RIVERBEND LANDFILL COMPANY
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August 11, 2016

Mr. Bob Schwarz
Oregon Department of Environmental Quality
Eastern Region
400 E. Scenic Drive, Suite 307
The Dalles, Oregon 97058

SUBJECT: Work Plan to Perform Informal Preliminary Assessment to Evaluate Changes in Well MW-12A Groundwater Quality
Riverbed Landfill Solid Waste Disposal Site Permit (SWDP) No. 345
Yamhill County, Oregon

Dear Mr. Schwarz:

Please find attached a copy of a work plan prepared by SCS Engineers to perform an Informal Preliminary Assessment (IPA) at Riverbend Landfill (RL) in Yamhill County, Oregon. The purpose of the IPA is to further evaluate the source for changes in the inorganic chemistry of groundwater collected from compliance monitoring well MW-12A during the second quarter 2016 monitoring event performed at RL. The IPA is being conducted consistent with Section 11.5.3 of the RL's approved environmental monitoring plan (EMP).

Please let me know if you agree with our recommended course of action and/or if you would like to further discuss the information provided in the work plan.

Sincerely,

James L. Denson, Jr.
PNW/BC Environmental Protection Manager

Enclosure: MW-12A IPA Work Plan

Cc (w/enclosure): Bill Mason, DEQ
Nick Godfrey, RLC
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SCS ENGINEERS

August 11, 2016
File No. 04216038.00

Mr. Jim Denson
Riverbend Landfill Company
13469 SW Highway 18
McMinnville, OR 97128

Subject: Work Plan to Perform Informal Preliminary Assessment to Evaluate Changes in Monitoring Well MW-12A Groundwater Quality: Riverbend Landfill, Oregon

Dear Mr. Denson

This letter presents a work plan for an Informal Preliminary Assessment (IPA) to assess the source of changes in the inorganic chemistry of groundwater collected from compliance monitoring well MW-12A during the Spring (May) 2016 monitoring event performed at Riverbend Landfill (RL) in McMinnville, Oregon. SCS Engineers (SCS) prepared this work plan at the request of Riverbend Landfill Company (RLC), consistent with Section 11.5.3 of RL's environmental monitoring plan (EMP; SCS, 2014[1]). The IPA work plan provides a scope of work comprised of the following elements, and includes a schedule for implementing the proposed assessment activities:

- Analyzing groundwater samples collected from existing monitoring wells and piezometers in the area between MW-5A and MW-12A for further assessing the inorganic groundwater quality and evaluating the geochemical characteristics (including ionic chemistry) of groundwater in this area of the site.

- Reviewing and evaluating available information on natural conditions including precipitation data, groundwater elevation data and Yamhill River stage information to evaluate any potential correlations with the chemistry of MW-12A groundwater.

BACKGROUND

The RL compliance monitoring well network, including compliance monitoring well MW-12A, is located south of the landfill (see Figure 1).[2] Well MW-12A is screened in the shallow, silt-clay water-bearing zone (WBZ) and is located hydraulically downgradient of landfill Modules 3 and 4 based on interpretative groundwater flow towards the south-southwest (and Yamhill River) in the vicinity of well MW-12A (see Figure 2). A paired deep monitoring well (MB-12B) is installed adjacent to the shallow compliance monitoring well at the MW-12 location. The well construction information for well MW-12A is summarized in Table 1, and the well construction

[1] SCS Engineers, 2016, *Environmental Monitoring Plan, Riverbend Landfill, Yamhill County, Oregon*, dated December 14.

[2] The compliance monitoring wells denoted with an "A" monitor the shallow, silt-clay WBZ and monitoring wells denoted with a "B" monitor the deeper, sand-gravel WBZ.

detail is provided in Attachment 1. Groundwater samples for laboratory analysis of site-specific inorganic parameters and volatile organic compounds (VOCs) are collected semiannually from compliance well MW-12A during the Spring (April-May) and Fall (October-November) monitoring events, consistent with RL's environmental monitoring plan (SCS, 2014[1]).

Analytical results of a groundwater sample collected from well MW-12A during the Spring (May) 2016 semiannual monitoring event showed concentrations of four non-hazardous inorganic parameters (bicarbonate alkalinity [HCO_3], dissolved magnesium [Mg], dissolved sodium [Na], and total dissolved solids [TDS]) that were above their respective statistically-derived concentration limits (designated as site-specific limits [SSLs]); the analytical results are presented in Table 2. Volatile organic compounds (VOCs) were not detected in this sample. As specified in Section 11.3.2 of the EMP, detection of three or more parameters at concentrations above their SSLs may constitute a potential change in groundwater quality requiring follow-up actions (i.e., notification and verification resampling). The Oregon Department of Environmental Quality (DEQ) was notified within 10 days of identifying this potential change in groundwater quality in an email communication from Waste Management (WM) dated June 20, 2016 (WM, 2014a[3]). The June 20, 2016 email also informed the DEQ of RL's intent to perform verification resampling of well MW-12A, consistent with Section 11.5.1 of the EMP.

Verification resampling of well MW-12A was performed on June 22, 2016. The analytical results of the verification sample indicated that the TDS concentration was below its SSL; however, concentrations of HCO_3, Mg, and Na remained slightly above their SSLs (see Table 2) and confirmed the change in groundwater quality originally identified in the May 2016 analytical results. In a letter dated July 13, 2016 (WM, 2016b[4]), WM notified the DEQ of the verification sample results within 10 days after receiving the final analytical results, consistent with Section 11.5.2 of RL's EMP. The letter also appraised the DEQ of RL's intent to submit an IPA work plan describing actions to be proposed for further assessing the changes in well MW-12A groundwater quality, consistent with Section 11.5.3 of the EMP.

