MOTT MACDONALD

# Annual Groundwater Monitoring Report Closed Snipes Mountail Landfill

2022 Monitoring Year

April 1, 2023

This page left intentionally blank for pagination.

Mott MacDonald
1601 5th Avenue
Suite 800
Seattle
WA 98101
United States of America

T +1 (206) 838 2886
mottmac.com

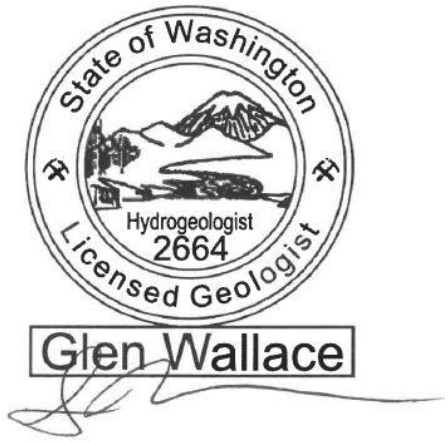
Yakima County Public Services
Solid Waste Division
7151 Roza Hill Drive
Yakima WA, 98901

# Annual Groundwater Monitoring Report Closed Snipes Mountail Landfill

2022 Monitoring Year

April 1, 2023

This report, and Pacific Groundwater Group's work contributing to this report, were reviewed by the undersigned and approved for release.




Glen Wallace, PhD, LHG
Principal Scientist
Washington State Hydrogeologist No. 2664

# Contents



## Tables



## Figures

# 1 Introduction

This is the 2021 annual groundwater report for the closed Snipes Mountain Landfill. The landfill is currently the site of the Lower Valley Transfer Station. This report includes all data collected to date. This report is written to fulfill reporting requirements stipulated in Chapter 173-304-490 WAC (Minimum Functional Standards or MFS) as discussed with the Yakima County Health Department and Central Regional Office of the Department of Ecology on February 14, 1992.

## 1.1 2022 Monitoring Activities

The following wells were sampled in 2022:

- 2022 Q2: June 21, 2022, SMW-1, SMW-2
- 2022 Q4: November 29, 2022, SMW-1, SMW-2, SMW-4, SMW-5s; January 10, 2023 SMW-4, SMW-5s, SMW-5d

Water levels were measured at all wells concurrent with the 2022 Q2 and 2022 Q4 sampling events. Analytical data is included in Table 2. Field sheets from the 2022 Q2 event were lost after sampling and water levels and field parameters are not available.

A newly installed replacement pump at SMW-5d failed at Snipes preventing sample collection. The pumps at SMW-5s and SMW-5d were pulled after several attempts at repair and replacement of the RediFlo2 pumps. Groundwater samples were collected with Hydrasleeve grab samplers as an interim method in lieu of electric submersible pumps.

## 1.2 Landfill History

Snipes Mountain Landfill has been closed since March 30, 1994. Municipal solid waste was disposed in accordance with the Development and Closure Plan until the landfill was closed under WAC 173-304. It is not regulated under the new solid waste regulations, WAC 173-351, except for the final cover, which was established in 1994. Unlined septage ponds at the landfill were pumped out and closed in 1991. The major reference for detailed site information is the Development and Closure Plan (DCP), which includes a hydrogeologic assessment and description of sampling procedures (Parametrix, 1990). Additional hydrogeologic information obtained from the installation of three monitoring wells in 1993 was incorporated into the third annual report (Pacific Groundwater Group, 1994).

In August 1998, a variance was granted allowing monitoring at the landfill to be conducted on a semi-annual basis as opposed to a quarterly basis (Ecology and Dept. of Health, 1998). The first semi-annual sampling round was conducted in December 1998. On March 14, 2007 the Yakima Health District approved reducing sampling at SMW-3 to only water level measurements (Yakima Health, 2007). Declining water levels at SMW-3 have prevented collection of samples with the current pump configuration.

Groundwater samples were collected quarterly from September 1989 until June 1998. As of December 1998, sampling events were conducted on a semi-annual basis. All wells are sampled during each event, except SMW-3 or when water levels drop below the pumps in SMW-1, SMW-4, or SMW-5s. In September 1989, analytical parameters included the MFS suite, priority pollutant metals, pesticides, and volatile organic compounds (VOCs). Based on those results, sampling was continued for the MFS suite in all wells with additional VOC

sampling in SMW-1. The current sampling plan requires analysis of MFS parameters; however, VOC analyses are performed for all sampled wells.

# 2 Water Levels and Groundwater Flow Directions

## 2.1 Water Level Trends

Table 1 presents well survey and water level data for the monitoring wells. The data presented in Table 1 are plotted in Figure 1 as hydrographs. Changes in monitoring well water levels reflect influences of regional and local groundwater withdrawals for irrigation. Water levels in wells SMW-1, SMW-2, SMW-4, and SMW-5d have historically declined during the irrigation season and recovered when irrigation wells are not pumping. This effect is less evident in recent data because the semi-annual measurements are not sufficient to fully document the highs and lows. SMW-1, SMW-2, SMW-4, SMW-5d, DNR, and the Newhouse well are all screened in the Tem aquifer.

In contrast to water levels in the irrigation-influenced wells, water levels in SMW-3 and SMW-5s remain nearly constant. The lack of response in these wells is attributed to their completion intervals, which are stratigraphically below (SMW-3) and (SMW-5s) above the Tem aquifer.

Although water levels at SMW-3 are not highly seasonal, they have declined approximately 4 feet from 2000 levels (Table 1). Water levels in SMW-3 have been too low for sampling since 2005. In 2007 Yakima County Health District approved reducing sampling at SMW-3 to monitoring water levels with the contingency that if site conditions change significantly, sampling at SMW-3 may be required (Yakima Health, 2007). Similar, but less pronounced declining trends are observed at SMW-1, SMW-4, SMW-5s and SW-5d. In contrast, water levels at SMW-2 have risen approximately 4 feet since 2000.

## 2.2 Interpretation of Groundwater Flow Directions

Groundwater flow direction is estimated from wells screened in the Elephant Mountain member of the Columbia River Basalt Group (Tem) aquifer including SMW-1, SMW-4 and SMW-5d. As seen in the hydrographs in Figure 1, the pumping of the irrigation wells changes water levels in the Tem aquifer, which also influences groundwater flow direction and gradient. When the irrigation wells are pumping, the hydraulic gradient in the Tem aquifer is towards the northeast in the north limb of the anticline. The hydraulic gradient in the Tem aquifer has historically shifted to a more southerly flow direction during the December water level measurement when the irrigation wells are not pumping.

Water levels were measured at wells SMW-1, SMW-4 and SMW-5D during the 2022 Q4, and groundwater flow directions are plotted over a top-of-basalt structural contour maps on Figure 2. Historically the hydraulic gradient between SMW-1, SMW-4 and SMW-5D reverses from a northeasterly direction during the pumping season and a southwesterly direction in the winter, non-pumping months. The gradient is typically steeping during irrigation at approximately 0.0158 in Q2 and 0.004 in Q4. This year the gradient was approximately 0.004 in Q4; a gradient was not calculated for Q2.

# 3 Water Quality Sampling

This section describes water quality sampling conducted at Snipes, geochemical results, and quality assurance reviews.

## 3.1 Analysis of Water Quality Data

Data analysis was completed by visual inspection of time series plots of selected analytical parameters with knowledge of site hydrogeology. Figures 3 through 11 present time series plots of various parameters. Parameters with numerous non-detects were not plotted. Where non-detects are plotted, they are shown as being equal to the detection limit. Table 2 shows the statistical summary of MFS parameters and selected organics for each of the wells and Table 3 presents the analytical results for samples collected in 2022.

Similar to previous years, groundwater quality data collected in 2022 indicate that most parameters are within expected ambient ranges, but that wells SMW-1, SMW-4 and SMW-5S appear to be contaminated with organic and inorganic contaminants. Historically, septage was disposed into unlined ponds at the landfill, which is the most likely source and transport mechanism for the contaminants. The last septage pond to be used was the western-most pond. Disposal of septage ceased prior to the pond being pumped out in May 1991.

## 3.2 MFS Conventional Parameters

The analytical results for these parameters indicate that the concentrations in the samples are generally in the range of expected ambient values. Time series plots of conventional parameters are presented in Figures 3 through 6.

Concentrations of MFS parameters within the Tem aquifer are generally greater in SMW-1 than concentrations in SMW-4 and SMW-5d, which are frequently similar. Concentrations within the Tem aquifer vary widely over the short distances between wells SMW-1, SMW-4 and SMW-5d. MFS concentrations are relatively stable at wells SMW-2, SMW-4, and SMW-5D, and have historically been stable at SMW-3.

- Chloride increased from 1989 through 2004 at SMW-1, followed by stabilization from 2006 through 2022 (Figure 4). Chloride concentrations increased in SMW-5s from 2000 through 2012, and stabilizing to decreasingwith variability from 2015 through 2022. Overall chloride concentrations in all wells remain below the GWCL.
- Sulfate concentrations in SMW-5s increased from 2006 through 2013, followed by stabilization with variability from 2013 through 2022. Available data indicate that sulfate concentrations remain consistent with prior values in 2022.
- Nitrate concentrations at SMW-5s increased from near 0.2 mg/L to over 3 mg/L between approximately 2001 and 2015 and have been stable to decreasing through 2022 (Figure 6). Nitrate concentrations at SMW-1 have been variable but relatively stable through 2022.

The increasing trends in chloride, nitrate, sulfate and specific conductance at SMW-5S through 2014 followed by declines over the last year are consistent with the arrival of a groundwater plume with a decreasing source. This is qualitatively consistent with the site conceptual model of a set of releases at the site that stopped concurrent with landfill closure. These trends will continue to be monitored in future sampling events.

## 3.3 MFS Metals

Concentrations of MFS metals concentrations were generally consistent with previously detected concentrations or trends. There were no MFS metals exceedances of the GWCL in 2021. MFS trends include:

- Dissolved iron did not exceed the GWCL (0.3 mg/l) during 2022 (Figure 7).
- Dissolved manganese did not exceed the GWCL (0.05 mg/l) during 2020 (Figure 8). Dissolved manganese concentrations in SMW-5d had a long-term decreasing trend followed by stabilization from 2013 through 2016, but were not available in 2022 due to pump failure. All other concentrations were within expected ranges.
- Dissolved zinc concentrations were below the reporting limit in 2022 (Figure 9).

Differences in iron and manganese concentrations in the Tem wells (SMW-1, SMW-4, and SMW-5d) are likely caused by differing redox conditions in the aquifer. No other dominant trends were observed.

## 3.4 Volatile Organic Compounds

Volatile organic compounds (VOCs) have been consistently detected in wells SMW-1 and SMW-4 since monitoring began in 1989 and 1994, and at SMW-5s since 2010. Reporting limits for VOC analyses were lowered 2013 to conform to current laboratory standards of practice. Several constituents are now detected at concentrations below the previous standard reporting limits. VOC detections in 2022 included:

- Well SMW-1 had detections of Tetrachloroethene (PCE) (12 and 11.3 ug/L), trichloroethene (TCE) (0.66 and .059 ug/L), and 1,1-dichloroethene (1,1 -DCE) (0.29 ug/L) in 2022.
- Well SMW-4 had detections of PCE (2.34 ug/L), TCE (0.67 ug/L), cis-1,2 dichloroethene (cis-1,2DCE) (0.53 ug/L), and chloroethane (0.29 ug/L) in 2022.
- Well SMW-5s had detections of PCE (0.97 ug/L), carbon disulfide (0.7 ug/L) and 1,1,2-Trichloro-1,2,2-trifluoroethane (0.79 ug/L) in 2022.

VOCs detections are consistent with septage disposal into the landfill prior to 1991. PCE is a common solvent used in dry cleaning, chemical manufacturing, as a parts cleaner, and is readily available to the general public. TCE is either a degradation product of PCE, or was a primary organic contaminant, likely in the septage. 1,1 DCE is a common degradation product of TCE and indicates that biodegradation of chlorinated ethenes is occurring along the transport pathway. CFC-11 is a common landfill VOC constituent.

PCE is the highest-concentration VOC contaminant at the site. Key PCE results include:

- PCE has been detected in SMW-1 every sample collected since 1989 (Figure 10). Concentrations in SMW-1 have decreased substantially since 1989, and appear to have roughly stabilized into a concentration range between 5 and 15 ug/L.
- PCE has also been consistently detected in SMW-4 since the well was installed in 1994. Concentrations in SMW-4 slowly increased between 1994 and 2000 and are generally stable to decreasing through 2022.
- PCE detection frequency and concentrations at SMW-5s increased beginning in 2010. Concentrations increased through 2012, stabilized below 5 ug/L, and appear to have decreased since 2020 (Figure 10).

The rise and recent declines in PCE concentrations at SMW-5s (Figure 10) appear to be following the trends for chloride, sulfate, and nitrate. The inorganic compounds are common leachate indicators and the rising and falling trends may reflect a slug of landfill-impacted

groundwater moving past well SMW-5s. These trends will continue to be evaluated and compared as an indicator of contaminant fate and transport.

## 3.5 Quality Assurance / Quality Control

Each semi-annual report includes the results of a quality assurance review of the analytical data. Quality assurance reviews of the 2022 analytical data generally indicate that the data are representative of the quality of samples submitted for analysis.

# 4 References

Department of Ecology, 1998. Letter dated August 6, 1998 to Art McEwen Re: Snipes Mountain Landfill Semiannual Groundwater Monitoring Variance Request.

