REVISED SAMPLING AND ANALYSIS PLAN
CITY OF HELENA LANDFILL
GROUNDWATER, SURFACE WATER, AND LANDFILL GAS MONITORING ACTIVITIES

Prepared for:

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1.0 INTRODUCTION

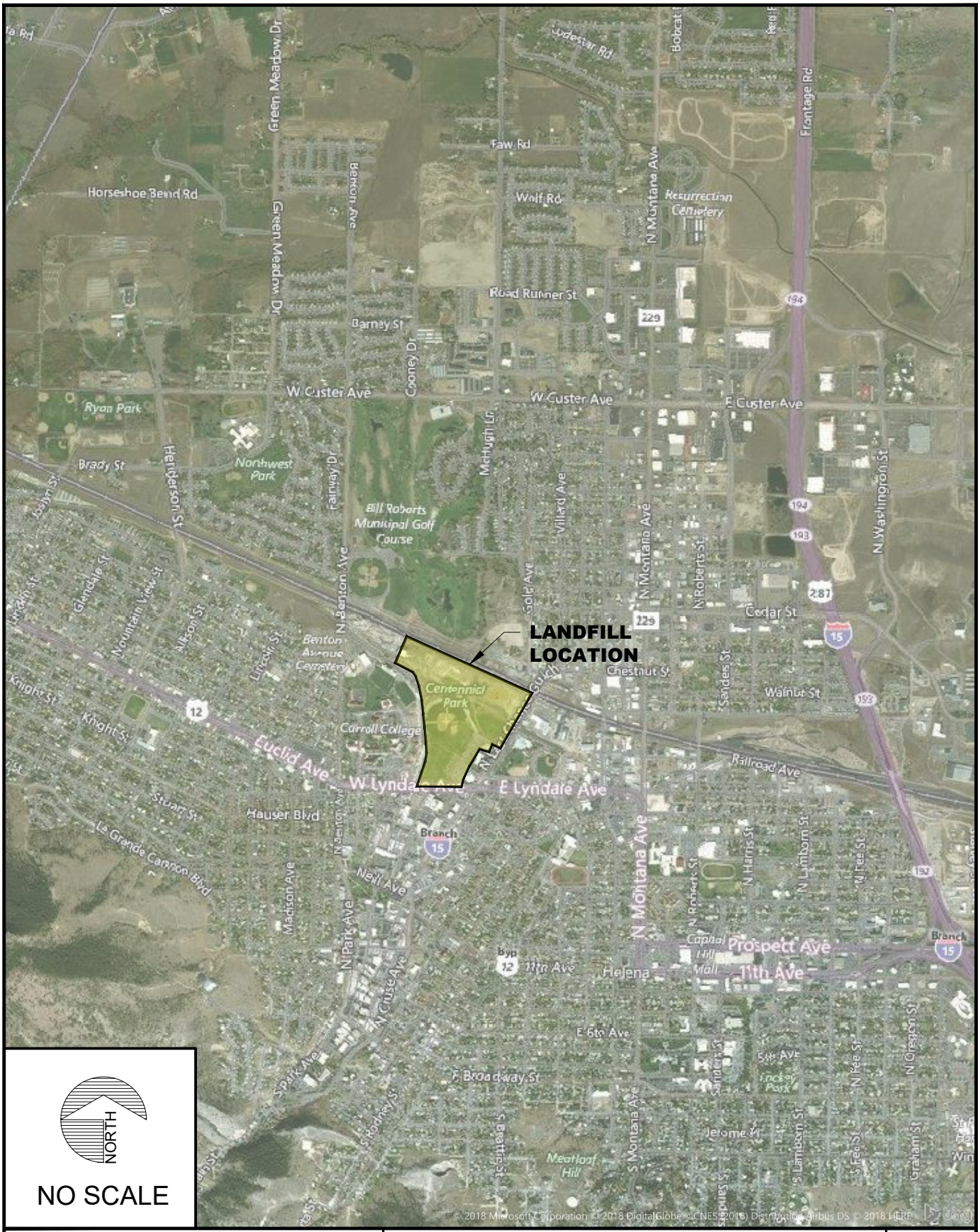
In accordance with State of Montana regulations, this Sampling and Analysis Plan (SAP) includes both a sampling plan (referred herein as the Data Collection Plan) and a quality assurance/quality control (QA/QC) plan. The Data Collection Plan addresses field sampling and laboratory analysis procedures, while the QA/QC plan addresses data quality procedures to ensure the collected samples are of known and acceptable quality to support their intended uses. Data generated under this plan will be used by the City of Helena and the Montana Department of Environmental Quality (MDEQ) for compliance and assessment monitoring of the closed City of Helena Landfill and statistical data evaluations in accordance with the groundwater monitoring regulations.

1.1 SITE DESCRIPTION AND BACKGROUND

1.1.1 Location and History

A site location map is provided in Figure 1-1. The landfill is located east of Carroll College, west of Memorial Park and north of Lyndale Avenue. The landfill is surrounded for several miles in all directions by residential, commercial and industrial zoned property. There are several businesses upgradient of the landfill that have the potential to affect groundwater quality in the area.

A site plan and December 2018 potentiometric surface is shown on Figure 1-2. The landfill encompasses about 37 acres and is divided into three sections. The southern part of the landfill (Phase I and Phase II sections) opened in the late 1800s, when open burning was the primary disposal method. Prior to 1970 no records of disposal practices are available, so actual methods



REVISED SAMPLING AND ANALYSIS PLAN CITY OF HELENA LANDFILL GROUNDWATER, SURFACE WATER, AND LANDFILL GAS MONITORING ACTIVITIES

SITE LOCATION

FIGURE

1-1

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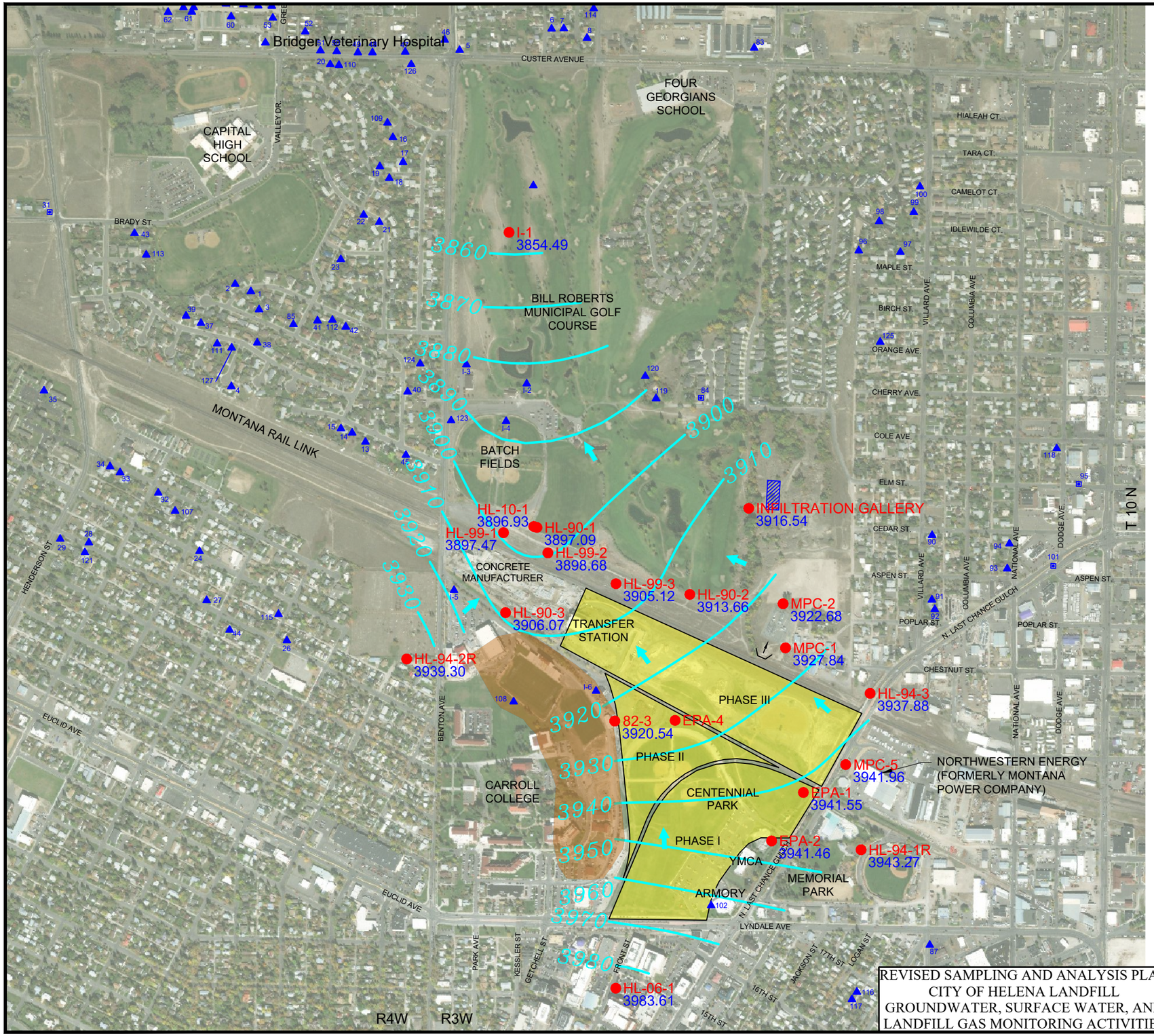
SITE CODE	DTWL	MPE	SWL
	Dec-18		
HL-06-1	13.64	3997.25	3983.61
82-3	62.00	3982.54	3920.54
EPA-1	42.48	3984.03	3941.55
EPA-2	50.63	3992.09	3941.46
EPA-4	nm	3982.71	
HL-10-1	49.41	3946.34	3896.93
HL-90-1	48.72	3945.81	3897.09
HL-90-2	43.24	3956.90	3913.66
HL-90-3	54.68	3960.75	3906.07
HL-94-1R	50.85	3994.12	3943.27
HL-94-2R	33.15	3972.45	3939.30
HL-94-3	32.83	3970.71	3937.88
HL-99-1	49.01	3946.48	3897.47
HL-99-2	50.39	3949.07	3898.68
HL-99-3	46.27	3951.39	3905.12
INF. GALLE	5.37	3921.91	3916.54
I-1	58.25	3912.74	3854.49
MPC-1	21.22	3949.06	3927.84
MPC-2	16.39	3939.07	3922.68
MPC-5	52.05	3994.01	3941.96



LEGEND

- MONITORING WELL
- I-6 IRRIGATION WELL
- 80 DOMESTIC WELL
- INFILTRATION GALLERY (GROUNDWATER COLLECTION SYSTEM)
- LANDFILLED AREA
- AREA OF SHALLOW LOW PERMIABILITY BEDROCK
- 3900 POTENTIOMETRIC CONTOUR LINE
- INFERRED GROUNDWATER FLOW DIRECTION
- STORM WATER OUTFALL FOR LAST CHANCE GULCH

NORTH

SCALE (In Feet) 0 800

REVISED SAMPLING AND ANALYSIS PLAN
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SITE PLAN AND DECEMBER 2018 POTENTIOMETRIC SURFACE

FIGURE **1-2**

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of disposal are not well defined. In 1970, landfill operations began when sanitary landfill regulations were promulgated and open burning ceased. This area operated until the early 1980s and is unlined.

The northern part of the landfill (Phase III) is also unlined, and was in operation until November 1993. The Phase III landfill has been capped with an 18-inch clay cover to minimize surface water percolation through the landfill and subsequent migration of chemicals into groundwater. The landfill is defined by the Administrative Rules of Montana as a Class II landfill, which is to contain solid waste and decomposable waste, and only household quantities of hazardous waste.

After closure, all areas of the landfill were converted into what is now Centennial Park. Park improvements completed during 2011 added additional soil cover at varying depths over the majority of the landfill. The requirements for final closure were fulfilled and effective January 27, 2000; however, because of the potential for landfills to adversely impact the environment for an extended period after closure, post-closure monitoring as well as corrective action must continue at the facility until MDEQ gives written approval to discontinue.

1.1.2 Groundwater Monitoring

The present groundwater monitoring well network consists of twenty-nine sampling sites including eighteen monitoring wells, eight domestic wells, two irrigation wells and the infiltration gallery as shown in Figure 1-2. The well logs for each of the wells are provided in Appendix A and field sampling site forms for each sampling site are included in Appendix B. These wells are characterized as follows:

- Background monitoring wells: HL-06-1, HL-94-1R, HL-94-2R, MPC-5;
- Downgradient monitoring wells: EPA-1, HL-10-1, HL-90-1, HL-90-2, HL-90-3, HL-99-1, HL-99-2, HL-99-3, MPC-1, MPC-2;
- Cross-gradient monitoring wells: HL-94-3;
- Water level only monitoring wells: 82-3, EPA-2, EPA-4, I-1;

- Domestic Wells: 5, 16, 40, 48, 57, 62, 90, and Bridger Veterinary Clinic; and
- Irrigation Wells: I-1, I-4, Infiltration Gallery.

Figure 1-2 also shows recent water level elevations observed in December 2018 and the groundwater potentiometric surface contours. The general groundwater flow direction in the vicinity of the landfill is to the north-northwest.

Data collected from monitoring wells in accordance with the previous project work plans, "Sampling and Analysis Plan, City of Helena Landfill Groundwater Monitoring Activities" (Hydrometrics, 1994); "Revised Sampling and Analysis Plan, City of Helena Landfill Groundwater, Surface Water, and Landfill Gas Monitoring Activities" (Hydrometrics, 2006), and "Revised Sampling and Analysis Plan, City of Helena Landfill Groundwater, Surface Water, and Landfill Gas Monitoring Activities" (Hydrometrics, 2008), have been evaluated according to the statistical procedures required by MDEQ on a semi-annual basis for the past ten years. The statistical reports conclude that:

- Concentrations of common ions downgradient of the landfill are not statistically greater than concentrations found in background wells with the exception of chloride in two downgradient wells.
- Elevated concentration of nitrate + nitrite as N (nitrate) exist both upgradient and downgradient of the landfill with the highest concentrations historically occurring in upgradient wells.
- Elevated concentration of cyanide exist both upgradient and downgradient of the landfill with the highest concentrations historically occurring in upgradient wells.
- Trace metals occur downgradient of the landfill at concentrations at or below those in upgradient or background wells with the exception of copper, mercury, and zinc which have statistically greater concentrations in some downgradient wells compared to background wells. All detections were well below the primary Maximum Contaminant Level (MCL) values for their respective parameters.
- Several chlorinated hydrocarbons occur downgradient of the landfill at trace levels and are not found in background wells.

