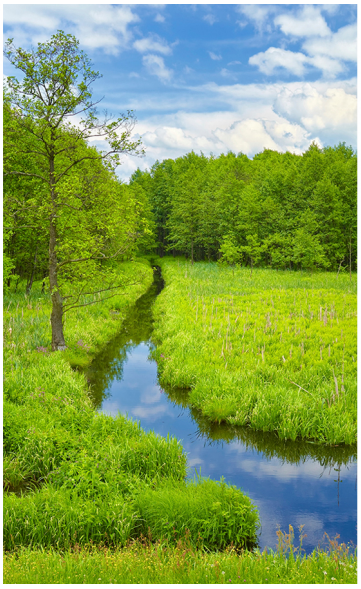
CONESTOGA-ROVERS & ASSOCIATES

www.CRAworld.com



Final Report

2014 Annual Monitoring Report

Highway 96 Site
White Bear Township, Minnesota

Conestoga-Rovers & Associates
1801 Old Highway 8 Northwest, Suite 114
St. Paul, Minnesota 55112

March 2015 • 002012 • Report No. 65

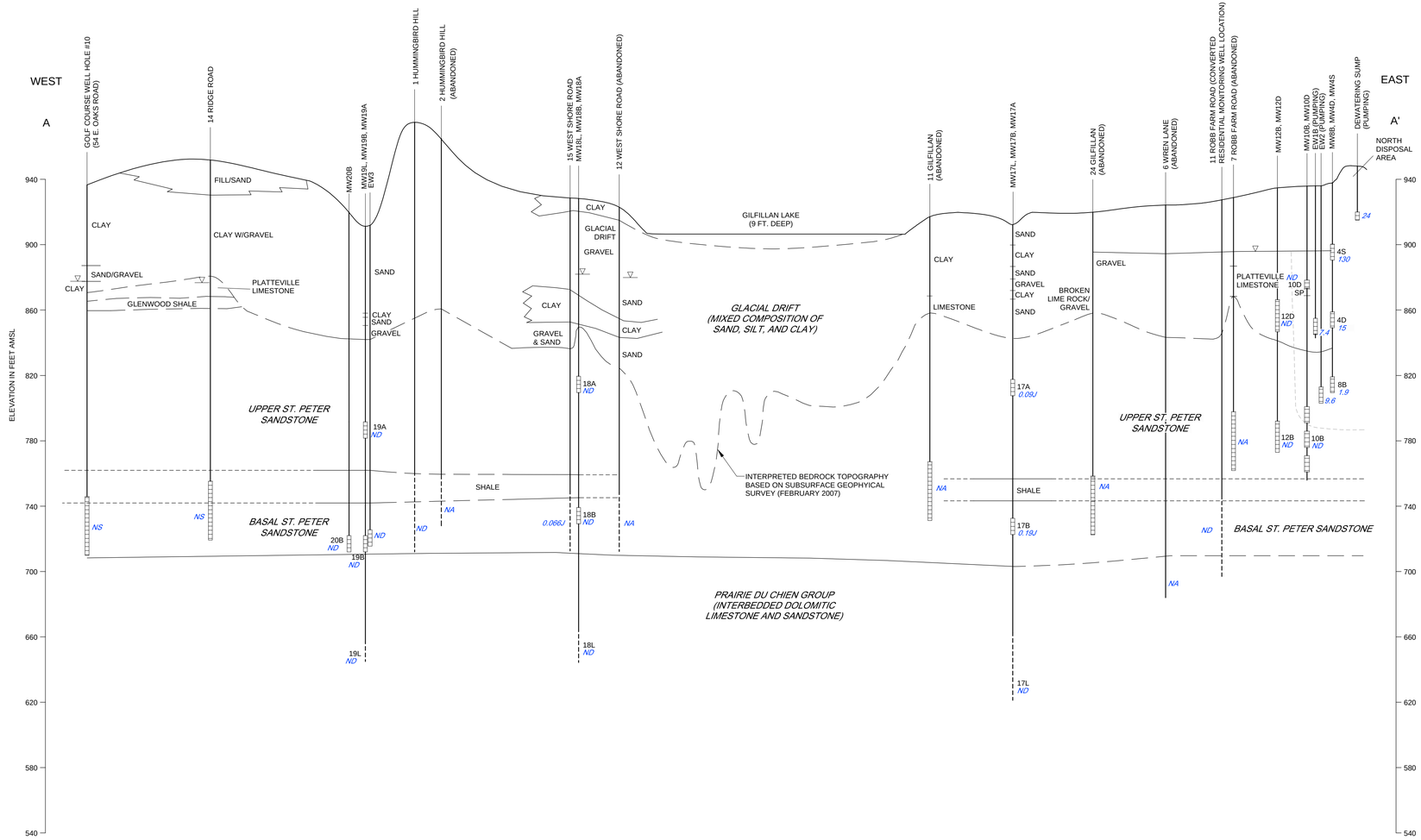
Partners in Sustainability

List of Appendices

Appendix A	Geologic Cross Sections
Appendix B	Historical Summary of Groundwater Elevations
Appendix C	Annual Monitoring Well Sampling Technical Memo
Appendix D	Documentation of Site Cleanup Levels
Appendix E	Historical Data Summary
Appendix F	Laboratory Analytical Reports and Data Quality Assessment and Validation Memos
Appendix G	Graphs of Vinyl Chloride Detections in Off Site Monitoring Well and Active Residential Well Locations

