Municipality of Calvin - 2022/2023 Landfill Monitoring Results

Presentation to Council on April 9, 2024

Knight Piésold CONSULTING

Adding value. Delivering results.

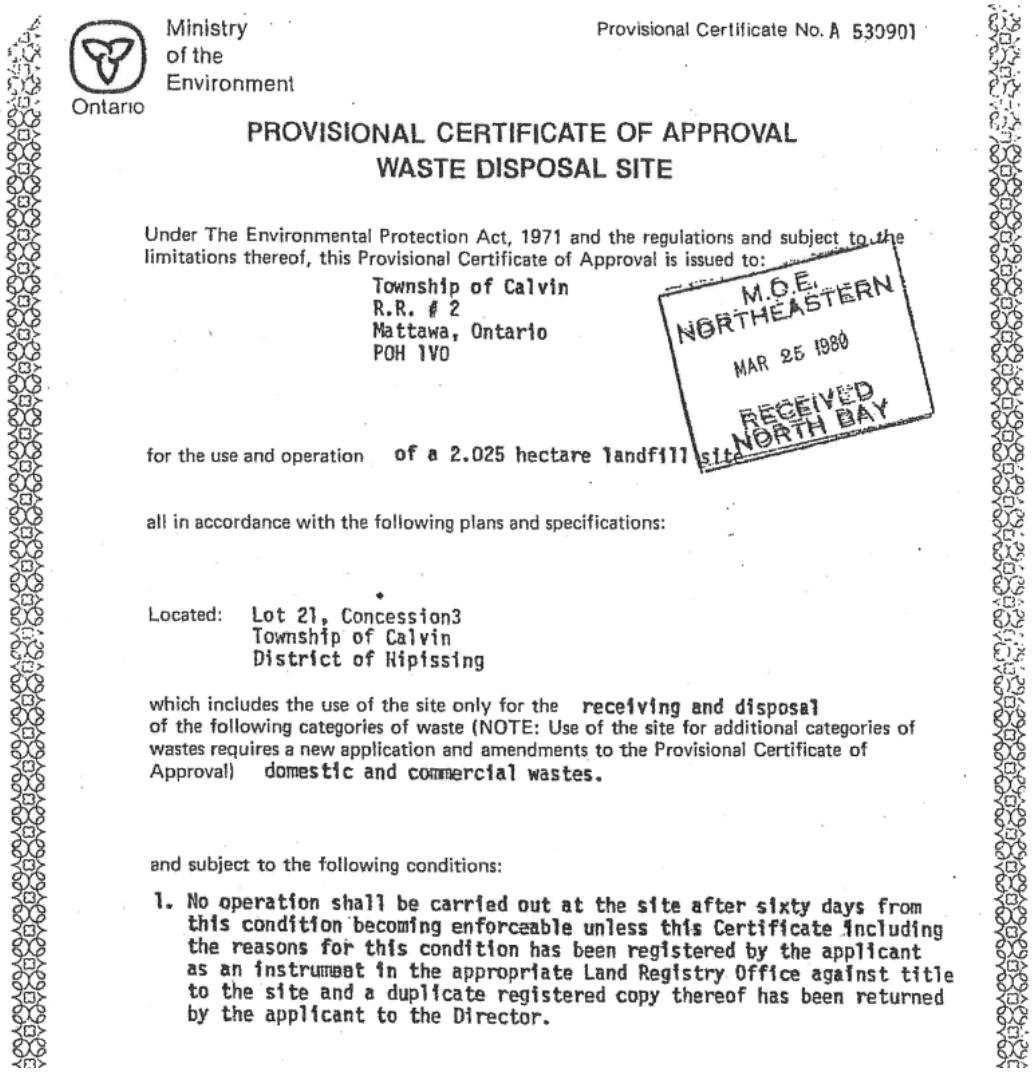
Outline

- Brief Project Background
- Description of the Landfill Monitoring Program
- 2022/2023 Water Quality Results
- Recommendations for 2024

Calvin Landfill - 2022/2023 Monitoring Results

Brief Project Background

- Landfilling is permitted through the Certificate of Approval (C of A) with the MOE. Permit Number A530901.
- Permit allows for the use and operation of a 2.025-hectare landfill site.
- Permits the landfilling of domestic and commercial wastes.
- Permit falls under the Environmental Protection Act (EPA), 1971.