SCOPE OF WORK FOR WELL MW-12A IPA

Task 1 - Sample Collection and Analysis

Groundwater and leachate samples will be collected and analyzed for the purpose of comparing the geochemistry (water quality and geochemical signature) of monitoring well MW-12A groundwater to the geochemistry of groundwater collected from other monitoring wells and piezometers in the vicinity of this well and to leachate collected from the nearby leachate collection and removal systems (LCRSs). Specifically, groundwater and leachate samples will be collected from the following monitoring locations:

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[3] Waste Management (WM), 2016a, Email (re: Riverbend Landfill Groundwater Verification Sampling Notification) to B. Schwarz, DEQ, The Dalles, Oregon, and B. Mason, DEQ, Eugene, Oregon from J. Denson, WM, Portland, Oregon, June 20.

[4] Waste Management (WM), 2015b, Letter (re: Notification of the MW-12A Groundwater Confirmation Resampling Results, Riverbed Landfill Solid Waste Disposal Site Permit (SWDP) No. 345, Yamhill County, Oregon) to B. Schwarz, DEQ, The Dalles, Oregon, from J. Denson, WM, Portland, Oregon, July 13.

- Groundwater samples from wells MW-5A, MW-5B, MW-12A, and MW-12B.
- Groundwater samples from piezometers P-01, P-02, and P-03.
- Liquid samples from Modules 1 through 5 primary LCRS sumps (1/5 P) and Modules 4 and 5 secondary sump (4/5 S).

Before groundwater samples are collected, a limited scope groundwater elevation survey will be performed in the southern portion of the RL property to evaluate localized groundwater flow conditions. Groundwater levels will be measured at the following shallow WBZ monitoring wells and piezometers: wells MW-3A, MW-4A, MW-5A, MW-6A, MW-12A, MW-14A, MW-15A, MW-21A, and MW-22A, and piezometers P-1, P-2, and P-3 (see Figure 1).

Groundwater and leachate sampling and analysis will be conducted consistent with procedures described in RL's EMP (SCS, 2014[1]). The monitoring wells (MW designations) will be purged and sampled using dedicated QED® bladder pumps, and the piezometers (P-1, P-2 and P-3) will be purged and sampled using new, disposable, polyethylene bailer since the piezometers are not equipped with dedicated bladder pumps. Groundwater samples will be collected from the (1) monitoring wells (A-series designations) and piezometers screened in shallow silt-clay WBZ using the traditional purge method and (2) monitoring wells screened in the lower (sand and gravel) WBZ (MW-5B and MW-12B) using the low-flow purging and sampling technique (as described in the EMP). Liquid samples from the LCRS and secondary collection sumps will be collected using the dedicated submersible pumps installed in each sump's riser pipe.

Groundwater-quality parameters will be monitored during purging and sampling and recorded on Field Sampling Data Sheets (FSDSs). The samples (including quality control samples such as a duplicate sample, field blank, and equipment blank) will be submitted to TestAmerica Laboratories in Arvada, Colorado (TestAmerica) for analysis of the full list of parameters with SSLs (HCO_3, Mg, Na, TDS, dissolved chloride and potassium [Cl and K], and total organic carbon). The samples will also be analyzed for dissolved calcium (Ca) and sulfate (SO_4) to facilitate evaluating the groundwater and leachate analytical results using geochemical analysis (i.e., Piper [Trilinear] and Stiff plots), as described in Task 2.

Task 2 - Geochemical Analysis

The geochemistry of monitoring well MW-12A groundwater will be compared to the geochemistry of the other groundwater and leachate samples, collected as describe above, to evaluate the recent change in well MW-12A groundwater chemistry. The ionic geochemistry (common cations and anions) of these samples will be evaluated using Piper (Trilinear) and Stiff geochemical diagrams. A brief description of the application of Piper and Stiff diagrams to assess the source of changes in groundwater quality is provided below.

The geochemical composition of groundwater and leachate samples, represented by the common anions (HCO_3, SO_4, and Cl), and the major dissolved cations (Ca, Mg, K, and Na), can be illustrated graphically using Piper (Trilinear) diagrams to represent the overall ionic chemistry of the samples. The major ions used in the creation of Piper plots typically account for the vast

majority of the total dissolved solids in different water types. Therefore, they are the best diagnostic chemical indicators of the various sources that combine to form the chemistry of particular water or liquids (i.e., leachate). Different water quality types will plot in different areas on the Piper diagrams. If two different water types mix, the data for the mixed water will typically plot on a line connecting the two different water types or sources.

Whereas Piper diagrams illustrate the relative concentrations of the major cations and anions in the water quality or leachate samples, Stiff diagrams provide absolute concentrations of these constituents (in milliequivalents per liter [meq/L]). Stiff diagrams are polygons constructed by connecting the concentrations of the major ions, arranged in an ordered sequence. The resultant polygon graphically represents the ionic chemistry of each water quality sample, which can be compared using its shape and the magnitude of the parameter concentrations.

Task 3 - Review Available Information on Natural Conditions

As shown on Table 2, the magnitude of the water quality changes observed in MW-12A are relatively minor, and the concentrations have generally fluctuated up and down since 2014. An evaluation of available information on precipitation, groundwater elevation and Yamhill stage level changes will be performed to assess any potential temporal correlations with the fluctuating inorganic parameter concentrations observed in MW-12A.

Task 4 - Evaluate Results and Prepare Report

A report presenting and evaluating the field and laboratory results of the IPA will be submitted to the DEQ within 60 days after TestAmerica issues the final laboratory analytical reports. The water quality results and geochemical analysis of environmental samples collected for this IPA will be evaluated to (1) assess the variability in the distribution and concentrations of the SSL parameters in groundwater in the vicinity of MW-12A, (2) identify potential correlations between natural conditions (based on the review of information described under Task 3) and recent changes in well MW-12A groundwater chemistry, and (3) ascertain whether the source of changes in the inorganic parameter concentrations were due to conditions not related to the landfill. Additionally, the report will include the following:

- Groundwater elevations data collected as part of this IPA and a groundwater potentiometric surface contour map interpreted from these data to evaluate groundwater flow velocities and transport times.

