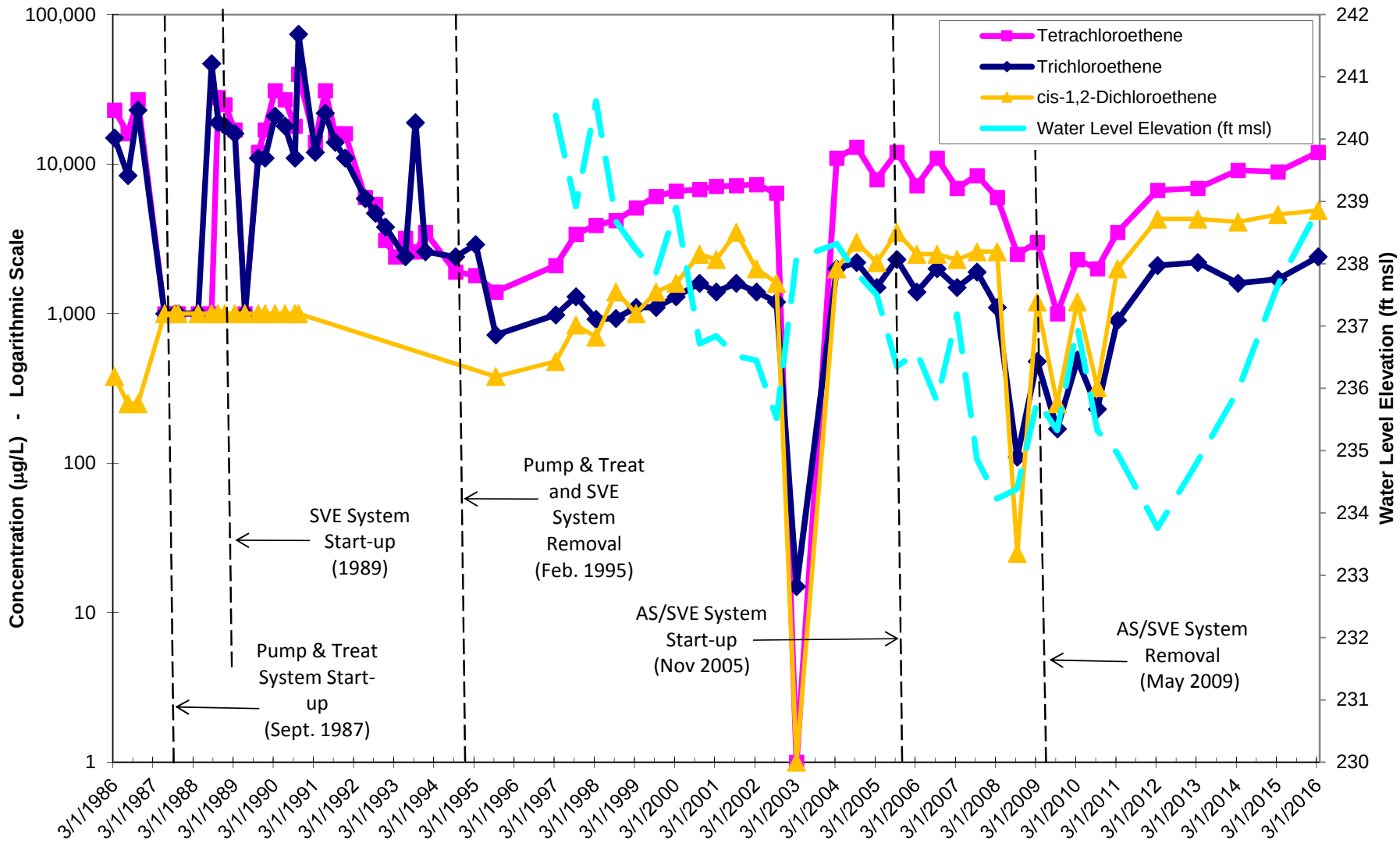


ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-3D Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **7**

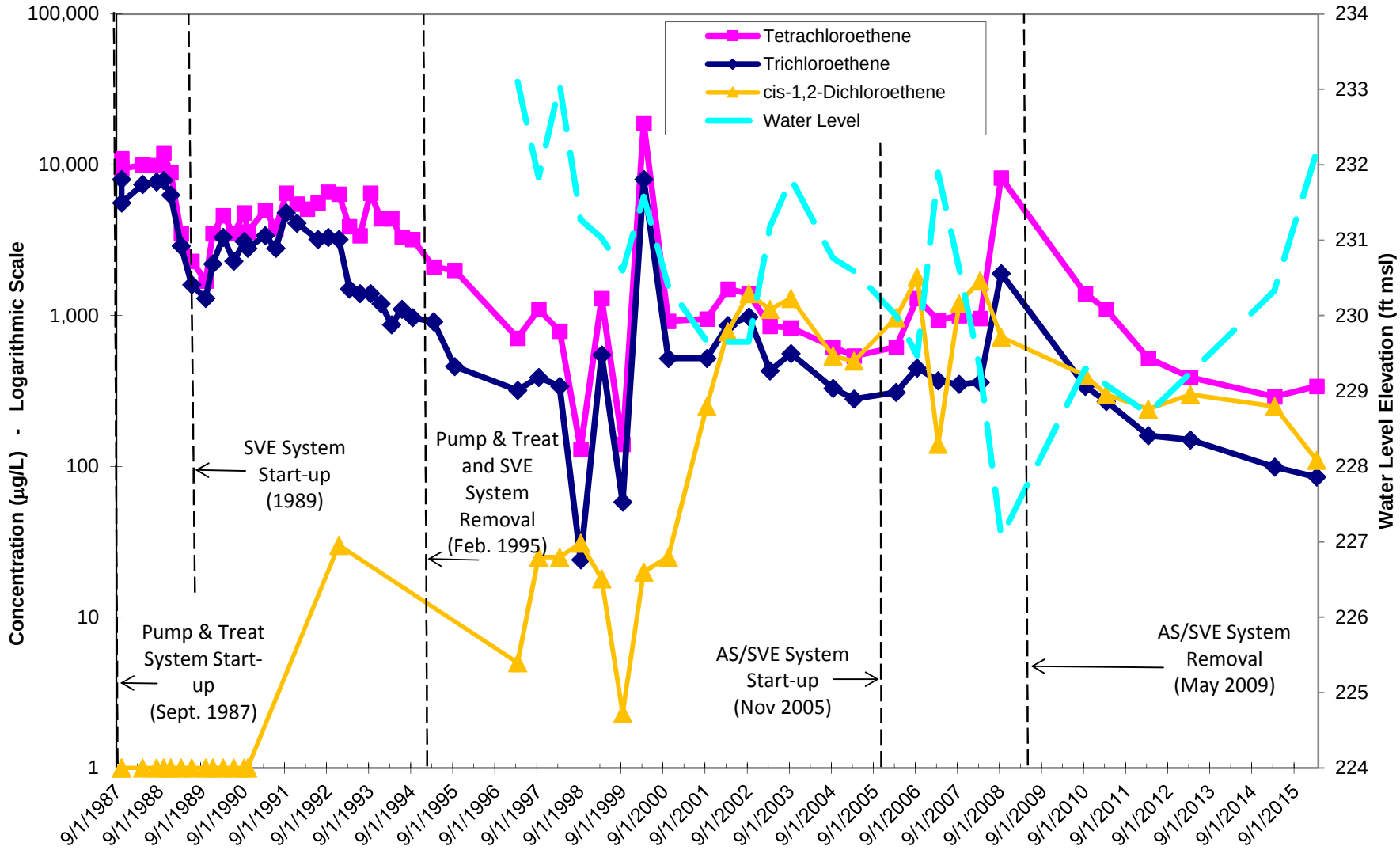


Note: cis-1,2-Dichloroethene was first detected in March 2015. Previous values indicate laboratory reporting limits