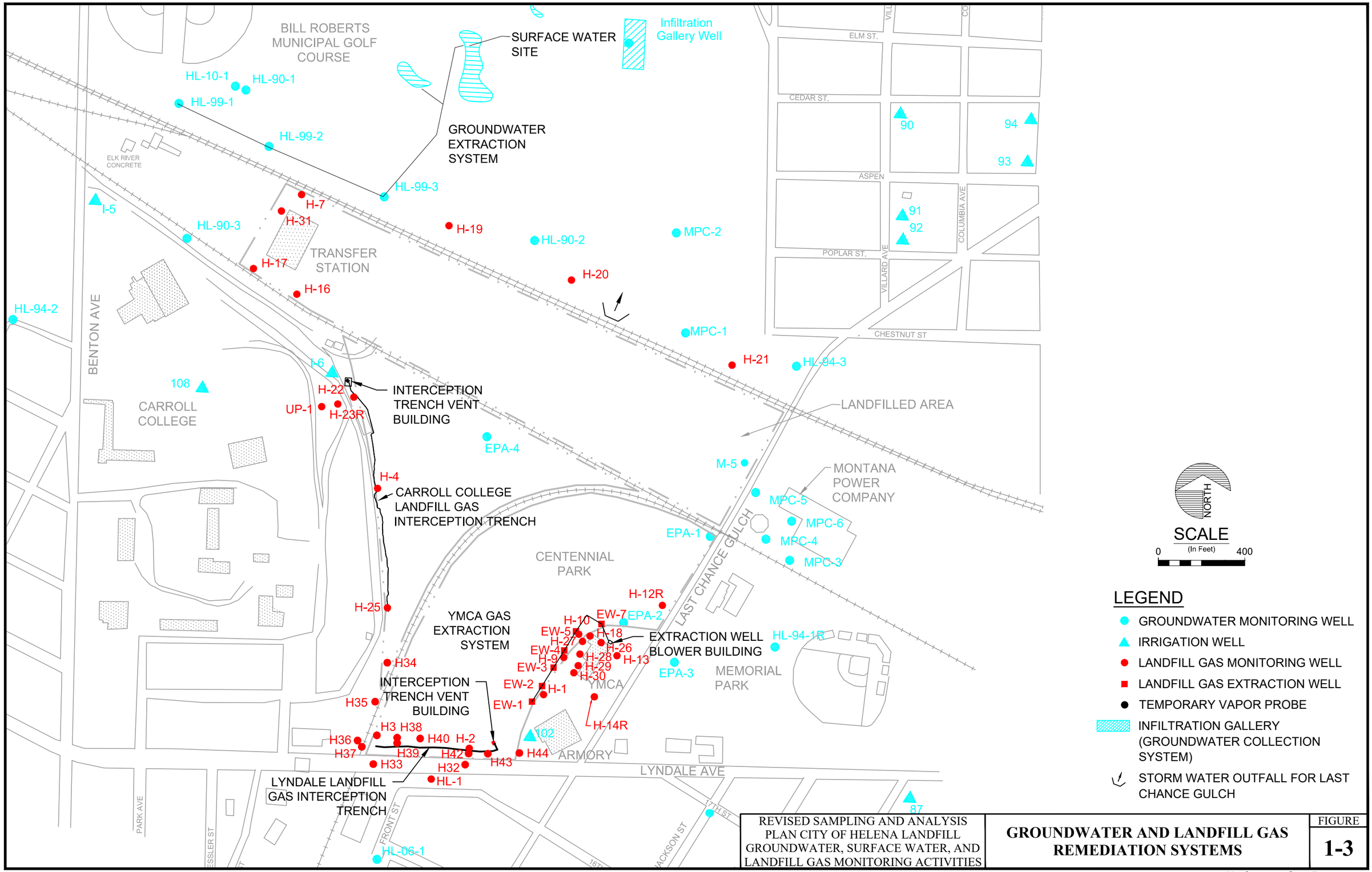
- Tetrachloroethene (PCE) is the chlorinated organic compound of greatest concern due to MCL exceedances; however, concentrations of PCE appear to be decreasing over time in well EPA-1, the well that has historically shown the highest concentrations, and in compliance wells HL-90-1, HL-99-1, and HL-99-3.

1.1.3 Groundwater Remediation

In an attempt to reduce concentrations of PCE downgradient of the landfill, the City installed a groundwater extraction system (GWES) in the spring of 2000. This treatment system included the installation of three pumping wells HL-99-1, HL-99-2, and HL-99-3 to intercept PCE impacted groundwater migrating downgradient of the landfill. This remediation system is shown in Figure 1-3. Extracted groundwater is then treated to remove volatile organic compounds (VOCs) prior to land application on Bill Roberts Golf Course. In accordance with regulations, the treated water is sampled monthly during operation to ensure the treatment goals have been met prior to land application. The three extraction wells along with compliance wells HL-10-1 and HL-90-1 are monitored semiannually to evaluate the progress of the GWES.

1.1.4 Surface Water Monitoring

Since the GWES uses land application to dispose of the treated water, the applied water must be sampled during system operation to ensure treatment goals (less than the detection limit for all VOCs) are met prior to application on the golf course. The present surface water monitoring consists of two sampling sites including one sample collected from one of the collection ponds on Bill Roberts Golf Course (see Figure 1-3) and one sample collected from the golf course irrigation system near the collection ponds.



REVISED SAMPLING AND ANALYSIS PLAN CITY OF HELENA LANDFILL GROUNDWATER, SURFACE WATER, AND LANDFILL GAS MONITORING ACTIVITIES

GROUNDWATER AND LANDFILL GAS REMEDIATION SYSTEMS

FIGURE 1-3

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1.1.5 Landfill Gas Monitoring

The present landfill gas monitoring well network consists of sixty-nine sampling sites including thirty-eight methane probes, ten groundwater wells, two utility corridor gas probes, nine gas extraction system (GES) components, and ten nearby buildings. The location of each of the sampling sites is shown in Figure 1-2. The well logs for each of the methane probes are provided in Appendix A and field sampling sites for each site are included in Appendix B. These sites are characterized as follows:

- Methane Probes: H-1, H-2, H-3, H-4, H-7, H-9, H-10, H-12R, H-13, H-14R, H-16, H-17, H-18, H-19 (shallow and deep probes), H-20, H-21, H-22, H-23R, H-25, H-26, H-27, H-28, H-29, H-30, H-31, H-32, H-33, H-34, H-35, H-36, H-37, H-38, H-39, H-40, H-42, H-43, H-44;
- Groundwater Wells: HL-90-1, HL-90-2, HL-90-3, EPA-1, EPA-2, EPA-4, MPC-1, MPC-2, M-5, HL-1;
- Utility Corridor Methane Probes: Carroll College sanitary sewer, Carroll College storm sewer;
- GES Components: EW-1, EW-2, EW-3, EW-4, EW-5, EW-7, YMCA GES stack gas, Carroll College interception trench stack gas, Lyndale interception trench stack gas; and
- Nearby Buildings: concrete fabricators, transfer station, transfer station scale house, transfer station office, Carroll College shop, St. Catherine dormitory, St. Matthew dormitory, old Armory building, YMCA basement, YMCA mechanical room.

1.1.6 Landfill Gas Remediation

In attempts to reduce methane migrating off-site and into areas of concern, three landfill gas extraction systems have been installed. In 1998, six gas extraction wells were installed on the west and north sides of the YMCA, as shown in Figure 1-3, to help prevent methane from entering the building's basement. These wells are manifolded together and attached to a blower which extracts gas from these wells and the surrounding areas. The extracted gas is passed through carbon canisters to remove volatile organics before being vented to the atmosphere. In late 2004, EW-6 was blinded off and no more gas could be extracted from

that well. In March 2005, EW-7 was drilled just east of EW-6 and added to the system. Since installation of the YMCA GES, concentrations of methane have decreased below the instrument detection limit in EW-1 and EW-2; these two wells are no longer used to actively remove landfill gas from this area.

In 1999, a passive interception trench was installed near and along the boundary between the old landfill and Carroll College property as shown in Figure 1-3. A collection header runs through the trench to collect landfill gases that are released through an attic ventilator on the roof of the vent house located at the north end of the trench. Since installation, no detectable concentration of methane has been measured in any well west of the interception trench.

In 2016, another passive interception trench was installed along the southern boundary of the landfill just north of Lyndale Avenue as shown in Figure 1-3. A collection header runs through the trench to collect landfill gases that are released through an attic ventilator on the roof of the vent house located at the east end of the trench. Since installation, no detectable concentration of methane has been measured in monitoring wells H-32 and H-33 located in the Lyndale Avenue median.

1.2 PROJECT ORGANIZATION AND TASK ASSIGNMENTS

The successful implementation of this SAP is the primary responsibility of the project manager, while meeting the project objectives depends upon faithful execution of this plan by all project members. The roles and responsibilities of key project personnel are as shown on Table 1-1.

TABLE 1-1. PROJECT PERSONNEL AND RESPONSIBILITIES

Role	Personnel	Responsibility
Owner's Representatives	Randall Camp and Pete Anderson City of Helena	Review and approve all activities to ensure Owner's needs are met.
MDEQ Contact	John Collins MDEQ	Review reports and submittals to ensure compliance with all relevant regulations.
Project Manager	Mike Wignot Hydrometrics, Inc.	Oversee all Hydrometrics activities.
Project Engineer	Jodi Bingham Hydrometrics, Inc.	Complete all reports and submittals as required to ensure compliance with all relevant regulations and to meet Owner's needs.
Sampling Monitor	Rick Lane Hydrometrics, Inc.	Supervise Hydrometrics field personnel, equipment, procedures and documentation.
QA Officer/Data Monitor	Ericka Vallance Hydrometrics, Inc.	Supervise field and laboratory QA/QC procedures; corrective actions; performance and systems audits. Data quality review; track and maintain records and samples.
Health and Safety Officer	Bob Anderson Hydrometrics, Inc.	Determine appropriate levels of personal protection; assures compliance with Site Safety Plan.
Analytical Laboratory/ Analysis Monitor	Energy Laboratories, Inc.	Analyze collected samples. Monitor supervises laboratory personnel, equipment, procedures, and documentation; reviews laboratory internal QC before analytical data is released.

1.3 GROUNDWATER MONITORING REQUIREMENTS AND SCHEDULES

1.3.1 Groundwater Monitoring Schedule

Semiannual sampling is scheduled for June and December to coincide with maximum and minimum groundwater levels, respectively, as determined by monthly water level measurements collected as outlined in a previous sampling plan (Hydrometrics, 1994). The June sampling schedule includes all the sampling sites while the December sampling event includes only those wells with MCL exceedances or increasing parameter trends.

1.3.2 June Groundwater Monitoring Sites and Parameters

As listed in Section 1.1.2, eighteen monitoring wells, eight domestic wells, two irrigations wells, and the infiltration gallery will be included as part of the June groundwater sampling. These samples will aid in defining the potentiometric surface, the extent of groundwater contamination, and the effectiveness of remediation. Table 1-2 shows the monitoring sites and analytical schedule for the June sampling events. Based on past sampling results, the order listed on Table 1-2 will be the order in which the samples will typically be collected (generally clean to dirty). In addition to the groundwater samples, several quality control samples will be collected and analyzed to assure quality of the sample collection and analysis procedures. These samples will include a duplicate sample, a rinsate sample, a DI blank, and at least one trip blank.

1.3.3 December Groundwater Monitoring Sites and Parameters

Eight monitoring wells and two domestic wells will be included as part of the December groundwater sampling. In addition, water level measurements will be taken from an additional eleven monitoring and irrigation wells. Table 1-3 shows the monitoring sites and analytical schedule for the December sampling events. Based on past sampling results, the order listed on Table 1-3 will be the order in which the samples will typically be collected (generally clean to dirty). In addition to the groundwater samples, several quality control samples will be collected and analyzed to assure quality of the sample collection and analysis procedures. These samples will include a duplicate sample, a rinsate sample, a DI blank, and at least one trip blank.

1.3.4 Groundwater Reporting Requirements and Schedules

MDEQ will be notified prior to conducting groundwater sampling to provide them the opportunity to obtain split samples. A copy of the approved SAP will be kept at the office of the facility owner; a copy will also be kept by the Project Engineer and a copy will be provided to sampling personnel during sampling.

TABLE 1-2. JUNE MONITORING SITES AND SAMPLING PARAMETERS

Well Identification	Water Level Measurement	Field Parameters[1]	Metals and Commons[2]	Volatile Organic Compounds[3]
Infiltration Gallery	X	X		X
MPC-2	X	X		X
HL-90-2	X	X	X	X
HL-94-1R	X	X	X	X
HL-94-3	X	X	X	X
HL-06-1	X	X	X	X
HL-90-3	X	X	X	X
HL-94-2R	X	X	X	X
HL-99-1	X	X	X	X
HL-99-2	X	X	X	X
HL-10-1	X	X	X	X
HL-99-3	X	X	X	X
MPC-1	X	X	X	X
I-4		X		X
EPA-1	X	X	X	X
MPC-5	X	X	X	X
I-1	X			
82-3	X			
EPA-2	X			
EPA-4	X			
5 (350 Custer Ave.)		X		X
16 (3 Parr Court)		X		X
40 (2509 Teakwood)		X		X
48 (308 W. Custer Ave.)		X		X
Bridger Veterinary Clinic (3104 Green Meadow Dr.)		X		X
57 (112 Dunbar Ave.)		X		X
62 (76 Dunbar Ave.)		X		X
90 (933 Cedar St.)		X		X

Notes:
(1) Field parameters include pH, SC, and water temperature.
(2) Metals and commons include those compounds listed in the first half of 40 CFR Part 258 Appendix I.
(3) Volatile organic compounds include those listed in the second half of 40 CFR Part 258 Appendix I.