- Field sampling data sheets, laboratory analytical data reports (including field and laboratory quality assurance/quality control results), and a table summarizing the groundwater and leachate analytical results.

- Geochemical diagrams and isoconcentration contour maps illustrating the distribution of key inorganic indicator parameters.

Schedule

The IPA fieldwork activities will be initiated within 2 weeks of the DEQ's approval of this work plan. A report presenting and evaluating the results of the IPA will be submitted to the DEQ within 45 days after issuance of the final laboratory reports.

SCS ENGINEERS

David Lamadrid, RG
Senior Project Professional II

Louis Caruso
Project Director

Attachments: Table 1: Groundwater Monitoring Network Construction Information
Table 2: Comparison of Concentration Limits (PSCLs, ALs, and SSLs) and MW-12A Groundwater Analytical Results
Figure 1: Site Plan and Monitoring Locations
Figure 2: Shallow Water-Bearing Zone Potentiometric Surface Contours, May 5, 2015
Attachment 1: Well MW-12A Boring Log and Well Construction Detail

cc: Mark Verwiel; WM
Nick Godfrey; RLC
Jeff O'Leary; WM
Jim Obereiner; JMO Consulting

Tables

Table 1
Groundwater Monitoring Network Construction Information
Riverbend Landfill

Well Designation	Hydro-stratigraphic Unit Screened	Date Installation Completed	Eastings[a]	Northings[a]	Ground Elevation[a] (ft-msl)	TOC Elevation[a] (ft-msl)	Boring Depth (ft-bgs)	Boring Diameter (inches)	Well Diameter (inches)	Well Screen Interval (ft-bgs)	Sand Pack Interval (ft-bgs)	Well Seal Interval (ft-bgs)
Monitoring Wells												
MW-1A	Sand-Gravel	6-Sep-89	3999.9	4210.2	153.40	155.30	61.5	10	2	50.0 to 60.0	48.0 to 61.5	3.0 to 48.0
MW-1B	Silt-Clay	8-Sep-89	4001.1	4214.5	153.40	155.00	26.5	10	2	15.0 to 25.0	13.0 to 26.5	3.0 to 13.0
MW-2	Silt-Clay	26-Jan-81	5123.7	4126.2	146.30	148.30	40.0	NA	2	NA	NA	NA
MW-5A	Silt-Clay	8-Sep-92	5490.7	2069.0	132.00	138.73	28.0	10	2	18.0 to 28.0	16.0 to 28.0	3.0 to 16.0
MW-5B	Sand-Gravel	9-Mar-92	5481.2	2073.1	132.80	138.88	44.7	10	2	42.0 to 45.0	40.0 to 45.0	3.0 to 40.0
MW-9A	Silt-Clay	21-Oct-93	6486.5	3663.2	128.10	128.42	24.5	8	2	14.3 to 23.8	27.0 to 40.0	2.0 to 11.0
MW-9BR	Sand-Gravel	24-Aug-94	5903.2	3760.8	124.76	127.40	36.5	10	2	28.2 to 33.7	27.0 to 37.5	2.0 to 26.0
MW-10A	Silt-Clay	28-Oct-93	3501.0	3805.0	150.75	153.21	28.3	8	2	17.3 to 26.8	14.0 to 28.3	2.2 to 14.0
MW-10B	Sand-Gravel	27-Oct-93	3492.5	3795.5	150.76	152.87	69.0	10	2	44.3 to 53.8	40.9 to 55.3	2.0 to 40.9
MW-12A	Silt-Clay	19-Jul-95	5650.8	1676.5	123.80	126.00	25.5	10	2	15.3 to 24.8	12.0 to 25.5	0.5 to 15.3
MW-12B	Sand-Gravel	19-Jul-95	5643.6	1676.5	124.00	126.54	49.9	10	2	34.3 to 43.8	31.0 to 45.0	0.5 to 31.0
MW-14A	Silt-Clay	16-Oct-96	4863.8	1652.6	118.80	121.87	21.0	10	2	10.7 to 20.2	7.8 to 21.0	2.2 to 7.8
MW-14B	Sand-Gravel	15-Oct-96	4854.1	1653.7	119.10	123.32	42.0	10	2	31.7 to 41.2	2.85 to 42.0	2.2 to 28.5
MW-15A	Silt-Clay	21-Oct-96	6385.5	2209.1	126.00	130.07	22.8	10	2	12.5 to 22.0	10.0 to 22.8	2.0 to 10.0
MW-15B	Sand-Gravel	21-Oct-96	6393.5	2214.7	126.00	129.73	44.0	10	2	33.2 to 42.7	30.2 to 44.0	2.0 to 30.2
MW-16A	Silt-Clay	23-Oct-96	7010.7	2675.6	126.30	128.89	23.5	10	2	13.5 to 23.0	11.0 to 23.5	1.5 to 11.0
MW-16B	Sand-Gravel	23-Oct-96	7004.3	2670.7	126.30	128.95	45.0	10	2	34.8 to 44.3	31.6 to 45.0	2.0 to 31.6
MW-17A	Silt-Clay	26-Sep-00	1221.4	1431.4	151.12	153.83	24.5	10	2	14.0 to 24.0	11.5 to 24.5	0.5 to 11.5
MW-18A	Silt-Clay	26-Sep-00	2612.9	2938.0	146.77	148.77	26.0	10	2	13.5 to 23.5	11.0 to 24.0	0.5 to 11.0
