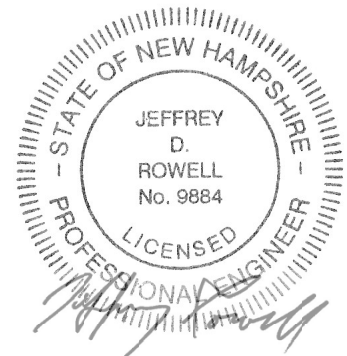


**DES Waste Management Division
29 Hazen Drive; PO Box 95
Concord, NH 03302-0095**

**ANNUAL SUMMARY REPORT
CALENDAR YEAR 2019
CROSS ROAD LANDFILL
EXETER, NEW HAMPSHIRE
NHDES SITE # 198401081
GROUNDWATER MANAGEMENT PERMIT #198401081-E-005
PROJECT NO. 978**

Prepared For:
Town of Exeter, New Hampshire
10 Front Street
Exeter, New Hampshire 03833
Contact Name: Ms. Jennifer Mates, P.E.
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GZA File No.: 04.0021270.31



Date of Report: January 31, 2020

Groundwater Monitoring Report Cover Sheet

Site Name: Cross Road Landfill and Stump Dump

Town: Exeter, New Hampshire

Permit #: GWP-198401081-E-005

Type of Submittal *(Check all that apply)*

- ☒ Periodic Summary Report (year): 2019
- ☐ Data Submittal *(per Condition #7 of Permit)*:
-

Check each box where the answer to any of the following questions is "YES"

Sampling Results

- ☐ During the most recent monitoring event, were any new compounds detected at any sampling point?

Well/Compound:

- ☐ Are there any detections of contamination in drinking water that is untreated prior to use?

Well/Compound:

- ☐ Do compounds detected exceed AGQS?

- ☐ Was free product detected for the first time in any monitoring point?

☐ Surface Water *(visible sheen)*

☐ Groundwater *(1/8" or greater thickness)*

Location/Thickness:

Contaminant Trends

- ☐ Do sampling results show an increasing concentration trend in any source area monitoring well?

Well/Compound:

- ☒ Do sampling results indicate an AGQS violation in any of the GMZ boundary wells?

Well/Compound: 1,4-Dioxane: RFW-3, GZ-102, GZ-106

Recommendations

- ☐ Does the report include any recommendations requiring DES action? *(Do not check this box if the only recommendation is to continue with existing permit conditions.)*

This form is to be completed for groundwater monitoring data submittals and periodic summary reports submitted to the New Hampshire Department of Environmental Services Waste Management Division.



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January 31, 2020
File No. 04.0021270.31

Groundwater Management Permit Coordinator
New Hampshire Department of Environmental Services
Waste Management Division
29 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302-0095

Re: Annual Summary Report Year 2019
Cross Road Landfill
Exeter, New Hampshire
Groundwater Management Permit No. GWP-198401081-E-005

Dear Permit Coordinator:

On behalf of the Town of Exeter (Town), GZA GeoEnvironmental, Inc. (GZA) is pleased to provide the New Hampshire Department of Environmental Services (NHDES) this report summarizing water quality monitoring at the Cross Road Landfill (Landfill; Site) in Exeter, New Hampshire during calendar year 2019. This report has been submitted to fulfill the requirement of an Annual Summary Report for the Landfill for calendar year 2019, as required by Condition No. 7 of the Groundwater Management Permit (Permit; GWP-198401081-E-005) issued on February 26, 2019.

This report includes GZA's conclusions and recommendations regarding the Landfill water quality monitoring completed in accordance with the Permit and includes the analytical laboratory reports from the November 2019 sampling round. The analytical laboratory reports from the April 2019 sampling were submitted to NHDES in GZA's data transmittal¹ dated June 5, 2019. GZA's work and this report are subject to the attached **Limitations**.

The following are attached:

- **Table 1** - summarizing the results of analytical laboratory analyses and field screening measurements associated with the Landfill from May 1992 through 2019;
- **Table 2** - summarizing recent and historical surface water and groundwater level elevation data;
- **Table 3** - summarizing the results of the per- and polyfluoroalkyl substances (PFAS) analyses associated with groundwater samples collected during April and November 2018;

¹ April 2019 Data Transmittal, Cross Road Landfill, Exeter, New Hampshire, prepared by GZA dated June 5, 2019.