Parametrix, Inc. 1991. Snipes Mountain Landfill Development and Closure Plan. March 1991.

Yakima Health District, 1998. Letter to Ron Pepper dated August 20, 1998 Re: Variance Request for Snipes Mountain Landfill Groundwater Monitoring.

## Table 1. Well Survey and Water Level Data

Closed Snipes Mountain Landfill

| | SMW-1 | | SMW-2 | | SMW-3 | | SMW-4 | | SMW-5s (Shallow) | | SMW-5d (Deep) | | 30E1 (DNR) | | 31D1 (Newhouse) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Northing | 9290.69 | | 7612.63 | | 7808.01 | | 9312.34 | | 10052.6 | | 10052.6 | | | | | |
| Easting | 11227 | | 11415.2 | | 11415.2 | | 11717.3 | | 11256.3 | | 11256.3 | | | | | |
| Ground Elevation, ft | 999 | | 895 | | 1035 | | 1000 | | 951 | | 951 | | 819 | | 791 | |
| Measuring Point | TOSM | | TOSM | | TOSM | | TOSM | | TOSM | | TOSM | | TOSM | | TOSM | |
| Measuring Pt Elevation, ft | 1001.23 | | 896.8 | | 1037.03 | | 1002.8 | | 953.57 | | 953.57 | | 820.15 | | 793.54 | |
| Top of Tem Basalt Elev, ft | 781 | | 749 | | 1028 | | 710 | | 522 | | -429 | | 53 | | 683 | |
| DATE | DTW | PSE | DTW | PSE | DTW | PSE | DTW | PSE | DTW | PSE | DTW | PSE | DTW | PSE | DTW | PSE |
| 01-Mar-88 | | | | | | | | | | | | | 37.16 | 782.99 | | |
| 01-Nov-88 | | | | | | | | | | | | | 49.08 | 771.07 | | |
| 30-Mar-89 | | | | | | | | | | | | | 36.79 | 783.36 | | |
| 18-Oct-89 | 227.94 | 773.29 | 220.64 | 676.16 | 275.15 | 761.88 | | | | | | | | | | |
| 24-Oct-89 | | | | | | | | | | | | | 43.58 | 776.57 | | |
| 05-Dec-89 | 224.54 | 776.69 | 231.67 | 665.13 | 276.46 | 760.57 | | | | | | | | | | |
| 27-Feb-90 | | | | | | | | | | | | | 36.83 | 783.32 | | |
| 27-Mar-90 | 221.16 | 780.07 | 221.62 | 675.18 | 276.07 | 760.96 | | | | | | | | | | |
| 29-Jun-90 | 230.69 | 770.54 | 221.09 | 675.71 | 275.12 | 761.91 | | | | | | | | | | |
| 05-Oct-90 | 235.00 | 766.23 | 226.43 | 670.37 | 276.09 | 760.94 | | | | | | | | | | |
| 13-Feb-91 | 222.00 | 779.23 | 222.31 | 674.49 | 275.85 | 761.18 | | | | | | | | | | |
| 13-Mar-91 | | | | | | | | | | | | | 37.17 | 782.98 | | |
| 29-Mar-91 | 220.21 | 781.02 | 221.71 | 675.09 | 275.83 | 761.20 | | | | | | | | | | |
| 12-Apr-91 | 220.72 | 780.51 | 220.56 | 676.24 | 274.66 | 762.37 | | | | | | | | | | |
| 13-Apr-91 | | | | | | | | | | | | | | | 75.00 | 718.54 |
| 18-Apr-91 | | | | | | | | | | | | | | | 163.58 | 629.96 |
| 26-Apr-91 | 222.67 | 778.56 | 221.43 | 675.37 | 274.18 | 762.85 | | | | | | | | | 75.15 | 718.39 |
| 10-May-91 | 225.80 | 775.43 | 222.75 | 674.05 | 274.39 | 762.64 | | | | | | | | | 75.49 | 718.05 |
| 13-May-91 | 226.38 | 774.85 | 221.99 | 674.81 | 274.16 | 762.87 | | | | | | | | | | |
| 16-May-91 | 226.38 | 774.85 | 221.99 | 674.81 | 274.16 | 762.87 | | | | | | | | | | |
| 24-May-91 | 227.23 | 774.00 | 221.91 | 674.89 | 274.23 | 762.80 | | | | | | | | | 76.49 | 717.05 |
| 07-Jun-91 | 227.62 | 773.61 | 223.25 | 673.55 | 274.33 | 762.70 | | | | | | | | | 77.97 | 715.57 |
| 21-Jun-91 | 229.75 | 771.48 | 223.80 | 673.00 | 274.28 | 762.75 | | | | | | | | | 78.35 | 715.19 |
| 05-Jul-91 | 230.91 | 770.32 | 226.07 | 670.73 | 274.13 | 762.90 | | | | | | | | | 163.00 | 630.54 |
| 19-Jul-91 | 233.13 | 768.10 | 225.54 | 671.26 | 274.83 | 762.20 | | | | | | | | | 81.88 | 711.66 |
| 02-Aug-91 | 231.99 | 769.24 | 227.99 | 668.81 | 274.25 | 762.78 | | | | | | | 48.84 | 771.31 | 162.79 | 630.75 |
| 15-Aug-91 | 234.44 | 766.79 | 228.41 | 668.39 | 274.28 | 762.75 | | | | | | | | | 163.01 | 630.53 |
| 28-Aug-91 | 236.18 | 765.05 | | | | | | | | | | | | | | |
| 04-Sep-91 | 236.84 | 764.39 | 229.24 | 667.56 | 274.37 | 762.66 | | | | | | | | | 163.31 | 630.23 |
| 20-Sep-91 | 238.25 | 762.98 | 229.79 | 667.01 | 274.25 | 762.78 | | | | | | | | | 163.03 | 630.51 |
| 08-Oct-91 | 236.68 | 764.55 | 230.18 | 666.62 | 274.61 | 762.42 | | | | | | | | | 163.00 | 630.54 |
| 17-Oct-91 | 235.48 | 765.75 | 230.73 | 666.07 | 274.66 | 762.37 | | | | | | | | | 163.00 | 630.54 |
| 04-Nov-91 | 233.38 | 767.85 | 229.89 | 666.91 | 274.69 | 762.34 | | | | | | | 48.25 | 771.90 | 80.17 | 713.37 |
| 20-Nov-91 | 230.80 | 770.43 | 226.85 | 669.95 | 274.48 | 762.55 | | | | | | | 45.93 | 774.22 | 78.37 | 715.17 |
| 04-Dec-91 | 228.67 | 772.56 | 225.62 | 671.18 | 274.38 | 762.65 | | | | | | | 44.08 | 776.07 | 77.50 | 716.04 |
| 23-Dec-91 | 226.56 | 774.67 | 224.95 | 671.85 | 274.62 | 762.41 | | | | | | | 42.29 | 777.86 | 77.13 | 716.41 |
| 06-Jan-92 | 225.14 | 776.09 | 224.30 | 672.50 | 274.15 | 762.88 | | | | | | | 41.07 | 779.08 | 76.13 | 717.41 |
| 21-Jan-92 | 223.94 | 777.29 | 223.78 | 673.02 | 274.54 | 762.49 | | | | | | | 40.06 | 780.09 | 76.58 | 716.96 |
| 04-Feb-92 | 222.89 | 778.34 | 223.51 | 673.29 | 274.49 | 762.54 | | | | | | | | | 76.11 | 717.43 |
| 18-Feb-92 | 221.84 | 779.39 | 223.03 | 673.77 | 274.06 | 762.97 | | | | | | | 40.67 | 779.48 | 75.95 | 717.59 |
| 26-Feb-92 | 221.75 | 779.48 | 223.24 | 673.56 | 274.87 | 762.16 | | | | | | | | | | |
| 03-Mar-92 | 221.10 | 780.13 | 222.56 | 674.24 | 274.12 | 762.91 | | | | | | | 38.59 | 781.56 | 75.56 | 717.98 |
| 17-Mar-92 | 220.91 | 780.32 | 222.46 | 674.34 | 274.19 | 762.84 | | | | | | | 33.91 | 786.24 | 75.56 | 717.98 |
| 30-Mar-92 | 220.51 | 780.72 | 222.31 | 674.49 | 274.35 | 762.68 | | | | | | | 37.29 | 782.86 | 76.10 | 717.44 |
| 13-Apr-92 | 223.26 | 777.97 | 223.27 | 673.53 | 274.12 | 762.91 | | | | | | | 40.67 | 779.48 | 78.98 | 714.56 |
| 27-Apr-92 | 223.05 | 778.18 | 223.51 | 673.29 | 274.30 | 762.73 | | | | | | | 78.79 | 741.36 | 163.27 | 630.27 |
| 11-May-92 | 224.35 | 776.88 | 225.85 | 670.95 | 274.37 | 762.66 | | | | | | | 40.67 | 779.48 | 163.27 | 630.27 |
| 19-May-92 | 225.37 | 775.86 | 226.33 | 670.47 | 273.97 | 763.06 | | | | | | | | | | |
| 26-May-92 | 226.15 | 775.08 | 226.64 | 670.16 | 274.11 | 762.92 | | | | | | | 44.14 | 776.01 | 163.00 | 630.54 |
| 08-Jun-92 | 228.18 | 773.05 | 227.16 | 669.64 | 274.05 | 762.98 | | | | | | | 79.36 | 740.79 | 163.04 | 630.50 |
| 01-Sep-92 | 239.71 | 761.52 | 230.78 | 666.02 | 274.49 | 762.54 | | | | | | | | | | |
| 22-Dec-92 | 228.64 | 772.59 | 225.15 | 671.65 | | | | | | | | | | | | |
| 11-Mar-93 | 222.96 | 778.27 | 223.39 | 673.41 | 275.27 | 761.76 | | | | | | | | | | |
| 27-May-93 | 223.17 | 778.06 | 226.61 | 670.19 | 274.88 | 762.15 | | | | | | | | | | |
| 25-Aug-93 | 236.21 | 765.02 | 228.97 | 667.83 | 275.30 | 761.73 | | | | | | | | | | |
| 21-Dec-93 | 228.71 | 772.52 | 224.71 | 672.09 | 275.57 | 761.46 | 228.25 | 774.55 | 179.07 | 774.50 | 179.15 | 774.42 | | | | |
| 30-Mar-94 | 225.08 | 776.15 | 223.50 | 673.30 | 276.56 | 760.47 | 226.35 | 776.45 | 179.30 | 774.27 | 176.16 | 777.41 | | | | |
| 15-Jun-94 | 232.45 | 768.78 | 226.16 | 670.64 | 275.63 | 761.40 | 237.51 | 765.29 | 179.61 | 773.96 | 189.64 | 763.93 | | | | |
| 22-Sep-94 | | | 228.61 | 668.19 | 276.29 | 760.74 | 250.37 | 752.43 | 180.78 | 772.79 | 205.49 | 748.08 | | | | |
| 13-Dec-94 | 236.71 | 764.52 | 225.08 | 671.72 | 276.66 | 760.37 | 236.40 | 766.40 | 180.44 | 773.13 | 186.06 | 767.51 | | | | |
| 27-Mar-95 | 229.22 | 772.01 | 223.92 | 672.88 | 277.33 | 759.70 | 232.37 | 770.43 | 180.12 | 773.45 | 186.05 | 767.52 | | | | |
| 08-Jun-95 | 231.92 | 769.31 | | | 276.96 | 760.07 | 236.31 | 766.49 | 180.28 | 773.29 | 189.35 | 764.22 | | | | |
| 15-Jun-95 | | | 225.39 | 671.41 | | | | | | | | | | | | |
| 21-Aug-95 | 242.69 | 758.54 | 227.12 | 669.68 | 277.12 | 759.91 | 249.47 | 753.33 | 180.62 | 772.95 | 204.27 | 749.30 | | | | |
| 19-Dec-95 | 231.60 | 769.63 | 224.08 | 672.72 | 277.70 | 759.33 | 231.60 | 771.20 | 179.97 | 773.60 | 181.60 | 771.97 | | | | |
| 13-Mar-96 | 226.22 | 775.01 | 222.14 | 674.66 | 277.55 | 759.48 | 226.78 | 776.02 | 179.56 | 774.01 | 177.05 | 776.52 | | | | |
| 29-May-96 | 230.34 | 770.89 | 223.47 | 673.33 | 277.18 | 759.85 | 234.60 | 768.20 | 179.98 | 773.59 | 187.67 | 765.90 | | | | |
| 01-Aug-96 | 241.40 | 759.83 | 225.27 | 671.53 | 277.09 | 759.94 | 249.81 | 752.99 | 180.49 | 773.08 | 205.35 | 748.22 | | | | |
| 17-Dec-96 | 233.29 | 767.94 | 224.13 | 672.67 | 278.60 | 758.43 | 233.31 | 769.49 | 180.09 | 773.48 | 183.28 | 770.29 | | | | |