Ontario Ministry of the Environment

Provisional Certificate No. A 530901

PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE

Under The Environmental Protection Act, 1971 and the regulations and subject to the limitations thereof, this Provisional Certificate of Approval is issued to:

Township of Calvin
R.R. # 2
Mattawa, Ontario
P0H 1V0

M.O.E. NORTHEASTERN
MAR 25 1980
RECEIVED NORTH BAY

for the use and operation of a 2.025 hectare landfill site

all in accordance with the following plans and specifications:

Located: Lot 21, Concession3
Township of Calvin
District of Nipissing

which includes the use of the site only for the receiving and disposal of the following categories of waste (NOTE: Use of the site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval) domestic and commercial wastes.

and subject to the following conditions:

1. No operation shall be carried out at the site after sixty days from this condition becoming enforceable unless this Certificate including the reasons for this condition has been registered by the applicant as an instrument in the appropriate Land Registry Office against title to the site and a duplicate registered copy thereof has been returned by the applicant to the Director.

Calvin Landfill - 2022/2023 Monitoring Results

Brief Project Background

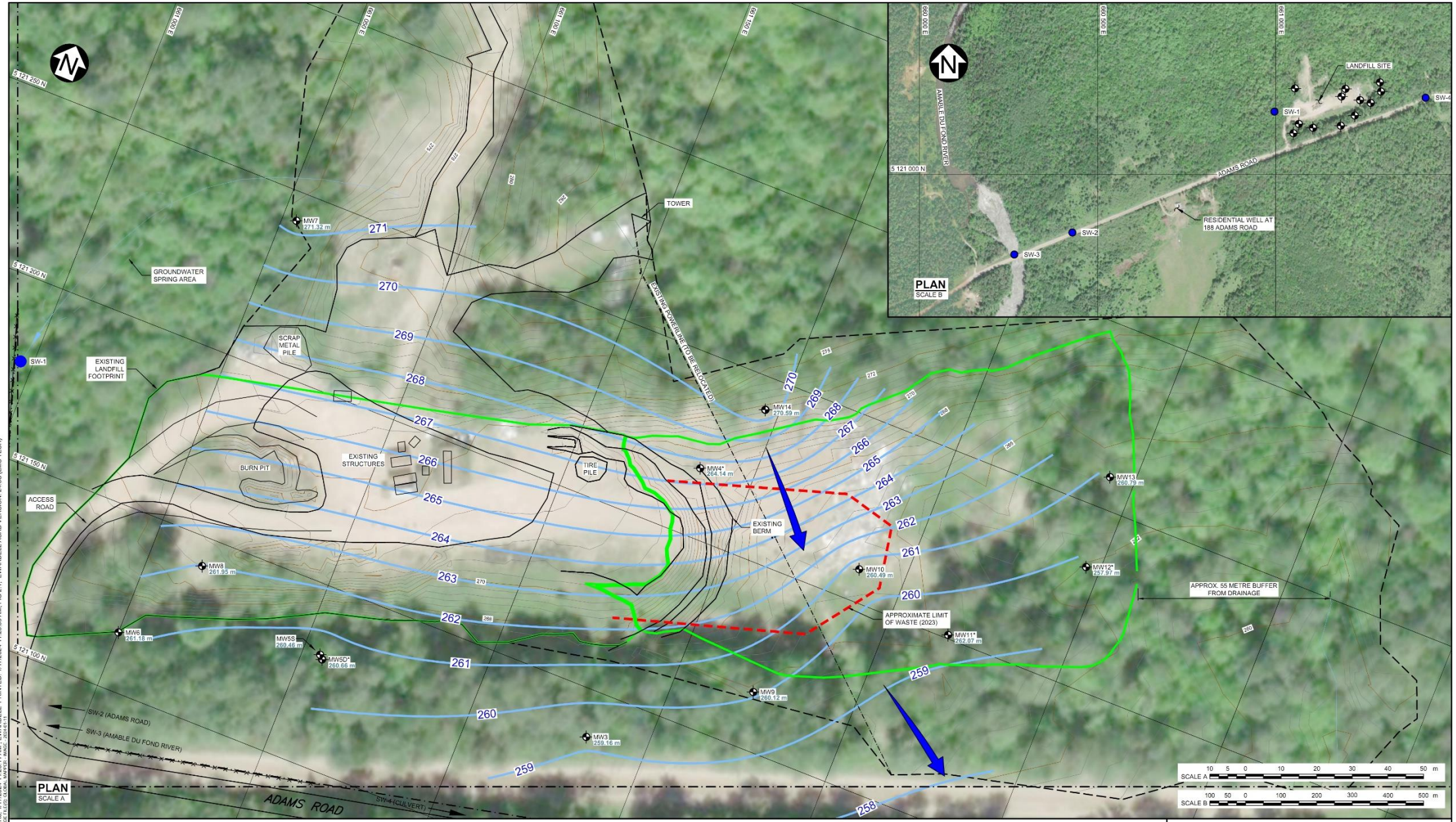
- Knight Piésold Ltd. (KP) was first retained by the Township of Calvin in 2005 to prepare the 2005 Landfill Monitoring Report.
- Since 2005, KP has been involved in annual environmental reporting, capacity assessments and landfill liability costing.
- KP is an environmental and engineering consulting firm located on Devonshire Ave. (off O'Brien Street) in North Bay. We are a group of approximately 50 scientists and engineers.
- KP completes a similar scope of work for several other landfills in the area (Chisholm, Powassan, Machar, East Ferris, previously Bonfield, Cochrane)