Appendix A

Geologic Cross Sections



Nº	Revision	Date	Initial

MAXIMUM VINYL CHLORIDE RESULTS (2014)

ND	NOT DETECTED
NS	NOT SAMPLED (OUTSIDE SAMPLE AREA)
NA	NOT AVAILABLE (ABANDONED)
7.4	VINYL CHLORIDE CONCENTRATION IN ug/L
J	ESTIMATED RESULT
	ESTIMATED EW1B / EW2 CAPTURE AREA

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

HIGHWAY 96 SITE

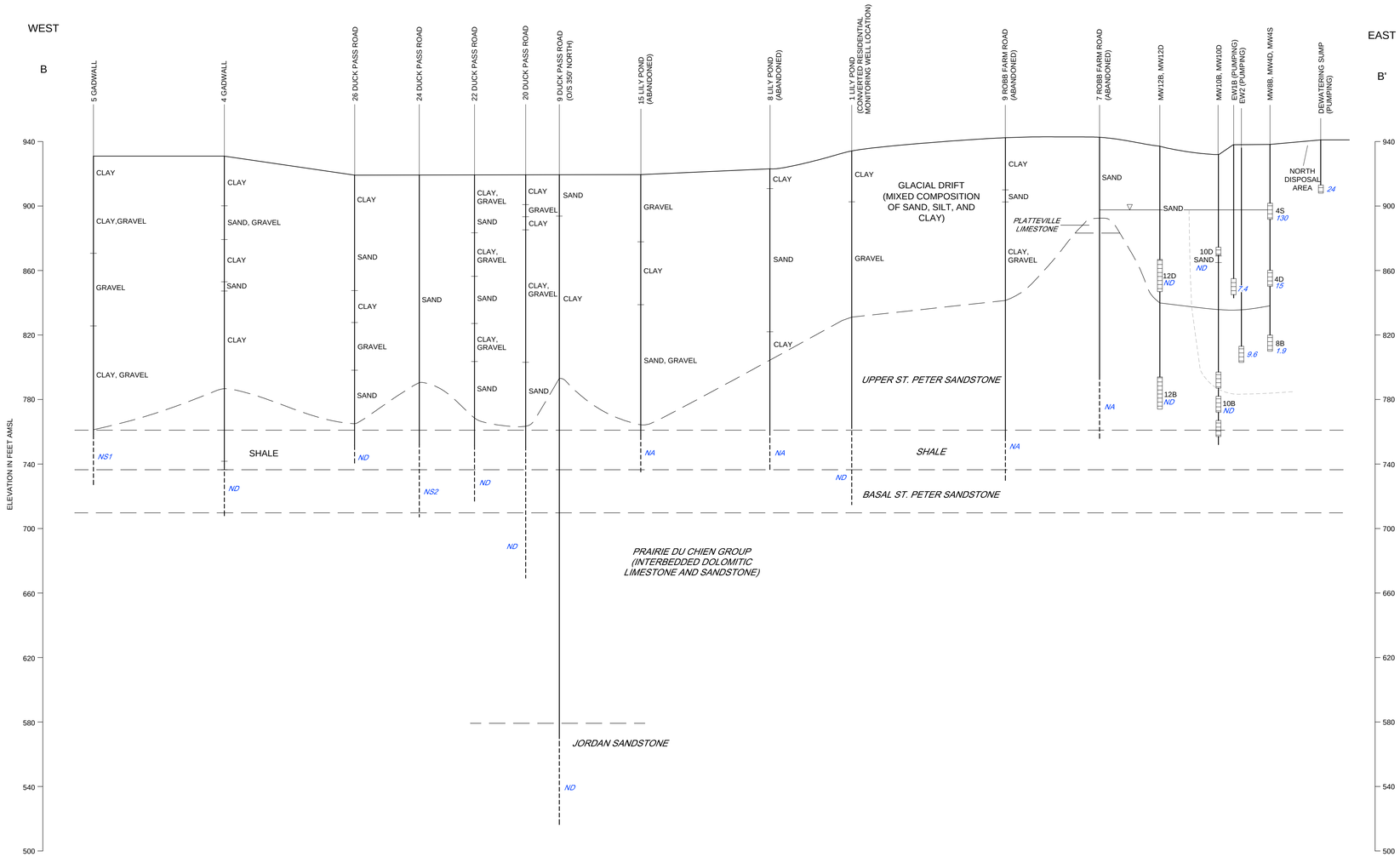
GEOLOGIC CROSS SECTION A-A'

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
S. ILLI	M. RICHIE	JANUARY 2015	
Scale: 1"=400' HOR. 1"=40' VER.	Project Nº: 02012-00	Report Nº: 065	Drawing Nº: PLAN 1