TABLE 1-3. DECEMBER MONITORING SITES AND SAMPLING PARAMETERS

Well Identification	Water Level Measurement	Field Parameters[1]	Metals and Commons[2]	Volatile Organic Compounds[3]
HL-94-1R	X	X	X	X
HL-06-1	X	X	X	X
HL-99-1	X	X	X	X
HL-99-2	X	X	X	X
HL-90-1	X	X	X	X
HL-10-1	X	X	X	X
HL-99-3	X	X	X	X
MPC-5	X	X	X	X
EPA-1	X			
EPA-2	X			
EPA-4	X			
HL-90-2	X			
HL-90-3	X			
HL-94-2R	X			
HL-94-3	X			
I-1	X			
Infiltration Gallery	X			
MPC-1	X			
MPC-2	X			
5 (350 Custer Ave.)		X		X
16 (3 Parr Court)		X		X

Notes:
(1) Field parameters include pH, SC, and water temperature.
(2) Metals and commons include those compounds listed in the first half of 40 CFR Part 258 Appendix I.
(3) Volatile organic compounds include those listed in the second half of 40 CFR Part 258 Appendix I.

A copy of all field records will be kept on file at the Hydrometrics' Helena office. A data validation report will be completed after each sampling event to verify the data quality. A copy of this report including sampling results, field records, and deviations from the approved SAP will be provided to MDEQ.

Two statistical reports will be prepared each year by Hydrometrics after the June and December groundwater sampling events. These reports will fulfill the requirements provided in ARM Title 17, Chapter 50 and will describe all work performed during the previous six months and present all data collected and a statistical analysis of that data. These semi-annual statistical reports will be submitted to the City for review prior to submittal to MDEQ.

1.4 SURFACE WATER MONITORING REQUIREMENTS AND SCHEDULES

1.4.1 Surface Water Monitoring Schedule

Since the GWES uses land application to dispose of the treated water, the system is only operated during the irrigation season, approximately April through October. While the extraction system is in operation, monthly samples will be taken to ensure that treatment goals are being met prior to land application.

1.4.2 Surface Water Monitoring Sites and Parameters

A single sampling site will be included in the monthly surface water sampling. The sample will be collected in a stainless steel bowl from an operating sprinkler head near the lined holding ponds on Bill Roberts Golf Course. During the June sampling event, an additional sample will be taken from the edge of the east lined holding pond near the pump house as shown in Figure 1-3. Surface water samples will be analyzed for the VOCs listed in the second half of 40 CFR Part 258 Appendix I (see Appendix C) using the lowest detection limit for each VOC.

1.4.3 Surface Water Reporting Requirements and Schedules

A copy of the approved SAP will be kept at the office of the facility owner; a copy will also be kept by the Project Engineer and a copy will be provided to sampling personnel during sampling. A copy of all field records will be kept on file at the Hydrometrics' Helena office.

MDEQ will be notified immediately upon receipt of any sprinkler sample that exceeds the treatment goals (the detection limit for each VOC) for the land application process. An annual land application compliance report will be completed at the end of each irrigation season. This report will include a complete set of analyses along with a summary of the work performed and the total volume of water extracted and treated during that irrigation season.

1.5 LANDFILL GAS MONITORING REQUIREMENTS AND SCHEDULES

1.5.1 Landfill Gas Monitoring Schedule

Monthly, the GES components as well as nine methane probes near the system will be sampled using the hand-held landfill gas meter. In addition, two probes near the southern landfill boundary (H-32 and H-33) will also be sampled. Two probes near the Transfer Station (H-7 and H-31) and one probe near the southern end of the Carroll College landfill gas interception trench (H-25) are sampled if the previous month's samples had measurable concentrations of methane present in these same wells; otherwise, they are sampled the next quarterly sampling event. Ten nearby buildings will also be monitored monthly for public safety. Quarterly, all the landfill gas monitoring sites listed in Section 1.1.5 will be sampled using the hand-held landfill gas meter. In addition, VOC bag samples will be taken from the YMCA GES stack, the Carroll College interception trench stack, and Lyndale interception trench stack to monitor the effectiveness of the remediation systems.

1.5.2 Monthly Landfill Gas Monitoring Sites and Parameters

Eleven methane probes, nine GES components and ten nearby buildings will be included as part of the monthly sampling. Three additional methane probes (H-7, H-25, and H-31) are sampled if the previous month's samples had measurable concentrations of methane present in these same wells; otherwise, they are sampled the next quarterly sampling event. These samples aid in defining the extent of landfill gas contamination and the effectiveness of remediation. There are six methane alarms located in buildings near the landfill (the YMCA basement, the YMCA mechanical room, the old Armory, the Carroll College shop, the transfer station scale house, and the transfer station office scale house). These alarms will all be tested on a monthly basis to confirm their condition and performance. The equipment in

the YMCA GES building will also be checked each month and routine maintenance performed. Table 1-4 shows the monitoring sites and analytical schedule for the monthly sampling events.

1.5.3 Quarterly Landfill Gas Monitoring Sites and Parameters

In addition to the typical monthly sampling, twenty-six methane probes, ten groundwater monitoring wells, and two utility corridor probes will be included as part of the quarterly sampling during the January, April, July, and October sampling events. These samples will aid in defining the extent of landfill gas contamination. Ten temporary methane probes (H-34 through H-44) were installed along the southern boundary of the landfill to help define the landfill gas plume in this area; these probes typically last approximately five years and will be sampled as long as the wells remain in good condition. Table 1-5 shows the monitoring sites and analytical schedule for the quarterly sampling events. In addition, VOC samples will be taken from the YMCA GES stack, the Carroll College gas interception trench stack, and the Lyndale gas interception trench stack. The samples will be analyzed at the lab for the compounds listed in the second half of 40 CFR Part 258 Appendix I (see Appendix C). These samples will help determine the effectiveness of the remediation systems.

1.5.4 Landfill Gas Monitoring Reporting Requirements and Schedules

A copy of the approved SAP will be kept at the office of the facility owner; a copy will also be kept by the Project Engineer and a copy will be provided to sampling personnel during sampling. A copy of all field records will be kept on file at the Hydrometrics' Helena office.

Monthly reports will be prepared that will describe all work performed during the previous month, present all data collected that month, and provide the cumulative methane results for the year to date. These monthly reports will be submitted to the City of Helena and MDEQ within 30 days after collecting the data. Quarterly reports will also be submitted to Carroll College.

TABLE 1-4. MONITORING SITES AND PARAMETERS FOR MONTHLY LANDFILL GAS SAMPLING

Site Identification	Gas Meter Readings[1]	Temperature	Pressure	Alarm Check
METHANE PROBES				
H-1	X		X	
H-7[2]	X			
H-9	X		X	
H-10	X		X	
H-18	X		X	
H-25[2]				
H-26	X		X	
H-27	X		X	
H-28	X		X	
H-29	X		X	
H-30	X		X	
H-31[2]	X			
H-32	X			
H-33	X			
GAS EXTRACTION SYSTEM COMPONENTS				
EW-1	X	X	X	
EW-2	X	X	X	
EW-3	X	X	X	
EW-4	X	X	X	
EW-5	X	X	X	
EW-7	X	X	X	
YMCA GES Stack	X	X		
Carroll College GIT Stack	X			
Lyndale GIT Stack	X			
NEARBY BUILDINGS				
Concrete Fabricators	X			
Transfer Station Scale	X			X
Transfer Station	X			
Transfer Station Office	X			X
Carroll College Shop	X			X
St. Catherine dormitory	X			
St. Matthew dormitory	X			
Old Armory Building	X			X
YMCA Basement	X			X
YMCA Mechanical Room	X			X

Notes:

(1) Landfill gas meter readings include %methane, %LEL, and %oxygen.

(2) Sampled only if the previous month's samples had measureable concentrations of methane present in this same well; otherwise, are sampled during the next quarterly sampling event.

TABLE 1-5. MONITORING SITES AND PARAMETERS FOR QUARTERLY LANDFILL GAS SAMPLING

Site Identification	Gas Meter Readings[1]	Temperature	Pressure	Alarm Check
METHANE PROBES				
H-1	X		X	
H-2	X			
H-3	X			
H-4	X			
H-7	X			
H-9	X		X	
H-10	X		X	
H-12R	X			
H-13	X			
H-14R	X			
H-16	X			
H-17	X			
H-18	X		X	
H-19 shallow	X			
H-19 deep	X			
H-20	X			
H-21	X			
H-22	X			
H-23R	X			
H-25	X			
H-26	X		X	
H-27	X		X	
H-28	X		X	
H-29	X		X	
H-30	X		X	
H-31	X			
H-32	X			
H-33	X			
H-34[2]	X			
H-35[2]	X			
H-36[2]	X			
H-37[2]	X			
H-38[2]	X			
H-39[2]	X			
H-40[2]	X			
H-42[2]	X			
H-43[2]	X			
H-44[2]	X			

TABLE 1-5. MONITORING SITES AND PARAMETERS FOR QUARTERLY LANDFILL GAS SAMPLING (continued)

Site Identification	Gas Meter Readings[(1)]	Temperature	Pressure	Alarm Check
UTILITY CORRIDOR PROBES				
CC Sanitary Sewer	X			
CC Storm Sewer	X			
GAS EXTRACTION SYSTEM COMPONENTS				
EW-1	X	X	X	
EW-2	X	X	X	
EW-3	X	X	X	
EW-4	X	X	X	
EW-5	X	X	X	
EW-7	X	X	X	
YMCA GES Stack	X	X		
Carroll College GIT Stack	X			
Lyndale GIT Stack	X			
GROUNDWATER MONITORING WELLS				
HL-90-1	X			
HL-90-2	X			
HL-90-3	X			
EPA-1	X			
EPA-2	X			
EPA-4	X			
MPC-1	X			
MPC-2	X			
M-5	X			
HL-1	X			
NEARBY BUILDINGS				
Concrete Fabricators	X			
Transfer Station Scale	X			X
Transfer Station	X			
Transfer Station Office	X			X
Carroll College Shop	X			X
St. Catherine dormitory	X			
St. Matthew dormitory	X			
Old Armory Building	X			X
YMCA Basement	X			X
YMCA Mechanical Room	X			X

Notes:
(1) Landfill gas meter readings include %methane, %LEL, and %oxygen.
(2) These are temporary probes that were installed in 2014 and will be sampled as long as conditions allow.

A landfill GES performance report will be completed at the end of each year. This report will include the results of the stack sampling for the YMCA, Carroll College, and Lyndale gas extraction systems, an estimate of the total volume of gas and mass of each VOC extracted from the YMCA GES, and a summary of all work completed the previous year. This report will be submitted to the City of Helena and MDEQ.

2.0 DATA COLLECTION PLAN

2.1 DATA COLLECTION OBJECTIVES

This data collection plan (DCP) describes the procedures to be used during sample collection and analysis. When properly implemented, this DCP will ensure that the data collected will be representative of existing on-site conditions and comparable to previously collected data at this site.

2.2 GENERAL SAMPLE HANDLING PROCEDURES

2.2.1 Field Documentation

Field notebooks will be used to record pertinent sampling information as outlined in HSOP-31: Field Notebooks, located in Appendix D. Notebook entries will include, at a minimum, the following information:

- Project name;
- Date and time;
- Sample location;
- Sample number;
- Sampling personnel present;
- Analyses requested;
- Sample preservation;
- Field observations;
- Weather observations; and
- Other relevant project-specific site or sample information.

Entries will be made in permanent ink, with corrections crossed out with a single line, dated, and initialed. Field books will be signed and dated at the bottom of each page by personnel making entries on that page.

2.2.2 Sample Numbering

Individual samples (including QC samples) will be assigned unique sample numbers according to the following sample numbering scheme:

AAAA-YYMM-XXX

where AAAA is a four-character code denoting the project, YYMM is a four-digit code denoting the year (i.e., 18 for 2018) and month (i.e., 09 for September) of collection, and XXX is a three-digit code that is incremented sequentially for each successive sample (i.e., if the first sample collected is 100, then subsequent samples are numbered 101, 102, 103, etc.).

Additional information to be included on the sample container label (date, time, analytical parameters requested, etc.) is described in HSOP-29 in Appendix D.

2.2.3 Sample Handling, Packaging, Shipping, and Chain-of-Custody

Sample handling, packaging, and shipping requirements are outlined in HSOP-4: Chain-of-Custody Procedures, Packing, and Shipping Samples (Appendix D). All sample shipments will conform to Department of Transportation (DOT) requirements for environmental samples.

All shipped coolers will be accompanied by chain-of-custody documentation, and will be sealed with custody seals. Chain-of-custody requirements are outlined in Hydrometrics' HSOP-4 cited above. Each shipment to the laboratory also will be accompanied by a cover letter and parameter list specifying analytical parameters, analytical method, and required detection limits for the enclosed samples.

2.3 GROUNDWATER SAMPLING PROCEDURES

The most recent revision of the Standard Operating Procedure (SOPs) and standard field forms (or their equivalents) listed below in Tables 2-1 and 2-2, and included in Appendix D, will be used to guide the collection and documentation of groundwater samples, decontamination of equipment, sample handling and shipping procedures, and measurement of field parameters.