MW-18B	Sand-Gravel	26-Sep-00	2621.6	2931.1	146.58	148.57	62.0	10	2	47.0 to 53.0	45.0 to 53.0	0.5 to 45.0
MW-19A	Silt-Clay	27-Sep-00	2537.0	1437.0	149.05	151.27	30.0	10	2	18.0 to 28.0	18 .5 to 28.5	0.5 to 16.5
MW-20A	Silt-Clay	26-Sep-00	3776.2	2490.1	127.20	129.92	21.0	10	2	10.0 to 20.0	8.5 to 21.0	0.5 to 8.5
MW-20B	Sand-Gravel	26-Sep-00	3759.5	2491.2	127.10	129.72	40.0	10	2	29.0 to 34.0	26.5 to 95.3	0.5 to 26.5
MW-21A	Silt-Clay	26-Sep-00	4645.5	1945.3	116.18	120.02	13.0	10	2	8.0 to 13.0	7.0 to 23.0	0.5 to 7.0
MW-21B	Sand-Gravel	26-Sep-00	4631.3	1941.6	116.56	119.53	34.0	10	2	21.0 to 26.0	18.5 to 27.0	0.5 to 18.5
MW-22A	Silt-Clay	23-Sep-10	4105.3	1578.5	123.50	125.38	22.5	10	2	10.0 to 20.0	8.0 to 21.0	2.0 to 8.0
MW-22B	Sand-Gravel	23-Sep-10	4110.8	1584.6	123.50	125.43	38.0	10	2	27.0 to 37.0	25.0 to 38.0	2.0 to 25.0
MW-23A	Silt-Clay	18-Aug-10	3281.9	1515.9	129.00	131.79	28.0	10	2	16.0 to 26.0	14.0 to 28.0	2.0 to 14.0
MW-23B	Sand-Gravel	17-Aug-10	3290.0	1516.5	129.00	131.60	42.0	10	2	36.5 to 41.5	34.5 to 42.0	2.0 to 34.5
MW-24A	Silt-Clay	20-Aug-10	2140.0	984.2	147.50	149.93	26.0	10	2	15.0 to 25.0	13.0 to 26.0	2.0 to 13.0
MW-25A	Silt-Clay	22-Jul-15	4218.8	4114.0	153.0	155.62	26.6	6	2	15.0 to 25.0	13.0 to 26.6	2.0 to 13.0
MW-25B	Sand-Gravel	22-Jul-15	4208.3	4114.6	152.8	155.54	90.0	6 and 7	2	75.0 to 85.0	73.0 to 86.0	2.0 to 73.0
Piezometers												
MW-3A	Silt-Clay	23-Jun-93	4430.9	2493.9	138.20	140.81	35.0	8	2	24.0 to 34.0	21.0 to 35.0	2.2 to 21.0
MW-3B	Sand-Gravel	28-Jun-93	4415.6	2496.3	137.80	140.57	63.5	10	2	45.0 to 55.0	42.0 to 56.0	36.8 to 42.0
MW-4A	Silt-Clay	25-May-93	4798.0	2238.7	139.46	142.31	36.0	8	2	26.0 to 36.0	22.5 to 36.0	2.0 to 22.5
MW-4B	Sand-Gravel	10-Jun-93	4805.5	2239.4	139.24	141.81	72.0	10	2	52.0 to 62.0	49.0 to 63.0	47.0 to 49.0
MW-6A	Silt-Clay	24-May-93	6043.5	2437.7	127.00	128.95	22.5	8	2	11.5 to 21.5	8.5 to 22.5	2.0 to 8.5
MW-6B	Sand-Gravel	9-Jun-93	6054.4	2443.0	127.00	128.59	56.0	8	2	36.0 to 46.0	34.2 to 47.0	2.5 to 34.2
P-01	Silt-Clay	21-Dec-92	5482.1	2038.3	123.20	125.93	19.0	8	2	8.0 to 18.0	5.9 to 19.0	2.0 to 5.9
P-02	Silt-Clay	22-Dec-92	5498.5	1994.0	121.10	123.88	18.0	8	2	6.8 to 16.8	5.0 to 18.0	1.0 to 5.0
P-03	Silt-Clay	23-Jun-93	5601.9	1754.2	120.90	123.63	19.5	8	2	9.0 to 19.0	7.3 to 19.5	2.0 to 9.3
P-05A	Silt-Clay	13-Oct-05	3612.4	2875.1	138.60	140.74	20.0	3.5	1	9.7 to 19.5	7.5 to 20.0	0.5 to 7.5
P-06A	Silt-Clay	13-Oct-05	3363.7	2566.2	129.30	131.58	20.0	3.5	1	9.7 to 19.5	7.5 to 20.0	0.5 to 7.5
P-07A	Silt-Clay	3-Feb-12	3804.2	2168.8	145.70	147.90	31.0	10	2	16.0 to 26.0	14.0 to 26.5	2.0 to 14.0
GT10-1	Silt-Clay	10-Sep-10	3444.2	3211.7	143.80	145.56	66.5	5.9	2	15.0 to 25.0	13.0 to 30.0	2.0 to 13.0/ 30.0 to 65.0
GT10-11	Silt-Clay	9-Sep-10	2518.1	1781.3	149.30	150.08	61.0	5.9	2	15.0 to 25.0	13.0 to 30.0	2.0 to 13.0 / 30.0 to 60.0
GT10-12	Silt-Clay	14-Sep-10	1736.5	1971.4	150.60	152.41	55.0	5.9	2	15.0 to 25.0	13.0 to 30.0	2.0 to 13.0/ 30.0 to 65.0
SA-BH-1	Silt-Clay	24-Aug-10	716.6	3175.5	152.80	155.21	23.0	10	2	12.0 to 22.0	10.0 to 23.0	2.0 to 10.0
SA-BH-3	Silt-Clay	24-Aug-10	813.1	1679.7	152.80	155.07	26.5	10	2	12.0 to 22.0	10.0 to 23.5	2.0 to 10/ 23.5 to 25.0
SA-BH-5	Silt-Clay	23-Aug-10	1773.0	586.9	148.60	151.01	28.5	10	2	18.0 to 28.0	15.5 to 28.5	2.0 to 15.5
SA-BH-6	Silt-Clay	29-Sep-10	2895.0	597.7	123.80	125.93	25.0	10	2	14.0 to 24.0	12.0 to 25.0	2.0 to 12.0

NOTES:

Indicates well or piezometer proposed to be sampled as part of the Informal Preliminary Assessment (IPA)

NA = not available; TOC = top of casing; ft-msl = feet mean sea level; ft-bgs = feet below ground surface.

