Attachment D

2010 Groundwater Data Evaluation

King County

Department of Natural Resources and Parks
Solid Waste Division

CEDAR HILLS REGIONAL LANDFILL 2010 GROUNDWATER DATA EVALUATION

JUNE 2011

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EXECUTIVE SUMMARY

This 2010 Groundwater Data Evaluation Annual Report summarizes groundwater data collected in 2010 and presents significant findings supported by the evaluation of this data.

Groundwater at the Cedar Hills Regional Landfill (CHRLF) occurs both in a regional aquifer and in perched zones. The regional aquifer flows through advance outwash and deeper deposits and is separated from the base of waste placement areas by more than 200 feet of unsaturated sands and gravels. Perched groundwater occurs in onsite till, ice-contact deposits and recessional outwash. No laterally or vertically extensive perched zones have been identified, leaving the regional aquifer beneath the landfill is the earliest target hydraulic pathway for groundwater contaminant detection.

REGIONAL AQUIFER

The regional aquifer beneath CHRLF is entirely recharged by precipitation. A local recharge area is located immediately south of the landfill within the Queen City Farms property, and is centered north of the Main Gravel Pit Lake. In general, groundwater flow in the regional aquifer is radial from the recharge area. Beneath the landfill, regional flow is to the north in the south and central portions of the landfill site. Flow direction in the northern part of the site turns northeasterly as recharge from the McDonald Creek drainage comes into effect. Regional Aquifer flow is physically separated from the Cedar River and likely discharges to Issaquah Creek. There is no significant seasonal variation in horizontal groundwater flow paths. Horizontal gradients are influenced by infiltrating precipitation in the recharge area. Vertical hydraulic gradients are demonstrated by head differences in adjacent wells screened at different depths and related to hydraulic conductivity of the aquifer materials.

A monitoring network is in place consisting of 45 monitoring and production wells. Monitoring network wells are located to characterize groundwater flow and to obtain representative samples for water quality characterization. A majority of the perimeter wells are upgradient to waste placement and indicate a complex flow regime in the landfill vicinity. Downgradient flow converges into a high transmissivity zone which provides excellent monitoring coverage for all flow paths within the potential source area.

An extensive list of chemical analytes and field parameters are analyzed and the results are evaluated by a variety of graphical and statistical methods. The groundwater data analyses presented in this report describe onsite groundwater elevations, flow direction and velocity; and summarizes the evaluation of groundwater quality to determine if chemical concentrations have changed over time or differ between well locations. This report also seeks evidence of impacts to groundwater quality by surface activities.

Upgradient groundwater quality, especially in wells nearest the southern recharge zone, is profoundly affected by conditions and activities that have occurred on the adjoining Queen City Farms property. Upgradient groundwater quality manifests a high degree of spatial variation and temporal trends, which is not unexpected given recharge area site history which has included a variety of land uses, investigations and remediation.

Downgradient groundwater quality also manifests a high degree of spatial variation and temporal trends. Much as recharge effects are dampened with distance from the source, the concentrations of many analytes are attenuated by processes such as dispersion dilution, sorption, and degradation as groundwater flows beneath the landfill. The highest concentrations of certain analytes occur in upgradient wells.

These data indicate that CHRLF acts as an attenuation zone for upgradient impacts, allowing a reduction in the concentration of chlorinated volatile organic compounds (CVOCs), iron and manganese.

The regional aquifer is the first continuously saturated zone beneath the landfill and serves as the earliest path for detection monitoring. Recent water quality evaluations of Queen City Farms groundwater are available in the *2010 Expanded Hydrogeology Assessment Queen City Farms King County, Washington,*(December 2010) and *Report Evaluation of Remedial Action 10-Year Review Queen City Farms King County, Washington* (2008).

PERCHED ZONES

Perched groundwater occurs in onsite till, ice-contact deposits and recessional outwash. No laterally or vertically extensive perched zones have been identified. Recharge is by precipitation with possible hydraulic continuity to surface streams.

Impacts from past landfilling practices have previously been recognized in several perched zone wells. Site improvements and engineered facilities have been effective in reducing contaminant concentrations attributable to past practices. Declining long term trends for most contaminants are apparent in these wells. Additional investigations are underway to evaluate residual impacts and make recommendations. Findings are available in the Technical Memoranda *Results of Groundwater Sampling and Fate and Transport Analysis South Solid Waste Area Perched Zone Assessment,* April 2010, and the *East Main Hill Perched Zones*, October 2010.

CEDAR HILLS REGIONAL LANDFILL
2010
GROUNDWATER DATA EVALUATION

1.0 INTRODUCTION

This Cedar Hills Regional Landfill (CHRLF) 2010 Groundwater Data Evaluation report evaluates groundwater monitoring data collected during the past calendar year and summarizes the significant findings supported by these evaluations. This report evaluats water quality in the regional aquifer, which is the first continuously saturated zone beneath the landfill and provides the earliest path for detection monitoring. Water quality in the perched water-bearing zones at CHRLF is also evaluated.

Chapter 2 contains a brief description of the geologic and hydrogeologic conditions at CHRLF. For a complete discussion of site conditions, the development of the hydrogeological model and monitoring network, see the *Cedar Hills Regional Landfill Hydrogeologic Report*, March 1999, and the *Cedar Hills Regional Landfill Sitewide Hydrogeologic Report*, March 2004. Additional findings from continuing investigations can be found in two Technical Memoranda: *Phase I Investigations Groundwater Monitoring Well System Enhancements*, October 2007 and *East Main Hill Perched Zones* October 2010.

Chapter 3 discusses the methods used to evaluate and analyze the groundwater data, and Chapter 4 presents the results of these evaluations. Conclusions based on the analyses results are included in Chapter 5.

Groundwater monitoring has been conducted at the CHRLF since 1983. A large quantity of data has been developed for the site as a result of the monitoring program. The groundwater monitoring program and this annual data evaluation are in accordance with the King County Board of Health Solid Waste Regulations. (Title 10, Rules and Regulations No. 03-06) and "Criteria for Municipal Solid Waste Landfills" (Chapter173-351 WAC).

2.0 GEOLOGY AND HYDROGEOLOGY

In order to effectively analyze water quality data collected at CHRLF, it is important to have a clear understanding of the regional and site geology and hydrogeology, and to understand groundwater occurrence and flow beneath the Cedar Hills site. Figure 2-1 displays the location of CHRLF in a regional context and Figure 2-2 indicates the environmental monitoring locations for groundwater, surface water and landfill gas migration detection. Figures 2-3 and 2-4 povide cross sectional views of the major hydogeologic features of the landfill site. A detailed discussion of site geology and hydrogeology is beyond the scope of this report, but may be found in the *Cedar Hills Regional Landfill Site wide Hydrogeologic Report*, March 2004 and the *Phase I Investigations Groundwater Monitoring Well System Enhancements Technical Memorandum*, October 2007. Geologic evaluations of the CHRLF site have identified a complex history of

sediments deposited by rivers, lakes and glaciers over volcanic and sedimentary bedrock. Sediments beneath the site consist of generally fine grained sands and silts, in some areas part of a prehistoric lake deposit. In the northern portion, the sediments are continuous with coarse sands and gravels, suggesting removal by erosion of the finer sediments and replacement by river channel deposits. These sediments are overlain by a thick blanket of sands and gravels deposited during Vashon era glacial advance. The advance outwash is capped by a complex group of deposits overridden by or deposited from the glacial ice (till, contact deposits and recessional outwash).

Groundwater occurs both as a regional aquifer and in perched zones. The regional aquifer flows through advance outwash and deeper deposits and is separated from the base of waste placement areas by more than 200 feet of unsaturated sands and gravels. Perched groundwater occurs in onsite till, ice-contact deposits and recessional outwash. No laterally or vertically extensive perched zones have been identified; therefore, the regional aquifer beneath the landfill is the earliest target hydraulic pathway for groundwater contaminant detection. The regional aquifer potentiometric surface lies at approximately 350 feet MSL at the south property line and at approximately 285 feet MSL at the north east.

The regional aquifer beneath CHRLF is entirely recharged by precipitation. A dominant local recharge area is located immediately south of the landfill within the Queen City Farms property, centered north of the Main Gravel Pit Lake. In general, groundwater flow in the regional aquifer is radial from the recharge area. Beneath the landfill, regional flow is to the north in the south and central portions of the landfill site. Flow direction in the northern part of the site turns northeasterly as recharge from the McDonald Creek drainage comes into effect. Flow then converges into a high transmissivity channel and likely discharges to Issaquah Creek. There is no significant seasonal variation in horizontal groundwater flow paths; horizontal gradients are influenced by infiltrating precipitation in the recharge area. Vertical hydraulic gradients in the southern area are demonstrated by head differences in adjacent wells screened at different depths. Flow determinations and a Regional Aquifer Potentiometric Surface Map are prepared quarterly by a licensed Hydrogeologist.

2.1 LOCAL PERCHED WATER BEARING ZONES

A number of local water bearing zones have been (?) identified in the Vashon-aged units around the Cedar Hills site. Table 2-1 lists onsite wells, and gives construction dates and locational information. The perched zones are divided into three groups for discussion and presentation purposes. The North and West perched zones contain five wells and include areas along the west and north buffers and infrastructure north of landfilled areas. The East Main Hill perched zone contains 10 wells and extend along the eastern edge of the landfill adjacent to unlined areas. The South Solid Waste Area (SSWA) perched zone includes nine wells encompassing the non-contiguous South Solid Waste Area and extending into CHRLF's south buffer area, abutting

Queen City Farms. Though water levels are obtained from multiple wells in each zone, lateral or vertical continuity between wells in a zone cannot be assumed.

Recently completed investigations focused on the SSWA perched zone and the East Main Hill perched zone. The SSWA is monitored by well MW-101 (water levels and water quality), MW-25, MW-41S, MW-41D, MW-45, MW-79, MW-96 and MW-97 (water levels only). Findings from this investigation are presented in the Technical Memorandum *Results of Groundwater Sampling and Fate and Transport Analysis South Solid Waste Area Perched Zone Assessment*, April 2010. The East Main Hill perched zones are monitored by wells MW-30A, MW-47, MW-62 and MW-EB6 (water level and water quality); and wells MW-48 and MW-50 (water levels only). Three additional wells, MW-102, MW-103 and MW-104, were installed in this zone as part of the Groundwater Monitoring Well System Enhancements project. Findings from this investigation are presented in the *East Main Hill Perched Zones Technical Memorandum*, October 2010.

2.2 REGIONAL AQUIFER

The regional aquifer, contained within the pre-Vashon stratigraphic units, has been identified as the shallowest laterally extensive water bearing zone encountered beneath the landfill; and is therefore the earliest target hydraulic pathway for groundwater contaminant detection. A monitoring network is in place consisting of 45 monitoring and production wells where water level measurements are obtained. Of those 45 wells, 39 are also sampled and analyzed for water quality. Table 2-1 lists all wells, construction dates and locational information for onsite wells.

As a follow up to the *Groundwater Monitoring Well System Enhancements Phase I* investigation, a report is being prepared to evaluate regional aquifer flow, the need for new or replacement monitoring wells, and the enhancement of the groundwater monitoring network. This report will be completed in 2011.

The piezometric surface contour maps (Appendix I) indicate a north and northeasterly flow direction in the regional aquifer. Interpolation and contouring methodology are the methodology developed for the *Technical Memorandum Phase I Investigations Groundwater Monitoring Well System Enhancements*, October 2007. The contouring methodology includes triangulation using linear interpolation and three passes of a 3x3 Gaussian filter. Quarterly monitoring of groundwater elevations has shown very little seasonal or annual variability in regional groundwater flow and velocity. For 2010, the average horizontal flow velocities for the regional aquifer have been calculated to range from 0.015 ft/day in the south landfill area, to 2.13 ft/day in the central area and 1.23 ft/day in the north area.

TABLE 2-1

SUMMARY OF CEDAR HILLS REGIONAL LANDFILL SITE WELLS

Well Number	Date Constructed	Screened Zone	Gradient[1]	Purpose[2]	Ground Surface Elevation	Top of Well Casing Elevation	Total Well Depth	Screened Interval Depth		Screened Interval Elevation		Coordinates Northing	Coordinates Easting
MW-21	5/17/1983	Regional	C	WL/WQ	418.2	420.66	180.0	155	163	263.2	255.2	173876.38	1697901.86
MW-22	5/25/1983	Regional	C	WL	515.0	517.09	284.0	279	283.8	236.0	231.2	173088.17	1701844.34
MW-24	6/1/1983	Regional	U	WL/WQ	473.8	475.99	193.0	187	192	286.8	281.8	167767.76	1702441.65
MW-43	4/30/1985	Regional	D	WL/WQ	544.6	547.06	325.0	299	309	245.6	235.6	174327.14	1701274.23
MW-54	9/26/1986	Regional	U	WL	579.3	580.43	360.0	329	351	250.3	228.3	168435.53	1702154.28
MW-56	10/12/1988	Regional	U	WL/WQ	479.2	480.33	170.5	156	166	323.2	313.2	167214.82	1698980.77
MW-57	8/22/1988	Regional	U	WL/WQ	455.7	456.64	145.5	129	144	326.7	311.7	167201.99	1699993.32
MW-58A	9/26/1988	Regional	U	WL/WQ	478.6	479.27	220.5	208.5	218.5	270.1	260.1	167207.16	1699006.59
MW-59	8/16/1988	Regional	U	WL/WQ	455.6	457.13	185.5	170.5	180.5	285.1	275.1	167193.44	1699983.91
MW-60	9/13/1991	Regional	U	WL/WQ	564.8	567.15	266.4	230	239	334.8	325.8	167873.2	1701154.47
MW-64	3/22/1993	Regional	C	WL/WQ	594.3	596.55	276.3	260.3	274.1	334.0	320.2	168772.19	1701980.27
MW-65	3/29/1993	Regional	U	WL/WQ	543.2	545.83	236.9	225.5	234.3	317.7	308.9	167146.55	1701602.10
MW-66	4/5/1993	Regional	D	WL/WQ	528.6	531.28	250.7	234.2	248	294.4	280.6	174250.32	1699750.19
MW-67	4/28/1993	Regional	D	WL/WQ	514.1	516.43	232.4	216.3	230.1	297.8	284.0	172610.65	1701776.69
MW-68	4/15/1993	Regional	D	WL/WQ	644.8	647.07	354.6	333.5	352.5	311.3	292.3	170609.35	1701917.32
MW-69	4/23/1993	Regional	C	WL/WQ	651.0	653.69	368.8	357.4	371	293.6	280.0	172400.20	1698061.86
MW-70	5/11/1993	Regional	U	WL/WQ	527.9	530.57	221.5	205.1	218.8	322.8	309.1	168699.89	1698412.97
MW-72	8/7/1998	Regional	C	WL/WQ	669.8	671.87	389.0	366.2	375.8	303.6	294.0	170987.71	1698229.92
MW-73	7/3/1999	Regional	C	WL/WQ	484.3	485.70	218.0	196.2	205.5	288.1	278.8	174995.59	1698954.95
MW-74	11/1/2000	Regional	D	WL/WQ	529.2	531.26	270.0	239.3	248.8	289.9	280.4	173813.79	1700386.85
MW-75	9/24/1999	Regional	D	WL/WQ	529.8	532.40	287.0	258.7	268.8	271.1	261.0	173432.42	1701059.70
MW-76	10/25/1999	Regional	U	WL/WQ	489.8	491.71	155.9	138.7	148.2	351.1	341.6	167193.13	1700376.23
MW-77	10/12/1999	Regional	U	WL/WQ	550.5	552.67	251.5	230	239.5	320.5	311.0	168999.71	1700007.63
MW-78	10/8/1999	Regional	U	WL/WQ	535.3	537.35	229.5	213	225.5	322.3	309.8	169027.58	1698881.94
MW-80	2/27/2001	Regional	D	WL/WQ	528.5	530.41	270.0	249.3	258.8	279.2	269.7	172964.99	1701309.78
MW-81	10/3/2002	Regional	C	WL/WQ	492.2	493.66	199.0	183	192	309.2	300.2	172113.99	1702568.87
MW-82	11/2/2000	Regional	U	WL/WQ	472.8	474.85	139.5	123.9	133.4	348.9	339.4	167725.31	1699553.72
MW-83	10/27/2000	Regional	U	WL/WQ	494.5	496.81	160.0	144.3	153.8	350.2	340.7	167212.27	1697939.89
MW-84	10/20/2000	Regional	C	WL/WQ	528.7	530.80	250.5	236.2	245.7	292.5	283.0	173894.54	1698602.89
MW-85	12/1/2000	Regional	D	WL/WQ	529.8	531.76	270.0	247.2	256.7	282.6	273.1	173694.52	1701828.95
MW-86	12/12/2000	Regional	D	WL/WQ	533.9	536.04	282.0	250.5	259.3	283.4	274.6	174917.90	1701331.25
MW-87	11/21/2000	Regional	D	WL/WQ	535.2	537.31	272.5	251.5	260.8	283.7	274.4	173493.76	1700670.27
MW-88	9/13/2001	Regional	D	WL/WQ	511.2	513.68	248.5	229.7	239	281.5	272.2	174303.06	1701807.87
MW-89	11/12/2001	Regional	D	WL/WQ	510.7	512.82	328.0	281.5	290.8	229.2	219.9	174319.44	1701799.57
MW-90	8/14/2002	Regional	D	WL/WQ	500.2	502.22	300.0	265	274	235.2	226.2	174300.67	1702203.13
MW-91	10/26/2001	Regional	D	WL/WQ	529.7	532.02	331.0	268.9	289	260.8	240.7	173423.94	1701023.09
MW-93	6/24/2002	Regional	C	WL/WQ	630.2	632.15	350.0	310.3	320.1	319.9	310.1	169851.24	1702259.35
MW-94	7/2/2002	Regional	U	WL/WQ	493.2	495.51	168.0	136	144.7	357.2	348.5	167210.22	1698674.21
MW-95	7/22/2002	Regional	U	WL/WQ	568.6	571.54	311.0	254	262.7	314.6	305.9	169426.92	1697265.32
MW-99	8/30/2002	Regional	U	WL/WQ	491.8	493.64	287.0	270	279	221.8	212.8	172098.73	1702556.06
MW-100	8/26/2002	Regional	C	WL/WQ	618.4	620.32	124.7	299.3	309.3	319.1	309.1	169610.46	1700791.72
MW-106	2/19/2009	Regional	C	WL	473.0	475.47	270.0	193	203	280.0	270.0	173461.69	1702536.99
WS-ATC-1	2/7/1972	Regional	C	WL	624.9	625.51	535.0	325	340	299.9	284.9	169823.34	1702268.95
WS-NPW-1	8/221990	Regional	C	WL	644.6	646.33	382.0	365.7	375.7	278.9	268.9	171138.99	1701906.96
WS-NPW-3	6/51990	Regional	C	WL	644.3	645.81	376.0	359.4	367.4	284.9	276.9	170663.28	1701922.88