TABLE 2-1. SUMMARY LIST OF STANDARD OPERATING PROCEDURES FOR SAMPLING GROUNDWATER

Standard Operating Procedure	Title of Standard Operating Procedure
HF-SOP-2	Determination, Identification, and Description of Field Sampling Sites
HF-SOP-3	Preservation and Storage of Inorganic Water Samples
HF-SOP-4	Chain-of-Custody Procedures, Packing and Shipping Samples
HF-SOP-7	Decontamination of Sampling Equipment
HF-SOP-10	Water Level Measurement With An Electric Probe
HF-SOP-11	Sampling Monitoring Wells for Inorganic Parameters
HS-SOP-13	Equipment Rinsate Blank Collection
HF-SOP-20	Field Measurement of pH Using a pH Meter
HF-SOP-29	Labeling and Documentation of Samples
HF-SOP-31	Field Notebooks
HF-SOP-32	Preservation and Storage of Organic Water Samples
HF-SOP-35	Decontamination Procedures for Organics Sampling Equipment
HF-SOP-38	Sampling Monitoring Wells For Organic Parameters
HF-SOP-73	Filtration of Water Samples
HF-SOP-79	Field Measurement of Specific Conductivity
HF-SOP-84	Field Measurement of Temperature

TABLE 2-2. SUMMARY LIST OF STANDARD FIELD FORMS FOR SAMPLING GROUNDWATER

Form	Title of Standard Field Form
HF-FORM-001	Chain-of-Custody Record
HF-FORM-430	Water Sampling Form
HF-FORM-500	Instrument Calibration Form

2.3.1 Groundwater Well Sampling Procedures

The general sequence of procedures for well sampling will be as follows:

1. Static water level will be measured with a water level probe prior to well purging. Static water levels will be used with surveyed well elevations to determine groundwater elevations relative to mean sea level for each monitoring event.
2. Wells will be purged to remove stagnant water. The volume of water removed prior to sampling will be a minimum of three well bore volumes.
3. Samples will be collected from each well for analysis of VOCs, common ions, nitrate + nitrite as N, chemical oxygen demand, cyanide, and dissolved metals. In addition, field parameters will be measured at each well, including pH, specific conductance (SC), and water temperature.

Samples will be collected from monitoring wells using a dedicated pump, decontaminated stainless steel bailer, a plastic disposable bailer, or a decontaminated submersible pump. Prior to sampling, the static water level will be measured with a decontaminated water level probe. A minimum of three well bore volumes will be purged from each monitoring well before samples are collected. Table 2-3 shows the monitoring well completion information including casing size, well depth and measuring point elevation so that well bore volumes and static water levels can be easily calculated. Sampling of monitoring wells will be performed in accordance with Hydrometrics' SOP HF-SOP-38: Sampling Monitoring Wells for Organic Parameters and HF-SOP-11: Sampling Monitoring Wells for Inorganic Parameters. Per DEQ guidance, purge water generated during sampling and decontamination will be disposed of on the ground near the monitoring site.

If a non-dedicated pump is used to purge or sample groundwater, the pump and tubing will be thoroughly decontaminated between sample locations using a phosphate-free detergent rinse, followed by a tap water rinse and a deionized water rinse. Field instruments will be rinsed thoroughly with distilled or deionized water between sampling locations.

TABLE 2-3. GROUNDWATER MONITORING WELL COMPLETION INFORMATION

Well Identification	Casing Inside Diameter (in)	Total Depth of Well (ft)	Screened Interval	Measuring Point Elevation (ft)
EPA-1	2.0	54.5	39.5-54.5	3984.03
HL-06-1	6.0	26.5	16.0-26.5	3997.25
HL-10-1	6.0	78.0	58.0-78.0	3946.34
HL-90-1	4.0	60.0	40.0-60.0	3945.81
HL-90-2	4.0	68.0	60.0-68.0	3956.90
HL-90-3	4.0	79.0	59.0-79.0	3960.75
HL-94-1R	2.0	86.0	66.0-86.0	3994.12
HL-94-2R	6.0	40.0	30.0-40.0	3972.45
HL-94-3	2.0	67.5	47.5-67.5	3970.71
HL-99-1	4.5	100.0	73.0-93.0	3946.48
HL-99-2	5.5	118.0	93.0-113.0	3949.07
HL-99-3	7.5” 0-80’ 4.5”80-105’	105.0	80.0-100.0	3951.39
I-1	7.5	132.0	35.0-95.0	3912.74
I-4	7.5” 0-60’ 5.5” 60-156’	156.0	60.0-156	—
MPC-1	2.0	39.0	24.0-39.0	3949.06
MPC-2	2.0	35.5	20.5-35.5	3939.07
MPC-5	2.0	72.0	47.0-72.0	3994.01

Sample containers, preservation methods, and holding times for the requested laboratory analytical parameters (VOC, common ions, nitrates + nitrite as N, chemical oxygen demand, cyanide, and dissolved metals) are listed in Table 2-4.

General groundwater sample handling procedures, including sample designation, sample shipment, documentation (labels, chain-of-custody records, field notebook) are discussed in Section 2.2.

TABLE 2-4. GROUNDWATER SAMPLE CONTAINER, PRESERVATION AND HOLDING TIME REQUIREMENTS

Media	Parameters	Analytical Method[(1)]	Detection Limit	Sample Container	Preservation	Holding Time
Water	Physical Parameters - pH - SC	 A4500-HB A2510B	 0.1 s.u. 1 umhos/cm	1-500 mL plastic bottle	Cool to ≤6°C	 15 minutes 28 days
Water	Common Ions - sulfate - chloride	 E300.0 E300.0	 1 mg/L 1 mg/L	1-500 mL plastic bottle	Cool to ≤6°C	28 days
Water	Nitrate + Nitrite as N	E353.2	0.05 mg/L	1-500 mL plastic bottle	pH < 2 with H_2SO_4; cool to ≤6°C	28 days
Water	Dissolved Metals - antimony - arsenic - barium - beryllium - cadmium - chromium - cobalt - copper - iron - lead - mercury - nickel - selenium - silver - thallium - vanadium - zinc	 E200.8 E200.8 E200.8 E200.8 E200.8 E200.8 E200.8 E200.8 E200.8 E200.8 E245.1 E200.8 E200.8 E200.8 E200.8 E200.8 E200.8	 0.0005 L 0.001 mg/L 0.003 mg/L 0.0008 mg/L 0.00003 mg/L 0.01mg/L 0.01mg/L 0.002 mg/L 0.02 mg/L 0.0003 mg/L 0.000005 mg/L 0.002 mg/L 0.001 mg/L 0.0002 mg/L 0.0002 mg/L 0.1 mg/L 0.008 mg/L	1- 500 mL plastic bottle	Filtered (0.45 µm), pH < 2 with HNO_3; cool to ≤6°C	 6 months 6 months 6 months 6 months 6 months 6 months 6 months 6 months 6 months 6 months 28 days 6 months 6 months 6 months 6 months 6 months 6 months
Water	Chemical Oxygen Demand (COD)	E410.4	4 mg/L	1-500 mL plastic bottle	pH < 2 with H_2SO_4; cool to ≤6°C	28 days
Water	Cyanide	Kelada-01	0.003 mg/L	1-250 mL plastic bottle	PH<2 with NaOH; cool to 4° C	14 days
Water	VOC (see Appendix C)	SW8260B	Standard detection limit (see specific compound – PCE=0.0005 mg/L)	3-40 mL VOA vials (no headspace)	pH < 2 with HCl; cool to ≤6°C	14 days

Notes:

(1) All methods are EPA methods unless otherwise specified.

2.3.2 Field Quality Control Sample Collection

Field quality control (QC) samples will be collected to aid in the evaluation of data quality. The type of QC sample to be collected, QC sample collection procedures and the required frequency of QC sample collection are discussed in Section 3.3.

2.4 SURFACE WATER SAMPLING PROCEDURES

The latest version of the SOPs and standard field forms (or their equivalents) listed below in Tables 2-5 and 2-6 and included in Appendix D will be used to guide the collection and documentation of surface water samples, as well as sample handling and shipping procedures.

TABLE 2-5. SUMMARY LIST OF STANDARD OPERATING PROCEDURES FOR SAMPLING SURFACE WATER

Standard Operating Procedure	Title of Standard Operating Procedure
HF-SOP-2	Determination, Identification, and Description of Field Sampling Sites
HF-SOP-4	Chain-of-Custody Procedures, Packing and Shipping Samples
HF-SOP-7	Decontamination of Sampling Equipment
HF-SOP-29	Labeling and Documentation of Samples
HF-SOP-31	Field Notebooks
HF-SOP-32	Preservation and Storage of Organic Water Samples
HF-SOP-35	Decontamination Procedures for Organics Sampling Equipment

TABLE 2-6. SUMMARY LIST OF STANDARD FIELD FORMS FOR SAMPLING SURFACE WATER

Form	Title of Standard Field Form
HF-FORM -001	Chain-of-Custody Record
HF-FORM -430	Water Sampling Form

2.4.1 Pond Sampling

Samples will be collected from the edge of the pond directly into the sample containers, taking care to ensure that as little particulate matter is included in the sample as possible. The sampler will ensure that no air bubbles are present in the vials prior to sealing. Sample containers, preservation methods, and holding times for the requested analytical parameters (VOCs) are listed in Table 2-7. General water sample handling procedures, including sample designation, sample shipment, documentation (labels, chain-of-custody records, field notebook) are discussed in Section 2.2.

TABLE 2-7. SURFACE WATER SAMPLE CONTAINER, PRESERVATION AND HOLDING TIME REQUIREMENTS

Media	Parameters	Analytical Method	Detection Limit	Sample Container	Preservation	Holding Time
Water	VOC (see Appendix C)	EPA 8260B	(see specific compound, PCE = 0.0005 mg/L)	3-40 mL VOA vials (no headspace)	pH < 2 with HCl; cool to ≤6°C	14 days

2.4.2 Sprinkler Sampling

Samples will be collected from a sprinkler head near the Golf Course pump house. The sprinkler will be turned on and a sample collected in a metal bowl from the sprinkler discharge as it nears the ground. The sample will then be transferred to the appropriate sample containers ensuring that no air bubbles are present in the vials prior to sealing. Sample containers, preservation methods, and holding times for the requested analytical parameters (VOCs) are the same as for the pond samples and are listed in Table 2-7. General sample handling procedures, including sample designation, sample shipment, documentation (labels, chain-of-custody records, field notebook) are discussed in Section 2.2.

2.5 LANDFILL GAS SAMPLING PROCEDURES

The latest version of the SOPs and standard field forms (or their equivalents) listed below in Tables 2-8 and 2-9, and included in Appendix D, will be used to guide the collection and documentation of landfill gas samples, sample handling and shipping procedures, and measurement of field parameters.

TABLE 2-8. SUMMARY LIST OF STANDARD OPERATING PROCEDURES FOR SAMPLING LANDFILL GAS

Standard Operating Procedure	Title of Standard Operating Procedure
HF-SOP-2	Determination, Identification, and Description of Field Sampling Sites
HSOP-4	Chain-of-Custody Procedures, Packing and Shipping Samples
HSOP-29	Labeling and Documentation of Samples
HSOP-31	Field Notebooks
HSOP-109	Landfill Gas Sampling Using Portable Gas Meter

TABLE 2-9. SUMMARY LIST OF STANDARD FIELD FORMS FOR SAMPLING LANDFILL GAS

Form	Title of Standard Field Form
HF-001	Chain-of-Custody Record
HF-500	Instrument Calibration Form
	Helena Landfill Monthly Gas Sampling Form
	Helena Landfill Quarterly Gas Sampling Form

2.5.1 Landfill Gas Probe Sampling

Monitoring wells can be accessed using either the appropriate Hydrometrics' key or a 9/16" socket wrench. Samples will be collected from monitoring wells using a portable landfill gas meter. Each gas probe and any groundwater well used for gas monitoring will be fitted with a PVC sampling cap containing a hose barb fitting and attached tubing. This tubing will be normally crimped and clamped to prevent atmospheric gases from entering the probe. If a pressure reading is required, a vacuum magnehelic gauge will be coupled to the sampling port via a hose-to-hose connector before removing the clamp. The vacuum reading will be recorded on the appropriate form. The tubing will then be re-crimped and clamped before disconnecting the gauge. When measuring landfill gas concentrations in the field, the landfill gas meter will be connected as described above. The meter and associated pump will then be

started and a gas sample taken. When gas readings stabilize, the results will be recorded on the appropriate form. The meter will then be shut down and the tubing clamped before disconnecting the meter from the sample port. Well lids will be replaced and locked after sampling.

2.5.2 Gas Extraction Well Sampling

Pressure will be measured across the orifice plate to determine the flow rate of gas being extracted. The center valve box contains both an upstream and a downstream sampling port which are normally crimped and clamped to prevent atmospheric gases from entering the system. The pressure can be measured with either a magnehelic gauge or an internal pressure indicator included in some landfill gas meters. The upstream tubing shall be connected to the inlet connection of the meter or pressure gauge and the downstream tubing shall be connected to the outlet connection before the clamps are removed. If using a gas meter, the meter will be turned on, but the associated air pump will remain off during the pressure reading. The pressure drop across the orifice will be recorded on the appropriate form. The sample tubing will be crimped and clamped before being disconnected from the meter.

All landfill gas field measurements from the YMCA GES wells will be accomplished using a portable landfill gas meter. The landfill gas meter will be connected as described above before removing the tubing clamps. The gas concentrations will then be allowed to stabilize before being recorded on the appropriate form. The sample tubing will be crimped and clamped before being disconnected from the meter.

The third valve box contains a temperature gauge and the sampler will read the temperature to the nearest degree and record the value on the appropriate form. If the temperature reads above 150 degrees Celsius, sampling personnel will shut down the extraction system and notify the Project Engineer or the Project Manager immediately as this may indicate an underground fire. Both valve box lids will be replaced after sampling.