02012-00(065)GN-WA021 JAN 16/2015



Nº	Revision	Date	Initial

MAXIMUM VINYL CHLORIDE RESULTS (2014)

ND	NOT DETECTED
NS1	NOT SAMPLED (OUTSIDE SAMPLE AREA)
NS2	NOT SAMPLED (NO RESPONSE/DECLINED)
NA	NOT AVAILABLE (ABANDONED)
24	VINYL CHLORIDE CONCENTRATION IN ug/L
- - -	ESTIMATED EW1B / EW2 CAPTURE AREA

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

HIGHWAY 96 SITE

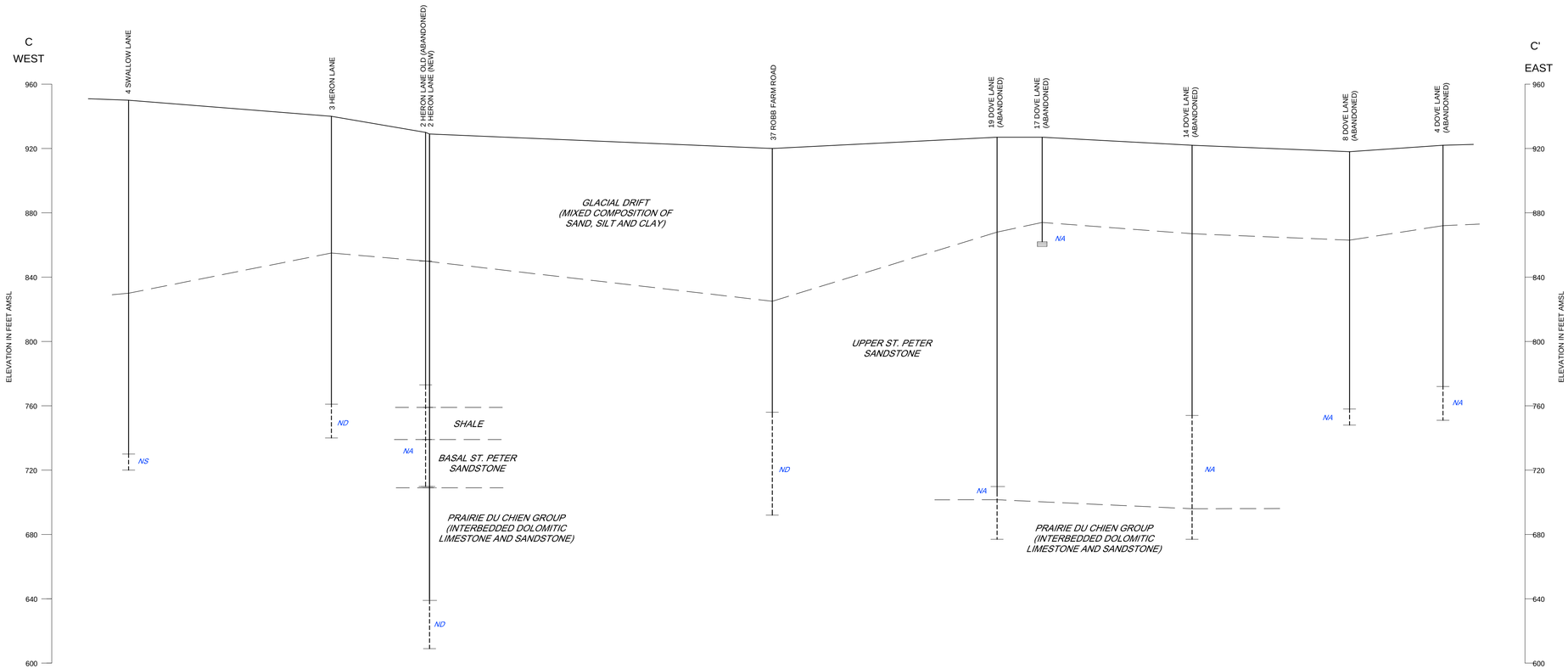
GEOLOGIC CROSS SECTION B-B'

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
S. ILLI	M. RICHIE	JANUARY 2015	
Scale: 1"=200' HOR. 1"=40' VER.	Project Nº: 02012-00	Report Nº: 065	Drawing Nº: PLAN 2

02012-00(065)GN-WA022 JAN 26/2015



Nº	Revision	Date	Initial

MAXIMUM VINYL CHLORIDE RESULTS (2014)

ND	NOT DETECTED
NS	NOT SAMPLED (OUTSIDE SAMPLE AREA)
NA	NOT AVAILABLE (ABANDONED)

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

HIGHWAY 96 SITE

GEOLOGIC CROSS SECTION C-C'

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
S. ILLI	M. RICHIE	JANUARY 2015	
Scale: 1"=200' HOR. 1"=40' VER.	Project Nº: 02012-00	Report Nº: 065	Drawing Nº: PLAN 3