TABLE 2-1

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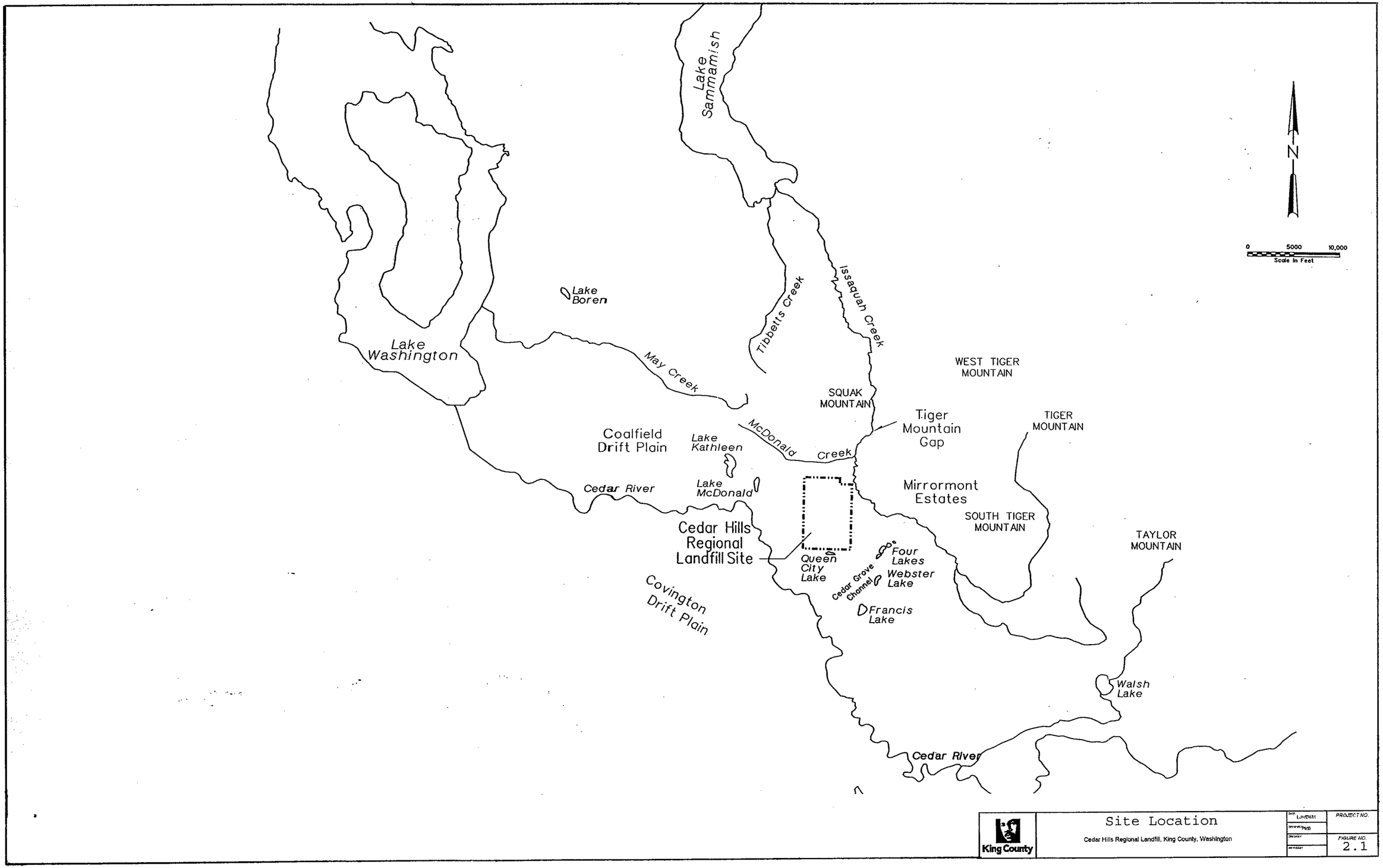
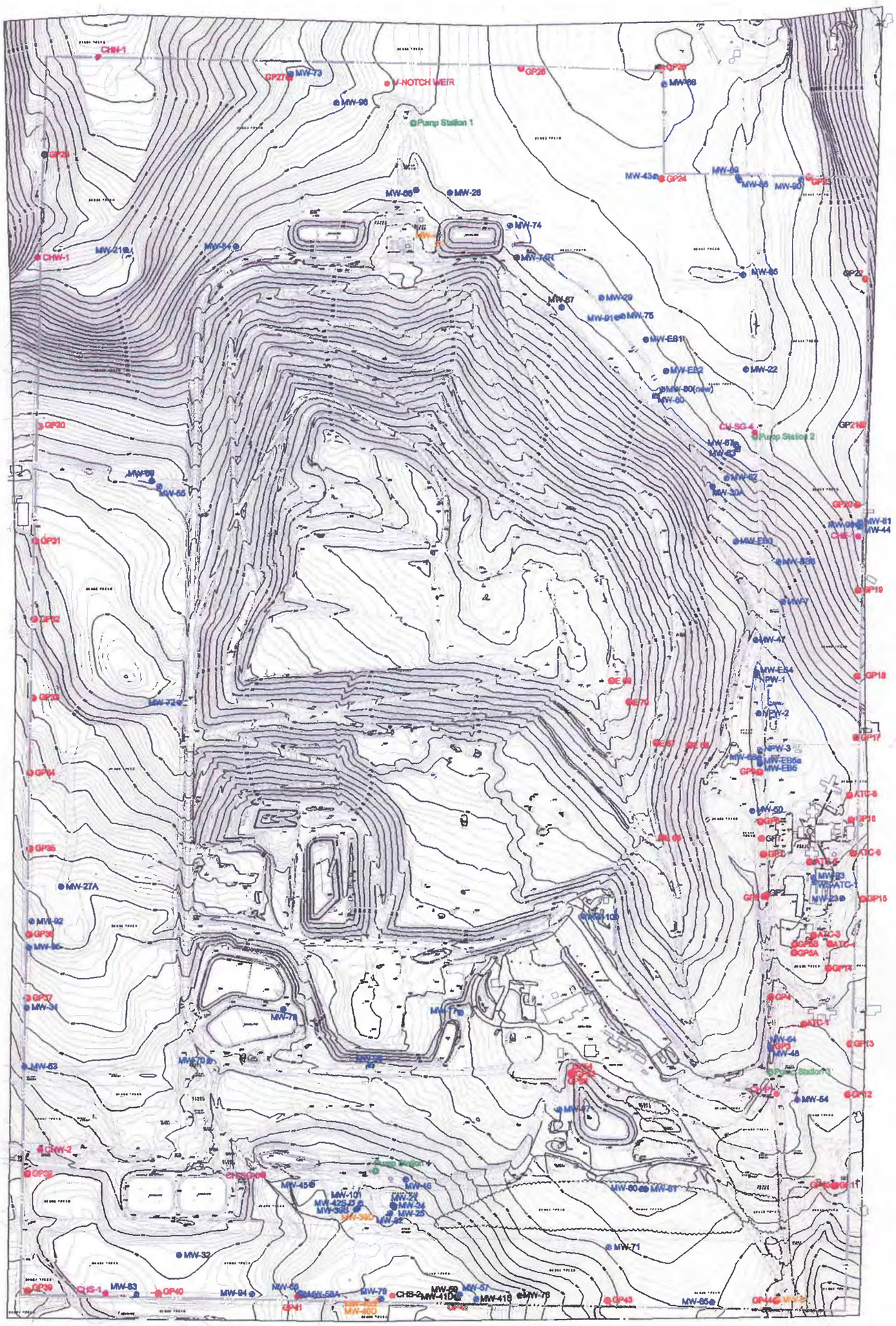
Well Number	Date Constructed	Screened Zone	Gradient[1]	Purpose[2]	Ground Surface Elevation	Top of Well Casing Elevation	Total Well Depth	Screened Interval Depth		Screened Interval Elevation		Coordinates Northing	Coordinates Easting
MW-30A	9/6/1989	East Perched	--	WL/WQ	567.7	568.43	40.0	25	35	542.7	532.7	172345.48	1701628.59
MW-47	6/31/1985	East Perched	--	WL/WQ	633.6	634.60	50.0	23.5	43.5	610.1	590.1	171365.53	1701898.69
MW-48	5/24/1985	East Perched	--	WL	593.6	594.49	63.0	37	47	556.6	546.6	168758.73	1701985.17
MW-50	6/3/1985	East Perched	--	WL	636.2	637.02	39.5	27.5	37.5	608.7	598.7	170276.14	1701873.92
MW-62	2/1/1990	East Perched	--	WL/WQ	555.3	556.21	65.5	44	54	511.3	501.3	172397.77	1701719.18
MW-63	2/12/1990	East Perched	--	WL	513.8	515.88	22.0	12	17	501.8	496.8	172580.25	1701786.72
MW-102	1/27/2009	East Perched	--	WL	549.7	552.48	50	35	50	515.2	500.2	172313.75	1701858.76
MW-103	1/28/2009	East Perched	--	WL	636.8	639.08	40.00	25	35	611.8	601.8	170473.99	1702210.55
MW-104	1/29/2009	East Perched	--	WL	626.9	629.68	35.00	22	32	604.9	594.9	171153.34	1702169.14
MW-EB6	11/28/1990	East Perched	--	WL/WQ	587.9	589.61	50.0	20	30	567.9	557.9	171862.72	1702049.75
MW-98	3/9/2001	N - W Perched	--	WL	501.6	503.73	22.5	10.7	20	490.9	481.6	174810.64	1699245.65
MW-28	6/21/1983	N - W Perched	--	WL/WQ	526.2	527.75	39.0	27	37	499.2	489.2	174231.84	1699966.20
MW-29	6/23/1983	N - W Perched	--	WL/WQ	531.7	532.92	60.0	17	27	514.7	504.7	173552.23	1700926.39
MW-55	10/2/1986	N - W Perched	--	WL/WQ	651.1	652.29	67.0	37.5	47.5	613.6	603.6	172364.53	1698110.11
MW-27A	10/3/1985	N - W Perched	--	WL/WQ	583.2	584.23	80.0	59	69	524.2	514.2	169817.29	1697470.72
MW-25	6/3/1983	SSWA Perched	--	WL	473.2	474.41	43.0	18	38	455.2	435.2	167760.97	1699580.14
MW-41S	7/12/1983	SSWA Perched	--	WL	460.7	462.44	51.0	8	18	452.7	442.7	167171.51	1700100.82
MW-41D	7/12/1983	SSWA Perched	--	WL	460.7	462.32	51.0	30	50	430.7	410.7	167171.51	1700100.82
MW-45	5/17/1985	SSWA Perched	--	WL	487.7	488.40	64.0	31	41	447.6	457.6	167907.28	1699058.03
MW-79	11/5/1999	SSWA Perched	--	WL	456.9	459.17	56.0	40.5	50	416.4	406.9	167175.91	1699495.56
MW-96	12/18/2001	SSWA Perched	--	WL	545.4	547.74	102.9	88.8	97.5	456.6	447.9	168667.73	1699434.47
MW-97	9/5/2001	SSWA Perched	--	WL	562.5	564.54	124.7	101	110	461.5	452.5	168380.87	1700636.96
MW-101	6/2/2006	SSWA Perched	--	WL/WQ	472.1	474.72	57.50	44	54	428.1	418.1	167791.40	1699364
MW-105	1/30/2009	SSWA Perched	--	WL	518.7	521.23	30.00	18	28	500.7	490.7	167697.49	1698320.49

Notes

[1]Gradient relative to the postion of the well in the regional Aquifer relative to the waste placement areas.
U = Upgradient C = Crossgradient D = Downgradient

[2]WL = Water Level WQ = Water Quality


Lake Sammamish
Lake Boren
Lake Washington
May Creek
Tibbetts Creek
Issaquah Creek
WEST TIGER MOUNTAIN
SQUAK MOUNTAIN
Tiger Mountain Gap
TIGER MOUNTAIN
Coalfield Drift Plain
Lake Kathleen
McDonald Creek
Cedar River
Lake McDonald
Mirrormont Estates
SOUTH TIGER MOUNTAIN
TAYLOR MOUNTAIN
Cedar Hills Regional Landfill Site
Queen City Lake
Four Lakes
Cedar Grove Channel
Webster Lake
Francis Lake
Covington Drift Plain
Walsh Lake
Cedar River
N
0
5000
10,000
Scale in Feet
King County
Site Location
Cedar Hills Regional Landfill, King County, Washington
PROJECT NO.
FIGURE NO.
2.1



LEGEND

MW-9 Monitoring Well

GP-19 Gas Probe

MW-8 Decommissioned Monitoring Well

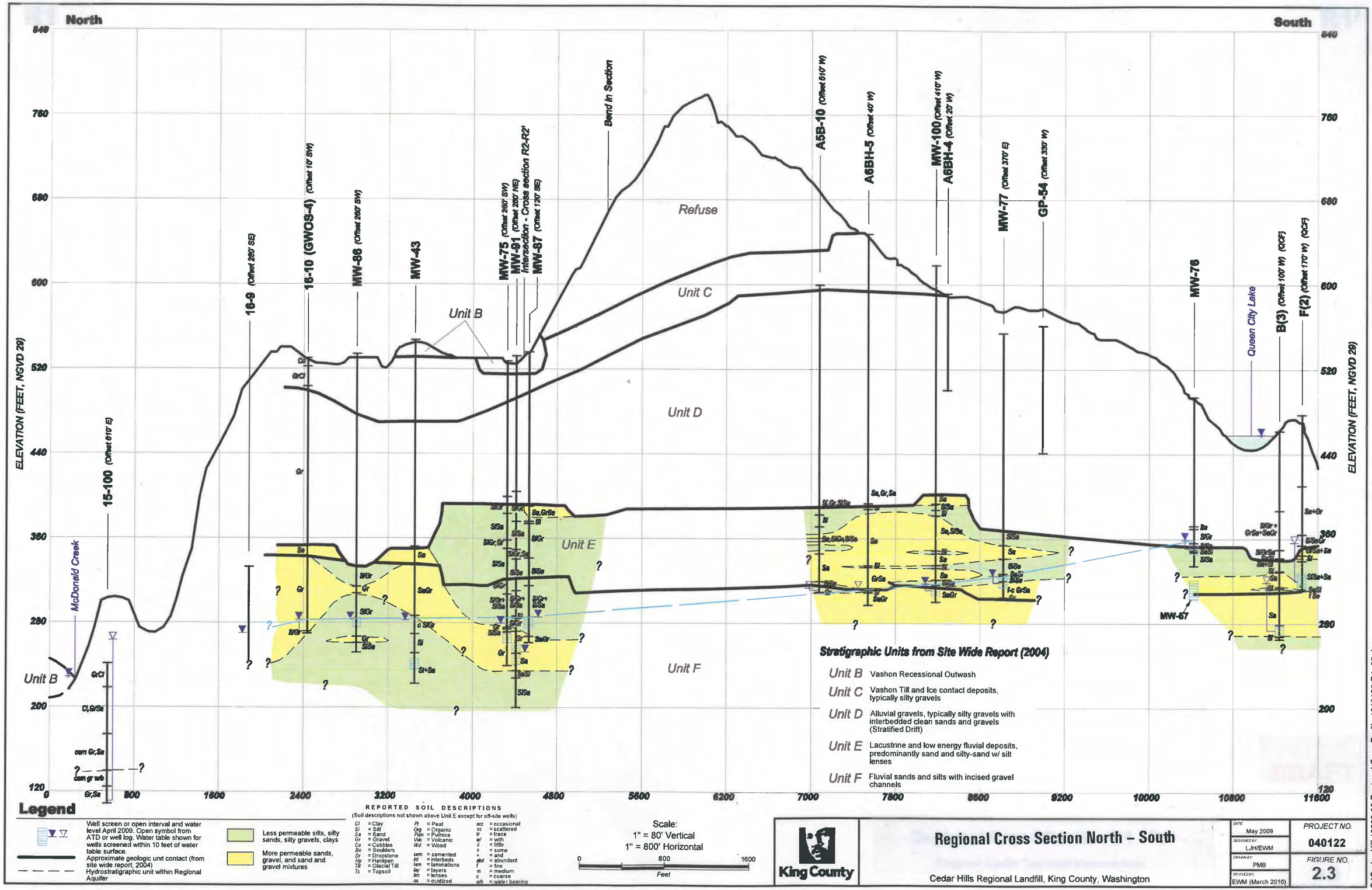
GP-13 Decommissioned Gas Probe

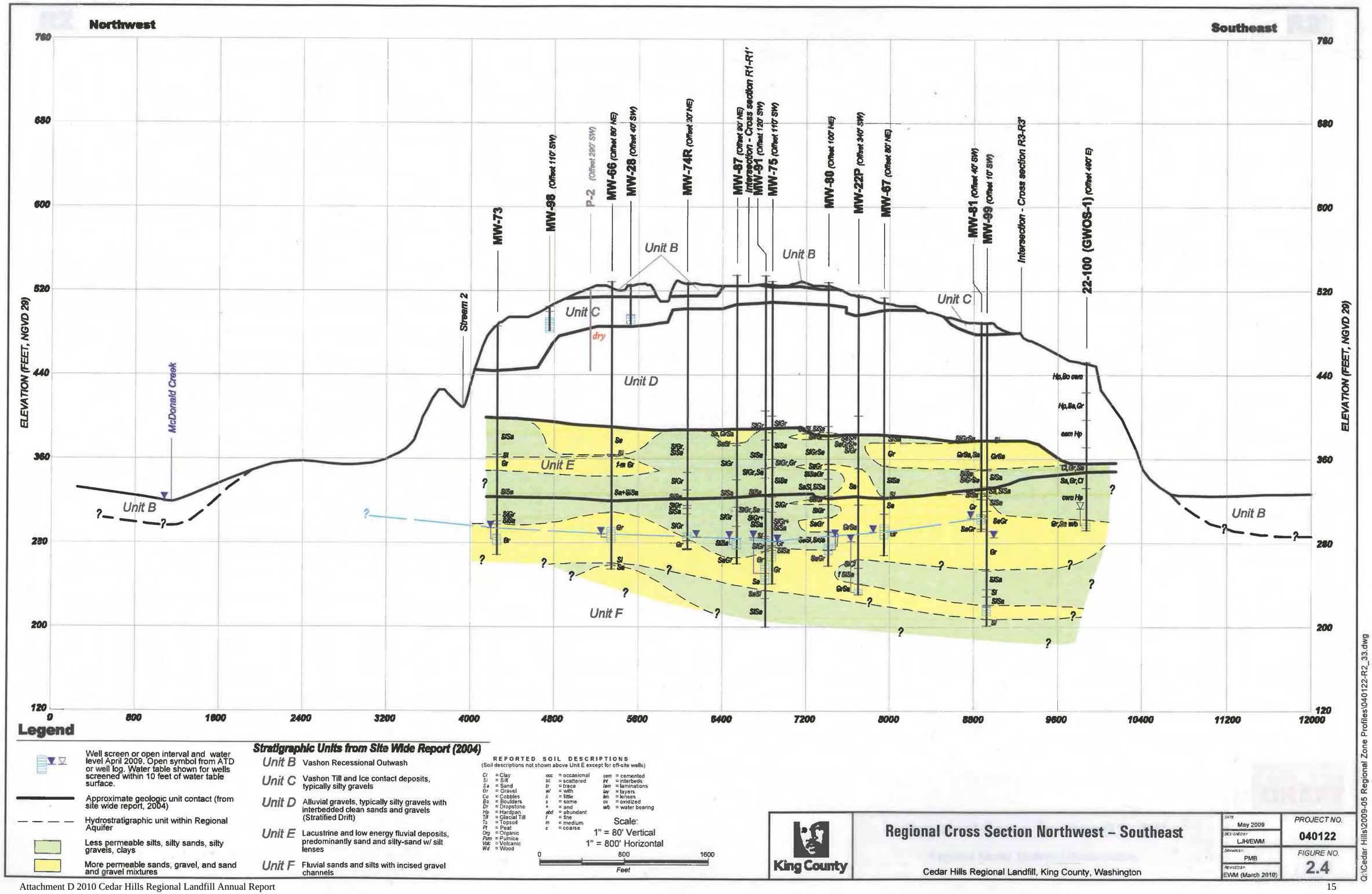
Pump Station NO.__

MW-9 Surface Water Stations

Scale 1"=200'

King County Solid Waste Division	DATE: Oct. 2007	Figure 2.2 **SITE MAP** Cedar Hills Landfill Maple Valley, Washington	Aero-Metric Aerial Photo taked August 24, 2007


North
South
ELEVATION (FEET, NGVD 29)
840
760
680
600
520
440
360
280
200
120
0
800
1600
2400
3200
4000
4800
5600
6200
7000
7800
8600
9200
10000
10800
11600
15-100 (Offset 510' E)
16-9 (Offset 260' SE)
16-10 (GWOS-4) (Offset 10' SW)
MW-86 (Offset 260' SW)
MW-43
MW-75 (Offset 260' SW)
MW-91 (Offset 260' NE)
Intersection - Cross section R2-R2'
MW-87 (Offset 130' SE)
Bend in Section
A5B-10 (Offset 510' W)
A6BH-5 (Offset 40' W)
MW-100 (Offset 410' W)
A6BH-4 (Offset 20' W)
MW-77 (Offset 370' E)
GP-54 (Offset 330' W)
MW-76
Queen City Lake
B(3) (Offset 100' W) (QCF)
F(2) (Offset 170' W) (QCF)
MW-67
McDonald Creek
Refuse
Unit B
Unit C
Unit D
Unit E
Unit F
Stratigraphic Units from Site Wide Report (2004)
Unit B Vashon Recessional Outwash
Unit C Vashon Till and Ice contact deposits, typically silty gravels
Unit D Alluvial gravels, typically silty gravels with interbedded clean sands and gravels (Stratified Drift)
Unit E Lacustrine and low energy fluvial deposits, predominantly sand and silty-sand w/ silt lenses
Unit F Fluvial sands and silts with incised gravel channels
Legend
Well screen or open interval and water level April 2009. Open symbol from ATD or well log. Water table shown for wells screened within 10 feet of water table surface.
Approximate geologic unit contact (from site wide report, 2004)
Hydrostratigraphic unit within Regional Aquifer
Less permeable silts, silty sands, silty gravels, clays
More permeable sands, gravel, and sand and gravel mixtures
REPORTED SOIL DESCRIPTIONS
(Soil descriptions not shown above Unit E except for off-site wells)
Cl = Clay
Si = Silt
Sa = Sand
Gr = Gravel
Co = Cobbles
Bo = Boulders
Dr = Dropstone
Hp = Hardpan
Till = Glacial Till
Ts = Topsoil
Pt = Peat
Org = Organic
Pum = Pumice
Volc = Volcanic
Wd = Wood
cem = cemented
int = interbeds
lam = laminations
lay = layers
len = lenses
ox = oxidized
occ = occasional
sc = scattered
tr = trace
w/ = with
li = little
s = some
+ = and
abd = abundant
f = fine
m = medium
c = coarse
wb = water bearing
Scale:
1" = 80' Vertical
1" = 800' Horizontal
0
800
1600
Feet
King County
Regional Cross Section North – South
Cedar Hills Regional Landfill, King County, Washington
DATE May 2009
DESIGNED BY LJH/EWM
DRAWN BY PMB
REVISED BY EWM (March 2010)
PROJECT NO. 040122
FIGURE NO. 2.3
Q:\Cedar Hills\2009-05 Regional Zone Profiles\040122-R1_32.dwg



Excerpted From: *Cedar Hills Regional Aquifer Regional Aquifer Technical Memorandum* 2011

3.0 DATA COLLECTION AND EVALUATION

Environmental samples are collected and analyzed in accordance with the *Quality Assurance Project Plan for Environmental Monitoring at King County Solid Waste Facilities* (QAPP) (1999) and the *Environmental Monitoring Sampling and Analysis Plan for Cedar Hills Regional Landfill* (2002) (SAP). These documents contain procedures to ensure that environmental data meet desired objectives for quality, consistency and documentation.

Groundwater quality is evaluated by comparison of analysis results to regulatory standards, geochemical analysis and statistical evaluation. Following is a brief description of each. King County Solid Waste Division monitors groundwater in accordance with Chapter 173-351 WAC.

Data collected include field parameters and laboratory analysis results. These data are evaluated by a variety of graphical and statistical methods. The groundwater evaluation presented herein describes onsite groundwater elevations, flow direction and velocity.

Groundwater chemical data are evaluated to determine if chemical concentrations have changed over time or differ between well locations. Groundwater evaluation serves to determine evidence of impacts to groundwater quality by surface activities.

3.1 DATA REVIEW

Throughout the groundwater monitoring program conducted by KCSWD, numerous Quality Assurance/Quality Control (QA/QC) samples have been collected and analyzed as an ongoing part of meeting data quality objectives. These samples include field and trip blanks, field duplicates and split samples for inter-laboratory comparison. Laboratory data was reviewed as outlined in the QAPP for compliance with Data Quality Objectives (DQOs) and Quality Assurance/Quality Control (QA/QC).

Field data collection QA/QC is ensured by adherence to standardized procedures of instrument calibration and data acquisition as outlined in the SAP. The laboratory data review is conducted by staff that have the initial responsibility for the accuracy and completeness of the data. The reviewer will evaluate the quality of the work based on guidelines established in the QAPP to ensure that:

- Appropriate procedures have been followed.
- Laboratory deliverables are correct and complete.
- Analyses are completed within holding times.
- QC sample and laboratory blank results are within appropriate QC limits.
- Documentation is complete.

Data qualifiers may be assigned to the data based on the QA review. The qualified data will then be made available for data evaluation and interpretation. A complete compilation of water quality data for groundwater, surface water and leachate are presented in Appendix IV.

3.2 GROUNDWATER ELEVATION AND FLOW

Groundwater levels in individual wells are presented in Appendix I. Upgradient and downgradient designations were determined by well position relative to the placement of waste.

Flow determinations are calculated quarterly by a Licensed Hydrogeologist and following the model presented in the Hydrogeologic Report and subsequent investigation.

3.3 GROUNDWATER ANALYTICAL DATA

The outcome of the sampling, analysis and data review processes are data that meet the requirements for use in evaluating groundwater quality and can be used as a basis for decision making. Statistical and graphical methods are then applied to answer questions of comparison.

Descriptive statistics are calculated and tabulated to provide a snapshot of data set distributional parameters. These include the number of analyses, number of detections, minimum, maximum, mean, standard deviation and median. Although both means and medians are reported in the summary tables, medians are used in the text because they tend to be a more reliable measure of central tendency in the case of non-normal distributions, particularly when there are outliers, as is the case here.

Using the Shapiro-Wilk test for normality, data sets are tested for approximation to a normal distribution, to determine which statistical procedures, described below in sections 3.5 and 3.6, may be appropriately applied.

3.4 GROUNDWATER QUALITY STANDARDS

Water quality monitoring results are compared to Federal Drinking Water Maximum Contaminant Limits, 40 CFR Parts 141 and 143; Washington State Groundwater Quality Criteria, Chapter 173-200 WAC and Public Water Supplies, Chapter 246-290 WAC. Standards are compared to actual analytical values, not mean or median values. All exceedances are determined by the standards that were in effect at the time of the sampling and are summarized in Tables 4-1a and 4-1b. These tables include primary standard exceedances, those where concentrations are greater than the MCL for analytes having health consequences, and exceedances of secondary standard, non-mandatory Federal guidelines regarding aesthetic (taste, odor, or color) or cosmetic (tooth or skin discoloration) effects.

3.5 TREND TESTING

Testing for trend is one of our primary means of evaluating water quality data over time. The statistical test used is the Mann-Kendall test for trend. This test is well suited for environmental data (Gibbons 1994) as it makes no distributional assumptions (non-parametric); and allows

irregularly spaced (temporally) samples. Values below detection limits are allowed in the calculation, a condition which is frequently encountered in groundwater monitoring. The test yields the probability (p values) that a temporal trend is due to chance. Low p-values indicate low probability of a trend existing solely due to chance, therefore significant evidence of a trend exists. Values of less than 0.05 indicate statistical significance.

This test has been applied to data sets for parameters of value for evaluating water quality or that are indicative of impacts from anthropogenic sources. Naturally occurring trace level constituents with low detection frequencies are not trend tested.