2.5.3 Gas Extraction System Stack Sampling

The stacks for the YMCA GES, the Carroll College passive interception trench, and the Lyndale passive interception trench each have a sampling port to allow for easy sampling of the stack gases. The portable landfill gas meter will be connected to the sample port before the sample port valve is opened. The gas concentration measurements will be allowed to stabilize before the values are recorded on the appropriate form. The gas meter will then be disconnected and the inlet to a peristaltic pump connected in its place. The outlet of the pump will be connected inlet port of a gas sampling bag and the pump turned on. The valve on the bag will then be opened to allow the sample bag to fill. After the bag is sufficiently full, the bag port will be closed and the pump turned off before disconnecting the bag from the pump. The stack sample port valve will then be closed and the pump disconnected from the port.

Sample containers, preservation methods, and holding times for the requested laboratory analytical parameters are listed in Table 2-10.

TABLE 2-10. STACK GAS SAMPLE CONTAINER, PRESERVATION AND HOLDING TIME REQUIREMENTS

Media	Parameters	Analytical Method[(1)]	Detection Limit	Sample Container	Preservation	Holding Time
Gas	VOC (see Appendix C)	EPA 8260B	(see specific compound)	1-500 ml Tedlar bag	Cool to ≤6°C	14 days

General sample handling procedures, including sample designation, sample shipment, documentation (labels, chain-of-custody records, field notebook) are discussed in Section 2.2.

2.5.4 Gas Extraction System Equipment Check

During the monthly monitoring of the GES wells, sampling personnel will also perform a brief check of the GES to ensure that the system is operating correctly. On the bottom of both the monthly and quarterly gas sampling forms, there is a YMCA GES checklist with a short list of operational parameters to be recorded and maintenance procedures to be

performed. The results of this check will be compared to conditions during normal operations. Should conditions fall outside the range of "normal" as indicated on the form, sampling personnel will immediately notify the Project Engineer or the Project Manager.

2.5.5 Methane Alarms Check

During the monthly monitoring of the landfill gas probes, sampling personnel will also perform a check on the methane alarms located in the transfer station scale house, the crawl space of the scale house office, the Carroll College shop, the basement of the old Armory building, the YMCA mechanical room located on the north side of the building, and underneath the pool in the YMCA. These alarms will be inspected to ensure good physical condition. Each alarm will be tested by passing a propane bottle near the alarm's detection port to ensure that an alarm does sound when the alarm is activated. Should the alarm fail to activate, sampling personnel will immediately notify the Project Engineer or the Project Manager. Gas sensors will be replaced prior to the manufacturer's specified expiration date.

3.0 QUALITY ASSURANCE/QUALITY CONTROL PROJECT PLAN

This quality assurance/quality control project plan (QA/QCPP) describes procedures for ensuring that chemical data generated from groundwater, surface water, and gas sampling are of known and acceptable quality to support their intended uses.

The QA/QCPP and its associated work plan are intended to provide a framework for sampling and analytical protocol for water and soil samples and summarizes procedures for expressing the quality of the results generated: quantitatively in terms of precision, accuracy, and completeness, and qualitatively in terms of representativeness and comparability.

The quality assurance mechanisms that will be used in this investigation can be categorized as prevention, assessment, and correction.

Prevention of defects in quality or quantity of measurements through planning and design of the investigation, documenting instructions and procedures, and employing experienced and qualified personnel.

Assessment of the quantity and quality of sampling and testing information through a data quality review. Analytical performance will be gauged from evaluation of field and laboratory quality control sample analyses. Data quality review of the analytical results will generally follow EPA established criteria, as found in National Functional Guidelines for Inorganic Superfund Methods Data Review (EPA, 2017a) and National Functional Guidelines for Organic Superfund Methods Data Review (EPA, 2017b). Review of analytical data will proceed as outlined in this QA/QCPP.

Correction of conditions, which could compromise the quality of samples or sample results, based on the review and inspection of measurements and measurement results. Corrective actions may be undertaken as described in Section 3.4.5 of this QA/QCPP.

Quality assurance in field investigation activities will be ensured through the use of standard field operating procedures (SOPs), sample chain-of-custody documentation, and submission of field duplicates and trip blanks. SOPs for all field activities including the collection, documentation and shipment of samples, decontamination of sampling equipment, and all other applicable activities have been included in Appendix D.

Quality assurance in laboratory analyses is ensured through the use of approved methods of analyses and through the laboratory's quality control program which includes regular analysis of laboratory control samples (standards), preparation blanks, duplicates, sample spikes, matrix spikes, matrix spike duplicates, and other calibration verification standards and blanks.

3.1 DATA QUALITY OBJECTIVES

The overall goal of the QA/QCPP is to ensure that data are acceptable for their intended uses. A summary of intended uses of data generated for this project are:

- To characterize landfill impacted groundwater conditions;
- To assist in remediation of landfill impacted groundwater;
- To characterize landfill gas migration conditions; and
- To assist in remediation of landfill gas.

To ensure that the data generated support the intended data uses, the following sampling and analytical specific data quality objectives for the PARCC parameters (precision, accuracy, representativeness, completeness and comparability) are specified. These sampling and analytical specific objectives are consistent with guidelines provided in National Functional Guidelines for Inorganic Superfund Methods Data Review (EPA, 2017a), National Functional Guidelines for Organic Superfund Methods Data Review (EPA, 2017b) and in EPA Requirements for Quality Assurance Project Plans (EPA, 2001). Assessment of the PARCC parameters will guide the evaluation of overall data quality.

3.1.1 Precision Objective

Precision is defined as a measure of reproducibility of replicate measurements, and is inversely related to the variability among the results obtained (e.g., highly variable results have low precision). Precision of field duplicates is a measure of both field sampling variability and the laboratory analytical variability. Precision will be assessed using field and laboratory duplicates, and laboratory matrix spike duplicates.

The control limit for precision is a relative percent difference (RPD) of 35% or less for field and laboratory duplicates for soil samples with concentrations greater than five times the PRDL (Project Required Detection Limit) and 20% RPD or less for aqueous analysis. Control limits for sample results less than five times the PRDL are plus or minus two times the PRDL for soils and plus or minus five times the PRDL for aqueous data. Matrix spike duplicate analyses will be used to determine laboratory precision. Control limits for matrix spike duplicates are listed in Table 1 and are taken from the USEPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods Multi-Media, Multi-Concentration (EPA, 2016a) and USEPA Contract Laboratory Program Statement of Work for Organic Superfund Methods Multi-Media, Multi-Concentration (EPA, 2016b).

The target precision is evaluation of 90% of all field and laboratory duplicates (matrix spike duplicates) to be within control limits.

3.1.2 Accuracy Objectives

Accuracy is the agreement between a measured value and a ‘true’ value. Accuracy will be assessed using field trip blanks, field equipment/rinsate blanks, laboratory matrix spikes, laboratory control standards, laboratory method blanks, laboratory fortified blanks, and laboratory surrogate standard checks. Control limits will be taken from the USEPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods Multi-Media, Multi-Concentration (EPA, 2016a) and USEPA Contract Laboratory Program Statement of Work for Organic Superfund Methods Multi-Media, Multi-Concentration (EPA, 2016b).

The target accuracy is evaluation of 90% of all field trip blanks, field equipment/rinsate blanks, laboratory matrix spikes, laboratory control standards, laboratory method blanks, and laboratory surrogate standard checks to be within control limits.

3.1.3 Representativeness Objective

Representativeness is the extent to which discrete measurements and testing accurately describe the environmental system. Representative data are achieved through careful selection of sampling sites, and proper sampling and analytical procedures.

3.1.4 Completeness Objective

Completeness is achieved when the number of valid measurements is sufficient to satisfactorily address all-important issues about the site. Completeness is assessed as the number of "valid" measurements. A "valid" measurement is one in which the sample was properly collected and considered representative of the material sampled, and which was not rejected during the data quality review process. Results qualified during the data quality review process as estimated will be considered valid measurements, unless extenuating circumstances or professional judgment indicate otherwise.

The target completeness for this project is assessment of at least 90% of the sample analyses as "valid" (not rejected).

3.1.5 Comparability Objective

Comparability is the degree to which two or more data sets from the same site are generated using consistent procedures. Inherent compositional differences aside, discrete data sets may differ as a result of non-random (biased) sampling, variability in sampling technique, and variations in methods of analysis. To ensure comparability of data collected under this plan, the following actions will be implemented:

1. Hydrometrics' SOPs will be employed for sampling and analytical activities, as appropriate;
2. Field personnel will be thoroughly trained in sampling techniques;

3. Data results will be reported in standard units;
4. Data qualifiers will be consistent for all project data;
5. All sampling sites will be accurately delineated and recorded (HF-SOP-2); and
6. Analyses will be performed using EPA-accepted methods, as available and appropriate.

3.2 SAMPLING PROCEDURES

3.2.1 Field Measurements and Sample Collection Procedures

Field measurements and sample collection procedures for groundwater samples, surface water samples, and landfill gas samples are described in Sections 2.3, 2.4, and 2.5, respectively. Field procedures will be conducted according to Hydrometrics' SOPs provided in Appendix D.

3.2.2 Sample Labeling, Documentation, and Shipping Procedures

Procedures for sample labeling, documentation, and shipping are discussed in Section 2.2 and Hydrometrics' SOPs for these items are included in Appendix D. All samples collected and sent to the laboratory for analysis will follow these standard documentation and chain-of-custody procedures. Documents generated during sample collection will consist of:

1. Sample collection field notes and forms;
2. Chain-of-Custody forms; and
3. Shipping receipts for those samples sent to the laboratory by an independent courier.

3.3 FIELD QUALITY CONTROL SAMPLE COLLECTION

Field quality control samples will be used to provide quality assurance for field sampling and subsequent laboratory analysis of metals concentrations. This section describes the types of field quality control samples to be collected, and the frequency at which each type of field quality control sample will be collected.

Field duplicate samples are replicate samples from a single sampling location submitted to a laboratory for the same set of analyses. For the purposes of this project, field duplicates will be

collected per the SOPs as referenced in Appendix D. Duplicates will be sent to the same laboratory, but will be identified with different sample numbers. Field duplicates will be collected at a frequency of one per twenty samples collected with a minimum of one per sampling event.

Rinsate blank samples are samples collected using deionized water. The rinsate blank is prepared by running the water over or through all previously decontaminated sampling equipment which potentially contacts the sample during sample collection. For the purposes of this project, rinsate blank samples will be collected per the SOPs as referenced in Appendix D (HF-SOP-13). The rinsate sample will be collected immediately prior to collecting the natural field sample. Rinsate blanks will be submitted for all parameters to be analyzed for during the sampling event. At a minimum, one rinsate blank sample will be collected per sampling event.

Trip blank samples are samples that are filled in the lab with reagent water using the same required sample-preparation procedures. The trip blank is not opened in the field. Field trip blanks will be submitted at a frequency of one per sample delivery group or one per cooler and for all parameters to be analyzed for during the sampling event.

3.4 LABORATORY PROCEDURES

Samples will be submitted to a qualified laboratory. Energy Laboratories, Inc. (ELI) located in Helena, MT will conduct all chemical analyses for both the water and gas samples.

3.4.1 Analytical Detection Limits

The project detection limits (PDL) for groundwater samples, surface water samples, and landfill gas samples listed in Tables 2-4, 2-7, and 2-10, respectively, are at concentrations normally achieved by routine analytical testing in the absence of unusual matrix interferences, and below anticipated regulatory standards wherever possible. The lower reporting limit for all field samples and quality control samples will be the PDL.

3.4.2 Laboratory Quality Control Limits

A summary of the laboratory quality control limits is listed in Table 3-1. These procedures are to be conducted at the laboratory in accordance with MDEQ requirements.

TABLE 3-1. SUMMARY OF LABORATORY QUALITY CONTROL LIMITS

QA Sample/ Indicator	Frequency	Acceptance Criteria
Instrument Calibration (IC)	Calibrated daily, after maintenance, or as needed.	Calibration correlation coefficient must be ≥0.996
Initial Calibration Verification (ICV)	Immediately following calibration.	%R=90-110
Continuing Calibration Verification (CCV)	Analyzed at beginning of run, every 10 samples and end of run.	%R=90-110
Laboratory Control Standard (LCS)	1 per analytical run for direct samples or 1 per digestion batch	%R=85-115
Method Blank	1 per analytical run for direct samples or 1 per digestion batch	Larger of ±1 times lowest reporting limit or 2.2 times MDL < Reporting limit
Matrix Spike	Minimum 1/10 samples	%R=70-130
Matrix Spike Duplicate	Minimum 1/10 samples	%R=70-130 Larger of 3*PQL or 20% RPD
Laboratory Duplicate Samples	Minimum 1/10 samples	%R=70-130 Larger of 3*PQL or 20% RPD

3.4.3 Laboratory Deliverables

The selected laboratory for performing water and gas chemical analyses will deliver thorough documentation including the results of the tests, the testing method employed, and any relevant quality control information (calibration, laboratory standard sample results, etc.). Laboratory deliverables will consist of standard laboratory deliverables for all analyses. Laboratory reports should provide information on results, methods, and associated laboratory QC data.

All sample results will be provided in electronic format such as a PDF file and/or an Excel file. The deliverable package will also contain a summary of any deviations from procedures described in this work plan required as a result of corrective actions. Results will be provided to

Hydrometrics' Data Management Department (attn. Ericka Vallance) within 30 days of sample receipt.

3.4.4 Data Quality Review

Data received from the laboratory will be transferred into the Hydrometrics database system. All entries will be compared with results provided by the laboratories to ensure database entries are free of transcription errors.

All data will be reviewed for completeness of deliverables, and adherence to prescribed sampling and analytical protocols and will generally be reviewed in accordance with National Functional Guidelines for Inorganic Superfund Methods Data Review (EPA, 2017a) and National Functional Guidelines for Organic Superfund Methods Data Review (EPA, 2017b).

In addition to the data quality review procedures outlined in the functional guidelines, data quality review will include:

- Completeness of submittal packages;
- Completeness of field documentation;
- Field equipment calibration and maintenance and quality of field measurements; and
- Adherence to proper sample collection procedures.

Data qualifiers will be assigned to data, which does not meet data quality objectives. A summary of the data qualifier codes is provided in Table 3-2.