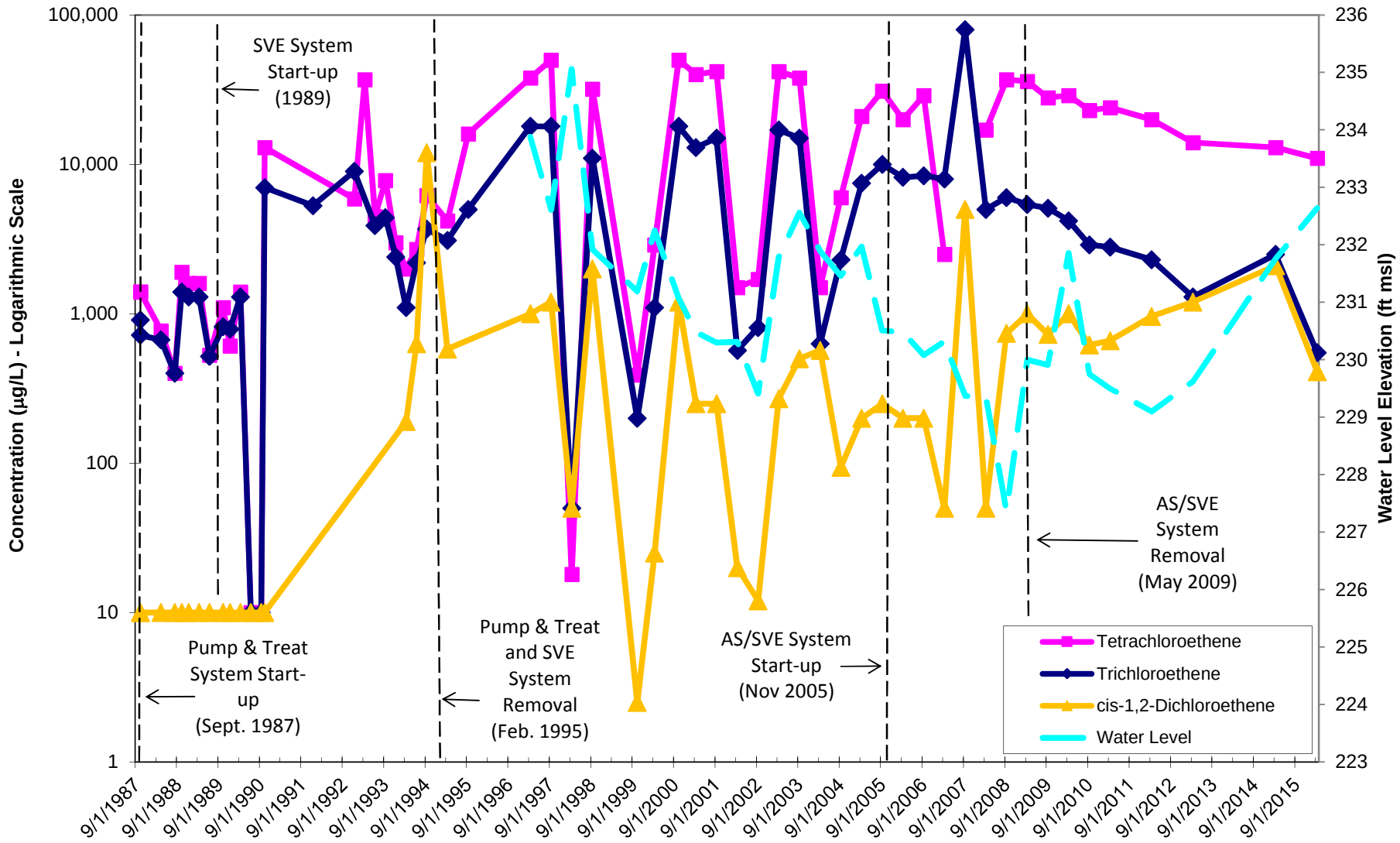
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-5 Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **8**



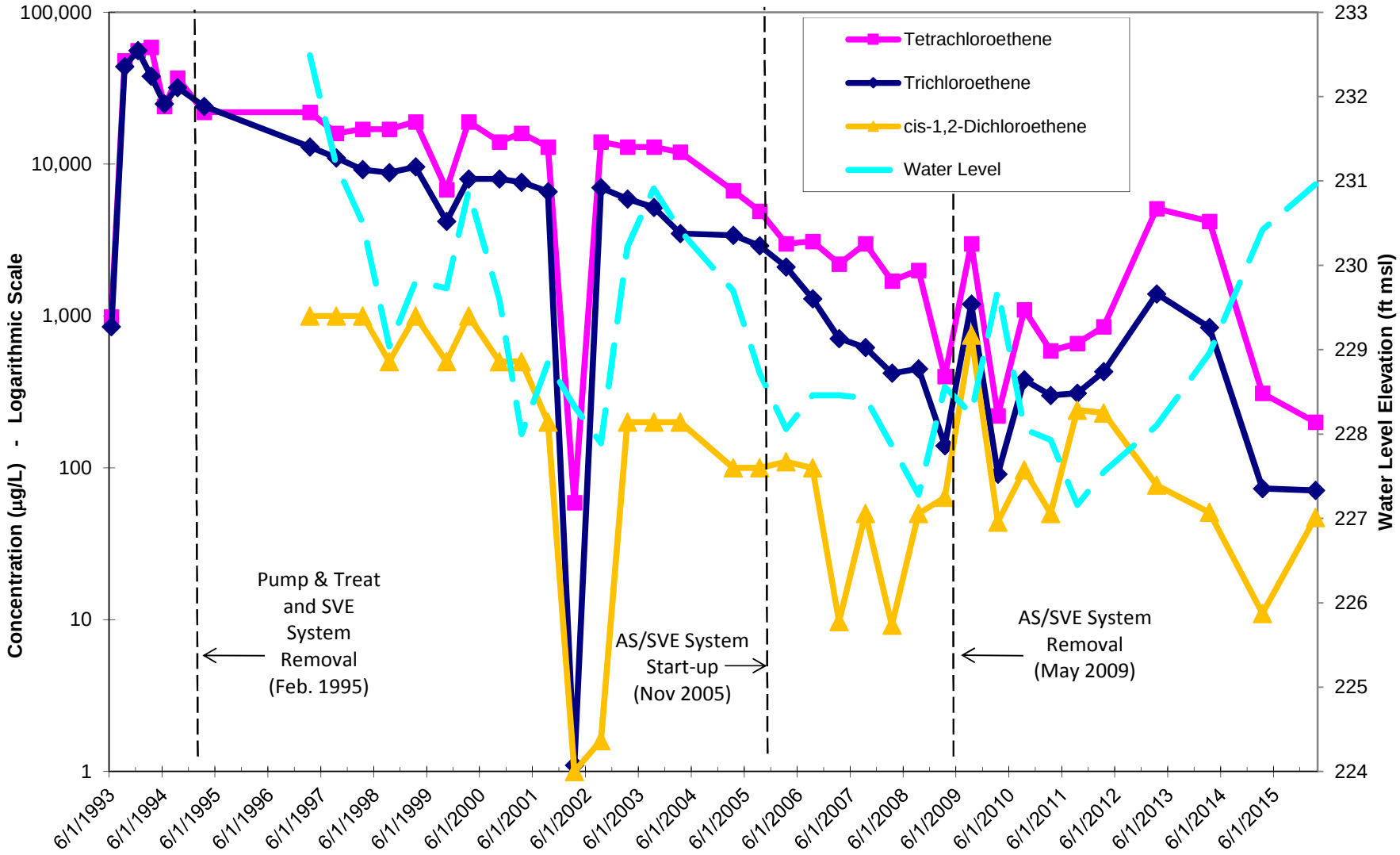
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-7 Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **9**