To yield meaningful results, trend results must be interpreted carefully in cases where frequency of detection is low or in cases where reporting limits have changed over the period of record. Trend test are conducted on an annual basis and results are tabulated in the Statistical Summary Tables (Table 4-2a, 4-2b and 4-2c). Statistically significant decreasing trends are denoted by "D" in the table, statistically significant increasing trends by "I". Absence of a trend and non-significant trends are indicated in the table as "—".

3.6 PREDICTION LIMITS

The Prediction Limit used in this evaluation is an intrawell statistical test that compares an analytical result to a computed limit value. The limit value is derived from past analytical results from the same well, considered to be representative background data. A value outside of this limiting value is considered evidence that the result is not drawn from the same sample population distribution. Population here refers to the set of potential measurements or values, including not only cases actually observed but those that are potentially observable. The prediction limits generated in this report are based on a 5% false positive rate (type I error) and depend on the background distribution. For each parameter tested, an appropriate background data set is chosen. Limits are recalculated each year with the incorporation of the previous year's data into the dataset. The updated limits are used to define the range of expected values for future samples. The data set is tested for normality by application of the Shapiro-Wilk Test for Normality. If the data set fails the test for normality, several transformations of the data are tested. When normal or transformed normal data sets are determined, a parametric prediction limit is calculated and future results compared to this value. When all transformations fail the test for normality, a non-parametric method is applied and future results are compared to this limit.

This test is performed on a quarterly basis, Prediction Limit Exceedances of Chapter 173-351 WAC Appendix I constituents are presented in Table 4-3.

3.7 TIME-CONCENTRATION PLOTS

Time plots are generated for parameters with high detection frequencies and relevance to groundwater quality evaluation. The plots contain data from a number of wells grouped by

relative spatial and gradient location. The intent is to give the reader a visual synopsis of relevant and extensive interrelated data, rather than a graphical compilation of analytical results. All non-detections (ND) are displayed on graphs as one-half the limit of detection. All plots are scaled the same, to include the entire range of values measured and to provide a consistent context from plot to plot. Each plot shows analyte concentrations for the period 2001-2010. Since water quality data were typically collected quarterly, the plots are useful for showing temporal changes due to seasonality as well as long-term increasing or decreasing trends and a visual comparison of relative concentration magnitudes for wells in similar spatial and gradient location. Time-Concentration plots for selected parameters are included in Appendix II.

3.8 TRILINEAR DIAGRAMS

Geochemical data is presented on trilinear diagrams. Major cations and anions are plotted on individual triangles as percentages of total milliequivalents per liter (meq/L). These diagrams illustrate differences in major ion chemistry between groundwater samples and can be used to categorize water composition into identifiable groups known as hydrochemical facies. Used here, hydrochemical facies refers to distinct chemical compositions of groundwater solute concentrations contained in an aquifer. In general, a groundwater will have a dominant cation or cation pair and a dominant anion or anion pair. For our purposes, the four dominant possibilities are: calcium/magnesium or sodium/potassium for cations and chloride/sulfate or bicarbonate for anions. These facies reflect distinct compositions of cation and anion concentrations such that the value of the diagram lies in the ability to recognize relationships that exist among individual samples. Trilinear Diagrams are included with ionic balance calculations in Appendix III.

4.0 GROUNDWATER QUALITY EVALUATION

This section contains an overall description of water quality and an examination of contamination issues supported by the data. As perched zones have been identified to be neither laterally or vertically extensive and as such do not provide an opportunity for regional aquifer background characterization nor site-wide detection of waste placement areas; the regional aquifer beneath the landfill is the earliest target hydraulic pathway for groundwater contaminant detection.

Water quality, both upgradient and downgradient, is notable for its variability spatially and over time. This variability is only reasonable considering the history of activities and flow regime in place. Wells comprising the monitoring network serve to provide background characterization and downgradient performance monitoring.

The objective of the monitoring program is to utilize a system consisting of a sufficient number of wells installed at appropriate locations and depths to yield representative ground water samples from those hydrostratigraphic units which have been identified as the earlier target hydraulic pathways. The system provides data capable of providing early warning detection of any groundwater contamination and facilitates decision making that insures protection of human health and the environment.

4.1 REGIONAL AQUIFER GROUNDWATER ELEVATION AND FLOW

The primary recharge area for the regional aquifer is immediately across the south property line. Flow is radial from this center such that the flow across the south property line is oriented S to N. As flow moves northward under the property footprint, it remains predominantly to the north. As the flow approaches the north third of the landfill property, flow direction changes to the NE where flow lines converge and the gradient increases. This convergent effect influences regional flow in such a way that most wells on the east, west and north perimeters are upgradient or cross gradient to waste placement areas of the landfill. Available data indicate that all flow downgradient to waste placement flows in a relatively narrow corridor roughly between wells MW-66 on the NW and MW-67 on the SE. For the purposes of this review all wells north and east of and including these two locations, along with MW-68, are considered to be downgradient, while all wells outside this corridor are considered to be upgradient, see Table 2-1.

Response to seasonal rainfall is greatest at the southern wells and expresses little apparent time delay. Wells along the south property line can exhibit seasonal elevation changes in excess of eight feet and are highest in the spring, immediately following the wettest months of the water year. Seasonal lows generally occur in the fall and the end of the driest portion of the water year. For example, MW-76, MW-82 and MW-94, wells nearest to the recharge location and screened at the water table have seasonal changes of five to seven feet on average.

Downgradient wells on the site experience much less fluctuation with all downgradient water table wells having an average interseasonal range of one foot or less.

Hydrographs of groundwater elevations versus time appear in Appendix II in which seasonal changes in groundwater elevation are plotted along with cumulative annual precipitation. All regional well elevations are plotted along with April – March annual rainfall totals and top of screen elevations. Apparent on this plot are the correlation of seasonal recharge with depth to the water table and proximity to the recharge area. Also apparent are longer, multi-year effects of rainfall total and groundwater elevation. Wells completed in the regional aquifer are screened in pre-Vashon deposits consisting of lacusterine or fluvial sands and silts, alluvial gravels, fluvial gravels and fluvial sands and silts.

4.2 REGIONAL AQUIFER UPGRADIENT WATER QUALITY

Upgradient groundwater quality, especially in wells nearest the recharge zone, is profoundly affected by conditions and activities that have occurred over the past fifty years on the adjoining 320-acre Queen City Farms property. In general chronological order these activities included: a pig farming operation that brought MSW in for use as feed; a business that disposed of hazardous waste in excavated pits; a general aviation airport; a solvent reprocessing and recovery operation; a gravel mine with excavation extending down to a level near the water table of the regional aquifer (Gravel Pit Lake); and an MSW composting facility. The Queen City Farms property is listed on the National Priorities List for contaminated sites under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund) and has undergone site remediation efforts that included extensive excavation, stabilization and barrier wall construction. . Groundwater quality in upgradient CHRLF wells is impacted by chlorinated volatile organic compounds (CVOCs)from the Queen City Farms site. Presence of these contaminants and their migration is well documented in *Report Evaluation of Remedial Action 10-Year Review Queen City Farms King County, Washington*, 2008 and the *Expanded Hydrogeology Assessment Queen City Farms King County, Washington*, 2010 .

Upgradient quality also manifests a high degree of spatial variation and temporal trends, which are not unexpected given recharge area site conditions as described. These unstable conditions make the establishment of a benchmark “background water quality” an unusable concept.

Instead of direct background-compliance or upgradient-downgradient comparisons, site conditions and history must be incorporated in the evaluation of groundwater quality.

4.2.1 Water Quality Exceedances

Water quality exceedances are tabulated in Table 4-1a. Primary standards include National Primary Drinking Water Regulations Maximum Contaminant Levels (MCLs, 40 CFR 141) and Washington State Ground Water Criteria (GWC) (WAC 173-200-040). Secondary standards are included in National Secondary Drinking Water Regulations Maximum Contaminant Levels (MCLs) (40 CFR 143) and Washington State GWC (WAC 173-200-040). The secondary standards provide a measure of the aesthetic condition (taste, odor and color) and do not present a risk to human health.

Analytes exceeding primary standards in some upgradient wells are arsenic, trichloroethene (TCE) and vinyl chloride.

Arsenic occurs naturally in native soils and can be mobilized in groundwater by depressed redox and affected by pH conditions and ions available to form complexes or adsorption sites.

Four of 25 upgradient wells had arsenic detections in 2010. All detections exceeded the state GWC of 0.00005 mg/L; but were below the Federal MCL of 0.01mg/L.

All CVOCs exceeding standards in 2010 are known contaminants of compounds disposed of at Queen City Farms or degradation products of those compounds or contaminants. Trichloroethene is consistently detected in wells MW-76, MW-78, MW-82, MW-83 and MW-94. All 2010 samples collected from MW-76 and MW-82 exceeded both state GWC and federal MCLs. Vinyl chloride is regularly detected in MW-65 and exceeds state GWC only.

Occurrence of these contaminants is well documented on the Queen City Farms site and the occurrence and concentration of these compounds in CHRLF upgradient groundwater is consistent with findings presented in the *Second Five-Year Review for Queen City Farms Superfund Site,* the *2008 Annual Monitoring Data Report Queen City Farms King County, Washington* and the *Report Evaluation of Remedial Action 10-Year Review Queen City Farms King County, Washington,* which both indicate migration across the property line.

Secondary standards exceeded include pH, iron and manganese. The lower pH standard of 6.5 was exceeded in MW-76 and MW-64 in 2010. Natural groundwaters in the region tend to be slightly acidic, and can be influenced by surface activities and proximity to recharge by rainfall as rainfall in equilibrium with the atmosphere has a pH of ~5.5. .

Iron and manganese, like arsenic, are naturally occurring and mobilization is controlled by similar processes: redox, pH and sorption. The occurrence and concentrations of iron and manganese vary greatly over short distances. Maximum iron and manganese concentrations in individual upgradient wells vary over three orders of magnitude in upgradient wells inferring apidly changing redox conditions vertically and horizontally in the regional aquifer.

4.2.2 Trends

Trend test results are tabulated in the Statistical Summary of Upgradient Groundwater Quality Table 4-2a. Basic water quality indicators such as specific conductance, total dissolved solids (TDS), and dissolved cationic (i.e. calcium, magnesium, potassium, sodium) and anionic species (i.e. bicarbonate, nitrate, chloride sulfate) are found to have significant trends. Both increasing and decreasing trends are detected for these various parameters in upgradient wells; however, the VOCs present are generally stable or declining (see Trend results in Table 4-2a).

The only exception to these trends is *cis*-1,2 DCE in well MW-24 where the relatively recent occurrence (first detection in January 2006) indicates a further migration and degradation of parent CVOCs from Queen City Farms.

Trend test results indicate a highly dynamic upgradient water quality. This is not surprise ing considering the activities that have taken place in and very near to the recharge zone. The character of these flows are representative of groundwater as it flows to Cedar Hills and provides a reference to determine changes that may take place along any of many flow paths between an upgradient well and further downgradient wells. With regard to specifics as to why trends occur in upgradient water quality, greater knowledge of conditions and activities on upgradient properties would be required. Detailing specifics and their impacts to groundwater beyond characterization as the flow reaches Cedar Hills property is beyond the scope of this report.

4.2.3 Prediction Limits

While trend testing detects a significant change in relative concentration over time by defining a direction and probability, prediction limit results provide a way of determining if future measurements are inconsistent with an established background It sets a criterion, a limit value, such that any measurement in a future sample that exceeds that value will be considered to have been drawn from a different population. In order for a prediction limit test to be useful to test for different sample populations between wells, it is assumed that a benchmark background data set can be determined. As discussed with trend testing, a suitable background data set is unavailable. Data drawn from a dynamic population to construct an interwell prediction limit will lead to erroneous conclusions, indicating contamination by the landfill where there is none, or worse, failing to indicate contamination if it were present. By using an intrawell prediction limit, testing future results from a well against its own background, we can avoid the uncertainty and erroneous conclusions brought in by spatial variation, and we can also determine the existence of a change in water quality at any given monitoring well for the time interval.

The prediction limit concept is useful for evaluating parameters with high detection frequencies to detect water quality changes in discrete time intervals. A test can be done on a sample or sequence of samples (four samples collected in a year) to determine divergence from the underlying population.

By regulation, a finding of statistical significance is determined for analytes listed in Appendix I of Chapter 173-351 WAC. Table 4-3 lists intrawell prediction limit exceedances in these analytes. Parameter, well, sample date, analytical result and limit values for 2010 are included.

Prediction limit exceedances in upgradient wells include barium in MW-93, likely mobilized by mineral dissolution; and *cis* 1,2-dichloroethene in MW-59 likely representing plume spread from Queen City Farms.

The existence of upgradient prediction limit exceedances confirms that there is dynamic, unstable water quality in the regional aquifer flowing to the landfill. The prediction limit statistical test assumes a static, unchanging background dataset to compute expected future values. When this assumption does not hold, as is the case here, it increases the likelihood that exceedances of the computed limit will be found, even when these exceedances are not related to activities attributable to Cedar Hills.

Alterations to the measurable quality of these flows can be mediated by processes occurring as flow progresses across the landfill and sampled at downgradient locations. Attenuation processes act to decrease parameter concentrations most notably demonstrated by diminishing concentrations of VOCs to below detection limits downgradient.

Additionally, processes such as redox condition changes and inputs to flow can alter constituent concentrations. Redox depression along a flow path by dissolved oxygen depletion or input of reductive pressures can mobilize iron and manganese from native soils, influence arsenic mobility (increase or decrease depending on reductive strength). Also sensitive to redox environment are nitrogen (Ammonia-N and Nitrate-N) and sulfur (sulfate and sulfide) compounds. Mineral weathering (dissolution) can also occur if soil concentrations of carbon dioxide increase brining ionic forms of calcium, magnesium, barium and bicarbonate (alkalinity), among others, into solution. Redox reactions tend to be reversible with concentrations of representative species adjusting as redox environment changes.

In the case where upgradient water quality is unstable, prediction limits become useful as a tool to determine changing upgradient conditions with quantifiable certainty.

4.3 REGIONAL AQUIFER DOWNGRADIENT WATER QUALITY

Downgradient groundwater quality, like upgradient quality, also manifests a high degree of spatial variation and temporal trends. Much as recharge effects are dampened with distance from the source, so are the concentrations of many analytes attenuated by processes such as dispersion dilution, sorption, and degradation as groundwater flows beneath the landfill.

Additionally, flow analysis indicates convergence of flow, not only from recharge under Queen City Farms but also from areas west and north of the landfill.

4.3.1 Water Quality Exceedances

Downgradient water quality exceedances for 2010 are tabulated in Table 4-1a. Analytes exceeding primary standards in downgradient wells are arsenic and vinyl chloride.

In 2010, arsenic was detected in six of 13 downgradient wells. All detections exceed the state GWC of 0.00005 mg/L; no samples exceeded the applicable Federal MCL.

Vinyl chloride exceeded the state GWC in the third quarter sample from MW-43, and has had a series of low level detections at this sampling site, approximately one per year, since 2003. It is likely that these detections are related to the degradation of the PVC well construction materials at MW-43. Release of vinyl chloride monomer from PVC products manufactured in the 1970s is well documented. This well, installed in 1985, is likely to have been constructed using PVC materials susceptible to vinyl chloride leaching. MW-43 is being considered for decommissioning.

Secondary standards exceeded in 2010 were limited to iron and manganese (nine of thirteen wells each). As in upgradient wells, iron and manganese vary greatly over short distances with concentrations ranging over two orders of magnitude.

4.3.2 Trends

Trend test results are summarized in Table 4-2b. As in upgradient wells, several basic water quality indicators such as conductance, total dissolved solids (TDS), and dissolved cationic and anionic species are found to have significant trends. Both increasing and decreasing trends are detected for these parameters in downgradient wells.

As explained in the previous section, a highly variable flow reaches the landfill footprint as upgradient flow. Processes acting to change parameter concentrations continue. Redox changes along the flow paths beneath the landfill modify the high iron and manganese concentrations measured at the upgradient south end of the landfill.

Mineral weathering effects (calcium, magnesium and barium) are apparent in long term trends in several downgradient wells (MW-67, MW-68, MW-74 and MW-75). As redox reactions tend to be reversible, and as attenuation processes occur, concentrations of these parameters diminish with further downgradient flow.

Finally, inputs of solutes to groundwater flow from surface or near surface activities can alter water quality measurably. This is apparent with chloride concentrations in wells MW-66, MW-74 and MW-75. Again, concentrations decline with further flow downgradient.

4.3.3 Prediction Limits

Table 4-3 lists downgradient intrawell prediction limit test results for Appendix I parameters in 2010. Limit values for each well and analyte tested and the date and concentration that exceeded the limit are included.

The downgradient prediction limit exceedances are similar to the upgradient findings in the regional aquifer. Prediction limit test results suggest that discernible water quality changes are occurring, both upgradient and downgradient, and can be detected using this statistical procedure.

4.4 PERCHED GROUNDWATER

Perched groundwater occurs in onsite glacial till, ice-contact deposits and recessional outwash. No laterally or vertically extensive perched zones have been identified. For purposes of presentation and discussion, perched zones are divided into three groups; North and West Perched Zones; East Perched Zone (EPZ); and South Solid Waste Area Perched Zone (SSWA Perched Zone).

Impacts to the EPZ and SSWA by historical site activities have been recognized over the years. Several investigations are underway to clarify interactions between engineered facilities, surface water and perched groundwater, and to further define perched zone extent.

Available data indicate that all onsite perched zones are separated from the regional aquifer by unsaturated deposits ranging from 100 to 300 feet. No laterally or vertically extensive perched zones have been identified leaving the regional aquifer beneath the landfill as the earliest target hydraulic pathway for groundwater contaminant detection. For this reason the regional aquifer, rather than any perched groundwater, is the target hydraulic pathway for detection monitoring. Table 2-1 lists perched wells, construction dates and locational information.

4.4.1 Groundwater Elevation and Flow

Depth to water and seasonal precipitation response plot is located in Appendix II. Flow direction and velocity are not able to be determined due to the discontinuous nature of perched zones. Additional borings in the East Main Hill perched zone may bring better definition of the extent of this zone and provide adequate data to infer flow in this zone. These findings are presented in the *East Main Hill Perched Zones Technical Memorandum*, published in 2010.

4.4.2 Water Quality Exceedances

Perched zones water quality exceedances for 2010 appear in Table 4-1b. In the North and West zone wells, arsenic occurs in MW-27A at concentrations above both the state GWC and federal MCL. Secondary standards are exceeded for pH and iron (wells MW-28 and MW-29) and manganese (MW-27A, MW28 and MW-55).

In the EPZ, primary state GWC standards were exceeded for arsenic (MW-EB6) and 1,1-dichloroethane (MW-30A and MW-62). Vinyl chloride was detected in well, MW-47, exceeding the federal MCL in all samples tested in 2010. Secondary standards were exceeded for pH in MW-30A, MW-62, and MW-EB6, for TDS in MW-47, for iron in MW-47and MW-EB6; and for manganese in MW-47 and MW-EB6.

In the SSWA perched zone, MW-101, exceeded the federal MCL and state GWC for arsenic and the state GWC for vinyl chloride. Iron and manganese exceeded the secondary standard.

As previously discussed, arsenic occurs naturally in native soils and can be mobilized in groundwater by depressed redox and affected by pH conditions and ions available to form complexes or adsorption sites. The physical and spatial properties of the perched zones enhance the likelihood of exposure to one or more of these mechanisms. Although arsenic can be found in leachate, the probability of leachate as a source of arsenic in groundwater samples is unlikely considering processes such as dilution and sorption that would reduce the contribution from leachate. It is likely that arsenic detected in site wells is mobilized from native soils by redox or pH changes which can be brought about by landfill associated processes.

The frequency and variety of VOC exceedances in the EPZ and SSWA wells have declined dramatically over time. Primary standards have been exceeded by seven VOCs at some point

during the monitoring history of the perched zone wells. Presently only two compounds, 1,1-dichloroethane and vinyl chloride have exceeded standards.

Iron and manganese, like arsenic, are naturally occurring and are mobilized by similar processes, redox, pH and sorption. Iron and manganese exceedances occur in both impacted and unimpacted perched wells.

4.4.3 Trends

Trend test results are tabulated in the Statistical Summary of Perched Groundwater Quality Table 4-2c. North and West perched zone wells display few trends long or short term. MW-28 tests significant for long term decreases in sulfate and manganese. MW-27A shows significant short term increasing trends with increased concentrations in chloride, calcium, magnesium, potassium, sodium and barium in 2010.

Trends in the East perched zone are detected primarily in wells MW-30A; and MW-47 and to a lesser extent in MW-62 and MW-EB6. Long term trends are predominantly downward with the exception of alkalinity and magnesium in MW-30A. Short term trends are detected for at least one parameter in each well. The long term declines are consistent with site improvements and modified operational methods which have occurred over the past several decades. All analytes with Primary MCLs (volatile organics and arsenic) are declining long term in the East perched zone.

The South Solid Waste Area perched zone is monitored primarily by MW-101. Several perched zone wells have been sampled occasionally during ongoing investigation and have not produced sufficient data for trend testing. MW-101 yields short term declining trends for specific conductance and sodium. No other analytes display any trend.

Short term trends can be influenced by more recent site activities, especially in perched zone wells with high response to seasonal precipitation. Analytical variation can also contribute statistically to trend detection.

4.4.4 Prediction Limits

perched zone wells were tested for intrawell prediction limit exceedances for Appendix I analytes where adequate data are available. In wells with sufficient data, no exceedances of intrawell prediction limits were detected in any perched wells.