[a] All monitoring wells and piezometers were re-surveyed in July 2013.

Table 2
Comparison of Concentration Limits (PSCLs, ALs, and SSLs) and MW-12A Groundwater Analytical Results
Riverbend Landfill

Monitoring Well	PSCL	AL	SSLs						
	Vinyl Chloride[a] (mg/L)	VOCs[b]	Bicarbonate Alkalinity (mg/L)	Chloride (mg/L)	Magnesium Dissolved (mg/L)	Potassium Dissolved (mg/L)	Sodium Dissolved (mg/L)	Total Dissolved Solids (mg/L)	Total Organic Carbon (mg/L)
MW-12A Concentration Limits	*0.002*	*(see Note 1)*	*81.3*	*63.4*	*11.5*	*1.20*	*21.8*	*240*	*3.2*
MW-12A April 2014 Results	0.001 U	No Detections	77	38	10	0.69	**24**	180	1.6
MW-12A November 2014 Results	0.001 U	No Detections	65	47	11	0.81	**24**	210	1.1
MW-12A May 2015 Results	0.001 U	No Detections	70	35	8.8	0.68	**22**	200	1.4
MW-12A November 2015 Results	0.001 U	No Detections	68	32	8.8	0.83	**22**	170	1.9
MW-12A May 2016 Results	0.001 U	No Detections	**110**	57	**15**	0.86	**29**	**250**	2.5
MW-12A June 2016 Results (Resample)	NS	NS	**93**	NS	**15**	NS	**24**	220	NS
MW-12A June 2016 Results (Resample) (Dup)	NS	NS	**97**	NS	**15**	NS	**24**	230	NS

NOTES:

mg/L = milligrams per liter; Dup = field duplicate sample.; U = not detected at or above the practical quantitation limit (PQL), NS = parameter not required to be analyzed

Note 1: Detection of a volatile organic compound (VOC) above the laboratory derived PQL.

PSCL: Permit-Specific Concentration Limit; concentration above a single PSCL not previously reported and explained to the DEQ will trigger verification resampling. Verification of a concentration above a PSCL would require follow-up actions, consistent with Section 11.5.3 of the Environmental Monitoring Plan (EMP).

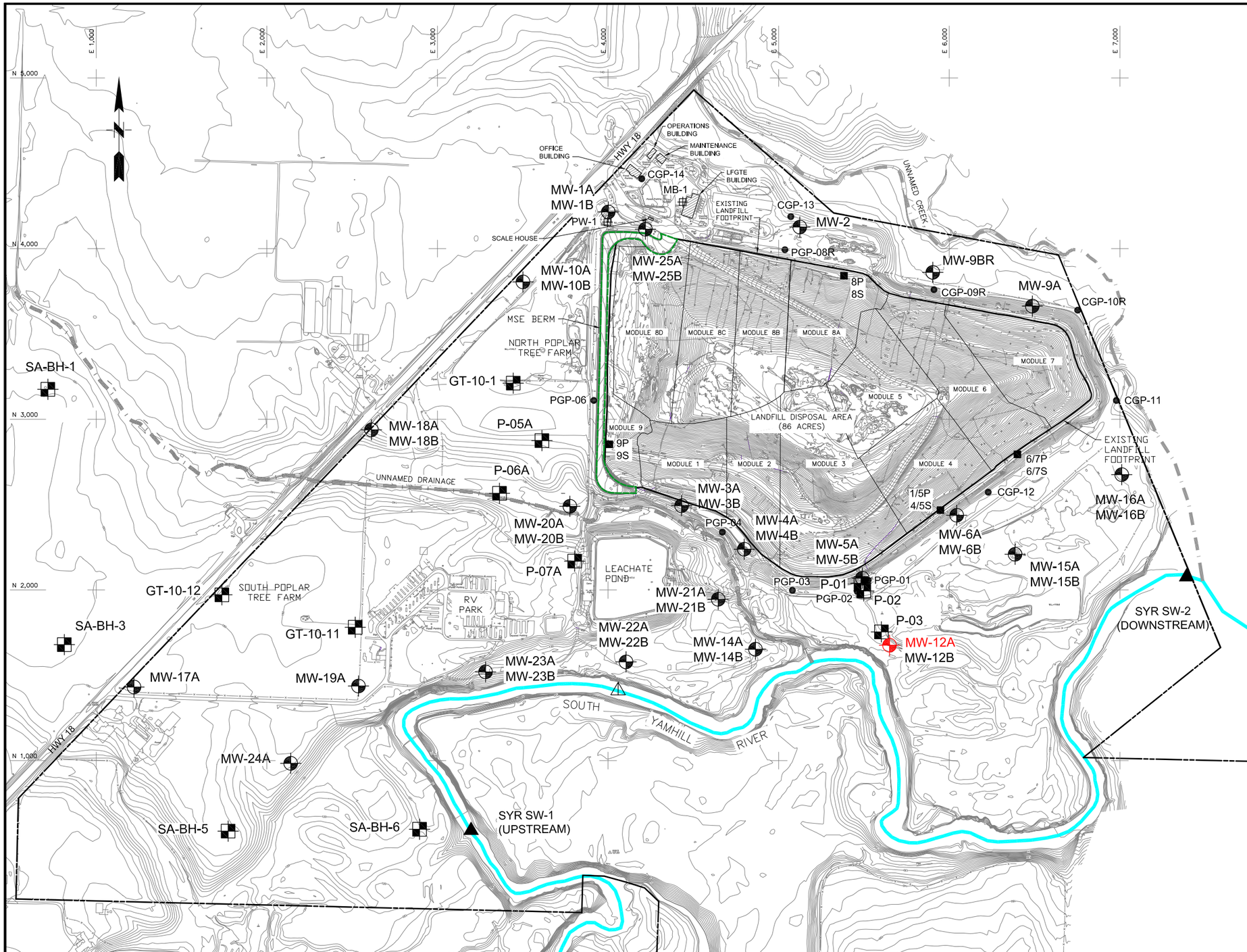
AL: Action Limit; a concentration above a single AL not previously reported and explained to the DEQ will trigger verification resampling. Verification of a concentration above an AL would require follow-up actions, consistent with Section 11.5.3 of the EMP.