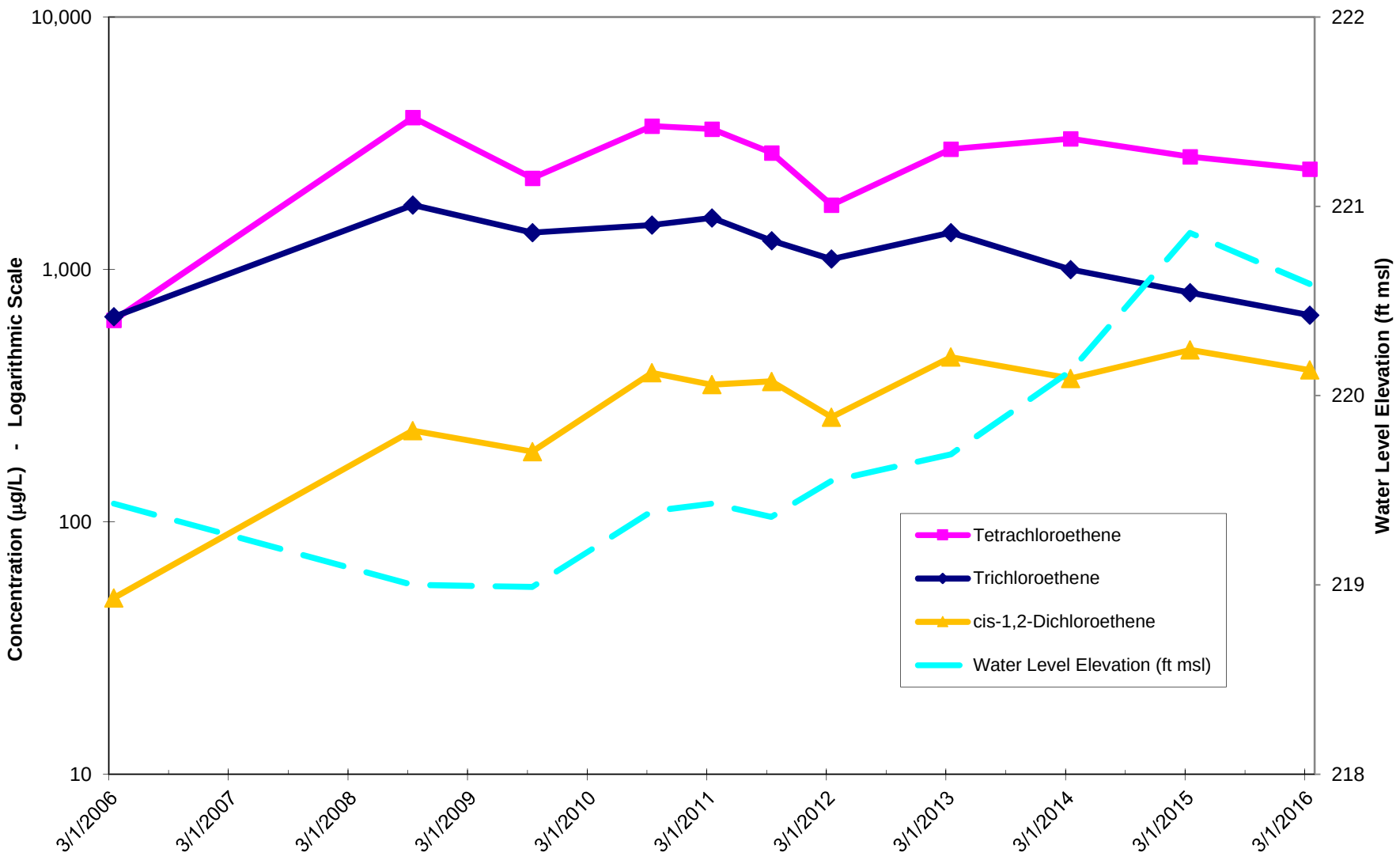
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-8/8R Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **10**