MOTT MACDONALD

## Table 1. Well Survey and Water Level Data

Closed Snipes Mountain Landfill

| | SMW-1 | | SMW-2 | | SMW-3 | | SMW-4 | | SMW-5s (Shallow) | | SMW-5d (Deep) | | 30E1 (DNR) | | 31D1 (Newhouse) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25-Feb-97 | 227.24 | 773.99 | 221.94 | 674.86 | 277.64 | 759.39 | 227.86 | 774.94 | 179.04 | 774.53 | 178.13 | 775.44 | | | | |
| 15-May-97 | 231.34 | 769.89 | 223.19 | 673.61 | 277.20 | 759.83 | 238.41 | 764.39 | 179.53 | 774.04 | 194.74 | 758.83 | | | | |
| 08-Jul-97 | 237.55 | 763.68 | 224.70 | 672.10 | 277.11 | 759.92 | 244.93 | 757.87 | 179.83 | 773.74 | 200.49 | 753.08 | | | | |
| 04-Dec-97 | 233.62 | 767.61 | 223.10 | 673.70 | 277.66 | 759.37 | 233.73 | 769.07 | 180.77 | 772.80 | 183.43 | 770.14 | | | | |
| 25-Feb-98 | 226.68 | 774.55 | 221.53 | 675.27 | 277.18 | 759.85 | 227.24 | 775.56 | 179.31 | 774.26 | 177.44 | 776.13 | | | | |
| 03-Jun-98 | 229.65 | 771.58 | 221.56 | 675.24 | 276.83 | 760.20 | 231.53 | 771.27 | 179.78 | 773.79 | 181.97 | 771.60 | | | | |
| 09-Dec-98 | 236.03 | 765.20 | 224.04 | 672.76 | 278.20 | 758.83 | 235.86 | 766.94 | 180.54 | 773.03 | 185.45 | 768.12 | | | | |
| 27-May-99 | 231.53 | 769.70 | 223.91 | 672.89 | 277.32 | 759.71 | 237.29 | 765.51 | 180.23 | 773.34 | 192.67 | 760.90 | | | | |
| 28-Sep-99 | 245.32 | 755.91 | 225.64 | 671.16 | 278.08 | 758.95 | 248.41 | 754.39 | 180.88 | 772.69 | 199.8 | 753.77 | | | | |
| 15-Dec-99 | 234.04 | 767.19 | 223.26 | 673.54 | 277.62 | 759.41 | 233.83 | 768.97 | 183.51 | 770.06 | 180.3 | 773.27 | | | | |
| 14-Jun-00 | 231.99 | 769.24 | 222.18 | 674.62 | 277.65 | 759.38 | 236.57 | 766.23 | 179.62 | 773.95 | 190.69 | 762.88 | | | | |
| 6-Dec-00 | 234.41 | 766.82 | 220.72 | 676.08 | 277.55 | 759.48 | 234.89 | 767.91 | 180.15 | 773.42 | 184.18 | 769.39 | | | | |
| 6-Jun-01 | 233.51 | 767.72 | 220.11 | 676.69 | 277.38 | 759.65 | 237.07 | 765.73 | 180.49 | 773.08 | 187.13 | 766.44 | | | | |
| 11-Dec-01 | 235.60 | 765.63 | 220.25 | 676.55 | 278.42 | 758.61 | 236.08 | 766.72 | 180.83 | 772.74 | 185.79 | 767.78 | | | | |
| 3-Jul-02 | 234.40 | 766.83 | 219.35 | 677.45 | 278.15 | 758.88 | 240.90 | 761.90 | 181.00 | 772.57 | 196.65 | 756.92 | | | | |
| 11-Dec-02 | 234.35 | 766.88 | 219.62 | 677.18 | 278.74 | 758.29 | 234.80 | 768.00 | 180.72 | 772.85 | 184.57 | 769.00 | | | | |
| 18-Jul-03 | 241.70 | 759.53 | 220.00 | 676.80 | 280.00 | 757.03 | 245.55 | 757.25 | 182.00 | 771.57 | 195.15 | 758.42 | | | | |
| 11-Dec-03 | 239.95 | 761.28 | 219.75 | 677.05 | 280.71 | 756.32 | 239.25 | 763.55 | 181.96 | 771.61 | 188.39 | 765.18 | | | | |
| 23-Jun-04 | 234.75 | 766.48 | 219.15 | 677.65 | 280.71 | 756.32 | 240.59 | 762.21 | 181.52 | 772.05 | 196.73 | 756.84 | | | | |
| 14-Dec-04 | 234.38 | 766.85 | 219.15 | 677.65 | 281.75 | 755.28 | 234.41 | 768.39 | 181.62 | 771.95 | 184.00 | 769.57 | | | | |
| 15-Jun-05 | 236.71 | 764.52 | 221.57 | 675.23 | 281.40 | 755.63 | 243.41 | 759.39 | 181.38 | 772.19 | 200.40 | 753.17 | | | | |
| 12-Jan-06 | 234.94 | 766.29 | 219.47 | 677.33 | 282.65 | 754.38 | 235.16 | 767.64 | 181.84 | 771.73 | 184.83 | 768.74 | | | | |
| 29-Jun-06 | 239.10 | 762.13 | 219.58 | 677.22 | 283.09 | 753.94 | 246.60 | 756.20 | 181.67 | 771.90 | 198.69 | 754.88 | | | | |
| 13-Dec-06 | 232.74 | 768.49 | 219.28 | 677.52 | 283.35 | 753.68 | 237.61 | 765.19 | 181.37 | 772.20 | 186.85 | 766.72 | | | | |
| 27-Jun-07 | 238.97 | 762.26 | 219.36 | 677.44 | 283.20 | 753.83 | 253.30 | 749.50 | 181.08 | 772.49 | 198.49 | 755.08 | | | | |
| 11-Dec-07 | 237.57 | 763.66 | 219.63 | 677.17 | 284.01 | 753.02 | 237.78 | 765.02 | 181.18 | 772.39 | 187.10 | 766.47 | | | | |
| 25-Jun-08 | 237.70 | 763.53 | 220.35 | 676.45 | 283.73 | 753.30 | 243.63 | 759.17 | 181.29 | 772.28 | 201.15 | 752.42 | | | | |
| 9-Dec-08 | 237.03 | 764.20 | 220.45 | 676.35 | 284.21 | 752.82 | 237.30 | 765.50 | 181.50 | 772.07 | 186.83 | 766.74 | | | | |
| 17-Jun-09 | 236.18 | 765.05 | 219.11 | 677.69 | 283.14 | 753.89 | 242.67 | 760.13 | 181.12 | 772.45 | 200.01 | 753.56 | | | | |
| 15-Sep-09 | | | | | | | | | 181.74 | 771.83 | | | | | | |
| 1-Dec-09 | 237.49 | 763.74 | 220.44 | 676.36 | 283.68 | 753.35 | 242.30 | 760.50 | 181.47 | 772.10 | 193.14 | 760.43 | | | | |
| 22-Jun-10 | 233.88 | 767.35 | 219.50 | 677.30 | 283.92 | 753.11 | 237.05 | 765.75 | 180.88 | 772.69 | 187.66 | 765.91 | | | | |
| 26-Jul-10 | | | | | | | | | 181.12 | 772.45 | | | | | | |
| 7-Dec-10 | 234.79 | 766.44 | 219.02 | 677.78 | 283.09 | 753.94 | 235.14 | 767.66 | 180.92 | 772.65 | 184.58 | 768.99 | | | | |
| 29-Jun-11 | 233.62 | 767.61 | 218.86 | 677.94 | 282.08 | 754.95 | 238.58 | 764.22 | 180.75 | 772.82 | 192.69 | 760.88 | | | | |
| 13-Dec-11 | 233.03 | 768.20 | 181.50 | 715.30 | 282.50 | 754.53 | 233.63 | 769.17 | 180.98 | 772.59 | 183.12 | 770.45 | | | | |
| 13-Jun-12 | 233.16 | 768.07 | 219.22 | 677.58 | 282.05 | 754.98 | 239.15 | 763.65 | 180.85 | 772.72 | 195.55 | 758.02 | | | | |
| 5-Dec-12 | 234.45 | 766.78 | 219.52 | 677.28 | 282.56 | 754.47 | 234.52 | 768.28 | 181.12 | 772.45 | 183.68 | 769.89 | | | | |
| 12-Jun-13 | 232.00 | 769.23 | 219.50 | 677.30 | 282.10 | 754.93 | 237.90 | 764.90 | 180.85 | 772.72 | 190.00 | 763.57 | | | | |
| 2-Dec-13 | 234.62 | 766.61 | 219.22 | 677.58 | 282.18 | 754.85 | 235.02 | 767.78 | 181.12 | 772.45 | 184.43 | 769.14 | | | | |
| 17-Jun-14 | 235.64 | 765.59 | 219.52 | 677.28 | 281.56 | 755.47 | 239.17 | 763.63 | 181.26 | 772.31 | 212.91 | 740.66 | | | | |
| 17-Jul-14 | 240.67 | 760.56 | | | | | 247.50 | 755.30 | 181.43 | 772.14 | 204.90 | 748.67 | | | | |
| 10-Nov-14 | 238.00 | 763.23 | | | | | 238.32 | 764.48 | 182.29 | 771.28 | 187.31 | 766.26 | | | | |
| 2-Dec-14 | 235.13 | 766.10 | 219.49 | 677.31 | 282.10 | 754.93 | 235.43 | 767.37 | 182.15 | 771.42 | 184.94 | 768.63 | | | | |
| 23-Jun-15 | 240.42 | 760.81 | 219.52 | 677.28 | 281.74 | 755.29 | | | 182.60 | 770.97 | 199.83 | 753.74 | | | | |
| 1-Dec-15 | 240.20 | 761.03 | 220.00 | 676.80 | 282.65 | 754.38 | | | 183.87 | 769.70 | 189.46 | 764.11 | | | | |
| 30-Mar-16 | 230.14 | 771.09 | | | | | | | | | | | | | | |
| 15-Jun-16 | 239.27 | 761.96 | 219.59 | 677.21 | 282.51 | 754.52 | | | 182.62 | 770.95 | 197.24 | 756.33 | | | | |
| 7-Sep-16 | 245.00 | 756.23 | | | | | 250.09 | 752.71 | 183.69 | 769.88 | 198.17 | 755.40 | | | | |
| 14-Dec-16 | 234.66 | 766.57 | 220.00 | 676.80 | 283.32 | 753.71 | | | 182.61 | 770.96 | 184.23 | 769.34 | | | | |
| 6-Jun-17 | 230.60 | 770.63 | 219.22 | 677.58 | 282.63 | 754.40 | | | 181.32 | 772.25 | 182.71 | 770.86 | | | | |
| 5-Dec-17 | 232.76 | 768.47 | 219.69 | 677.11 | 283.02 | 754.01 | 233.03 | 769.77 | 182.35 | 771.22 | 182.62 | 770.95 | | | | |
| 26-Jun-18 | 244.04 | 757.19 | 219.43 | 677.37 | 282.13 | 754.90 | 238.64 | 764.16 | 181.66 | 771.91 | 191.24 | 762.33 | | | | |
| 12-Dec-18 | 234.64 | 766.59 | 219.22 | 677.58 | 282.52 | 754.51 | 233.05 | 769.75 | 181.79 | 771.78 | 182.44 | 771.13 | | | | |
| 12-Jun-19 | 230.60 | 770.63 | 219.73 | 677.07 | 292.84 | 744.19 | 234.35 | 768.45 | 181.09 | 772.48 | 194.72 | 758.85 | | | | |
| 12-Dec-19 | 231.87 | 769.36 | 218.86 | 677.94 | 282.09 | 754.94 | 232.48 | 770.32 | 182.15 | 771.42 | 181.45 | 772.12 | | | | |
| 9-Jun-20 | 233.91 | 767.32 | 219.82 | 676.98 | 282.52 | 754.51 | 237.12 | 765.68 | 182.30 | 771.27 | 187.47 | 766.10 | | | | |
| 29-Dec-20 | 233.48 | 767.75 | 219.70 | 677.10 | 281.99 | 755.04 | 233.23 | 769.57 | 182.64 | 770.93 | 183.74 | 769.83 | | | | |
| 2-Jun-21 | 233.12 | 768.11 | 219.80 | 677.00 | 281.70 | 755.33 | 238.58 | 764.22 | 182.18 | 771.39 | 195.04 | 758.53 | | | | |
| 8-Dec-21 | 235.42 | 765.81 | 219.09 | 677.71 | 282.56 | 754.47 | 235.03 | 767.77 | 181.51 | 772.06 | 184.60 | 768.97 | | | | |
| 29-Nov-22 | 237.37 | 763.86 | 219.33 | 677.47 | 282.51 | 754.52 | 237.70 | 765.10 | 182.41 | 771.16 | 186.97 | 766.60 | | | | |
| 10-Jan-23 | NT | | NT | | NT | | 233.32 | 769.48 | 181.90 | 771.67 | 183.12 | 770.45 | | | | |

TOSM = Top of Steel Casing Monument.

DTW = Depth to Water.

PSE = Potentiometric Surface Elevation (MSL).

NT = Not Taken.