SSL: Site-Specific Limit (statistically-derived); detection above the limit of three or more SSLs in a single compliance monitoring well during a monitoring event not previously reported and explained to the DEQ will trigger verification resampling. Verification of concentrations above three or more SSLs would require follow-up actions consistent with Section 11.5.3 of the EMP.

[a] PSCL for vinyl chloride in all compliance wells established at the numerical groundwater quality reference level (NGWQRL) of 0.002 mg/L (specified in Table 2 of the Oregon Administrative Rule [OAR] 340-40).

[b] VOCs by U.S. Environmental Protection Agency (EPA) Method 8260B and 8011 except for vinyl chloride which was defined as a PSCL.

Figures



LEGEND:

- Topographic Contours (Surveyed)
- Topographic Contours (USGS)
- Property Boundary
- Flow Line - Yamhill River
- Flow Line - Tributary Stream
- MW-25A — Groundwater Monitoring Well
- P-05A — Piezometer
- PW-1 — On-Site Water Well
- CGP-11 — Compliance Landfill Gas Monitoring Probe
- PGP-06 — Performance Landfill Gas Monitoring Probe
- 6/7P, 6/7S — LCRS and LSCS Monitoring Location
- SYR SW-1 — South Yamhill River Sampling Location (Approximate)
- South Yamhill River Gauging Station
- MW-12A — Monitoring Well Associated with Informal Preliminary Assessment (IPA)

SOURCE:

1) Existing contours based on aerial topography provided by Miller Creek Aerial Mapping, date of photograph February 8, 2016. Contours are based on NAVD 88.

2) Horizontal Datum: Assumed
Iron pipe at scale house = N4000.000 E4000.000
Iron pipe at maintenance building = N2825.685 E4000.000

NOTES:

1) Monitoring wells and piezometers with "A" designation are screened in the shallow (Silt-Clay) water-bearing zone, and monitoring wells and piezometers with "B" designation are screened in the deeper (Sand-Gravel) water-bearing zone.

2) Piezometers with "GT" and "SA-BH" designations are screened in the shallow (Silt-Clay) water-bearing zone.

3) Leachate Collection and Removal System (LCRS) monitoring locations are identified by a "P" designation and Leak Detection System (LDS) monitoring locations are identified with a "S" designation.

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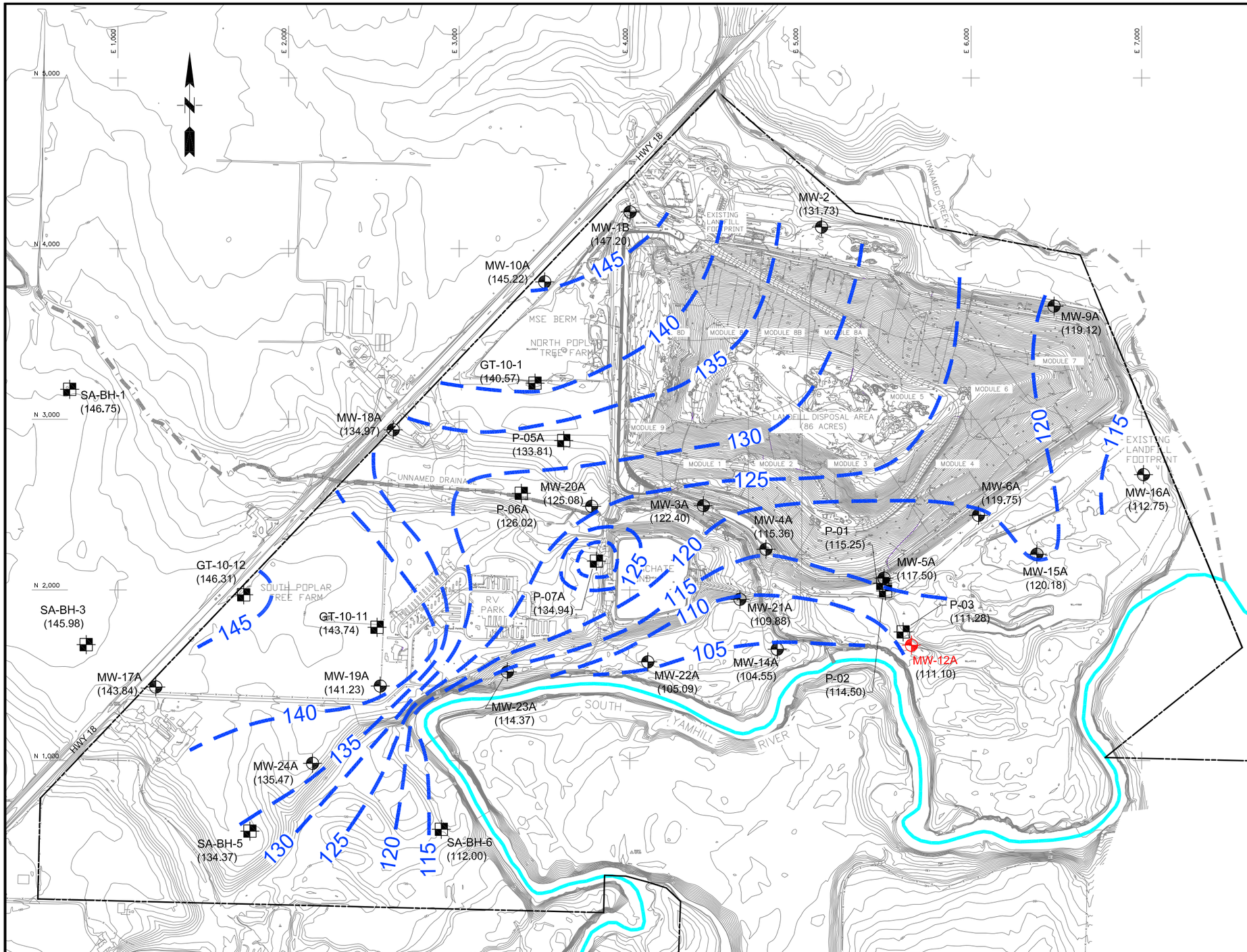
Portland, Oregon 97224
(503) 639-9201 FAX: (503) 684-6948