TABLE 4-1a

CEDAR HILLS REGIONAL LANDFILL

SUMMARY OF GROUNDWATER QUALITY STANDARD EXCEEDANCES REGIONAL AQUIFER

(January 1, 2010 to December 31, 2010)

			Arsenic		Trichloroethene		Vinyl Chloride		pH (Field)	Iron	Manganese
			Primary Standards						**Secondary Standards**		
Well ID	Sample Date	Sample ID	DWS 0.01	GWC 0.0005	DWS 5 ug/L	GWC 3 ug/L	DWS 2 ug/L	GWC 0.02 ug/L	< 6.5, > 8.5	0.3 mg/L	0.05 mg/L
Upgradient Wells											
MW-21	01/06/10	W21-100106-								2	0.063
MW-21	04/02/10	W21-100402-								2.04	0.0703
MW-21	10/13/10	W21-101013-								2.1	0.070
MW-24	01/07/10	W24-100107-								3.70	0.15
MW-24	04/02/10	W24-100402-								3.73	0.137
MW-24	07/13/10	W24-100713-								3.92	0.17
MW-24	10/13/10	W24-101013-								3.77	0.150
MW-56	01/07/10	W56-100107-									0.06
MW-56	04/16/10	W56-100416-									0.0546
MW-56	07/07/10	W56-100707-									0.0702
MW-56	10/14/10	W56-101014-									0.0789
MW-57	01/07/10	W57-100107-								7.7	0.25
MW-57	04/26/10	W57-100426-								7.81	0.22
MW-57	07/07/10	W57-100707-								7.92	0.252
MW-57	10/05/10	W57-101005-								8.87	0.238 D
MW-58A	01/14/10	W58A100114-								1.0	0.34
MW-58A	04/02/10	W58A100402-								1.0	0.34
MW-58A	07/06/10	W58A100706-								0.95	0.339
MW-58A	10/04/10	W58A101004-								1.01	0.334 D
MW-59	01/06/10	W59-100106-								3.9	0.09
MW-59	04/02/10	W59-100402-								3.99	0.10
MW-59	07/02/10	W59-100702-								4.11	0.103
MW-59	10/08/10	W59-101008-								4.14	0.102 D
MW-64	01/12/10	W64-100112-	0.0021							0.48	0.090
MW-64	04/20/10	W64-100420-	0.00176							0.532	0.1310
MW-64	07/20/10	W64-100720-	0.00224						6.4	0.718	0.2290
MW-64	10/22/10	W64-101022-	0.0020							0.524	0.209
MW-65	03/30/10	W65-100330-					0.0538			4.0	0.20
MW-65	04/16/10	W65-100416-					0.0495			4.0	0.188
MW-65	07/26/10	W65-100726-					0.0653			4.0	0.192 D
MW-69	02/04/10	W69-100204-	0.0024							1.1	0.18
MW-69	04/19/10	W69-100419-	0.0023							1.1	0.164
MW-69	07/26/10	W69-100726-	0.0025							1.1	0.181
MW-69	10/26/10	W69-101026-	0.0024							1.10	0.182
MW-72	02/01/10	W72-100201-								1.6	0.233
MW-72	04/19/10	W72-100419-								1.91	0.232
MW-72	07/30/10	W72-100730-								1.72	0.224 D
MW-72	10/28/10	W72-101028-								2.09	0.255
MW-76	01/23/09	W76-090123-			10.8						
MW-76	04/22/09	W76-090422-			9.65						
MW-76	07/20/09	W76-090720-			10.8				6.4		
MW-76	10/26/09	W76-091026-			11.2						
MW-82	01/23/09	W82-090123PA			5.48						
MW-82	04/21/09	W82-090421-			5.65						
MW-82	07/08/09	W82-090708-			6.52						
MW-82	10/16/09	W82-091016-			5.34						
MW-93	01/21/10	W93-100121-	0.0015								0.278

TABLE 4-1a

CEDAR HILLS REGIONAL LANDFILL

SUMMARY OF GROUNDWATER QUALITY STANDARD EXCEEDANCES REGIONAL AQUIFER

(January 1, 2010 to December 31, 2010)

			Arsenic		Trichloroethene		Vinyl Chloride		pH (Field)	Iron	Manganese
			Primary Standards						**Secondary Standards**		
Well ID	Sample Date	Sample ID	DWS 0.01	GWC 0.0005	DWS 5 ug/L	GWC 3 ug/L	DWS 2 ug/L	GWC 0.02 ug/L	< 6.5, > 8.5	0.3 mg/L	0.05 mg/L
MW-93	04/22/10	W93-100422-	0.0013								0.275
MW-93	07/28/10	W93-100728-	0.0014								0.289 D
MW-93	10/29/10	W93-101029-	0.0014								0.293
MW-94	02/09/10	W94-100209-			3.1						
MW-94	11/01/10	W94-101101-			3.2						
MW-95	02/09/10	W95-100209-									0.127
MW-95	04/22/10	W95-100422-									0.124
MW-95	07/28/10	W95-100728-									0.127 D
MW-95	11/01/10	W95-101101-									0.112
MW-99	01/22/10	W99-100122-	0.0029								0.0596
MW-99	04/13/10	W99-100413-	0.0026								
MW-99	07/09/10	W99-100709-	0.0030								
MW-99	10/21/10	W99-101021-	0.0028								0.0651
MW-100	02/03/10	W100100203-								2.1	0.186
MW-100	07/26/10	W100100726-								1.95	0.211
MW-100	10/29/10	W100101029-								1.86	0.21

TABLE 4-1a

CEDAR HILLS REGIONAL LANDFILL

SUMMARY OF GROUNDWATER QUALITY STANDARD EXCEEDANCES REGIONAL AQUIFER

(January 1, 2010 to December 31, 2010)

			Arsenic		Trichloroethene		Vinyl Chloride		pH (Field)	Iron	Manganese
			Primary Standards						**Secondary Standards**		
Well ID	Sample Date	Sample ID	DWS 0.01	GWC 0.0005	DWS 5 ug/L	GWC 3 ug/L	DWS 2 ug/L	GWC 0.02 ug/L	< 6.5, > 8.5	0.3 mg/L	0.05 mg/L
Downgradient Wells											
MW-43	01/05/10	W43-100105-								0.89	0.200
MW-43	04/08/10	W43-100408-								0.990	0.21
MW-43	07/22/10	W43-100722-7					0.03080			1.050	0.209
MW-43	10/12/10	W43-101012-								0.964	0.209
MW-67	01/08/10	W67-100108-									0.051
MW-67	07/19/10	W67-100719-									0.074
MW-67	10/21/10	W67-101021-									0.069
MW-68	02/05/10	W68-100205-								1.51	0.271
MW-68	04/21/10	W68-100421-								2.51	0.299
MW-68	07/27/10	W68-100727-								2.56	0.266 D
MW-68	10/25/10	W68-101025-								2.37	0.258
MW-74	01/19/10	W74R100119-	0.0010							2.6	0.14
MW-74	04/12/10	W74R100412-								2.13	0.130
MW-74	07/12/10	W74R100712-								2.7	0.176
MW-74	10/21/10	W74R101021-	0.0010							2.81	0.15
MW-75	01/22/10	W75-100122-	0.0011							1.54	0.12
MW-75	04/13/10	W75-100413-								1.45	0.115
MW-75	07/09/10	W75-100709-	0.0011							1.20	0.114
MW-75	10/21/10	W75-101021-	0.0010							1.86	0.135
MW-80	02/08/10	W80-100208-	0.0050							1.320	0.225
MW-80	04/20/10	W80-100420-	0.0046							1.370	0.228
MW-80	08/02/10	W80-100802-	0.0049							1.410	0.272
MW-80	10/28/10	W80-101028-	0.0047							1.51	0.237
MW-86	01/29/10	W86-100129-								0.259	
MW-86	04/19/10	W86-100419-								0.561	
MW-86	07/27/10	W86-100727-								0.491	
MW-86	10/29/10	W86-101029-								0.404	
MW-87	01/19/10	W87-100119-								3.0	0.31
MW-87	04/12/10	W87-100412-								2.8	0.27
MW-87	07/12/10	W87-100712-								3.02	0.335
MW-87	10/21/10	W87-101021-								3.10	0.326
MW-88	02/08/10	W88-100208-	0.0011								
MW-88	04/09/10	W88-100409-	0.0011								
MW-88	07/28/10	W88-100728-	0.0011								
MW-88	10/22/10	W88-101022-	0.0012								
MW-89	01/07/10	W89-100107-	0.0016								
MW-89	04/09/10	W89-100409-	0.0016								
MW-89	07/28/10	W89-100728-	0.0016								
MW-89	10/22/10	W89-101022-	0.0016								
MW-90	01/08/10	W90-100108-								1.1	0.263
MW-90	04/08/10	W90-100408-								1.16	0.253
MW-90	07/21/10	W90-100721-								1.11	0.251
MW-90	10/15/10	W90-101015-								1.13	0.254
MW-91	01/08/10	W91-100108-	0.0035							2.2	0.23
MW-91	04/19/10	W91-100419-	0.0026							1.88	0.203
MW-91	07/19/10	W91-100719-	0.0027							1.88	0.227
MW-91	10/22/10	W91-101022-	0.0052							2.44	0.24

TABLE 4-1b

CEDAR HILLS REGIONAL LANDFILL

SUMMARY OF GROUNDWATER QUALITY STANDARD EXCEEDANCES PERCHED ZONES

(January 1, 2010 to December 31, 2010)

			Arsenic		1,1-Dichloro-ethane		Vinyl Chloride		pH (Field)	TDS	Iron	Manganese
			Primary Standards						**Secondary Standards**			
Well ID	Sample Date	Sample ID	DWS 0.01	GWC 0.0005	DWS 5 ug/L	GWC 3 ug/L	DWS 2 ug/L	GWC 0.02 ug/L	< 6.5, > 8.5	500	0.3	0.05
North and West Perched Wells												
MW-27A	01/08/10	W27A100108-	0.0107									
MW-27A	04/06/10	W27A100406-	0.00501									
MW-27A	07/12/10	W27A100712-	0.0162									
MW-27A	10/15/10	W27A101015-	0.0159									0.0533
MW-28	04/05/10	W28-100405-							5.6			
MW-28	07/08/10	W28-100708-							5.7			
MW-28	10/15/10	W28-101015-							5.8			
MW-29	04/01/10	W29-100401-							6.4			
MW-29	07/26/10	W29-100726-							6.1			
MW-29	10/15/10	W29-101015-							6.4			
MW-55	01/05/10	W55-100105-									0.2	
MW-55	04/14/10	W55-100414-									0.1	
MW-55	07/29/10	W55-100729-									0.16 D	
MW-55	10/18/10	W55-101018-									0.158	
East Perched Zone Wells												
MW-30A	01/06/10	W30A100106-			3.48							
MW-30A	04/01/10	W30A100401-			3.37				6.4			
MW-30A	07/28/10	W30A100728-			3.41				6.2			
MW-30A	10/14/10	W30A101014-			3.01				6.5			
MW-47	01/06/10	W47-100106-					4.4			645.0		1.55 D
MW-47	04/14/10	W47-100414-					4.1			587		1.3 D
MW-47	07/27/10	W47-100727-					5.9			632		1.37 D
MW-47	10/14/10	W47-101014-					3.9			620		1.75 D
MW-62	01/06/10	W62-100106-			1.81							
MW-62	04/06/10	W62-100406-			1.28				6.1			
MW-62	07/07/10	W62-100707-			3.7							
MW-EB6	02/03/10	WB6-100203-	0.00417								8.80	0.866
MW-EB6	04/09/10	WB6-100409-	0.00227						6.3		5.60	0.677 D
MW-EB6	07/08/10	WB6-100708-	0.00172						6.3		3.8	0.808
MW-EB6	12/03/10	WB6-101203-	0.0175						6.2		9.1	0.64 D
South Solid Waste Area Wells												
MW-101	02/02/10	W101100202-	0.0112				0.753				0.57	1.73
MW-101	07/30/10	W101101207-	0.0129				0.555				0.47	1.55 D
MW-101	12/07/10	W101100730-	0.0102				0.653					1.33 D

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-21		MW-24		MW-56		MW-57		MW-58A		MW-59		MW-60		MW-64	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
pH, (Field) Standard Units																
No. of Analyses	63	7	65	8	64	8	64	7	64	8	64	8	64	8	62	8
No. of Detections	63	7	65	8	64	8	64	7	64	8	64	8	64	8	62	8
Maximum	9.36	7.8	9.06	7.1	8.4	7.5	7.6	6.9	9.0	7.8	8.7	7.0	7.5	7.1	8.1	7.4
Minimum	5.89	7.4	5.94	6.8	5.9	6.6	6.3	6.6	6.0	7.3	5.9	6.8	6.2	6.7	6.2	6.4
Mean	7.347	7.6	7.082	7.0	7.1	6.9	6.9	6.8	7.5	7.5	7.1	6.9	7.1	7.0	7.3	7.0
Standard Deviation	0.473	0.16	0.384	0.13	0.34	0.28	0.27	0.09	0.36	0.18	0.36	0.11	0.22	0.14	0.34	0.31
Median	7.33	7.5	7.02	7.0	7.1	6.9	6.9	6.8	7.5	7.6	7.1	6.9	7.1	7.0	7.3	7.0
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Specific Conductance, (Field) micromhos/cm																
No. of Analyses	63	7	65	8	63	8	64	7	64	8	64	8	64	8	62	8
No. of Detections	63	7	65	8	63	8	64	7	64	8	64	8	64	8	62	8
Maximum	162	120	303	190	255	145	300	200	265	185	250	160	500	200	360	280
Minimum	65	100	133	170	120	120	180	180	115	165	145	155	130	155	112	160
Mean	109	113	197	178	165	130	235	194	173	173	173	158	244	181	184	211
Standard Deviation	13	6	40	7	34	8	29	8	31	7	17	3	105	16	44	45
Median	110	115	190	178	150	128	230	195	170	170	170	160	200	180	180	203
Trend	I	D	--	D	D	--	D	D	I	--	D	--	--	D	I	--
Total Dissolved Solids, mg/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	63	7	65	8	64	8	64	8	64	8	64	8	64	8	61	8
Maximum	140.0	82	167	200	151	103	1100	146	157	130	250	116	300	138	270	196
Minimum	25.0	67	74	102	61	56	92	125	75	108	27	94	31	119	ND	111
Mean	67.7	75	116	126	98	90	162	139	108	120	104	103	153	131	109	145
Standard Deviation	16.86	5	21	31	20	15	122	8	19	9	26	7	63	7	41	29
Median	67.0	75	110	119	99	94	150	142	100	120	100	100	125	134	100	138
Trend	--	--	--	--	D	--	--	--	--	--	D	--	--	--	--	--
Alkalinity, total (CaCO3), mg/L																
No. of Analyses	54	7	56	8	55	8	55	8	55	8	55	8	55	8	55	8
No. of Detections	54	7	56	8	55	8	55	8	55	8	55	8	55	8	55	8
Maximum	62	53	110	98	86	56	110	93	96	75	110	66	260	96	120	101
Minimum	38	50	3	68	48	47	76	72	55	69	58	54	60	76	54	50
Mean	46	52	74	77	60	51	91	78	71	74	67	62	104	89	72	79
Standard Deviation	5	1	18	9	9	3	9	6	8	2	8	4	45	8	11	16
Median	46	52	75	75	57	50	92	78	72	74	66	63	90	92	72	80
Trend	I	--	I	--	D	--	D	--	--	--	D	--	--	--	--	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-65		MW-69		MW-70		MW-72		MW-73		MW-76		MW-77		MW-78		MW-81	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
pH, (Field) Standard Units																		
No. of Analyses	63	7	61	8	63	8	41	8	37	8	37	8	37	8	37	4	36	8
No. of Detections	63	7	61	8	63	8	41	8	37	8	37	8	37	8	37	4	36	8
Maximum	8.2	7.2	8.2	7.7	8.0	7.8	7.5	7.4	7.5	7.1	7.0	6.7	7.3	7.1	7.3	6.5	7.7	7.4
Minimum	6.4	6.8	6.7	7.2	6.8	7.2	6.8	7.2	0.3	6.7	6.2	6.3	6.8	6.7	6.5	6.3	6.9	6.9
Mean	7.1	7.0	7.4	7.4	7.4	7.5	7.2	7.2	6.8	7.0	6.6	6.5	7.0	6.9	6.9	6.4	7.3	7.2
Standard Deviation	0.36	0.13	0.29	0.15	0.26	0.20	0.18	0.07	1.12	0.17	0.18	0.16	0.11	0.11	0.18	0.12	0.17	0.19
Median	7.1	6.9	7.5	7.4	7.5	7.5	7.3	7.2	7.0	7.0	6.6	6.5	7.0	6.9	6.9	6.5	7.3	7.3
Trend	--	--	--	--	--	--	--	--	--	**--**	D	**--**	--	--	D	--	--	--
Specific Conductance, (Field) mi																		
No. of Analyses	63	7	62	8	63	8	41	8	37	8	37	8	37	8	37	4	36	8
No. of Detections	63	7	62	8	63	8	41	8	37	8	37	8	37	8	37	4	36	8
Maximum	175	140	320	240	280	180	340	250	170	150	330	170	330	270	220	180	130	135
Minimum	88	135	85	220	127	160	220	245	115	130	115	125	200	240	150	150	95	110
Mean	140	136	203	230	179	170	271	249	150	141	150	143	259	254	182	166	116	121
Standard Deviation	13	2	60	7	23	7	30	2	13	6	35	13	28	10	18	13	9	7
Median	140	135	195	230	180	170	260	250	150	140	145	143	260	253	180	168	115	120
Trend	--	--	--	--	D	--	D	--	--	--	--	--	--	D	--	--	I	--
Total Dissolved Solids, mg/L																		
No. of Analyses	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
Maximum	170	113	210	168	160	127	220	173	1100	117	140	120	200	180	180	131	140	96
Minimum	60	66	40	140	46	84	130	150	61	92	60	69	80	160	96	100	56	76
Mean	89	90	129	156	109	114	176	163	126	103	96	99	159	168	127	118	87	87
Standard Deviation	16	16	39	9	19	13	26	8	165	8	18	15	23	7	16	14	16	6
Median	89	89	120	155	110	118	165	163	100	102	91	100	160	165	120	125	84	87
Trend	--	--	I	--	--	--	D	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total (CaCO3), mg/L																		
No. of Analyses	56	7	55	8	56	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	56	7	55	8	56	8	42	8	37	8	37	8	37	8	37	5	36	8
Maximum	76	55	130	122	100	82	130	120	78	58	66	64	180	140	94	83	67	50
Minimum	42	51	56	82	63	71	26	108	42	52	38	39	120	126	69	69	42	41
Mean	52	53	98	114	78	75	110	112	61	56	46	47	138	132	80	74	48	47
Standard Deviation	5	1	24	13	8	4	15	4	7	2	5	8	15	5	7	5	5	3
Median	51	52	98	118	76	74	110	111	60	56	46	45	140	130	82	73	47	48
Trend	--	--	I	--	I	--	--	--	--	--	--	--	--	--	--	--	I	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-82		MW-83		MW-84		MW-93		MW-94		MW-95		MW-99		MW-100	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
pH, (Field) Standard Units																
No. of Analyses	34	8	35	8	36	8	28	8	26	7	29	8	25	8	30	7
No. of Detections	34	8	35	8	36	8	28	8	26	7	29	8	25	8	30	7
Maximum	7.7	7.1	7.6	7.2	7.3	7.0	7.9	7.4	7.5	7.5	7.6	7.6	8.1	7.9	7.1	6.9
Minimum	6.5	6.7	6.7	6.9	6.6	6.5	6.8	7.2	6.6	6.7	7.1	7.2	7.4	7.5	6.6	6.6
Mean	6.9	6.9	7.2	7.1	7.0	6.8	7.3	7.3	7.0	7.1	7.4	7.4	7.7	7.7	6.9	6.8
Standard Deviation	0.21	0.13	0.20	0.09	0.18	0.17	0.19	0.09	0.24	0.29	0.13	0.13	0.20	0.12	0.14	0.12
Median	6.9	6.9	7.1	7.1	7.1	6.8	7.3	7.3	7.0	7.3	7.4	7.4	7.7	7.7	6.9	6.7
Trend	--	--	--	--	--	--	I	--	--	--	--	--	--	--	--	--
Specific Conductance, (Field) mi																
No. of Analyses	34	8	35	8	36	8	28	8	27	7	29	8	25	8	30	7
No. of Detections	34	8	35	8	36	8	28	8	27	7	29	8	25	8	30	7
Maximum	220	205	190	175	155	150	300	300	160	140	225	190	150	120	360	260
Minimum	150	165	100	150	100	130	120	260	115	115	160	180	110	110	245	240
Mean	183	179	156	165	137	138	230	282	141	128	199	183	121	115	300	253
Standard Deviation	20	13	18	8	11	7	30	18	9	9	16	4	10	3	31	8
Median	185	178	160	165	140	138	230	283	140	130	200	183	120	115	303	250
Trend	--	--	I	--	--	--	--	--	--	--	D	D	D	--	--	--
Total Dissolved Solids, mg/L																
No. of Analyses	34	8	34	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	34	8	34	8	35	8	28	8	26	8	29	8	25	8	30	7
Maximum	210	150	140	129	130	105	650	247	150	114	150	144	210	96	250	170
Minimum	97	101	42	100	ND	90	130	170	79	77	110	117	36	72	130	149
Mean	127	128	103	114	83	95	171	211	98	93	129	128	88	81	185	160
Standard Deviation	21	16	19	8	20	5	95	26	15	11	13	9	36	8	28	8
Median	120	125	100	115	86	94	150	213	94	93	130	126	82	81	180	161
Trend	--	--	--	--	--	--	I	I	--	--	--	--	D	--	--	--
Alkalinity, total (CaCO3), mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
Maximum	90	85	80	68	120	60	110	104	55	54	100	88	100	54	160	132
Minimum	38	72	51	50	50	46	64	75	44	47	78	82	48	46	110	95
Mean	77	79	61	64	60	56	93	95	51	50	89	85	55	51	136	116
Standard Deviation	9	4	7	6	11	4	7	9	4	2	7	2	10	2	11	13
Median	78	81	60	66	60	58	94	98	50	50	90	85	52	51	140	120
Trend	--	--	--	--	D	--	D	--	--	--	D	--	D	--	D	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-21		MW-24		MW-56		MW-57		MW-58A		MW-59		MW-60		MW-64	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Ammonia as N, mg/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	24	1	50	7	22	3	48	7	60	8	24	1	8	1	54	7
Maximum	0.2	0.0	0.4	0.1	0.2	0.0	0.2	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.1	0.1
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	ND	ND	ND
Mean	0.0	ID	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	ID	0.0	ID	0.0	0.1
Standard Deviation	0.03	ID	0.06	0.01	0.02	0.00	0.02	0.00	0.04	0.01	0.01	ID	0.03	ID	0.03	0.02
Median	0.0	ID	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	ID	0.0	ID	0.0	0.1
Trend	--	--	--	--	--	D	--	--	--	--	--	--	--	--	--	--
Chloride, mg/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	62	7	65	8	64	8	64	7	64	8	64	8	64	8	62	8
Maximum	4.0	3.0	7.3	7.8	5.0	4.2	8.5	4.3	9.3	4.1	6.3	4.5	5.0	3.1	6.0	3.9
Minimum	ND	2.8	3.0	4.1	2.0	3.5	3.6	ND	3.0	3.4	2.9	3.8	2.6	2.6	2.0	3.1
Mean	2.5	2.9	4.2	4.8	3.3	3.9	5.3	3.7	4.7	3.8	3.9	4.1	3.5	2.9	3.2	3.6
Standard Deviation	0.5	0.1	1.0	1.2	0.7	0.3	1.3	1.3	1.4	0.2	1.1	0.2	0.6	0.2	0.7	0.3
Median	2.6	3.0	4.0	4.4	3.0	4.0	5.0	4.2	4.0	3.8	3.4	4.1	3.3	3.0	3.0	3.6
Trend	I	--	D	--	--	--	D	--	D	--	--	--	D	--	I	--
Nitrate as N, mg/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	12	0	18	1	47	7	15	5	6	2	12	2	58	8	20	7
Maximum	1.9	ND	1.0	0.0	0.7	1.6	1.0	0.1	1.1	0.0	1.0	0.0	4.9	1.6	2.0	0.0
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4	ND	ND
Mean	0.1	ID	0.1	ID	0.2	0.6	0.0	0.0	0.0	ID	0.0	ID	1.8	1.5	0.1	0.0
Standard Deviation	0.24	ID	0.16	ID	0.19	0.51	0.12	0.02	0.14	ID	0.13	ID	0.92	0.08	0.25	0.01
Median	0.0	ID	0.0	ID	0.2	0.7	0.0	0.0	0.0	ID	0.0	ID	1.9	1.6	0.0	0.0
Trend	--	--	--	--	--	--	--	--	--	--	--	--	D	--	D	--
Sulfate, mg/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
Maximum	9	6	23	39	24	18	22	19	25	17	23	17	13	9	110	56
Minimum	2	4	9	16	13	12	16	2	9	16	14	16	6	6	7	16
Mean	7	5	16	20	18	16	19	16	15	17	18	16	7	8	24	32
Standard Deviation	1	0	4	8	3	2	1	6	4	0	2	1	2	1	20	15
Median	7	5	16	17	17	15	19	18	16	17	17	16	7	8	17	28
Trend	D	--	I	--	D	--	D	--	I	--	D	--	--	--	I	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-65		MW-69		MW-70		MW-72		MW-73		MW-76		MW-77		MW-78		MW-81	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Ammonia as N, mg/L																		
No. of Analyses	63	7	61	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	24	2	21	7	16	4	15	7	6	0	6	0	6	1	9	0	6	0
Maximum	0.1	0.0	0.1	0.0	0.3	0.0	0.1	0.0	0.2	ND	0.2	ND	0.1	0.0	0.1	ND	0.1	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	0.0	ID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ID	0.0	ID	0.0	ID	0.0	ID	0.0	ID
Standard Deviation	0.01	ID	0.03	0.00	0.07	0.01	0.02	0.00	0.03	ID	0.03	ID	0.04	ID	0.01	ID	0.02	ID
Median	0.0	ID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ID	0.0	ID	0.0	ID	0.0	ID	0.0	ID
Trend	--	D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloride, mg/L																		
No. of Analyses	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	62	7	61	8	63	8	42	8	36	8	37	8	37	8	37	5	36	8
Maximum	7.0	4.2	4.0	5.0	7.0	4.1	4.2	4.3	3.2	3.9	8.0	4.5	4.7	5.1	6.1	5.1	5.0	3.2
Minimum	ND	3.7	ND	3.6	2.0	3.4	2.0	3.7	ND	3.2	2.0	3.4	3.0	4.2	3.4	4.2	2.0	2.7
Mean	4.3	4.0	3.0	4.0	3.3	3.7	3.5	4.0	2.7	3.6	4.8	4.1	3.8	4.7	4.8	4.8	2.2	2.9
Standard Deviation	1.1	0.2	0.9	0.5	0.8	0.2	0.5	0.2	0.5	0.3	1.2	0.4	0.4	0.3	0.6	0.4	0.5	0.2
Median	4.0	4.1	3.0	3.9	3.0	3.7	3.9	4.0	3.0	3.6	4.7	4.2	4.0	4.7	5.0	5.0	2.0	2.9
Trend	--	--	--	I	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrate as N, mg/L																		
No. of Analyses	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	9	1	12	0	52	8	12	0	37	8	37	8	36	8	37	5	35	8
Maximum	0.1	0.0	0.3	ND	0.2	0.1	1.0	ND	2.1	2.0	2.1	1.5	0.8	1.6	2.0	1.2	1.8	1.7
Minimum	ND	ND	ND	ND	ND	0.0	ND	ND	0.4	1.7	0.9	0.9	ND	0.8	0.6	1.0	ND	1.5
Mean	0.0	ID	0.0	ID	0.1	0.0	0.1	ID	1.0	1.9	1.5	1.2	0.5	1.1	1.3	1.1	1.5	1.6
Standard Deviation	0.02	ID	0.05	ID	0.05	0.02	0.15	ID	0.45	0.11	0.35	0.24	0.17	0.23	0.26	0.10	0.36	0.06
Median	0.0	ID	0.0	ID	0.1	0.0	0.0	ID	0.9	1.9	1.4	1.2	0.4	1.1	1.4	1.1	1.6	1.6
Trend	--	--	--	--	D	--	--	--	I	--	--	--	I	--	--	--	--	--
Sulfate, mg/L																		
No. of Analyses	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	62	7	61	8	63	8	42	8	36	8	36	8	37	8	37	5	35	8
Maximum	20	14	42	16	22	19	72	27	24	11	24	20	14	12	13	8	22	11
Minimum	ND	12	ND	14	10	18	18	22	ND	9	ND	15	8	10	7	7	ND	7
Mean	15	13	19	15	16	18	37	25	14	10	17	18	10	11	9	8	8	9
Standard Deviation	3	1	9	1	2	0	17	2	4	0	4	2	2	1	1	0	3	1
Median	16	14	17	15	16	18	31	25	13	10	18	19	10	11	9	8	8	9
Trend	--	--	I	--	--	--	D	I	D	--	--	--	D	I	--	--	I	I