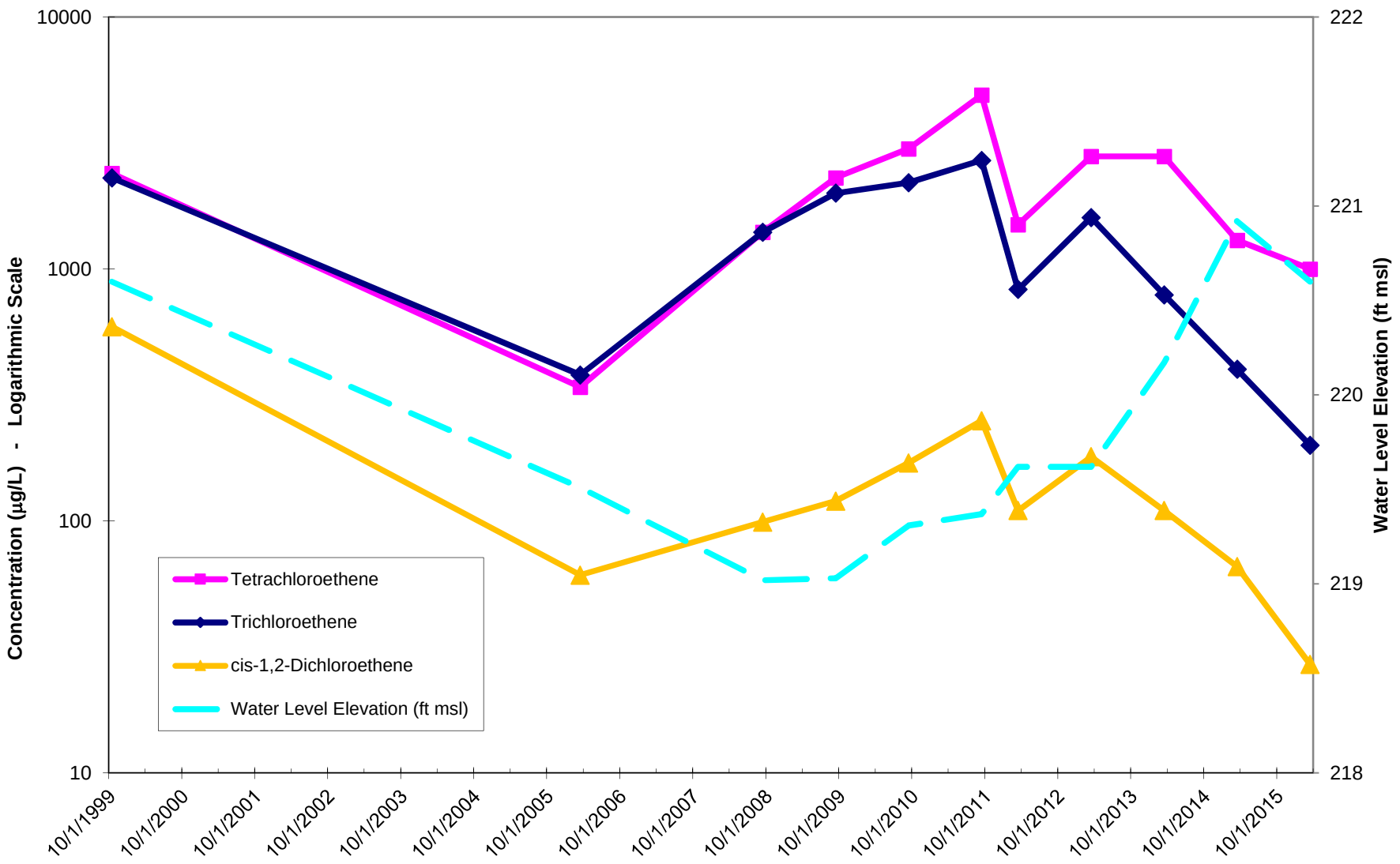
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-8D/8DR Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **11**



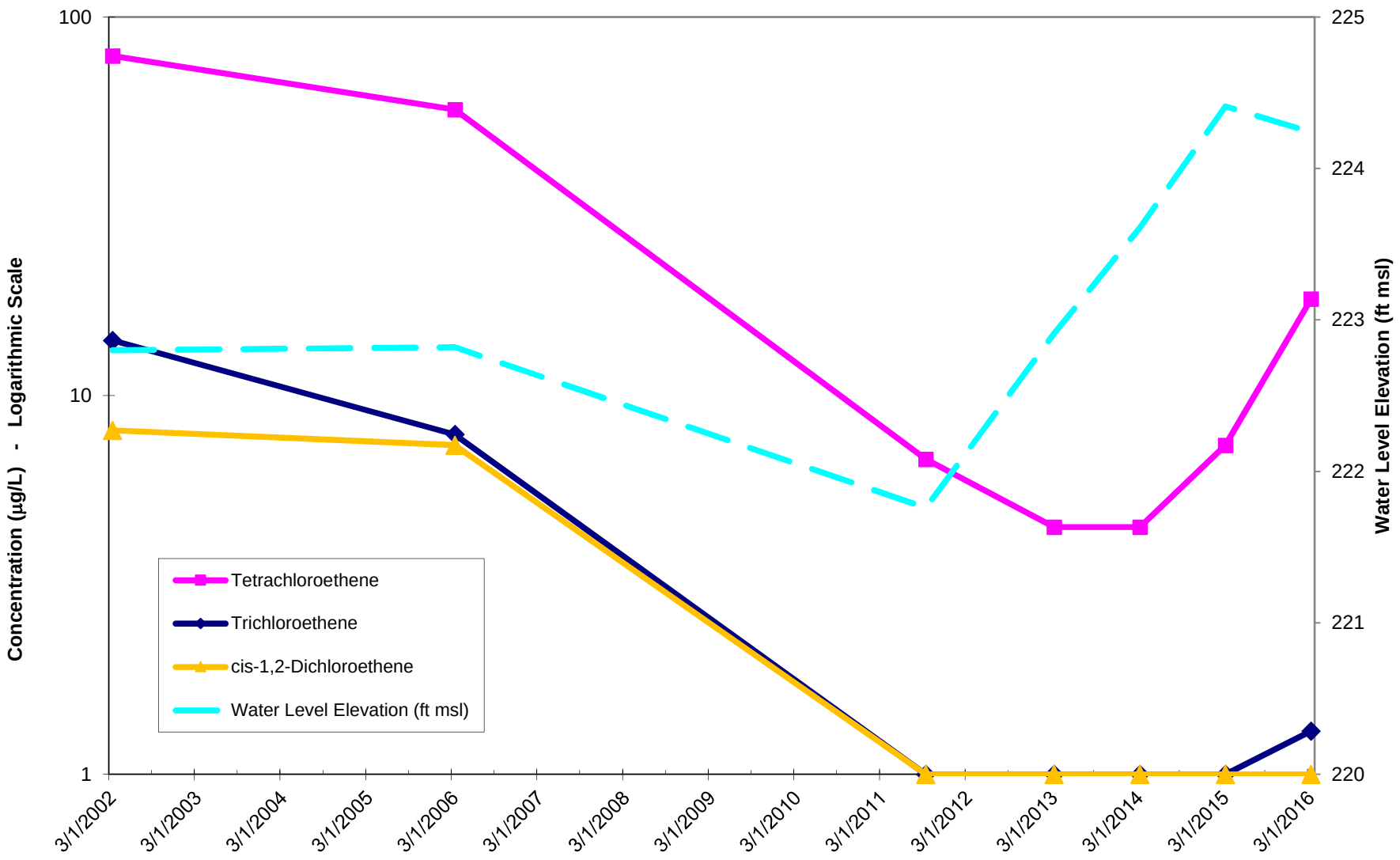
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-12D Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **12**