02012-00(065)GN-WA022 JAN 16/2015

Appendix B

Historical Summary of Groundwater Elevations

APPENDIX B

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Location	*TOC (ft. AMSL)*	*1/15/1999 (ft. AMSL)*	*2/26/1999 (ft. AMSL)*	*3/19/1999 (ft. AMSL)*	*4/8/1999 (ft. AMSL)*	*5/13/1999 (ft. AMSL)*	*6/9/1999 (ft. AMSL)*	*7/16/1999 (ft. AMSL)*	*8/13/1999 (ft. AMSL)*	*9/17/1999 (ft. AMSL)*	*10/1/1999 (ft. AMSL)*	*11/15/1999 (ft. AMSL)*	*12/3/1999 (ft. AMSL)*	*1/17/2000 (ft. AMSL)*	*2/22/2000 (ft. AMSL)*	*2/28/2000 (ft. AMSL)*	*3/29/2000 (ft. AMSL)*	*4/28/2000 (ft. AMSL)*
Perched Groundwater Unit																		
DEWATERING SUMP*	946.71	918.51	913.53	NM	913.08	915.24	914.98	913.80	913.50	913.60	913.44	913.55	913.47	913.90	913.49	913.48	913.58	907.71
LW1	938.86	926.43	928.30	928.24	932.28	934.24	931.74	929.56	928.35	929.23	928.34	926.84	926.83	926.82	926.82	928.33	929.15	929.52
LW2	945.66	929.33	929.15	929.42	DRY	931.39	932.00	931.57	931.00	930.89	930.78	929.91	929.77	929.04	928.79	928.73	929.00	DRY
LW3	944.82	928.37	928.47	928.57	930.56	934.16	933.67	931.98	930.74	931.28	930.80	929.29	929.02	928.19	927.84	928.09	929.28	930.00
MW1S	950.65	932.67	932.68	932.67	933.79	936.10	938.14	936.40	935.20	934.58	934.27	933.42	933.14	932.47	932.00	932.11	932.40	932.30
MW4U	939.65	DRY	DRY	DRY	DRY	DRY	DRY	910.19	910.62	910.47	910.49	910.14	910.09	DRY	DRY	DRY	DRY	DRY
MW6S	948.44	926.84	926.12	925.88	926.53	928.53	931.76	930.97	930.08	929.81	929.44	928.29	927.84	926.80	926.03	926.20	926.06	926.12
MW10S	935.94	922.40	924.66	928.95	930.30	931.22	929.02	930.02	928.26	930.01	928.60	929.60	928.86	922.40	919.26	929.53	928.88	928.87
MW11S	936.34	919.49	DRY	DRY	929.43	932.19	932.30	930.88	928.34	931.12	929.33	924.70	923.48	920.32	DRY	918.51	922.29	921.89
PZ 1	941.70	934.22	934.73	935.73	937.29	939.89	937.38	936.15	935.43	935.34	935.11	934.62	934.44	933.90	933.56	936.17	934.55	934.48
PZ 2	946.11	CAP FROZEN	926.39	926.29	927.29	926.70	926.68	926.44	926.50	926.49	926.42	926.41	926.41	NM	926.38	926.38	926.37	926.38
PZ 3	947.11	927.35	927.30	927.29	927.30	927.51	927.42	927.42	927.45	927.45	927.40	927.37	927.36	927.30	927.28	927.31	927.49	927.45
PZ 4	948.16	929.80	929.89	928.54	930.03	930.07	929.98	930.80	929.82	929.92	929.84	929.79	929.76	929.64	929.52	930.00	929.98	930.02
Glacial Drift (Lower Sand) Aquifer																		
EW1*	936.66	877.68	876.59	875.93	876.14	872.10	871.31	897.35	870.67	869.55	869.05	896.86	896.98	896.67	877.99	877.01	867.76	867.94
EW1A*	938.67	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	897.30	NM	NM	NM	NM	895.89	895.39
EW1B*	939.99	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW1D	951.02	894.56	897.13	896.74	897.23	897.32	897.88	898.06	897.25	897.25	897.21	897.61	897.79	897.51	897.35	897.10	896.89	896.70
MW4S	940.33	899.08	898.49	897.92	898.19	898.16	898.81	899.82	899.42	899.35	899.45	900.15	900.44	899.92	899.68	899.20	898.46	898.19
MW4D	940.48	896.34	895.92	895.58	896.07	896.17	896.69	897.32	896.18	896.19	896.20	896.87	897.05	896.71	896.54	896.09	895.82	895.67
MW6D	948.15	897.26	896.84	896.49	896.86	896.91	897.47	897.97	897.28	897.20	897.22	897.77	897.89	897.54	897.44	897.18	896.75	896.58
MW10D	935.94	901.77	901.03	900.37	900.69	901.10	902.43	903.02	902.95	902.92	903.05	903.24	903.44	902.43	902.23	901.41	894.97	900.71
MW11D	935.40	900.19	899.49	899.06	899.72	900.49	901.49	902.19	902.31	901.57	901.57	901.29	901.32	900.53	900.14	899.87	899.48	899.24
MW12D	940.52	899.78	899.08	898.68	898.90	899.20	900.09	900.77	900.29	900.14	900.05	900.08	900.03	899.54	899.17	899.12	898.57	898.40
MW13D	937.66	898.45	897.88	897.44	897.90	898.11	898.13	899.46	898.63	898.52	898.51	898.58	898.64	898.21	898.05	897.77	897.42	897.24
MW16D	940.70	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI

APPENDIX B

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Location	*TOC (ft. AMSL)*	*1/15/1999 (ft. AMSL)*	*2/26/1999 (ft. AMSL)*	*3/19/1999 (ft. AMSL)*	*4/8/1999 (ft. AMSL)*	*5/13/1999 (ft. AMSL)*	*6/9/1999 (ft. AMSL)*	*7/16/1999 (ft. AMSL)*	*8/13/1999 (ft. AMSL)*	*9/17/1999 (ft. AMSL)*	*10/1/1999 (ft. AMSL)*	*11/15/1999 (ft. AMSL)*	*12/3/1999 (ft. AMSL)*	*1/17/2000 (ft. AMSL)*	*2/22/2000 (ft. AMSL)*	*2/28/2000 (ft. AMSL)*	*3/29/2000 (ft. AMSL)*	*4/28/2000 (ft. AMSL)*
Upper St. Peter Sandstone Aquifer																		
EW2*	938.67	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW7B	942.91	898.66	898.21	897.78	898.27	898.30	898.85	898.96	898.15	898.31	898.30	898.59	898.80	898.48	898.31	898.12	897.89	897.76
MW8B	940.91	896.22	895.81	895.47	895.99	896.04	896.59	897.20	896.05	896.08	896.07	896.76	896.89	896.64	896.24	895.99	895.69	895.52
MW10B	936.64	896.21	895.80	895.46	895.96	896.04	896.58	897.07	896.00	896.01	896.02	896.66	896.80	896.52	896.25	895.96	901.63	895.50
MW12B	939.89	896.19	895.74	895.42	895.90	895.97	896.53	895.92	895.89	895.92	895.91	896.47	896.64	896.34	896.12	895.87	895.58	895.33
MW13B	938.34	896.05	895.58	895.29	895.77	895.85	896.42	896.68	895.76	895.78	895.77	896.23	896.36	896.09	895.89	895.66	895.42	895.18
MW16B	940.71	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW17A	914.58	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW18A	925.39	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW19A	913.56	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW21A	909.03	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Basal St. Peter Sandstone Aquifer																		
EW3	913.88	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW17B	914.50	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW18B	925.24	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW19B	913.33	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW20B	915.04	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
1 Lily Pond Road #	931.18	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
11 Lily Pond Road #	928.54	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
11 Robb Farm Road #	942.63	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
6 Blue Goose Road #	954.15	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
6 West Shore Road ^	920.20	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
38 East Oaks Road ^	926.25	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Prairie du Chien Aquifer																		
MW17L	914.65	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW18L	925.44	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW19L	914.18	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI

APPENDIX B

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Location	*TOC (ft. AMSL)*	*5/26/2000 (ft. AMSL)*	*6/28/2000 (ft. AMSL)*	*7/26/2000 (ft. AMSL)*	*8/31/2000 (ft. AMSL)*	*9/21/2000 (ft. AMSL)*	*10/2/2000 (ft. AMSL)*	*11/17/2000 (ft. AMSL)*	*12/13/2000 (ft. AMSL)*	*1/9/2001 (ft. AMSL)*	*2/28/2001 (ft. AMSL)*	*3/16/2001 (ft. AMSL)*	*4/23/2001 (ft. AMSL)*	*5/31/2001 (ft. AMSL)*	*8/3/2001 (ft. AMSL)*	*10/1/2001 (ft. AMSL)*	*2/7/2002 (ft. AMSL)*	*5/29/2002 (ft. AMSL)*
Perched Groundwater Unit																		
DEWATERING SUMP*	946.71	913.41	914.17	913.47	907.87	913.69	913.53	916.54	917.85	918.84	914.36	913.59	916.38	918.96	920.97	921.86	914.84	916.27
LW1	938.86	928.26	928.31	928.33	928.20	928.05	928.28	929.79	928.33	928.21	928.17	928.66	934.86	931.90	929.17	928.30	928.38	931.02
LW2	945.66	DRY	929.86	929.59	DRY	DRY	DRY	DRY	DRY	<929.42	DRY	<929.31	932.81	933.07	931.96	931.91	932.44	933.71
LW3	944.82	929.54	930.44	929.92	928.80	929.55	929.40	930.83	930.28	929.24	928.44	928.54	937.48	934.61	931.61	929.46	929.22	933.98
MW1S	950.65	932.30	932.40	932.16	931.74	931.86	931.72	932.08	932.04	931.59	931.15	931.09	931.33	938.72	935.66	933.36	932.05	937.84
MW4U	939.65	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	<909.32	<909.37	< 909.6	DRY	< 909.6	910.21	910.79	909.83	910.39
MW6S	948.44	926.21	927.68	928.00	927.45	927.34	927.21	926.86	926.83	926.44	925.79	925.53	929.51	933.62	932.57	931.05	928.07	930.01
MW10S	935.94	928.28	928.11	927.49	924.71	927.84	926.09	928.49	927.83	923.71	919.70	919.86	932.63	931.60	929.93	928.93	923.99	931.13
MW11S	936.34	920.23	923.74	923.11	919.62	925.41	923.70	923.55	921.19	918.91	<918.60	<918.6	932.68	932.04	930.53	923.91	918.77	932.18
PZ 1	941.70	933.76	933.83	933.49	932.97	933.45	933.25	934.27	933.59	933.13	933.33	933.35	940.76	937.80	935.12	934.01	933.48	937.18
PZ 2	946.11	926.33	926.51	NM	926.51	926.50	926.51	927.35	CAP FROZEN	926.56	CAP FROZEN	926.45	926.56	926.78	926.75	926.72	926.54	926.72
PZ 3	947.11	927.36	927.38	927.39	927.48	927.48	927.46	930.14	929.66	929.38	929.01	928.97	931.66	930.28	929.95	929.91	929.59	928.98
PZ 4	948.16	929.98	929.96	929.90	929.85	929.95	929.89	930.05	929.99	928.40	929.81	929.83	930.11	DRY	DRY	DRY	DRY	DRY
Glacial Drift (Lower Sand) Aquifer																		
EW1*	936.66	881.52	882.21	883.24	884.50	894.15	894.51	884.80	884.20	883.80	884.13	883.78	883.95	884.02	NM	887.18	884.26	880.00
EW1A*	938.67	879.98	NM	NM	878.59	878.98	879.18	887.37	887.56	886.98	888.31	888.22	889.77	890.18	888.91	889.19	894.92	880.39
EW1B*	939.99	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW1D	951.02	896.10	896.01	895.62	895.25	895.26	895.26	895.10	895.21	895.14	895.34	895.04	896.39	896.85	896.22	896.01	896.60	897.05
MW4S	940.33	897.43	897.28	896.81	896.39	896.25	896.40	895.93	896.01	895.91	896.01	895.73	896.63	897.68	898.55	898.52	898.16	898.20
MW4D	940.48	894.89	894.93	894.43	894.18	894.35	894.39	893.90	893.98	893.87	894.02	893.84	895.16	895.71	895.00	894.78	895.46	895.72
MW6D	948.15	895.96	895.88	895.35	894.91	895.04	895.14	894.71	894.78	894.72	894.85	894.66	895.65	896.43	896.35	896.08	896.39	896.63
MW10D	935.94	900.10	900.42	900.02	899.79	899.86	900.12	899.19	899.25	899.04	898.86	898.57	899.54	901.02	901.97	901.49	901.37	902.37
MW11D	935.40	898.59	898.83	898.36	896.84	898.16	898.22	897.68	897.64	897.37	897.28	896.89	898.79	900.03	900.25	899.39	898.93	900.53
MW12D	940.52	898.04	897.91	897.60	897.19	897.14	897.20	896.68	896.76	896.67	896.51	896.32	897.22	898.51	899.52	898.94	898.56	899.40
MW13D	937.66	896.71	896.73	896.29	895.94	895.91	895.94	895.54	895.65	895.48	895.48	895.21	896.77	898.04	898.41	897.92	897.84	899.16
MW16D	940.70	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI

APPENDIX B

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Location	*TOC (ft. AMSL)*	*5/26/2000 (ft. AMSL)*	*6/28/2000 (ft. AMSL)*	*7/26/2000 (ft. AMSL)*	*8/31/2000 (ft. AMSL)*	*9/21/2000 (ft. AMSL)*	*10/2/2000 (ft. AMSL)*	*11/17/2000 (ft. AMSL)*	*12/13/2000 (ft. AMSL)*	*1/9/2001 (ft. AMSL)*	*2/28/2001 (ft. AMSL)*	*3/16/2001 (ft. AMSL)*	*4/23/2001 (ft. AMSL)*	*5/31/2001 (ft. AMSL)*	*8/3/2001 (ft. AMSL)*	*10/1/2001 (ft. AMSL)*	*2/7/2002 (ft. AMSL)*	*5/29/2002 (ft. AMSL)*
Upper St. Peter Sandstone Aquifer																		
EW2*	938.67	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW7B	942.91	897.21	897.09	896.76	896.39	896.30	896.33	896.16	896.29	896.24	896.40	896.10	897.34	897.80	897.29	897.08	897.60	898.05
MW8B	940.91	894.76	894.66	894.30	894.03	894.22	894.26	893.80	893.83	893.77	893.93	893.71	895.01	895.56	894.92	894.64	895.31	895.57
MW10B	936.64	894.76	894.83	894.27	894.00	894.23	894.18	893.78	893.86	893.78	893.92	893.72	895.08	895.60	894.93	894.64	895.28	895.62
MW12B	939.89	894.69	894.72	894.21	893.90	894.09	894.05	893.71	893.86	893.73	893.89	893.63	895.01	895.53	894.84	894.60	895.21	894.90
MW13B	938.34	894.58	894.54	894.05	893.73	893.90	893.84	893.59	893.68	893.62	893.73	893.52	894.93	895.48	894.76	894.51	895.09	895.55
MW16B	940.71	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW17A	914.58	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW18A	925.39	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW19A	913.56	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW21A	909.03	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Basal St. Peter Sandstone Aquifer																		
EW3	913.88	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW17B	914.50	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW18B	925.24	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW19B	913.33	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW20B	915.04	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
1 Lily Pond Road #	931.18	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
11 Lily Pond Road #	928.54	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
11 Robb Farm Road #	942.63	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
6 Blue Goose Road #	954.15	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
6 West Shore Road ^	920.20	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
38 East Oaks Road ^	926.25	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Prairie du Chien Aquifer																		
MW17L	914.65	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW18L	925.44	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW19L	914.18	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI

APPENDIX B

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Location	*TOC (ft. AMSL)*	*8/8/2002 (ft. AMSL)*	*9/30/2002 (ft. AMSL)*	*1/6/2003 (ft. AMSL)*	*5/20/2003 (ft. AMSL)*	*9/18/2003 (ft. AMSL)*	*10/13/2003 (ft. AMSL)*	*10/18/2004 (ft. AMSL)*	*11/14/2005 (ft. AMSL)*	*10/16/2006 (ft. AMSL)*	*10/1/2007 (ft. AMSL)*	*10/6/2008 (ft. AMSL)*	*12/14/2009 (ft. AMSL)*	*10/11/2010 (ft. AMSL)*	*10/10/2011 (ft. AMSL)*	*10/1/2012 (ft. AMSL)*	*9/30/2013 (ft. AMSL)*	*10/6/2014 (ft. AMSL)*
Perched Groundwater Unit																		
DEWATERING SUMP*	946.71	913.96	913.61	915.61	919.49	921.30	920.14	917.31	921.92	926.35	923.60	924.91	923.21	919.71	921.48	918.52	920.58	924.75
LW1	938.86	931.13	930.64	928.34	932.72	928.31	928.18	927.67	929.58	926.75	931.06	927.01	DRY	929.75	928.26	927.95	928.06	932.20
LW2	945.66	934.11	933.40	932.15	934.69	933.66	933.45	933.61	932.88	933.56	933.50	932.58	932.64	931.86	932.62	931.61	931.91	933.44
LW3	944.82	934.76	932.86	930.46	935.65	930.25	929.33	929.80	932.08	930.57	930.91	928.33	929.96	930.85	930.79	928.40	928.86	933.21
MW1S	950.65	939.37	935.46	933.59	938.26	933.23	932.40	932.74	932.97	931.85	931.03	931.63	930.33	931.52	933.96	931.67	932.74	933.31
MW4U	939.65	912.00	912.63	911.43	910.50	912.30	911.90	911.81	911.97	911.80	DRY	909.88	DRY	909.86	913.36	910.24	911.11	914.40
MW6S	948.44	930.06	928.62	927.03	931.48	928.96	928.62	928.90	930.05	930.11	930.99	928.05	928.43	927.94	930.47	928.22	929.66	931.29
MW10S	935.94	931.40	931.08	928.66	931.36	924.92	926.66	927.81	931.39	928.99	931.13	DRY	927.69	929.74	928.71	919.89	920.18	930.74
MW11S	936.34	932.72	932.43	928.35	932.60	925.64	923.50	924.39	931.86	928.15	931.49	920.62	920.32	931.08	928.20	922.34	923.49	932.36
PZ 1	941.70	937.35	934.73	933.03	939.52	933.09	932.64	933.11	933.95	932.73	932.84	932.05	932.36	932.45	933.39	931.67	932.29	933.59
PZ 2	946.11	926.70	926.62	926.55	926.20	927.56	926.52	926.56	926.53	928.02	927.04	928.40	926.68	926.57	928.47	926.62	926.62	930.77
PZ 3	947.11	928.73	928.57	928.31	928.16	928.18	928.09	927.90	927.85	929.30	928.93	929.21	929.06	928.66	929.58	928.75	928.42	930.35
PZ 4	948.16	930.78	930.64	930.57	930.32	930.64	930.59	930.64	930.65	930.65	930.65	930.68	930.65	DRY	930.65	930.68	930.68	930.75
Glacial Drift (Lower Sand) Aquifer																		
EW1*	936.66	877.62	887.66	897.35	897.42	895.95	896.11	895.60	891.88	894.36	891.64	892.16	891.96	891.26	894.96	891.26	893.84	896.94
EW1A*	938.67	880.66	877.35	875.58	870.07	859.92	858.50	860.91	857.22	856.97	865.22	861.67	871.43	891.79	895.28	892.74	894.22	897.31
EW1B*	939.99	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	888.44	894.88	889.43	891.04	893.42
MW1D	951.02	898.01	898.92	898.99	899.04	897.47	897.56	897.04	896.63	895.81	893.55	893.91	893.26	892.13	896.08	894.04	895.55	898.74
MW4S	940.33	899.29	900.46	901.07	900.26	900.05	900.12	898.93	898.48	898.36	894.43	895.39	893.51	894.58	899.26	897.09	898.27	902.57
MW4D	940.48	896.80	897.89	897.96	898.02	896.46	896.96	896.06	895.58	894.64	892.30	892.45	892.17	891.93	895.06	892.91	894.39	897.53
MW6D	948.15	897.63	898.54	898.92	898.72	897.52	897.71	897.02	896.67	896.02	893.38	893.72	893.15	893.23	896.68	894.62	895.95	898.94
MW10D	935.94	904.27	905.36	904.68	904.09	903.49	903.41	902.48	903.74	902.61	898.80	899.92	897.05	898.59	903.43	900.50	901.00	904.50
MW11D	935.40	902.09	903.27	902.90	902.84	901.49	901.30	900.66	901.56	900.50	896.83	897.06	894.94	896.46	901.03	897.98	899.22	903.70
MW12D	940.52	901.38	902.21	902.10	901.17	900.60	900.32	NO ACCESS	899.38	898.63	896.17	896.89	895.62	894.68	900.48	897.80	899.27	902.75
MW13D	937.66	900.72	901.27	900.70	901.09	899.59	899.55	NO ACCESS	898.88	897.69	895.26	895.88	894.35	894.10	898.87	896.35	898.28	901.56
MW16D	940.70	NI	NI	NI	NI	NI	NI	NI	896.38	895.49	893.10	893.15	892.79	892.70	895.84	893.55	895.05	898.35