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-82		MW-83		MW-84		MW-93		MW-94		MW-95		MW-99		MW-100	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Ammonia as N, mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	6	0	7	0	4	0	19	7	7	1	9	7	14	7	8	0
Maximum	0.1	ND	0.3	ND	0.1	ND	0.2	0.1	0.9	0.1	0.2	0.0	0.1	0.1	0.1	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	0.0	ID	0.0	ID	0.0	ID	0.0	0.1	0.1	ID	0.0	0.0	0.0	0.0	0.0	ID
Standard Deviation	0.03	ID	0.06	ID	0.02	ID	0.04	0.02	0.17	ID	0.04	0.00	0.03	0.02	0.03	ID
Median	0.0	ID	0.0	ID	0.0	ID	0.0	0.1	0.0	ID	0.0	0.0	0.0	0.0	0.0	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloride, mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	34	8	35	8	35	8	28	8	26	8	29	8	25	8	30	7
Maximum	10.0	5.9	6.6	24.8	3.9	3.7	8.0	3.3	4.9	4.0	5.6	5.8	3.1	3.6	5.9	3.4
Minimum	4.0	4.0	3.0	4.0	ND	3.4	1.6	2.7	3.0	3.2	3.8	5.1	2.0	2.9	2.4	2.7
Mean	6.3	4.8	4.3	7.3	3.1	3.6	3.1	3.0	3.6	3.6	4.3	5.4	2.6	3.2	3.3	3.1
Standard Deviation	1.5	0.6	0.9	7.1	0.5	0.1	1.0	0.2	0.6	0.3	0.5	0.2	0.4	0.2	0.7	0.2
Median	6.2	4.7	4.0	4.9	3.0	3.6	3.0	3.0	3.5	3.6	4.0	5.4	2.7	3.2	3.0	3.2
Trend	--	--	--	--	I	--	--	--	--	--	--	--	--	--	--	--
Nitrate as N, mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	34	8	35	8	36	8	13	1	26	8	4	0	20	8	4	0
Maximum	1.5	1.2	1.8	0.6	1.4	0.7	1.2	0.0	1.5	1.2	0.1	ND	0.5	0.1	0.3	ND
Minimum	0.6	0.8	0.2	0.1	0.1	0.5	ND	ND	0.8	0.8	ND	ND	ND	0.0	ND	ND
Mean	1.0	0.9	0.7	0.3	0.4	0.6	0.1	ID	1.1	1.0	0.0	ID	0.2	0.0	0.0	ID
Standard Deviation	0.21	0.11	0.27	0.22	0.28	0.06	0.22	ID	0.18	0.18	0.01	ID	0.16	0.01	0.07	ID
Median	0.9	0.9	0.7	0.3	0.3	0.6	0.0	ID	1.0	0.9	0.0	ID	0.2	0.0	0.0	ID
Trend	--	--	--	--	I	--	--	--	--	D	--	--	D	--	--	--
Sulfate, mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
Maximum	18	15	19	63	18	14	54	78	20	13	28	17	18	8	110	25
Minimum	12	13	12	12	10	12	1	50	9	11	14	15	6	7	18	18
Mean	15	14	15	23	12	13	31	64	15	12	18	16	8	7	33	21
Standard Deviation	2	1	3	16	2	0	11	11	3	1	3	0	3	0	18	2
Median	14	14	15	19	12	13	27	61	16	11	17	16	7	7	27	20
Trend	I	--	I	--	D	--	--	I	D	--	D	--	D	--	--	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-21		MW-24		MW-56		MW-57		MW-58A		MW-59		MW-60		MW-64	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Iron, dissolved mg/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	63	7	65	8	64	8	64	8	64	8	64	8	62	5	62	8
Maximum	3.7	2.1	8.8	4.1	4.7	0.2	11.0	9.2	8.5	1.1	7.5	4.5	0.4	0.1	1.3	0.8
Minimum	1.3	2.0	3.0	1.7	0.2	0.0	6.6	7.4	0.8	1.0	3.1	3.9	ND	ND	0.0	0.5
Mean	2.2	2.0	4.8	3.6	0.7	0.1	8.5	8.3	1.2	1.0	4.4	4.1	0.1	0.0	0.4	0.6
Standard Deviation	0.50	0.04	1.36	0.77	0.63	0.07	0.95	0.66	0.94	0.05	0.54	0.18	0.07	0.05	0.36	0.12
Median	2.2	2.0	4.4	3.8	0.5	0.0	8.6	8.1	1.1	1.0	4.4	4.1	0.1	0.0	0.2	0.5
Trend	I	--	--	--	--	--	I	--	--	D	D	--	I	--	I	--
Manganese, dissolved mg/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	63	7	65	8	64	8	64	8	63	8	64	8	37	4	62	8
Maximum	0.093	0.072	0.684	0.167	0.330	0.113	0.471	0.280	0.490	0.370	0.350	0.106	0.028	0.002	0.310	0.229
Minimum	0.0	0.1	0.2	0.1	0.1	0.1	0.3	0.2	ND	0.3	0.1	0.1	ND	ND	0.0	0.1
Mean	0.1	0.1	0.3	0.1	0.2	0.1	0.3	0.3	0.3	0.3	0.1	0.1	0.0	0.0	0.1	0.1
Standard Deviation	0.02	0.00	0.14	0.01	0.05	0.02	0.05	0.02	0.08	0.01	0.03	0.00	0.01	0.00	0.06	0.06
Median	0.1	0.1	0.3	0.2	0.2	0.1	0.3	0.3	0.3	0.3	0.1	0.1	0.0	0.0	0.0	0.1
Trend	I	--	D	--	I	--	D	--	I	D	D	--	--	--	D	I
Calcium, dissolved mg/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
Maximum	14	10	25	19	28	17	27	19	27	19	23	15	59	21	35	25
Minimum	6.8	8.8	11	14.9	11	12	15	15.2	11	16	12	12.0	12	16	9.5	14
Mean	8.6	9.4	16.8	15.7	16.7	14.0	20	16.6	17.5	17.1	14.4	13.5	27.9	19	16.1	18.3
Standard Deviation	1.0	0.4	3.9	1.4	4.8	1.6	2.9	1.4	3.4	0.9	1.7	0.9	14.2	2.0	4.3	3.8
Median	8.6	9.4	16	15	15	13.5	19	16.1	17	17	14.0	13.4	21.0	19.9	16	17.7
Trend	I	--	I	--	D	--	--	--	--	--	--	--	I	--	I	--
Magnesium, dissolved mg/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
Maximum	7.6	5.7	13.4	15	11.3	6.6	14.6	10	12.4	9	13	9	25.4	10.1	23	17.0
Minimum	3.9	5.2	6.7	9.0	5.4	4.6	7.7	7.9	6.2	7.8	7.1	7.2	6.4	7.4	5.1	7.6
Mean	4.8	5.4	10.0	10.4	7.4	5.4	10.8	9.2	8.4	8.6	8.5	8.0	12.6	9.3	9.6	12.2
Standard Deviation	0.6	0.2	2.1	1.9	1.5	0.6	1.7	0.7	1.5	0.4	0.9	0.5	6.2	1.0	3.2	3.5
Median	4.6	5.5	9.8	10	6.9	5.4	11	9.3	8.3	8.5	8.4	8.2	10	9.6	8.9	11.8
Trend	I	--	I	--	--	--	D	--	--	--	D	--	I	--	--	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-65		MW-69		MW-70		MW-72		MW-73		MW-76		MW-77		MW-78		MW-81	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Iron, dissolved mg/L																		
No. of Analyses	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	63	7	62	8	58	1	42	8	36	1	36	1	36	1	36	2	34	1
Maximum	8.4	4.0	3.2	1.2	0.3	0.0	2.9	2.1	0.12	0.02	8.80	0.04	0.97	0.06	0.14	0.04	0.14	0.03
Minimum	0.4	3.7	0.1	1.0	ND	ND	0.02	1.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	3.5	3.9	0.9	1.1	0.1	ID	2.2	1.9	0.1	ID	0.3	ID	0.1	ID	0.1	ID	0.0	ID
Standard Deviation	1.11	0.11	0.58	0.06	0.06	ID	0.46	0.17	0.02	ID	1.44	ID	0.15	ID	0.03	ID	0.02	ID
Median	3.7	4.0	0.7	1.1	0.0	ID	2.2	1.9	0.0	ID	0.0	ID	0.1	ID	0.1	ID	0.0	ID
Trend	I	--	I	--	I	--	D	--	--	--	I	--	--	--	I	--	I	--
Manganese, dissolved mg/L																		
No. of Analyses	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	63	7	61	8	48	8	42	8	8	0	7	0	36	8	4	1	8	0
Maximum	0.382	0.204	0.280	0.200	0.110	0.047	0.360	0.285	0.012	ND	0.067	ND	0.062	0.025	0.010	0.002	0.006	ND
Minimum	0.1	0.2	ND	0.2	ND	0.0	0.01	0.22	ND	ND	ND	ND	ND	0.0	ND	ND	ND	ND
Mean	0.2	0.2	0.1	0.2	0.0	0.0	0.3	0.2	0.0	ID	0.0	ID	0.0	0.0	0.0	ID	0.0	ID
Standard Deviation	0.03	0.01	0.06	0.01	0.03	0.01	0.06	0.02	0.00	ID	0.01	ID	0.02	0.01	0.00	ID	0.00	ID
Median	0.2	0.2	0.1	0.2	0.0	0.0	0.3	0.3	0.0	ID	0.0	ID	0.0	0.0	0.0	ID	0.0	ID
Trend	--	--	I	--	I	D	D	--	--	--	--	--	D	D	--	--	D	--
Calcium, dissolved mg/L																		
No. of Analyses	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
Maximum	14	12	40	27	23	17	34	25	19	14	17	15	33	29	23	18	12	12
Minimum	8.9	10.7	11	23	13	15	18	20	12	12.2	8.8	11	19	24	13	14	7.8	10
Mean	11.5	11.1	21.1	25.8	18.2	16.9	25.5	23.1	14.6	13.0	12.8	12.6	26.9	25.4	17.9	15.5	10	11
Standard Deviation	1.1	0.4	7.1	1.1	2.6	0.7	3.7	1.5	1.6	0.5	2.1	1.3	3.7	1.6	2.5	1.8	1.2	0.8
Median	12	11.0	19	26.2	18	17.0	25	23.4	14	13.0	13	12	27	25	18.0	15.0	10	11
Trend	I	--	I	--	--	--	D	--	--	--	I	--	--	--	I	--	I	--
Magnesium, dissolved mg/L																		
No. of Analyses	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
Maximum	7.9	6.8	18	13	13	10	19	15	16	7.4	7.5	7.0	17	16	10.0	9	6.8	6.4
Minimum	4.7	6.1	4.6	11	7.2	7.7	7.1	12.5	4.6	6.2	4.0	4.7	11	13	6.8	6.7	4.5	5.4
Mean	6.4	6.5	9.7	12.4	9.1	8.8	15	14.0	7.2	6.6	5.6	5.8	14	14.2	8	7.3	5.4	5.8
Standard Deviation	0.6	0.3	3.2	0.8	1.1	0.7	2.4	0.8	1.8	0.4	0.9	0.7	1.6	1.0	0.9	0.9	0.5	0.3
Median	6.4	6.5	8.8	12	9	8.8	14	14.1	6.9	6.5	5.4	5.6	15	14.0	8.1	6.8	5.3	5.7
Trend	I	--	I	--	--	--	D	--	--	--	--	--	--	--	--	--	I	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-82		MW-83		MW-84		MW-93		MW-94		MW-95		MW-99		MW-100	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Iron, dissolved mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	33	1	34	1	35	1	26	1	25	3	29	1	25	8	30	7
Maximum	0.18	0.03	0.13	0.03	0.48	0.03	0.25	0.07	0.27	0.03	0.19	0.05	0.22	0.05	3.4	2.4
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0	ND	0.0	0.0	1.2	1.9
Mean	0.1	ID	0.1	ID	0.1	ID	0.1	ID	0.1	0.0	0.1	ID	0.1	0.0	2.6	2.1
Standard Deviation	0.04	ID	0.03	ID	0.08	ID	0.05	ID	0.05	0.01	0.04	ID	0.04	0.01	0.49	0.19
Median	0.1	ID	0.1	ID	0.0	ID	0.1	ID	0.1	0.0	0.1	ID	0.0	0.0	2.6	2.1
Trend	I	--	--	--	--	--	--	--	--	--	--	--	I	--	D	D
Manganese, dissolved mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	5	0	14	7	35	8	28	8	6	2	29	8	25	8	30	7
Maximum	0.002	ND	0.017	0.008	0.037	0.012	0.280	0.293	0.007	0.035	0.240	0.141	0.150	0.065	0.230	0.211
Minimum	ND	ND	ND	ND	ND	0.0	0.1	0.2	ND	ND	0.1	0.1	0.0	0.0	0.1	0.2
Mean	0.0	ID	0.0	0.0	0.0	0.0	0.2	0.3	0.0	ID	0.1	0.1	0.1	0.0	0.1	0.2
Standard Deviation	0.00	ID	0.00	0.00	0.01	0.00	0.03	0.02	0.00	ID	0.05	0.01	0.03	0.01	0.03	0.02
Median	0.0	ID	0.0	0.0	0.0	0.0	0.2	0.3	0.0	ID	0.2	0.1	0.1	0.0	0.1	0.2
Trend	--	--	--	--	D	--	--	I	--	--	--	D	D	--	--	I
Calcium, dissolved mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
Maximum	21	19	23	18	15	11	28	34	16	14	23	19	10	9	38	25
Minimum	9.1	14	11	16	8.8	10.0	20	25	11	11	10	18	7	7.6	23	23
Mean	17.0	16.6	16.1	16.5	10.7	10.8	23.6	29.5	13.7	12.6	19.9	18.5	8.5	8.3	29.0	24.5
Standard Deviation	2.6	1.7	2.4	0.7	1.1	0.4	2.1	2.5	1.3	0.8	2.4	0.7	0.8	0.5	4.1	0.9
Median	18	16.4	16	16.1	11	11	24	29.5	14.0	13	20	18	8.6	8.5	28	25.0
Trend	I	--	I	--	--	--	I	I	--	--	--	--	--	--	--	--
Magnesium, dissolved mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
Maximum	12	11.4	8.9	8.9	9.7	9.2	14	17	7.2	6.4	12	11	4.5	4.3	21	16
Minimum	5.0	8.5	4.7	6.0	4.4	7.8	9.7	13	4.6	5.2	6.8	9.0	3.0	3.6	12	13
Mean	9.6	10.0	6.4	7.2	7.9	8.5	11.7	15.5	5.7	5.7	10.1	10.0	3.7	3.9	16.0	14.5
Standard Deviation	1.4	0.9	0.9	1.0	0.9	0.4	1.3	1.5	0.6	0.4	1.0	0.7	0.4	0.3	2.4	1.2
Median	9.8	10.0	6.3	6.9	7.9	8.5	12	15.9	5.6	5.8	10	10	3.7	3.8	16	15
Trend	I	I	I	--	--	--	I	I	--	--	--	--	--	I	--	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-21		MW-24		MW-56		MW-57		MW-58A		MW-59		MW-60		MW-64	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Potassium, dissolved mg/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
Maximum	1.6	1.05	1.6	1.4	2.4	1.06	3.4	0.943	1.6	1.06	3.3	1.08	2.3	1.26	2.2	1.67
Minimum	0.6	0.9	0.7	0.9	1.0	0.8	0.7	0.7	0.6	0.9	0.6	0.9	0.9	1.0	0.9	1.2
Mean	1.0	1.0	1.0	1.0	1.4	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.3	1.2	1.3	1.4
Standard Deviation	0.2	0.0	0.2	0.2	0.4	0.1	0.4	0.1	0.2	0.0	0.3	0.1	0.4	0.1	0.2	0.2
Median	0.9	1.0	0.9	0.9	1.2	1.0	0.9	0.9	0.9	1.0	1.0	1.0	1.2	1.2	1.25	1.385
Trend	--	--	--	--	D	--	--	--	--	--	--	--	--	--	--	--
Sodium, dissolved mg/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
Maximum	7.2	5.39	7.42	7	6.61	5.23	22	6.9	7.8	5.47	7.6	5.51	14	6.69	8.9	7.51
Minimum	4.4	4.65	5.1	5.25	4	4	5.3	5.6	4.3	4.78	4.73	4.9	4.7	4.9	4.8	5.07
Mean	4.9	5.0	6.1	5.9	5.1	4.5	7.1	6.5	5.5	5.3	5.6	5.3	7.0	6.0	6.1	6.4
Standard Deviation	0.4	0.2	0.7	0.6	0.6	0.5	2.0	0.4	0.7	0.2	0.5	0.2	2.1	0.6	0.8	0.9
Median	4.8	5.0	5.8	5.7	5.0	4.4	6.9	6.5	5.3	5.3	5.6	5.4	6.0	6.1	6.0	6.4
Trend	I	--	I	--	D	--	--	--	--	--	D	--	--	--	--	I
Arsenic, dissolved mg/L																
No. of Analyses	63	7	65	8	64	8	64	4	64	8	64	8	64	8	62	8
No. of Detections	24	0	8	1	3	0	9	0	1	0	2	0	1	0	62	8
Maximum	0.002	ND	0.002	0.001	0.002	ND	0.003	ND	0.001	ND	0.001	ND	0.001	ND	0.018	0.003
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	0.002
Mean	0.001	ID	0.001	ID	0.0005	ID	0.0006	ID	ID	ID	ID	ID	ID	ID	0.005	0.002
Standard Deviation	0.000	ID	0.000	ID	0.0002	ID	0.0004	ID	ID	ID	ID	ID	ID	ID	0.004	0.000
Median	0.001	ID	0.001	ID	0.0005	ID	0.0005	ID	ID	ID	ID	ID	ID	ID	0.003	0.002
Trend	D	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00	--
Barium, dissolved mg/L																
No. of Analyses	63	7	65	8	64	8	64	4	64	8	64	8	64	8	62	8
No. of Detections	62	7	64	8	64	8	62	4	62	8	63	8	64	8	62	8
Maximum	0.008	0.004	0.005	0.008	0.018	0.0038	0.011	0.002	0.018	0.0048	0.005	0.0034	0.017	0.0035	0.023	0.012
Minimum	ND	0.003	ND	0.002	0.002	0.0021	ND	0.0016	ND	0.0042	ND	0.003	0.003	0.0029	0.006	0.006
Mean	0.004	0.003	0.002	0.003	0.005	0.003	0.003	0.002	0.005	0.004	0.004	0.003	0.006	0.003	0.010	0.009
Standard Deviation	0.001	0.000	0.001	0.002	0.003	0.001	0.002	0.000	0.002	0.000	0.001	0.000	0.004	0.000	0.003	0.002
Median	0.004	0.003	0.002	0.002	0.004	0.003	0.002	0.002	0.005	0.004	0.004	0.003	0.004	0.003	0.009	0.008
Trend	--	--	--	--	D	--	--	--	--	--	D	--	--	--	--	I