Calvin Landfill - 2022/2023 Monitoring Results

Landfill Monitoring Program

The Landfill Monitoring Program consists of the following:

- Monitoring water quality (groundwater and surface water) and methane gas concentrations at the landfill twice per year (spring and fall).
- Monitoring results are presented in an annual report every two years.
- Groundwater quality is collected from 13 groundwater monitoring wells located at specific locations throughout the property. Occasionally a domestic residential water sample is collected from the 188 Adams Road property (when available).
- Surface water sampling occurs at four surface water sampling locations near the landfill.



NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 17.
2. CONTOUR INTERVAL IS 0.5 METRES.
3. TOPOGRAPHICAL SURVEYS PROVIDED BY TALBOT SURVEYS INC. (2005, 2006, 2008).
4. ASTERISK INDICATES GROUNDWATER ELEVATION WAS NOT USED FOR CONTOURING.
5. IMAGERY OBTAINED FROM GLOBAL MAPPER, (JANUARY 11, 2024).

LEGEND:

- LANDFILLING EXTENTS
- PROPERTY LINE
- FENCE
- APPROXIMATE LIMITS OF WASTE (2023)
- POWERLINE
- GROUNDWATER ELEVATION CONTOUR
- SW1 SURFACE WATER SAMPLE LOCATION
- MONITORING WELL LOCATION
- 260 m GROUNDWATER ELEVATION (SPRING 2023)
- DIRECTION OF GROUNDWATER FLOW (APPROXIMATE)

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	17JAN'24	ISSUED WITH REPORT	MSA	EDW	SBF

MUNICIPALITY OF CALVIN

MUNICIPALITY OF CALVIN LANDFILL SITE

SITE PLAN
WITH MONITORING WELL LOCATIONS

Knight Piésold CONSULTING

P/A NO. NB102-192/15 | REF NO. 1

FIGURE 2.1 | REV 0

SAVED: I:\1\02\00\192\15\A\Acad\FIGS\BG01 R0, 1/17/2024 11:23:11 AM , EWARDELL PRINTED: 1/17/2024 11:23:55 AM, FIG 2.1, EWARDELL ACAD VERSION: 24.3S (LMS TECH)
XREF FILES: X-C-SITE_INFO_IMAG - 2024-01-11 - DW_IMAGE FILE(S): GLOBAL MAPPER IMAGE - 2024-01-11

Calvin Landfill - 2022/2023 Monitoring Results

2022/2023 Water Quality Results

The following are the main water quality results from the 2022/2023 Report

- Groundwater
  - There were no instances of health-related groundwater quality exceedances in monitoring wells downgradient of the Landfill in 2022 and 2023.
  - Elevated concentrations of chloride, sulphate, TDS, manganese, and nitrates at several downgradient monitoring wells, relative to background water quality. Levels are largely below reasonable use guidelines and Ontario Drinking Water Standards (O.Reg 169/03).
  - Nitrate levels continue to show a declining trend (historically high in 2017-2019).
- Surface Water
  - Sampling locations were largely dry, and when sampled successfully, the water quality results are largely similar to background results.