## Table 2 - Statistical Summary of Selected Parameters

Closed Snipes Mountain Landfill

| Well | Constituent | Analyses | Detections | Mean | Standard | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| SMW-1 | 1,1-Dichloroethene | 71 | 6 | 0.30 | 0.05 | 0.24 | 0.36 |
| SMW-1 | 2-Butanone (MEK) | 71 | 0 | | | | |
| SMW-1 | Acetone | 71 | 4 | 7.23 | 4.00 | 2.3 | 11 |
| SMW-1 | Carbon Tetrachloride | 71 | 14 | 1.81 | 1.22 | 0.6 | 5.5 |
| SMW-1 | Carbon, Total Organic | 71 | 15 | 1.22 | 0.82 | 0.39 | 3.3 |
| SMW-1 | Chloride | 72 | 72 | 15.08 | 2.56 | 10.1 | 20.4 |
| SMW-1 | cis-1,2-Dichloroethene | 70 | 1 | 0.24 | | 0.24 | 0.24 |
| SMW-1 | Nitrate | 71 | 71 | 2.69 | 1.05 | 0.082 | 7 |
| SMW-1 | Sulfate | 70 | 70 | 117.01 | 32.42 | 36.1 | 193.7 |
| SMW-1 | Tetrachloroethene (PCE) | 71 | 71 | 18.62 | 40.83 | 3.5 | 350 |
| SMW-1 | trans-1,2-Dichloroethene | 71 | 0 | | | | |
| SMW-1 | Trichloroethene (TCE) | 71 | 31 | 0.79 | 0.36 | 0.3 | 1.6 |
| SMW-1 | Vinyl Chloride | 71 | 0 | | | | |
| SMW-2 | 1,1-Dichloroethene | 49 | 0 | | | | |
| SMW-2 | 2-Butanone (MEK) | 49 | 0 | | | | |
| SMW-2 | Acetone | 49 | 2 | 8.45 | 3.61 | 5.9 | 11 |
| SMW-2 | Carbon Tetrachloride | 49 | 0 | | | | |
| SMW-2 | Carbon, Total Organic | 84 | 17 | 0.99 | 0.64 | 0.12 | 2.04 |
| SMW-2 | Chloride | 83 | 83 | 4.84 | 0.79 | 3.4 | 10 |
| SMW-2 | cis-1,2-Dichloroethene | 49 | 0 | | | | |
| SMW-2 | Nitrate | 84 | 84 | 0.27 | 0.05 | 0.02 | 0.4 |
| SMW-2 | Sulfate | 82 | 82 | 65.50 | 10.48 | 16.6 | 85.5 |
| SMW-2 | Tetrachloroethene (PCE) | 49 | 0 | | | | |
| SMW-2 | trans-1,2-Dichloroethene | 49 | 0 | | | | |
| SMW-2 | Trichloroethene (TCE) | 49 | 0 | | | | |
| SMW-2 | Vinyl Chloride | 49 | 0 | | | | |
| SMW-3 | 1,1-Dichloroethene | 15 | 0 | | | | |
| SMW-3 | 2-Butanone (MEK) | 15 | 0 | | | | |
| SMW-3 | Acetone | 15 | 0 | | | | |
| SMW-3 | Carbon Tetrachloride | 15 | 0 | | | | |
| SMW-3 | Carbon, Total Organic | 48 | 12 | 0.99 | 0.80 | 0.12 | 2.6 |
| SMW-3 | Chloride | 48 | 48 | 3.20 | 0.50 | 2.1 | 5 |
| SMW-3 | cis-1,2-Dichloroethene | 15 | 0 | | | | |
| SMW-3 | Nitrate | 48 | 47 | 0.21 | 0.02 | 0.16 | 0.26 |
| SMW-3 | Sulfate | 48 | 48 | 17.31 | 8.01 | 8.6 | 68.4 |
| SMW-3 | Tetrachloroethene (PCE) | 15 | 0 | | | | |
| SMW-3 | trans-1,2-Dichloroethene | 15 | 0 | | | | |
| SMW-3 | Trichloroethene (TCE) | 15 | 0 | | | | |
| SMW-3 | Vinyl Chloride | 15 | 0 | | | | |
| SMW-4 | 1,1-Dichloroethene | 54 | 0 | | | | |
| SMW-4 | 2-Butanone (MEK) | 54 | 6 | 38.18 | 23.67 | 6.1 | 66 |
| SMW-4 | Acetone | 54 | 5 | 12.22 | 10.61 | 3 | 30 |
| SMW-4 | Carbon Tetrachloride | 54 | 0 | | | | |
| SMW-4 | Carbon, Total Organic | 53 | 12 | 1.42 | 0.48 | 0.58 | 2.2 |
| SMW-4 | Chloride | 53 | 53 | 5.69 | 0.94 | 3.3 | 7.97 |
| SMW-4 | cis-1,2-Dichloroethene | 54 | 7 | 0.36 | 0.11 | 0.21 | 0.53 |
| SMW-4 | Nitrate | 53 | 39 | 0.33 | 0.27 | 0.01 | 0.99 |
| SMW-4 | Sulfate | 53 | 53 | 32.32 | 4.01 | 18 | 40.9 |

## Table 2 - Statistical Summary of Selected Parameters

Closed Snipes Mountain Landfill

| Well | Constituent | Analyses | Detections | Mean | Standard | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| SMW-4 | Tetrachloroethene (PCE) | 54 | 53 | 6.69 | 2.18 | 1.16 | 11 |
| SMW-4 | trans-1,2-Dichloroethene | 54 | 0 | | | | |
| SMW-4 | Trichloroethene (TCE) | 54 | 10 | 0.51 | 0.12 | 0.38 | 0.73 |
| SMW-4 | Vinyl Chloride | 54 | 0 | | | | |
| SMW-5D | 1,1-Dichloroethene | 60 | 0 | | | | |
| SMW-5D | 2-Butanone (MEK) | 60 | 5 | 21.04 | 12.72 | 8.1 | 34 |
| SMW-5D | Acetone | 60 | 3 | 10.67 | 1.53 | 9 | 12 |
| SMW-5D | Carbon Tetrachloride | 60 | 0 | | | | |
| SMW-5D | Carbon, Total Organic | 58 | 8 | 1.42 | 0.50 | 0.76 | 2.35 |
| SMW-5D | Chloride | 57 | 57 | 5.13 | 0.61 | 4.1 | 6.33 |
| SMW-5D | cis-1,2-Dichloroethene | 60 | 0 | | | | |
| SMW-5D | Nitrate | 58 | 13 | 0.02 | 0.01 | 0.01 | 0.04 |
| SMW-5D | Sulfate | 57 | 57 | 32.30 | 2.88 | 25 | 39.5 |
| SMW-5D | Tetrachloroethene (PCE) | 60 | 0 | | | | |
| SMW-5D | trans-1,2-Dichloroethene | 60 | 0 | | | | |
| SMW-5D | Trichloroethene (TCE) | 60 | 0 | | | | |
| SMW-5D | Vinyl Chloride | 60 | 0 | | | | |
| SMW-5S | 1,1-Dichloroethene | 68 | 0 | | | | |
| SMW-5S | 2-Butanone (MEK) | 68 | 7 | 23.96 | 38.37 | 5 | 110 |
| SMW-5S | Acetone | 68 | 3 | 15.87 | 8.33 | 8.7 | 25 |
| SMW-5S | Carbon Tetrachloride | 68 | 0 | | | | |
| SMW-5S | Carbon, Total Organic | 66 | 23 | 1.73 | 1.34 | 0.29 | 7.32 |
| SMW-5S | Chloride | 66 | 65 | 17.60 | 12.01 | 4.1 | 38.4 |
| SMW-5S | cis-1,2-Dichloroethene | 68 | 0 | | | | |
| SMW-5S | Nitrate | 66 | 65 | 4.84 | 27.38 | 0.16 | 222 |
| SMW-5S | Sulfate | 64 | 64 | 53.70 | 25.50 | 26.8 | 141 |
| SMW-5S | Tetrachloroethene (PCE) | 68 | 28 | 3.76 | 4.78 | 0.97 | 26 |
| SMW-5S | trans-1,2-Dichloroethene | 68 | 0 | | | | |
| SMW-5S | Trichloroethene (TCE) | 68 | 14 | 0.30 | 0.23 | 0.2 | 1.1 |
| SMW-5S | Vinyl Chloride | 68 | 0 | | | | |

Notes:

SMW-3 was last sampled in 2009

Blank spaces indicate too few detections to calculate statistics.

Table 3. Groundwater Monitoring Data, Snipes Mountain Landfill 2022 Q2

| Sample Name | | SMW-1 | SMW-2 | SMW-3 | SMW-4 | SMW-5s | SMW-5d |
|---|---|---|---|---|---|---|---|
| Constituent | GWCL | | | | | | |
| **Inorganics** | | | | | | | |
| Ammonia, Total, mg/L as N | | 0.04U | 0.04U | | | | |
| Carbon, Total Organic, mg/L | | 0.58 | 0.5U | | | | |
| Chemical Oxygen Demand (COD), mg/L | | 10U | 10U | | | | |
| Chloride, mg/L | 250 | 18.2D | 5.05 | | | | |
| Nitrate, mg/L as N | 10 | 1.86H | 0.307H | | | | |
| Nitrate + Nitrite (NO2 + NO3), mg-N/L | 10 | 1.88HD | 0.307H | | | | |
| Nitrite, mg/L as N | 1 | 0.015H | UH | | | | |
| Sulfate, mg/L | 250 | 82.5D | 83D | | | | |
| **Metals** | | | | | | | |
| Iron, Dissolved, mg/L | 0.3 | 0.168 | 0.05U | | | | |
| Manganese, Dissolved, mg/L | 0.05 | 0.0137 | 0.004 | | | | |
| Zinc, Dissolved, mg/L | 5 | 0.02 | 0.02U | | | | |
| **VOC** | | | | | | | |
| 1,1,1,2-Tetrachloroethane, ug/L | | 0.2U | 0.2U | | | | |
| 1,1,1-Trichloroethane (TCA), ug/L | 200 | 0.2U | 0.2U | | | | |
| 1,1,2,2-Tetrachloroethane, ug/L | | 0.2U | 0.2U | | | | |
| 1,1,2-Trichloro-1,2,2-trifluoroetha, ug/l | | 0.2U | 0.2U | | | | |
| 1,1,2-Trichloroethane, ug/L | | 0.2U | 0.2U | | | | |
| 1,1-Dichloroethane, ug/L | 1 | 0.2U | 0.2U | | | | |
| 1,1-Dichloroethene, ug/L | | 0.2U | 0.2U | | | | |
| 1,1-Dichloropropene, ug/L | | 0.2U | 0.2U | | | | |
| 1,2,3-Trichlorobenzene, ug/L | | 0.5U | 0.5U | | | | |
| 1,2,3-Trichloropropane, ug/L | | 0.5U | 0.5U | | | | |
| 1,2,4-Trichlorobenzene, ug/L | 70 | 0.5U | 0.5U | | | | |
| 1,2,4-Trimethylbenzene, ug/L | | 0.2U | 0.2U | | | | |
| 1,2-Dibromo-3-chloropropane (DBCP), ug/L | | 0.5U | 0.5U | | | | |
| 1,2-Dibromoethane (EDB), ug/L | | 0.2U | 0.2U | | | | |
| 1,2-Dichlorobenzene, ug/L | | 0.2U | 0.2U | | | | |
| 1,2-Dichloroethane (EDC), ug/L | 0.5 | 0.2U | 0.2U | | | | |
| 1,2-Dichloropropane, ug/L | 0.6 | 0.2U | 0.2U | | | | |
| 1,3,5-Trimethylbenzene, ug/L | | 0.2U | 0.2U | | | | |
| 1,3-Dichlorobenzene, ug/L | | 0.2U | 0.2U | | | | |
| 1,3-Dichloropropane, ug/L | | 0.2U | 0.2U | | | | |
| 1,4-Dichlorobenzene, ug/L | 4 | 0.2U | 0.2U | | | | |
| 2,2-Dichloropropane, ug/L | | 0.2U | 0.2U | | | | |
| 2-Butanone (MEK), ug/L | | 5U | 5U | | | | |
| 2-Chloroethyl Vinyl Ether, ug/L | | 1U | 1U | | | | |
| 2-Chlorotoluene, ug/L | | 0.2U | 0.2U | | | | |
| 2-Hexanone, ug/L | | 5U | 5U | | | | |
| 4-Chlorotoluene, ug/L | | 0.2U | 0.2U | | | | |
| 4-Isopropyltoluene, ug/L | | 0.2U | 0.2U | | | | |

* CONF = Confluent growth on all dilutions, no coliforms. ** Indicates detected in the trip blank but not qualified.
J - Estimated value. B - Compound found in blank. M - Estimated value - low spectral match parameters.
No result indicates analyte not analyzed for. Q - Indicates quarter of the year (ie: Q1 = first quarter).
U - Not detected above indicated detection limit. Y - Not detected at raised detection limit.
GWCL - Groundwater Contaminant Level as outlined in WAC 173-200, Appendix A. These values are the most stringent levels derived from WAC 173-200 (10/1990) and WAC 246-290 (7/2004).
The Groundwater Quality Criteria for pH is 6.5 to 8.5.