TABLE 3-2. DATA VALIDATION CODES AND DEFINITIONS

CODE	DEFINITION
U-	Blank contamination. Indicates possible high bias and/or false positive.
H -	Holding time not met. Indicates low bias.

3.4.5 Corrective Actions

Any deviations from the work plan (concerning both field and laboratory work) which are necessary in order to generate data to meet the intended data uses of this QA/QCPP are considered corrective actions. Corrective actions may include:

- Changes in sample collection methods;
- Collection of additional samples;
- Sample reanalysis;
- Modification of analytical procedures or selection of new procedures; and
- Qualifying sample results as estimated or rejected.

All corrective actions must be approved by the project manager and QA Officer prior to making the changes. All corrective actions must be documented. A summary of corrective actions taken will be included in the data quality report.

3.5 DATA QUALITY REPORTS

A final report summarizing the overall quality of the data in terms of meeting the data quality objectives will be prepared after the conclusion of all sampling and analysis. This report shall consist of a summary of all the data validation quality review conducted for each sampling event and media type, an assessment of the overall completeness objectives for each analyte, and a summary of any relevant corrective action measures that were implemented.

4.0 REFERENCES

EPA, 2001. EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, March 2001.

EPA, 2016a. USEPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods Multi-Media, Multi-Concentration, ISM 02.4, October 2016.

EPA, 2016b. USEPA Contract Laboratory Program Statement of Work for Organic Superfund Methods Multi-Media, Multi-Concentration, OSM 02.4, October 2016.

EPA, 2017a. National Functional Guidelines for Inorganic Superfund Methods Data Review, EPA-540-R-2017-001, January 2017.

EPA, 2017b. National Functional Guidelines for Organic Superfund Methods Data Review, EPA-540-R-2017-002, January 2017.

Hydrometrics, Inc., 1994. Sampling and Analysis Plan, City of Helena Landfill Groundwater Monitoring Activities, Prepared for City of Helena, 1994.

Hydrometrics, Inc., 2006. Revised Sampling and Analysis Plan, City of Helena Landfill Groundwater, Surface Water, and Landfill Gas Monitoring Activities, Prepared for City of Helena, 2006.

Hydrometrics, Inc., 2008. Revised Sampling and Analysis Plan, City of Helena Landfill, Groundwater, Surface Water and Landfill Gas Monitoring Activities, Prepared for City of Helena, March 2008.

APPENDIX A

WELL LOGS

APPENDIX B

FIELD SAMPLING SITE FORMS

FIELD SAMPLING SITE FORMS

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-1

NARRATIVE SITE DESCRIPTION: In parking lot behind the old Armory building near tower in Armory parking lot near EW-2.

SITE LOCATION: 46.59905003 ° latitude -112.032516 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): 7 ft off chain link fence behind concrete barrier

DESCRIPTION OF PHOTO "VIEW": Concrete barrier and chain link fence in Armory parking lot.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-2

NARRATIVE SITE DESCRIPTION: In concrete structure south of bench at intersection of walking trail paths.

SITE LOCATION: 46.59833799 ° latitude -112.033861 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): 26 ft from edge of pavement, 28 ft from bench, and 13'4" north of H-42

DESCRIPTION OF PHOTO "VIEW": walking path intersection, bathrooms, bench, and well by clipboard

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-3

NARRATIVE SITE DESCRIPTION: located in Centennial Park by walking path, use GPS to get close to site

SITE LOCATION: 46.59845601 ° latitude -112.035559 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): 19 ft from pavement, 24 ft from mounded tree, in concrete pad with large steel cap

DESCRIPTION OF PHOTO "VIEW": concrete pad with well is shown next to clipboard, mounded tree in background with edge of pavement at shortest distance from the well.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-4

NARRATIVE SITE DESCRIPTION: Halfway between H-25 and Carrol College Stack in drainage ditch located 3 ft off cedar fence.

SITE LOCATION: 46.60132798 ° latitude -112.035693 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): 3 ft off of cedar fence, snow is piled here in the winter time, use culvert and access road to help find the methane probe.

DESCRIPTION OF PHOTO "VIEW": Well location in small ditch near cedar fence.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-7

NARRATIVE SITE DESCRIPTION: Well is located on the walking trail behind the transfer station building.

SITE LOCATION: 46.60491301 ° latitude -112.036842 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): 4-ft from fence, 11-ft from white aspen tree

DESCRIPTION OF PHOTO "VIEW": Well is 4 ft from the fence along the walking trail and 11 ft from the white aspen tree in the picture

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-9

NARRATIVE SITE DESCRIPTION: Well is in the YMCA Parking Lot below the retaining wall shown in the picture

SITE LOCATION: 46.599505 ° latitude -112.032175 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): The probe is 23.5 ft from the retaining wall shown in the picture in between EW-3 and EW-4.

DESCRIPTION OF PHOTO "VIEW": Well location in YMCA parking lot

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-10

NARRATIVE SITE DESCRIPTION: In YMCA Parking Lot below retaining wall shown in picture.

SITE LOCATION: 46.59982301 ° latitude -112.031872 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): The probe is offset 6 ft 5-inches north of a power outlet on the retaining wall and 20 ft 5 in from the retaining wall.

DESCRIPTION OF PHOTO "VIEW": Retaining wall and well shown in the YMCA Parking lot.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-12R

NARRATIVE SITE DESCRIPTION: Near flagpole by YMCA

SITE LOCATION: 46.60031897 ° latitude -112.030449 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Steel pipe by flagpole edge 8.5 ft from tree, 13 ft from concrete border around flag pole.

DESCRIPTION OF PHOTO "VIEW": steel pipe, concrete border around pole, and tree.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-13

NARRATIVE SITE DESCRIPTION: Between YMCA, Skate Park, and North Last Chance Gulch

SITE LOCATION: 46.599504 ° latitude -112.031056 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Probe is located northwest of three large pine trees between the YMCA and North Last Chance Gulch Road on a grassy hill. The well is 30 ft from the walking path and 32 ft from the north most large pine tree.

DESCRIPTION OF PHOTO "VIEW": Hill with well, walking path, and pine tree

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John R. Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-14R

NARRATIVE SITE DESCRIPTION: The probe is located near the garden shack behind the YMCA Building

SITE LOCATION: 46.59902296 ° latitude -112.031536 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): 17.5 ft from horseshoe pit, 27ft from corner of the garden shack near three large pine trees

DESCRIPTION OF PHOTO "VIEW": Garden shack and corner of horseshoe pit with well nearby clipboard.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-16

NARRATIVE SITE DESCRIPTION: Manhole cover located off transfer station service road

SITE LOCATION: 46.60385697 ° latitude -112.037118 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Triangulate manhole from pine tree and Russian olive. The well is 63 ft from pine tree and 64 ft from the Russian olive below the hill leading up to the transfer station building.

DESCRIPTION OF PHOTO "VIEW": The photo shows the pine tree and the transfer station, the Russian olive is located to the right of the photograph.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-17

NARRATIVE SITE DESCRIPTION: Well located near bend in walking trail between concrete block and chain link fence.

SITE LOCATION: 46.60415696 ° latitude -112.037551 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): The probe is 4.5 ft from chain link fence and 11.5 ft from the north side of the concrete block near Rick in the picture.

DESCRIPTION OF PHOTO "VIEW": Trail with fence and concrete barriers.

DATE FORM COMPLETED: 10/31/2018
INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-18

NARRATIVE SITE DESCRIPTION: Northwest corner of YMCA building near the pool stairwell.

SITE LOCATION: 46.59987297 ° latitude -112.031701 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Probe is located 4 ft 9 in from the wall, 11 ft 8 in from the pool stairwell and is next to the clipboard in the photograph.

DESCRIPTION OF PHOTO "VIEW": Photograph of building corner, well, and pool stairwell on YMCA building.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-19-SMD

NARRATIVE SITE DESCRIPTION: Between railroad tracks and power lines along access road behind golf course.

SITE LOCATION: 46.60483003 ° latitude -112.034227 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Two Probes in casing, one well is shallow and one well is deep. The two probes are located between the road and the railroad tracks south of the power line and 42.5 ft from the power pole.

DESCRIPTION OF PHOTO "VIEW": well and reference power pole are shown in figure.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-20

NARRATIVE SITE DESCRIPTION: Located at the intersection of the railroad maintenance access roads.

SITE LOCATION: 46.60425201 ° latitude -112.032237 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): 13 ft 11 in from centerline of the south road, 12 ft 7 in from the centerline of the north road

DESCRIPTION OF PHOTO "VIEW": Southern access road is on left, northern access road is on the right.

DATE FORM COMPLETED: 10/31/2018
INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-21

NARRATIVE SITE DESCRIPTION: Probe located on driveway behind cabinet building shop.

SITE LOCATION: 46.60360501 ° latitude -112.030106 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Probe is 5 ft 5 inches from the fence in the bush off of the driveway access road.

DESCRIPTION OF PHOTO "VIEW": Probe is in the bush 5 ft 5 inches from the fence.

DATE FORM COMPLETED: 10/30/2018
INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-22

NARRATIVE SITE DESCRIPTION: In Carroll College Shop parking lot.

SITE LOCATION: 46.60269197 ° latitude -112.036231 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): 33 ft from fence, 88 ft from building corner in parking lot. Well is a small manhole in the Carroll College Shop Parking lot.

DESCRIPTION OF PHOTO "VIEW": Probe located next to clipboard on ground, building corner and fence are shown in the image as well.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-23R

NARRATIVE SITE DESCRIPTION: Northeast corner of Carroll College practice field.

SITE LOCATION: 46.60216601 ° latitude -112.036151 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is located in a metal casing by the northeast corner of the CC soccer practice field 7 ft off the fence line.

DESCRIPTION OF PHOTO "VIEW": Northeast corner of practice field, well, and fence line.

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-25

NARRATIVE SITE DESCRIPTION:

SITE LOCATION: 46.60010599 ° latitude -112.035493 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): By parking lot off corner of cedar fence and curb, end of Carroll College trench across from the Saint Catherine Dorm. 7 ft 6 in to curb, 6 ft from the corner of the cedar fence.

DESCRIPTION OF PHOTO "VIEW": Corner of cedar fence with well and Carroll College trench curb box.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-26

NARRATIVE SITE DESCRIPTION: Near the south wall of the YMCA building south of the skate park.

SITE LOCATION: 46.599777 ° latitude -112.031454 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Probe is located 5 ft from the building wall and 10 ft from the window frame.

DESCRIPTION OF PHOTO "VIEW": Window frame, south wall, and well location.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-27

NARRATIVE SITE DESCRIPTION: Near the YMCA building by the door to the blue chlorinated room.

SITE LOCATION: 46.59975696 ° latitude -112.031851 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Probe is located 11 ft 7 in from the double door to the blue chlorinated room and 8 ft 6 in from the sidewalk.

DESCRIPTION OF PHOTO "VIEW": Blue doors to chlorinated room, sidewalk, and well located next to the clipboard.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-28

NARRATIVE SITE DESCRIPTION: Main entrance to YMCA

SITE LOCATION: 46.59960399 ° latitude -112.031871 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is located by main YMCA entrance 5 ft from the wall and 13 ft from the sidewalk.

DESCRIPTION OF PHOTO "VIEW": Main entrance to YMCA, well, and sidewalk.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-29

NARRATIVE SITE DESCRIPTION: YMCA Building south of the main entrance.

SITE LOCATION: 46.59942303 ° latitude -112.031907 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is located 8 ft 10 in from the west wall, 23 ft from the south wall.

DESCRIPTION OF PHOTO "VIEW": West wall and south wall of the YMCA Building

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-30

NARRATIVE SITE DESCRIPTION: Southwest corner of the YMCA Building

SITE LOCATION: 46.59929596 ° latitude -112.031995 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is located 20 ft 4 in from the building corner and 7 ft 5 in from the wall of the YMCA.

DESCRIPTION OF PHOTO "VIEW": South west corner of YMCA Building, methane probe is located next to clipboard and equipment on ground surface.

DATE FORM COMPLETED: 10/31/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-31

NARRATIVE SITE DESCRIPTION: Dirt walking trail behind the transfer station

SITE LOCATION: 46.60463397 ° latitude -112.037201 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is 11 ft from tree and 6 ft 9 in from fence on the west side of the Transfer Station

DESCRIPTION OF PHOTO "VIEW": The methane probe is located in a small manhole next to the clipboard in the photo. The nearby tree and fence are the reference measuring points.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-32

NARRATIVE SITE DESCRIPTION: Red brick divider on Lyndale Road

SITE LOCATION: 46.59814102 ° latitude -112.03393 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): The probe is located 4 ft from the planter on Lyndale, 10 ft from the north side of the street, and 11 ft from the south side of the street.

DESCRIPTION OF PHOTO "VIEW": Red brick divider with planter, well is located at the center of the brick area.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-33

NARRATIVE SITE DESCRIPTION: Planter in center divider on Lyndale Road

SITE LOCATION: 46.59811897 ° latitude -112.035455 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): The probe is located between two trees in the planter in the center divider on Lyndale Road, 13 ft 4 in from the west tree and 34 ft from the east tree 5 ft off the south edge of the road.

DESCRIPTION OF PHOTO "VIEW": Rick standing on top of the well on Lyndale, two trees are shown as the measuring points with Carroll College in the background.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-34

NARRATIVE SITE DESCRIPTION: Below retaining wall for Carroll College dorm parking lot.

SITE LOCATION: 46.59935002 ° latitude -112.035437 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): This methane probe is missing its protective metal cap and is covered by a white concrete rock. The well is 24.5 ft from the mounded tree in the picture and is offset 4 ft 10 in from the concrete retaining wall.

DESCRIPTION OF PHOTO "VIEW": Carroll college in background, retaining wall and two trees are shown in the figure, the right tree is the reference for the well location measurement.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-35

NARRATIVE SITE DESCRIPTION: Below large satellite receiver at corner of walking paths

SITE LOCATION: 46.59888399 ° latitude -112.035560 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is located 7 ft from the paved path and 19 ft from the dirt path near the large satellite receiver.