Example Results Format

TABLE 3.2

MUNICIPALITY OF CALVIN
MUNICIPALITY OF CALVIN LANDFILL SITE

2022/2023 LANDFILL MONITORING REPORT
SUMMARY OF 2022/2023 GROUNDWATER QUALITY RESULTS

Print Jan-16-24 14:53:47

Parameter	RL	ODWS (Cr)	Standard or Objective (x = 0.5 for AO/OG parameters, and 0.25 for MAC)	MW7				Spring 2022	Fall 2022	Spring 2023	Fall 2023
				11-May-22	6-Oct-22	16-May-23	14-Nov-23	Reasonable Use Guideline (Cm)			
Location		-	-	Background (Cb)				Cm = Cb + x(Cr-Cb)			
In Situ Parameters											
Conductivity (mS/cm)	-	-	-	0.108	0.213	0.054	0.253	-	-	-	-
Depth to Water (below top of PVC) m	-	-	-	2.32	2.86	2.185	2.615	-	-	-	-
Oxygen Dissolved (mg/L)	-	-	-	14.98	6.44	6.46	10.61	-	-	-	-
pH	-	6.5 to 8.5	OG	**6.19**	**5.65**	7.58	**6.41**	6.3 - 7.3	6.1 - 7.1	7.0 - 8.0	6.5 - 7.5
Temperature °C	-	15	AO	8.83	11.06	4.39	8	11.915	13.03	9.695	11.5
Physical Tests											
Alkalinity (Total as CaCO3)	2	30 to 500	OG	36	73	30	**74**	33.0 - 268.0	51.5 - 286.5	30.0 - 265.0	187.0 - 287.0
Chemical Oxygen Demand	8	-	-	21	13	18	19	-	-	-	-
Conductivity µS/cm	2	-	-	-	203	122	228	-	-	-	-
Hardness as CaCO3	0.05	80 to 100	OG	**38.6**	86.7	**41.2**	85.2	59.3 - 69.3	83.4 - 93.4	60.6 - 70.6	82.6 - 92.6
pH	0.05	6.5 to 8.5	OG	6.69	**6.43**	**6.28**	6.64	6.6 - 7.6	6.5 - 7.5	6.4 - 7.4	6.6 - 7.6
Total Dissolved Solids	3	500	AO	69	211	107	183	284.5	355.5	303.5	341.5
Total Suspended Solids	2	-	-	821	3630	1220	2900	-	-	-	-
Anions											
Chloride	1	250	AO	7	9	6	6	128.5	129.5	128	128
Sulphate	1 to 2	500	AO	17	31	15	37	258.5	265.5	257.5	268.5
Nutrients											
Ammonia (Total)	0.1	-	-	<0.1	<0.1	<0.1	<0.1	-	-	-	-
Nitrate (as N)	0.06	10	MAC	0.53	0.91	1.12	0.38	5.265	5.455	5.56	5.19
Nitrite (as N)	0.03	1	MAC	<0.03	<0.03	<0.03	<0.03	0.515	0.515	0.515	0.515
Nitrogen Kjeldahl (Total)	0.5	-	-	<0.5	<0.5	<0.5	0.6	-	-	-	-
Dissolved Metals											
Aluminum (Dissolved)	0.001	0.1	OG	**0.174**	**0.202**	0.044	0.008	0.137	0.151	0.072	0.054
Antimony (Dissolved)	0.0002 to 0.0009	0.006	IMAC	<0.0009	<0.0009	<0.0009	<0.0009	0.003	0.003	0.003	0.003
Arsenic (Dissolved)	0.0002	0.01	IMAC	<0.0002	0.0003	<0.0002	<0.0002	0.005	0.00515	0.005	0.005
Barium (Dissolved)	2E-005 to 8E-005	1	MAC	0.0139	0.0529	0.0103	0.0512	0.507	0.526	0.505	0.526
Beryllium (Dissolved)	7E-006	-	-	0.000027	0.00017	0.000017	0.000044	-	-	-	-
Bismuth (Dissolved)	7E-006 to 1E-005	-	-	<0.00001	0.00004	<0.00001	<0.00001	-	-	-	-
Boron (Dissolved)	0.002	5	IMAC	0.028	0.033	0.008	0.018	2.51	2.52	2.50	2.51
Cadmium (Dissolved)	3E-006	0.005	MAC	<0.000003	0.0001	0.000011	0.000034	0.0025	0.00255	0.0025055	0.002517
Calcium (Dissolved)	0.01	-	-	6.1	19.2	6.11	17.9	-	-	-	-