| Sample Name | | SMW-1 | SMW-2 | SMW-3 | SMW-4 | SMW-5s | SMW-5d |
|---|---|---|---|---|---|---|---|
| Constituent | GWCL | | | | | | |
| 4-Methyl-2-Pentanone (MIBK), ug/L | | 5U | 5U | | | | |
| Acetone, ug/L | | 5U | 5U | | | | |
| Acrolein, ug/L | | 5U | 5U | | | | |
| Acrylonitrile, ug/L | 0.07 | 1U | 1U | | | | |
| Benzene, ug/L | 1 | 0.2U | 0.2U | | | | |
| Bromobenzene, ug/L | | 0.2U | 0.2U | | | | |
| Bromochloromethane, ug/L | | 0.2U | 0.2U | | | | |
| Bromodichloromethane, ug/L | 0.3 | 0.2U | 0.2U | | | | |
| Bromoform, ug/L | 5 | 0.2U | 0.2U | | | | |
| Bromomethane, ug/L | | 1U | 1U | | | | |
| Carbon Disulfide, ug/L | | 0.2U | 0.2U | | | | |
| Carbon Tetrachloride, ug/L | 0.3 | 0.2U | 0.2U | | | | |
| Chlorobenzene, ug/L | 100 | 0.2U | 0.2U | | | | |
| Chloroethane, ug/L | | 0.2U | 0.2U | | | | |
| Chloroform, ug/L | 7 | 0.2U | 0.2U | | | | |
| Chloromethane, ug/L | | 0.5U | 0.5U | | | | |
| cis-1,2-Dichloroethene, ug/L | | 0.2U | 0.2U | | | | |
| cis-1,3-Dichloropropene, ug/L | | 0.2U | 0.2U | | | | |
| Dibromochloromethane, ug/L | | 0.2U | 0.2U | | | | |
| Dibromomethane, ug/L | | 0.2U | 0.2U | | | | |
| Dichloromethane(Methylene Chloride), ug/L | 5 | 1U | 1U | | | | |
| Ethylbenzene, ug/L | 700 | 0.2U | 0.2U | | | | |
| Hexachlorobutadiene, ug/L | | 2U | 2U | | | | |
| Iodomethane, ug/L | | 1U | 1U | | | | |
| Isopropylbenzene (Cumene), ug/L | | 0.2U | 0.2U | | | | |
| m,p-Xylene, ug/L | | 0.4U | 0.4U | | | | |
| Naphthalene, ug/L | | 0.5U | 0.5U | | | | |
| n-Butylbenzene, ug/L | | 0.2U | 0.2U | | | | |
| n-Propylbenzene, ug/L | | 0.2U | 0.2U | | | | |
| o-Xylene, ug/L | | 0.2U | 0.2U | | | | |
| sec-Butylbenzene, ug/L | | 0.2U | 0.2U | | | | |
| Styrene, ug/L | 100 | 0.2U | 0.2U | | | | |
| tert-Butylbenzene, ug/L | | 0.2U | 0.2U | | | | |
| Tetrachloroethene (PCE), ug/L | 0.8 | 12 | 0.2U | | | | |
| Toluene, ug/L | 1000 | 0.2U | 0.2U | | | | |
| Total Xylenes, ug/L | 10000 | 0.6U | 0.6U | | | | |
| trans-1,2-Dichloroethene, ug/L | 100 | 0.2U | 0.2U | | | | |
| trans-1,3-Dichloropropene, ug/L | | 0.2U | 0.2U | | | | |
| trans-1,4-Dichloro-2-butene, ug/L | | 1U | 1U | | | | |
| Trichloroethene (TCE), ug/L | 3 | 0.66 | 0.2U | | | | |
| Trichlorofluoromethane (CFC 11), ug/L | | 0.2U | 0.2U | | | | |
| Vinyl Acetate, ug/L | | 0.2U | 0.2U | | | | |
| Vinyl Chloride, ug/L | 0.02 | 0.2U | 0.2U | | | | |

* CONF = Confluent growth on all dilutions, no coliforms. ** Indicates detected in the trip blank but not qualified.
J - Estimated value. B - Compound found in blank. M - Estimated value - low spectral match parameters.
No result indicates analyte not analyzed for. Q - Indicates quarter of the year (ie: Q1 = first quarter).
U - Not detected above indicated detection limit. Y - Not detected at raised detection limit.
GWCL - Groundwater Contaminant Level as outlined in WAC 173-200, Appendix A. These values are the most stringent levels derived from WAC 173-200 (10/1990) and WAC 246-290 (7/2004).
The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Table 3. Groundwater Monitoring Data, Snipes Mountain Landfill 2022 Q4

| Sample Name | | SMW-1 | SMW-2 | SMW-3 | SMW-4 | SMW-5s | SMW-5d |
|---|---|---|---|---|---|---|---|
| Constituent | GWCL | | | | | | |
| **Field Parameters** | | | | | | | |
| Depth to water, Ft. | | 237.37 | 219.33 | 282.51 | 233.32 | 181.9 | 183.12 |
| pH, Field, std. units | | 7.11 | 7.45 | | 7.47 | 6.48 | 7.59 |
| Specific Conductance @ 25C, Field, umhos/cm | 700 | 564.6 | 406.6 | | 328.7 | 451.9 | 276.2 |
| Temperature, C | | 16.1 | 16.5 | | 16.2 | 12.2 | 14.4 |
| **Inorganics** | | | | | | | |
| Ammonia, Total, mg/L as N | | 0.04U | 0.04U | | 0.04U | 0.04U | 0.04U |
| Carbon, Total Organic, mg/L | | 1 | 0.7 | | 0.5U | 7.32 | 0.76 |
| Chemical Oxygen Demand (COD), mg/L | | 10U | 10U | | 10U | 40.5 | 10U |
| Chloride, mg/L | 250 | 17.3D | 5.95 | | 7.97 | 31.3D | 4.18 |
| Nitrate, mg/L as N | 10 | 2.12H | 0.02UH | | 0.02U | 0.851 | 0.02U |
| Nitrate + Nitrite (NO2 + NO3), mg-N/L | 10 | 2.12D | 0.01U | | 0.01U | 0.851 | 0.01U |
| Nitrite, mg/L as N | 1 | 0.01UH | 0.01UH | | 0.01U | 0.01U | 0.01U |
| Sulfate, mg/L | 250 | 75.2D | 85.5D | | 36.2D | 50.1D | 25 |
| **Metals** | | | | | | | |
| Iron, Dissolved, mg/L | 0.3 | 0.146 | 0.05U | | | | |
| Iron, Total, mg/L | | | | | 0.42 | 1.47 | 4.19 |
| Manganese, Dissolved, mg/L | 0.05 | 0.0113 | 0.012 | | | | |
| Manganese, Total, mg/L | | | | | 0.004U | 0.0608 | 0.044 |
| Zinc, Dissolved, mg/L | 5 | 0.02U | 0.02U | | | | |
| Zinc, Total, mg/L | | | | | 0.02U | 0.0229 | 0.0261 |
| **VOC** | | | | | | | |
| 1,1,1,2-Tetrachloroethane, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,1,1-Trichloroethane (TCA), ug/L | 200 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,1,2,2-Tetrachloroethane, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,1,2-Trichloro-1,2,2-trifluoroetha, ug/l | | 0.2U | 0.2U | | 0.2U | 0.79 | 0.2U |
| 1,1,2-Trichloroethane, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,1-Dichloroethane, ug/L | 1 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,1-Dichloroethene, ug/L | | 0.29 | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,1-Dichloropropene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,2,3-Trichlorobenzene, ug/L | | 0.5U | 0.5U | | 0.5U | 0.5U | 0.5U |
| 1,2,3-Trichloropropane, ug/L | | 0.5U | 0.5U | | 0.5U | 0.5U | 0.5U |
| 1,2,4-Trichlorobenzene, ug/L | 70 | 0.5U | 0.5U | | 0.5U | 0.5U | 0.5U |
| 1,2,4-Trimethylbenzene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,2-Dibromo-3-chloropropane (DBCP), ug/L | | 0.5U | 0.5U | | 0.5U | 0.5U | 0.5U |
| 1,2-Dibromoethane (EDB), ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,2-Dichlorobenzene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,2-Dichloroethane (EDC), ug/L | 0.5 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,2-Dichloropropane, ug/L | 0.6 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,3,5-Trimethylbenzene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,3-Dichlorobenzene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 1,3-Dichloropropane, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |

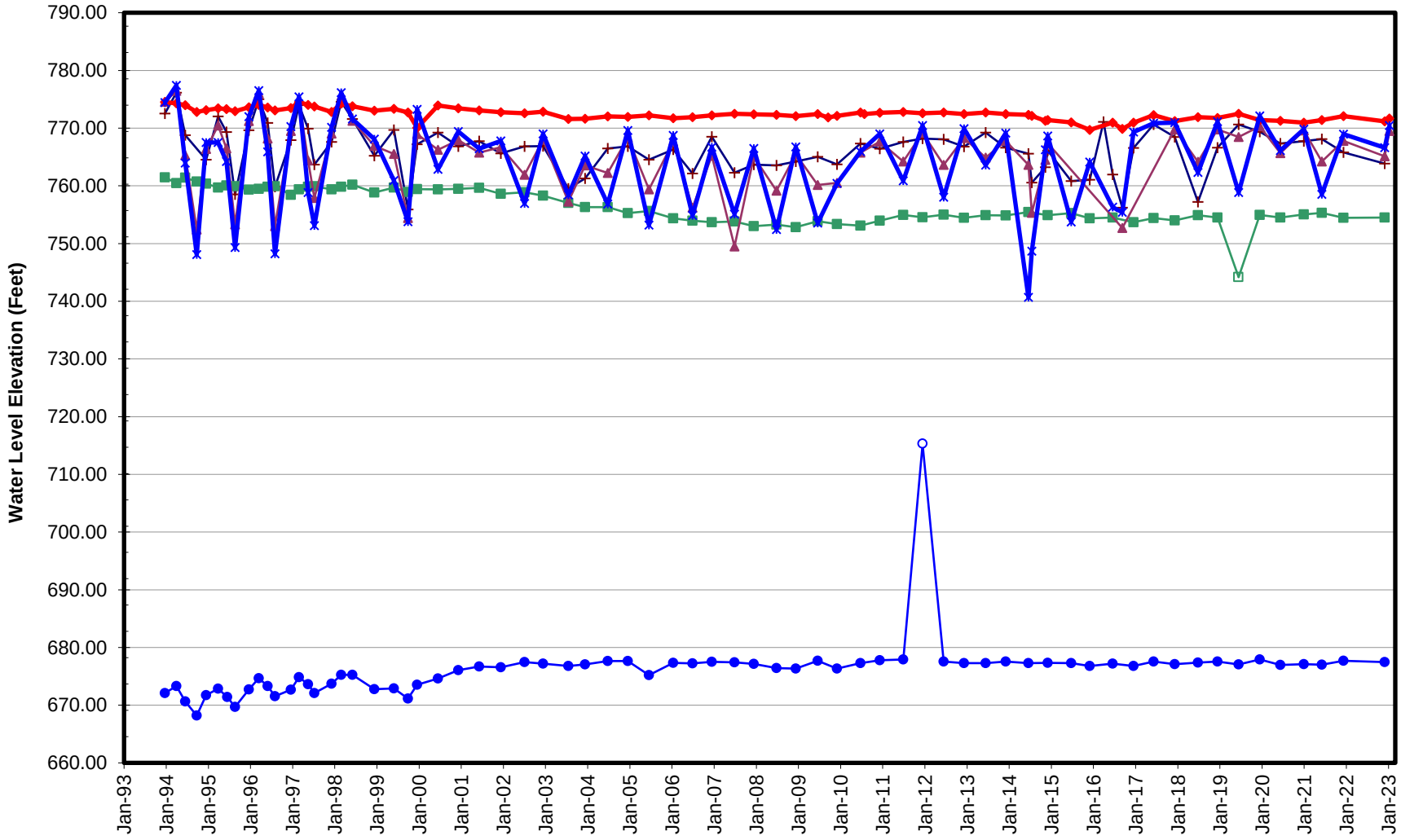
* CONF = Confluent growth on all dilutions, no coliforms. ** Indicates detected in the trip blank but not qualified.
J - Estimated value. B - Compound found in blank. M - Estimated value - low spectral match parameters.
No result indicates analyte not analyzed for. Q - Indicates quarter of the year (ie: Q1 = first quarter).
U - Not detected above indicated detection limit. Y - Not detected at raised detection limit.
GWCL - Groundwater Contaminant Level as outlined in WAC 173-200, Appendix A. These values are the most stringent levels derived from WAC 173-200 (10/1990) and WAC 246-290 (7/2004).
The Groundwater Quality Criteria for pH is 6.5 to 8.5.

| Sample Name | | SMW-1 | SMW-2 | SMW-3 | SMW-4 | SMW-5s | SMW-5d |
|---|---|---|---|---|---|---|---|
| Constituent | GWCL | | | | | | |
| 1,4-Dichlorobenzene, ug/L | 4 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 2,2-Dichloropropane, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 2-Butanone (MEK), ug/L | | 5U | 5U | | 5U | 5U | 5U |
| 2-Chloroethyl Vinyl Ether, ug/L | | 1U | 1U | | 1U | 1U | 1U |
| 2-Chlorotoluene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 2-Hexanone, ug/L | | 5U | 5U | | 5U | 5U | 5U |
| 4-Chlorotoluene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 4-Isopropyltoluene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| 4-Methyl-2-Pentanone (MIBK), ug/L | | 5U | 5U | | 5U | 5U | 5U |
| Acetone, ug/L | | 5U | 5.9 | | 5U | 5U | 5U |
| Acrolein, ug/L | | 5U | 5U | | 5U | 5U | 5U |
| Acrylonitrile, ug/L | 0.07 | 1U | 1U | | 1U | 1U | 1U |
| Benzene, ug/L | 1 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Bromobenzene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Bromochloromethane, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Bromodichloromethane, ug/L | 0.3 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Bromoform, ug/L | 5 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Bromomethane, ug/L | | 1U | 1U | | 1U | 1U | 1U |
| Carbon Disulfide, ug/L | | 0.2U | 0.2U | | 0.2U | 0.7 | 0.2U |
| Carbon Tetrachloride, ug/L | 0.3 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Chlorobenzene, ug/L | 100 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Chloroethane, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Chloroform, ug/L | 7 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Chloromethane, ug/L | | 0.5U | 0.5U | | 0.5U | 0.5U | 0.5U |
| cis-1,2-Dichloroethene, ug/L | | 0.2U | 0.2U | | 0.53 | 0.2U | 0.2U |
| cis-1,3-Dichloropropene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Dibromochloromethane, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Dibromomethane, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Dichloromethane(Methylene Chloride), ug/L | 5 | 1U | 1U | | 1U | 1U | 1U |
| Ethylbenzene, ug/L | 700 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Hexachlorobutadiene, ug/L | | 2U | 2U | | 2U | 2U | 2U |
| Iodomethane, ug/L | | 1U | 1U | | 1U | 1U | 1U |
| Isopropylbenzene (Cumene), ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| m,p-Xylene, ug/L | | 0.4U | 0.4U | | 0.4U | 0.4U | 0.4U |
| Naphthalene, ug/L | | 0.5U | 0.5U | | 0.5U | 0.5U | 0.5U |
| n-Butylbenzene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| n-Propylbenzene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| o-Xylene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| sec-Butylbenzene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Styrene, ug/L | 100 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| tert-Butylbenzene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Tetrachloroethene (PCE), ug/L | 0.8 | 11.3 | 0.2U | | 2.34 | 0.97 | 0.2U |
| Toluene, ug/L | 1000 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Total Xylenes, ug/L | 10000 | 0.6U | 0.6U | | 0.6U | 0.6U | 0.6U |
| trans-1,2-Dichloroethene, ug/L | 100 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |

* CONF = Confluent growth on all dilutions, no coliforms. ** Indicates detected in the trip blank but not qualified.
J - Estimated value. B - Compound found in blank. M - Estimated value - low spectral match parameters.
No result indicates analyte not analyzed for. Q - Indicates quarter of the year (ie: Q1 = first quarter).
U - Not detected above indicated detection limit. Y - Not detected at raised detection limit.
GWCL - Groundwater Contaminant Level as outlined in WAC 173-200, Appendix A. These values are the most stringent levels derived from WAC 173-200 (10/1990) and WAC 246-290 (7/2004).
The Groundwater Quality Criteria for pH is 6.5 to 8.5.

| Sample Name | | SMW-1 | SMW-2 | SMW-3 | SMW-4 | SMW-5s | SMW-5d |
|---|---|---|---|---|---|---|---|
| Constituent | GWCL | | | | | | |
| trans-1,3-Dichloropropene, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| trans-1,4-Dichloro-2-butene, ug/L | | 1U | 1U | | 1U | 1U | 1U |
| Trichloroethene (TCE), ug/L | 3 | 0.59 | 0.2U | | 0.67 | 0.2U | 0.2U |
| Trichlorofluoromethane (CFC 11), ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Vinyl Acetate, ug/L | | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |
| Vinyl Chloride, ug/L | 0.02 | 0.2U | 0.2U | | 0.2U | 0.2U | 0.2U |

* CONF = Confluent growth on all dilutions, no coliforms. ** Indicates detected in the trip blank but not qualified.
J - Estimated value. B - Compound found in blank. M - Estimated value - low spectral match parameters.
No result indicates analyte not analyzed for. Q - Indicates quarter of the year (ie: Q1 = first quarter).
U - Not detected above indicated detection limit. Y - Not detected at raised detection limit.
GWCL - Groundwater Contaminant Level as outlined in WAC 173-200, Appendix A. These values are the most stringent levels derived from WAC 173-200 (10/1990) and WAC 246-290 (7/2004).
The Groundwater Quality Criteria for pH is 6.5 to 8.5.

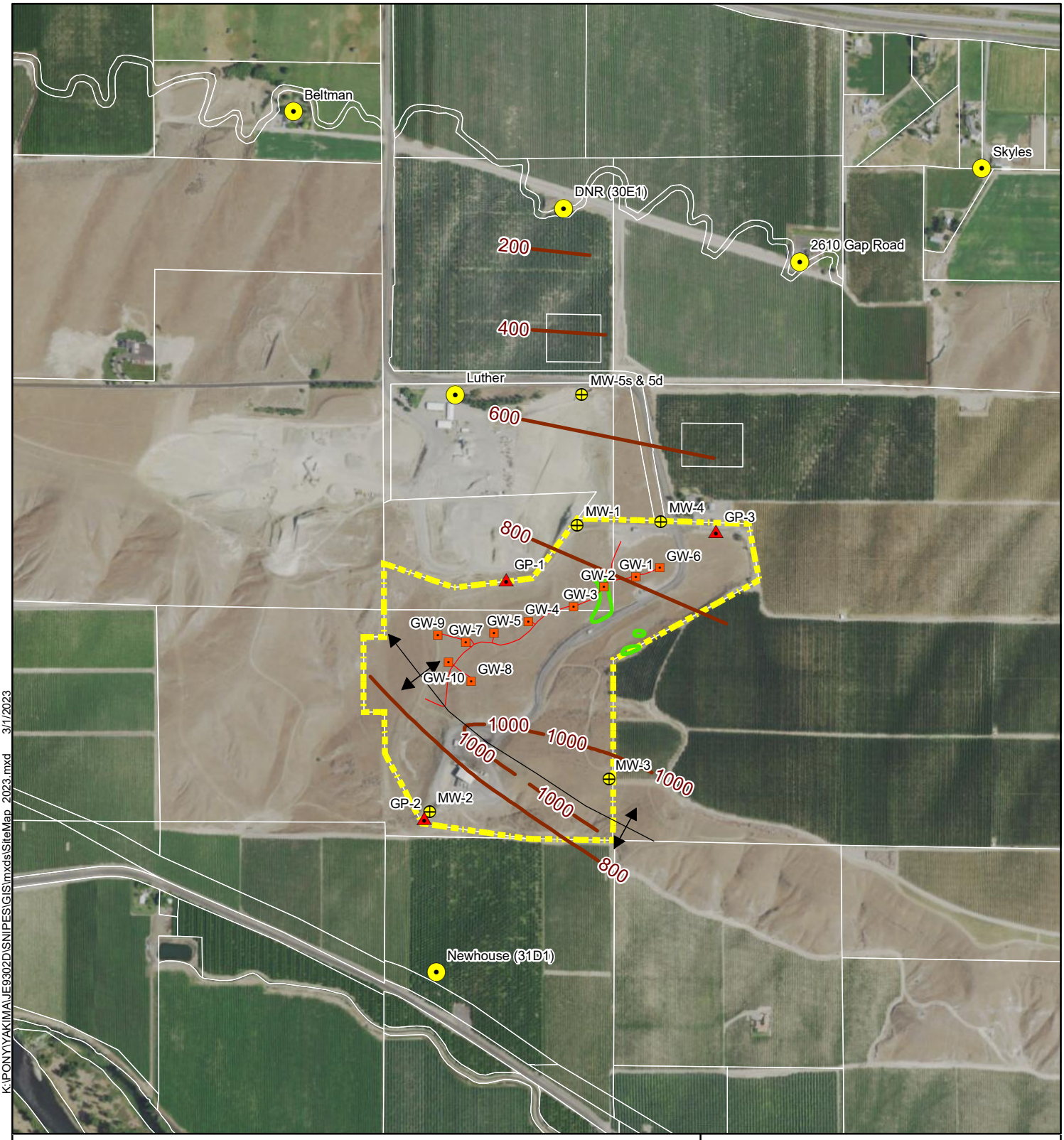



SMW-1 SMW-2 SMW-3
SMW-4 SMW-5s SMW-5d

Hollow data points indicate suspect measurements.

**Figure 1. Hydrographs**
Snipes Mountain Landfill (LVTS)

MOTT MACDONALD




Monitoring Well
Gas Well
Gas Probes & Gas Flair
Offsite Well

Elevation contour on top of Tem Geologic Unit; Dashed where removed.
Gas Extraction Piping
County Property Boundary
Former Septage Ponds (Approximate)