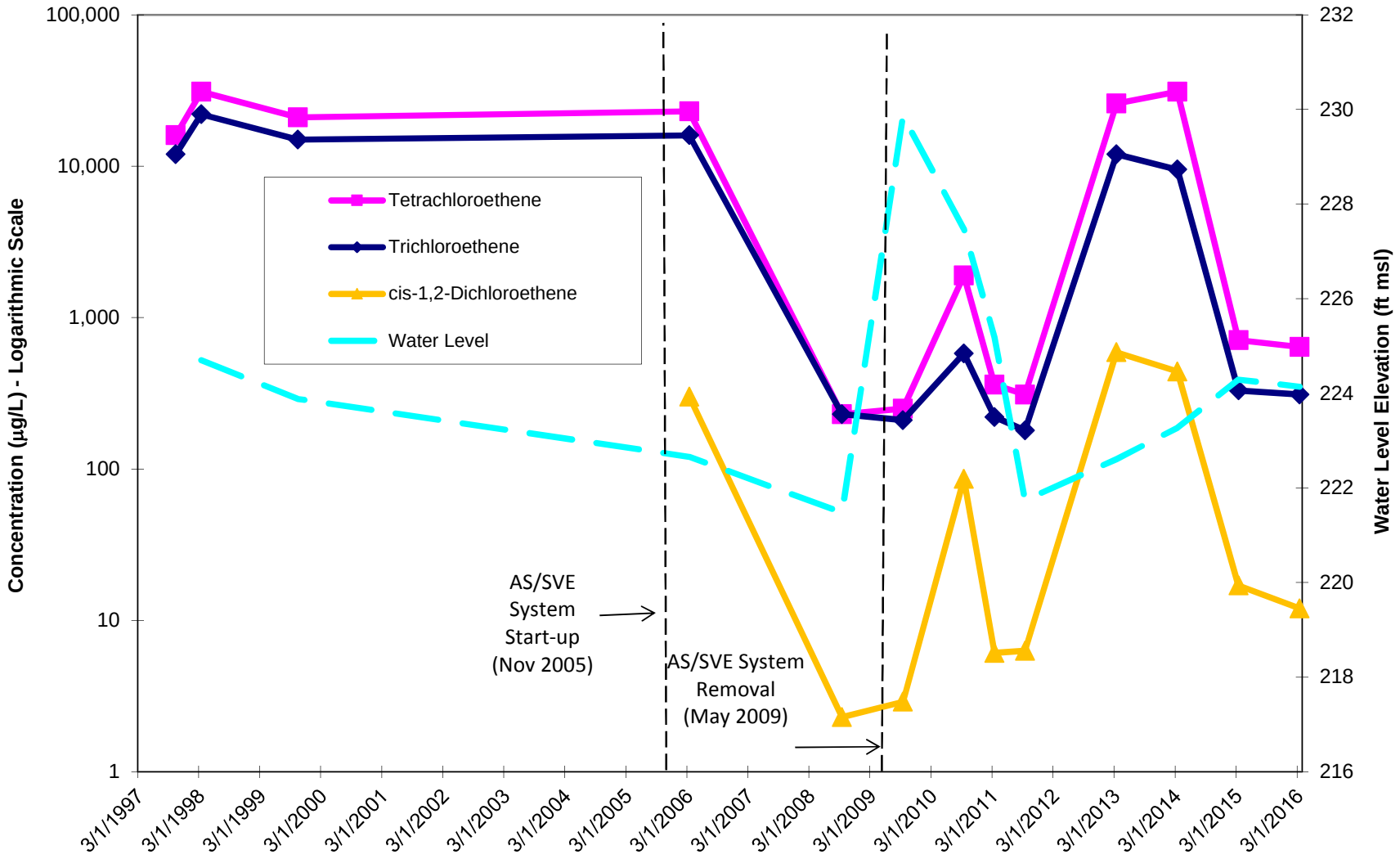
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-14OB Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **13**



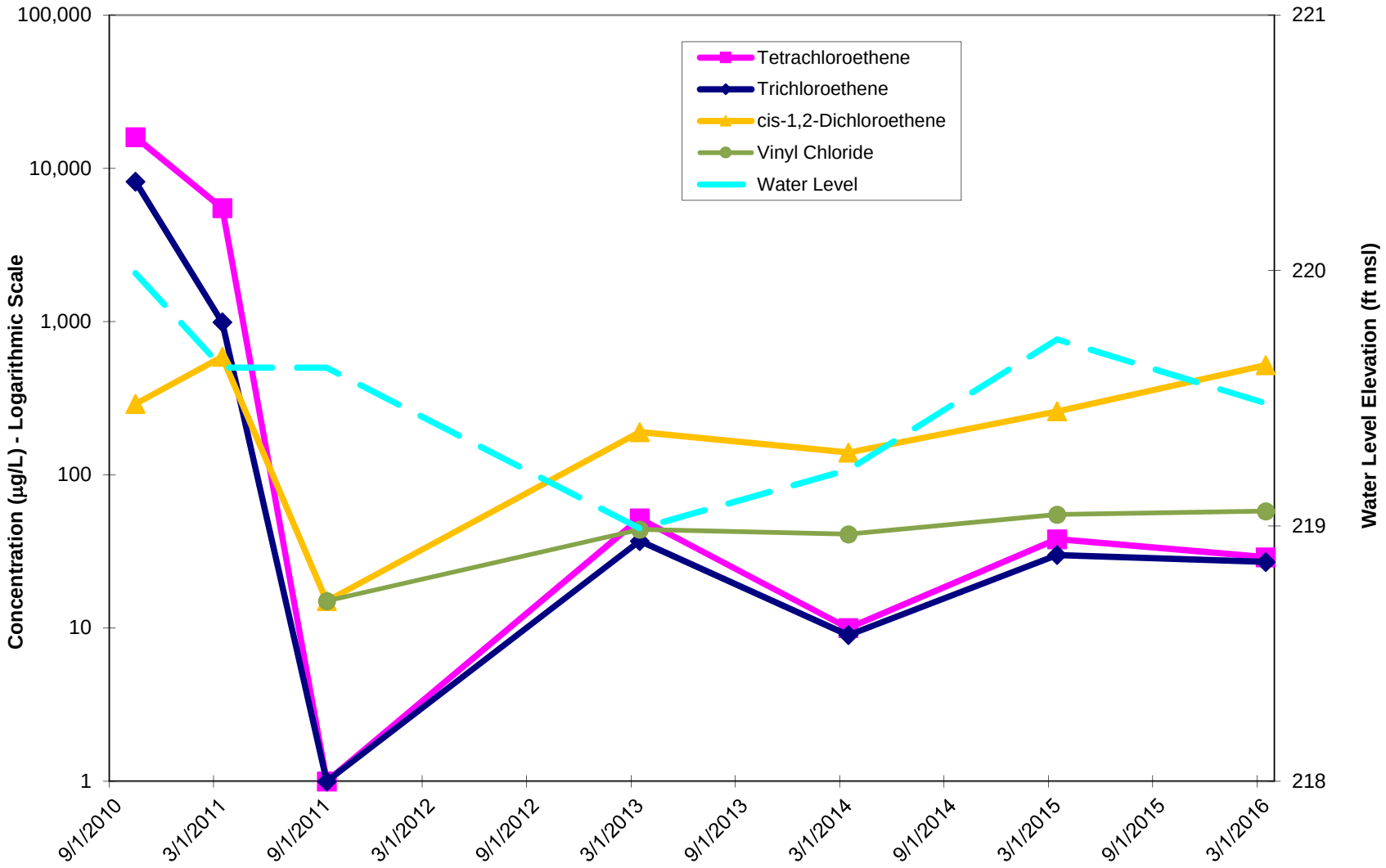
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-14TZ Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **14**