DESCRIPTION OF PHOTO "VIEW": The probe is located at the drill in the photograph.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-36

NARRATIVE SITE DESCRIPTION: West side of the path as the tunnel enters Centennial Park.

SITE LOCATION: 46.59838501 ° latitude -112.035978 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): The probe is 5 ft off the pavement on the walking path and 27.5 ft from the lamppost. The lamppost is not shown in the picture.

DESCRIPTION OF PHOTO "VIEW": Probe is located next to the clipboard in the photograph.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-37

NARRATIVE SITE DESCRIPTION: By base of stone retaining wall on the north side of the Lyndale walking path tunnel

SITE LOCATION: 46.59833497 ° latitude -112.03585 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): By base of stone retaining wall 1 ft 4 in from the retaining wall and 18 ft 9 in from the sign. The methane probe is covered by a cement block and does not have a cap.

DESCRIPTION OF PHOTO "VIEW": Probe is located below the clipboard, sign and retaining wall are shown.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-38

NARRATIVE SITE DESCRIPTION: Methane Probe is between the mounded tree and exercise bench.

SITE LOCATION: 46.59844302 ° latitude -112.035153 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is located 3 ft from the edge of the pavement and 29.5 ft from the corner of the brown bench on the playground shown in the picture.

DESCRIPTION OF PHOTO "VIEW": Playground/rest stop/ and walking path near the well.

DATE FORM COMPLETED: 11/1/2018
INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-39

NARRATIVE SITE DESCRIPTION: Methane probe is in-between manhole and tree south of the walking path.

SITE LOCATION: 46.59837596 ° latitude -112.035157 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is 19 ' from the edge of the pavement and 28' from the mounded tree on hill between the manhole and the tree.

DESCRIPTION OF PHOTO "VIEW": methane probe location is shown where equipment is piled on the ground surface.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-40

NARRATIVE SITE DESCRIPTION: North of walking path and west of running statue

SITE LOCATION: 46.59845802 ° latitude -112.034746 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is located 13 ft 7 in from the edge of the pavement and 8 ft from the sprinkler box.

DESCRIPTION OF PHOTO "VIEW": probe is on the ground next to the clipboard, pavement and sprinkler box are shown in the picture.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-42

NARRATIVE SITE DESCRIPTION: On the slope between the roadway south of H-2 between methane probe H-2 and street.

SITE LOCATION: 46.59827898 ° latitude -112.033843 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is located on the hillslope 15 ft off of the sidewalk and 13 ft 4 in from methane probe H-2.

DESCRIPTION OF PHOTO "VIEW": Probe is located on the slope next to the clipboard.

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-43

NARRATIVE SITE DESCRIPTION: By walking path, two buildings and roadway

SITE LOCATION: 46.598282 ° latitude -112.033495 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is located 17 ft from the sidewalk 42 ft 4 in from the south corner of the Lyndale Stack.

DESCRIPTION OF PHOTO "VIEW": Sidewalk and access road, methane probe is on the hillslope hidden in the grass.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: H-44

NARRATIVE SITE DESCRIPTION: On hill north of fire hydrant near the old armory parking lot.

SITE LOCATION: 46.59831704 ° latitude -112.03296 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is 25 ft 9 in to the parking lot corner and 23 ft 8 in from the fire hydrant.

DESCRIPTION OF PHOTO "VIEW": Armory parking lot corner and fire hydrant. Well is located next to Rick in the photo view.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Carroll College Sanitary Sewer

NARRATIVE SITE DESCRIPTION: By retaining wall below Carroll College.

SITE LOCATION: 46.59926201 ° latitude -112.035491 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is located in a 10 inch high steel casing 13 ft 8 in from the manhole cover and 5 ft 8 in from the concrete wall.

DESCRIPTION OF PHOTO "VIEW": Manhole cover, concrete block wall, and methane probe.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Carroll College Storm Sewer

NARRATIVE SITE DESCRIPTION: South end of stone retaining wall below Carroll College parking lot.

SITE LOCATION: 46.59904299 ° latitude -112.035624 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Methane probe is located near the end of the concrete retaining wall where a dirt walking path extends up to the parking lot. Methane probe is 13.5 ft from the south corner of the retaining wall and 11.5 ft from the edge of the dirt walkway.

DESCRIPTION OF PHOTO "VIEW": Probe, retaining wall, and dirt access are shown in the figure.

DATE FORM COMPLETED: 11/1/2018
INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: EW-1

NARRATIVE SITE DESCRIPTION: Old armory parking lot near chainlink enclosure.

SITE LOCATION: 46.59895901 ° latitude -112.032717 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe (Extraction Well) Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Extraction well is located 6.5 ft from the chain link fence behind a concrete barrier.

DESCRIPTION OF PHOTO "VIEW": Concrete barrier, chain link fence, and EW-1 are shown in in the picture.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: EW-2

NARRATIVE SITE DESCRIPTION: Old armory parking lot

SITE LOCATION: 46.59914701 ° latitude -112.032545 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe (Extraction Well) Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Extraction well is located in the armory parking lot near the concrete curb that divides this parking lot from the YMCA, near H-1.

DESCRIPTION OF PHOTO "VIEW": Extraction well and tower in the old armory parking lot.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: EW-3

NARRATIVE SITE DESCRIPTION: YMCA Parking lot near horseshoe court fenced area.

SITE LOCATION: 46.59938699 ° latitude -112.032353 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe (Extraction Well) Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Located 41 ft from retaining wall corner and 44 ft 7 in from horseshoe court fence corner.

DESCRIPTION OF PHOTO "VIEW": Parking lot of YMCA, edge of retaining wall and horseshoe court fence are in photo.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: EW-4

NARRATIVE SITE DESCRIPTION: YMCA Parking Lot

SITE LOCATION: 46.59961397 ° latitude -112.032154 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe (Extraction Well) Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Extraction is located 38 ft from the retaining wall. Use GPS locate to find the well.

DESCRIPTION OF PHOTO "VIEW": EW-4 in YMCA parking lot

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: EW-5

NARRATIVE SITE DESCRIPTION: West of H-10 in middle of YMCA parking lot.

SITE LOCATION: 46.599878 ° latitude -112.031932 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe (Extraction Well) Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Extraction well is located in the middle of the parking lot 38 ft 8 in from the retaining wall, a GPS will be needed to locate the extraction well.

DESCRIPTION OF PHOTO "VIEW": Extraction well in YMCA parking lot.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: EW-7

NARRATIVE SITE DESCRIPTION: South edge of skate park

SITE LOCATION: 46.59998998 ° latitude -112.031458 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe (Extraction Well) Building Groundwater Well Residential Well

REMARKS: (Access, etc.): Extraction well is in a grey concrete box south of the skate park. GPS point is centrally located, the sample port is 4ft south of the skate park and 25ft from the water fountain.

DESCRIPTION OF PHOTO "VIEW": Concrete box by skate park containing EW-5 sample port water fountain is in the background.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: YMCA Stack

NARRATIVE SITE DESCRIPTION: Between skate park and YMCA Building

SITE LOCATION: 46.59978596 ° latitude -112.031348 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): Building is located between the YMCA and the skate park. Sample port is located on the back wall and has enough pressure to fill the bag. Air compressor in this room runs the sump pumps for the extraction system, and the blower runs all the EW wells in the YMCA parking lot.

DESCRIPTION OF PHOTO "VIEW": YMCA Stack

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Carroll College GES Stack Gas

NARRATIVE SITE DESCRIPTION:

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): Inside of building at end of methane trench, sample taken from sample port on 6 inch PVC, use peristaltic pump to sample.

DESCRIPTION OF PHOTO "VIEW": Carroll College GES Stack Building

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Lyndale Stack

NARRATIVE SITE DESCRIPTION: Lyndale Stack

SITE LOCATION: 46.59845701 ° latitude -112.033417 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): Grey stone building across from armory, measure at sample port on 6 in pvc, use a peristaltic pump to sample.

DESCRIPTION OF PHOTO "VIEW": Lyndale Stack Building

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Concrete Fabricators

NARRATIVE SITE DESCRIPTION: Concrete Fabricators main office

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): Sample taken from the front desk by the window.

DESCRIPTION OF PHOTO "VIEW": Main office access door

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Transfer station scale house

NARRATIVE SITE DESCRIPTION: Transfer station scale house

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): The methane alarm is mounted to the wall in the scale house above the cabinetry. Enter the scale house from the door on the left side of the building in the below photo and walk down a short narrow hallway, the methane alarm is located on the cabinetry on the left at the end of the short hallway.

DESCRIPTION OF PHOTO "VIEW": Outside of Transfer Station scale house, access the door from the left.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Transfer station

NARRATIVE SITE DESCRIPTION: In truck access of transfer station

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): Enter the transfer station from the main pad where trash is deposited. Sign in with foreman and work crew before heading down two flights of stairs to the basement. Measurement is taken near the large garage door on the south side of building. Area is extremely hazardous.

DESCRIPTION OF PHOTO "VIEW": Measurement location at end of railway below the transfer station.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Transfer station office

NARRATIVE SITE DESCRIPTION: In office of transfer station, access is in utility closet.

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): There are two methane alarms under the building, one on the east side and one on the west side. To access, there is a trap door in the utility closet to the crawlspace. Check the methane level in the crawlspace before heading below the building. A light switch is immediately behind the ladder when entering the crawlspace. The control box is on the outside of the utility room closet.

e

DESCRIPTION OF PHOTO "VIEW": Office photo and methane alarm photo.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Carroll College shop

NARRATIVE SITE DESCRIPTION: Inside of Carroll College shop building.

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): Take the methane reading in the shop on the corner of the desk across from the microwave. The methane alarm is located above the microwave in the break area of the shop. If the main door is locked, there is another access on the back side of the building in the boneyard area.

DESCRIPTION OF PHOTO "VIEW": Garage door to Carroll College shop, office area is inside door on the left.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Carroll College House Unit #1

NARRATIVE SITE DESCRIPTION: Saint Catherine's Dorm

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): Access is inside the storage unit for Apartment 008. Metal access cover is marked, remove cover and sample out of geotubing.
Call building manager, 406-461-8273, to make appointment for access.
Need key card to gain entry.

DESCRIPTION OF PHOTO "VIEW": Methane probe is inside of the small cap on the back wall of the storage unit.

DATE FORM COMPLETED: 11/1/2018
INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Carroll College House Unit #2

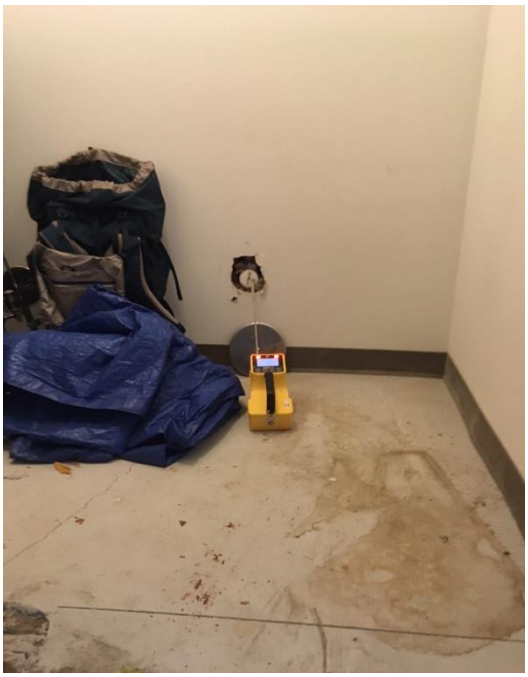
NARRATIVE SITE DESCRIPTION: Saint Mathew's Dorm

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): Storage unit for apartment No. 1, remove access cover and sample out of Geotubing. The metal cover is marked on the wall.
Call building manager, 406-461-8273, to make appointment for access.
Need key card to gain entry.



DESCRIPTION OF PHOTO "VIEW": Methane probe is shown in photo, on back wall of storage unit.

DATE FORM COMPLETED: 11/1/2018
INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Old Armory Building

NARRATIVE SITE DESCRIPTION: Basement of Old Armory Building

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): Alarm is is the basement of the Armory building and is expposed to the landfill. Take the reading in the middle of this room, then set the alarm off. If working correctly the alarm will be sounding near the front doors in the white control box pictured below. The code is written on the box.

DESCRIPTION OF PHOTO "VIEW": Methane alarm located by front doors on main level. Location of methane monitoring in the basement of the Arm The methane sensor is located above the door shown in the basement photo.

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: YMCA Sub-basement

NARRATIVE SITE DESCRIPTION: Sub Basement of YMCA Building

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): Access the sub basement through the pool area. Alarm is located above work bench. When setting this alarm off use hearing protection it will sound in the basment and above the main desk in the lobby.