Chromium (Dissolved)	3E-005 to 8E-005	0.05	MAC	0.00066	<0.00008	0.0003	0.0001	0.02533	0.025	0.02515	0.02505
Cobalt (Dissolved)	4E-006	-	-	0.000166	0.00311	0.000107	0.000894	-	-	-	-
Copper (Dissolved)	2E-005 to 0.0002	1	AO	0.0013	0.0177	0.0013	0.0014	0.50065	0.50885	0.50065	0.5007
Iron (Dissolved)	0.007	0.3	AO	0.139	**2.73**	0.023	0.007	0.2195	1.515	0.1615	0.1535
Lead (Dissolved)	1E-005 to 9E-005	0.01	MAC	0.0001	0.00137	<0.00009	<0.00009	0.00505	0.005685	0.005	0.005
Lithium (Dissolved)	0.0001	-	-	0.0084	0.0154	0.0081	0.0107	-	-	-	-
Magnesium (Dissolved)	0.00100	-	-	5.69	9.4	6.29	9.86	-	-	-	-
Manganese (Dissolved)	1E-005	0.05	AO	0.02	**0.13**	0.01	**0.12**	0.04	0.09	0.03	0.09
Mercury (Dissolved)	1E-005	0.001	MAC	-	<0.00001	0.00002	0.00003	-	0.0005	0.00051	0.000515
Molybdenum (Dissolved)	1E-005 to 4E-005	-	-	0.00008	0.00037	0.00006	0.00008	-	-	-	-
Nickel (Dissolved)	0.0001	-	-	0.0019	0.03	0.0014	0.0074	-	-	-	-
Phosphorus (Metal) Dissolved	0.003	-	-	0.034	<0.003	0.006	<0.003	-	-	-	-
Potassium (Dissolved)	0.003 to 0.009	-	-	0.926	1.36	0.677	1.3	-	-	-	-
Selenium (Dissolved)	4E-005	0.05	MAC	0.00005	0.00027	0.00005	0.00016	0.025025	0.025135	0.025025	0.02508
Silicon (Dissolved)	0.02	-	-	10.9	14.8	8.84	13.2	-	-	-	-
Silver (Dissolved)	2E-006 to 5E-005	-	-	<0.00005	<0.00005	<0.00005	<0.00005	-	-	-	-
Sodium (Dissolved)	0.01000	200	AO	7.32	8.12	7.55	8.16	103.66	104.06	103.775	104.08
Strontium (Dissolved)	2E-005 to 8E-005	-	-	0.0561	0.200	0.0492	0.180	-	-	-	-
Thallium (Dissolved)	5E-006	-	-	0.000008	0.00005	0.00001	0.000013	-	-	-	-
Tin (Dissolved)	1E-005 to 6E-005	-	-	<0.00006	0.00026	0.00014	<0.00006	-	-	-	-
Titanium (Dissolved)	5E-005 to 7E-005	-	-	0.0076	0.00042	0.001	<0.00007	-	-	-	-
Uranium (Dissolved)	2E-006	0.02	-	0.00006	0.00089	0.00005	0.00015	0.01003	0.01045	0.01002	0.01008
Vanadium (Dissolved)	1E-005	-	-	0.00104	0.00053	0.00094	0.00045	-	-	-	-
Zinc (Dissolved)	0.00200	5	-	<0.002	0.008	<0.002	0.003	2.501	2.504	2.501	2.5015
Zirconium (Dissolved)	0.002	-	AO	<0.002	<0.002	<0.002	<0.002	-	-	-	-
Organics											
Carbon Organic (Dissolved)	1	5	AO	**6**	**8**	**7**	**6**	5.5	6.5	6	5.5
Phenols	0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	-
Volatile Organics											
1/4-Dichlorobenzene	0.005	0.005		-	-	-	-	-	-	-	-
Acetone	0.03	-	-	-	-	-	-	-	-	-	-
Dichloromethane	0.0005	0.05	MAC	-	-	-	-	-	-	-	-
Methyl ethyl ketone	0.02	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	0.0002	0.002	MAC	-	-	-	-	-	-	-	-
Semi Volatile Organics											
1/4-Dichlorobenzene (SVO)	0.0005	-	-	-	-	-	-	-	-	-	-
BTEX											
Benzene	0.0005	0.001	MAC	-	-	-	-	-	-	-	-
Toluene	0.0005	0.06	AO	-	-	-	-	-	-	-	-