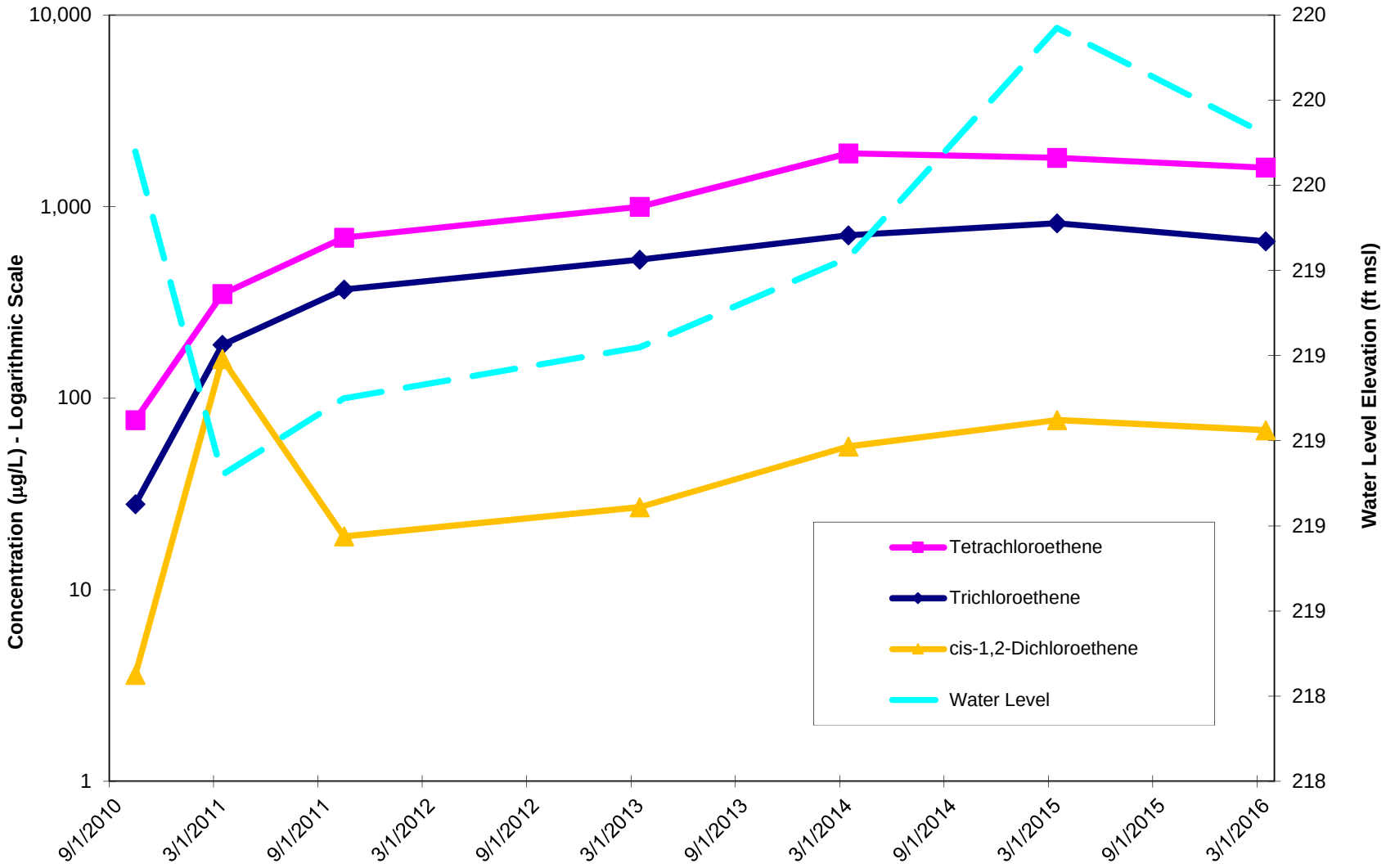
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-16OB Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **15**



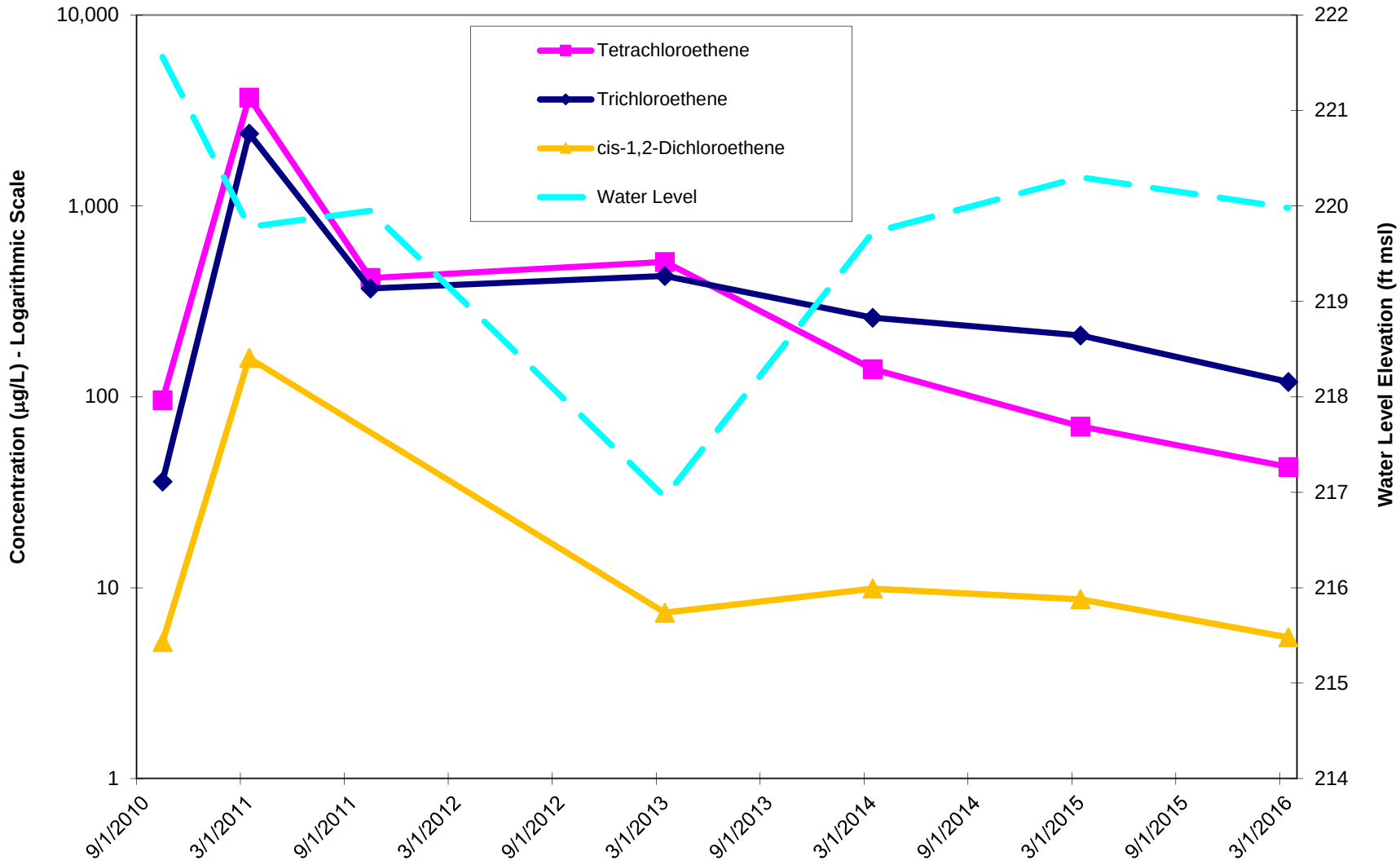
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-18BR Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **16**