WASTE MANAGEMENT

0 600 1200
SCALE IN FEET

PROJECT NO. 04216038.00	DES BY D.L.	SITE PLAN AND MONITORING LOCATIONS RIVERBEND LANDFILL McMINNVILLE, OREGON	DATE AUGUST 2016
SCALE AS SHOWN	CHK BY L.C.		FIGURE 1
CAD FILE FIGURE 1	APP BY L.C.		



LEGEND:

- Topographic Contours (Surveyed)
- Topographic Contours (USGS)
- Property Boundary
- Flow Line - Yamhill River
- Flow Line - Tributary Stream
- 110 — Potentiometric Surface Contours for shallow water - bearing zone (Feet MSL) Contour Interval = 5 Feet (Quieried where uncertain)
- MW-19A — Groundwater Monitoring Well
- P-05A — Piezometer
- (141.23) — Groundwater Elevation in Feet Above Mean Sea Level on May 5, 2015
- MW-12A — Monitoring Well Associated with Informal Preliminary Assessment (IPA)

SOURCE:

1) Existing contours based on aerial topography provided by Miller Creek Aerial Mapping, date of photograph February 8, 2016. Contours are based on NAVD 88.

2) Horizontal Datum: Assumed
Iron pipe at scale house = N4000.000 E4000.000
Iron pipe at maintenance building = N2825.685 E4000.000

NOTES:

1) Monitoring wells and piezometers with "A" designation are screened in the shallow (Silt-Clay) water-bearing zone, and monitoring wells and piezometers with "B" designation are screened in the deeper (Sand-Gravel) water-bearing zone.

2) Piezometers with "GT" and "SA-BH" designations are screened in the shallow (Silt-Clay) water-bearing zone.

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WASTE MANAGEMENT

0 600 1200
SCALE IN FEET

PROJECT NO. 04216038.00	DES BY D.L.
SCALE AS SHOWN	CHK BY L.C.
CAD FILE FIGURE 2	APP BY L.C.

SHALLOW WATER - BEARING ZONE
POTENTIOMETRIC SURFACE CONTOURS
(MAY 5, 2015)