Parameter	MW3				MW4				MW5D				MW5S			
	11-May-22	6-Oct-22	16-May-23	14-Nov-23	11-May-22	6-Oct-22	16-May-23	14-Nov-23	11-May-22	6-Oct-22	16-May-23	14-Nov-23	11-May-22	6-Oct-22	16-May-23	14-Nov-23
Location	Downgradient				Leachate				Downgradient				Downgradient			
In Situ Parameters																
Conductivity (mS/cm)	0.983	0.299	0.414	0.626	1.31	1.17	0.385	0.804	0.594	0.409	0.183	0.496	0.445	0.55	0.228	0.703
Depth to Water (below top of PVC) m	5.28	5.73	6.81	5.825	8.56	9.25	8.455	8.95	4.72	4.75	4.66	4.717	4.23	5.13	4.815	5.11
Oxygen Dissolved (mg/L)	14.39	4.5	3.13	6.26	11.33	10.93	4.44	12.76	6.01	4.93	8.55	5.7	11.77	6.73	3.6	5.05
pH	6.65	6.34	7.14	6.54	**6.17**	**5.91**	7.05	6.35	6.61	**7.62**	7.86	7.32	7.27	6.57	7.24	**6.39**
Temperature °C	**12.76**	10.05	5.09	7	11.19	9.72	6.26	7.55	**11.92**	9.27	6.93	7.47	10.74	9.67	5.4	7.28
Physical Tests																
Alkalinity (Total as CaCO3)	**468**		**476**	267	523	439	474	358	177	223	198	216	221	172	175	177
Chemical Oxygen Demand	41		38	18	152	96	142	124	<8	<8	<8	12	13	<8	<8	8
Conductivity µS/cm	988		1020	587	1080	883	966	742	612	629	580	674	423	351	457	453
Hardness as CaCO3	338	Dry	**381**	**200**	333	**291**	**326**	**260**	185	**220**	**244**	**274**	230	**193**	**228**	**213**
pH	7.39		6.87	7.31	7.22	6.79	6.76	7.06	**8.2**	6.83	6.79	7.16	7.29	**8.09**	**7.89**	**8**
Total Dissolved Solids	**540**		**577**	**331**	**577**	**520**	**537**	**397**	220	**371**	**360**	**389**	**323**	246	243	246
Total Suspended Solids	1510		1970	1260	906	1110	1130	624	43	70	35	486	713	65	20	46
Anions																
Chloride	46	Dry	40	15	36	26	26	11	23	36	32	39	38	24	25	22
Sulphate	20		14	16	67	31	46	30	28	64	53	69	64	27	26	28
Nutrients																
Ammonia (Total)	4.4		6.6	3.1	26.2	17.7	21.2	12.9	<0.1	0.3	0.3	0.3	0.3	<0.1	<0.1	<0.1
Nitrate (as N)	1.53	Dry	0.9	3.42	<0.06	<0.06	<0.06	<0.06	<0.06	0.72	0.75	1.17	0.71	<0.06	<0.06	<0.06
Nitrite (as N)	0.28		0.06	0.09	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Nitrogen Kjeldahl (Total)	5.2		7	3	26.8	20.9	23.9	15.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dissolved Metals																
Aluminum (Dissolved)	0.008		0.009	0.005	0.016	0.035	0.014	0.013	0.006	0.010	0.003	**0.412**	0.010	0.009	0.002	**0.395**
Antimony (Dissolved)	<0.0009		<0.0009	<0.0009	<0.0009	0.0013	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009
Arsenic (Dissolved)	0.0013		0.0017	0.0008	0.0007	0.0005	0.0006	0.0004	<0.0002	0.0003	0.0003	0.0006	0.0003	<0.0002	<0.0002	<0.0002
Barium (Dissolved)	0.3850		0.5220	0.2500	0.1980	0.1940	0.1760	0.1320	0.0455	0.0673	0.0741	0.0990	0.0657	0.0483	0.0520	0.0642
Beryllium (Dissolved)	<0.000007		0.000021	0.000022	0.000011	0.00011	0.000008	0.000014	<0.000007	0.00013	0.000016	0.000058	0.000016	0.0001	<0.000007	0.000096
Bismuth (Dissolved)	<0.00001		<0.00001	<0.00001	<0.00001	0.00004	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	<0.00001
Boron (Dissolved)	0.714		0.685	0.376	1.86	0.908	1.73	0.748	0.118	0.213	0.227	0.242	0.384	0.078	0.061	0.069
Cadmium (Dissolved)	0.000079		0.000089	0.000052	<0.000003	<0.000003	<0.000003	0.000005	0.000023	0.00009	0.000072	0.000101	0.000061	0.00005	0.000028	0.000025
Calcium (Dissolved)	77.6		92.7	48.6	101	91.8	103	82.3	41.7	62.6	70.7	78.8	62.7	45.8	55.1	51.3
Chromium (Dissolved)	0.00061		0.00064	0.00028	0.00189	0.00133	0.002	0.00163	<0.00008	<0.00008	0.00009	0.00095	0.00013	<0.00008	<0.00008	0.00056
Cobalt (Dissolved)	0.00593		0.00963	0.00451	0.00839	0.0119	0.00686	0.00887	0.000028	0.0021	0.00126	0.00483	0.000629	0.0005	0.000043	0.000339
Copper (Dissolved)	0.0268		0.0344	0.0146	0.0005	0.0018	0.0004	0.0004	0.0002	0.0041	0.0031	0.007	0.0028	0.001	0.0003	0.0018