DESCRIPTION OF PHOTO "VIEW": Sensor above work bench, and alarm above main desk in lobby

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: YMCA mechanical room

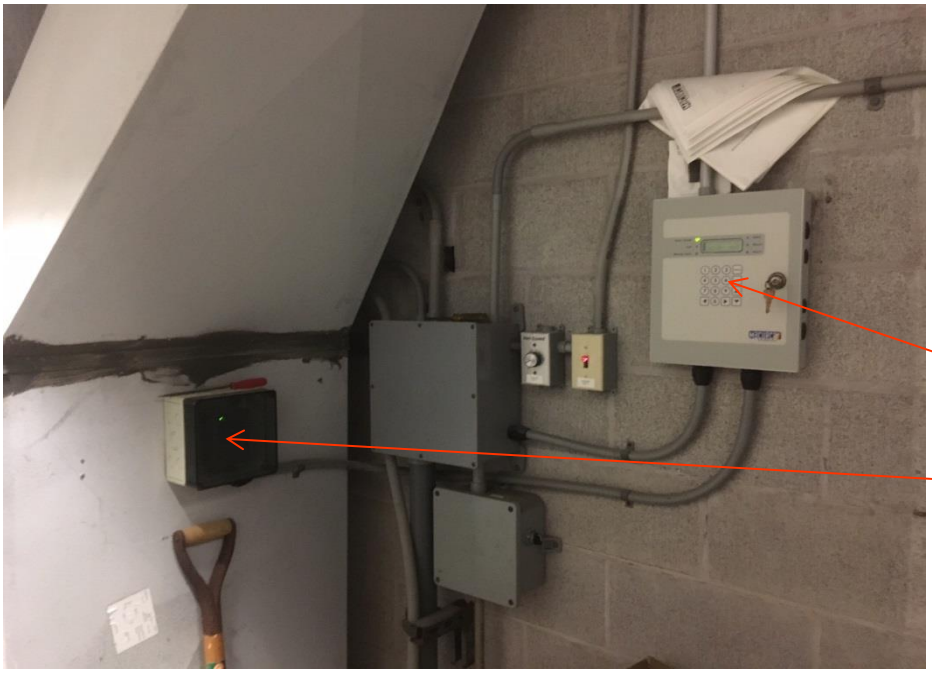
NARRATIVE SITE DESCRIPTION: Chlorinator room at the YMCA

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well (Building) Groundwater Well Residential Well

REMARKS: (Access, etc.): Access through blue chlorinated rooms outside of the YMCA. Get the key at the front desk. Alarm sensor is loacated in protective case on heating vent. Remove the case to test the alarm, alarm will sound in the main lobby.



DESCRIPTION OF PHOTO "VIEW": Alarm sensor and the main methane control panel

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Well 82-3

NARRATIVE SITE DESCRIPTION: Carroll College Shop storage area

SITE LOCATION: 46.60244403 ° latitude -112.035906 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): Located in the fenced area behind the Carroll College shop. Well is a casing offset from the shop wall.

DESCRIPTION OF PHOTO "VIEW": Well in the grass behind the shop.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: EPA-1

NARRATIVE SITE DESCRIPTION: By rest stop sign on walking path.

SITE LOCATION: 46.60103898 ° latitude -112.02999 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): By rest stop on walking path before tunnel under roadway, 7.5 ft from the edge of the walking path and 15 ft from the rest stop sign.

DESCRIPTION OF PHOTO "VIEW": Rest stop sign, well, and walking path

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: EPA-2

NARRATIVE SITE DESCRIPTION: Slope by skate park near Russian olive trees.

SITE LOCATION: 46.59999903 ° latitude -112.03094 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): Groundwater well is located in the sprinkler box located on slope east of the skate park 34.5 ft from the walking trail and 13 ft from the north side of the skate park near three Russian olive trees.

DESCRIPTION OF PHOTO "VIEW": Skate park and sprinkler box.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: EPA-4

NARRATIVE SITE DESCRIPTION: Intersection of walking paths

SITE LOCATION: 46.60249701 ° latitude -112.03402 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): At corner of walking paths in concrete structure. 36 ft to the light pole and 38 ft to the power box.

DESCRIPTION OF PHOTO "VIEW": Well at walking path intersection.

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: HL-1

NARRATIVE SITE DESCRIPTION: End of Front Street

SITE LOCATION: 46.59784103 ° latitude -112.0351 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: (Methane Probe) Extraction Well Building Groundwater Well Residential Well

REMARKS: (Access, etc.): In ripwrap slope by walking path 7 ft 9 inches from west cement post and 8 ft from the edge of the walking path at the end of Front Street.

DESCRIPTION OF PHOTO "VIEW": Well in the ripwrap slope at the end of Front Street

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: HL-06-1

NARRATIVE SITE DESCRIPTION: East side of Front Street near the parking lot.

SITE LOCATION: 46.59673001 ° latitude -112.035602 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): East side of Front Street near the parking lot. 20 ft 9 in from the curb corner and 9 ft from the curb.

DESCRIPTION OF PHOTO "VIEW": well is located between the truck and sedan on the white line 9 ft off of the curb.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: HL-10-1

NARRATIVE SITE DESCRIPTION: Batchfields parking lot.

SITE LOCATION: 46.60649903 ° latitude -112.038604 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): Well is located in the parking lot for Batchfields on the west side of the driving range fence. HL-90-1 is in the background.

DESCRIPTION OF PHOTO "VIEW": Well with driving range fence in background.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: HL-90-1

NARRATIVE SITE DESCRIPTION: Inside driving range fence.

SITE LOCATION: 46.60650398 ° latitude -112.038521 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): Well is 18.5 ft from the pole on driving range fence and is 17ft from the tie wire on the power line.

DESCRIPTION OF PHOTO "VIEW": Well, driving range fence. HL-10-1 is in the background

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: HL-90-2

NARRATIVE SITE DESCRIPTION: At edge of golf course off of railroad access road.

SITE LOCATION: 46.60518701 ° latitude -112.033743 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): 19.5 ft from the west post.

DESCRIPTION OF PHOTO "VIEW": Well is located 19.5 ft from the west post shown in the photo.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: HL-90-3

NARRATIVE SITE DESCRIPTION: Access road to transfer station.

SITE LOCATION: 46.60468896 ° latitude -112.039404 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): Groundwater well is located between the transfer station access road and the fence. The well is 19 ft off the fence line and 19 ft from the road in the photo. Use GPS to get close as there are no consistent landmarks.

DESCRIPTION OF PHOTO "VIEW": Well is located at clipboard on ground.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: HL-94-1R

NARRATIVE SITE DESCRIPTION: Memorial Park Bathrooms

SITE LOCATION: 46.59985998 ° latitude -112.028174 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): Well is in-between Memorial Park bathrooms and playground parking lot 2 ft off curb, 10.5 ft from bathrooms, and 12 ft from sidewalk.

DESCRIPTION OF PHOTO "VIEW": Rick, standing on well.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: HL-94-2R

NARRATIVE SITE DESCRIPTION: South side of Cemetery Fence

SITE LOCATION: 46.60361901 ° latitude -112.042412 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): Well is located about 6 ft off cemetery fence on south side of cemetery. North of a residential house.

DESCRIPTION OF PHOTO "VIEW": Cemetery fence and well location.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: HL-94-3

NARRATIVE SITE DESCRIPTION: Sharbano building parking lot.

SITE LOCATION: 46.60321701 ° latitude -112.028068 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): In parking lot of Sharbano Building in the dirt off the pavement.

DESCRIPTION OF PHOTO "VIEW": Well is in grass, sharbano building is in the background.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: HL-99-1

NARRATIVE SITE DESCRIPTION: West extraction well

SITE LOCATION: 46.60638898 ° latitude -112.039525 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe (Extraction Well) Building Groundwater Well Residential Well

REMARKS: (Access, etc.): West most extraction well in parking lot for Batchfields in fenced area.

DESCRIPTION OF PHOTO "VIEW": Fenced area with well HL-99-1 inside.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: HL-99-2

NARRATIVE SITE DESCRIPTION: Middle extraction well

SITE LOCATION: 46.605979 ° latitude -112.038146 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe (Extraction Well) Building Groundwater Well Residential Well

REMARKS: (Access, etc.): In fenced area, middle extraction well in between driving range and railroad tracks.

DESCRIPTION OF PHOTO "VIEW": Fenced area containing HL-99-2

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: HL-99-3

NARRATIVE SITE DESCRIPTION: East Extraction Well

SITE LOCATION: 46.605387 ° latitude -112.036016 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe (Extraction Well) Building Groundwater Well Residential Well

REMARKS: (Access, etc.): In fenced area next to propane tank between road and railroad tracks. east most extraction well

DESCRIPTION OF PHOTO "VIEW": Fenced area containing HL-99-3, propane tank in background.

DATE FORM COMPLETED: 11/1/2018
INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Infiltration Gallery

NARRATIVE SITE DESCRIPTION: East side of Golf Course.

SITE LOCATION: 46.607093 ° latitude -112.031997 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Irrigation Well) Residential Well

REMARKS: (Access, etc.): East side of golf course on access road, use GPS to locate the well. Sample this well with a bailer.

DESCRIPTION OF PHOTO "VIEW": Well and power box.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: I-1

NARRATIVE SITE DESCRIPTION: Well in golf course.

SITE LOCATION: 46.61275897 ° latitude -112.039649 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Irrigation Well) Residential Well

REMARKS: (Access, etc.): Located in golf course, use the access road by the maintenance shop to drive to the well. 37 ft to pine tree, 34 ft 4 in to edge of access road.

DESCRIPTION OF PHOTO "VIEW": Pine trees and access road nearby well.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: I-4

NARRATIVE SITE DESCRIPTION: Well house by maintenance shed.

SITE LOCATION: 46.608737 ° latitude -112.03972 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Irrigation Well) Residential Well

REMARKS: (Access, etc.): The well is located in the well house in-between the two batch fields by the maintenance shed. Sample is taken from the port on the main line.
Need to call City to gain access to shed.

DESCRIPTION OF PHOTO "VIEW": Well house

DATE FORM COMPLETED:
INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: M-5

NARRATIVE SITE DESCRIPTION: Off curb access on North Main Street

SITE LOCATION: 46.60221596 ° latitude -112.028733 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): Off curb access off of north main, well is located on the west side of the street. 12 ft off the edge of concrete.

DESCRIPTION OF PHOTO "VIEW": Well and sidewalk

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: MPC-1

NARRATIVE SITE DESCRIPTION: well in grass, use GPS to help locate

SITE LOCATION: 46.60411798 ° latitude -112.030685 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): Well is located 27 ft off the corner of the fence and 37 ft off the steel telephone pole.

DESCRIPTION OF PHOTO "VIEW": well is in the grass, fence corner and telephone pole are shown in the photograph.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: MPC-2

NARRATIVE SITE DESCRIPTION: North Western Energy Substation

SITE LOCATION: 46.60503899 ° latitude -112.030836 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): North of substation fence and south of barbed wire fence in grass, 5.5 ft away from the chain link.

DESCRIPTION OF PHOTO "VIEW": Well is in grass next to Montana Power Company substation.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: MPC-5

NARRATIVE SITE DESCRIPTION: Across from fire hydrant by Northwestern Energy sign and main office parking lot.

SITE LOCATION: 46.601676 ° latitude -112.028737 ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building (Groundwater Well) Residential Well

REMARKS: (Access, etc.): Well is located 6 ft from tree and 4 ft from the sidewalk.

DESCRIPTION OF PHOTO "VIEW": Well location, tree, and sidewalk.

DATE FORM COMPLETED: 11/1/2018

INDIVIDUAL COMPLETING FORM: John Anderson

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: 5

NARRATIVE SITE DESCRIPTION: Ms. Sandra Colvin, 350 Custer Ave., 443-7463

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building Groundwater Well (Residential Well)

REMARKS: (Access, etc.): Well is located in decorative wood well house. The control box for this well is located in the garage, Ms Colvin will turn it on and off. When sampling this well bring a long hose and run the purge water across the driveway to the grass by the other house. Sample taken from well head.

P

DESCRIPTION OF PHOTO "VIEW":

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: 16

NARRATIVE SITE DESCRIPTION: Mr. Mark Erickson, 3 Parr Court, 442-7610

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building Groundwater Well (Residential Well)

REMARKS: (Access, etc.): Well is located 3' behind wood gate on the east side of the house. The control box is in the garage. This well can run dry and the owner will turn it on and off. Sample taken from well head

DESCRIPTION OF PHOTO "VIEW":

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: 40

NARRATIVE SITE DESCRIPTION: Mr. Ed Hartman, 2509 Teakwood, 442-1331

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building Groundwater Well (Residential Well)

REMARKS: (Access, etc.): Well is located in the back yard near the raised bed gardens, control box is in the garage. The owner will turn it on and off. Sample take from well head.

DESCRIPTION OF PHOTO "VIEW":

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: 48

NARRATIVE SITE DESCRIPTION: C. A. Barbeau, 308 W. Custer Ave, 442-2117

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building Groundwater Well (Residential Well)

REMARKS: (Access, etc.): Well is located in front of the house on the east side of the property. To sample this well go to the breaker box on the north side of the deck, turn the breaker on. Bring a hose to run water away from the house.

DESCRIPTION OF PHOTO "VIEW":

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: 57

NARRATIVE SITE DESCRIPTION: Mr. Tom Osborne, 112 Dunbar Ave., 459-7171

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building Groundwater Well (Residential Well)

REMARKS: (Access, etc.): Well is located in decorative wood well house. Sample taken from frost free near well.

DESCRIPTION OF PHOTO "VIEW":

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: 62

NARRATIVE SITE DESCRIPTION: Mr. Thomas Herrin, 76 Dunbar Ave., 443-1163

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building Groundwater Well (Residential Well)

REMARKS: (Access, etc.): Well is located behind the house, sample is taken from spigot near the irrigation line. Sample port was put in by owner for us to sample.

DESCRIPTION OF PHOTO "VIEW":

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: 90

NARRATIVE SITE DESCRIPTION: 933 Cedar St., 439-4941

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building Groundwater Well (Residential Well)

REMARKS: (Access, etc.): Well is loacated under protective box in the alley. The control box is in the garage shop area. Turn on one zone and let it run for 15 minutes and sample from sigot in the well box.

DESCRIPTION OF PHOTO "VIEW":

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

PROJECT: Old City of Helena Landfill NUMBER: 027/1273

SITE CODE: Bridger Veterinary Clinic

NARRATIVE SITE DESCRIPTION: Sharlene Steav, 3104 Green Meadow Dr., 443-5874

SITE LOCATION: NA ° latitude NA ° longitude

COUNTY: Lewis and Clark STATE: Montana

STATION TYPE: Methane Probe Extraction Well Building Groundwater Well (Residential Well)

REMARKS: (Access, etc.): Sample is taken from the frost free in the back of the picture.

DESCRIPTION OF PHOTO "VIEW":

DATE FORM COMPLETED:

INDIVIDUAL COMPLETING FORM: Jodi Bingham

APPENDIX C

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APPENDIX I TABLE 1

APPENDIX D

STANDARD OPERATING PROCEDURES AND FORMS