- **Table 4** - summarizing the results of the recent stream flow gauging and water quality monitoring associated with metals loading evaluations to the Exeter River;
- **Plots 1A through 5D** - illustrating primary indicator water quality parameter concentration data;
- **Figure 1** - depicting Landfill and vicinity features including water quality and level monitoring locations;
- **Figure 2** - summarizing selected recent Landfill water quality data and depicting GZA's estimated groundwater hydraulic head contours and inferred direction of groundwater flow for the Landfill; and
- **Figure 3** - depicting an overburden hydrogeologic cross-section from the Landfill to the Exeter River.

The following sections summarize recent work performed, results, water quality trends, and GZA's conclusions and recommendations.

WORK PERFORMED

PERMIT-RELATED LANDFILL WATER QUALITY MONITORING

In accordance with Condition No. 7 of the Permit, water quality monitoring during the reporting period included sampling in April and November at the following sampling locations depicted on **Figure 1**:

- Twelve groundwater monitoring wells (RFW-2, RFW-3, RFW-4, GMW-11RR, GZ-1L, GZ-2L, GZ-3L, GZ-102, GZ-104, GZ-106, GZ-201 and GZ-202A);
- Two piezometers (P-9R [a.k.a., SW-P-9, P-9, and north spring], and P-2R [a.k.a., south spring, November monitoring round only]); and
- Four surface water sampling locations (SW-13, SW-15, SW-16, and SW-17 [groundwater seep located proximate to the Exeter River]).

Due to low groundwater levels at monitoring well GMW-11, a replacement well (GMW-11RR) was installed during August of 2019, adjacent to GMW-11 and screened within the observed water table. A groundwater quality sample was collected from the replacement well during the November 2019 sampling round.

Water quality monitoring has historically included volatile organic compounds (VOCs), arsenic, barium, cadmium, chloride, chromium, iron, lead, mercury, manganese, nitrate, total kjeldahl nitrogen (TKN), selenium, silver, and thallium. Sampling frequencies for individual water quality parameters and locations have been modified over time, based on monitoring results.

As required by the Permit (GWP-198401081-E-005), current water quality monitoring includes sample collection and analyses for specific conductance, pH, chloride, nitrate, TKN, iron, manganese, arsenic, and 1,4-Dioxane biannually during November and April. Per the Permit, VOC and drinking water metals sampling is also included at certain locations during the 2019 and 2022 rounds. Per- and Polyfluoroalkyl Substances (PFAS) is also included at certain locations during the November 2020 and 2022 sampling rounds.

With the exception of wells GZ-1L, GZ-2L, and GZ-3L, each of the Permit-related Landfill groundwater quality monitoring wells and piezometers are screened within overburden. Consistent with the Permit and standard NHDES requirements, overburden groundwater and groundwater seep samples collected for analytical laboratory analysis of metals concentrations are field-filtered, and the data represent dissolved concentrations. Surface water and bedrock





seep during May and September are 33 and 28 gallons per minute (gpm), respectively. The calculated estimates of the volumetric flow rate of water in the Exeter River prior to the confluence of the seep discharge during May and September are 35,628 and 14,966 gpm, respectively. Volumetric flow rate was calculated based on the measured velocity of the water and the cross section of the stream channel.

The tables below summarize the detected metals concentrations during the two sampling rounds, associated flow rates, and the concentration change in the River before and after the Seep.