Iron (Dissolved)	0.007		0.010	<0.007	0.169	**10.70**	**0.593**	0.077	<0.007	0.060	<0.007	0.568	0.010	0.050	<0.007	0.650
Lead (Dissolved)	<0.00009		0.00011	<0.00009	0.00015	0.00036	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	0.00034	<0.00009	<0.00009	<0.00009	0.00039
Lithium (Dissolved)	0.0009		0.0008	0.0008	0.0002	0.0036	0.0001	0.0001	0.0014	0.0046	0.0022	0.0032	0.0022	0.0034	0.0015	0.0026
Magnesium (Dissolved)	34.9		36.4	19.1	19.4	15.1	16.9	13.2	19.6	15.6	16.4	18.9	17.7	19	22.1	20.7
Manganese (Dissolved)	**4.27**		**5.88**	**2.72**	**4.49**	**5.17**	**3.86**	**3.63**	**0.11**	**1.67**	**1.55**	**2.28**	**1.47**	**0.15**	**0.21**	**0.26**
Mercury (Dissolved)		Dry	0.00002	<0.00001	-	<0.00001	0.00002	<0.00001	-	<0.00001	0.00001	<0.00001	-	<0.00001	<0.00001	<0.00001
Molybdenum (Dissolved)	0.00111		0.00135	0.00085	0.00042	0.00036	0.00036	0.00027	0.00462	0.00137	0.00116	0.00146	0.00143	0.00451	0.00442	0.00371
Nickel (Dissolved)	0.0104		0.0128	0.0064	0.0035	0.0202	0.0033	0.0028	0.0002	0.0197	0.0017	0.0027	0.0019	0.0164	0.0001	0.0006
Phosphorus (Metal) Dissolved	0.043		0.01	<0.003	0.027	0.02	0.019	<0.003	0.018	<0.003	0.004	0.176	0.016	<0.003	<0.003	0.048
Potassium (Dissolved)	11.2		17.9	10.5	29.6	25.9	28.7	20.5	3.97	17.9	19.4	19.5	19.8	4.33	4.95	4.98
Selenium (Dissolved)	0.00024		0.0004	0.0003	0.0003	0.00024	0.00021	0.00022	<0.00004	0.00009	0.00007	0.00009	<0.00004	<0.00004	<0.00004	<0.00004
Silicon (Dissolved)	5.06		5.4	5.18	4.68	4.68	5.09	5.05	4.67	5.5	6.62	6.82	6.3	4.17	4.9	5.3
Silver (Dissolved)	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Dissolved)	61.2		61.9	30.1	44.6	31.8	41.5	23.6	9.03	15.2	15.8	17	15.2	9.46	9.64	9.19
Strontium (Dissolved)	0.973		1.02	0.570	0.592	0.560	0.542	0.490	0.369	0.355	0.382	0.475	0.358	0.406	0.448	0.484
Thallium (Dissolved)	0.000005		<0.000005	0.00001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.00003	0.00001	0.00001	0.000009	0.00001	0.000005	<0.000005
Tin (Dissolved)	0.00041		0.00016	0.00006	0.00023	0.00022	0.00023	0.00009	<0.00006	0.00009	0.0001	0.00008	0.00011	0.00006	0.00007	0.0001
Titanium (Dissolved)	0.00049		0.0004	<0.00007	0.00064	0.00053	0.00043	<0.00007	0.00022	0.00035	<0.00005	0.0227	0.00022	0.00026	<0.00005	0.0353
Uranium (Dissolved)	0.00410		0.00440	0.00212	0.00035	0.00060	0.00023	0.00007	0.00479	0.00245	0.00199	0.00325	0.00224	0.00545	0.00519	0.00594
Vanadium (Dissolved)	0.00077		0.00085	0.00062	0.00067	0.00050	0.00091	0.00065	0.00090	0.00008	0.00025	0.00157	0.00024	0.00101	0.00092	0.00196
Zinc (Dissolved)	0.002		0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.003	<0.002	<0.002	<0.002	0.003
Zirconium (Dissolved)	<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Organics																
Carbon Organic (Dissolved)	**18**	Dry	**16**	**7**	**24**	**16**	**19**	**12**	<1	3	2	3	3	1	1	1
Phenols	0.003		<0.002	<0.002	0.007	0.004	0.004	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Volatile Organics																
1/4-Dichlorobenzene	-		-	-	0.0021	<0.0005	0.0043	0.001	-	-	-	-	-	-	-	-
Acetone	-		-	-	<0.03	<0.03	<0.03	<0.03	-	-	-	-	-	-	-	-
Dichloromethane	-	Dry	-	-	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-	-	-	-
Methyl ethyl ketone	-		-	-	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-	-	-	-
Vinyl Chloride	-		-	-	0.0019	0.002	0.0022	0.0043	-	-	-	-	-	-	-	-
Semi Volatile Organics																
1/4-Dichlorobenzene (SVO)	-	Dry	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BTEX																
Benzene	-	Dry	-	-	<0.0005	<0.0005	0.0023	0.0007	-	-	-	-	-	-	-	-
Toluene	-		-	-	<0.0005	<0.0005	0.0017	<0.0005	-	-	-	-	-	-	-	-