N
0 Feet 1,000
1 inch = 800 feet

Figure 1

Closed Snipes Mountain Landfill

Snipes Mountain Landfill, Yakima County

MOTT MACDONALD

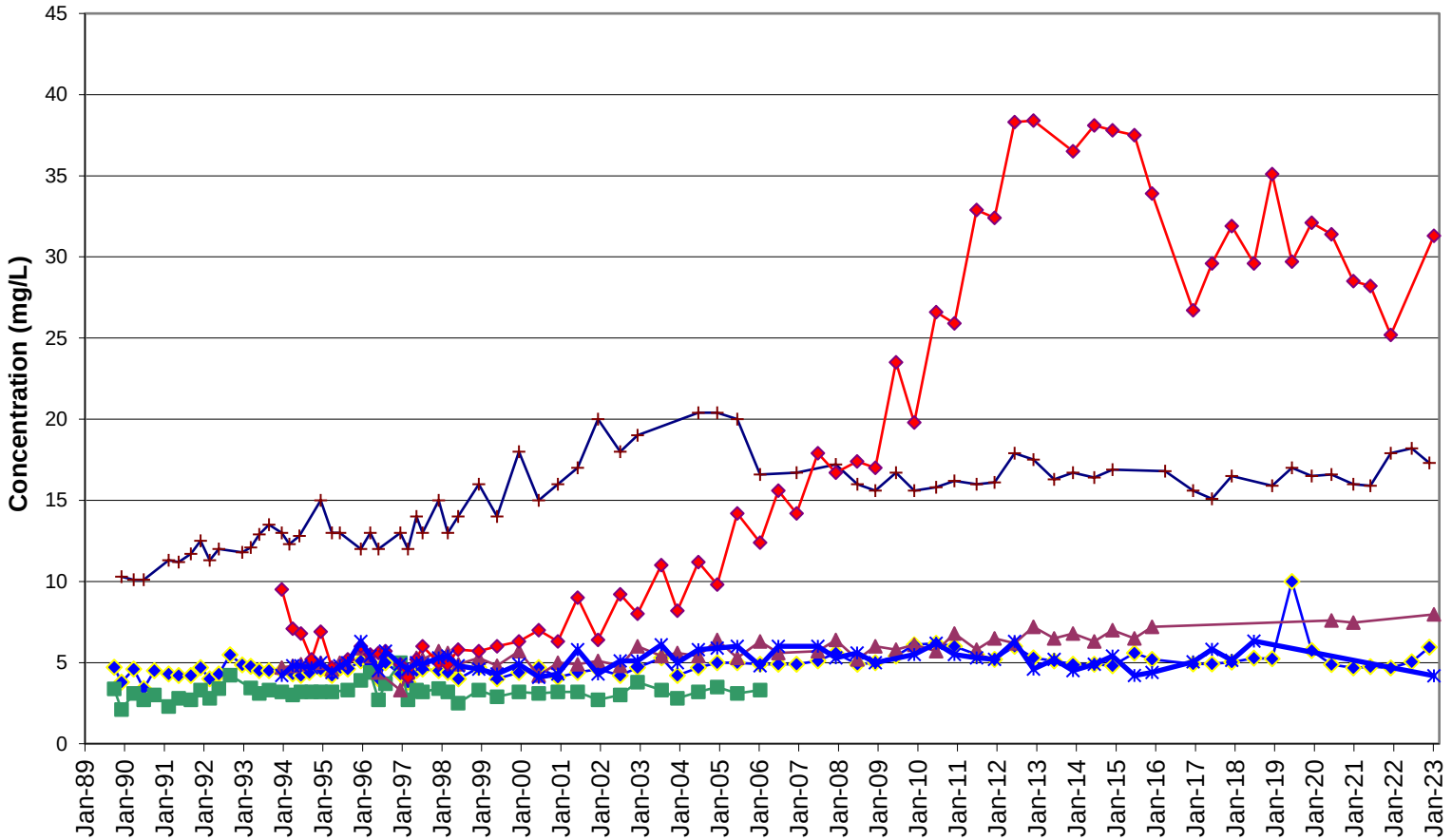



**Figure 4. Chloride Time Series Plot**
Snipes Mountain Landfill (LVTS)

MOTT MACDONALD

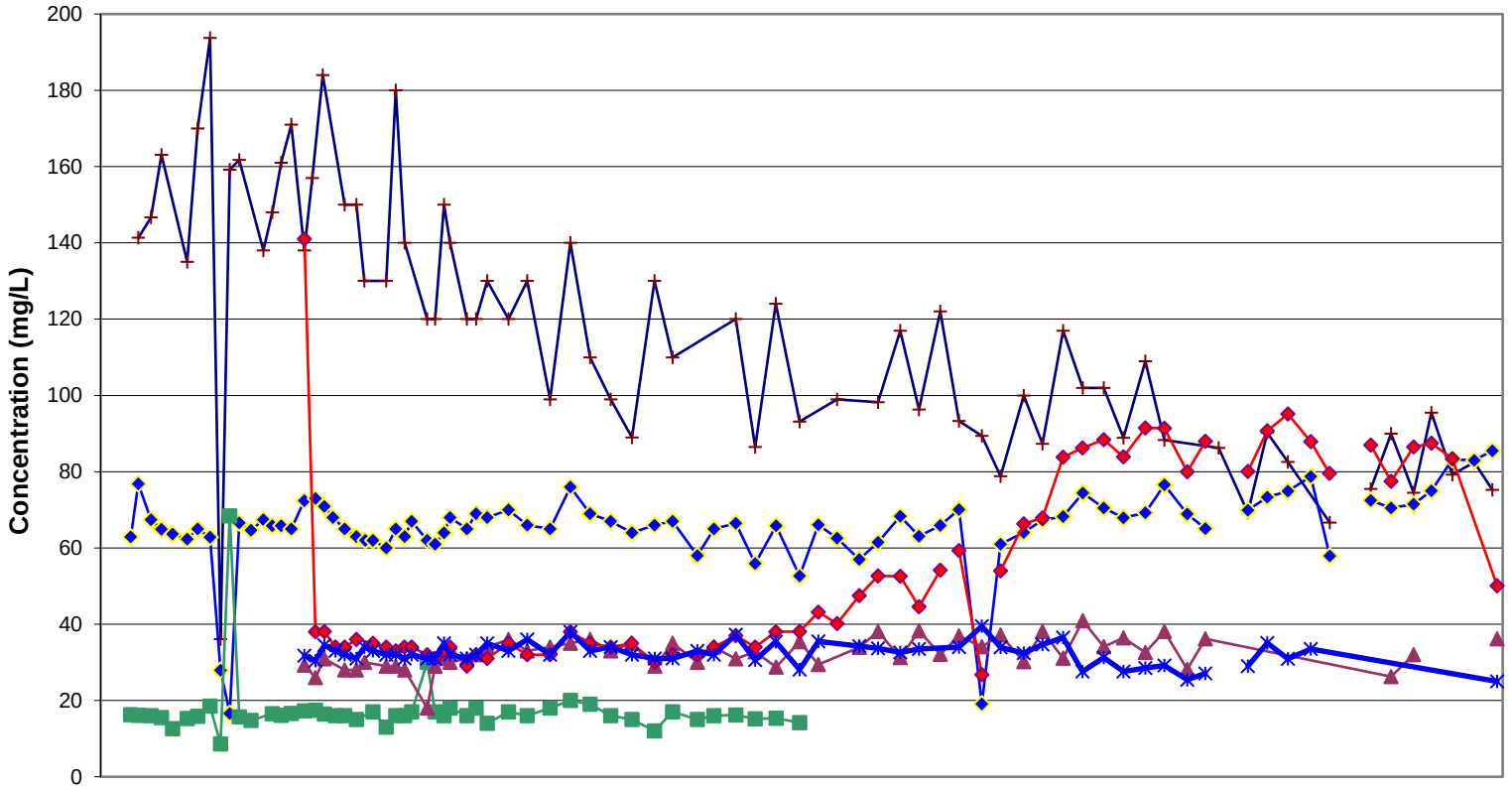
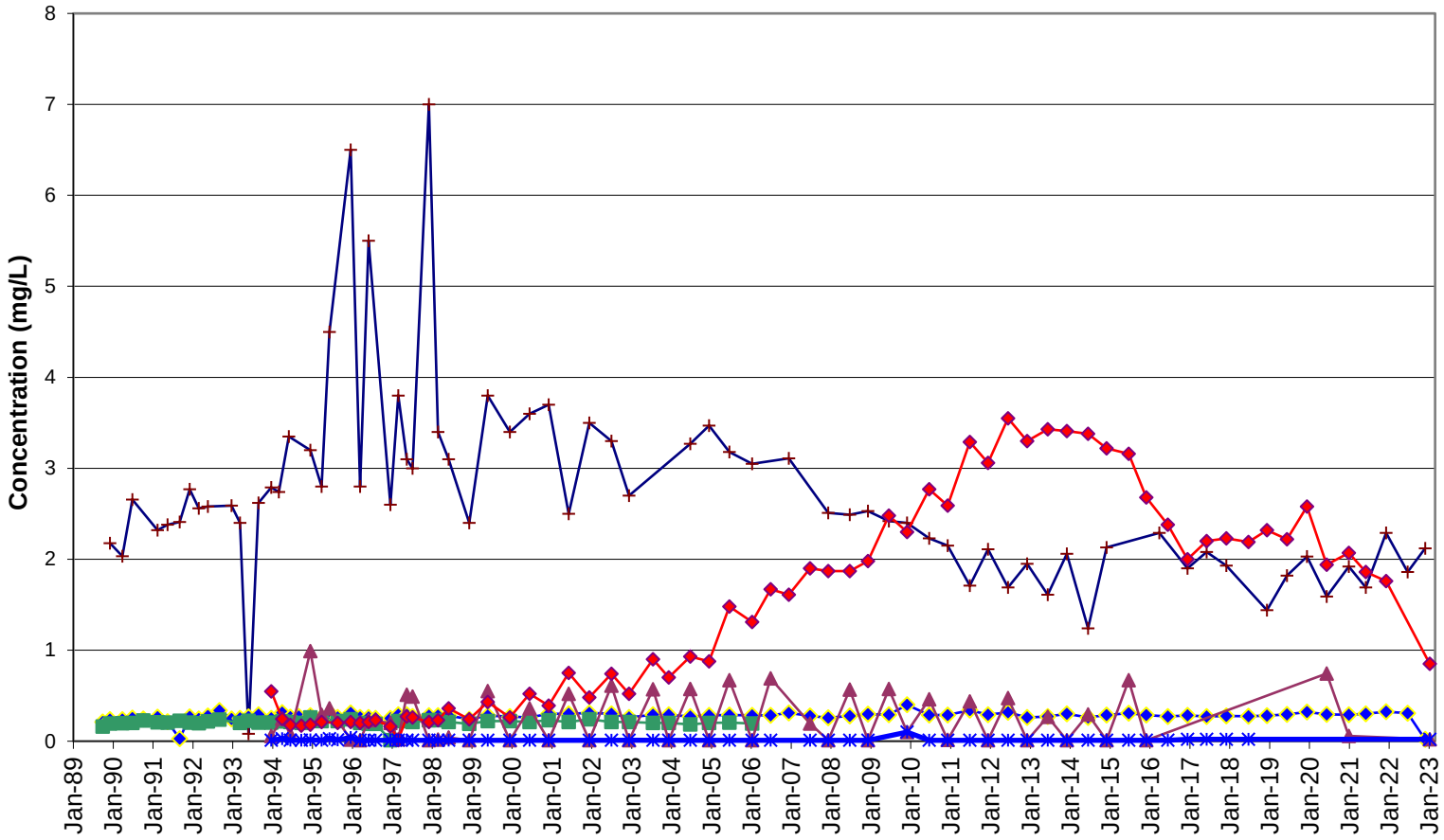