May 2019

Sample Location	Dissolved Iron (µg/L)	Total Iron (µg/L)	Dissolved Manganese (µg/L)	Total Manganese (µg/L)	Dissolved Arsenic (µg/L)	Total Arsenic (µg/L)	Flow (gpm)
WQTS/SMCL Standard	300		50		0.018		--
Upstream	315	772	130	152	<5.0	1.2	35,628
Seep	876	1,150	1,460	1,510	11.0	14.8	33
Downstream	434	672	142	145	<5.0	1.3	--
Stream Concentration Change	+119	-100	+12	-7	--	+0.1	--

Note:

µg/L - micrograms per liter

September 2019

Sample Location	Dissolved Iron (µg/L)	Total Iron (µg/L)	Dissolved Manganese (µg/L)	Total Manganese (µg/L)	Dissolved Arsenic (µg/L)	Total Arsenic (µg/L)	Flow (gpm)
WQTS Standard	300		50		0.018		--
Upstream	290	420	58	95	<1.0	1.0	14,966
Seep	730	1,200	2,000	2,100	12.0	14.0	28
Downstream	290	460	90	120	1.1	1.5	--
Stream Concentration Change	0	+40	+32	+25	+0.1	+0.5	--

Total iron, arsenic, and manganese concentrations were compared to the Water Quality for Toxic Substances (WQTS) surface water standards for human protection due to water and fish ingestion listed in the New Hampshire Code of Administrative Rules Chapter Env-Wq 1700. Standards for the iron, arsenic, and manganese are 300 µg/L, 0.018 µg/L, and 50 µg/L, respectively. Bolded concentrations shown above indicate the concentration exceeds its WQTS. All of the detected concentrations of total metals for each of the three total metals (i.e., Fe, Mn, and As) exceeds its respective WQTS for the samples collected at each of the three sampling locations for both sampling rounds.





Limitations



Tables

TABLE 1
WATER QUALITY DATA SUMMARY
Cross Road Landfill - Exeter, New Hampshire
NHDES No. 198401081

Arsenic (mg/L)

WQCTS (Water and Fish Ingestion) = 0.000018 mg/L

Sampling Date	Overburden Monitoring Wells																	Bedrock Monitoring and Residential Wells				Groundwater Seep Monitoring Stations			Surface Water Monitoring Stations												Leachate Monitoring Well	
	RFW-1	RFW-2	RFW-3	RFW-4	GZ-1U	GZ-2	GZ-3	GZ-4	GZ-5	GZ-6	GZWP-1	GZ-102	GZ-104	GZ-106	GZ-201	GZ-202A	GMW-11RR	GZ-1L	GZ-2L	GZ-3L	Giancola Residence	SW-P-2 (P-2/1P-2R Southern Spring)	GZ-P-SR	SW-P-9 (P-9/1P-9R Northern Spring)	SW-1	SW-5	SW-10	SW-11	SW-12	SW-13	SW-15	SW-16	SW-17	Exeter River	MW-6			
11/2/2016	-	0.007	0.015	0.09	-	-	-	-	-	-	-	-	0.160	-	<0.001	0.15	-	0.005	0.003	0.006	-	-	-	0.055	-	-	-	-	-	-	-	-	0.004	-	-			
4/24/2017	-	0.002	0.024	0.14	-	-	-	-	-	-	-	-	0.097	-	0.19	0.002	-	0.004	0.004	0.006	-	-	-	0.022	-	-	-	-	-	-	-	-	0.093	-	-			
11/7/2017	-	<0.001	0.038	0.13	-	-	-	-	-	-	-	-	0.160	-	0.009	0.14	-	0.003	0.004	0.007	-	0.053	-	0.23	-	-	-	-	-	0.027	-	-	0.004	-	-			
4/25/2018	-	<0.001	0.017	0.14	-	-	-	-	-	-	-	-	0.10	-	<0.001	0.086	-	0.002	0.005	0.009	-	-	-	0.030	-	-	-	-	-	-	-	-	0.016	-	-			
11/12/2018	-	<0.001	0.014	0.14	-	-	-	-	-	-	-	-	0.13	-	0.0017	0.15	-	0.0051	0.0071	0.0062	-	0.0081	-	0.038	-	-	-	-	-	-	-	-	0.047	-	-			
4/24/2019	-	0.0017	0.018	0.12	-	-	-	-	-	-	-	-	0.014	-	0.0030	0.19	-	0.0051	0.0014	0.0076	-	-	-	0.065	-	-	-	-	-	-	-	-	0.0018	-	-			
11/4/2019	-	<0.001	0.011	0.11								<0.001	0.075	<0.001	<0.00																							

TABLE

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