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-65		MW-69		MW-70		MW-72		MW-73		MW-76		MW-77		MW-78		MW-81	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Potassium, dissolved mg/L																		
No. of Analyses	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	62	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
Maximum	1.2	0.949	1.9	1.71	1.5	1.41	2.4	1.79	1.6	0.889	1.3	1.16	2.4	1.6	2.5	2.32	0.86	0.79
Minimum	ND	0.8	0.6	1.5	1.1	1.2	1.1	1.5	0.7	0.7	0.9	1.0	1.3	1.3	1.7	1.8	0.6	0.6
Mean	0.9	0.9	1.3	1.6	1.3	1.3	1.7	1.6	0.9	0.8	1.1	1.1	1.5	1.5	2.1	2.1	0.7	0.7
Standard Deviation	0.1	0.0	0.3	0.1	0.1	0.1	0.2	0.1	0.2	0.0	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1
Median	0.9	0.9	1.3	1.6	1.3	1.3	1.7	1.6	0.9	0.8	1.1	1.075	1.5	1.5	2.1	2.1	0.7	0.7
Trend	--	--	I	--	--	--	D	--	--	--	--	--	--	--	I	--	--	--
Sodium, dissolved mg/L																		
No. of Analyses	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
Maximum	7.74	5.38	8.8	7.79	8.4	5.93	8.7	7.87	7.8	6.06	9.2	8.12	10	9.6	7.9	6.88	7.5	5.97
Minimum	4.5	4.7	4.7	6.8	4.7	4.87	6.1	6.37	3.8	5.35	6	6.03	7	7.7	5.2	5.5	4.6	4.78
Mean	5.2	5.0	6.4	7.4	5.8	5.5	7.1	6.8	5.9	5.7	7.5	7.0	8.6	8.6	6.0	6.1	5.6	5.5
Standard Deviation	0.5	0.3	1.0	0.4	0.7	0.4	0.7	0.5	0.7	0.3	0.7	0.6	0.7	0.7	0.7	0.6	0.6	0.5
Median	5.1	4.8	6.3	7.4	5.7	5.5	7.0	6.6	6.0	5.6	7.4	6.9	8.6	8.7	5.8	6.1	5.6	5.6
Trend	--	I	--	--	D	--	D	--	--	--	--	--	--	--	I	--	D	--
Arsenic, dissolved mg/L																		
No. of Analyses	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	17	0	61	8	7	0	0	0	1	0	0	0	0	0	3	0	10	0
Maximum	0.002	ND	0.005	0.003	0.002	ND	ND	ND	0.001	ND	ND	ND	ND	ND	0.002	ND	0.002	ND
Minimum	ND	ND	ND	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	0.001	ID	0.003	0.002	0.001	ID	ID	ID	ID	ID	ID	ID	ID	ID	0.001	ID	0.001	ID
Standard Deviation	0.000	ID	0.001	0.000	0.000	ID	ID	ID	ID	ID	ID	ID	ID	ID	0.000	ID	0.000	ID
Median	0.001	ID	0.002	0.002	0.001	ID	ID	ID	ID	ID	ID	ID	ID	ID	0.0005	ID	5E-04	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium, dissolved mg/L																		
No. of Analyses	63	7	62	8	63	8	42	8	37	8	37	8	37	8	37	5	36	8
No. of Detections	63	7	62	8	61	8	42	8	37	8	37	8	37	8	36	5	36	8
Maximum	0.015	0.0074	0.018	0.011	0.017	0.002	0.017	0.01	0.007	0.003	0.12	0.0028	0.008	0.005	0.005	0.002	0.008	0.003
Minimum	0.004	0.0064	0.004	0.01	ND	0.002	0.008	0.008	0.003	0.003	0.002	0.0021	0.003	0.003	ND	0.002	0.002	0.002
Mean	0.008	0.007	0.009	0.010	0.003	0.002	0.011	0.009	0.004	0.003	0.006	0.002	0.004	0.004	0.002	0.002	0.004	0.003
Standard Deviation	0.002	0.000	0.003	0.000	0.002	0.000	0.002	0.001	0.001	0.000	0.019	0.000	0.001	0.001	0.001	0.000	0.001	0.000
Median	0.008	0.0068	0.009	0.01	0.002	0.002	0.011	0.009	0.004	0.003	0.003	0.002	0.004	0.004	0.0021	0.002	0.004	0.003
Trend	--	--	I	--	--	--	D	--	--	--	--	--	D	--	I	--	D	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-82		MW-83		MW-84		MW-93		MW-94		MW-95		MW-99		MW-100	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Potassium, dissolved mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
Maximum	1.7	1.55	2	1.84	1.3	1.17	1.9	1.62	1.7	1.63	1.4	1.27	1.2	0.909	2.1	2.03
Minimum	0.7	1.3	1.4	1.5	0.8	0.9	1.1	1.2	1.1	1.3	0.9	1.0	0.8	0.7	1.4	1.8
Mean	1.4	1.4	1.7	1.7	1.0	1.0	1.3	1.5	1.4	1.4	1.2	1.2	0.9	0.8	1.6	1.9
Standard Deviation	0.2	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Median	1.4	1.5	1.6	1.7	0.9	1.0	1.2	1.5	1.4	1.4	1.1	1.2	0.9	0.8	1.7	1.9
Trend	I	I	--	--	D	--	I	--	--	--	--	--	D	I	I	--
Sodium, dissolved mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
Maximum	6.51	6.47	6.6	6.36	6.7	6.23	9.4	9.17	6	5.29	7.8	6.41	16	9.94	11	9.54
Minimum	4.9	5.1	4.7	4.91	4.5	5.2	6.2	7.48	4.3	4.4	5.3	5.3	8.8	8.42	7.5	7.95
Mean	5.7	5.8	5.4	5.5	5.5	5.8	7.4	8.4	5.0	5.0	6.3	5.9	11.4	9.0	8.6	8.9
Standard Deviation	0.5	0.4	0.4	0.5	0.5	0.3	0.8	0.6	0.4	0.2	0.6	0.4	2.1	0.5	0.8	0.6
Median	5.6	5.9	5.2	5.6	5.5	5.8	7.3	8.6	4.8	5.1	6.2	6.1	11.0	9.0	8.5	9.2
Trend	I	--	--	I	--	--	I	--	I	--	--	--	D	--	--	--
Arsenic, dissolved mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	0	0	1	0	0	0	28	7	0	0	5	0	25	8	0	0
Maximum	ND	ND	0.001	ND	ND	ND	0.002	0.002	ND	ND	0.001	ND	0.007	0.003	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND	ND	ND	0.003	0.003	ND	ND
Mean	ID	ID	ID	ID	ID	ID	0.002	0.001	ID	ID	0.0006	ID	0.005	0.003	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	0.000	0.000	ID	ID	0.000	ID	0.001	0.000	ID	ID
Median	ID	ID	ID	ID	ID	ID	0.002	0.001	ID	ID	5E-04	ID	0.005	0.003	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	D	--	--	--
Barium, dissolved mg/L																
No. of Analyses	34	8	35	8	36	8	28	8	26	8	29	8	25	8	30	7
No. of Detections	17	0	35	8	36	8	28	7	26	8	29	8	25	8	29	7
Maximum	0.004	ND	0.006	0.0028	0.017	0.004	0.008	0.009	0.017	0.0025	0.007	0.004	0.013	0.003	0.013	0.008
Minimum	ND	ND	0.002	0.002	0.003	0.003	0.005	ND	0.0017	0.0013	0.003	0.003	0.003	0.002	ND	0.007
Mean	0.001	ID	0.003	0.002	0.004	0.003	0.007	0.007	0.006	0.002	0.004	0.003	0.005	0.002	0.009	0.007
Standard Deviation	0.001	ID	0.001	0.000	0.002	0.000	0.001	0.003	0.004	0.000	0.001	0.000	0.003	0.000	0.002	0.000
Median	0.001	ID	0.003	0.002	0.004	0.003	0.007	0.008	0.004	0.002	0.004	0.003	0.005	0.002	0.009	0.007
Trend	--	--	--	--	D	--	--	I	D	D	--	--	D	--	D	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-21		MW-24		MW-56		MW-57		MW-58A		MW-59		MW-60		MW-64	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Dichlorodifluoromethane, ug/L																
No. of Analyses	54	7	56	8	55	8	55	8	55	8	55	8	55	8	55	8
No. of Detections	14	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	11	ND	31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	0.99	ID	2.63	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	2.20	ID	6.35	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	0.1	ID	0.1	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	D	--	D	--	--	--	--	--	--	--	--	--	--	--	--	--
cis 1,2-Dichloroethene, ug/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	0	0	7	7	61	8	0	0	0	0	1	8	0	0	0	0
Maximum	ND	ND	0.39	0.33	1.8	1.1	ND	ND	ND	ND	0.28	0.449	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	0.592	ND	ND	ND	ND	ND	0.3	ND	ND	ND	ND
Mean	ID	ID	0.12	0.25	1.1	0.8	ID	ID	ID	ID	ID	0.35	ID	ID	ID	ID
Standard Deviation	ID	ID	0.06	0.07	0.3	0.2	ID	ID	ID	ID	ID	0.05	ID	ID	ID	ID
Median	ID	ID	0.1	0.26	1.2	0.8	ID	ID	ID	ID	ID	0.355	ID	ID	ID	ID
Trend	--	--	I	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene, ug/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene, ug/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	1.2	ND	ND	ND	0.45	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-65		MW-69		MW-70		MW-72		MW-73		MW-76		MW-77		MW-78		MW-81	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Dichlorodifluoromethane, ug/L																		
No. of Analyses	55	8	55	8	56	8	42	8	36	8	36	8	38	8	37	5	35	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	0	0	7	1	3	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.45	0.27	0.29	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	0.15	ID	0.1	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	0.11	ID	0.0	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	0.1	ID	0.1	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis 1,2-Dichloroethene, ug/L																		
No. of Analyses	62	8	62	8	63	8	42	8	37	8	37	8	38	8	37	5	36	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	35	8	0	0	0	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.1	1.7	ND	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.615	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	1.6	0.9	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	0.7	0.4	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	1.6	0.9	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	D	D	--	--	--	--	--	--
Tetrachloroethene, ug/L																		
No. of Analyses	62	8	62	8	63	8	42	8	37	8	37	8	38	8	37	5	36	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	36	8	0	0	0	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.89	0.59	ND	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.28	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	0.56	0.4781	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	0.13	0.11	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	0.55	0.494	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene, ug/L																		
No. of Analyses	62	8	62	8	63	8	42	8	37	8	37	8	38	8	37	5	36	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	37	8	0	0	14	5	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	17	15	ND	ND	0.61	0.62	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.7	9.06	ND	ND	ND	0.31	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	12.4	11.0	ID	ID	0.22	0.54	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	2.1	1.8	ID	ID	0.17	0.13	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	13	11	ID	ID	0.1	0.594	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	D	--	--	--	--	--	--	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-82		MW-83		MW-84		MW-93		MW-94		MW-95		MW-99		MW-100	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Dichlorodifluoromethane, ug/L																
No. of Analyses	33	8	34	8	36	8	27	8	26	8	29	8	87	12	30	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis 1,2-Dichloroethene, ug/L																
No. of Analyses	34	8	35	8	36	8	28	8	27	8	29	8	87	12	30	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene, ug/L																
No. of Analyses	34	8	35	8	36	8	28	8	27	8	29	8	87	12	30	8
No. of Detections	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	0.31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene, ug/L																
No. of Analyses	34	8	35	8	36	8	28	8	27	8	29	8	87	12	30	8
No. of Detections	33	8	35	8	0	0	0	0	27	8	0	0	0	0	0	0
Maximum	11	6.9	3.8	2.6	ND	ND	ND	ND	5.4	3.7	ND	ND	ND	ND	ND	ND
Minimum	ND	5.34	1.3	0.504	ND	ND	ND	ND	1.1	1.68	ND	ND	ND	ND	ND	ND
Mean	7.8	6.2	2.2	1.7	ID	ID	ID	ID	3.7	2.7	ID	ID	ID	ID	ID	ID
Standard Deviation	1.9	0.6	0.5	0.7	ID	ID	ID	ID	1.0	0.7	ID	ID	ID	ID	ID	ID
Median	8.0	6.4	2.3	1.8	ID	ID	ID	ID	3.9	2.8	ID	ID	ID	ID	ID	ID
Trend	D	D	D	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-21		MW-24		MW-56		MW-57		MW-58A		MW-59		MW-60		MW-64	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Vinyl Chloride, ug/L																
No. of Analyses	63	7	65	8	64	8	64	8	64	8	64	8	64	8	62	8
No. of Detections	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Maximum	ND	ND	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NOTES: * Gradient indicates location of monitoring well relative to the hydraulic gradient of the Aquifer and the placement of Solid Waste.
ND = Not Detected

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-65		MW-69		MW-70		MW-72		MW-73		MW-76		MW-77		MW-78		MW-81	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Vinyl Chloride, ug/L																		
No. of Analyses	62	8	62	8	63	8	42	8	37	8	37	8	38	8	37	5	36	8
No. of Detections	48	8	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Maximum	0.18	0.08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02	ND	ND	ND
Minimum	ND	0.0413	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	0.08	0.06	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	0.03	0.01	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	0.08	0.06	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NOTES: * Gradient indicates location of monitoring well relative to the hydraulic gradient of the Aquifer and the placement of Solid Waste.
ND = Not Detected

Table 4-2a
Statistical Summary of Regional Aquifer
Upgradient Groundwater Quality

Well Location	MW-82		MW-83		MW-84		MW-93		MW-94		MW-95		MW-99		MW-100	
Time Period	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Vinyl Chloride, ug/L																
No. of Analyses	34	8	35	8	36	8	28	8	27	8	29	8	87	12	30	8
No. of Detections	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	0.02	ND	ND	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NOTES: * Gradient indicates location of monitoring well relative to the hydraulic gradient of the Aquifer and the placement of Solid Waste.
ND = Not Detected

Table 4-2b
Statistical Summary of Regional Aquifer
Downgradient Groundwater Quality

Well Location	MW-43		MW-66		MW-67		MW-68		MW-74		MW-75		MW-80		MW-85	
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
pH, (Field) Standard Units																
No. of Analyses	64	8	61	8	61	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	64	8	61	8	61	8	56	6	36	8	37	8	ID	7	34	8
Maximum	8.9	7.6	8.8	7.3	8.8	7.1	8.7	7.4	7.2	7.0	7.7	7.2	ID	7.7	7.4	7.2
Minimum	5.8	7.1	6.4	6.8	6.4	6.8	6.2	7.0	6.8	6.7	6.7	6.9	ID	7.0	6.9	6.7
Mean	7.4	7.4	7.3	7.0	7.3	7.0	7.3	7.2	7.0	6.9	7.1	7.0	ID	7.2	7.1	7.0
Standard Deviation	0.42	0.17	0.42	0.14	0.42	0.12	0.41	0.17	0.12	0.08	0.20	0.10	ID	0.23	0.13	0.14
Median	7.4	7.4	7.2	7.0	7.2	6.9	7.3	7.2	7.0	6.9	7.1	7.0	ID	7.1	7.2	7.0
Trend	--	--	--	--	D	--	--	--	--	--	--	--	--	--	--	--
Specific Conductance, (Field) micromhos/cm																
No. of Analyses	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
Maximum	190	155	240	230	245	240	357	280	420	400	315	290	ID	265	220	240
Minimum	99	150	118	215	138	215	140	270	260	380	180	250	ID	210	165	205
Mean	156	152	184	222	197	228	238	273	330	389	251	258	ID	219	194	214
Standard Deviation	14	3	30	7	22	8	57	4	44	6	32	14	ID	21	14	12
Median	157	150	180	223	200	230	233	273	320	390	255	253	ID	210	195	210
Trend	D	--	--	--	I	--	I	--	I	--	--	--	--	--	--	--
Total Dissolved Solids, mg/L																
No. of Analyses	64	8	60	8	62	8	55	6	36	8	37	8	ID	7	34	8
No. of Detections	64	8	60	8	62	8	55	6	36	8	37	8	ID	7	34	8
Maximum	130	126	150	164	170	183	270	216	250	265	260	199	ID	237	140	157
Minimum	68	81	47	120	65	145	74	175	140	243	90	120	ID	143	100	140
Mean	100	111	110	150	127	170	148	193	203	254	162	176	ID	169	125	147
Standard Deviation	14	13	22	14	19	12	41	13	25	8	29	26	ID	32	12	6
Median	100	113	110	153	130	174	140	191	200	254	160	183	ID	156	130	146
Trend	--	--	--	--	I	--	I	--	I	--	--	--	--	--	--	--
Alkalinity, total (CaCO3), mg/L																
No. of Analyses	55	8	54	8	55	8	49	6	36	8	37	8	ID	7	34	8
No. of Detections	55	8	54	8	55	8	49	6	36	8	37	8	ID	7	34	8
Maximum	77	72	120	116	100	106	160	158	170	169	110	97	ID	83	90	89
Minimum	60	31	58	100	54	95	46	132	97	154	74	80	ID	74	65	76
Mean	71	65	82	108	77	99	114	148	123	161	90	92	ID	79	80	84
Standard Deviation	3.4	13.8	13.0	4.9	9.0	4.1	36.9	8.9	16.5	5.2	7.7	6.8	ID	3.4	7.2	4.9
Median	70	70	78	107	78	99	110	149	120	162	91	94	ID	79	84	86
Trend	D	--	--	I	I	--	I	--	I	--	--	--	--	I	I	--

Table 4-2b
Statistical Summary of Regional Aquifer
Downgradient Groundwater Quality

Well Location	MW-86		MW-87		MW-88		MW-89		MW-90		MW-91	
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
pH, (Field) Standard Units												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	34	8	36	8	34	8	34	8	29	8	30	8
Maximum	7.7	7.1	7.2	7.0	7.7	7.2	7.7	7.4	7.7	7.4	7.5	7.2
Minimum	6.7	6.6	6.7	6.7	6.8	6.9	7.0	7.0	7.0	7.1	6.8	6.9
Mean	7.0	6.9	7.0	6.9	7.3	7.0	7.3	7.2	7.3	7.3	7.1	7.0
Standard Deviation	0.19	0.18	0.12	0.08	0.18	0.13	0.16	0.15	0.19	0.14	0.17	0.10
Median	7.0	6.8	7.0	6.9	7.3	7.0	7.3	7.2	7.3	7.2	7.1	7.1
Trend	--	--	--	--	--	--	--	--	--	--	--	--
Specific Conductance, (Field) micror												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	34	8	36	8	34	8	34	8	29	8	30	8
Maximum	220	175	380	355	125	120	220	190	195	180	260	220
Minimum	150	155	270	330	100	110	140	170	145	170	190	210
Mean	172	163	328	348	110	113	170	176	172	174	239	215
Standard Deviation	12	7	27	8	6	4	15	7	10	4	19	5
Median	173	160	330	350	110	113	168	175	170	175	245	215
Trend	--	--	I	--	--	--	--	--	--	--	--	D
Total Dissolved Solids, mg/L												
No. of Analyses	34	8	35	8	34	8	34	8	29	8	30	8
No. of Detections	34	8	35	8	34	8	34	8	29	8	30	8
Maximum	150	126	270	290	96	87	150	127	130	142	170	244
Minimum	58	100	160	248	40	68	65	110	80	117	110	140
Mean	108	109	228	265	73	80	108	118	111	131	146	171
Standard Deviation	15	10	22	14	12	7	18	7	13	7	15	32
Median	110	106	230	263	75	80	110	120	110	130	150	162
Trend	--	--	--	--	--	--	--	--	--	--	D	--
Alkalinity, total (CaCO3), mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	34	8	36	8	34	8	34	8	29	8	30	8
Maximum	82	69	100	157	58	56	82	82	76	72	96	128
Minimum	50	51	47	80	48	50	67	75	44	52	68	80
Mean	69	65	91	98	51	53	72	78	66	67	86	88
Standard Deviation	4.7	5.8	8.5	24.3	2.6	1.7	4.1	2.0	5.2	6.3	5.3	16.3
Median	68	67	92	91	51	53	71	78	66	69	87	82
Trend	--	--	--	--	D	--	--	--	D	--	--	D

Table 4-2b
Statistical Summary of Regional Aquifer
Downgradient Groundwater Quality

Well Location	MW-43		MW-66		MW-67		MW-68		MW-74		MW-75		MW-80		MW-85	
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Ammonia as N, mg/L																
No. of Analyses	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	30	7	11	0	8	1	33	6	8	2	7	4	ID	3	5	0
Maximum	0.13	0.03	0.21	ND	0.49	0.01	0.17	0.02	0.53	0.02	0.06	0.02	ID	0.01	0.18	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	0.01	ND	ND	ND	ND	ID	ND	ND	ND
Mean	0.02	0.02	0.02	ID	0.02	ID	0.02	0.02	0.04	ID	0.02	0.01	ID	0.01	0.02	ID
Standard Deviation	0.02	0.00	0.03	ID	0.06	ID	0.02	0.004	0.09	ID	0.01	0.01	ID	0.00	0.03	ID
Median	0.02	0.02	0.01	ID	0.01	ID	0.02	0.02	0.02	ID	0.02	0.01	ID	0.01	0.02	ID
Trend	--	--	I	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloride, mg/L																
No. of Analyses	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	63	8	60	8	62	8	56	6	35	8	37	8	ID	7	34	8
Maximum	3.0	3	16	10	9	5	6.8	3.6	35	34	9	8	ID	5	10	7
Minimum	ND	2.5	ND	8	4	5	2	3	ND	31	3.3	4	ID	5	4	6
Mean	1.9	2.8	10.1	8.7	5.4	4.7	3.1	3.2	21.1	31.8	6.2	7.3	ID	5.0	5.2	6.2
Standard Deviation	0.4	0.2	3.0	0.6	1.5	0.1	0.7	0.29	7.4	1.1	1.7	1.3	ID	0.2	1.0	0.2
Median	2	3	10	9	5	5	3	3	21	32	7	8	ID	5	5	6
Trend	--	--	D	--	D	--	D	--	I	--	I	--	--	--	--	--
Nitrate as N, mg/L																
No. of Analyses	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	11	1	61	8	62	8	11	0	28	3	6	1	ID	0	34	8
Maximum	0.4	0.2	0.5	0.5	3.6	0.8	0.7	ND	1.4	0.0	2.0	0.0	ID	ND	0.2	0.2
Minimum	ND	ND	0.16	0.43	0.53	0.61	ND	ND	ND	ND	ND	ND	ID	ND	0.03	0.12
Mean	0.03	ID	0.31	0.47	1.14	0.66	0.04	ID	0.48	0.01	0.08	ID	ID	ID	0.14	0.14
Standard Deviation	0.05	ID	0.06	0.04	0.54	0.04	0.10	ID	0.50	0.01	0.33	ID	ID	ID	0.04	0.02
Median	0.03	ID	0.31	0.46	0.99	0.65	0.03	ID	0.22	0.01	0.03	ID	ID	ID	0.14	0.13
Trend	--	--	--	--	D	D	--	--	D	--	--	--	--	--	--	--
Sulfate, mg/L																
No. of Analyses	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	63	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
Maximum	15	20	11	13	36	35	70	24	29	27	54	45	ID	43	32	30
Minimum	ND	13	2.2	9	17.6	29	10	15	5	24	21	16	ID	32	16	25
Mean	12.5	14	8.0	11.6	23.8	32.6	19.4	17.6	23.8	26.3	39.8	40.0	ID	37.5	23.1	27.8
Standard Deviation	2	2	1.77	1.13	3.89	1.81	10.48	3.17	3.86	1.11	5.63	9.75	ID	4.67	4.83	1.85
Median	13	13	8	12	23.5	32.4	16	17.0	24	26	40	43	ID	37	22	27.3
Trend	--	D	I	I	--	I	D	--	--	--	--	--	--	I	D	I

Table 4-2b
Statistical Summary of Regional Aquifer
Downgradient Groundwater Quality