**Figure 5. Sulfate Time Series Plot**
Snipes Mountain Landfill (LVTS)

MOTT MACDONALD



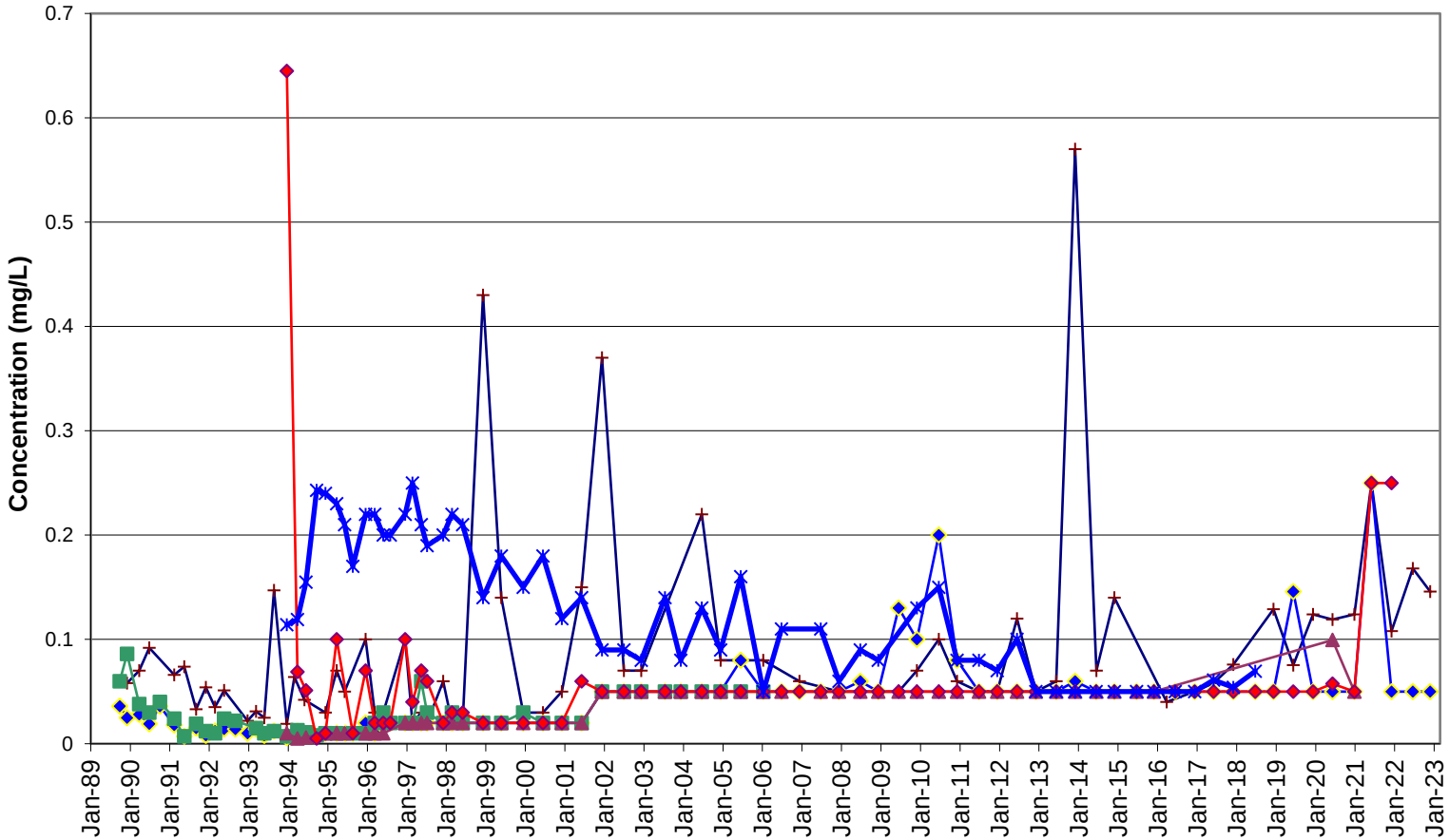

SMW-1 SMW-2 SMW-3

SMW-4 SMW-5S SMW-5D

Non-detects plotted at reporting limit

**Figure 6. Nitrate Time Series Plot**
Snipes Mountain Landfill (LVTS)

MOTT MACDONALD



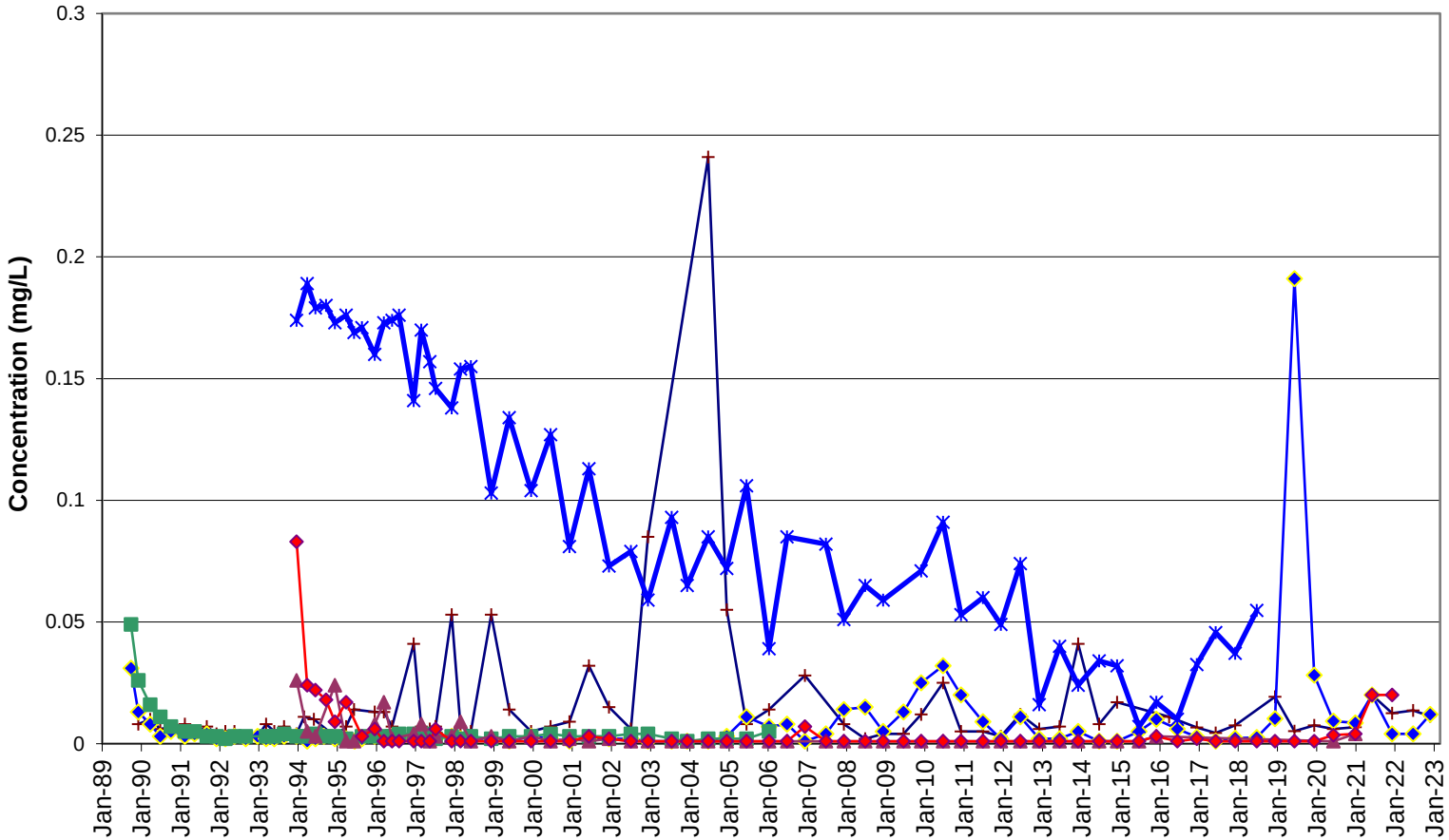

SMW-1 SMW-2 SMW-3

SMW-4 SMW-5S SMW-5D

Non-detects plotted at reporting limit

**Figure 7. Dissolved Iron Time Series Plot**
Snipes Mountain Landfill (LVTS)

MOTT MACDONALD



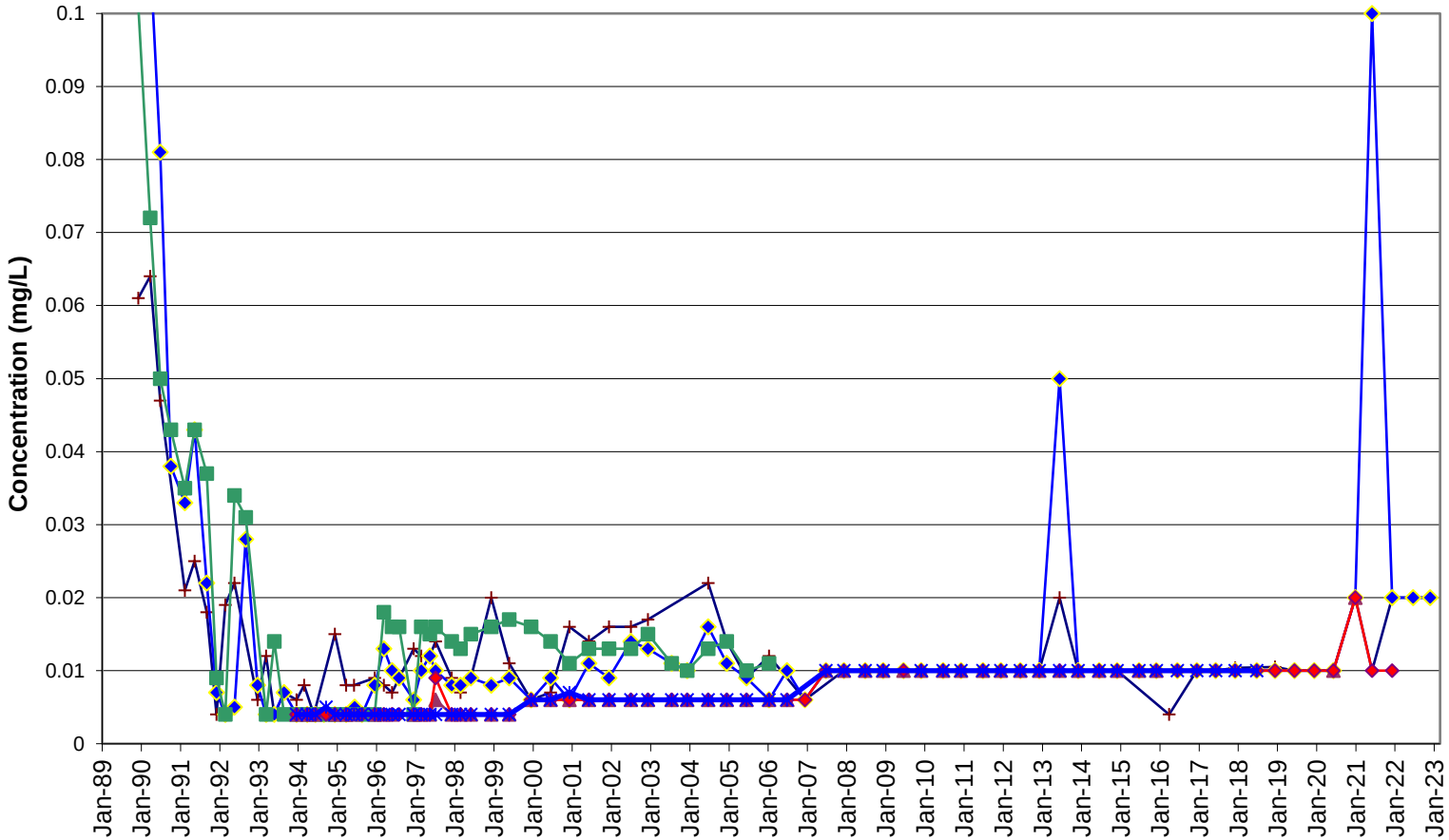

SMW-1 SMW-2 SMW-3

SMW-4 SMW-5S SMW-5D

Non-detects plotted at reporting limit

**Figure 8. Dissolved Manganese Time Series Plot**
Snipes Mountain Landfill (LVTS)

MOTT MACDONALD



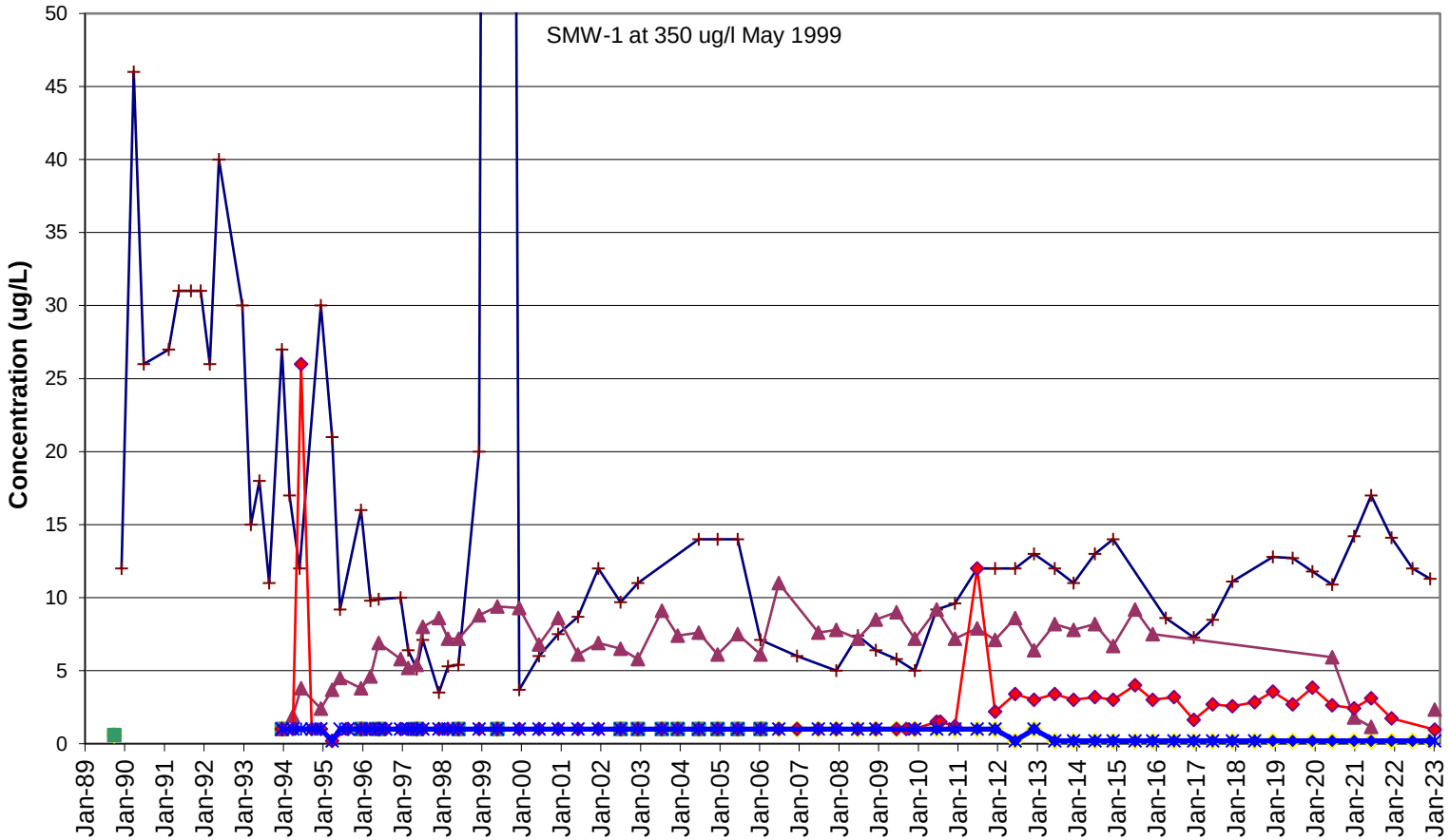

SMW-1 SMW-2 SMW-3

SMW-4 SMW-5S SMW-5D

Non-detects plotted at reporting limit

**Figure 9. Dissolved Zinc Time Series Plot**
Snipes Mountain Landfill (LVTS)

MOTT MACDONALD



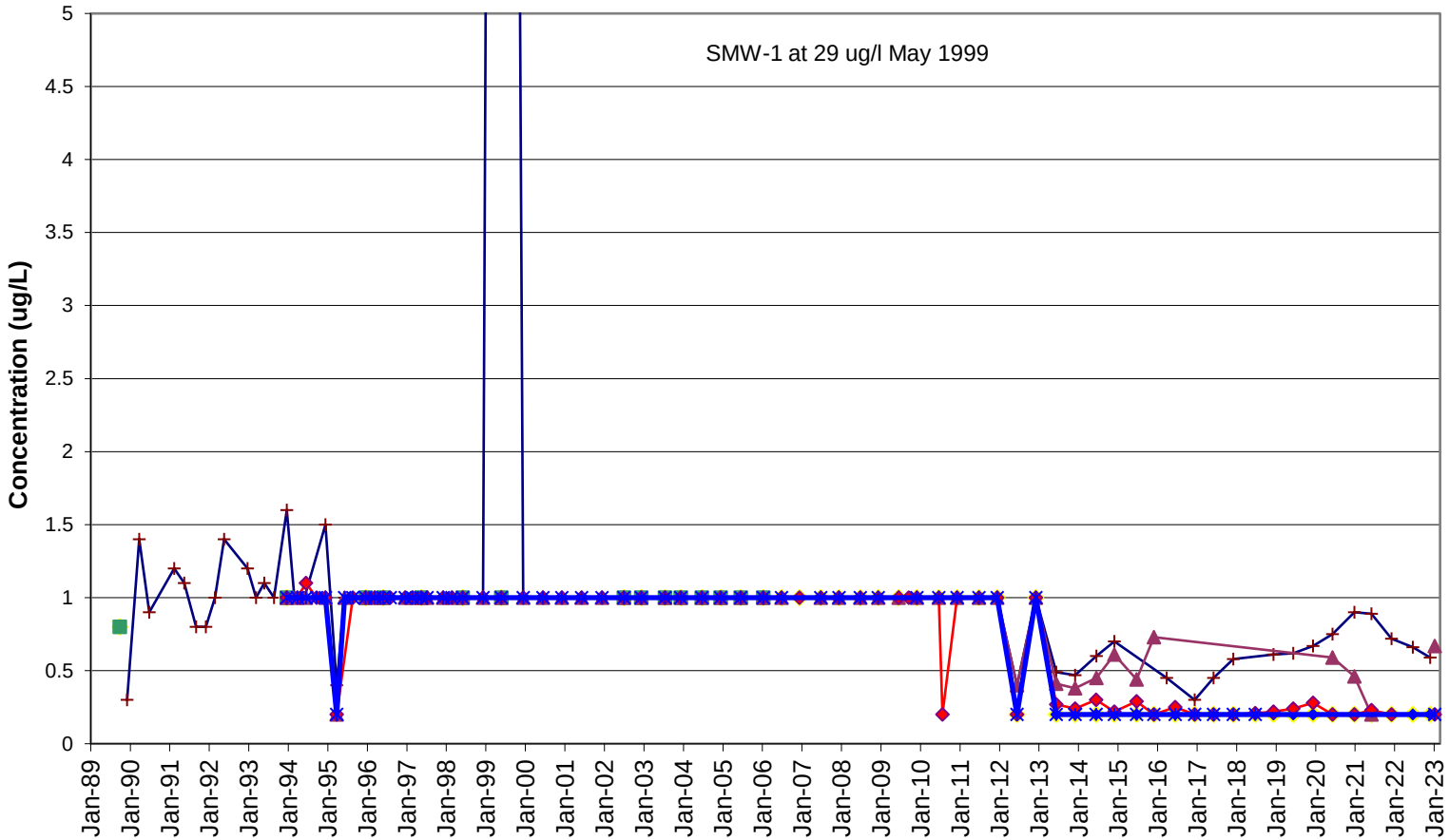

SMW-1 SMW-2 SMW-3

SMW-4 SMW-5S SMW-5D

Non-detects plotted at reporting limit

**Figure 10. Tetrachloroethene (PCE) Time Series Plot**
Snipes Mountain Landfill (LVTS)

MOTT MACDONALD




SMW-1 SMW-2 SMW-3

SMW-4 SMW-5S SMW-5D

Non-detects plotted at reporting limit

**Figure 11. Trichloroethene (TCE) Time Series Plot**
Snipes Mountain Landfill (LVTS)

MOTT MACDONALD