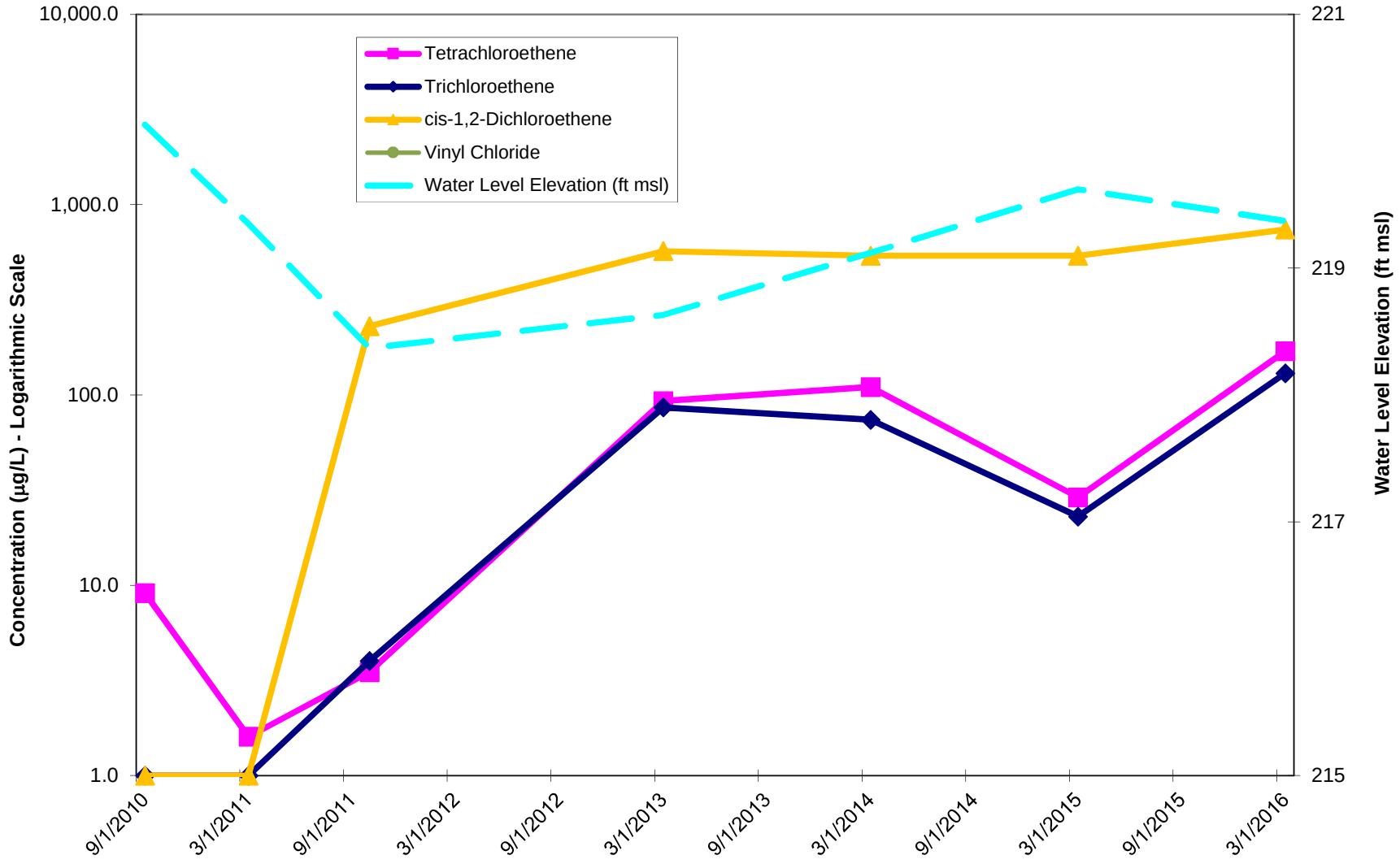
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-23 Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **17**