Well Location	MW-86		MW-87		MW-88		MW-89		MW-90		MW-91	
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Ammonia as N, mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	6	0	9	7	4	1	16	7	5	7	6	7
Maximum	0.13	ND	0.16	0.03	0.11	0.01	0.12	0.03	0.02	0.06	0.04	0.02
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	0.02	ID	0.02	0.02	0.01	ID	0.02	0.02	0.01	0.03	0.01	0.02
Standard Deviation	0.02	ID	0.03	0.01	0.02	ID	0.02	0.00	0.01	0.02	0.01	0.00
Median	0.02	ID	0.02	0.02	0.02	ID	0.02	0.02	0.02	0.02	0.02	0.02
Trend	--	--	--	--	--	--	--	--	--	--	--	--
Chloride, mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	34	8	36	8	32	8	34	8	29	8	30	8
Maximum	8	4	4	4	3	2.8	5	4	3	4	9	8
Minimum	3	4.0	2	4	ND	2	2	3	2	3	2	7.0
Mean	5.2	4.2	2.5	4.3	2.0	2.5	2.4	3.3	2.4	3.6	7.5	7.3
Standard Deviation	1.0	0.1	0.58	0.1	0.4	0.16	0.69	0.1	0.5	0.1	1.3	0.2
Median	5	4	2	4.2	2	3	2	3	2	4	8	7
Trend	D	--	--	--	--	D	--	--	--	I	--	--
Nitrate as N, mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	28	8	8	2	33	8	7	0	5	0	6	7
Maximum	2.5	0.3	0.2	0.0	1.7	0.6	0.2	ND	1.8	ND	1.0	0.0
Minimum	ND	0.06	ND	ND	ND	0.42	ND	ND	ND	ND	ND	ND
Mean	0.15	0.19	0.03	ID	0.36	0.50	0.03	ID	0.16	ID	0.07	0.02
Standard Deviation	0.42	0.09	0.04	ID	0.26	0.04	0.03	ID	0.44	ID	0.18	0.00
Median	0.07	0.21	0.03	ID	0.34	0.50	0.03	ID	0.03	ID	0.03	0.02
Trend	--	--	--	--	I	--	--	--	--	--	I	--
Sulfate, mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	34	8	36	8	32	8	34	8	29	8	30	8
Maximum	30	19	110	115	8	7	21	17	29	28	44	35
Minimum	10	16	72	91	ND	5.9	15	15	2	25.9	4	29
Mean	18.6	17.4	90.1	105.5	6.1	7	16.5	16.6	21.9	26.8	30.9	32.7
Standard Deviation	3	1	7.79	7.96	1.55	0.28	1.60	0.74	5.20	0.81	7.37	1.98
Median	19	18	91	106.5	6	7	16.0	17	23	27	31	33
Trend	--	--	I	I	D	--	D	--	--	--	D	I

Table 4-2b
Statistical Summary of Regional Aquifer
Downgradient Groundwater Quality

Well Location	MW-43		MW-66		MW-67		MW-68		MW-74		MW-75		MW-80		MW-85	
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Iron, dissolved mg/L																
No. of Analyses	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	64	8	55	1	59	8	56	6	36	8	37	8	ID	7	33	1
Maximum	1.7	1.1	1.70	0.03	8.50	0.10	3.8	2.6	2.7	2.8	2.4	3.8	ID	1.5	0.22	0.07
Minimum	0.13	0.04	ND	ND	ND	0.04	0.60	1.5	0.03	2.13	1.1	1.2	ID	0.9	ND	ND
Mean	0.99	0.85	0.08	ID	0.23	0.07	1.85	2.22	1.02	2.51	1.74	1.84	ID	1.24	0.06	ID
Standard Deviation	0.23	0.33	0.22	ID	1.07	0.02	0.77	0.39	0.90	0.24	0.32	0.81	ID	0.24	0.05	ID
Median	0.97	0.94	0.04	ID	0.06	0.07	1.7	2.3	0.87	2.53	1.8	1.62	ID	1.32	0.06	ID
Trend	--	--	I	--	I	--	I	--	I	--	I	--	--	I	--	--
Manganese, dissolved mg/L																
No. of Analyses	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	64	8	9	0	42	8	56	6	36	8	37	8	ID	7	6	0
Maximum	0.25	0.22	0.006	ND	0.270	0.074	0.39	0.30	0.150	0.18	0.17	0.15	ID	0.27	0.003	ND
Minimum	0.18	0.01	ND	ND	ND	0.035	0.14	0.26	0.001	0.13	0.07	0.11	ID	0.18	ND	ND
Mean	0.22	0.19	0.001	ID	0.022	0.056	0.23	0.27	0.078	0.14	0.12	0.12	ID	0.22	0.001	ID
Standard Deviation	0.02	0.07	0.001	ID	0.038	0.015	0.07	0.01	0.058	0.01	0.02	0.01	ID	0.03	0.000	ID
Median	0.22	0.21	0.001	ID	0.008	0.057	0.21	0.27	0.109	0.14	0.12	0.12	ID	0.23	0.001	ID
Trend	D	--	--	--	I	--	I	--	I	--	I	--	--	I	--	--
Calcium, dissolved mg/L																
No. of Analyses	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
Maximum	16.0	14	21	21	23	26	43	31	38	39	31	23	ID	27	35	21
Minimum	1.2	12	10	17.9	15	22	15	28	19	32	11	14	ID	18	8.4	19
Mean	12.6	12.8	14.6	18.9	18.4	23.8	23.3	29.2	27.3	35.1	19.0	20.2	ID	22.3	18.4	20.1
Standard Deviation	2	1	2.77	1.04	2.22	1.47	6.85	1.27	4.69	2.49	4.31	2.82	ID	3.00	4.67	0.76
Median	13	13	14	18.9	18	23.8	20.0	29.3	28	34.6	20	21.1	ID	22.7	18.0	20
Trend	D	--	--	I	--	--	I	--	I	--	I	--	--	--	I	--
Magnesium, dissolved mg/L																
No. of Analyses	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
Maximum	10.0	9.4	15	16.9	13	15.4	22	18.2	25	27.1	21	17.7	ID	13.7	21	13.3
Minimum	6.9	2.8	7.1	12.9	8.0	12.0	8.2	16	15	22	8.5	10	ID	10	6.4	11.1
Mean	8.7	8.2	11.2	15	10.2	13.6	12.4	16.7	19.6	24.8	14.0	15.2	ID	11.7	11.2	12.3
Standard Deviation	1	2	2.1	1.3	1.2	1.0	3.3	0.9	2.6	2.0	2.9	2.6	ID	1.4	2.5	0.8
Median	9	9	11	14.6	10	13.4	11	16.6	19	25.2	15	15.8	ID	12.0	11.0	13
Trend	D	--	--	--	I	--	I	--	I	I	I	--	--	--	I	--

Table 4-2b
Statistical Summary of Regional Aquifer
Downgradient Groundwater Quality

Well Location	MW-86		MW-87		MW-88		MW-89		MW-90		MW-91	
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Iron, dissolved mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	34	8	36	8	33	1	34	8	29	8	30	8
Maximum	2.00	0.56	3.1	3.1	2.9	0.02	0.87	0.8	1.2	1.2	2.3	2.4
Minimum	0.02	0.16	0.33	2.63	ND	ND	0.53	0.70	0.85	1.00	0.4	1.6
Mean	0.43	0.38	2.62	2.86	0.12	ID	0.71	0.7	1.02	1.09	2.02	2.00
Standard Deviation	0.31	0.13	0.47	0.19	0.49	ID	0.07	0.03	0.11	0.05	0.34	0.25
Median	0.35	0.39	2.7	2.9	0.03	ID	0.71	0.72	1.00	1.1	2.10	1.94
Trend	I	--	I	I	--	--	--	--	I	--	--	--
Manganese, dissolved mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	33	8	36	8	12	1	34	8	29	8	30	8
Maximum	0.250	0.025	0.35	0.34	0.31	0.003	0.40	0.29	0.38	0.26	0.29	0.24
Minimum	ND	0.009	0.02	0.27	ND	ND	0.29	0.25	0.24	0.25	0.02	0.20
Mean	0.023	0.015	0.30	0.31	0.01	ID	0.33	0.27	0.28	0.25	0.24	0.22
Standard Deviation	0.041	0.006	0.05	0.02	0.05	ID	0.03	0.01	0.03	0.00	0.05	0.01
Median	0.017	0.014	0.30	0.31	0.00	ID	0.33	0.27	0.28	0.25	0.25	0.22
Trend	--	--	--	--	--	--	D	--	--	--	--	--
Calcium, dissolved mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	34	8	36	8	34	8	34	8	29	8	30	8
Maximum	21	15	34	35	30	9.0	18	14	19	17	25	21
Minimum	11	12	16	4	7.4	8	10	13	14	14	15	17
Mean	14.3	13.3	28.2	28	9.7	8.5	13.0	13.2	15.9	15.9	21	19.2
Standard Deviation	2	1	3.73	10	4.25	0.31	1.44	0.54	1.22	0.82	2.14	1.33
Median	14	13	29	31	8.8	8.6	13	13.2	16	16	22	20
Trend	I	--	--	I	--	--	--	--	I	--	--	--
Magnesium, dissolved mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	34	8	36	8	34	8	34	8	29	8	30	8
Maximum	12	11	23	23.4	19	7.14	9.9	10.2	10	9.82	15	14.2
Minimum	7.6	8.2	11.0	19.7	4.9	5.6	7.0	8.6	7.3	8.3	10	11
Mean	9.5	9.1	18.7	21.8	6.6	6.4	8.4	9.4	8.5	9.4	12.6	12.9
Standard Deviation	1.0	0.9	2.3	1.4	2.4	0.5	0.8	0.6	0.8	0.6	1.1	1.0
Median	9.5	9	18.9	21.8	6.2	6.5	8.7	9.5	8.6	9.7	13	13.3
Trend	--	--	--	--	--	--	--	--	--	I	--	I

Table 4-2b
Statistical Summary of Regional Aquifer
Downgradient Groundwater Quality

Well Location	MW-43		MW-66		MW-67		MW-68		MW-74		MW-75		MW-80		MW-85	
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Potassium, dissolved mg/L																
No. of Analyses	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
Maximum	2.1	1.4	1.8	1.3	1.7	1.53	2.2	1.69	2.5	2.43	2.3	1.72	ID	1.56	2.3	1.38
Minimum	0.9	1.0	0.4	1.1	0.8	1.3	0.7	1.6	1.4	1.9	1.3	0.8	ID	1.3	0.8	1.2
Mean	1.3	1.2	1.0	1.2	1.2	1.4	1.4	1.6	1.8	2.1	1.6	1.5	ID	1.4	1.3	1.3
Standard Deviation	0.18	0.11	0.20	0.06	0.15	0.09	0.25	0.05	0.20	0.16	0.22	0.30	ID	0.09	0.23	0.06
Median	1.3	1.3	1.0	1.2	1.2	1.4	1.4	1.7	1.8	2.075	1.6	1.6	ID	1.4	1.2	1.3
Trend	D	I	--	--	--	--	I	--	--	--	D	--	--	--	I	--
Sodium, dissolved mg/L																
No. of Analyses	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	64	8	61	8	62	8	56	6	36	8	37	8	ID	7	34	8
Maximum	6.9	6.5	8.4	8.41	12.6	8.55	10	9.52	11	11.2	46	8.4	ID	7.77	8	7.73
Minimum	5.2	5.8	4.5	6.72	5.9	7.05	5	8.24	7.7	8.57	5.9	5.3	ID	5.74	4.6	6.69
Mean	6.1	6.1	6.6	7.6	7.2	7.8	7.1	8.6	9.2	9.9	12	7.5	ID	6.7	6.8	7.2
Standard Deviation	0.41	0.26	0.78	0.59	1.0	0.6	0.93	0.48	0.82	0.87	10	0.97	ID	0.72	0.78	0.38
Median	6.1	6.1	6.5	7.6	7.1	7.8	7.1	8.5	9.1	10.0	8	7.7	ID	6.7	6.8	7.4
Trend	D	--	--	I	--	--	I	--	--	--	D	--	--	--	I	I
Arsenic, dissolved mg/L																
No. of Analyses	64	8	61	8	61	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	6	0	6	0	3	0	21	0	23	4	36	6	ID	0	10	0
Maximum	0.002	ND	0.001	ND	0.003	ND	0.005	ND	0.003	0.001	0.007	0.001	ID	ND	0.002	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ID	ND	ND	ND
Mean	0.001	ID	0.001	ID	0.001	ID	0.001	ID	0.002	0.001	0.002	0.001	ID	ID	0.001	ID
Standard Deviation	0.000	ID	0.000	ID	0.000	ID	0.001	ID	0.001	0.000	0.001	0.000	ID	ID	0.000	ID
Median	0.001	ID	0.001	ID	0.001	ID	0.001	ID	0.002	0.001	0.002	0.001	ID	ID	0.001	ID
Trend	--	--	--	--	D	--	D	--	I	--	D	--	--	--	--	--
Barium, dissolved mg/L																
No. of Analyses	64	8	61	8	61	8	56	6	36	8	37	8	ID	7	34	8
No. of Detections	64	8	61	8	60	8	56	6	36	8	37	8	ID	7	34	8
Maximum	0.012	0.007	0.078	0.006	0.015	0.008	0.018	0.014	0.019	0.019	0.02	0.009	ID	0.005	0.023	0.005
Minimum	0.003	0.006	0.003	0.005	ND	0.006	0.005	0.013	0.008	0.016	0.008	0.002	ID	0.004	0.004	0.004
Mean	0.007	0.006	0.010	0.005	0.006	0.007	0.012	0.014	0.012	0.017	0.010	0.008	ID	0.005	0.005	0.004
Standard Deviation	0.001	0.000	0.011	0.000	0.002	0.000	0.003	0.000	0.003	0.001	0.002	0.002	ID	0.000	0.003	0.000
Median	0.007	0.006	0.006	0.005	0.006	0.007	0.012	0.014	0.012	0.017	0.009	0.009	ID	0.005	0.004	0.004
Trend	--	--	D	--	--	--	I	--	I	--	--	--	--	I	--	--

Table 4-2b
Statistical Summary of Regional Aquifer
Downgradient Groundwater Quality

Well Location	MW-86		MW-87		MW-88		MW-89		MW-90		MW-91	
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Potassium, dissolved mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	34	8	36	8	34	8	34	8	29	8	30	8
Maximum	1.6	1.3	2.2	2.27	2	0.881	1.6	1.48	1.4	1.38	1.9	1.68
Minimum	1.0	0.9	1.3	1.7	0.7	0.8	1.2	1.3	1.1	1.10	1.20	1.30
Mean	1.1	1.1	1.8	2.0	0.9	0.8	1.4	1.4	1.2	1.29	1.52	1.55
Standard Deviation	0.12	0.11	0.15	0.16	0.22	0.04	0.11	0.06	0.10	0.09	0.13	0.13
Median	1.1	1.2	1.8	2.0	0.8	0.83	1.4	1.4	1.2	1.3	1.5	1.6
Trend	--	--	--	I	D	--	--	--	--	--	--	--
Sodium, dissolved mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	34	8	36	8	34	8	34	8	29	8	30	8
Maximum	7.4	6.8	10	9.84	8.6	6.12	9.8	9.13	7	6.76	8.2	7.58
Minimum	5.6	5.5	7.1	7.96	4.3	4.7	6.3	7.94	4.9	5.1	6.2	6.1
Mean	6.3	6.3	8.2	8.8	5.4	5.4	7.7	8.6	5.7	6.0	6.8	7.0
Standard Deviation	0.49	0.48	0.73	0.65	0.71	0.42	0.89	0.46	0.5	0.5	0.50	0.52
Median	6	6	8.2	8.7	5.3	5.4	7.9	8.5	5.7	6.0	6.7	7.1
Trend	--	--	--	I	--	--	--	I	--	--	--	I
Arsenic, dissolved mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	1	0	2	0	21	7	33	8	0	0	29	8
Maximum	0.003	ND	0.003	ND	0.001	0.001	0.007	0.002	ND	ND	0.006	0.005
Minimum	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND	0.002
Mean	ID	ID	ID	ID	0.001	0.001	0.003	0.002	ID	ID	0.004	0.003
Standard Deviation	ID	ID	ID	ID	0.000	0.000	0.002	0.000	ID	ID	0.001	0.001
Median	ID	ID	ID	ID	0.001	0.001	0.003	0.002	ID	ID	0.004	0.003
Trend	--	--	--	--	--	--	D	--	--	--	D	--
Barium, dissolved mg/L												
No. of Analyses	34	8	36	8	34	8	34	8	29	8	30	8
No. of Detections	33	8	36	8	34	8	33	8	29	8	30	8
Maximum	0.008	0.005	0.019	0.019	0.006	0.002	0.009	0.007	0.008	0.006	0.012	0.009
Minimum	ND	0.003	0.014	0.016	0.002	0.002	ND	0.006	0.005	0.005	0.005	0.007
Mean	0.005	0.004	0.017	0.018	0.003	0.002	0.007	0.006	0.005	0.005	0.009	0.008
Standard Deviation	0.001	0.001	0.001	0.001	0.001	0.000	0.002	0.000	0.001	0.000	0.001	0.001
Median	0.005	0.005	0.017	0.017	0.003	0.002	0.007	0.006	0.005	0.005	0.009	0.008
Trend	--	--	--	I	D	--	D	--	--	--	--	--

Table 4-2b
Statistical Summary of Regional Aquifer
Downgradient Groundwater Quality

Well Location	MW-43		MW-66		MW-67		MW-68		MW-74		MW-75		MW-80		MW-85	
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Dichlorodifluoromethane, ug/L																
No. of Analyses	57	8	54	8	56	8	49	6	106	12	109	12	ID	7	35	8
No. of Detections	14	0	0	0	0	0	0	0	0	0	0	0	ID	0	0	0
Maximum	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ID	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ID	ND	ND	ND
Mean	0.25	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	0.30	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	0.1	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis 1,2-Dichloroethene, ug/L																
No. of Analyses	66	8	61	8	63	8	56	6	106	12	109	12	ID	7	35	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	1	0	ID	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.26	ND	ID	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ID	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene, ug/L																
No. of Analyses	66	8	61	8	63	8	56	6	106	12	109	12	ID	7	35	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	0	0	ID	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ID	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ID	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene, ug/L																
No. of Analyses	66	8	61	8	63	8	56	6	106	12	109	12	ID	7	35	8
No. of Detections	0	0	1	0	0	0	0	0	0	0	0	0	ID	0	0	0
Maximum	ND	ND	0.32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ID	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ID	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-2b
Statistical Summary of Regional Aquifer
Downgradient Groundwater Quality

Well Location	MW-86		MW-87		MW-88		MW-89		MW-90		MW-91	
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Dichlorodifluoromethane, ug/L												
No. of Analyses	34	8	103	12	33	8	33	8	29	8	30	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--
cis 1,2-Dichloroethene, ug/L												
No. of Analyses	34	8	103	12	34	8	34	8	29	8	30	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene, ug/L												
No. of Analyses	34	8	103	12	34	8	34	8	29	8	30	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene, ug/L												
No. of Analyses	34	8	103	12	34	8	34	8	29	8	30	8
No. of Detections	0	0	0	0	0	0	0	0	0	0	1	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.23	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-2b
Statistical Summary of Regional Aquifer
Downgradient Groundwater Quality

Well Location	MW-43		MW-66		MW-67		MW-68		MW-74		MW-75		MW-80		MW-85	
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Vinyl Chloride, ug/L																
No. of Analyses	66	8	61	8	63	8	56	6	106	12	109	12	ID	7	35	8
No. of Detections	7	2	0	0	0	0	1	0	0	0	2	0	ID	0	0	0
Maximum	0.07	0.031	ND	ND	ND	ND	0.02	ND	ND	ND	0.07	ND	ID	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ID	ND	ND	ND
Mean	0.026	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	0.033	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	0.01	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NOTES: * Gradient indicates location of monitoring well relative to the hydraulic gradient of the Aquifer and the placement of Solid Waste.
ND = Not Detected

Table 4-2b
Statistical Summary of Regional Aquifer
Downgradient Groundwater Quality

Well Location	MW-86		MW-87		MW-88		MW-89		MW-90		MW-91	
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Vinyl Chloride, ug/L												
No. of Analyses	34	8	103	12	34	8	34	8	29	8	30	8
No. of Detections	0	0	2	0	1	0	1	0	0	0	0	0
Maximum	ND	ND	0.08	ND	0.03	ND	0.04	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	--	--

NOTES: *Gradient indicates location of monitoring well relative to the hydraulic gradient of the Aquifer and the placement of Solid Waste.
ND = Not Detected

Table 4-2c
Statistical Summary of Perched Zones
Groundwater Data

Well Location	MW-27A		MW-28		MW-29		MW-55		MW-30A		MW-47		MW-62		MW-EB6		MW-101
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	All
	North and West								East Perched Zone								SSWA
pH, (Field) Standard Units																	
No. of Analyses	64	8	53	7	62	8	64	8	70	8	70	8	41	6	30	5	8
No. of Detections	64	8	53	7	62	8	64	8	70	8	70	8	41	6	30	5	8
Maximum	8.3	8.0	7.6	5.9	7.9	6.5	8.6	8.2	7.4	6.5	7.5	7.2	7.5	7.0	7.6	6.3	8.9
Minimum	5.9	7.0	5.6	5.4	5.8	5.9	6.9	7.5	5.8	6.1	6.4	6.9	6.2	6.1	6.1	5.6	6.7
Mean	7.7	7.6	6.2	5.7	6.7	6.2	7.8	7.8	6.5	6.3	7.0	7.0	6.9	6.6	6.8	6.1	7.1
Standard Deviation	0.475	0.33	0.42	0.14	0.502	0.24	0.314	0.20	0.305	0.13	0.208	0.09	0.319	0.37	0.422	0.28	0.74
Median	7.7	7.7	6.1	5.7	6.6	6.2	7.8	7.8	6.5	6.2	7.0	7.0	6.9	6.6	6.7	6.1	6.8
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Specific Conductance, (Field) uS/cm																	
No. of Analyses	64	8	53	7	62	8	64	8	85	8	70	8	40	6	30	5	8
No. of Detections	64	8	53	7	62	8	64	8	85	8	70	8	40	6	30	5	8
Maximum	180	185	242	110	108	100	160	145	469	350	1047	1000	324	245	710	200	724
Minimum	130	87	100	95	68	75	112	130	75	275	550	8	50	190	100	160	250
Mean	155	156	146	103	83	84	131	136	276	301	816	750	250	213	260	181	594
Standard Deviation	13	33	38	6	7	9	10	6	109	26	102	309	51	20	124	16	154
Median	156	165	127	100	84	83	130	135	291	295	823	850	250	213	673	185	660
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	D	--	D
Total Dissolved Solids, mg/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	41	6	22	5	7
No. of Detections	64	8	53	7	63	8	64	8	70	8	70	8	41	6	22	5	7
Maximum	500	155	180	100	3100	101	130	129	350	264	1500	645	240	181	560	144	481
Minimum	27.0	62.0	47.0	72.0	40.0	73	58	80	120	200	120	587	95	141	29	102	162
Mean	116.6	121.4	101.9	83.4	152.5	86.6	95.7	112.9	226.8	224.8	527.8	622.4	169.0	159.3	175.7	124.2	420.0
Standard Deviation	53.68	28.95	27.19	8.60	393	10	13.64	14.69	41.27	20.00	135	17.8	28.51	17.22	107.5	15.53	114.48
Median	110	126	100	83	77	87	97	118	220	218	513	626	175	159	460	123	455
Trend	--	--	--	--	--	--	--	--	--	I	--	I	--	--	--	--	--
Alkalinity, total (CaCO3), mg/L																	
No. of Analyses	55	8	46	7	54	8	55	8	55	8	55	8	35	6	18	5	7
No. of Detections	55	8	46	7	54	8	55	8	55	8	55	8	35	6	18	5	7
Maximum	90	90	64	71	48	30	68	68	200	190	920	640	110	104	600	102	520
Minimum	70	29	24	24	22	21	52	58	66	158	400	563	42	50	64	79	122
Mean	80	70	38	33	27	26	59	64	132	172	525	609	71	71	174	94	413
Standard Deviation	4	19	11	17	4	3	3	3	38	13	76	27	15	19	153	9	133
Median	80	77	35	26	26	26	59	65	120	171	520	615	69	69	450	98	448
Trend	--	--	--	--	--	--	--	--	I	--	--	--	--	--	--	--	--

