CONESTOGA-ROVERS & ASSOCIATES

651 Colby Drive, Waterloo, Ontario, Canada N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

MEMORANDUM

TO:	Mike Mateyk; Jon Williams	REF. NO.:	01069-20 / pw / 23
FROM:	Daniela Araujo; Wesley Dyck	DATE:	February 28, 2003

RE: Statistical Trend Analysis of Groundwater Monitoring Data
Fourth Quarter 2002 Monitoring
Hyde Park Landfill
Niagara Falls, New York

1.0 INTRODUCTION

Groundwater at the Hyde Park Landfill in Niagara Falls, New York (Site) is sampled quarterly and analyzed for indicator parameters including benzoic acid, chlorendic acid, phenolics, total chlorobenzoic acids, and total organic halides (TOX). As part of the evaluation of the quarterly monitoring data, a statistical analysis is performed to look for any evidence of increasing trends in indicator parameters at a given well over time.

This memorandum reports the findings of statistical evaluations of the Site groundwater monitoring data up to and including the fourth quarter 2002 samples.

2.0 STATISTICAL TREND ANALYSES

Helsel and Hirsch (1992) recommend a number of statistical trend analysis methods for application to environmental data sets. A typical pattern in groundwater constituent concentrations is a rapid decline in concentration immediately following a remedial action, which then slows and observed concentrations fluctuate up and down at a much lower level. This type of pattern has been observed at a number of Site monitoring wells, and may be observed in the concentration vs. time plots (Attachment A).

A recommended statistical procedure for trend assessment commonly applied to environmental monitoring data is the Mann-Kendall trend test. The Mann-Kendall test is a non-parametric (rank-based) method that evaluates a set of data for a monotonic (unidirectional) trend. The procedure makes no assumptions regarding the shape of the trend (e.g., linear, log-linear…), except that it is in a single direction (i.e., either consistently upward or downward). However, the Mann-Kendall procedure loses sensitivity if a large proportion of non-detected results is present.

For data sets with large proportions (> 50 percent) of censored data, logistic regression is recommended by Helsel and Hirsch. In this procedure, the numerical values of the monitoring data are not used, but instead the presence or absence of a detectable concentration of the analyte of interest is considered. Thus, the hypothesis tested as a measure of trend by logistic regression is that more detectable results are occurring later than earlier (increasing trend), or earlier than later (decreasing trend).

The Site groundwater monitoring data were assessed for trends on an individual well basis using either the Mann-Kendall trend test (if < 50 percent non-detects) or logistic regression (for 50-99 percent non-detects). Analytes that were not detected at a given well (i.e., 100 percent non-detects) during the time period of interest were not statistically evaluated.

3.0 SCOPE OF DATA

The approach most applicable to assessing current trends in groundwater quality at the Site is to apply a given test to analytical data representative of the current groundwater conditions at the Site. This is accomplished for the Site by treating calendar years as a unit (i.e. either keeping or removing the four quarters of monitoring data for a calendar year) and ensuring that a minimum of 8 data points and maximum of 11 data points are used for the statistical evaluation. In the case of the fourth quarter 2002 data analysis, the analytical data include eight sampling events from 2001 to present. This data scope approach provides a moving two to three year comparison window. Over this period of time, some monitoring wells were dry on one or more occasions, which results in fewer than eight data points. The statistical analyses were performed using all available data from 2001 to present.

For the concentration vs. time plots (Attachment A), all historical data are included (1993 to present).

4.0 RESULTS

The results of the trend analyses are presented in Table 1. No statistically significant ($P<0.05$) increasing trend was identified. Four statistically significant ($P<0.05$) decreasing trends were observed: TOX at well B1U, chlorendic acid at B1L, chlorendic acid at D2M and TOX at D2M.

Table 2 presents a comparison of results from the statistical trend analyses performed following monitoring events since the first quarter of 2001. Only wells / analytes with a significant trend identified during at least one evaluation are presented. This represents a total of 26 wells / analytes.

Comparing the present event's results to the previous round, none of the statistically significant (increasing or decreasing) trends from the third quarter 2002 evaluation were repeated, and four new decreasing trends were identified. This change is due to dropping the year 2000 data from the evaluation (see Section 3.0), and is representative of recent conditions at the Site.

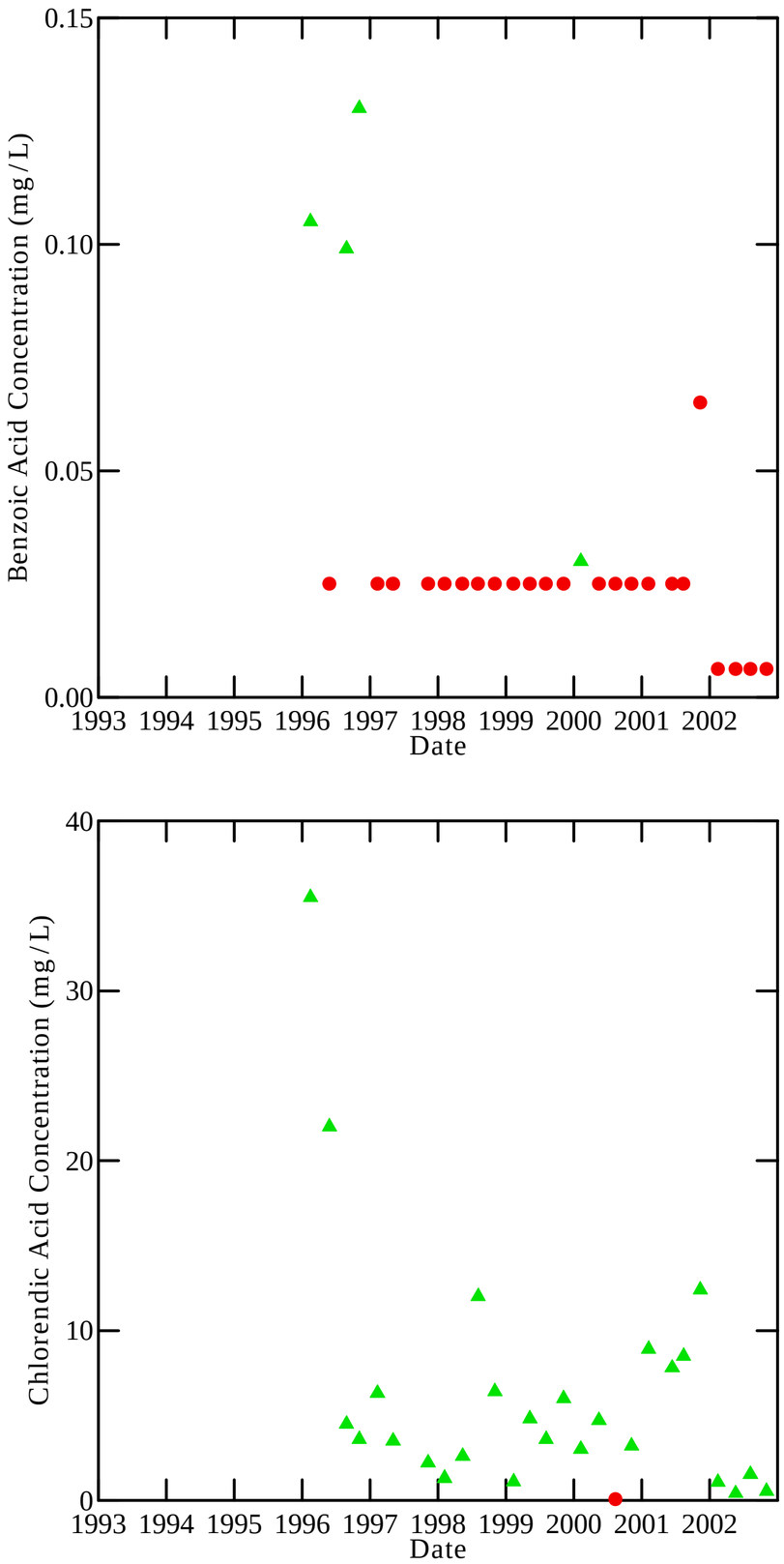
Comparing the present event's results to those from one year ago, one decreasing trend (TOX at B1U) is consistent. The three increasing and three other decreasing trends observed in the fourth quarter 2001 evaluation have not persisted through 2002, and four new decreasing trends have been noted.

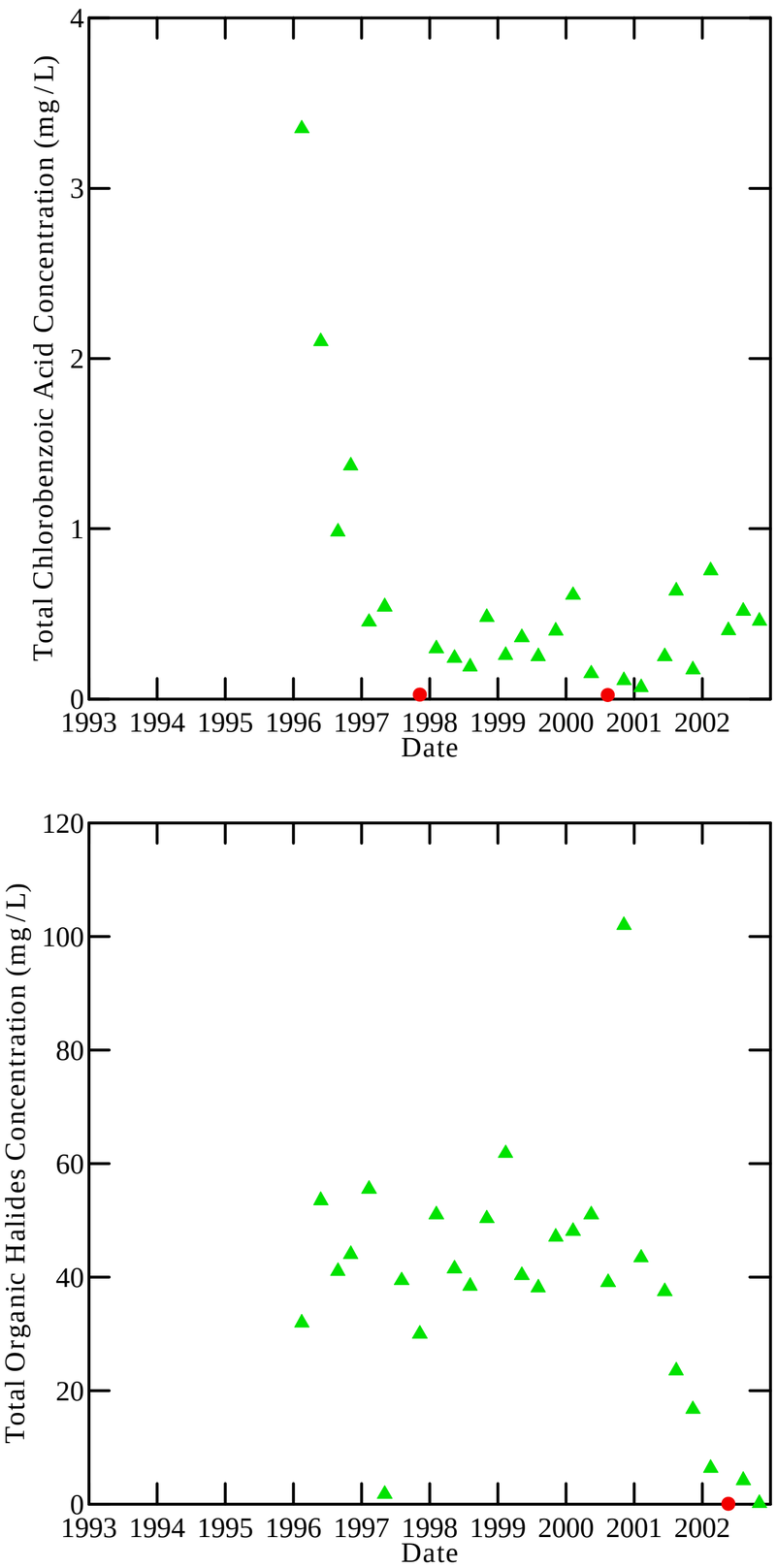
5.0 CONCLUSIONS

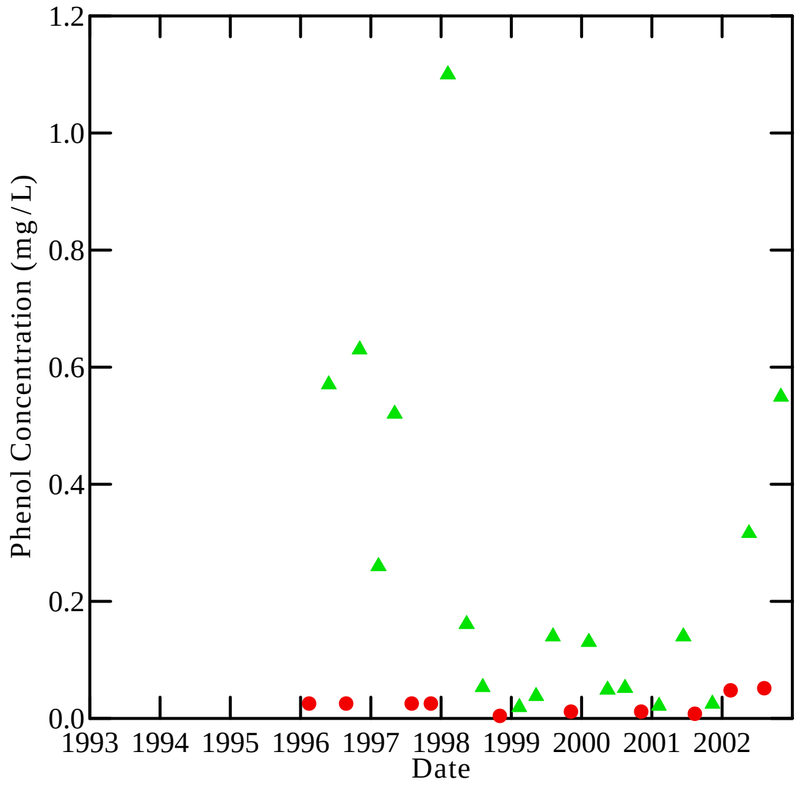
Statistical trend evaluations of Site groundwater monitoring data following the fourth quarter 2002 monitoring unit were carried out using either the Mann-Kendall trend test or logistic regression depending on proportion of non-detect values present. Data sets consisting entirely of non-detect results were not evaluated. Four statistically significant decreasing trends were identified as noted in Section 4.0 and on Table 1. This finding differs from the previous event and the previous year, with previously identified increasing trends not re-occurring, and new decreasing trends in parameter concentrations observed.

6.0 REFERENCE

Helsel, D.R. & R.M. Hirsch, 1992. Statistical Methods in Water Resources. Amsterdam: Elsevier.







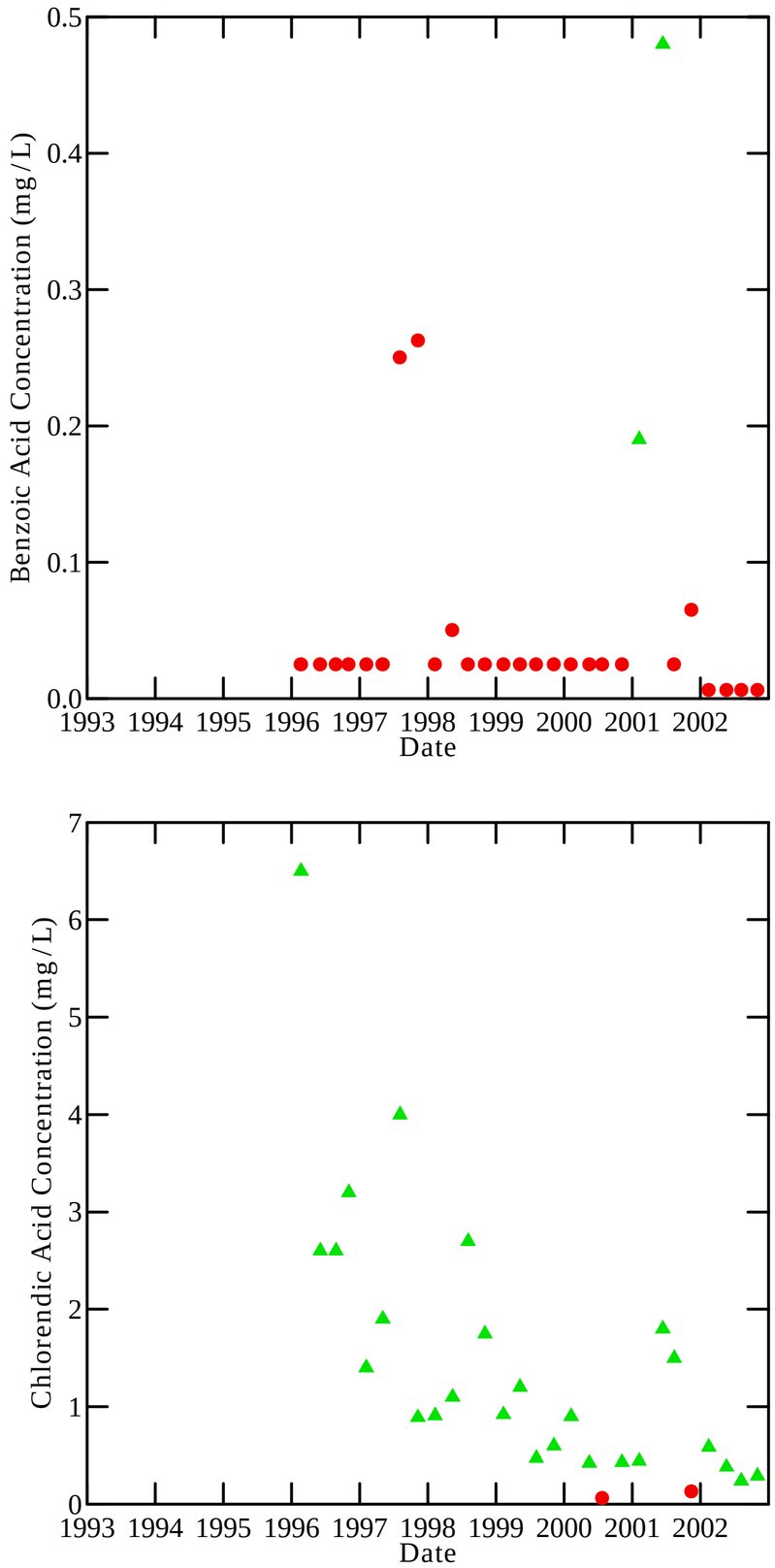
Notes:

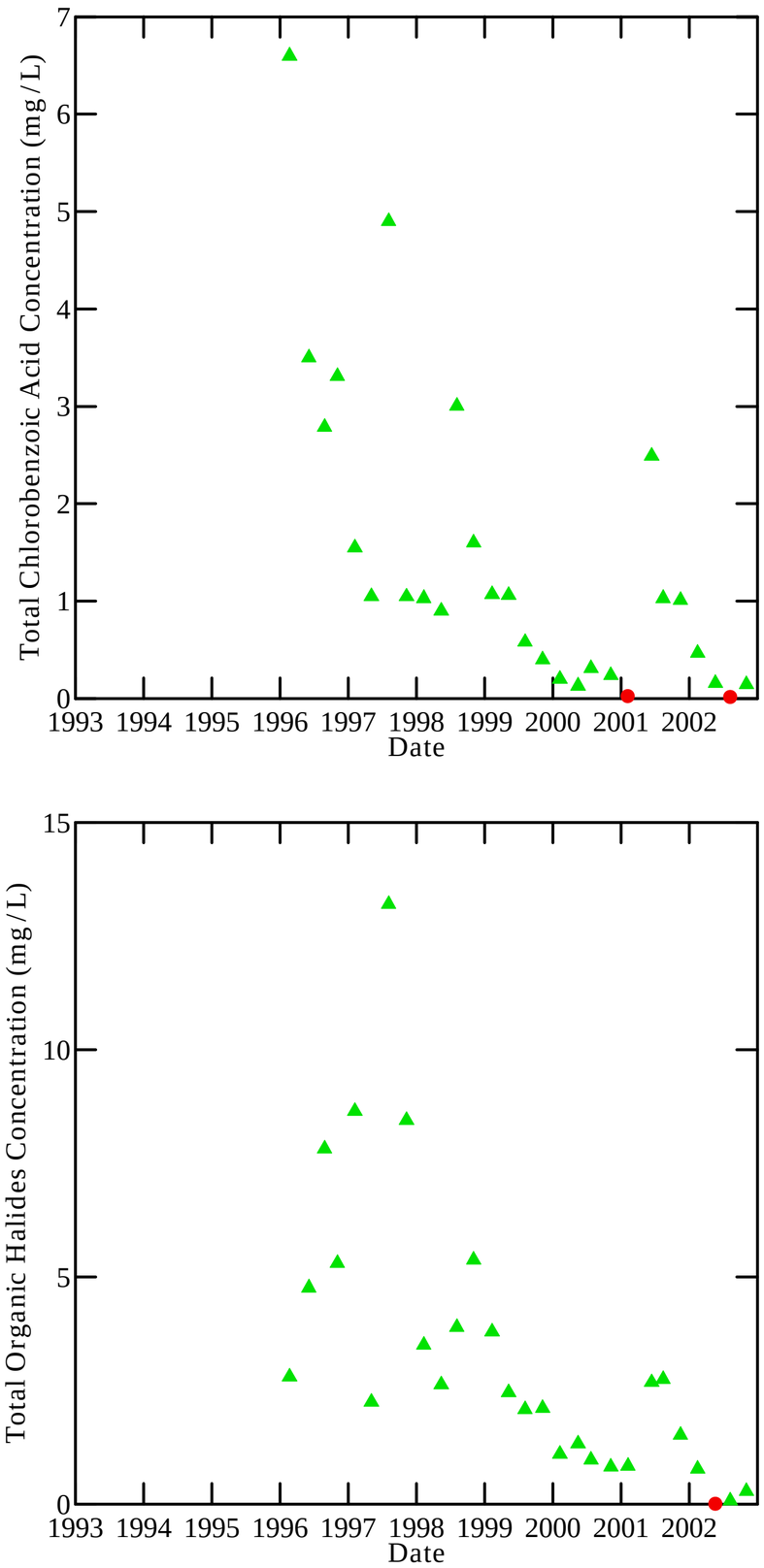
● Non-detect result

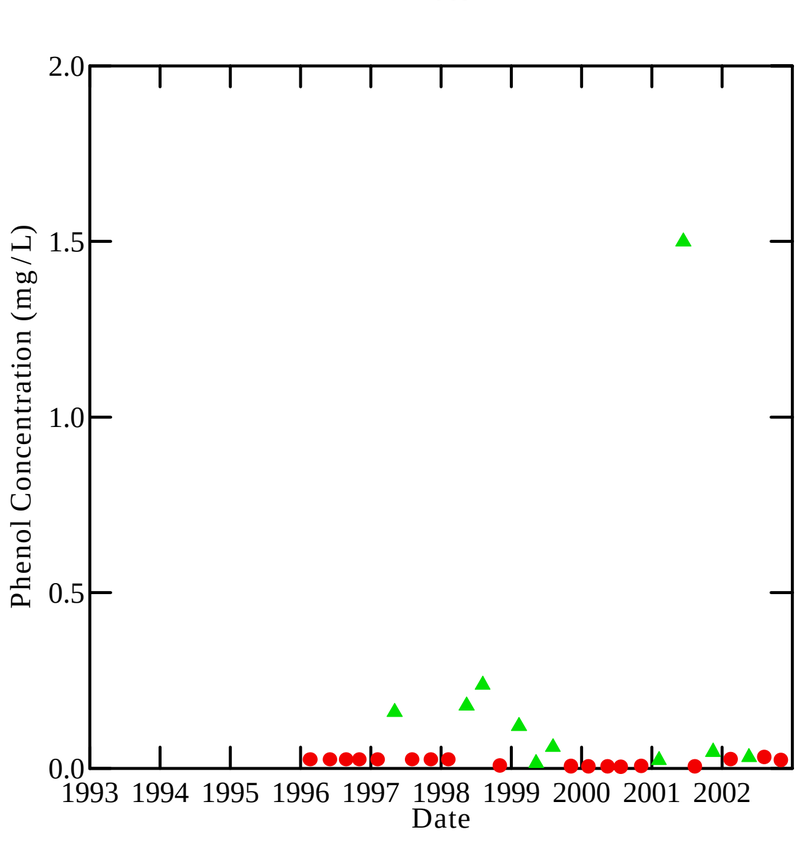
▲ Detected result

figure 1

Well B1U
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







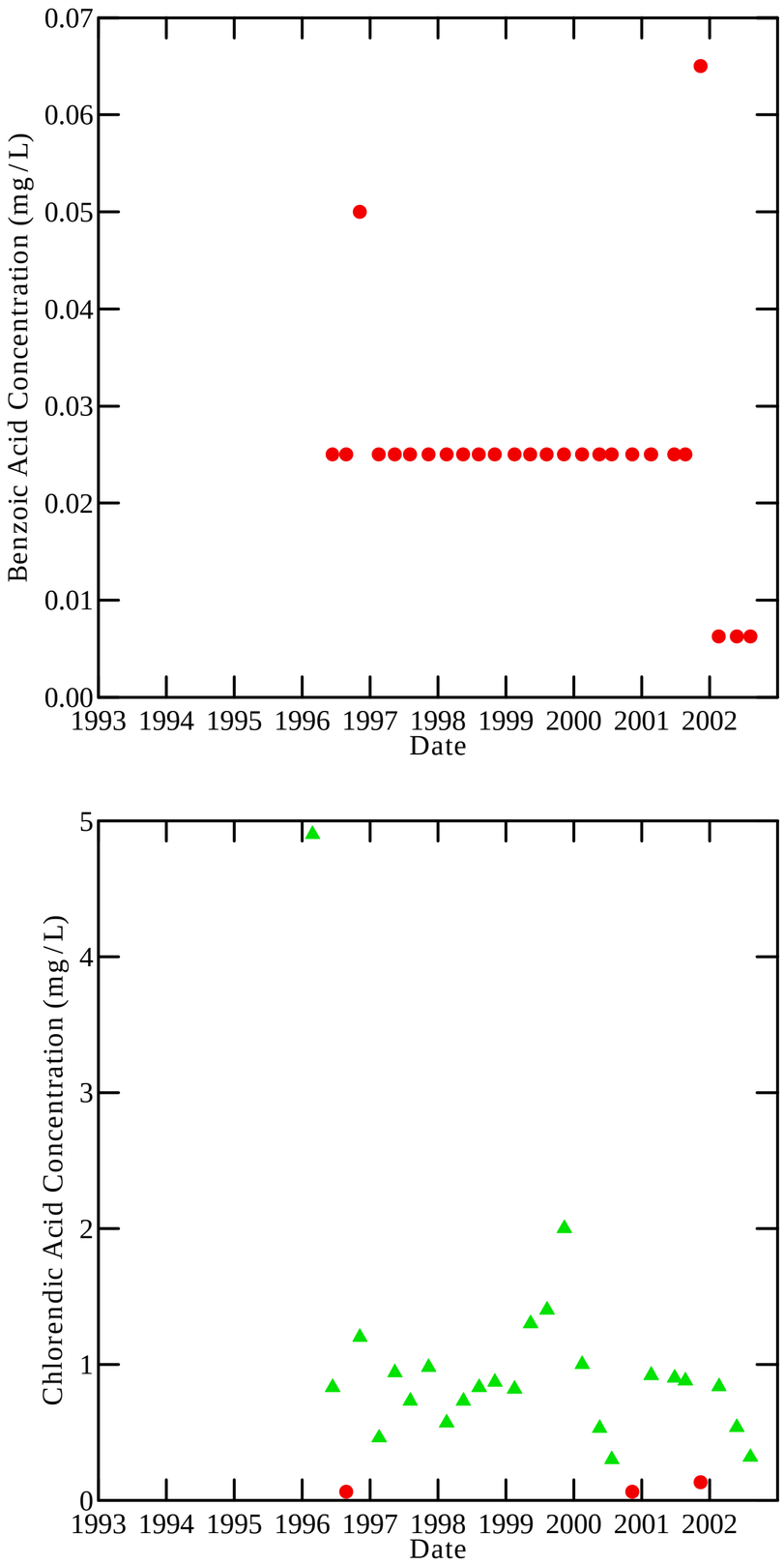
Notes:

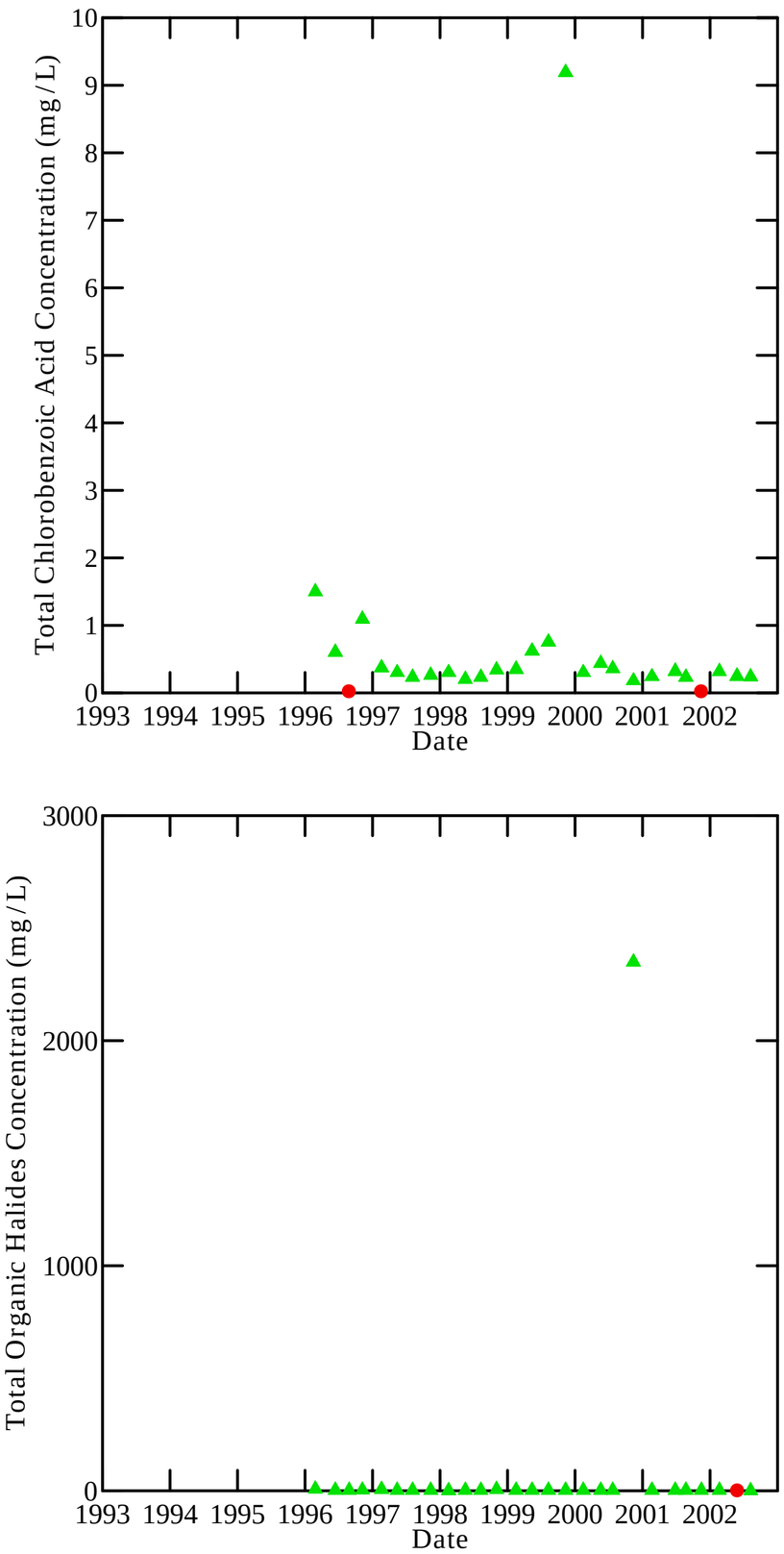
● Non-detect result

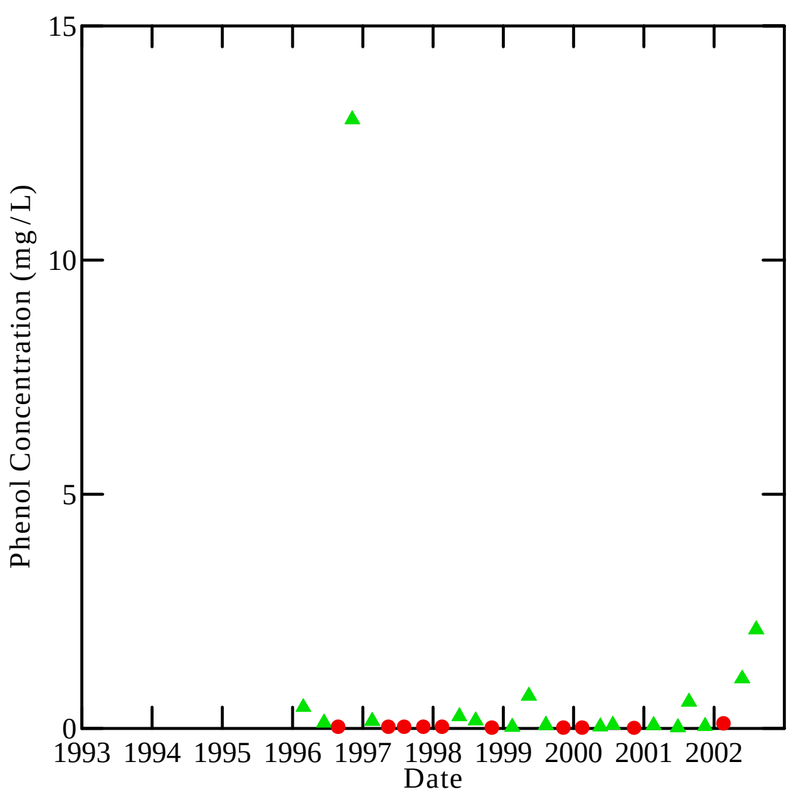
▲ Detected result

figure 2

Well B1M
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







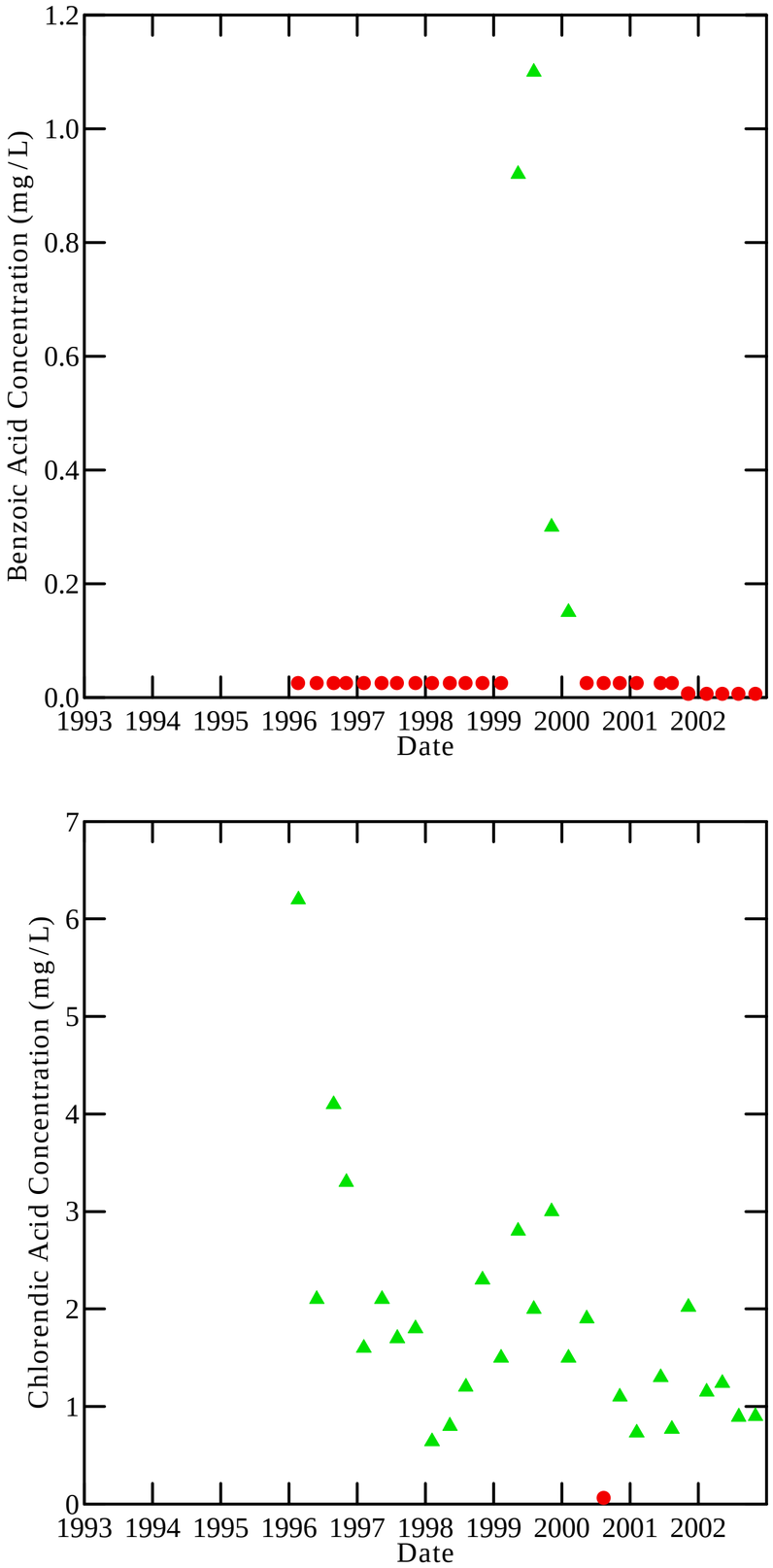
Notes:

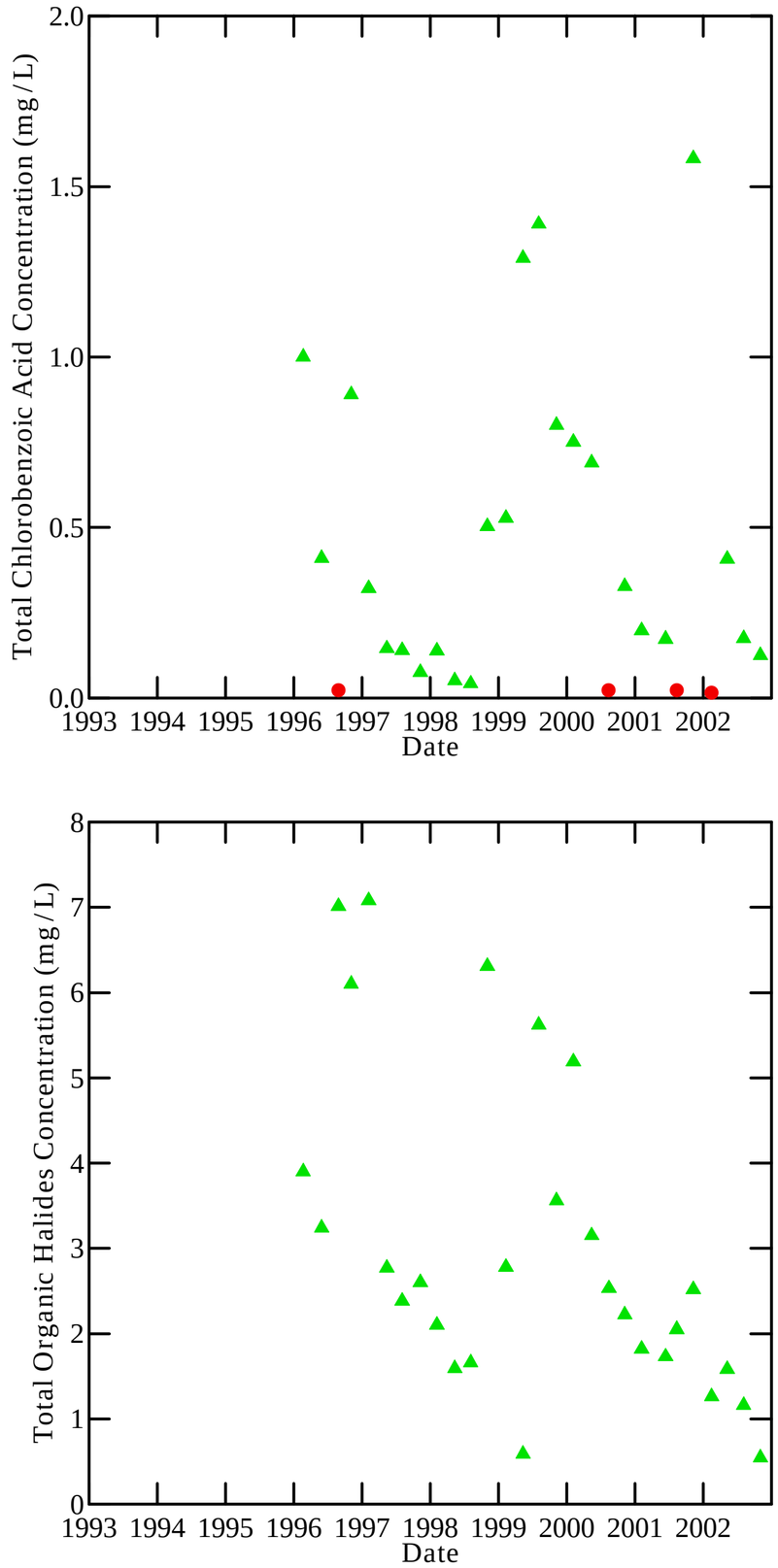
● Non-detect result

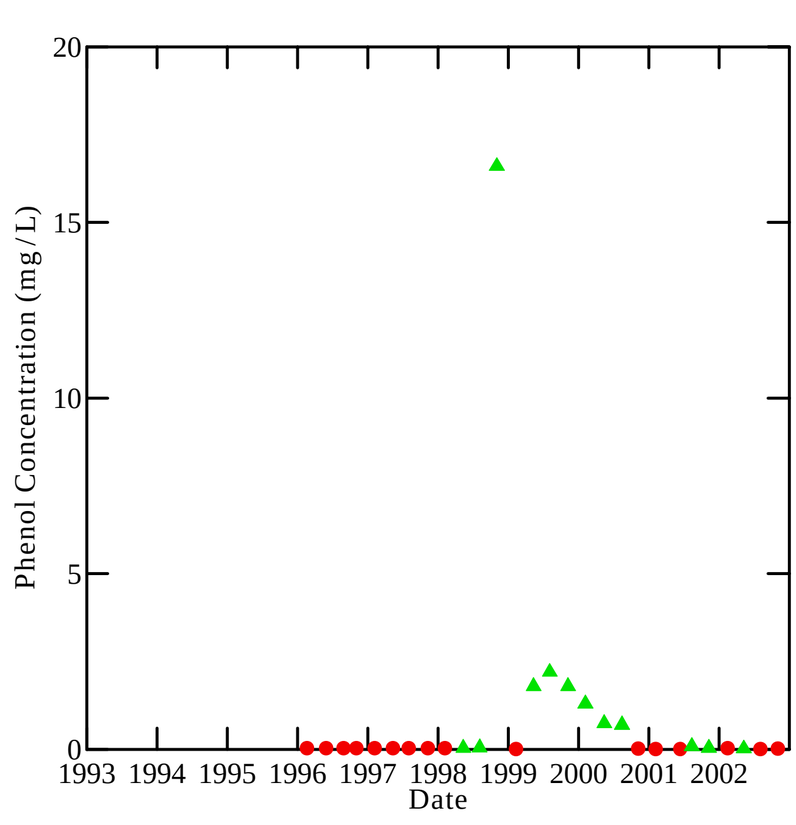
▲ Detected result

figure 3

Well B1L
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







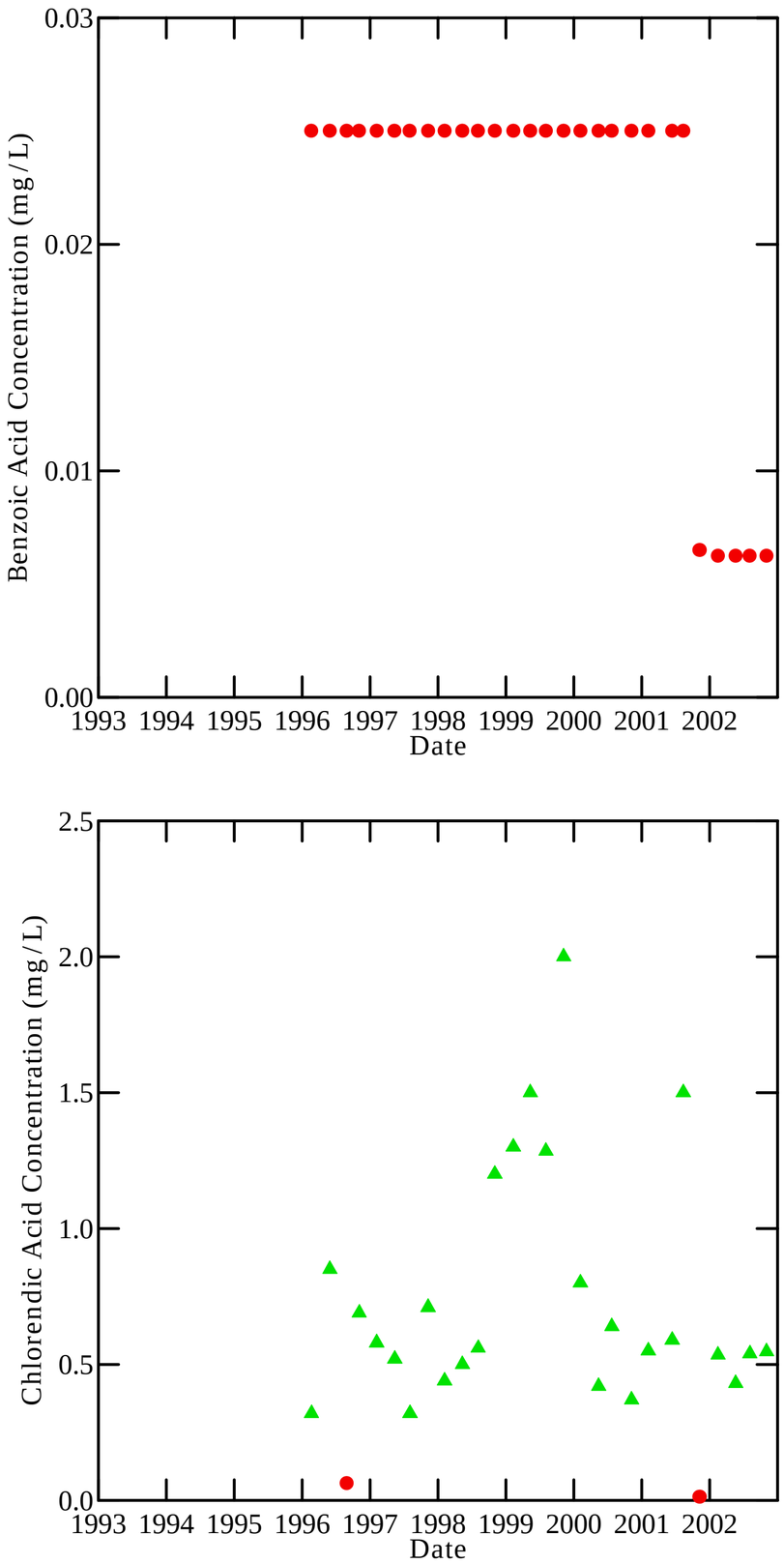
Notes:

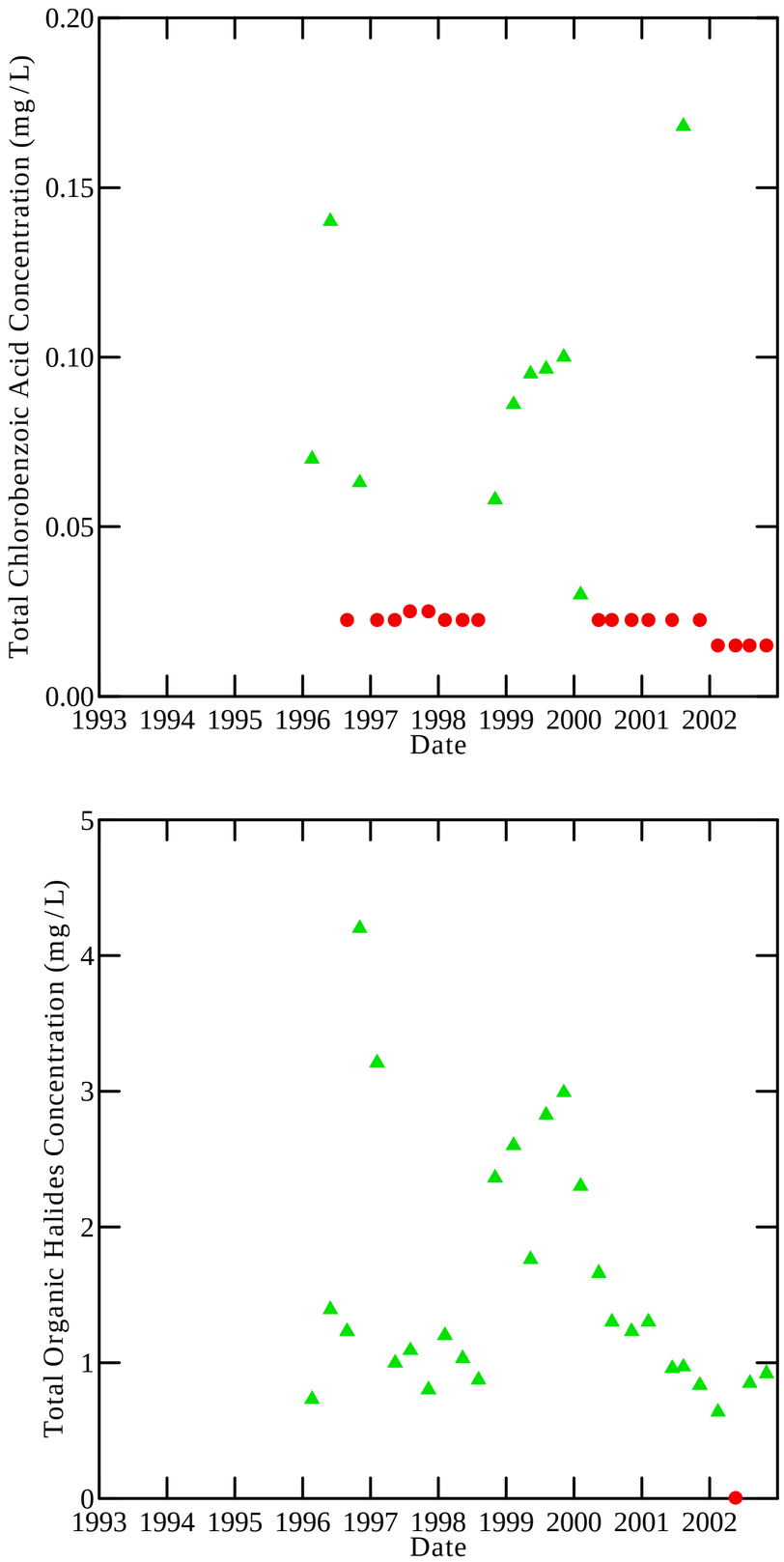
● Non-detect result

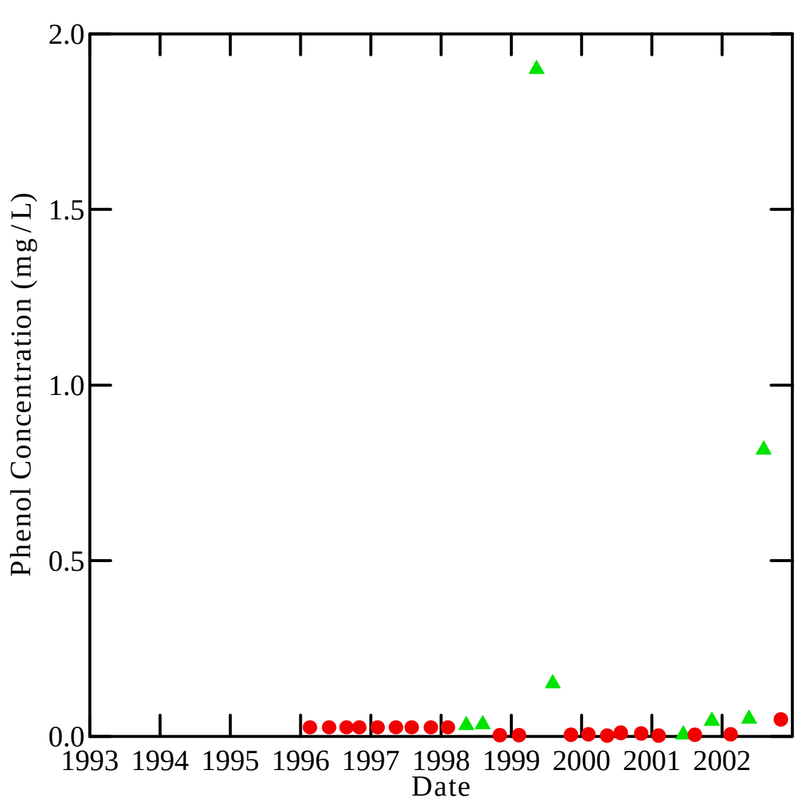
▲ Detected result

figure 4

Well C1U
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







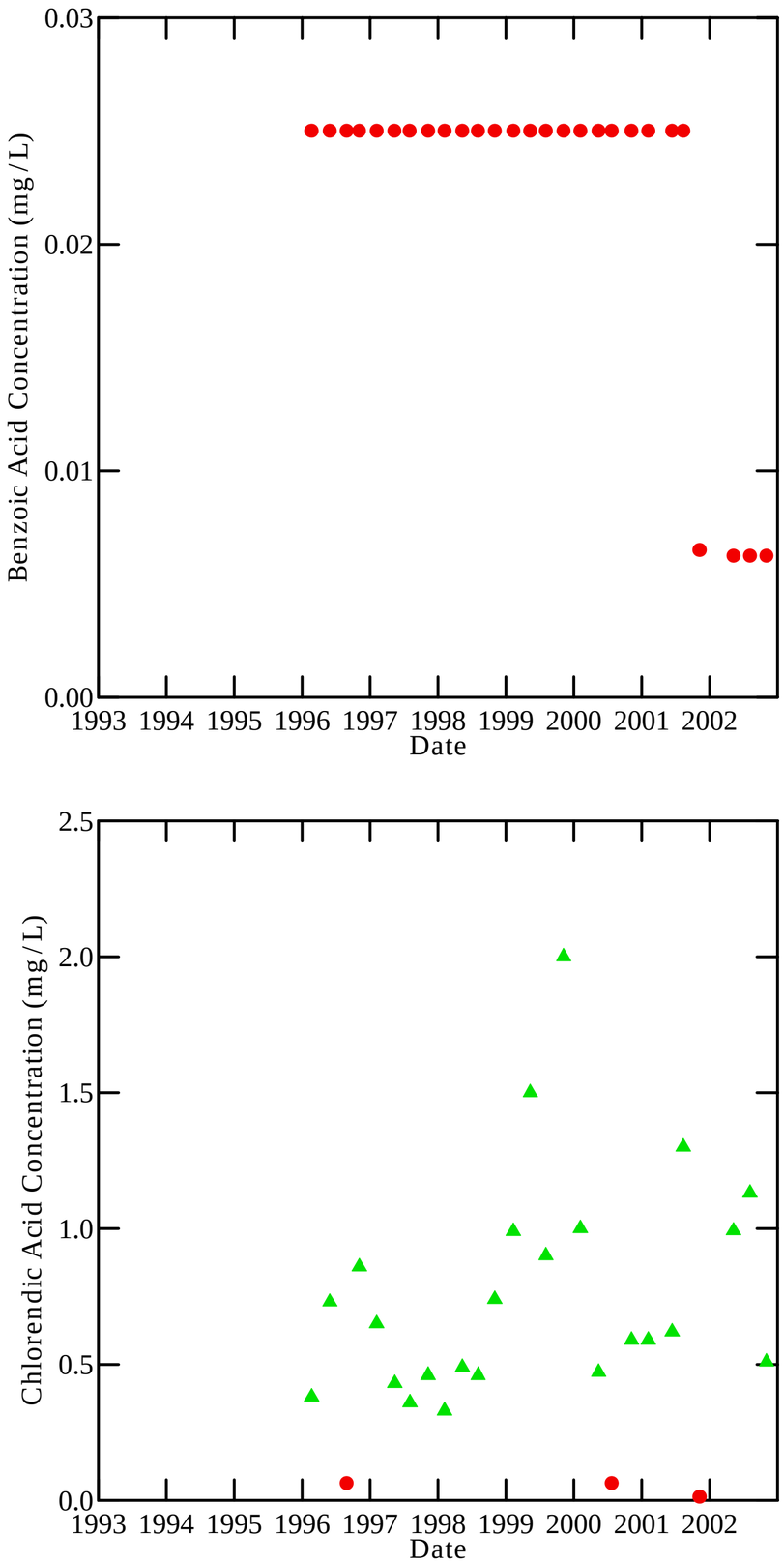
Notes:

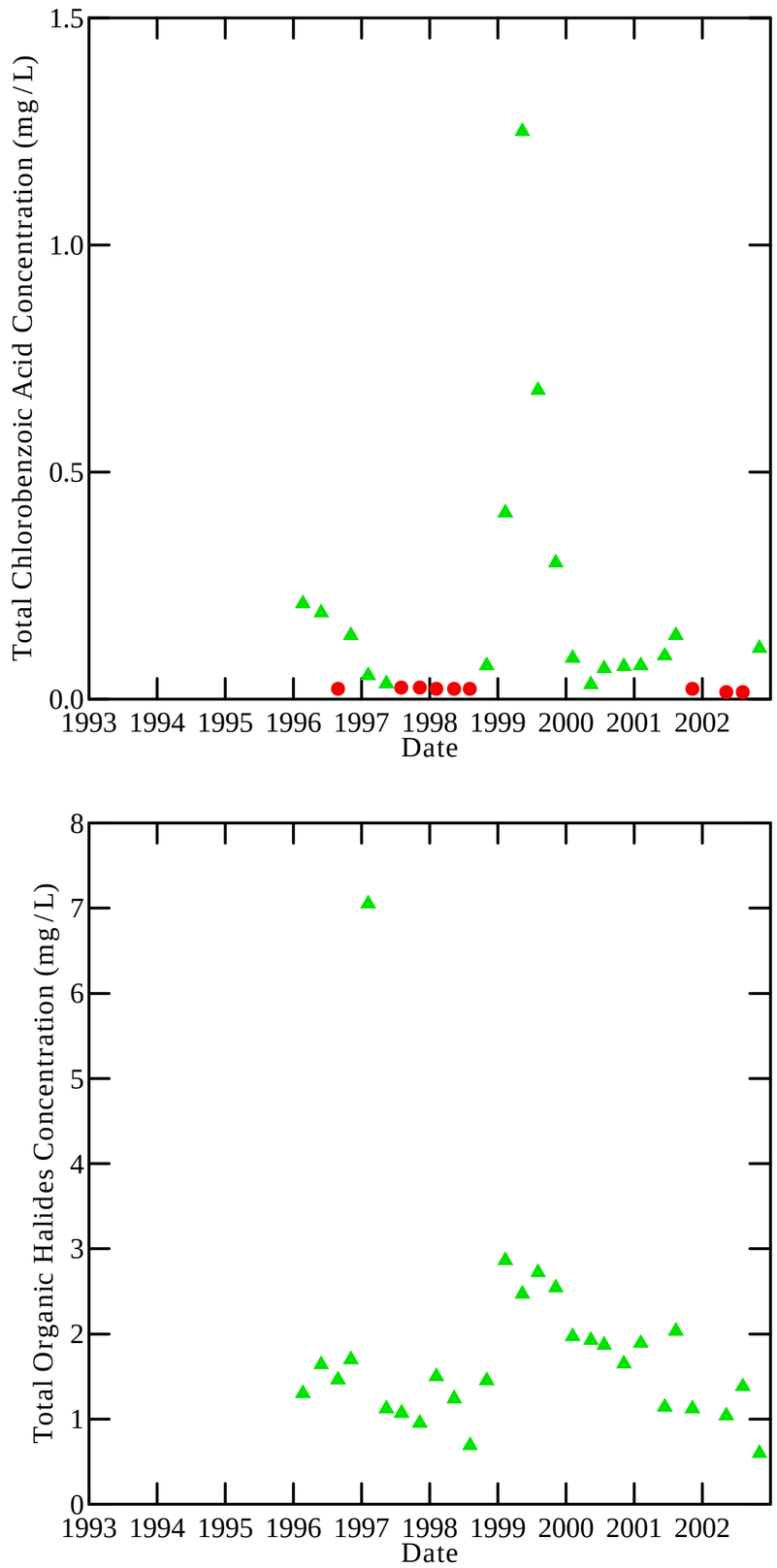
● Non-detect result

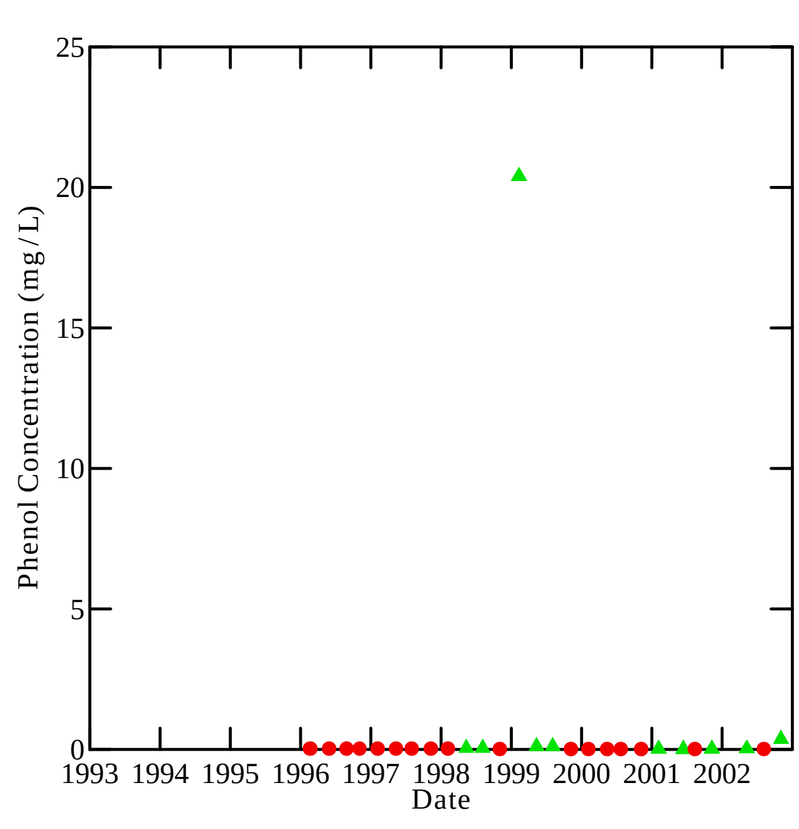
▲ Detected result

figure 5

Well C1M
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







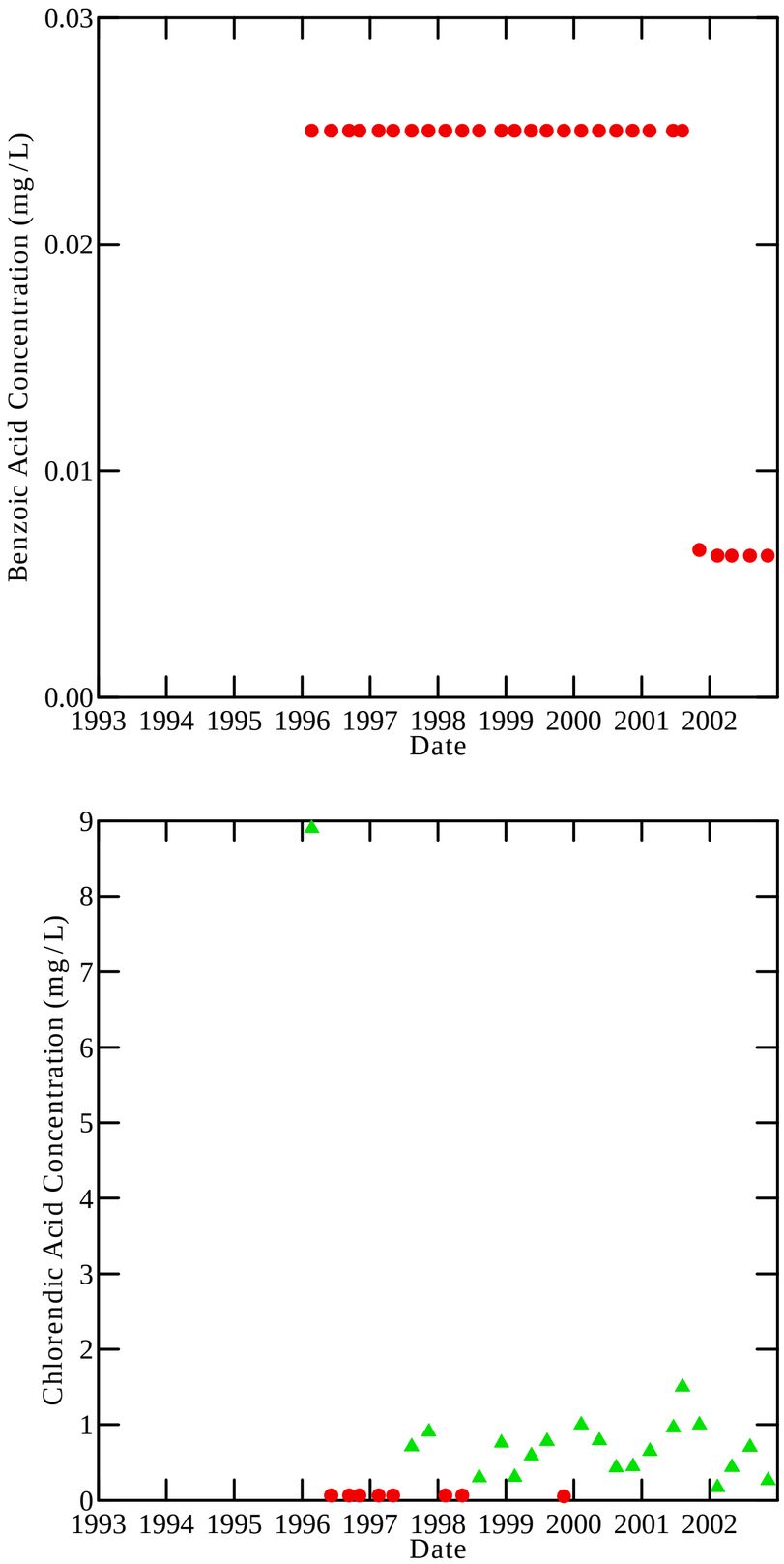
Notes:

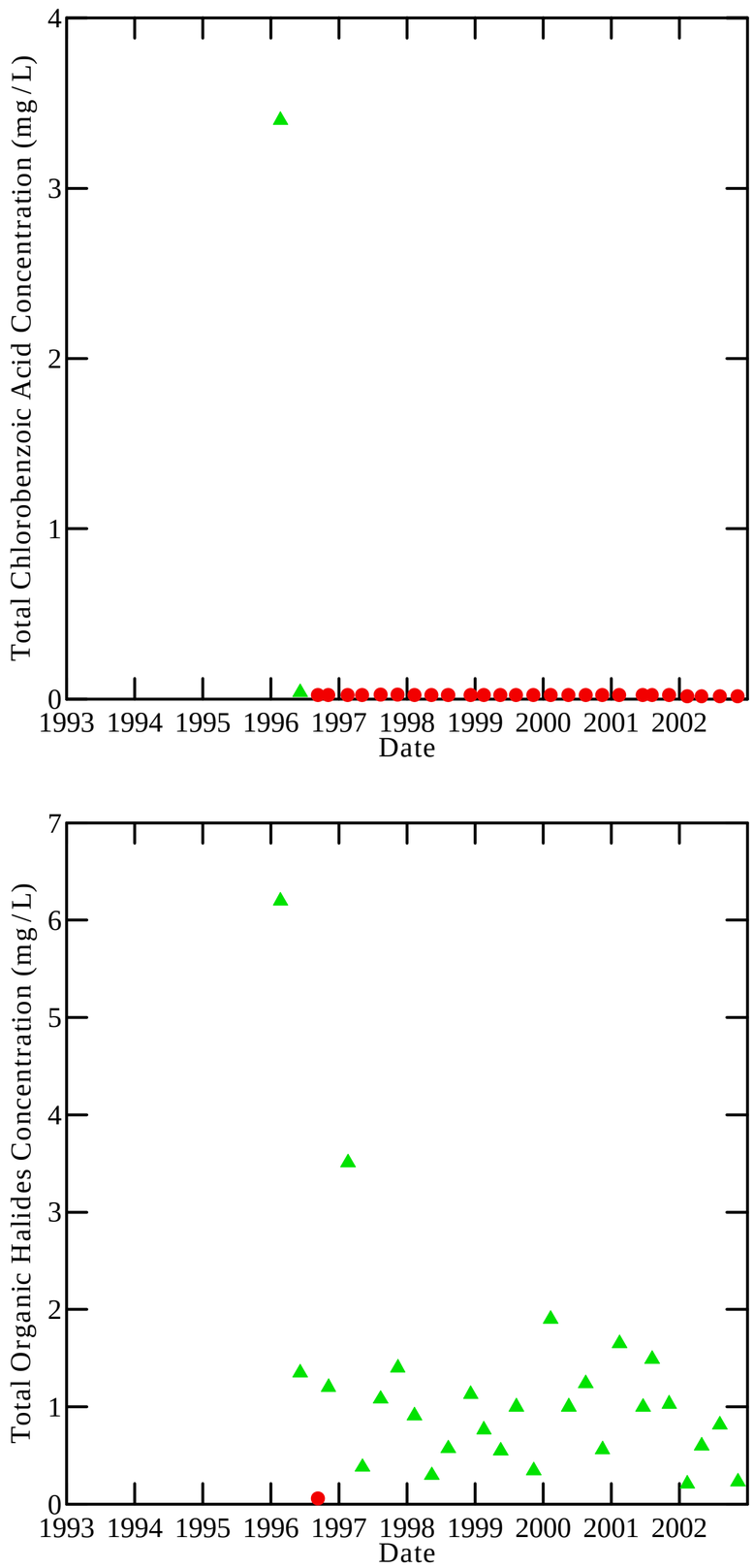
● Non-detect result

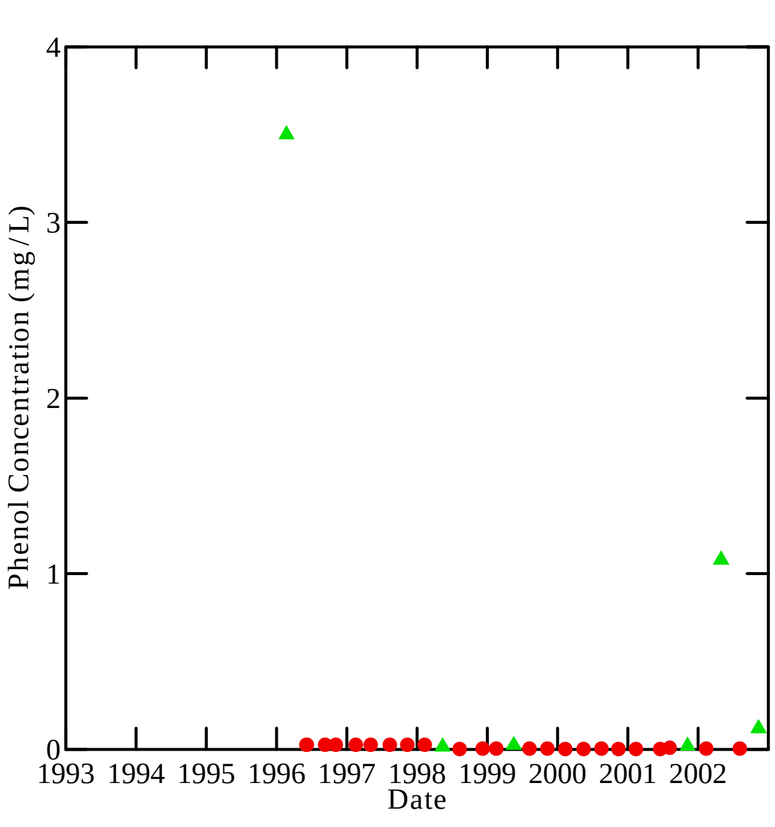
▲ Detected result

figure 6

Well C1L
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







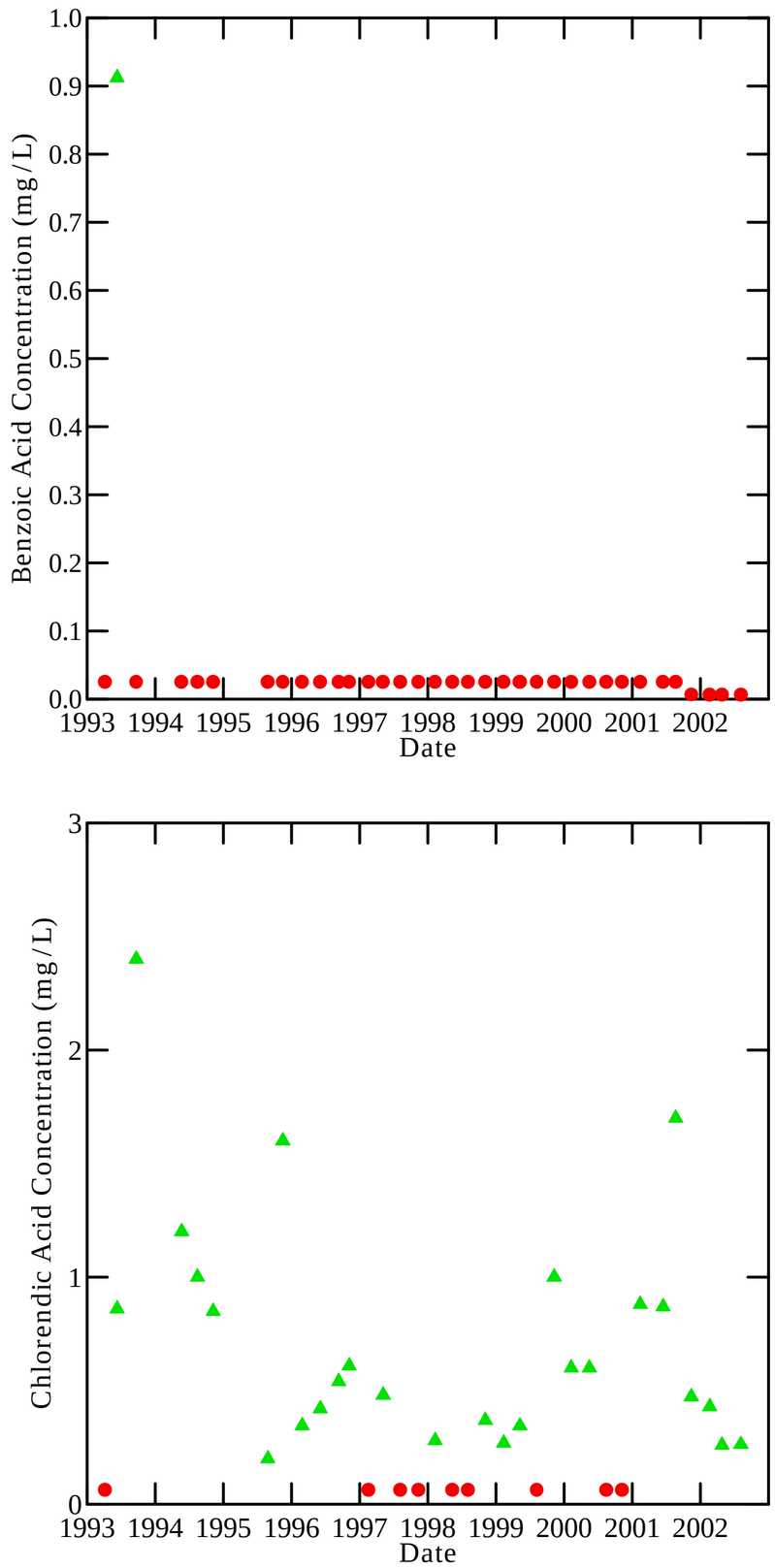
Notes:

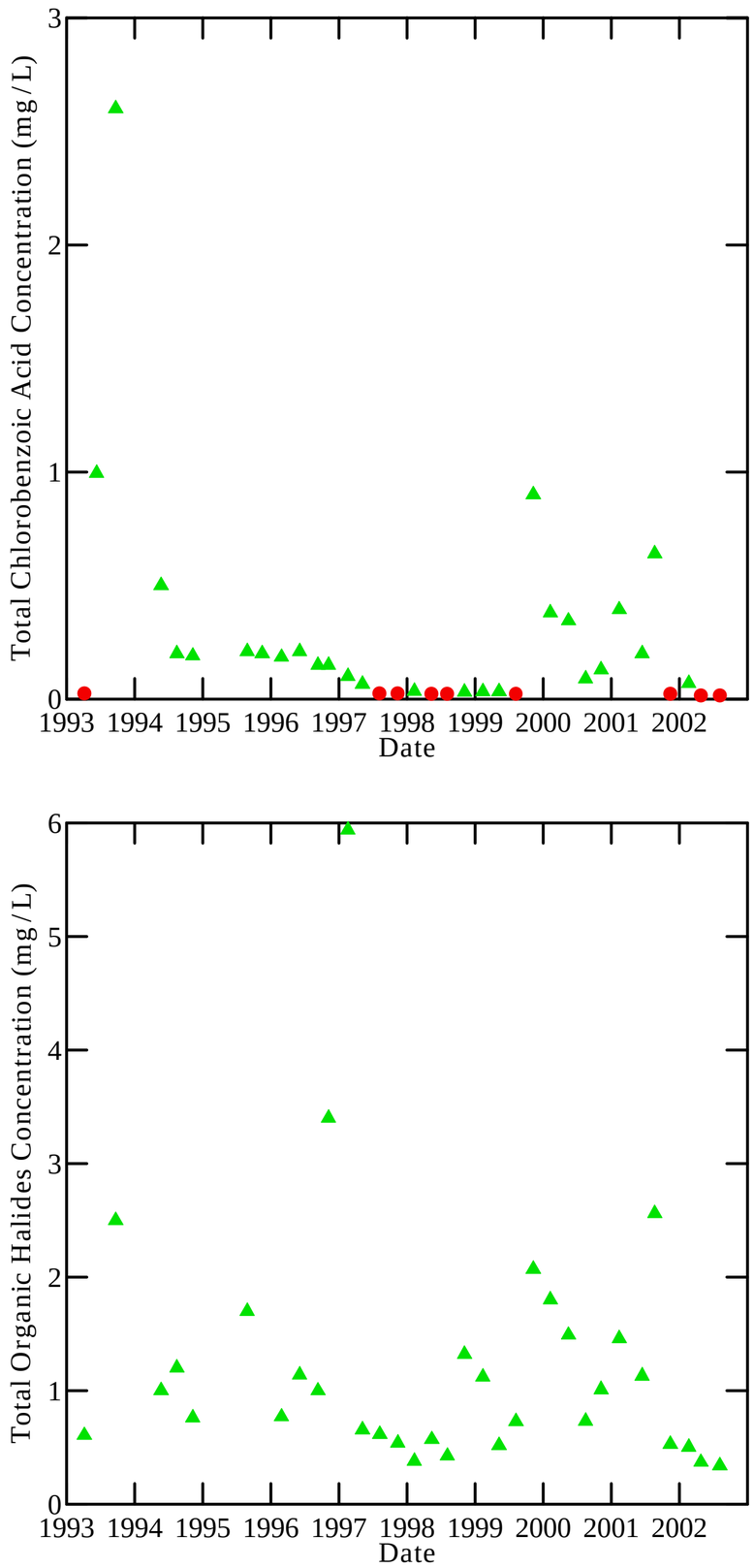
● Non-detect result

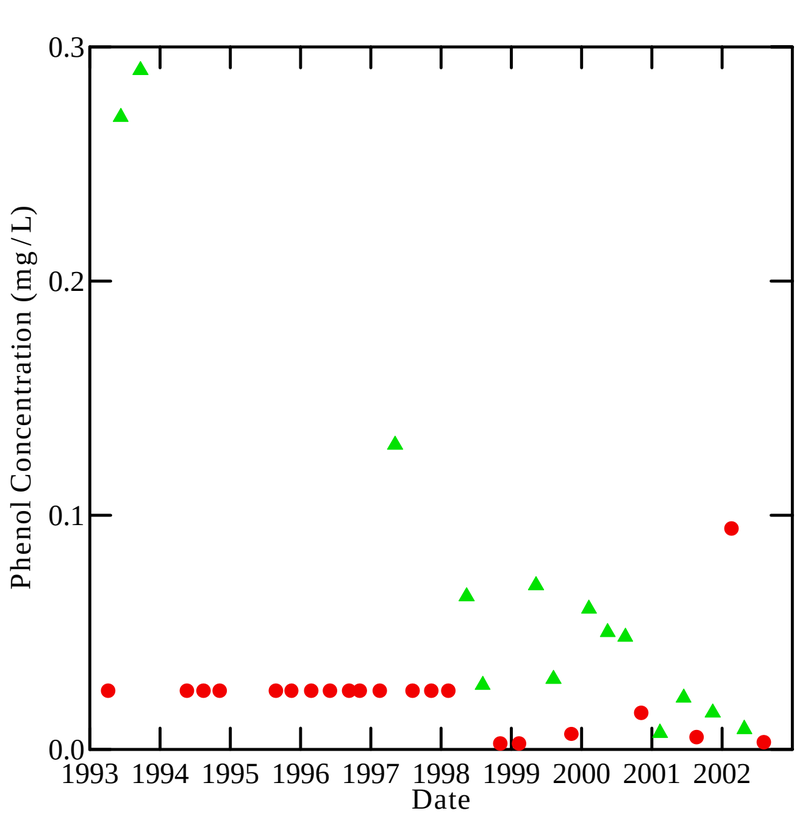
▲ Detected result

figure 7

Well D3U
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







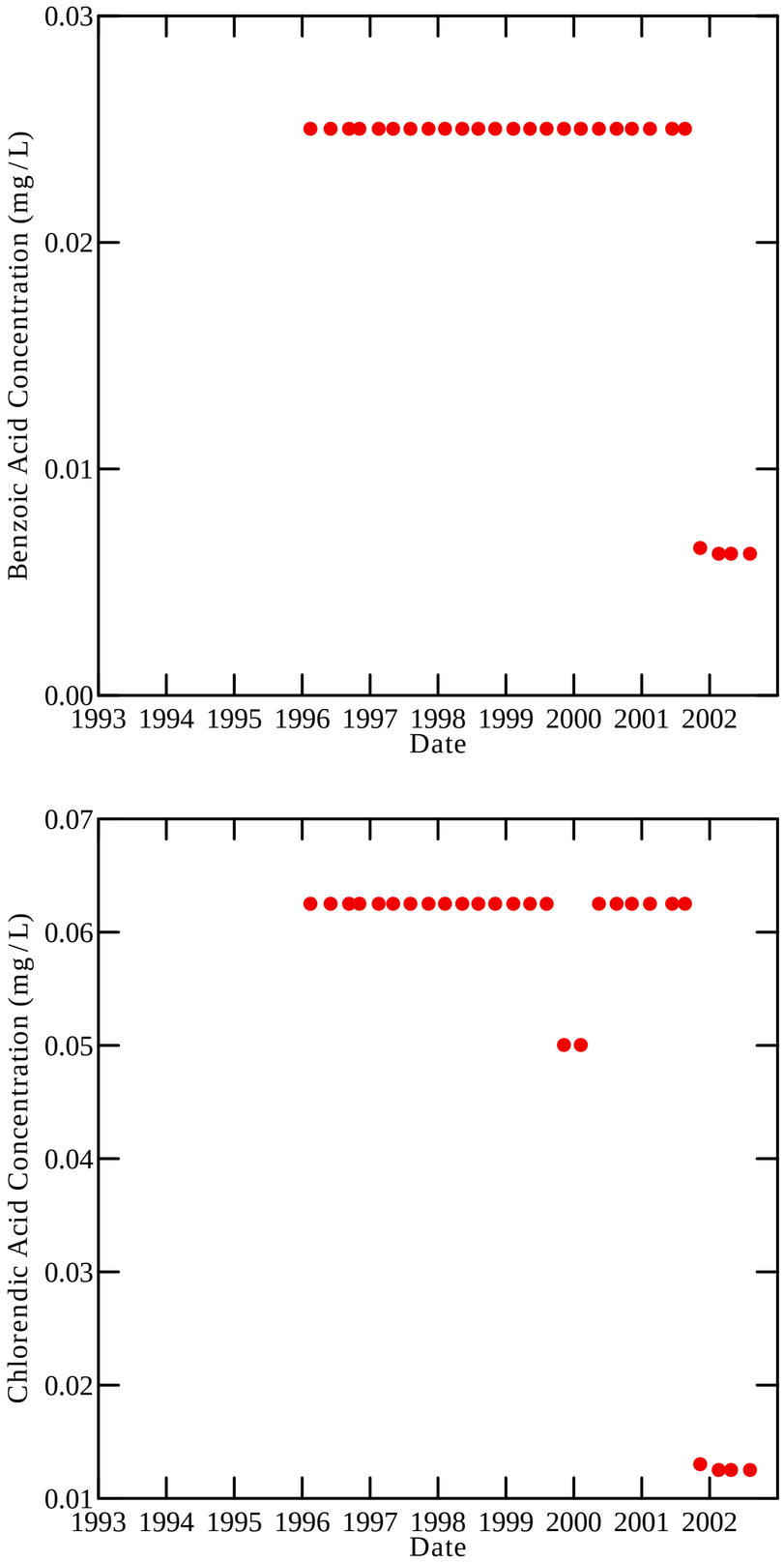
Notes:

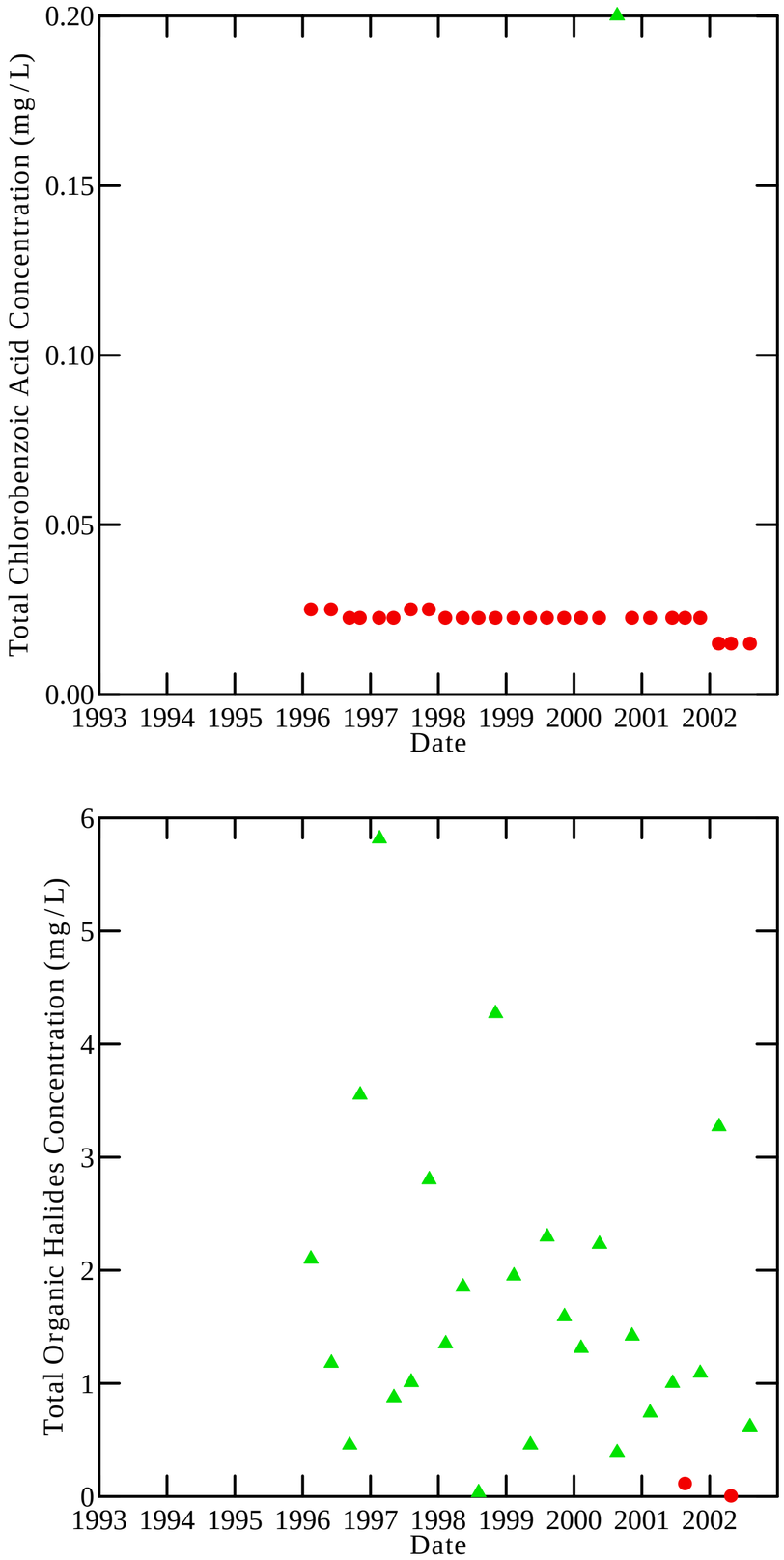
● Non-detect result

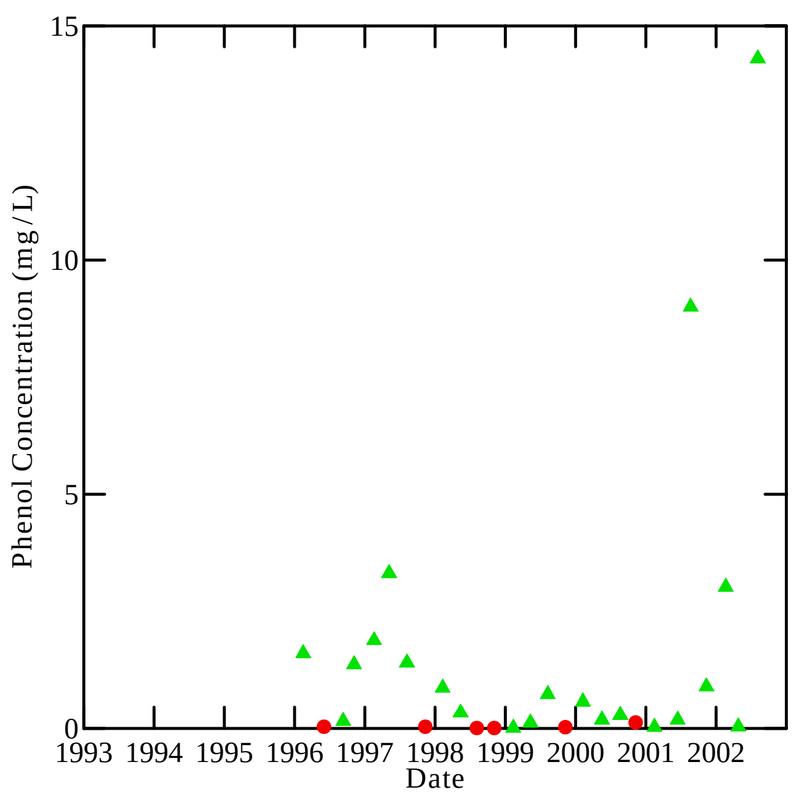
▲ Detected result

figure 8

Well D2M
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







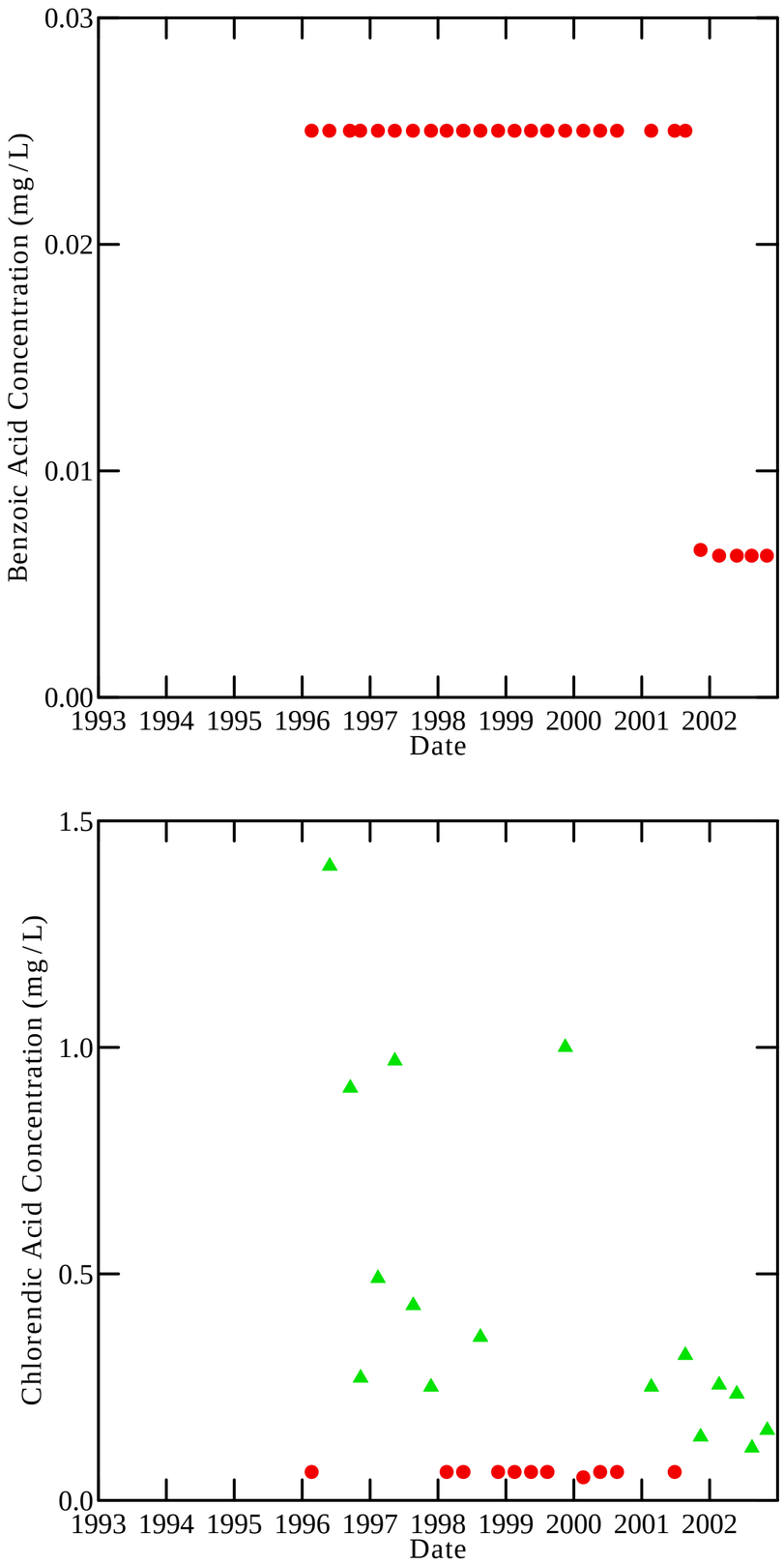
Notes:

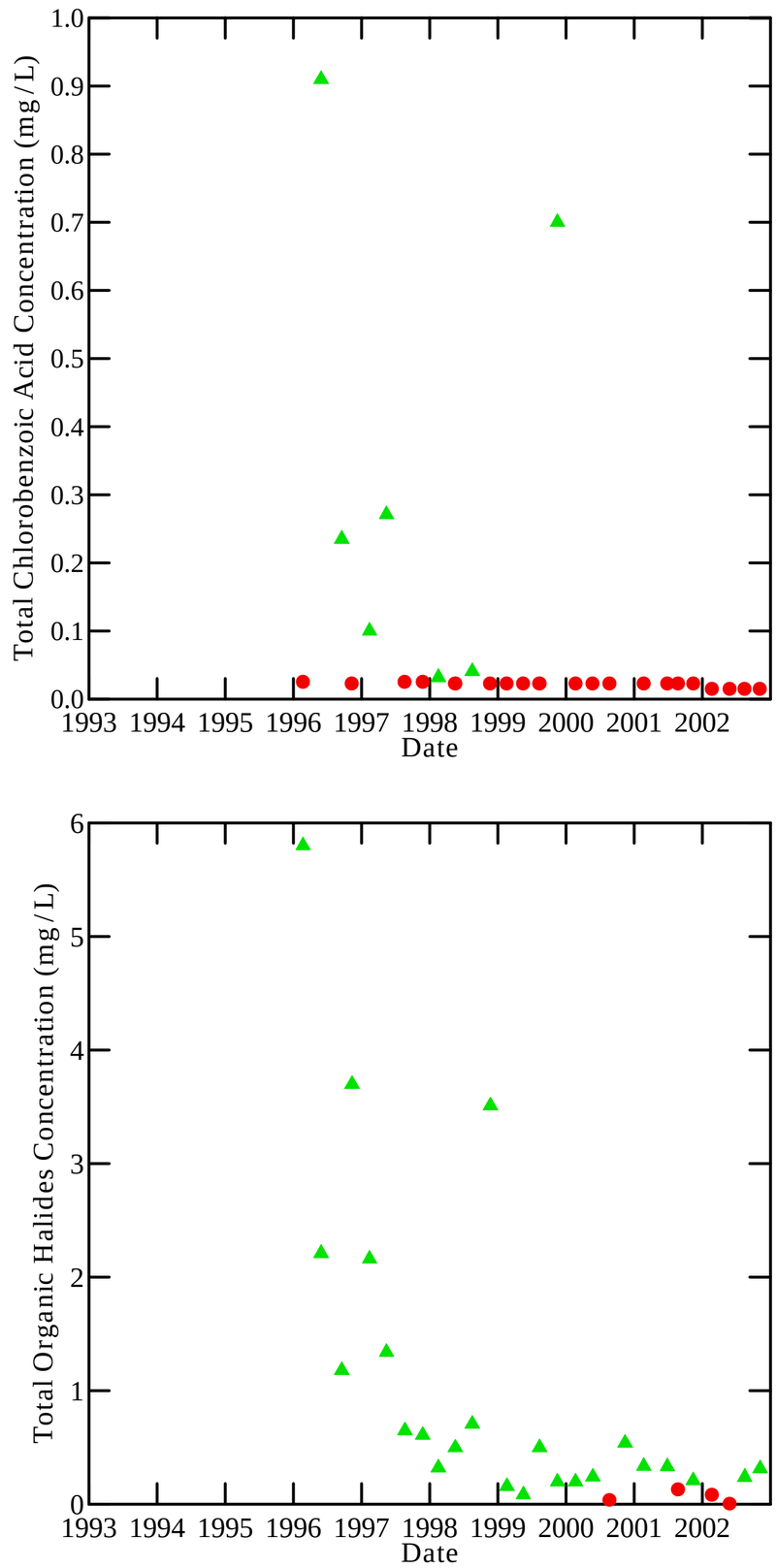
● Non-detect result

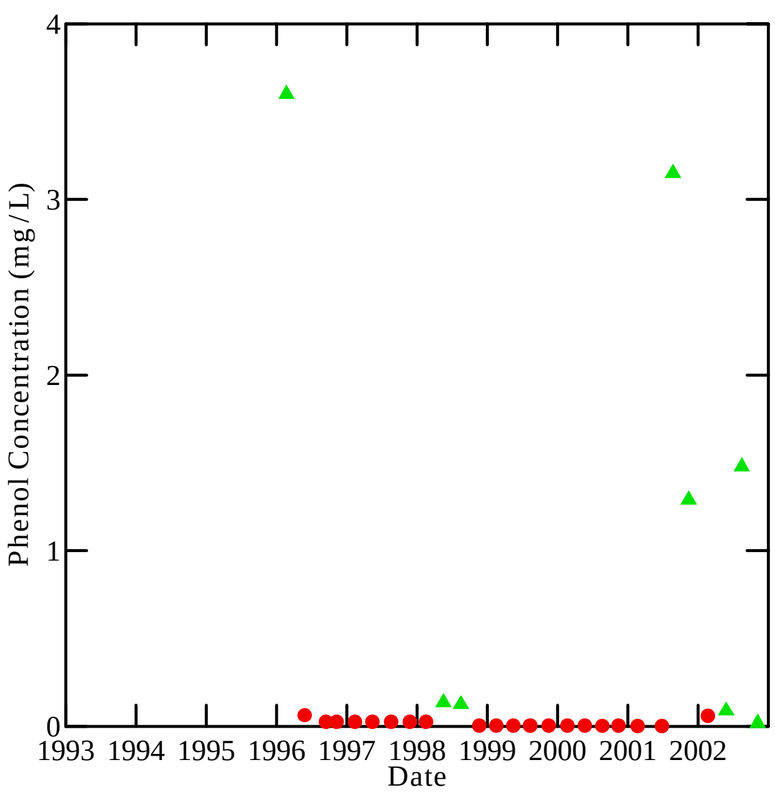
▲ Detected result

figure 9

Well D1L
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







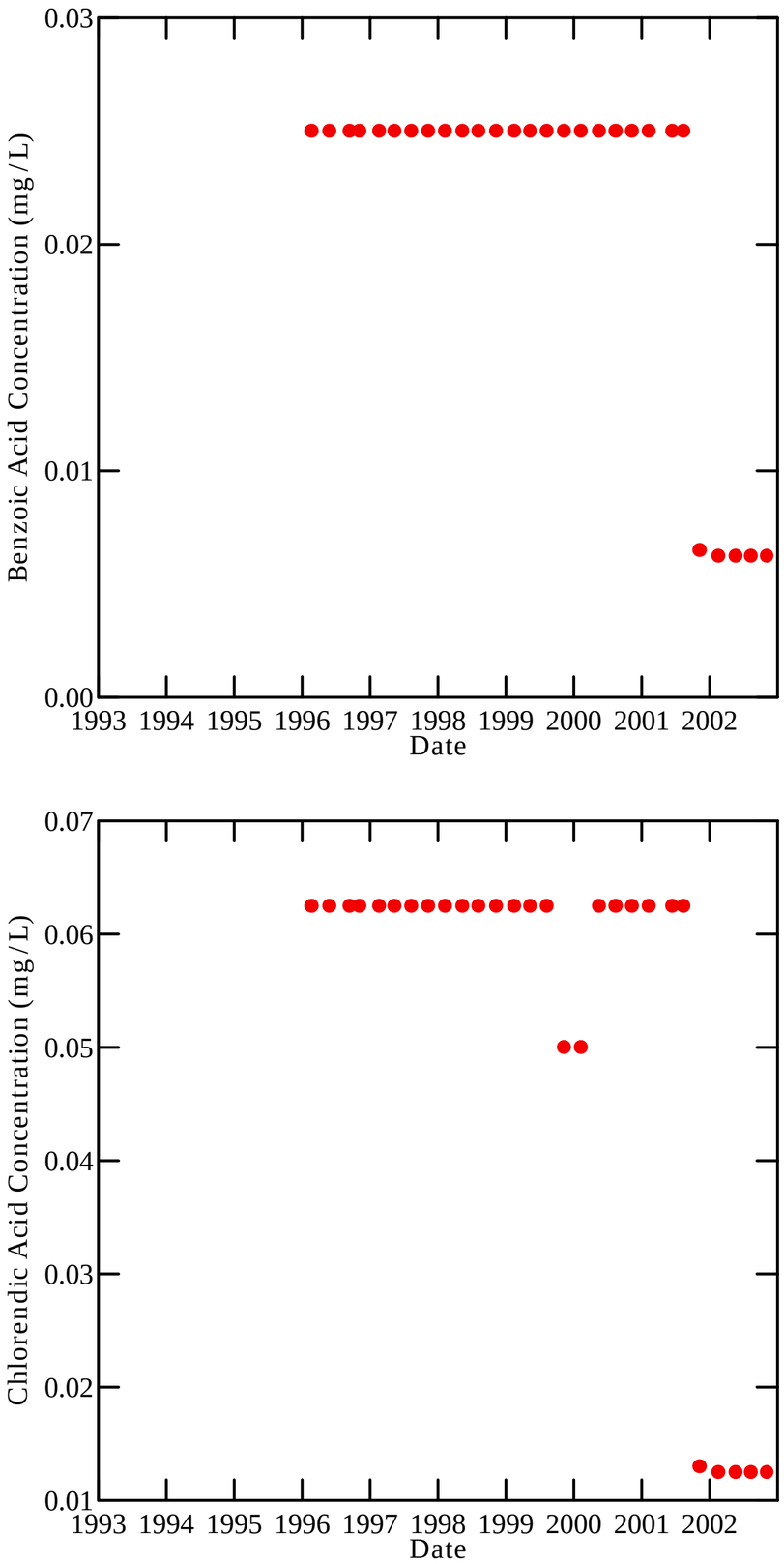
Notes:

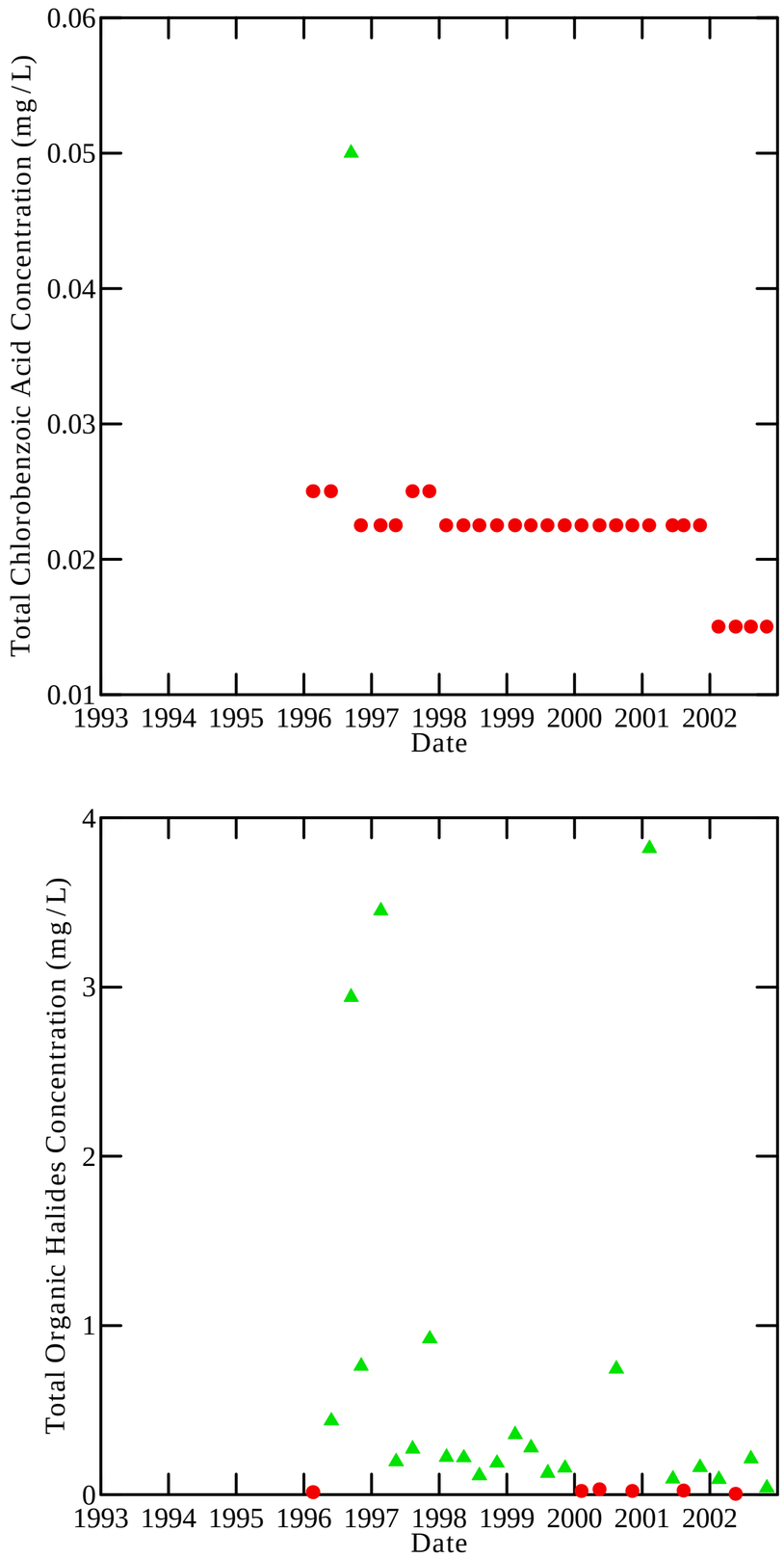
● Non-detect result

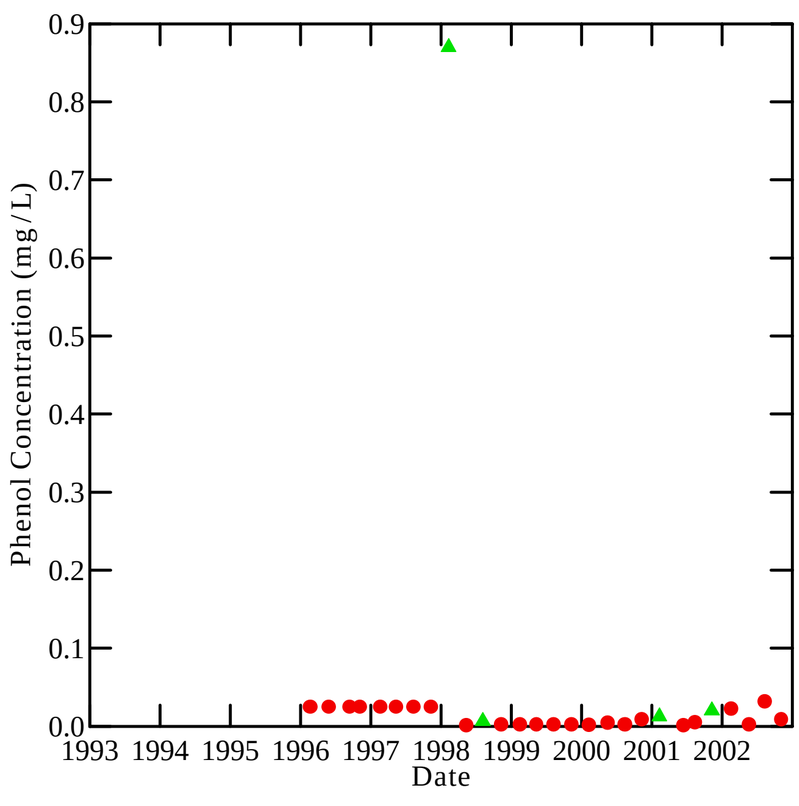
▲ Detected result

figure 10

Well E3U
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







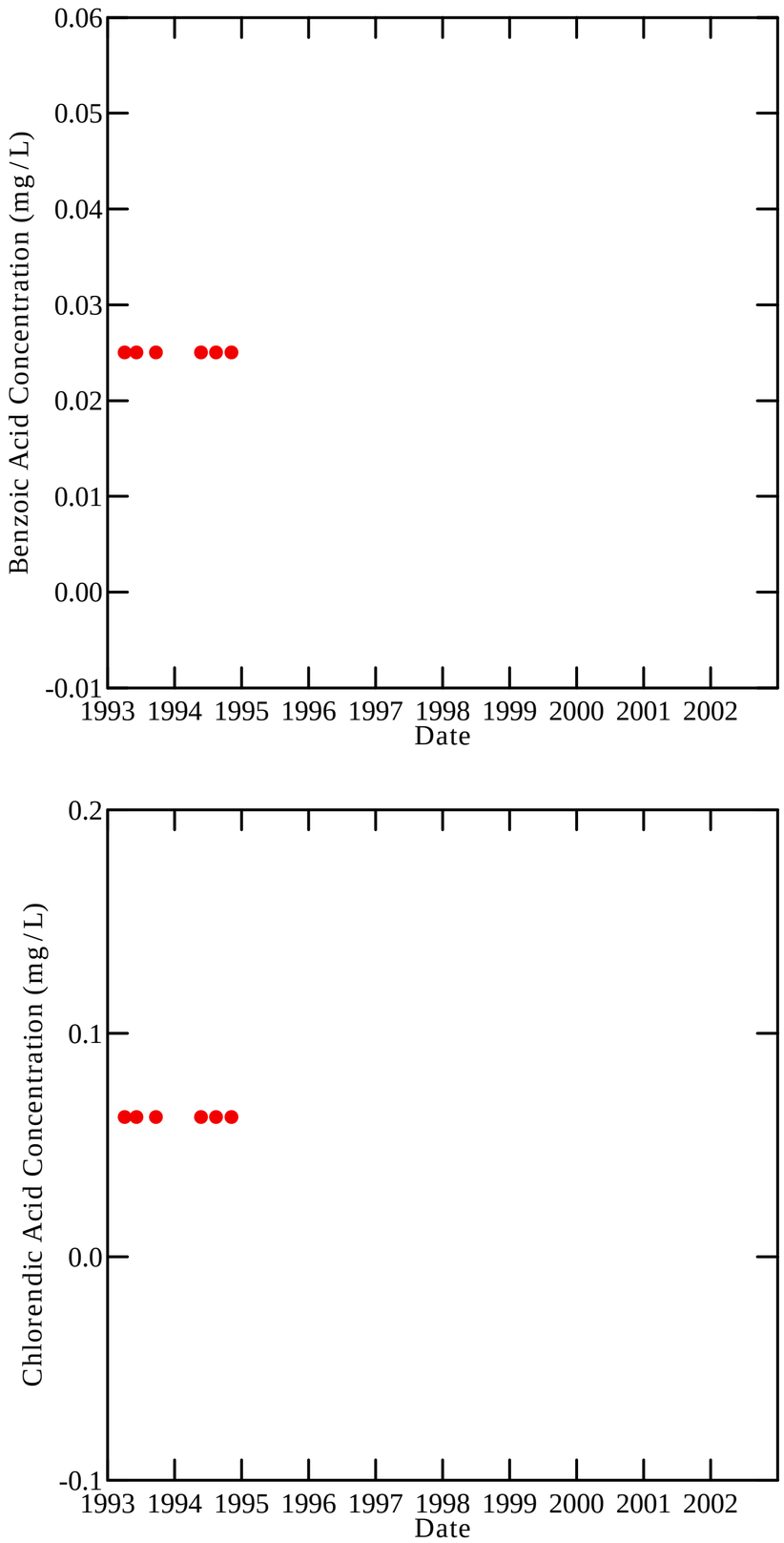
Notes:

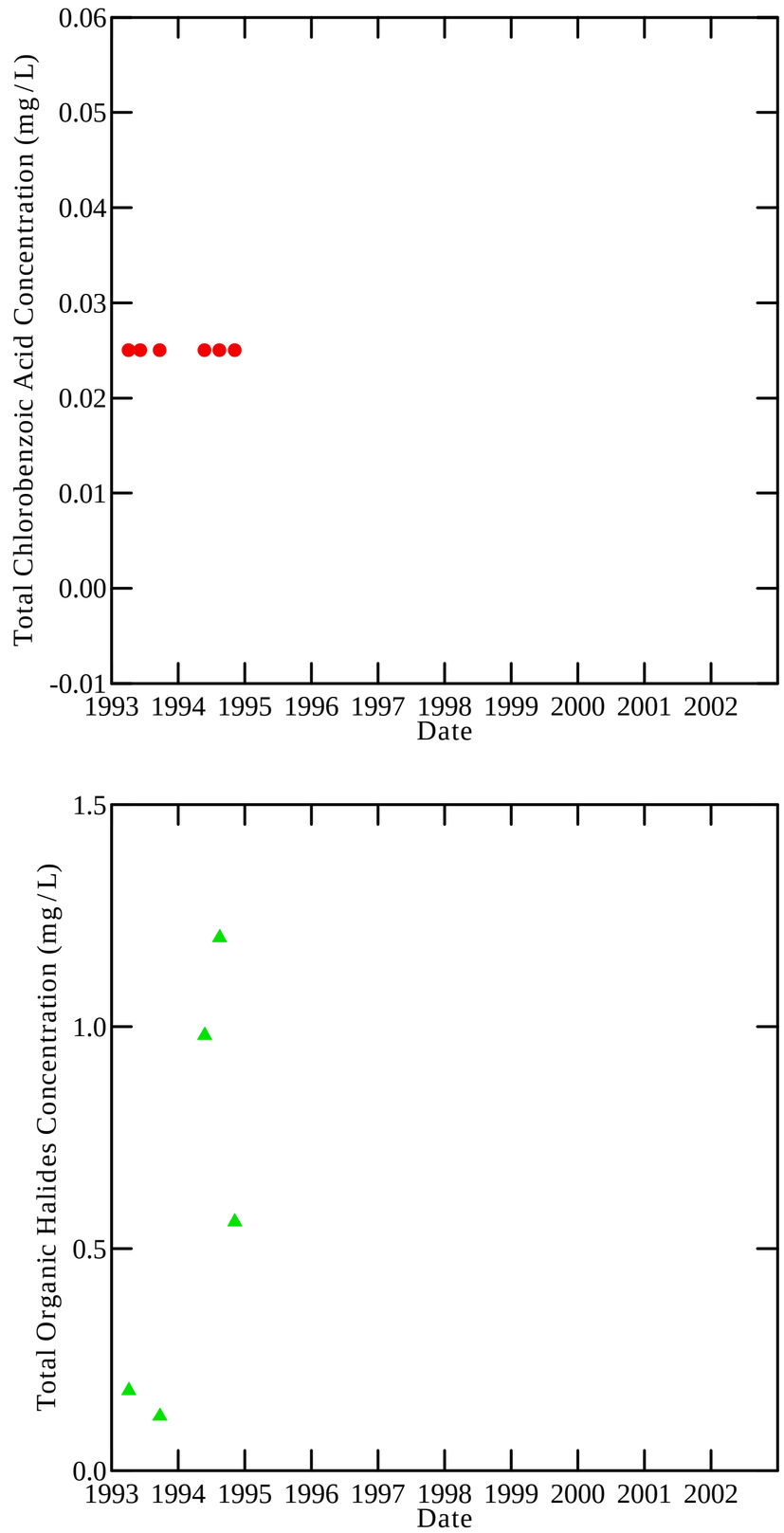
● Non-detect result

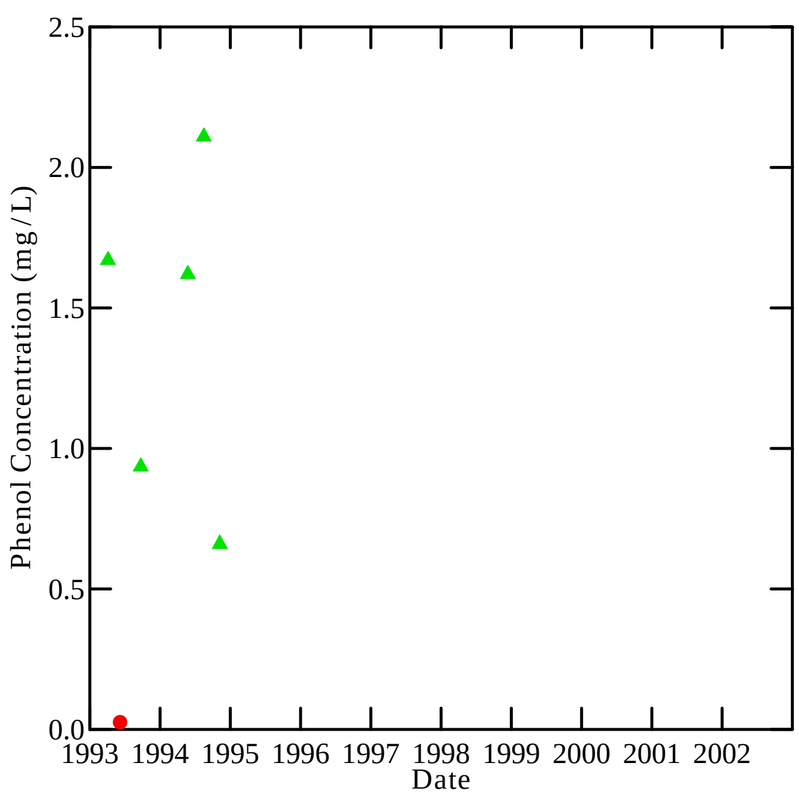
▲ Detected result

figure 11

Well E3M
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







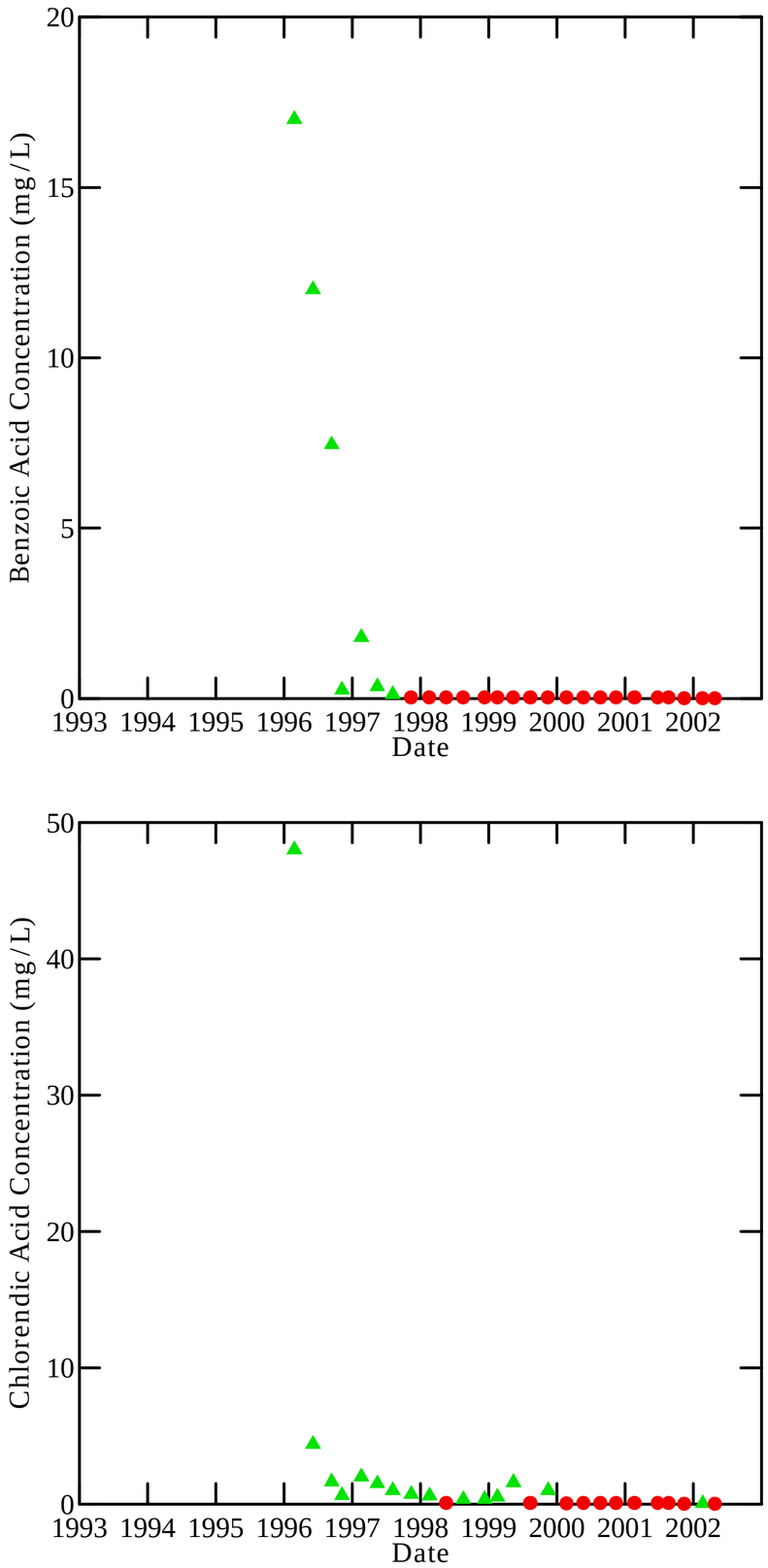
Notes:

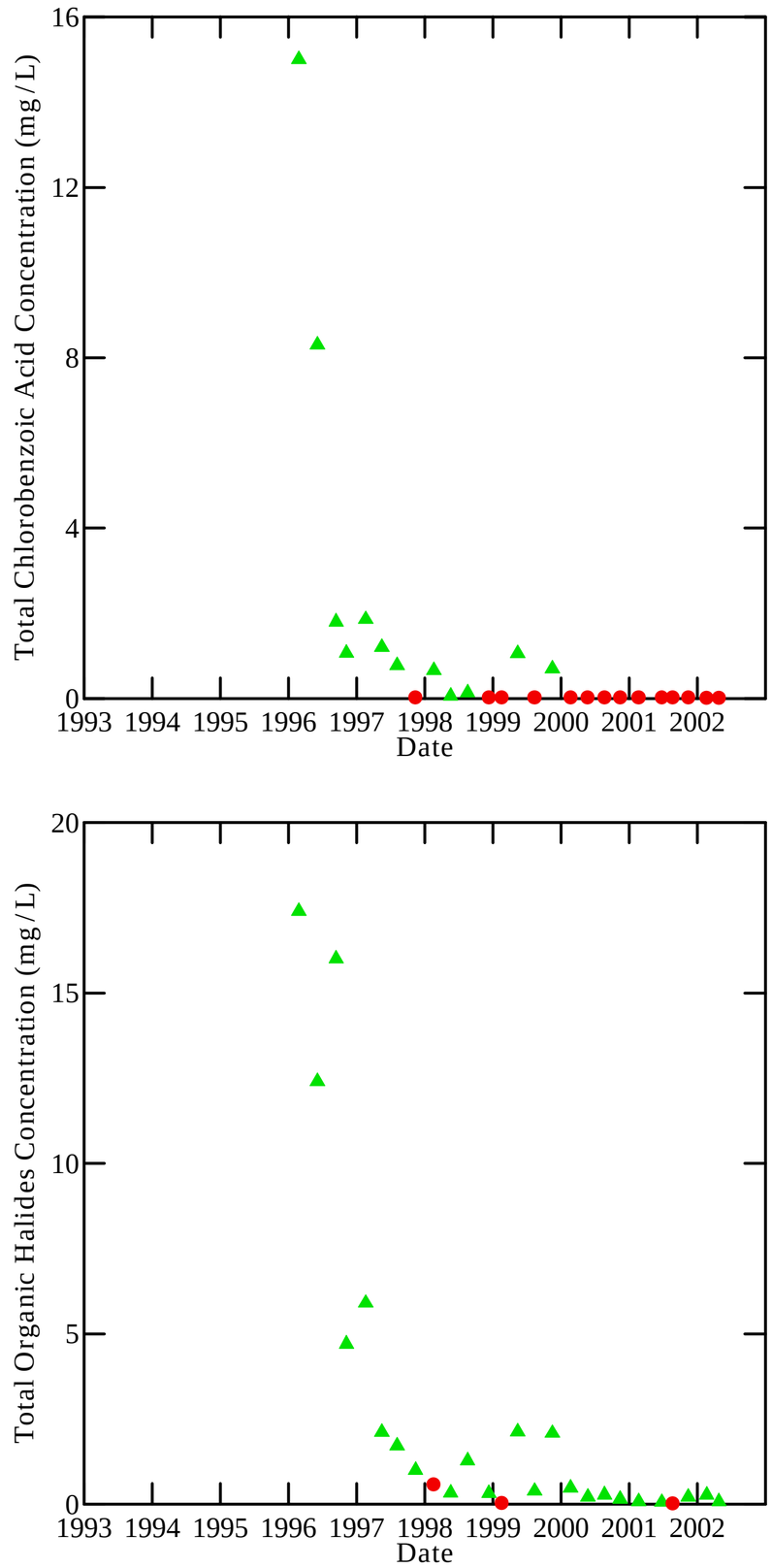
● Non-detect result

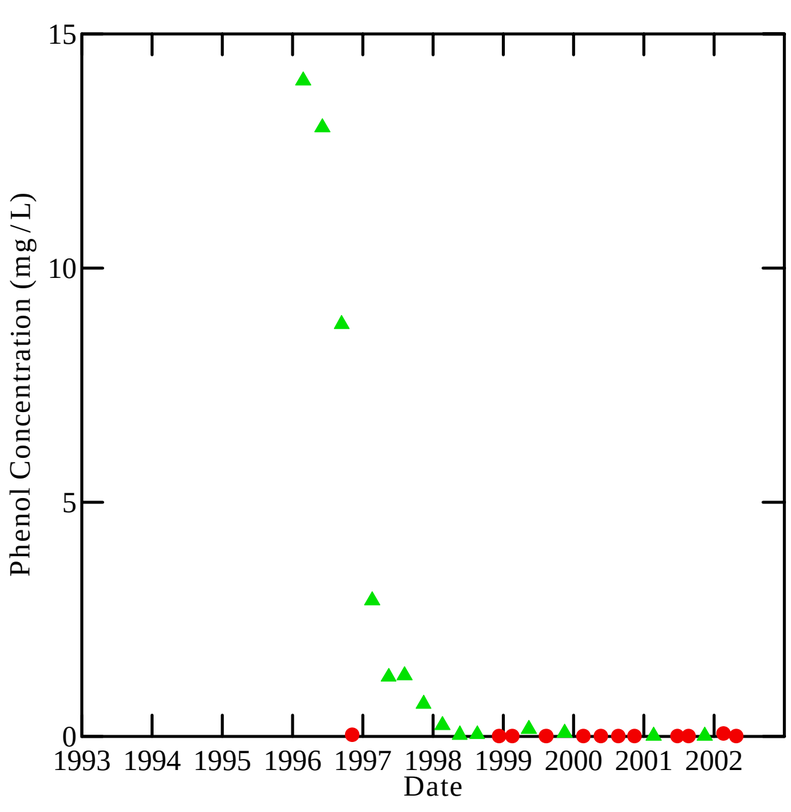
▲ Detected result

figure 12

Well E2L
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







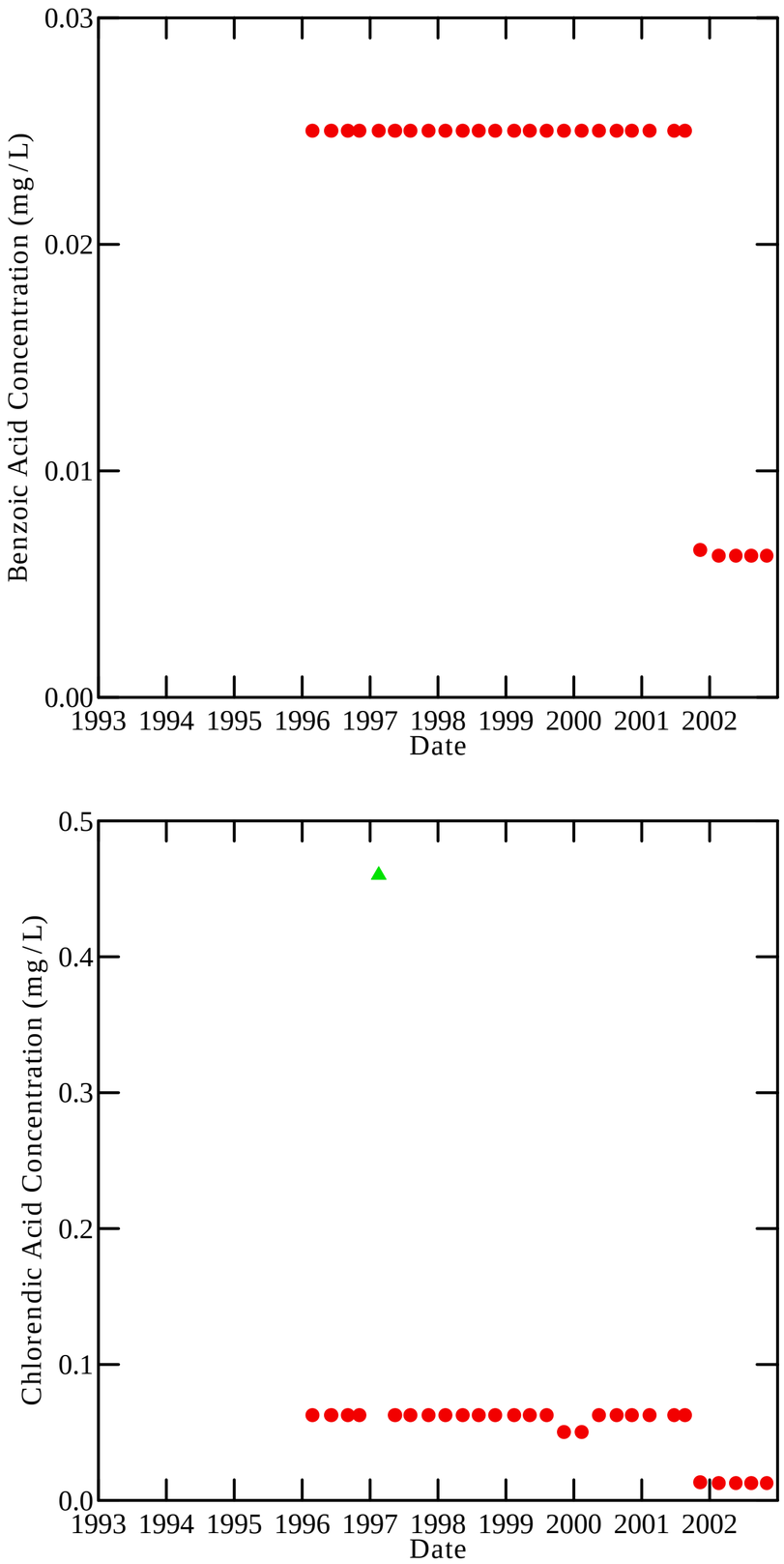
Notes:

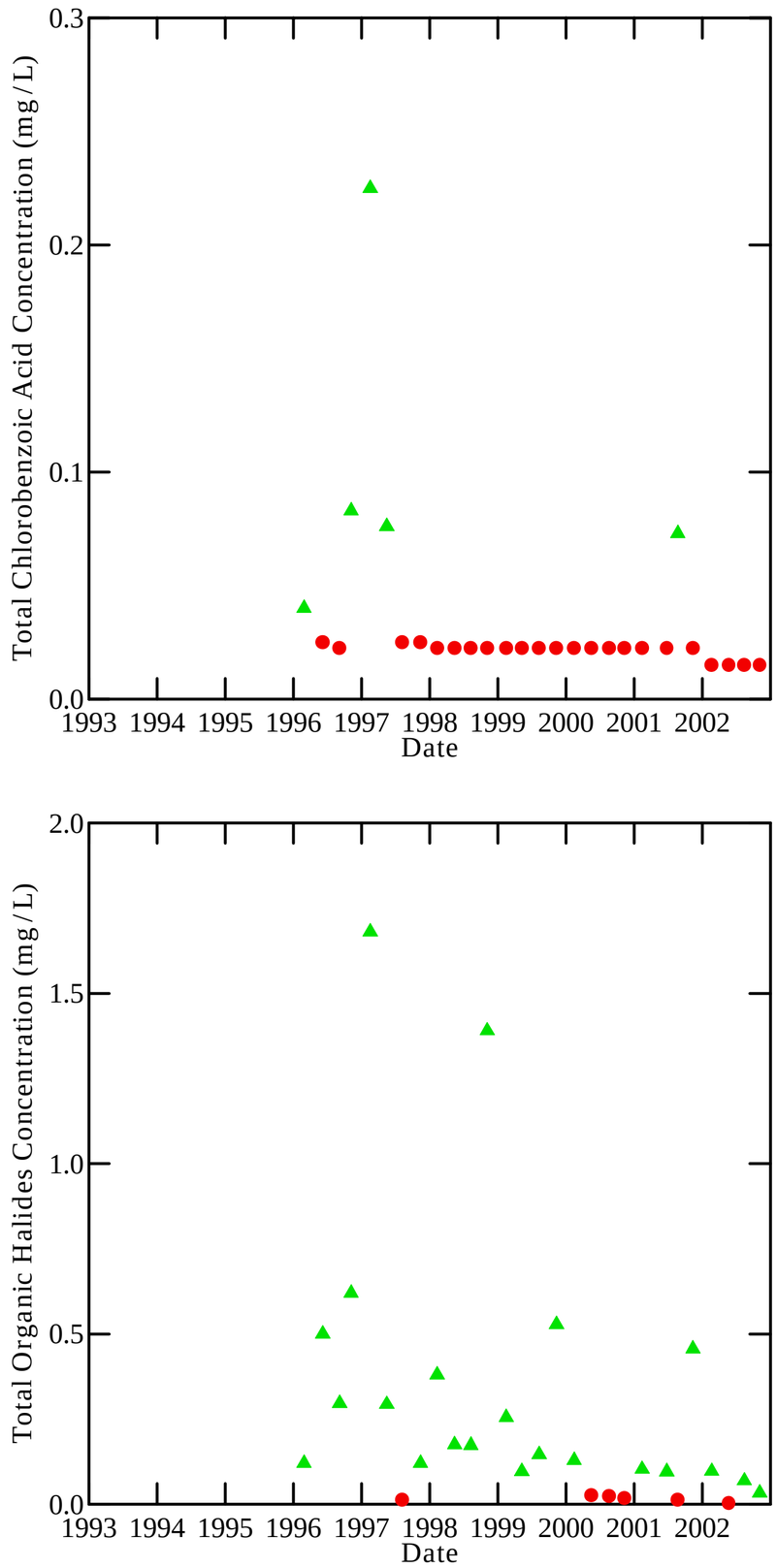
● Non-detect result

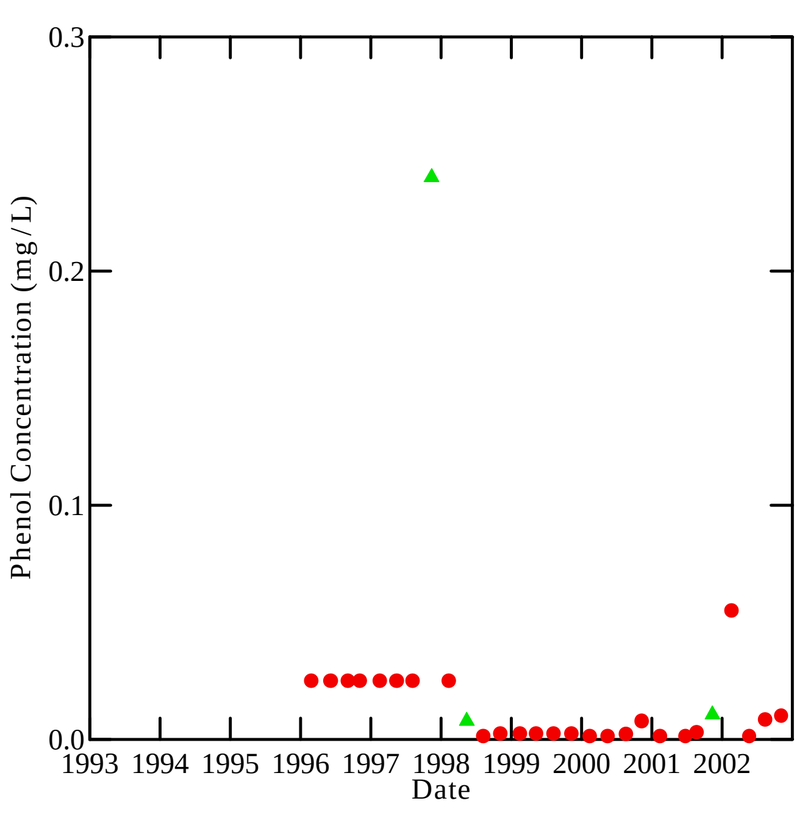
▲ Detected result

figure 13

Well F4U
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







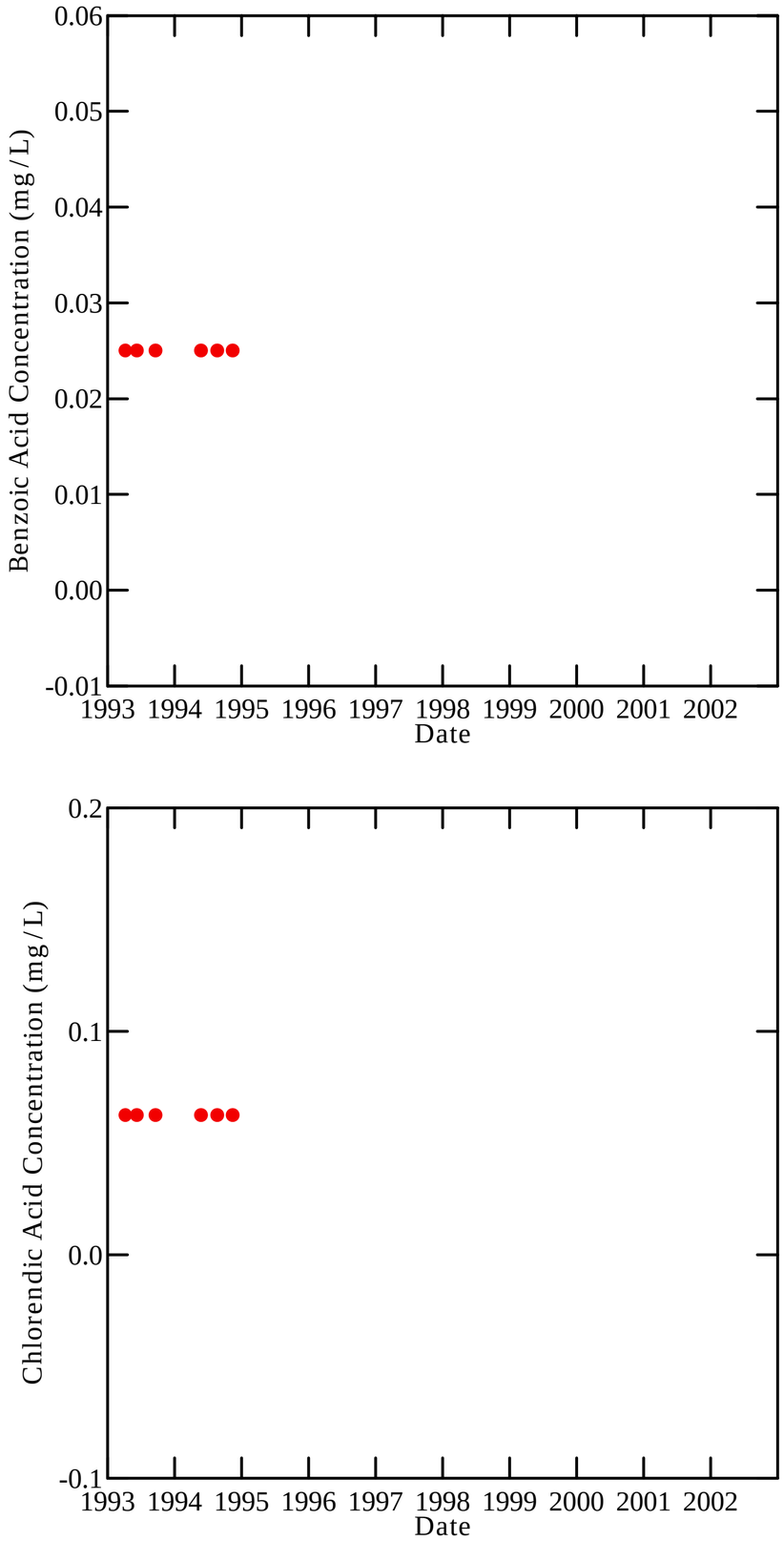
Notes:

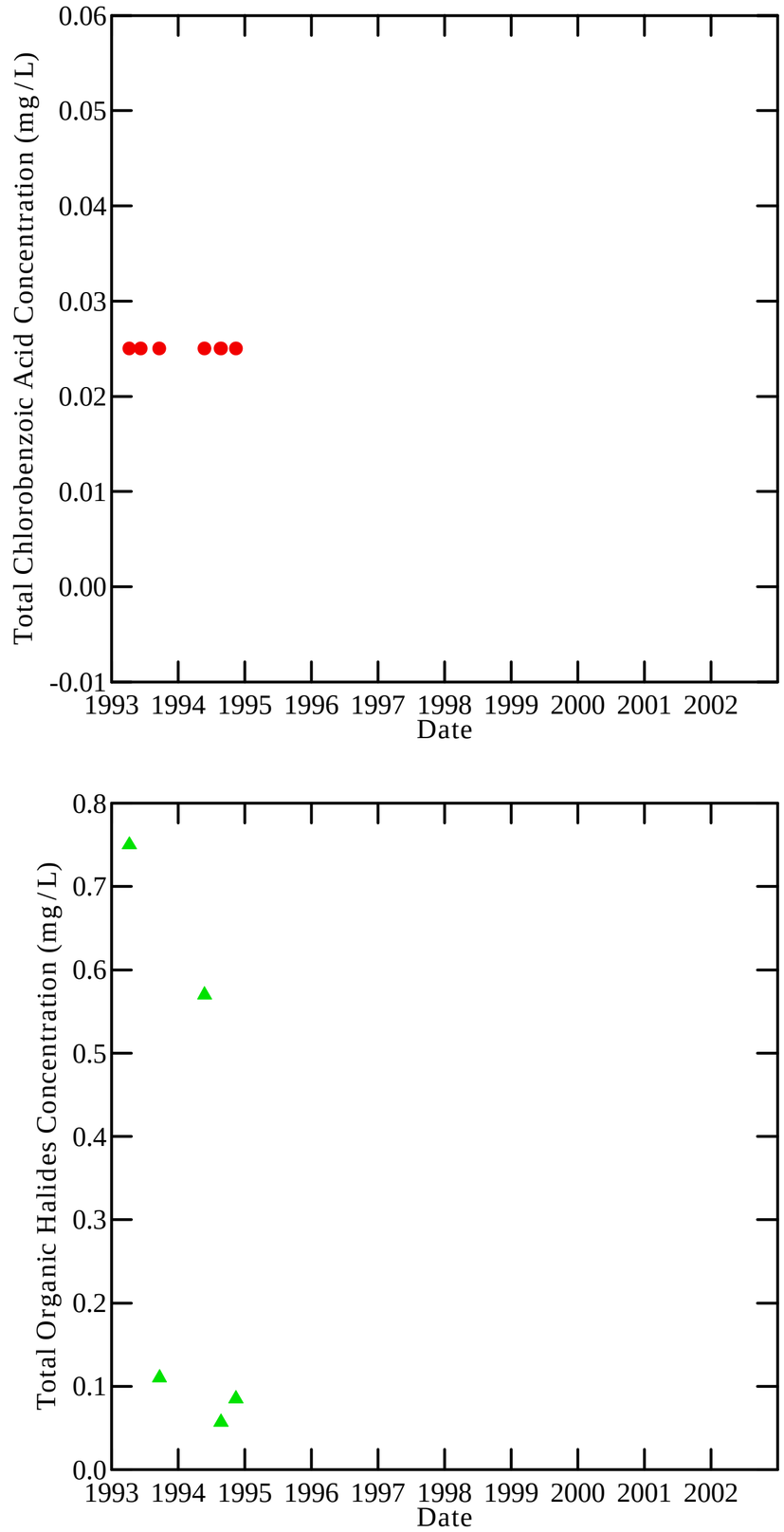
● Non-detect result

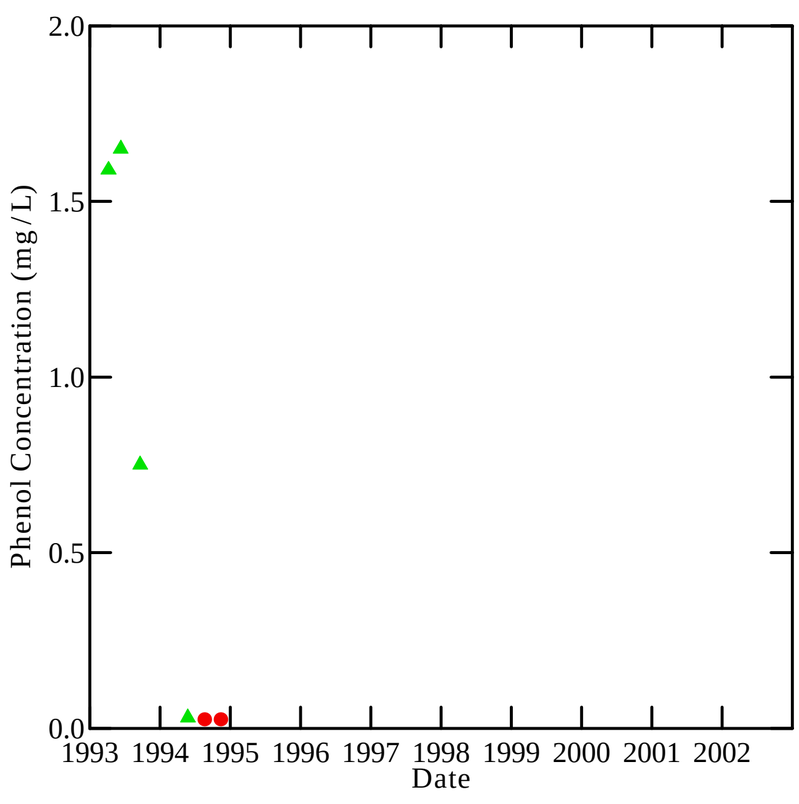
▲ Detected result

figure 14

Well F1M
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







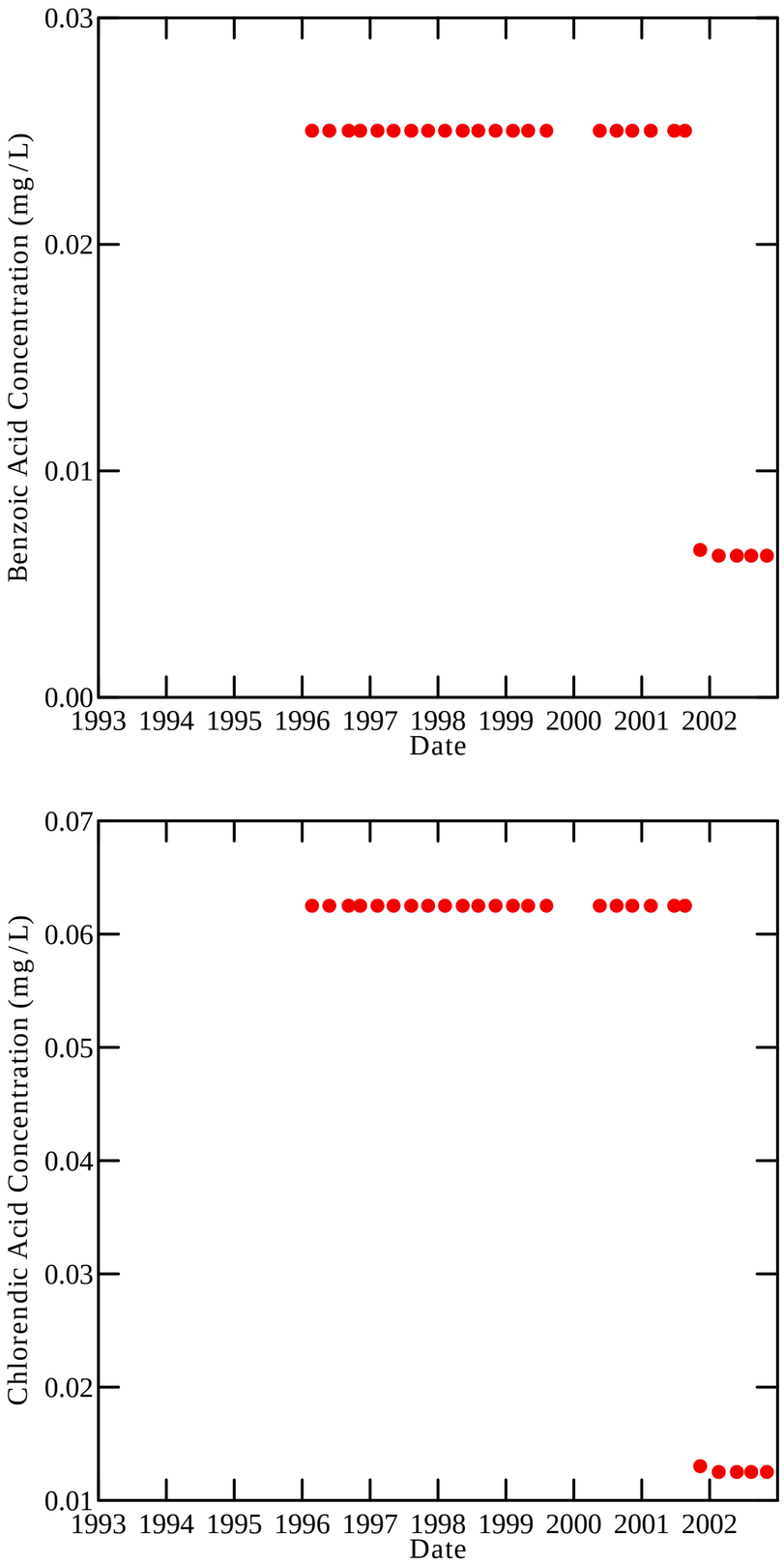
Notes:

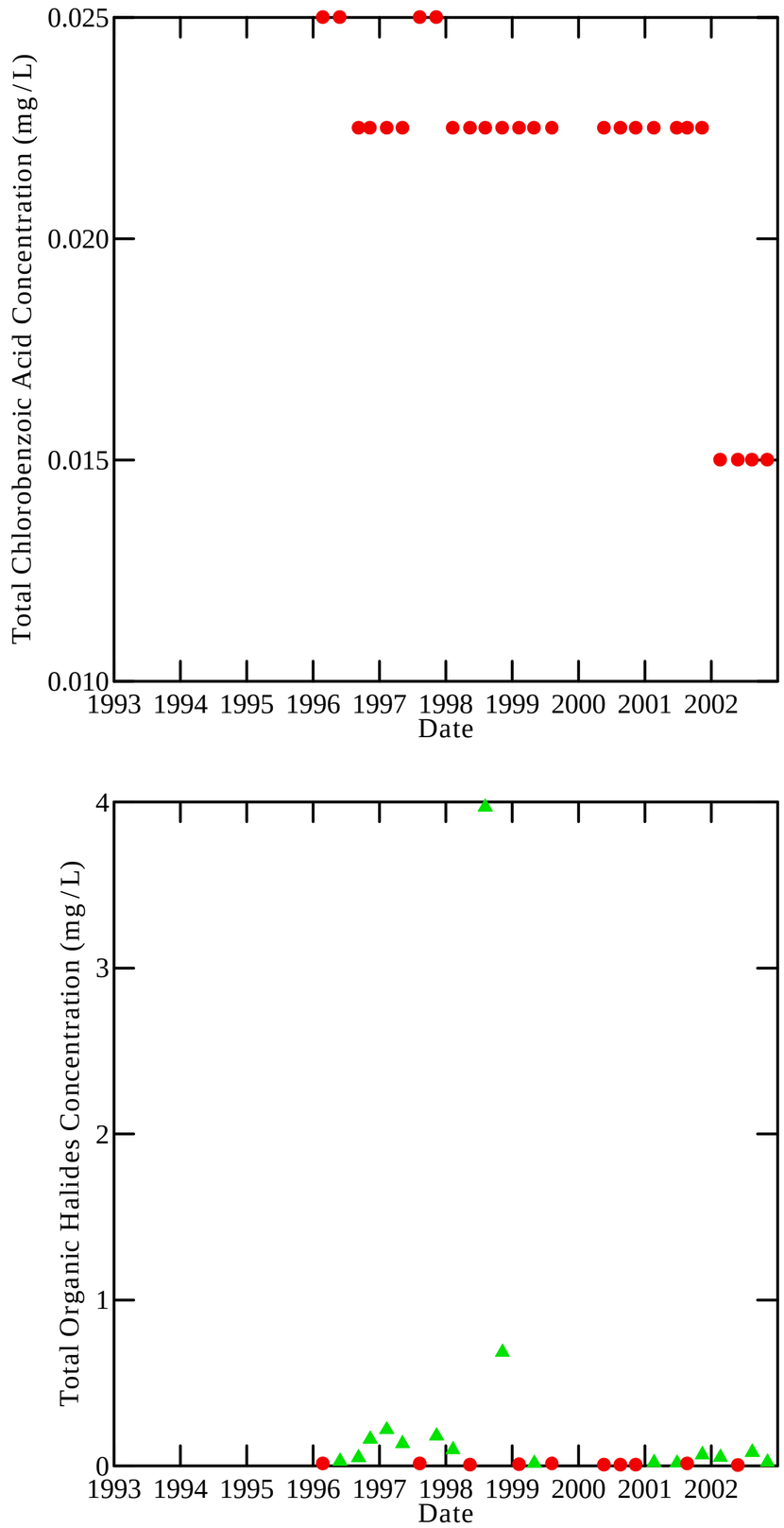
● Non-detect result

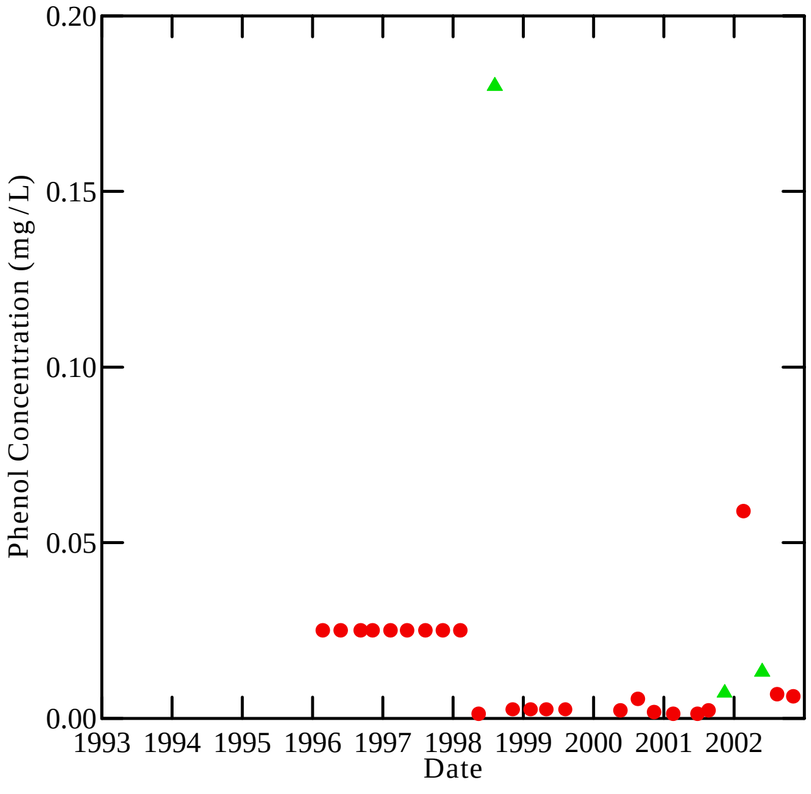
▲ Detected result

figure 15

Well F2L
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







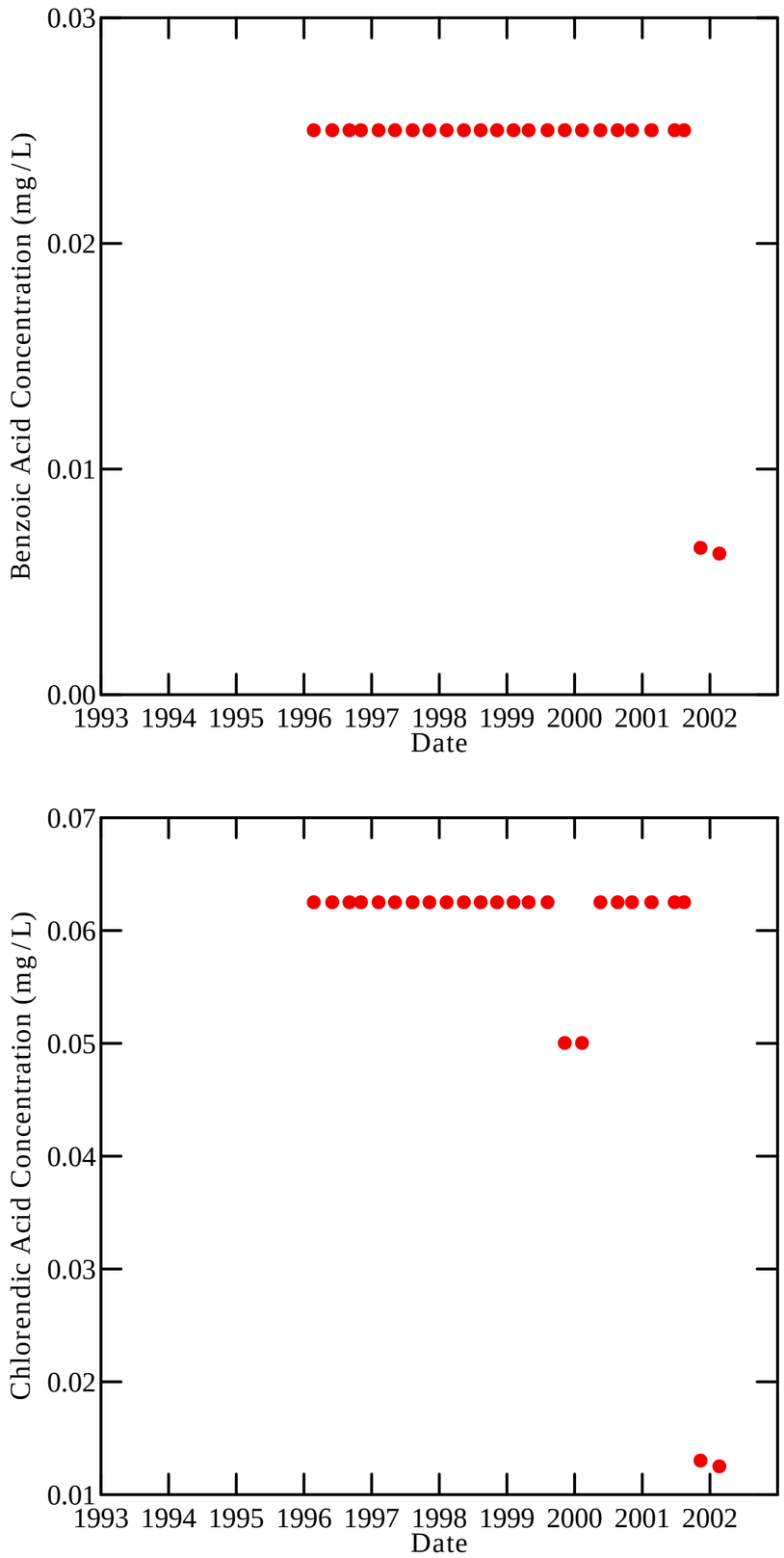
Notes:

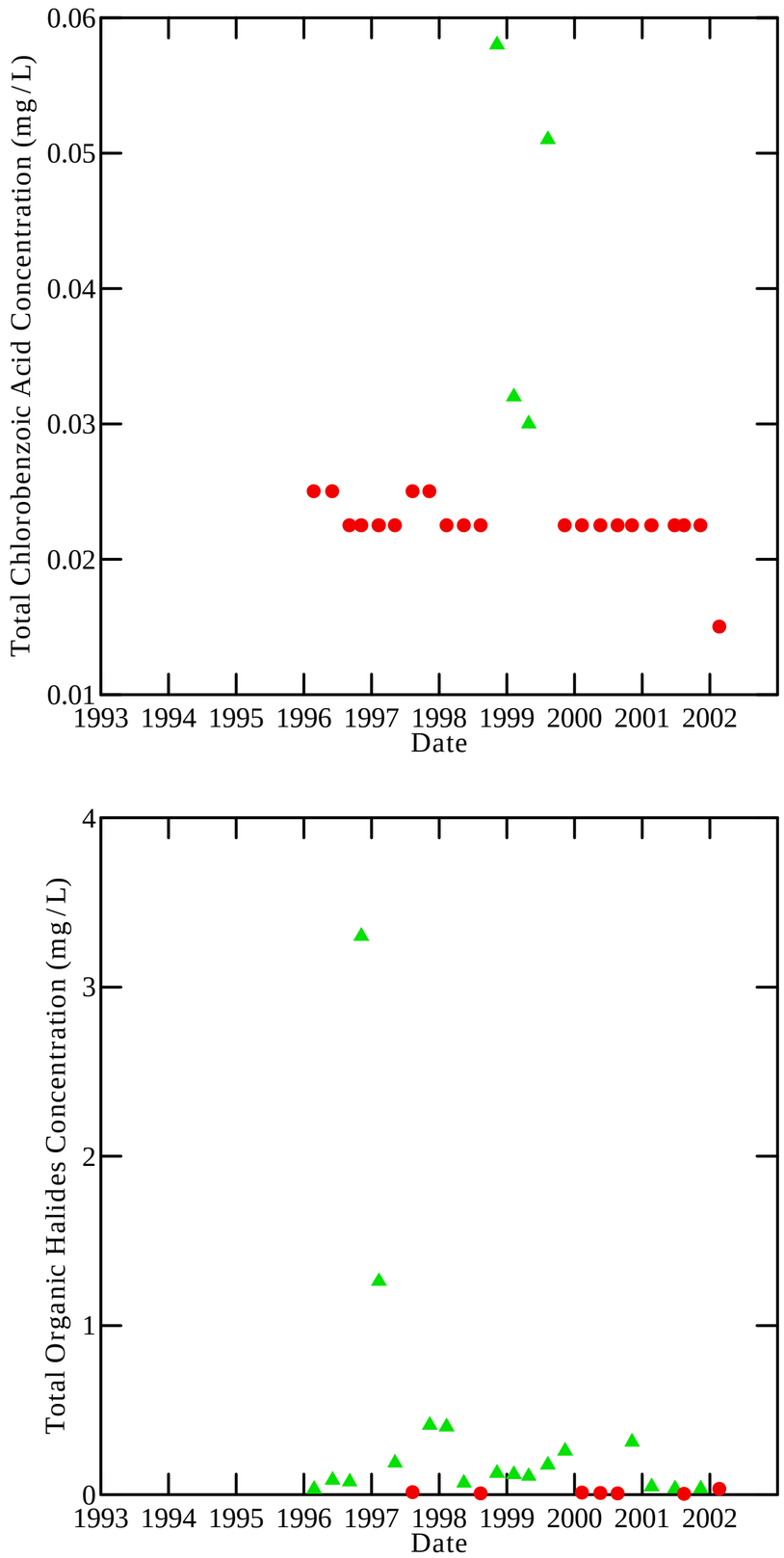
● Non-detect result

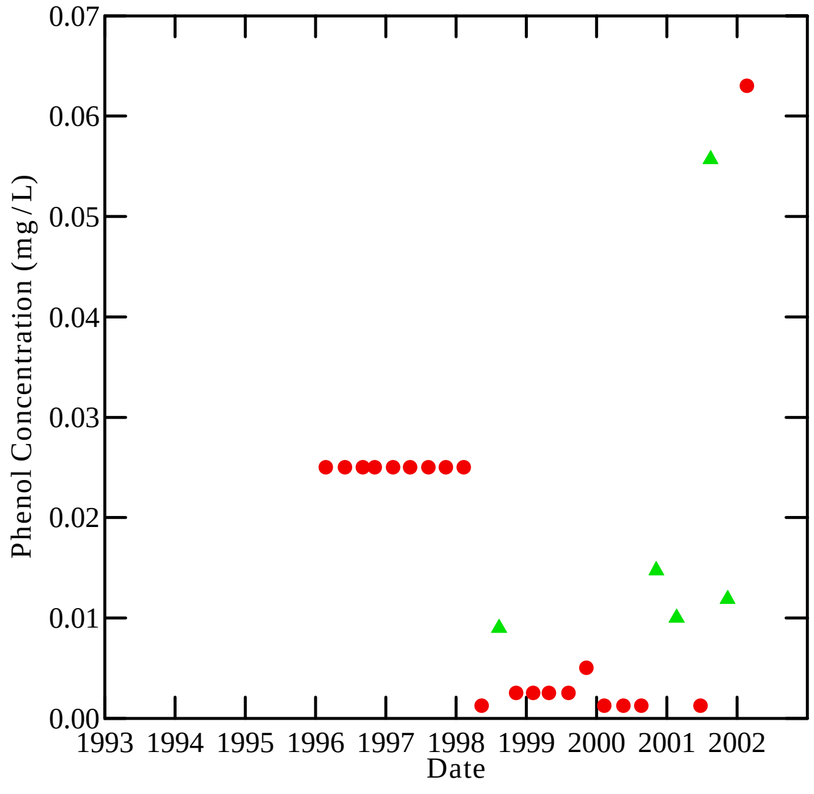
▲ Detected result

figure 16

Well G4U
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







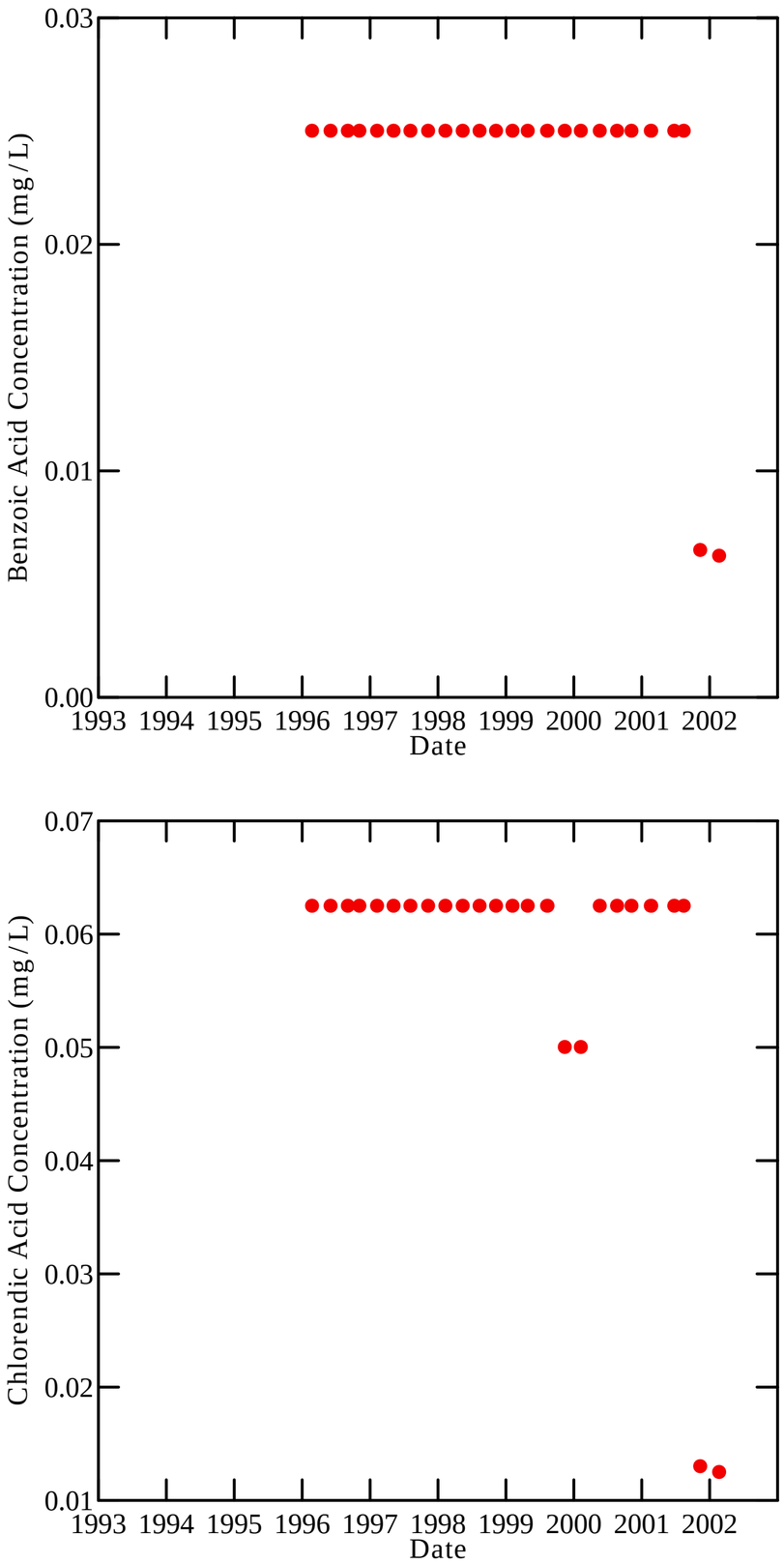
Notes:

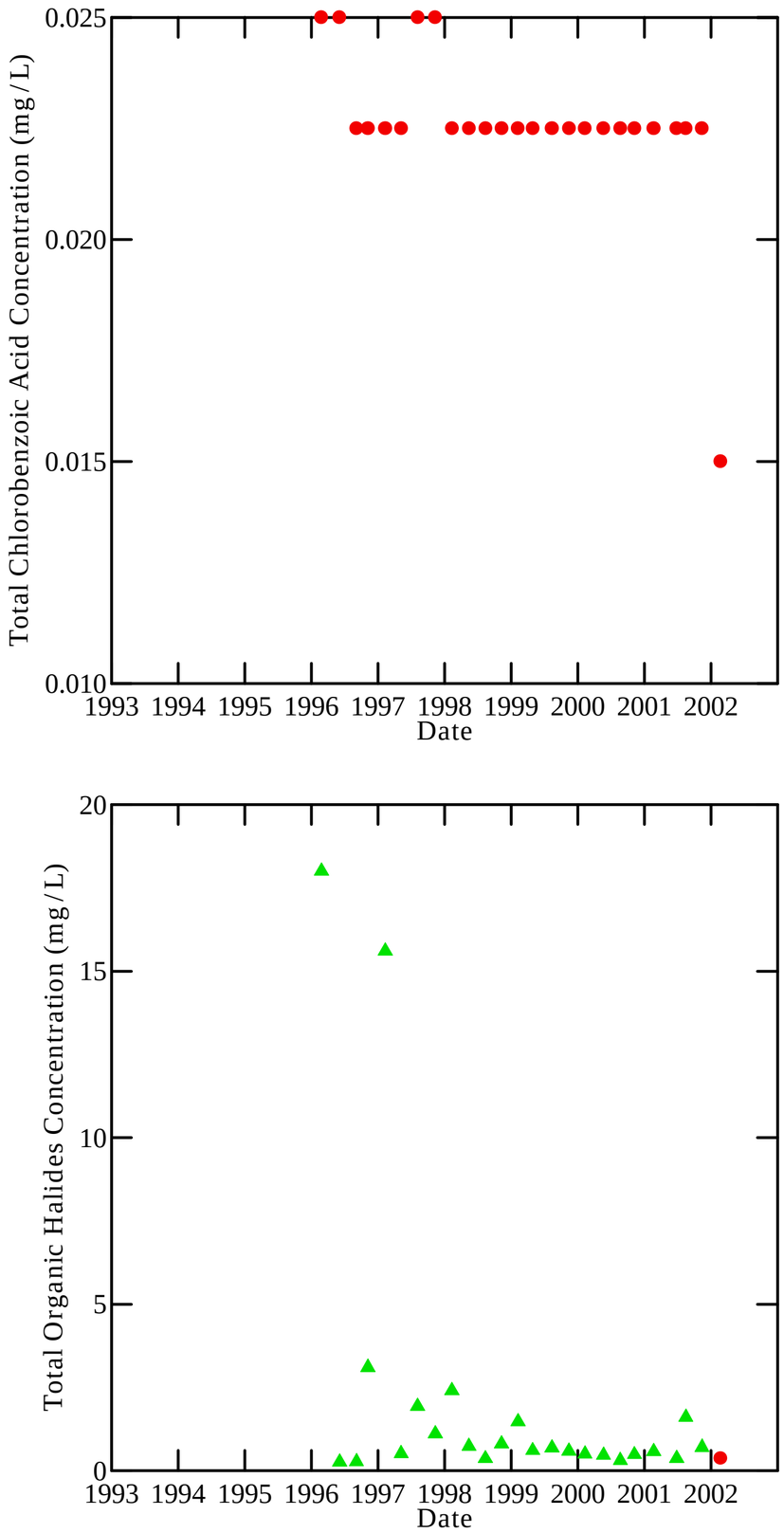
● Non-detect result

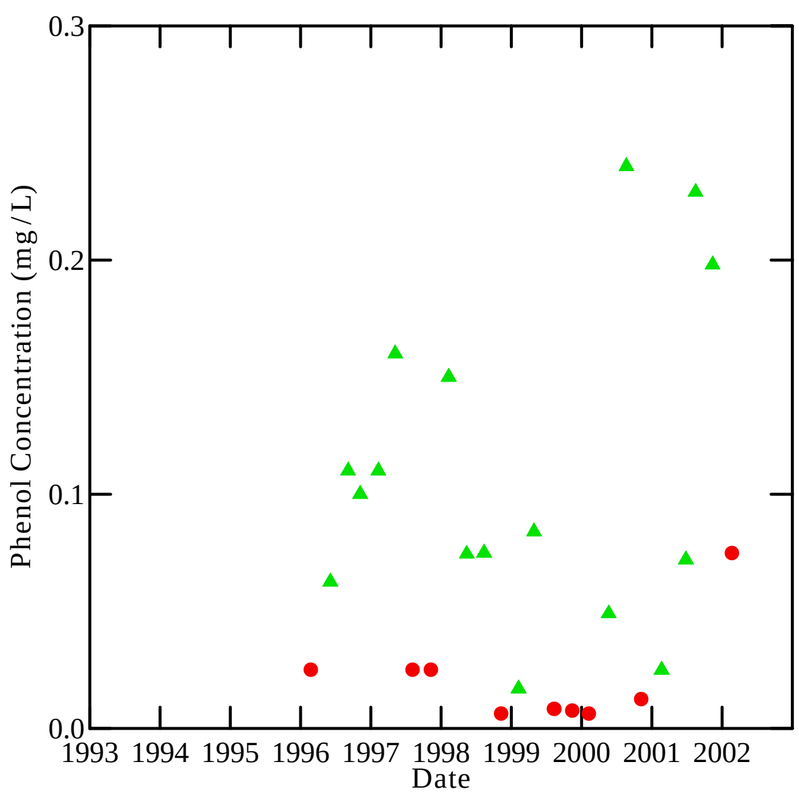
▲ Detected result

figure 17

Well G1M
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







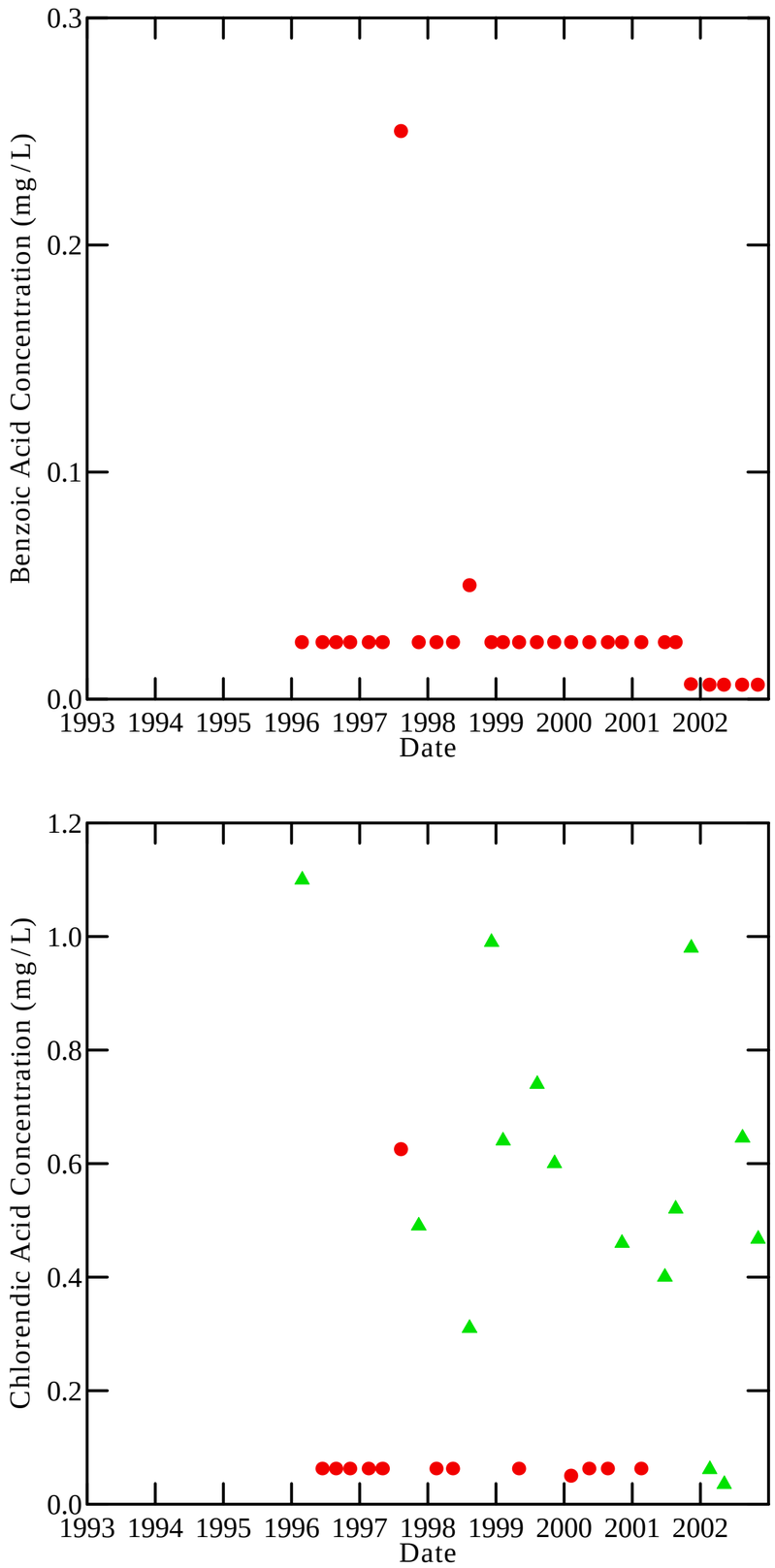
Notes:

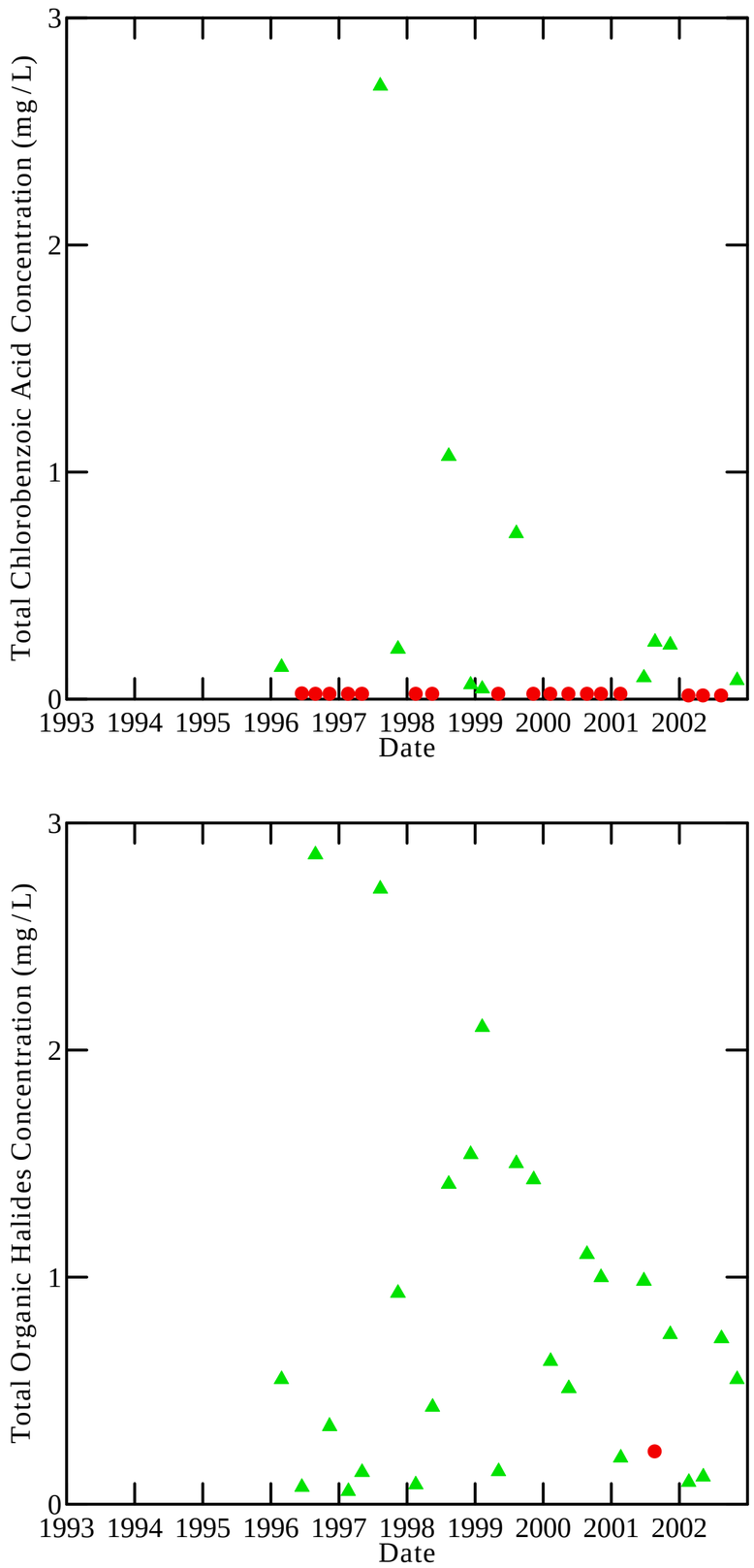
● Non-detect result

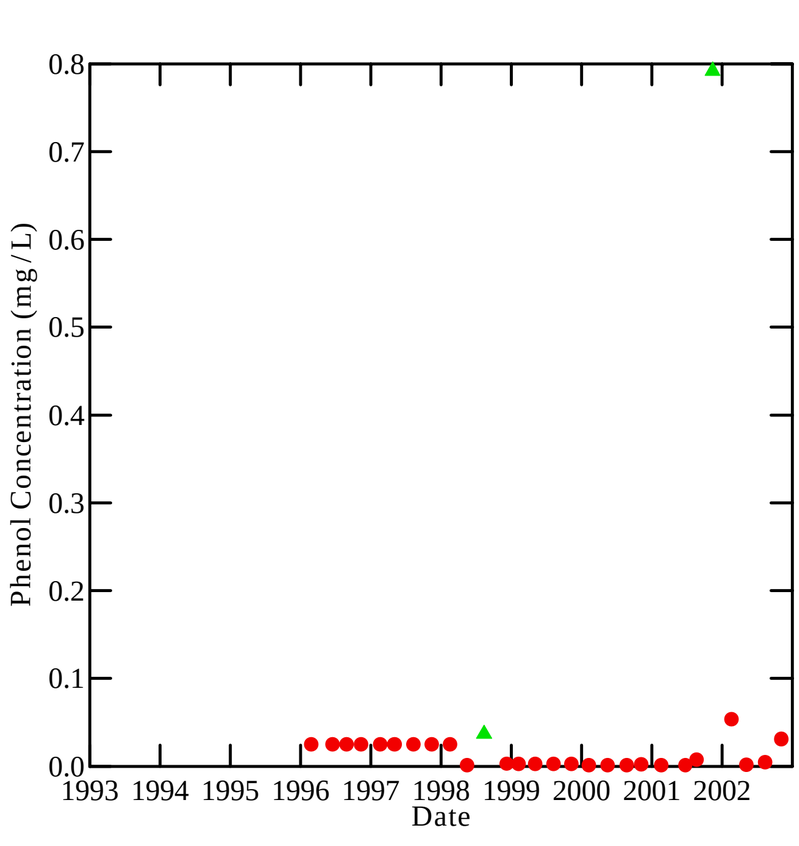
▲ Detected result

figure 18

Well G1L
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







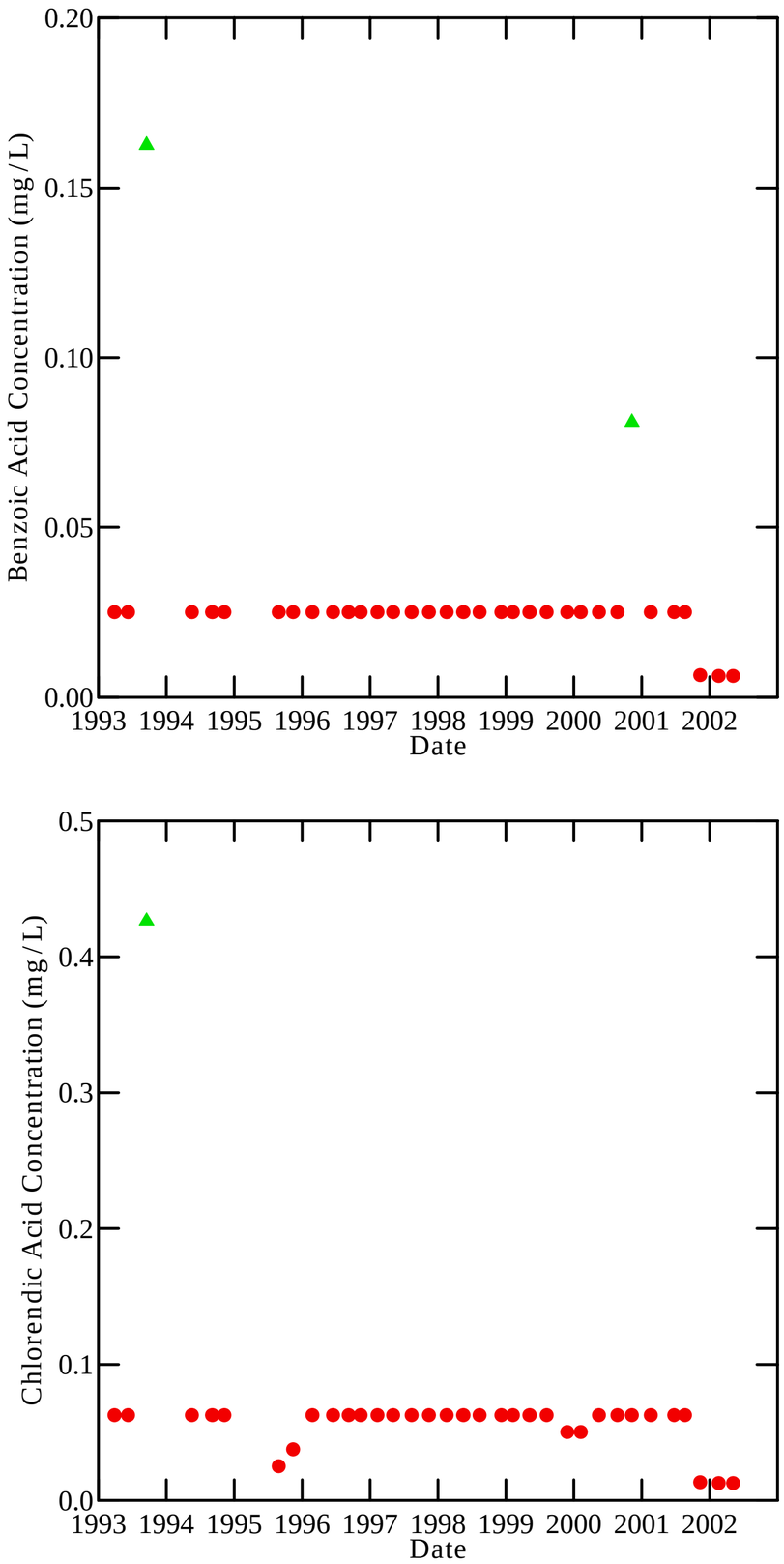
Notes:

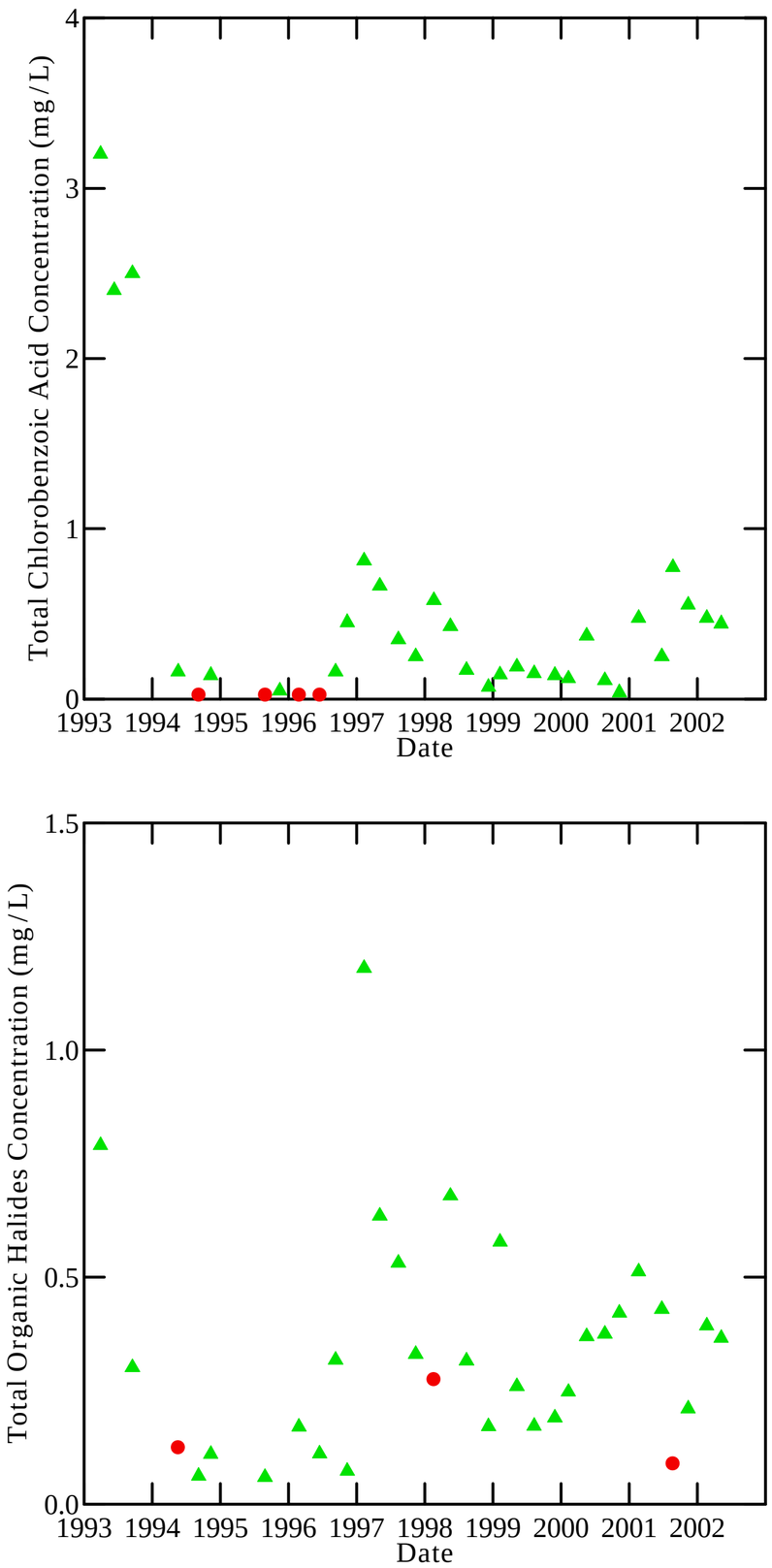
● Non-detect result

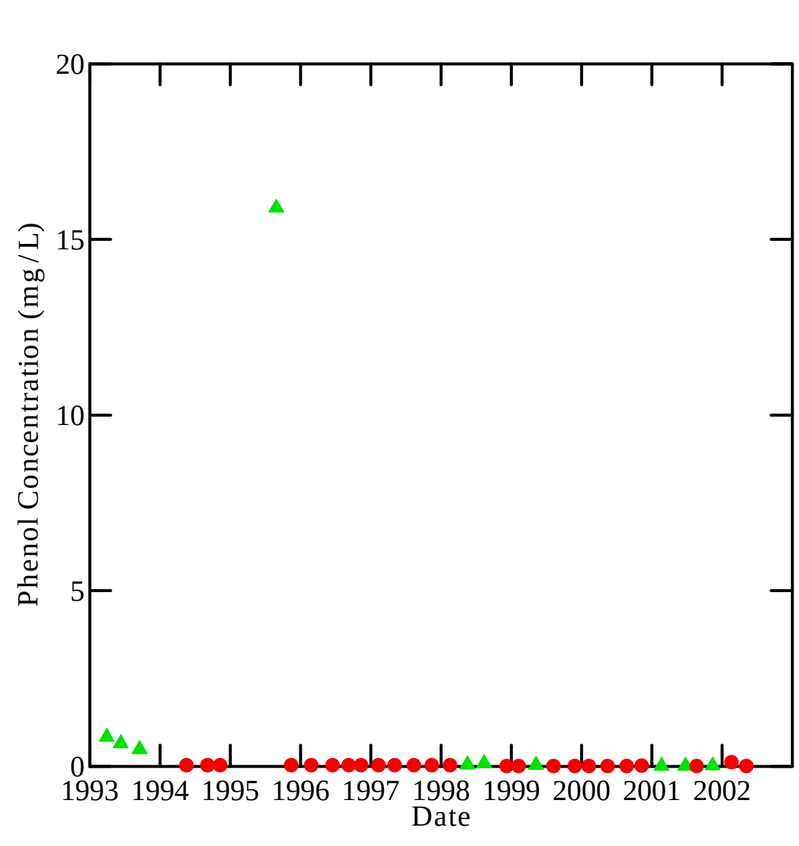
▲ Detected result

figure 19

Well H1U
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







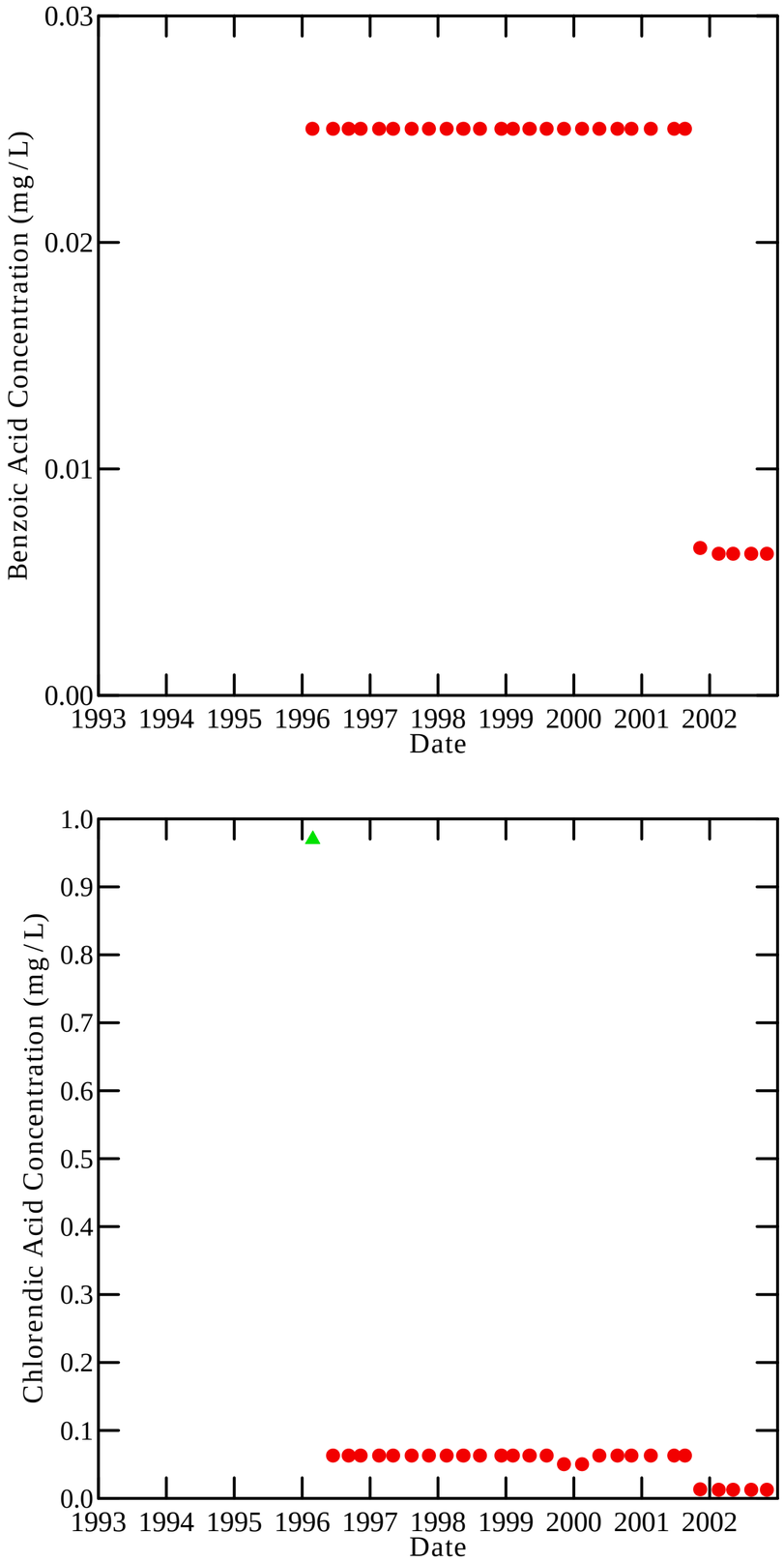
Notes:

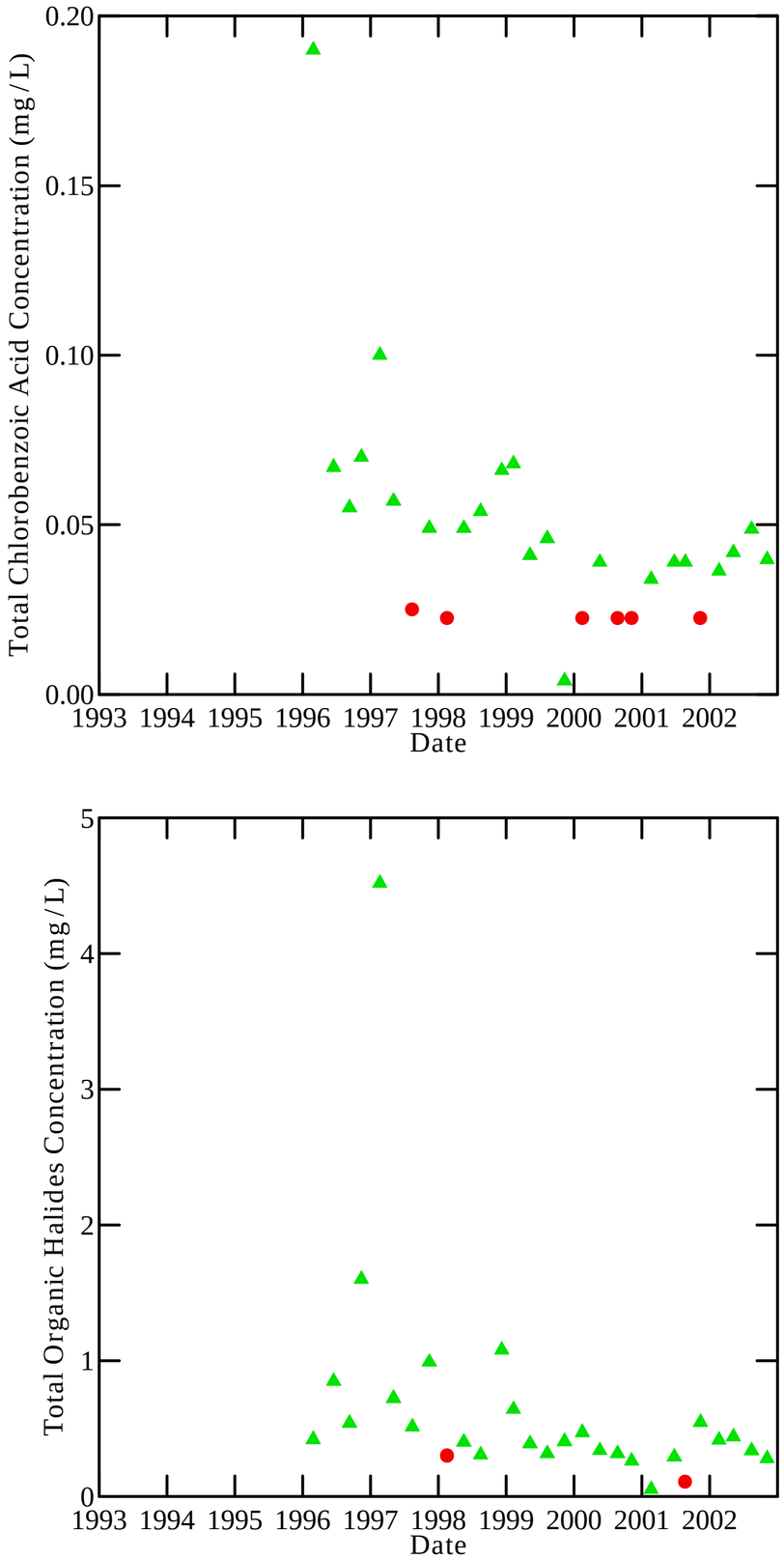
● Non-detect result

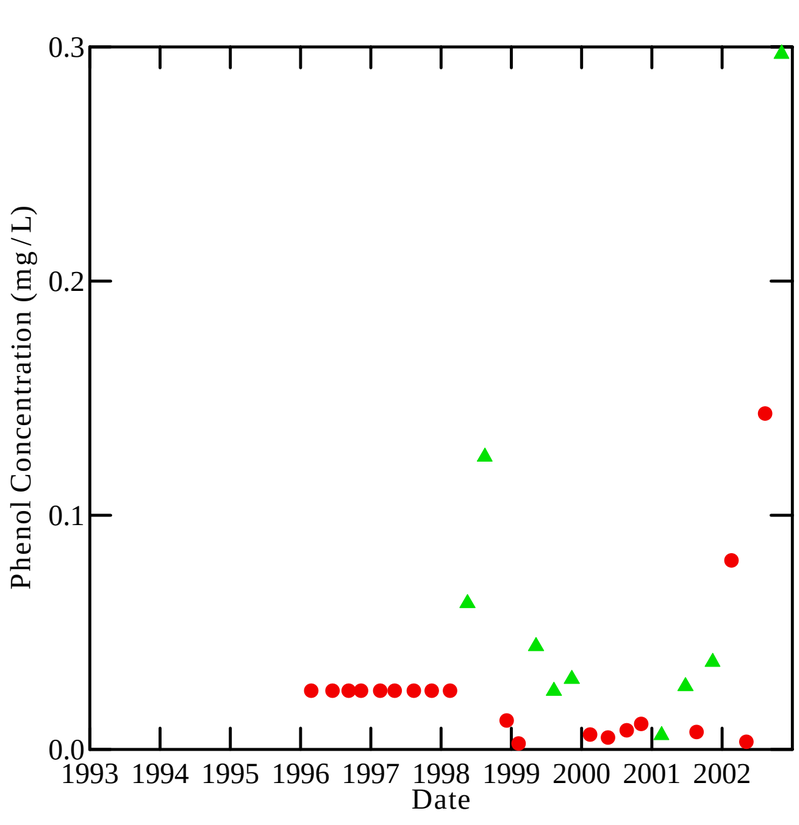
▲ Detected result

figure 20

Well H2M
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







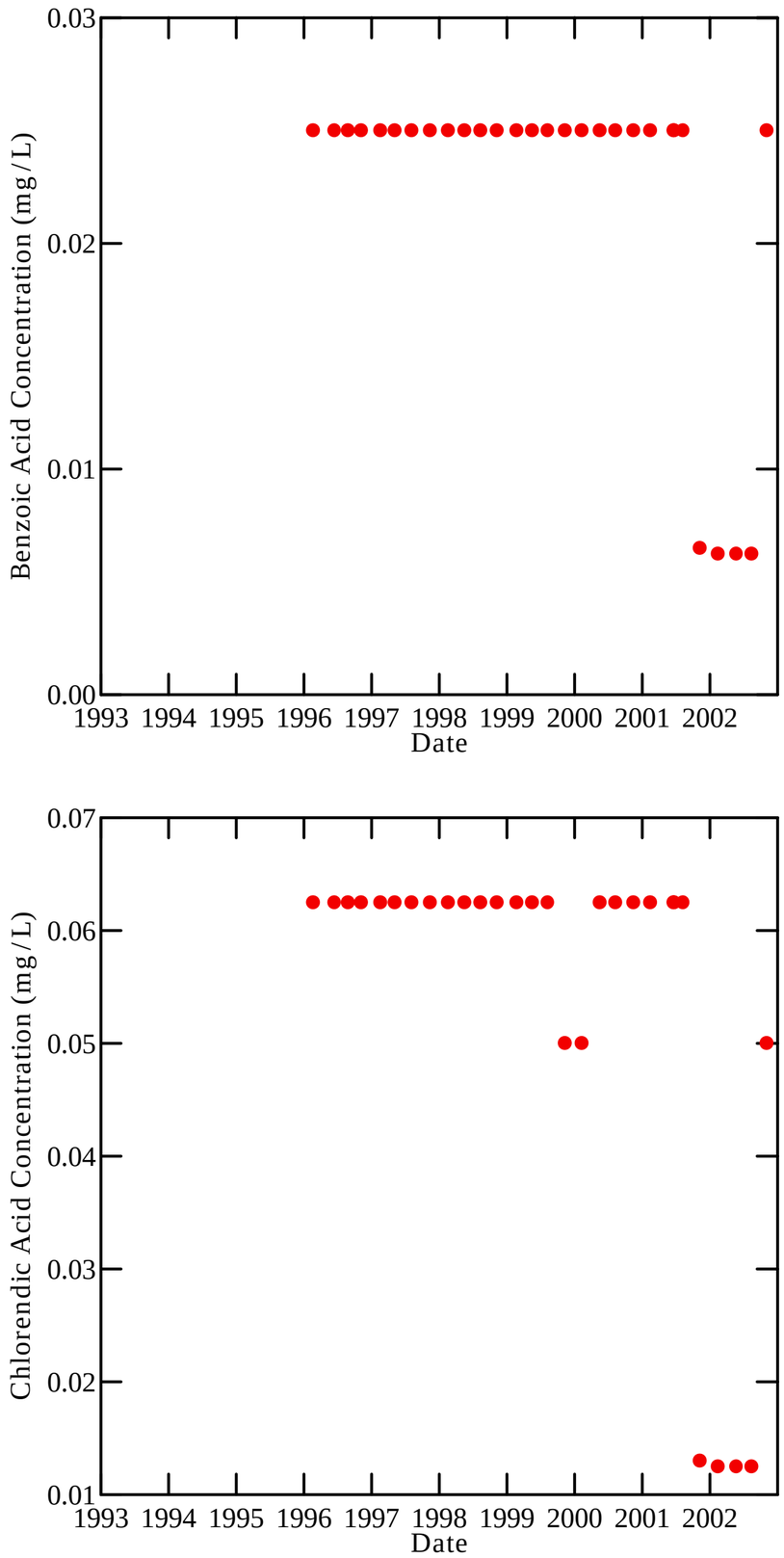
Notes:

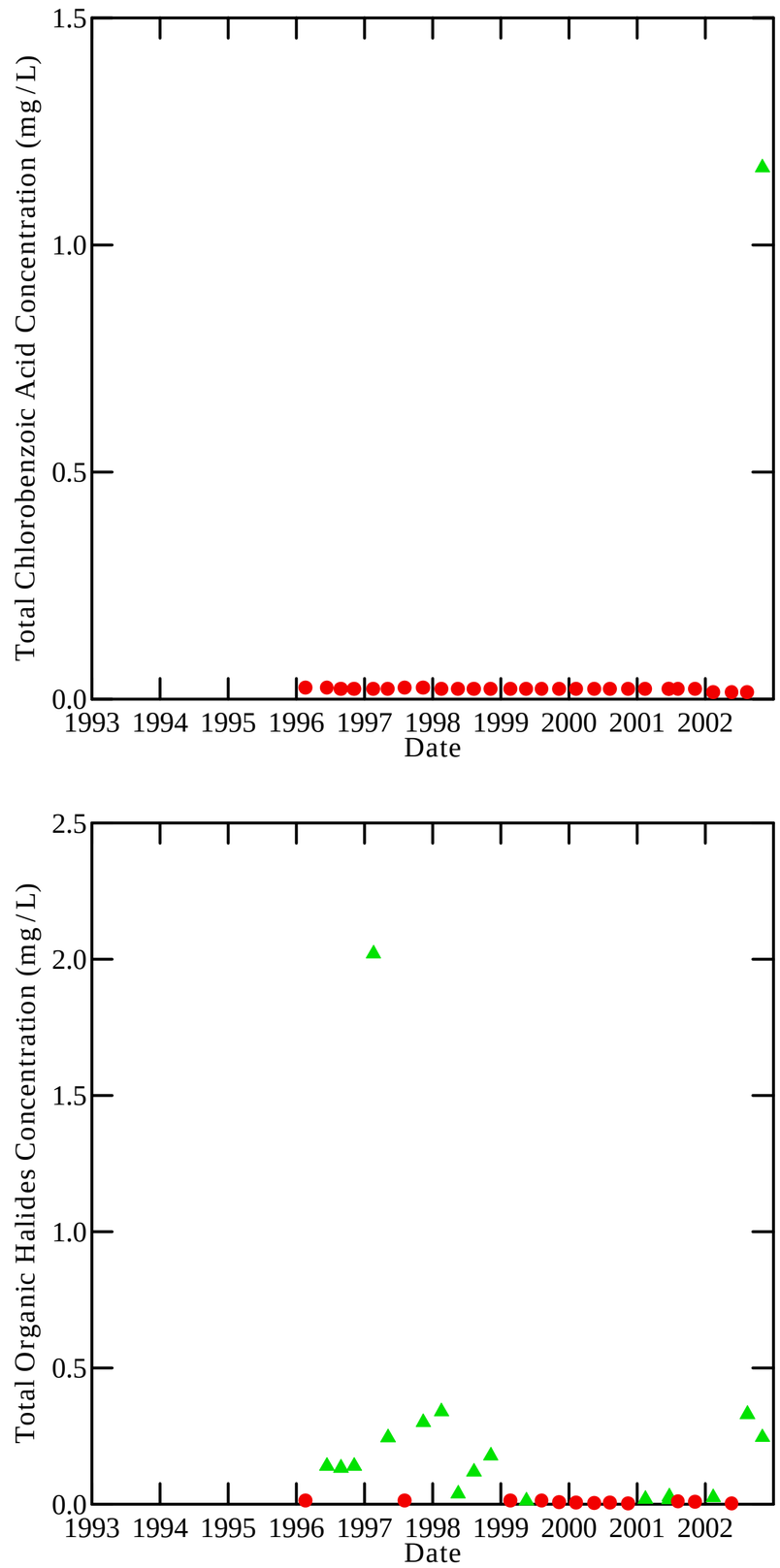
● Non-detect result

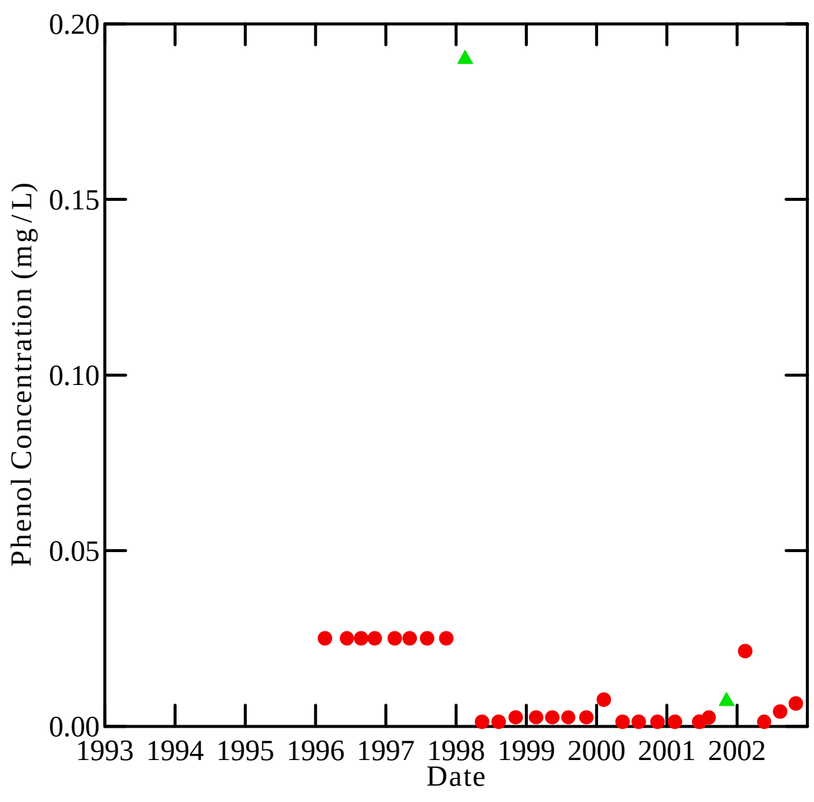
▲ Detected result

figure 21

Well H3L
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







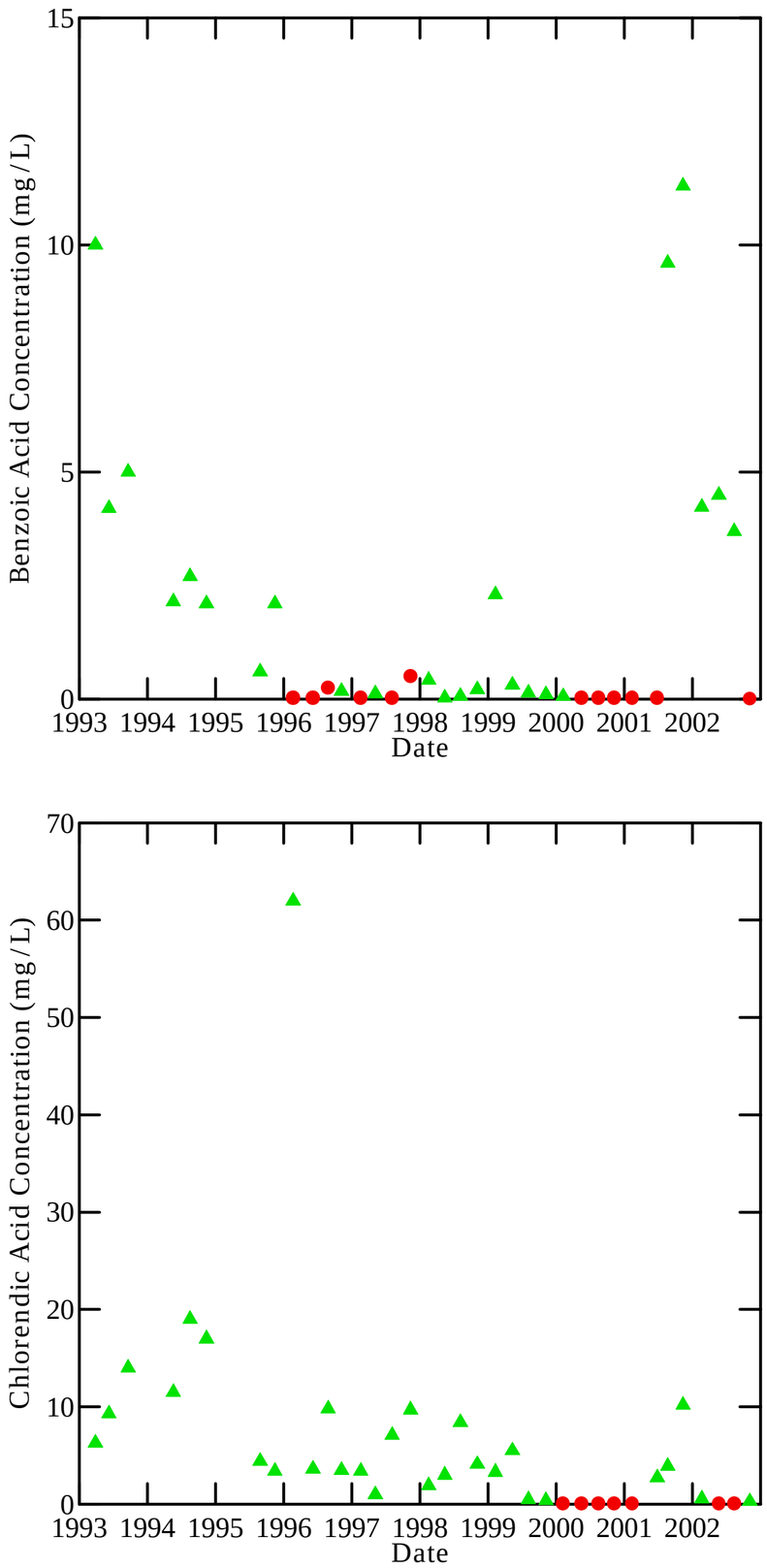
Notes:

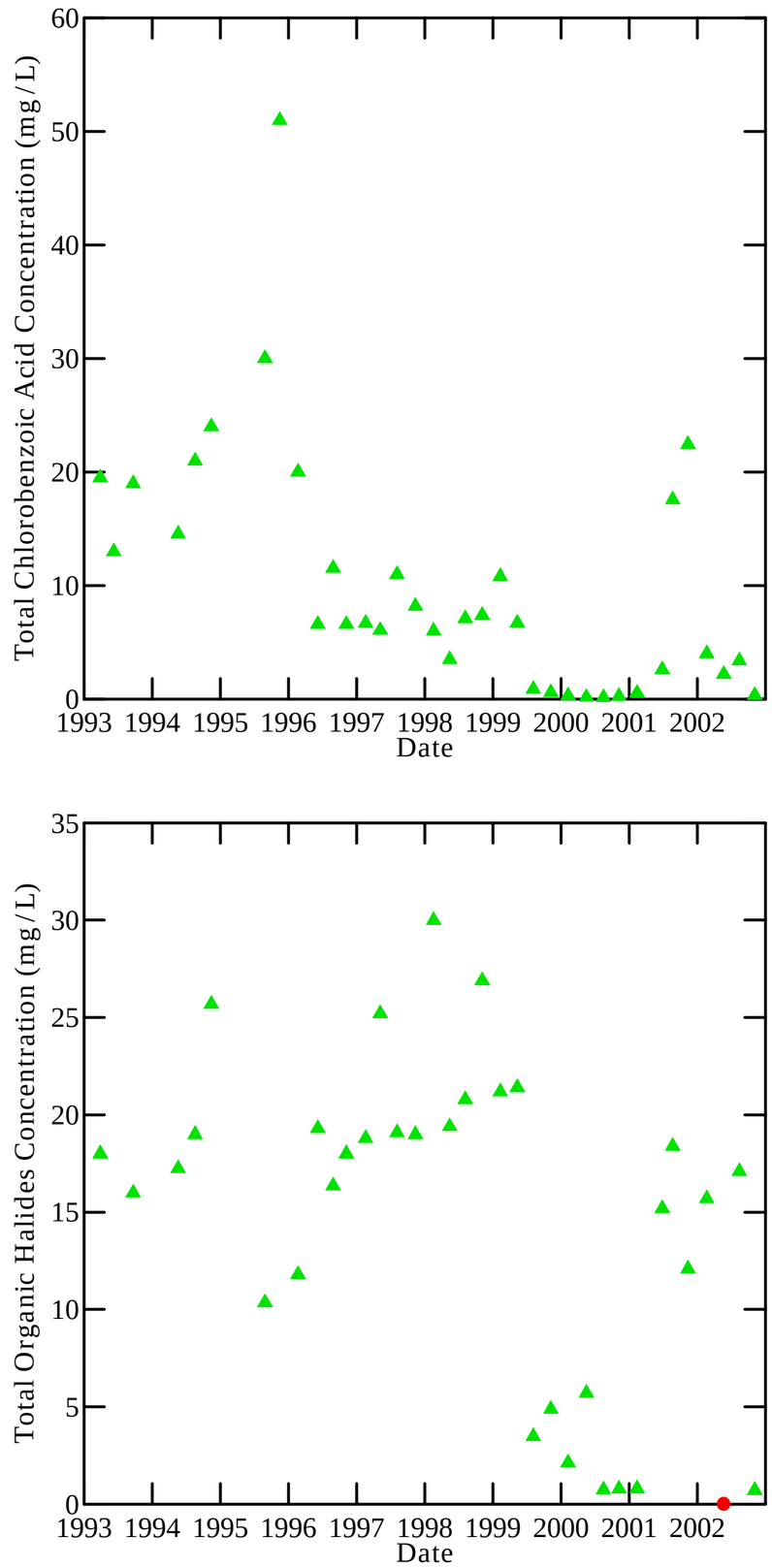
● Non-detect result

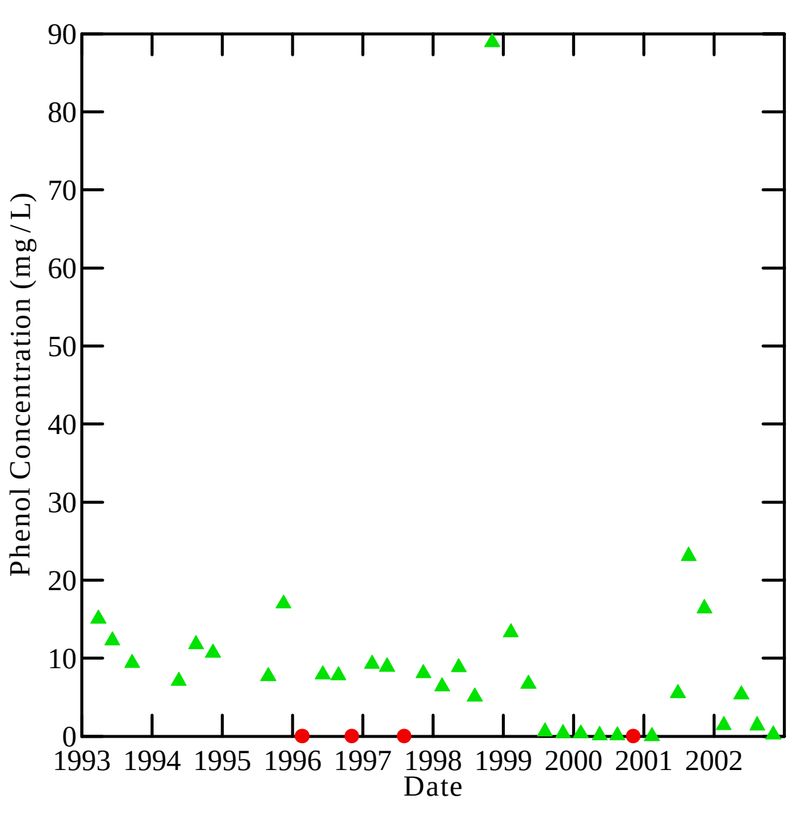
▲ Detected result

figure 22

Well J1U
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







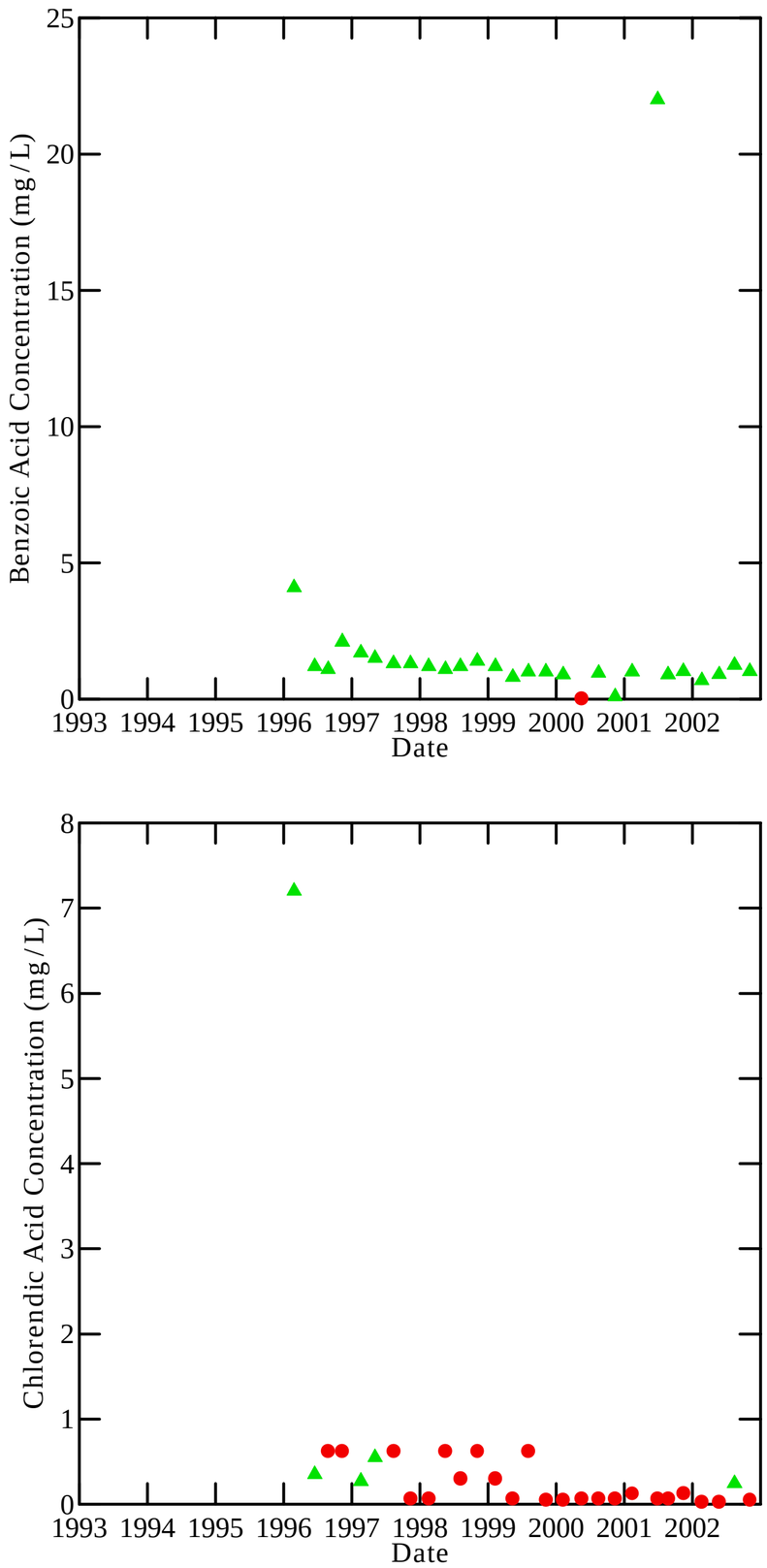
Notes:

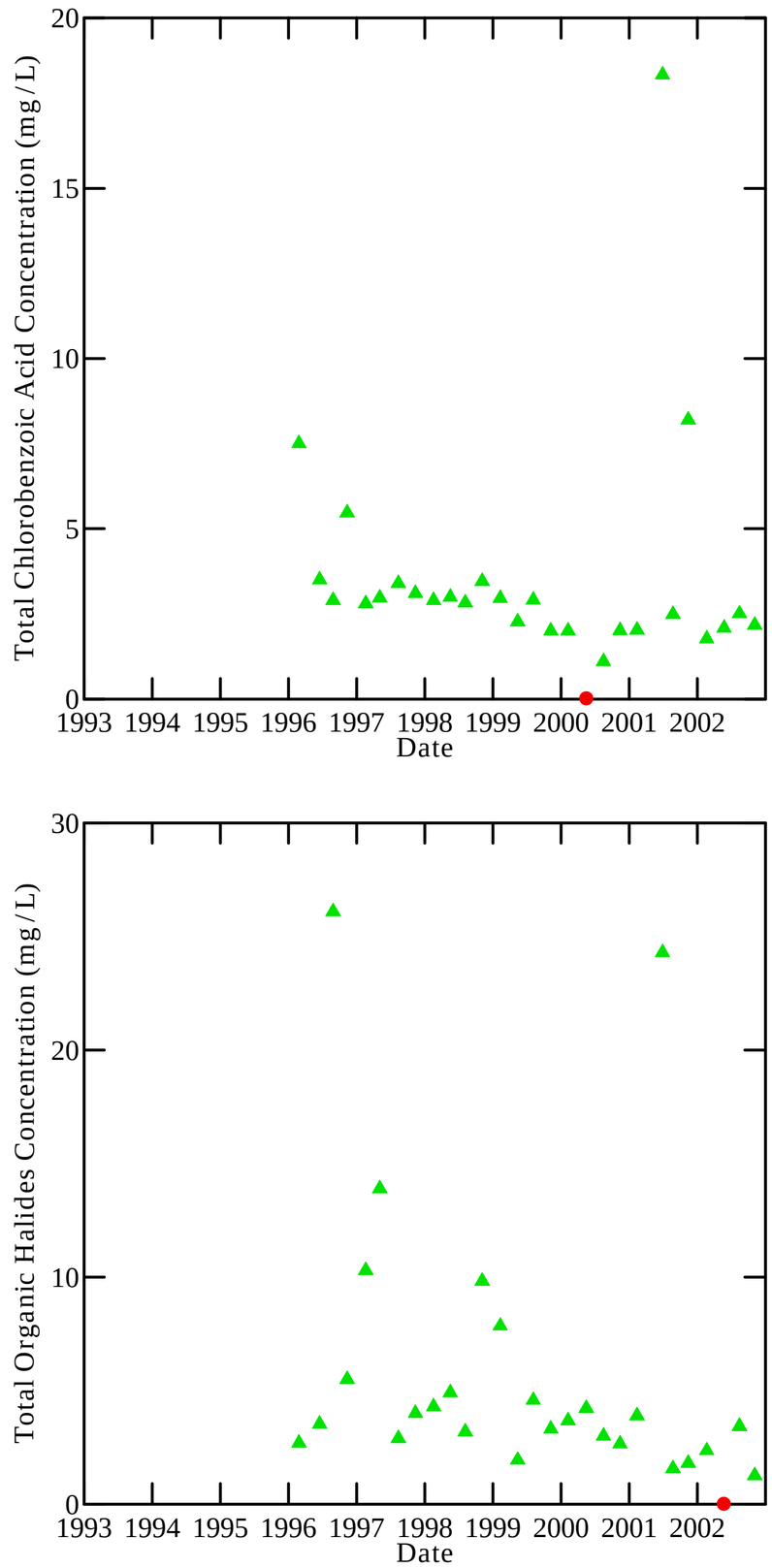
● Non-detect result

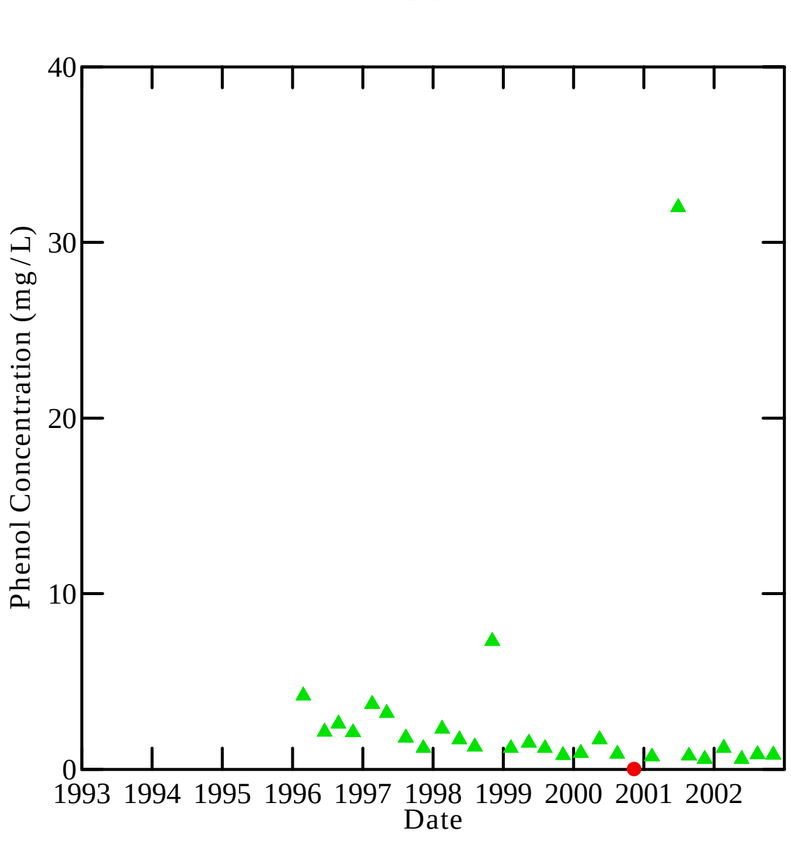
▲ Detected result

figure 23

Well J2M
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York







Notes:

● Non-detect result

▲ Detected result

figure 24

Well J3L
Analyte Concentration vs. Time
Fourth Quarter 2002
Hyde Park Landfill
Niagara Falls, New York

TABLE 1

RESULTS OF STATISTICAL TREND ANALYSES GROUNDWATER MONITORING
FOURTH QUARTER 2002
HYDE PARK LANDFILL
NIAGARA FALLS, NEW YORK

Location	*Analyte*	*Number of Observations*	*Percentage Non-Detect*	*Trend Test*			
				Method	*Test Statistic*	*Probability*	*Conclusion*
B1U	Benzoic acid	8	100.0%	Non-detect	--	--	ND
B1U	Chlorendic acid	8	0.0%	Mann-Kendall	-14	0.11	NST
B1U	Phenolics (Total)	8	37.5%	Mann-Kendall	16	0.06	NST
B1U	Total Chlorobenzoic Acid	8	0.0%	Mann-Kendall	10	0.27	NST
B1U	Total Organic Halides (TOX)	8	12.5%	Mann-Kendall	-24	0.00	Decreasing
B1M	Benzoic acid	8	75.0%	Logistic Regression	-0.384	0.94	NST
B1M	Chlorendic acid	8	12.5%	Mann-Kendall	-12	0.17	NST
B1M	Phenolics (Total)	8	50.0%	Logistic Regression	-0.006	0.18	NST
B1M	Total Chlorobenzoic Acid	8	25.0%	Mann-Kendall	-14	0.11	NST
B1M	Total Organic Halides (TOX)	8	12.5%	Mann-Kendall	-14	0.11	NST
B1L	Benzoic acid	7	100.0%	Non-detect	--	--	ND
B1L	Chlorendic acid	7	14.3%	Mann-Kendall	-15	0.04	Decreasing
B1L	Phenolics (Total)	7	14.3%	Mann-Kendall	13	0.07	NST
B1L	Total Chlorobenzoic Acid	7	14.3%	Mann-Kendall	-3	0.76	NST
B1L	Total Organic Halides (TOX)	7	14.3%	Mann-Kendall	-11	0.13	NST
C1U	Benzoic acid	8	100.0%	Non-detect	--	--	ND
C1U	Chlorendic acid	8	0.0%	Mann-Kendall	2	0.90	NST
C1U	Phenolics (Total)	8	62.5%	Logistic Regression	-0.001	0.84	NST
C1U	Total Chlorobenzoic Acid	8	25.0%	Mann-Kendall	-4	0.71	NST
C1U	Total Organic Halides (TOX)	8	0.0%	Mann-Kendall	-16	0.06	NST
C1M	Benzoic acid	8	100.0%	Non-detect	--	--	ND
C1M	Chlorendic acid	8	12.5%	Mann-Kendall	-4	0.71	NST
C1M	Phenolics (Total)	8	50.0%	Logistic Regression	0.001	0.70	NST
C1M	Total Chlorobenzoic Acid	8	87.5%	Logistic Regression	-0.004	0.49	NST
C1M	Total Organic Halides (TOX)	8	12.5%	Mann-Kendall	-12	0.17	NST
C1L	Benzoic acid	7	100.0%	Non-detect	--	--	ND
C1L	Chlorendic acid	7	14.3%	Mann-Kendall	1	1.00	NST
C1L	Phenolics (Total)	7	28.6%	Mann-Kendall	5	0.55	NST
C1L	Total Chlorobenzoic Acid	7	42.9%	Mann-Kendall	-4	0.65	NST
C1L	Total Organic Halides (TOX)	7	0.0%	Mann-Kendall	-11	0.13	NST
D3U	Benzoic acid	8	100.0%	Non-detect	--	--	ND
D3U	Chlorendic acid	8	0.0%	Mann-Kendall	-8	0.39	NST
D3U	Phenolics (Total)	8	62.5%	Logistic Regression	0.006	0.21	NST
D3U	Total Chlorobenzoic Acid	8	100.0%	Non-detect	--	--	ND
D3U	Total Organic Halides (TOX)	8	0.0%	Mann-Kendall	-16	0.06	NST
D2M	Benzoic acid	7	100.0%	Non-detect	--	--	ND
D2M	Chlorendic acid	7	0.0%	Mann-Kendall	-15	0.04	Decreasing
D2M	Phenolics (Total)	7	42.9%	Mann-Kendall	-3	0.76	NST
D2M	Total Chlorobenzoic Acid	7	42.9%	Mann-Kendall	-14	0.05	NST
D2M	Total Organic Halides (TOX)	7	0.0%	Mann-Kendall	-17	0.02	Decreasing
D1L	Benzoic acid	7	100.0%	Non-detect	--	--	ND
D1L	Chlorendic acid	7	100.0%	Non-detect	--	--	ND
D1L	Phenolics (Total)	7	0.0%	Mann-Kendall	9	0.23	NST
D1L	Total Chlorobenzoic Acid	7	100.0%	Non-detect	--	--	ND
D1L	Total Organic Halides (TOX)	7	28.6%	Mann-Kendall	-1	1.00	NST

TABLE 1

RESULTS OF STATISTICAL TREND ANALYSES GROUNDWATER MONITORING
FOURTH QUARTER 2002
HYDE PARK LANDFILL
NIAGARA FALLS, NEW YORK

Location	*Analyte*	*Number of Observations*	*Percentage Non-Detect*	*Trend Test*			
				Method	*Test Statistic*	*Probability*	*Conclusion*
E3U	Benzoic acid	8	100.0%	Non-detect	--	--	ND
E3U	Chlorendic acid	8	12.5%	Mann-Kendall	-4	0.71	NST
E3U	Phenolics (Total)	8	37.5%	Mann-Kendall	5	0.62	NST
E3U	Total Chlorobenzoic Acid	8	100.0%	Non-detect	--	--	ND
E3U	Total Organic Halides (TOX)	8	37.5%	Mann-Kendall	-8	0.39	NST
E3M	Benzoic acid	8	100.0%	Non-detect	--	--	ND
E3M	Chlorendic acid	8	100.0%	Non-detect	--	--	ND
E3M	Phenolics (Total)	8	75.0%	Logistic Regression	-0.008	0.21	NST
E3M	Total Chlorobenzoic Acid	8	100.0%	Non-detect	--	--	ND
E3M	Total Organic Halides (TOX)	8	25.0%	Mann-Kendall	-8	0.39	NST
F4U	Benzoic acid	6	100.0%	Non-detect	--	--	ND
F4U	Chlorendic acid	6	83.3%	Logistic Regression	0.011	0.38	NST
F4U	Phenolics (Total)	6	66.7%	Logistic Regression	-0.008	0.30	NST
F4U	Total Chlorobenzoic Acid	6	100.0%	Non-detect	--	--	ND
F4U	Total Organic Halides (TOX)	6	16.7%	Mann-Kendall	3	0.71	NST
F1M	Benzoic acid	8	100.0%	Non-detect	--	--	ND
F1M	Chlorendic acid	8	100.0%	Non-detect	--	--	ND
F1M	Phenolics (Total)	8	87.5%	Logistic Regression	-0.002	0.78	NST
F1M	Total Chlorobenzoic Acid	8	87.5%	Logistic Regression	-0.004	0.50	NST
F1M	Total Organic Halides (TOX)	8	25.0%	Mann-Kendall	-10	0.27	NST
G4U	Benzoic acid	8	100.0%	Non-detect	--	--	ND
G4U	Chlorendic acid	8	100.0%	Non-detect	--	--	ND
G4U	Phenolics (Total)	8	75.0%	Logistic Regression	0.001	0.73	NST
G4U	Total Chlorobenzoic Acid	8	100.0%	Non-detect	--	--	ND
G4U	Total Organic Halides (TOX)	8	25.0%	Mann-Kendall	4	0.71	NST
G1M	Benzoic acid	5	100.0%	Non-detect	--	--	ND
G1M	Chlorendic acid	5	100.0%	Non-detect	--	--	ND
G1M	Phenolics (Total)	5	40.0%	Mann-Kendall	6	0.22	NST
G1M	Total Chlorobenzoic Acid	5	100.0%	Non-detect	--	--	ND
G1M	Total Organic Halides (TOX)	5	40.0%	Mann-Kendall	-6	0.22	NST
G1L	Benzoic acid	5	100.0%	Non-detect	--	--	ND
G1L	Chlorendic acid	5	100.0%	Non-detect	--	--	ND
G1L	Phenolics (Total)	5	20.0%	Mann-Kendall	4	0.46	NST
G1L	Total Chlorobenzoic Acid	5	100.0%	Non-detect	--	--	ND
G1L	Total Organic Halides (TOX)	5	20.0%	Mann-Kendall	0	1.00	NST
H1U	Benzoic acid	8	100.0%	Non-detect	--	--	ND
H1U	Chlorendic acid	8	12.5%	Mann-Kendall	2	0.90	NST
H1U	Phenolics (Total)	8	87.5%	Logistic Regression	-0.002	0.78	NST
H1U	Total Chlorobenzoic Acid	8	50.0%	Logistic Regression	-0.001	0.79	NST
H1U	Total Organic Halides (TOX)	8	12.5%	Mann-Kendall	-2	0.90	NST
H2M	Benzoic acid	6	100.0%	Non-detect	--	--	ND
H2M	Chlorendic acid	6	100.0%	Non-detect	--	--	ND
H2M	Phenolics (Total)	6	50.0%	Logistic Regression	-0.014	0.194	NST
H2M	Total Chlorobenzoic Acid	6	0.0%	Mann-Kendall	-3	0.70711434	NST
H2M	Total Organic Halides (TOX)	6	16.7%	Mann-Kendall	-5	0.452370216	NST

TABLE 1

RESULTS OF STATISTICAL TREND ANALYSES GROUNDWATER MONITORING
FOURTH QUARTER 2002
HYDE PARK LANDFILL
NIAGARA FALLS, NEW YORK

Location	*Analyte*	*Number of Observations*	*Percentage Non-Detect*	*Trend Test*			
				Method	*Test Statistic*	*Probability*	*Conclusion*
H3L	Benzoic acid	8	100.0%	Non-detect	--	--	ND
H3L	Chlorendic acid	8	100.0%	Non-detect	--	--	ND
H3L	Phenolics (Total)	8	50.0%	Logistic Regression	-0.003	0.38	NST
H3L	Total Chlorobenzoic Acid	8	12.5%	Mann-Kendall	13	0.14	NST
H3L	Total Organic Halides (TOX)	8	12.5%	Mann-Kendall	6	0.54	NST
J1U	Total Chlorobenzoic Acid	8	87.5%	Logistic Regression	0.291	0.94	NST
J1U	Benzoic acid	8	100.0%	Non-detect	--	--	ND
J1U	Chlorendic acid	8	100.0%	Non-detect	--	--	ND
J1U	Phenolics (Total)	8	87.5%	Logistic Regression	-0.002	0.78	NST
J1U	Total Organic Halides (TOX)	8	37.5%	Mann-Kendall	6	0.54	NST
J2M	Benzoic acid	8	37.5%	Mann-Kendall	-3	0.80	NST
J2M	Chlorendic acid	8	37.5%	Mann-Kendall	-7	0.46	NST
J2M	Phenolics (Total)	8	0.0%	Mann-Kendall	-8	0.39	NST
J2M	Total Chlorobenzoic Acid	8	0.0%	Mann-Kendall	-4	0.71	NST
J2M	Total Organic Halides (TOX)	8	12.5%	Mann-Kendall	-2	0.90	NST
J3L	Benzoic acid	8	0.0%	Mann-Kendall	1	1.00	NST
J3L	Chlorendic acid	8	87.5%	Logistic Regression	0.01	0.35	NST
J3L	Phenolics (Total)	8	0.0%	Mann-Kendall	0	1.00	NST
J3L	Total Chlorobenzoic Acid	8	0.0%	Mann-Kendall	-2	0.90	NST
J3L	Total Organic Halides (TOX)	8	12.5%	Mann-Kendall	-10	0.27	NST

Notes:

Data used for the statistical tests include monitoring events from 2001 to present.
Logistic: Logistic regression used for trend test (>= 50%ND).
Mann-Kendall: Mann Kendall method used for trend test (<50%ND).
ND: Parameter not detected at this location. No trend analysis performed.
NST: No statistically significant (P<0.05) trend detected.
Increasing: Statistically significant (P<0.05) increasing trend detected.
Decreasing: Statistically significant (P<0.05) decreasing trend detected.
N / A: no analytical data available for fourth quarter 2002 monitoring event, therefore no statistical analysis performed.

TABLE 2

COMPARISON OF STATISTICAL TREND ANALYSES
(QUARTERLY EVALUATIONS SINCE THE BEGINNING OF 2001) HYDE PARK LANDFILL
NIAGARA FALLS, NEW YORK

Location	*Analyte*	*First Quarter 2001*		*Second Quarter 2001*		*Third Quarter 2001*		*Fourth Quarter 2001*		*First Quarter 2002*		*Second Quarter 2002*		*Third Quarter 2002*		*Fourth Quarter 2002*	
		Number of Samples	*Conclusion*	*Number of Samples*	*Conclusion*	*Number of Samples*	*Conclusion*	*Number of Samples*	*Conclusion*	*Number of Samples*	*Conclusion*	*Number of Samples*	*Conclusion*	*Number of Samples*	*Conclusion*	*Number of Samples*	*Conclusion*
B1U	Chlorendic Acid	9	NST	10	NST	11	NST	8	Increasing	9	NST	10	NST	11	NST	8	NST
	Total Organic Halides	9	NST	10	NST	11	NST	8	Decreasing	9	Decreasing	10	Decreasing	11	Decreasing	8	Decreasing
B1M	Total Chlorobenzoic Acid	9	Decreasing	10	NST	11	NST	8	NST	9	NST	10	NST	11	NST	8	NST
	Total Organic Halides	9	Decreasing	10	Decreasing	11	NST	8	NST	9	NST	10	NST	11	NST	8	NST
B1L	Chlorendic Acid	9	NST	10	NST	11	NST	8	NST	9	NST	10	NST	11	NST	7	Decreasing
	Total Organic Halides	9	NST	10	NST	11	NST	8	NST	9	NST	10	Decreasing	11	Decreasing	7	NST
C1U	Phenolics	9	NST	10	Decreasing	11	Decreasing	8	NST	9	NST	10	NST	11	NST	8	NST
	Total Organic Halides	9	NST	10	NST	11	NST	8	NST	9	Decreasing	10	Decreasing	11	Decreasing	8	NST
C1M	Chlorendic Acid	9	Decreasing	10	NST	11	NST	8	NST	9	NST	10	NST	11	NST	8	NST
	Total Chlorobenzoic Acid	9	Decreasing	10	NST	11	NST	8	NST	9	NST	10	NST	11	NST	8	NST
	Total Organic Halides	9	NST	10	NST	11	NST	8	Decreasing	9	Decreasing	10	Decreasing	11	NST	8	NST
C1L	Total Chlorobenzoic Acid	9	Decreasing	10	NST	11	NST	8	NST	9	NST	9	NST	10	NST	7	NST
	Total Organic Halides	9	Decreasing	10	Decreasing	11	Decreasing	8	NST	9	NST	9	Decreasing	10	NST	7	NST
D3U	No Trends	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D2M	Chlorendic Acid	9	NST	10	NST	11	NST	8	NST	9	NST	10	NST	11	NST	7	Decreasing
	Phenolics	9	NST	10	NST	11	NST	8	Decreasing	9	NST	10	NST	11	NST	7	NST
	Total Organic Halides	9	NST	10	NST	11	NST	8	NST	9	NST	10	Decreasing	11	NST	7	Decreasing
D1L	No Trends	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E3U	No Trends	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E3M	No Trends	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E2L	No Data	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F4U	Total Organic Halides	9	NST	10	NST	11	Decreasing	8	Decreasing	9	NST	10	NST	10	NST	6	NST
F1M	Total Organic Halides	9	NST	10	NST	11	Decreasing	8	NST	9	NST	10	NST	11	NST	8	NST
F2L	No Data	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G4U	No Trends	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G1M	No Trends	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G1L	Total Organic Halides	9	Decreasing	10	Decreasing	11	NST	8	NST	9	NST	9	NST	9	NST	5	NST
H1U	No Trends	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H2M	Total Organic Halides	9	Decreasing	10	NST	11	NST	8	NST	9	NST	10	NST	10	NST	6	NST
H3L	Total Organic Halides	9	Decreasing	10	Decreasing	11	Decreasing	8	NST	9	NST	10	NST	11	NST	8	NST
J1U	No Trends	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 2

COMPARISON OF STATISTICAL TREND ANALYSES
(QUARTERLY EVALUATIONS SINCE THE BEGINNING OF 2001) HYDE PARK LANDFILL
NIAGARA FALLS, NEW YORK

Location	*Analyte*	*First Quarter 2001*		*Second Quarter 2001*		*Third Quarter 2001*		*Fourth Quarter 2001*		*First Quarter 2002*		*Second Quarter 2002*		*Third Quarter 2002*		*Fourth Quarter 2002*	
		Number of Samples	*Conclusion*	*Number of Samples*	*Conclusion*	*Number of Samples*	*Conclusion*	*Number of Samples*	*Conclusion*	*Number of Samples*	*Conclusion*	*Number of Samples*	*Conclusion*	*Number of Samples*	*Conclusion*	*Number of Samples*	*Conclusion*
J2M	Benzoic Acid	9	Decreasing	10	NST	11	NST	8	NST	9	NST	10	NST	11	NST	8	NST
	Phenolics	9	Decreasing	10	Decreasing	11	NST	8	NST	9	NST	10	NST	11	NST	8	NST
	Total Chlorobenzoic Acid	9	Decreasing	10	NST	11	NST	8	Increasing	9	Increasing	10	Increasing	11	Increasing	8	NST
	Total Organic Halides	9	Decreasing	10	NST	11	NST	8	NST	9	NST	10	NST	11	NST	8	NST
J3L	Total Chlorobenzoic Acid	9	NST	10	NST	11	NST	8	Increasing	9	NST	10	NST	11	NST	8	NST

Notes:
No Trends: No statistically significant trends identified to date for any of the analytes at this well.
No Data: No data collected at this well for the year 2001 sampling rounds.
NST: No statistically significant (P<0.05) trend detected.
Increasing: Statistically significant (P<0.05) increasing trend detected.
Decreasing: Statistically significant (P<0.05) decreasing trend detected.
N / A: No analytical data available for fourth quarter 2002 monitoring event, therefore, no statistical analysis perfo

TABLE 2

COMPARISON OF STATISTICAL TREND ANALYSES
(QUARTERLY EVALUATIONS SINCE THE BEGINNING OF 2001) HYDE PARK LANDFILL
NIAGARA FALLS, NEW YORK

Location	*Analyte*
B1U	Chlorendic Acid Total Organic Halides
B1M	Total Chlorobenzoic Acid Total Organic Halides
B1L	Chlorendic Acid Total Organic Halides
C1U	Phenolics Total Organic Halides
C1M	Chlorendic Acid Total Chlorobenzoic Acid Total Organic Halides
C1L	Total Chlorobenzoic Acid Total Organic Halides
D3U	No Trends
D2M	Chlorendic Acid Phenolics Total Organic Halides
D1L	No Trends
E3U	No Trends
E3M	No Trends
E2L	No Data
F4U	Total Organic Halides
F1M	Total Organic Halides
F2L	No Data
G4U	No Trends
G1M	No Trends
G1L	Total Organic Halides
H1U	No Trends
H2M	Total Organic Halides
H3L	Total Organic Halides
J1U	No Trends

TABLE 2

COMPARISON OF STATISTICAL TREND ANALYSES
(QUARTERLY EVALUATIONS SINCE THE BEGINNING OF 2001) HYDE PARK LANDFILL
NIAGARA FALLS, NEW YORK

Location	*Analyte*
J2M	Benzoic Acid
	Phenolics
	Total Chlorobenzoic Acid
	Total Organic Halides
J3L	Total Chlorobenzoic Acid

ɔrmed.