RIVERBEND LANDFILL
McMINNVILLE, OREGON

DATE AUGUST 2016

FIGURE 2

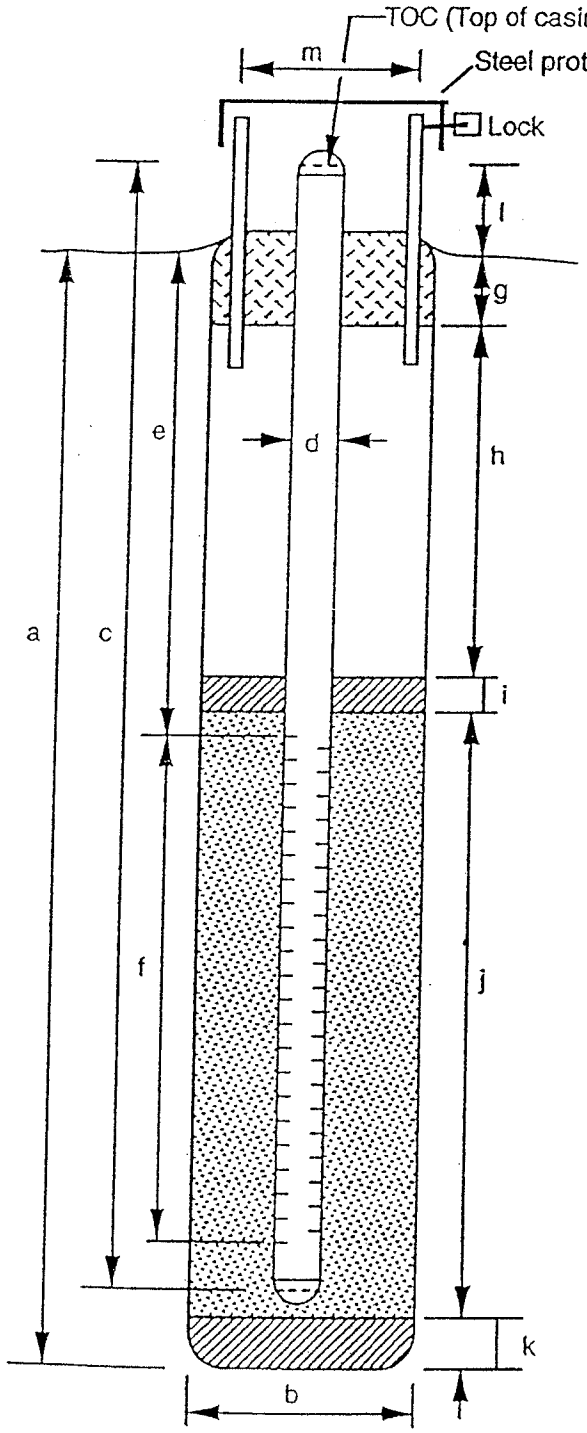
Attachment 1

Well MW-12A Boring Log and Well Construction Detail

WELL DETAILS

EMCON

CLIENT	Riverbend Landfill Company, Inc	BORING / WELL NO.	MW-12A
PROJECT NUMBER	0258-001.50	TOP OF CASING ELEV.	126.0
PROJECT NAME	Additional Hydrogeologic Investigation	GROUND SURFACE ELEV.	123.8
LOCATION	McMinnville, Oregon	DATUM	FT - MSL
WELL PERMIT NO.	80945	INSTALLATION DATE	7/19/95



EXPLORATORY BORING

a. Total depth 25.5 ft.

b. Diameter 10.5 in.

Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Total casing length 28.1 ft.

Material Schedule 40 PVC

d. Diameter 2.0 in.

e. Depth to top perforations 15.3 ft.

f. Perforated length 9.5 ft.

Perforated interval from 15.3 to 24.8 ft.

Perforation type Machine-Slotted

Perforation size 0.010 in.

g. Surface seal (0.0 to 0.5) 0.5 ft.

Material Concrete

h. Backfill NA ft.

Material NA

i. Seal (0.5 to 12.0) 11.5 ft.

Material Bentonite

j. Gravel pack 13.5 ft.

Gravel pack interval from 12.0 to 25.5 ft.

Material 10-20 Gradation Sand

k. Bottom seal/fill None 0 ft.

Material NA

l. Casing stickup 2.75 ft.

m. Protective casing diameter 6.5 in.

Well Constructed by CDF

LOG OF EXPLORATORY BORING

PROJECT NAME	Riverbend, Monitoring Well Installation	BORING NO.	MW-12A
LOCATION	McMinnville, Oregon	PAGE	1 OF 2
DRILLED BY	Geo-Tech Explorations, Inc.	GROUND ELEV.	123.80'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	25.50'
LOGGED BY	Craig D. Fanshier	DATE COMPLETED	07/19/95

SAMPLE METHOD AND NUMBER	RECOVERY (PERCENT)	BLOW COUNTS (N COMP)	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
								0 to 23.0 feet: SILTY CLAY (CL); dark brown (10YR 3/3), with 20 percent reddish brown mottling; medium plasticity fines; very stiff; damp.
SS S-1	60	6-7-9 (16)		5				
SS S-2	80	6-8-8 (16)		10				@ 9.0 feet: approximately 20 to 30 percent gray mottling.
SS S-3*	100	2-2-3 (5)	7/24/95 ▼	15				@ 14.0 feet: 5 percent fine sand; firm; moist, visible moisture on mottled soil.
SS S-4*	100	1-1-2 (3)	▽ 7/19/95	20				@ 19.0 feet: wet.

REMARKS

Borehole drilled with 10.5-inch O.D. (6.25-inch I.D.) hollow stem augers. Soil samples collected with 2.0-inch O.D. (1.4-inch I.D.) split spoons (SS). Blow counts are for 6-inch intervals. A 2-inch-diameter Schedule 40 PVC monitoring well was constructed in the borehole. Well construction information is presented in well details diagram (attached). See explanation for definition of symbols. * = Intervals where split spoons were inadvertently overdriven.

EMCON

LOG OF EXPLORATORY BORING

PROJECT NAME Riverbend, Monitoring Well Installation
LOCATION McMinnville, Oregon
DRILLED BY Geo-Tech Explorations, Inc.
DRILL METHOD Hollow Stem Auger
LOGGED BY Craig D. Fanshier

BORING NO. MW-12A
PAGE 2 OF 2
GROUND ELEV. 123.80'
TOTAL DEPTH 25.50'
DATE COMPLETED 07/19/95

SAMPLE METHOD AND NUMBER	RECOVERY (PERCENT)	BLOW COUNTS (N COMP)	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
SS S-5*	100	1-2-2 (4)		25				0 to 23.0 feet: SILTY CLAY (CL); continued. @ 20.0 feet: dark greenish gray (5G 4/1), with 10 to 20 percent reddish brown mottling; trace fine sand. 23.0 to 25.5 feet: CLAYEY SILT (ML); dark greenish gray (5G 4/1); 95 percent low to medium plasticity fines; 5 percent fine sand; soft; wet. 0.5-inch-thick layers of silty sands (50 percent fine sand and 50 percent low plasticity fines) at 23.5, 24.2, and 25.0 feet. 0.5-inch irregularly shaped areas of reddish brown iron oxide(?) staining. Total depth drilled = 25.5 feet. Total depth sampled = 25.7 feet.
				30				
				35				
				40				

REMARKS

Borehole drilled with 10.5-inch O.D. (6.25-inch I.D.) hollow stem augers. Soil samples collected with 2.0-inch O.D. (1.4-inch I.D.) split spoons (SS). Blow counts are for 6-inch intervals. A 2-inch-diameter Schedule 40 PVC monitoring well was constructed in the borehole. Well construction information is presented in well details diagram (attached). See explanation for definition of symbols. * = Intervals where split spoons were inadvertently overdriven.

EMCON