Table 4-2c
Statistical Summary of Perched Zones
Groundwater Data

Well Location	MW-27A		MW-28		MW-29		MW-55		MW-30A		MW-47		MW-62		MW-EB6		MW-101
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	All
	North and West								East Perched Zone								SSWA
Ammonia as N, mg/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	41	6	16	5	7
No. of Detections	64	8	21	2	18	0	57	8	15	0	51	8	5	2	16	5	3
Maximum	0.26	0.24	0.22	0.03	0.12	ND	0.12	0.07	0.29	ND	0.13	0.16	0.03	0.03	1.90	1.60	0.0
Minimum	0.0	0.0	ND	ND	ND	ND	ND	0.0	ND	ND	ND	0.1	ND	ND	0.1	0.8	ND
Mean	0.15	0.13	0.02	ID	0.01	ID	0.05	0.06	0.02	ID	0.04	0.10	0.01	ID	0.83	1.28	0.02
Standard Deviation	0.04	0.07	0.04	ID	0.02	ID	0.02	0.01	0.04	ID	0.04	0.03	0.01	ID	0.51	0.32	0.01
Median	0.2	0.1	0.0	ID	0.0	ID	0.1	0.1	0.0	ID	0.0	0.1	0.0	ID	0.0	1.4	0.0
Trend	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloride, mg/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	41	6	19	5	7
No. of Detections	64	8	53	7	62	8	64	8	69	8	70	8	41	6	15	5	7
Maximum	43.0	9.6	5.0	4.6	9.1	14.0	2.5	2.2	10.3	6.1	26.0	8.9	30.0	14.4	33.0	1.5	8.9
Minimum	1.0	1.5	2.0	2.4	ND	3.2	1.6	1.9	ND	2.7	3.8	7.3	3.0	5.4	ND	0.8	3.3
Mean	2.2	5.4	3.0	4.0	3.3	5.3	2.0	2.0	3.1	3.9	13.6	8.0	11.2	10.3	3.2	1.3	7.0
Standard Deviation	5.20	2.96	0.58	0.77	1.31	3.77	0.15	0.08	2.79	1.07	5.72	0.58	7.13	3.60	7.26	0.26	2.04
Median	1.5	6.1	3.0	4.3	3.0	3.7	2.0	2.0	2.0	3.7	13.0	8.0	9.0	11.2	8.0	1.3	7.5
Trend	--	I	--	--	--	--	--	I	D	I	D	--	D	I	--	--	--
Nitrate as N, mg/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	41	6	17	5	7
No. of Detections	26	6	46	6	61	8	8	0	69	8	9	0	41	6	6	3	0
Maximum	0.3	1.1	1.2	0.4	5.1	2.3	0.1	ND	22.0	1.9	1.1	ND	12.0	3.8	0.1	0.1	ND
Minimum	ND	ND	ND	ND	ND	1.1	ND	ND	ND	0.6	ND	ND	3.4	3.0	ND	ND	ND
Mean	0.0	0.3	0.4	0.2	2.5	1.8	0.0	ID	4.6	1.1	0.0	ID	6.1	3.4	0.0	0.0	ID
Standard Deviation	0.05	0.42	0.32	0.15	0.84	0.38	0.02	ID	5.00	0.51	0.13	ID	1.71	0.32	0.04	0.02	ID
Median	0.03	0.06	0.4	0.2	2.4	1.9	0.03	ID	2.8	1.0	0.03	ID	5.8	3.5	ID	0.0	ID
Trend	--	--	--	--	--	--	--	--	D	--	--	--	--	--	--	--	--
Sulfate, mg/L																	
No. of Analyses	64	8	52	7	63	8	64	8	70	8	70	8	41	6	19	5	7
No. of Detections	64	8	52	7	62	8	64	8	70	8	70	8	41	6	11	4	7
Maximum	9.0	16.5	59.5	18.1	4.0	2.6	27.0	12.2	65.0	18.9	13.9	8.5	41.0	25.2	8.0	0.5	20.9
Minimum	1.6	5.2	17.0	14.0	ND	1.8	9.0	10.6	2.0	10.2	1.6	5.6	17.0	16.7	ND	ND	5.2
Mean	7.2	10.9	29.0	16.3	2.1	2.0	10.6	11.5	24.2	12.2	6.9	6.9	26.8	20.7	2.3	0.3	8.0
Standard Deviation	0.91	4.12	11.34	1.72	0.61	0.29	2.20	0.57	9.18	2.94	2.03	1.03	4.60	3.68	1.91	0.17	5.70
Median	7.0	11.0	24.5	16.4	2.0	2.0	10.0	11.7	23.2	11.1	7.0	6.6	26.9	19.9	6.3	0.3	5.9
Trend	--	--	D	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-2c
Statistical Summary of Perched Zones
Groundwater Data

Well Location	MW-27A		MW-28		MW-29		MW-55		MW-30A		MW-47		MW-62		MW-EB6		MW-101
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	All
	North and West								East Perched Zone								SSWA
Iron, dissolved mg/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	28	5	7
No. of Detections	60	1	51	1	59	4	64	8	64	1	70	6	41	2	28	5	7
Maximum	0.2	0.0	1.11	1.00	34.0	0.7	0.6	0.3	0.5	0.1	3.0	0.6	1.7	0.0	29.3	9.4	2.5
Minimum	ND	ND	ND	ND	ND	ND	0.0	0.2	ND	ND	0.0	0.0	ND	ND	0.5	3.8	0.5
Mean	0.1	ID	0.1	ID	0.9	0.1	0.2	0.3	0.1	ID	0.7	0.2	0.2	ID	11.5	7.1	1.5
Standard Deviation	0.04	ID	0.15	ID	4.41	0.24	0.08	0.04	0.10	ID	0.61	0.23	0.30	ID	8.00	2.34	0.84
Median	0.0	ID	0.0	ID	0.0	0.0	0.2	0.3	0.1	ID	0.5	0.1	0.1	ID	1.5	7.8	2.0
Trend	--	--	--	--	--	--	--	--	--	D	--	D	--	--	D	--	--
Manganese, dissolved mg/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	28	5	7
No. of Detections	64	8	53	5	40	2	64	8	21	0	70	8	11	1	28	5	7
Maximum	0.2	0.1	4.2	0.2	0.5	0.0	0.2	0.2	0.1	ND	2.8	2.1	0.0	0.0	3.0	0.9	2.00
Minimum	0.0	0.0	0.0	ND	ND	ND	0.0	0.1	ND	ND	0.5	1.3	ND	ND	0.2	0.5	0.2
Mean	0.1	0.0	1.0	0.0	0.0	ID	0.1	0.2	0.0	ID	1.1	1.7	0.0	ID	1.1	0.7	1.5
Standard Deviation	0.02	0.02	1.27	0.08	0.07	ID	0.02	0.01	0.01	ID	0.43	0.25	0.01	ID	0.61	0.12	0.59
Median	0.1	0.0	0.3	0.0	0.0	ID	0.1	0.2	0.0	ID	1.0	1.7	0.0	ID	1.7	0.7	1.7
Trend	--	--	D	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Calcium, dissolved mg/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	28	5	7
No. of Detections	64	8	53	7	63	8	64	8	70	8	70	8	42	6	28	5	7
Maximum	22.0	24.7	25.2	13.0	12	9	17	14	55	39	160	127	32	27	29	14	83
Minimum	2.8	8.7	9.8	8.5	6	7	2	11	6	26	63	105	16	19	5	11	24
Mean	18.0	19.3	15.0	10.1	8	8	12	12	31	30	104	118	24	21	14	13	68
Standard Deviation	2.72	4.99	4.37	1.49	1	1	2	1	9	4	17	7	4	3	6	1	20
Median	18.0	20.1	13.0	9.7	8	8	12	12	31	29	103	120	24	20	74	13	74
Trend	--	I	--	--	--	--	--	--	--	--	--	I	--	--	--	I	--
Magnesium, dissolved mg/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	28	5	7
No. of Detections	64	8	53	7	63	8	64	8	70	8	70	8	42	6	28	5	7
Maximum	5.9	6.41	5.7	8.6	6.3	2.2	7.6	6.9	31.0	23.4	64.0	62.8	12.0	9.6	12.9	8.2	49.7
Minimum	3.1	2.1	2.3	2.0	1.5	1.7	3.4	6.0	1.7	13.0	31.0	49.5	4.4	5.0	2.7	5.9	15.3
Mean	4.9	5.2	3.5	3.3	2.1	2.0	5.6	6.4	17.9	17.5	49.1	56.9	8.1	6.6	6.7	6.8	38.0
Standard Deviation	0.50	1.41	0.94	2.35	0.6	0.2	0.6	0.3	5.4	3.2	6.3	4.4	1.8	1.7	2.6	0.9	10.9
Median	4.80	5.67	3.10	2.52	1.9	2.0	5.6	6.3	17.0	17.4	48.5	56.3	8.1	6.3	42.0	6.6	41.0
Trend	--	I	--	--	--	--	--	--	I	--	--	I	--	D	--	--	--

Table 4-2c
Statistical Summary of Perched Zones
Groundwater Data

Well Location	MW-27A		MW-28		MW-29		MW-55		MW-30A		MW-47		MW-62		MW-EB6		MW-101
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	All
	North and West								East Perched Zone								SSWA
Potassium, dissolved mg/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	28	5	7
No. of Detections	64	8	53	7	59	8	64	8	70	8	70	8	42	6	28	5	7
Maximum	15	3.92	4.6	1.3	1.6	0.689	2.2	1.69	7.2	2.11	24	5.68	1.6	1.37	2.8	1.69	3.09
Minimum	2.2	1.28	0.9	0.93	ND	0.503	1.00	1.50	0.53	1.4	3.70	4.47	0.70	0.92	1.00	1.10	1.92
Mean	3.5	3.2	1.2	1.0	0.6	0.6	1.56	1.59	1.8	1.8	5.14	5.01	1.15	1.10	1.58	1.35	2.7
Standard Deviation	1.5	0.9	0.6	0.1	0.2	0.1	0.2	0.1	0.7	0.2	2.3	0.4	0.2	0.2	0.5	0.2	0.4
Median	3.3	3.4	1.07	0.982	0.6	0.6	1.5	1.6	1.7	1.8	4.9	4.9	1.1	1.1	2.9	1.3	2.9
Trend	--	I	--	--	--	--	--	I	--	--	--	I	--	D	--	--	--
Sodium, dissolved mg/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	28	5	7
No. of Detections	64	8	53	7	63	8	64	8	70	8	70	8	42	6	28	5	7
Maximum	7.96	7.77	10.6	6.61	7.6	6.9	6.9	5.99	20	17.4	21	19	20	18.7	350	15.8	18.6
Minimum	5.3	3.01	5.6	5.02	3.5	4.37	4.7	5.1	4.3	13	13	16	13	12.4	8.9	11	9.05
Mean	6.6	6.4	7.7	6.0	5.0	5.0	5.6	5.6	13.3	15.0	16.1	17.7	15.4	14.9	35.7	13.0	15.8
Standard Deviation	0.52	1.47	1.24	0.52	0.79	0.89	0.45	0.30	1.75	1.46	1.71	1.16	1.67	2.12	65.78	2.27	3.22
Median	6.5	6.8	7.3	6.1	4.9	4.6	5.5	5.5	13.0	15.0	16.0	17.8	15.0	14.6	18.0	12.1	17.0
Trend	--	I	--	--	--	--	--	--	--	--	--	--	--	--	--	--	D
Arsenic, dissolved mg/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	28	5	7
No. of Detections	64	8	1	0	5	0	2	0	4	0	67	0	1	0	28	5	6
Maximum	0.019	0.017	0.002	ND	0.009	ND	0.001	ND	0.013	ND	0.006	ND	0.001	ND	0.016	0.0069	0.0129
Minimum	0.010	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	0.0017	ND
Mean	0.016	0.014	ID	ID	0.001	ID	ID	ID	0.001	ID	0.003	ID	ID	ID	0.006	0.003	0.008
Standard Deviation	0.002	0.004	ID	ID	0.001	ID	ID	ID	0.002	ID	0.001	ID	ID	ID	0.004	0.002	0.004
Median	0.016	0.016	ID	ID	0.001	ID	ID	ID	5E-04	ID	0.002	ID	ID	ID	0.007	0.0023	0.007
Trend	--	--	--	--	--	--	--	--	--	--	--	D	--	--	--	--	--
Barium, dissolved mg/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	28	5	7
No. of Detections	64	8	52	7	59	8	64	8	70	8	70	8	42	6	28	5	7
Maximum	0.018	0.008	0.02	0.007	0.2	0.007	0.009	0.005	0.083	0.007	0.04	0.036	0.008	0.003	0.04	0.0177	0.041
Minimum	0.004	0.005	ND	0.006	ND	0.001	0.004	0.004	0.005	0.005	0.026	0.031	0.002	0.002	0.009	0.015	0.0071
Mean	0.007	0.006	0.011	0.006	0.007	0.002	0.006	0.005	0.009	0.006	0.033	0.034	0.003	0.002	0.025	0.016	0.031
Standard Deviation	0.002	0.001	0.004	0.000	0.026	0.002	0.001	0.000	0.009	0.001	0.003	0.002	0.001	0.001	0.009	0.001	0.011
Median	0.007	0.006	0.011	0.006	0.002	0.002	0.006	0.005	0.007	0.006	0.034	0.034	0.002	0.002	0.036	0.015	0.0339
Trend	--	I	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 4-2c
Statistical Summary of Perched Zones
Groundwater Data

Well Location	MW-27A		MW-28		MW-29		MW-55		MW-30A		MW-47		MW-62		MW-EB6		MW-101
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	All
	North and West								East Perched Zone								SSWA
Dichlorodifluoromethane, ug/L																	
No. of Analyses	55	8	45	7	54	8	55	8	55	8	54	8	35	6	24	5	10
No. of Detections	0	0	1	0	0	0	0	0	16	1	48	8	0	0	0	0	0
Maximum	ND	ND	0.84	ND	ND	ND	ND	ND	0.67	0.22	46	5.9	ND	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.01	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	0.2	ID	12.9	2.8	ID	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	0.2	ID	12.0	2.0	ID	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	0.1	ID	10.9	1.705	ID	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	--	--	D	--	--	--	--	--	--
1,1-Dichloroethane, ug/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	31	5	10
No. of Detections	0	0	0	0	0	0	0	0	69	8	62	8	41	6	0	0	1
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	77	4.24	2.1	0.49	13	3.7	ND	ND	0.21
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.01	ND	0.39	ND	1.28	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	19.5	3.5	0.5	0.4	6.2	2.1	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	18.2	0.4	0.3	0.0	3.6	0.9	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	12	3.405	0.46	0.447	6	1.705	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	D	--	--	--	--	--	--	--	--
1,2-Dichloroethane, ug/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	31	5	10
No. of Detections	0	0	0	0	0	0	0	0	42	0	1	0	7	0	0	0	1
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	3.8	ND	0.21	ND	0.6	ND	ND	ND	0.22
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	0.6	ID	ID	ID	0.1	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	0.8	ID	ID	ID	0.1	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	0.37	ID	ID	ID	0.1	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	D	--	--	--	D	--	--	--	--
cis 1,2-Dichloroethene, ug/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	31	5	10
No. of Detections	0	0	2	0	0	0	0	0	70	8	66	8	42	6	0	0	1
Maximum	ND	ND	0.24	ND	ND	ND	ND	ND	110	10.5	3.2	0.924	14	7.52	ND	ND	0.21
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	5.9	4.37	ND	0.524	1.3	1.91	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	29.8	5.6	1.0	0.7	7.5	3.7	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	26.4	2.0	0.8	0.1	3.3	2.1	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	19	4.985	0.715	0.68	7.1	2.825	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	D	--	--	--	--	--	--	--	--

Table 4-2c
Statistical Summary of Perched Zones
Groundwater Data

Well Location	MW-27A		MW-28		MW-29		MW-55		MW-30A		MW-47		MW-62		MW-EB6		MW-101
	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	All
	North and West								East Perched Zone								SSWA
1,2-Dichloropropane, ug/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	31	5	10
No. of Detections	0	0	0	0	0	0	0	0	45	0	0	0	6	0	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	1.5	ND	ND	ND	0.32	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	0.5	ID	ID	ID	0.1	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	0.4	ID	ID	ID	0.1	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	0.36	ID	ID	ID	0.1	ID	ID	ID	ID
Trend	--	--	--	--	--	--	--	--	D	--	--	--	--	--	--	--	--
Trichloroethene, ug/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	31	5	10
No. of Detections	0	0	0	0	0	0	0	0	70	8	0	0	25	0	0	0	0
Maximum	ND	ND	ND	ND	ND	ND	ND	ND	3.5	1.51	ND	ND	0.47	ND	ND	ND	ND
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	1.2	0.939	ND	ND	ND	ND	ND	ND	ND
Mean	ID	ID	ID	ID	ID	ID	ID	ID	1.84	1.26	ID	ID	0.21	ID	ID	ID	ID
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	0.50	0.23	ID	ID	0.10	ID	ID	ID	ID
Median	ID	ID	ID	ID	ID	ID	ID	ID	1.7	1.285	ID	ID	0.23	ID	ID	ID	ID
n Trend	--	--	--	--	--	--	--	--	D	--	--	--	--	--	--	--	--
Vinyl Chloride, ug/L																	
No. of Analyses	64	8	53	7	63	8	64	8	70	8	70	8	42	6	31	5	10
No. of Detections	1	0	0	0	0	0	0	0	23	1	70	8	3	0	1	0	10
Maximum	0.06	ND	ND	ND	ND	ND	ND	ND	3.22	0.025	15.9	5.94	0.23	ND	0.02	ND	0.9
Minimum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4	1.87	ND	ND	ND	ND	0.51
Mean	ID	ID	ID	ID	ID	ID	ID	ID	0.27	ID	7.72	3.49	0.03	ID	ID	ID	1
Standard Deviation	ID	ID	ID	ID	ID	ID	ID	ID	0.61	ID	3.61	1.43	0.05	ID	ID	ID	0
Median	ID	ID	ID	ID	ID	ID	ID	ID	0.015	ID	7.05	3.75	0.01	ID	0.66	ID	0.66
n Trend	--	--	--	--	--	--	--	--	D	--	D	--	--	--	--	--	--

NOTES: * Gradient indicates location of monitoring well relative to the hydraulic gradient of the Aquifer and the placement of Solid Waste.

ND = Not Detected

Perched Zone Wells MW-25, MW-41S, MW-41D, NW-45, MW-79, MW-102 and MW-103 are not tabulated due to insufficient data.

TABLE 4-3
CEDAR HILLS REGIONAL LANDFILL
2010 REGIONAL AQUIFER GROUNDWATER
INTRAWELL PREDICTION LIMIT EXCEEDANCES
(January 1, 2010 to December 31, 2010)

Parameter	Units	Well ID	Sample Date	Max 2010 Value	Intrawell Limit Value
Upgradient Wells					
Barium	(mg/L)	MW-93	10/29/10	0.00939	0.0082
cis- 1,2-Dichloroethene	(υg/L)	MW-59	10/08/10	0.449	0.39
Downgradient Wells					
Nitrate as N	(mg/L)	MW-66	07/21/10	0.523	0.46
		MW-66	10/20/10	0.516	0.46

5.0 SUMMARY AND CONCLUSIONS

5.1 REGIONAL AQUIFER

Recharge of the regional aquifer beneath CHRLF is predominately by rainfall. The recharge area is centered on the Queen City Farms property to the south of the landfill. Queen City Farms has been the site of many activities including solid and hazardous waste disposal, solvent reprocessing and recovery; gravel mining; and a composting operation. The property is on the National Priorities List for hazardous waste sites and has gone through remediation efforts including excavation, stabilization and barrier wall construction. These past activities and current conditions affect and define upgradient groundwater quality for CHRLF. Groundwater flow from the recharge area is radial and is monitored by extensive networks of wells at both Queen City Farms and CHRLF.

Upgradient water quality to CHRLF exhibits wide spatial and temporal variation. Contamination of the regional groundwater by CVOCs on the Queen City Farms site is well documented, as is migration across the property line and under CHRLF.

The CVOCs TCE, PCE and *cis*-1,2-dichloroethene are detected regularly in several upgradient wells. TCE was present in five upgradient wells, exceeding primary drinking water standards in two. Vinyl chloride is regularly detected in one upgradient well and is likely related to degradation of the PVC monitoring well construction materials. Overall, primary drinking water standards were exceeded in some upgradient wells for PCE, TCE, vinyl chloride and arsenic. Some wells exceeded secondary standards for iron, manganese and occasionally pH.

In summary, the regional aquifer is the first continuously saturated zone beneath the landfill and serves as the earliest path for detection monitoring. Groundwater flowing onto the CHRLF site is highly variable both spatially and temporally.

A small crescent of wells in the northeast corner of the CHRLF property monitors regional aquifer flow along preferential flow paths downgradient to MSW placement. Downgradient ground water quality has exceeded primary standards for arsenic and secondary standards for iron, manganese and pH. Downgradient water quality is generally better than upgradient when compared with drinking water standards. The CVOCs TCE, PCE and *cis*-1,2 DCE are undetected in downgradient wells. Vinyl chloride was detected in one sample from a downgradient well in 2010. Again, the detection of vinyl chloride is likely related to degradation of the PVC construction materials used for this monitoring well which is being considered for decommissioning. These data indicate that CHRLF is acting as an attenuation zone for upgradient impacts, allowing a reduction in the concentration of VOCs, iron and manganese.

Additional findings related to regional aquifer flow analysis and monitoring well detection zones can be found in the *Phase I Investigations Groundwater Monitoring Well System Enhancements Technical Memorandum*, October 2007. A more complete analysis of the regional aquifer will be completed later in 2011 and will include recommended enhancements to the regional aquifer monitoring network.

Off-site flow paths will be further defined through collection of onsite and additional off-site groundwater elevation data. Flow path and detection zone analyses performed in the Phase I investigation will be updated.

5.2 PERCHED ZONES

Perched groundwater occurs in onsite till, ice-contact deposits and recessional outwash. No laterally or vertically extensive perched zones have been identified at CHRLF. Recharge of perched groundwater is by precipitation with possible hydraulic continuity to surface streams.

The Hydrogeologic Investigation Report for Area 6 development (2003) determined that no perched zones have been identified to be either laterally or vertically extensive and as such do not provide an opportunity for regional aquifer background characterization or site wide detection monitoring of waste placement areas. On this basis, the regional aquifer beneath the landfill is the earliest target hydraulic pathway for groundwater contaminant detection.

Impacts from historical landfilling methods have previously been recognized in several perched zone wells. Site improvements and engineered facilities have been effective in moderating the impacts to water quality as evidenced by the preponderance of declining trends for most contaminants in these wells.

Two investigations have been completed recently that pertain to perched zone conditions. The Technical Memoranda *Results of Groundwater Sampling and Fate and Transport Analysis South Solid Waste Area Perched Zone Assessment,* April 2010, and the *East Main Hill Perched Zones,* October 2010 evaluate occurrence and conditions in the Main Hill and South Solid Waste Area perched zones.

These memoranda include an evaluation of the gas-to-groundwater pathway for contaminant migration and further define extent and flow paths of groundwater in the East Main Hill perched zone, and in the South Solid Waste Area perched zone, confirmation of the local extent and the fate and transport of vinyl chloride.

Secondly, efforts to date to evaluate the integrity and effectiveness of engineered facilities in closed, unlined landfill areas can be found in the *Cedar Hills Regional Landfill Environmental Management Facility Evaluation And Modifications For Closed Landfill Areas, 2007 Summary Report*, 2008.

Results and conclusions from these investigations will be presented in an addendum updating the Site Wide Hydrogeologic report.

6.0 REFERENCES

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