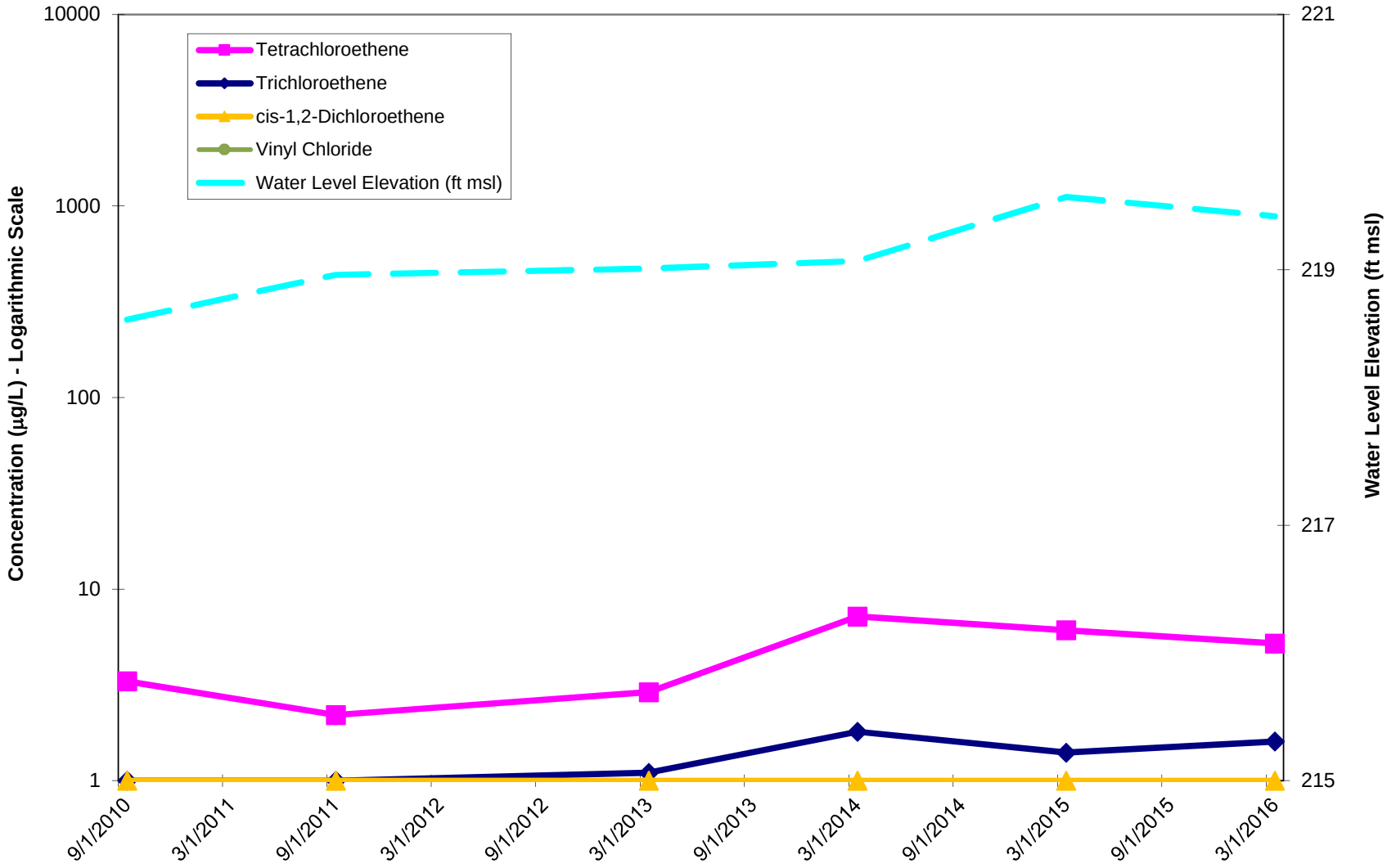
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-23D Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **18**



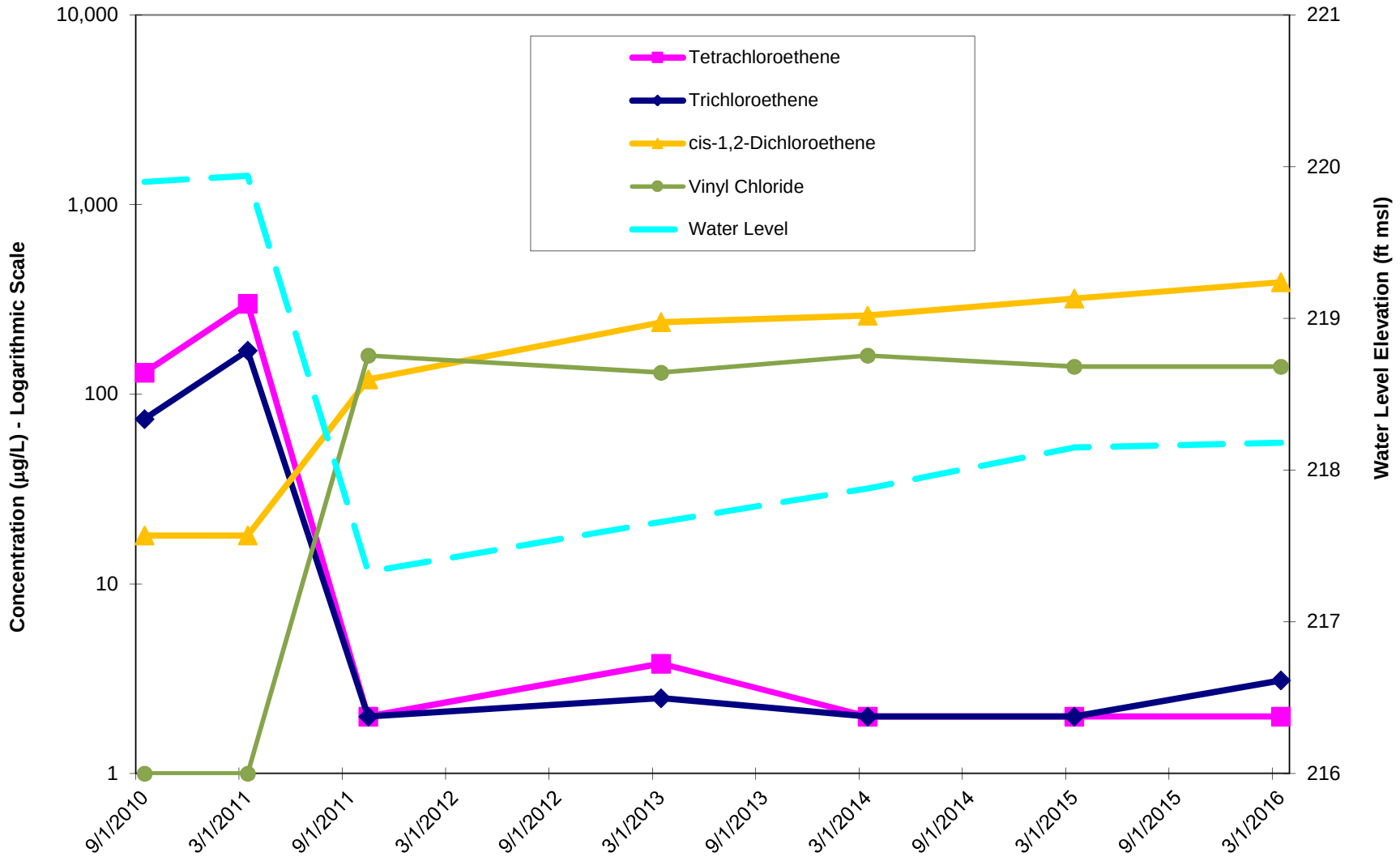
ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-23BR Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **19**



ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-24 Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **20**



ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-25 Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **21**



ARCADIS	Arcadis G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607	PROJECT MANAGER: D. Wilderman	PROJECT NUMBER: OH009000.NC29	MW-26 Primary Constituent Concentrations Over Time Former Ashland Facility Raleigh, North Carolina	FIGURE: **22**