\\nb4\project$\1\02\00192\15\A\Report\Report 1 Rev 0\Tables\[2022-2023 Report Tables_MSA.xlsx]Table 3.2-GW

NOTES:
1. SAMPLES ANALYZED BY SGS CANADA INC. IN LAKEFIELD, ON.
2. ODWS REFERS TO THE ONTARIO DRINKING WATER STANDARDS, OBJECTIVES AND GUIDELINES, MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS (MECP, 2018).
3. HIGHLIGHTED CONCENTRATIONS INDICATE VALUES EXCEEDING THE ODWS.
4. REASONABLE USE GUIDELINES (RUG) REFER TO GUIDELINE B-7 (MOEE, 2016a) AND PROCEDURE B-7-1 (MOEE, 2016b). WHERE BACKGROUND RESULTS ARE LESS THAN THE RL, HALF OF THE RL WAS USED IN THE RUG CALCULATION AND THE "<" WAS REMOVED.
5. REASONABLE USE GUIDELINES (RUG) CALCULATED BASED ON GUIDELINE B-7 (MOECC, 2016a) AND PROCEDURE B-7-1 (MOECC, 2016b). WHERE BACKGROUND RESULTS ARE LESS THAN THE MDL, HALF OF THE RL WAS USED IN THE REASONABLE USE GUIDELINE CALCULATION.
6. **BOLDED** VALUES WITH RED OUTLINE INDICATE CONCENTRATIONS EXCEEDING THE RESPECTIVE RUGs.
7. WHERE THE BACKGROUND CONCENTRATION OF A PARAMETER IS ABOVE THE RESPECTIVE ODWS GUIDELINE, THE BACKGROUND CONCENTRATION IS USED IN REPLACEMENT OF THE RUG CALCULATION.
8. UNITS ARE IN mg/L UNLESS OTHERWISE STATED.
9. "-" INDICATES THAT DATA ARE NOT AVAILABLE.
10. WHERE A VALUE IS LESS THAN THE RESPECTIVE RL BUT THE RL IS ELEVATED ABOVE THE GUIDELINES, THE EXCEEDANCE IS NOT HIGHLIGHTED, AS THE ACTUAL VALUE IS UNKNOWN.

0	17JAN'24	ISSUED WITH REPORT NB102-192/15-1	MSA	SBF
REV	DATE	DESCRIPTION	PREP'D	RVW'D

Calvin Landfill - 2022/2023 Monitoring Results

Recommendations for 2024

The following are the recommendations from the 2022/2023 Report

- Continuing the water quality sampling with QA/QC samples on a frequency of twice per year (spring and fall) with the reporting occurring once every two years.
- New 1/2” Waterra sample tubing should be installed in 2024.
- Physical barriers (such as tractor tires or cement bollards) should be installed around monitoring well MW-4 to prevent potential damage to this well. The sand/backfill material that has been recently placed near the well should be removed from this area to avoid damage to the well.
- Monitoring well MW10 should be excavated and decommissioned.
- All monitoring wells should have a clear path/trail free of weeds, branches, and garbage for sampling and inspections

Calvin Landfill - 2022/2023 Monitoring Results

Recommendations for 2024

Monitoring Well MW4

Relocate sand or re-install monitoring well

Monitoring Well MW10

Relocate MW10 and decommission or extend well to ground surface

Simon Foster M.Sc., P.Geo.
705-476-2165
sfoster@knightpiesold.com