APPENDIX B

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Location	*TOC (ft. AMSL)*	*8/8/2002 (ft. AMSL)*	*9/30/2002 (ft. AMSL)*	*1/6/2003 (ft. AMSL)*	*5/20/2003 (ft. AMSL)*	*9/18/2003 (ft. AMSL)*	*10/13/2003 (ft. AMSL)*	*10/18/2004 (ft. AMSL)*	*11/14/2005 (ft. AMSL)*	*10/16/2006 (ft. AMSL)*	*10/1/2007 (ft. AMSL)*	*10/6/2008 (ft. AMSL)*	*12/14/2009 (ft. AMSL)*	*10/11/2010 (ft. AMSL)*	*10/10/2011 (ft. AMSL)*	*10/1/2012 (ft. AMSL)*	*9/30/2013 (ft. AMSL)*	*10/6/2014 (ft. AMSL)*
Upper St. Peter Sandstone Aquifer																		
EW2*	938.67	NI	NI	NI	NI	NI	NI	NI	NM	851.37	851.76	830.76	844.88	838.11	829.96	855.39	892.30	895.08
MW7B	942.91	898.98	899.83	899.89	899.67	898.49	898.54	898.06	897.67	896.90	894.65	894.69	894.29	894.28	897.41	895.40	896.71	899.80
MW8B	940.91	896.65	897.77	897.84	897.88	896.34	896.77	895.92	895.44	894.51	892.12	892.26	892.01	891.74	892.87	892.72	894.24	897.38
MW10B	936.64	896.71	897.77	897.86	897.93	896.33	896.77	895.94	895.49	894.51	892.21	892.32	892.04	891.76	894.88	892.66	894.27	897.45
MW12B	939.89	896.68	897.70	897.80	897.87	896.24	896.35	NO ACCESS	895.42	894.46	892.18	892.28	891.95	891.71	894.82	892.68	894.20	897.41
MW13B	938.34	896.66	897.61	897.67	897.76	896.10	896.22	NO ACCESS	895.32	894.37	892.13	892.23	891.89	891.64	894.77	892.59	894.14	897.36
MW16B	940.71	NI	NI	NI	NI	NI	NI	NI	895.84	894.94	892.59	892.72	892.42	892.16	895.24	893.08	894.61	897.85
MW17A	914.58	NI	NI	NI	NI	NI	NI	NI	893.22	892.13	890.11	890.16	889.78	889.55	892.56	890.51	892.03	895.36
MW18A	925.39	NI	NI	NI	NI	NI	NI	NI	NI	NI	885.63	885.88	885.39	885.21	888.49	886.64	887.96	891.15
MW19A	913.56	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	882.33	881.79	881.75	885.61	883.82	884.96	887.92
MW21A	909.03	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	882.51	882.01	881.96	885.80	884.01	885.20	887.90
Basal St. Peter Sandstone Aquifer																		
EW3	913.88	NI	NI	NI	NI	NI	NI	NI	NI	NI	877.14	877.16	878.33	877.05	879.68	877.15	879.48	882.57
MW17B	914.50	NI	NI	NI	NI	NI	NI	NI	886.53	885.09	883.28	883.10	884.25	882.56	884.78	881.67	884.21	888.54
MW18B	925.24	NI	NI	NI	NI	NI	NI	NI	NI	NI	883.73	883.83	883.58	882.06	885.05	882.39	883.85	887.92
MW19B	913.33	NI	NI	NI	NI	NI	NI	NI	NI	878.79	876.90	876.92	877.91	876.65	879.43	876.90	878.67	882.43
MW20B	915.04	NI	NI	NI	NI	NI	NI	NI	NI	NI	876.66	876.64	877.97	877.00	879.83	877.27	879.16	882.19
1 Lily Pond Road #	931.18	NM	NM	NM	NM	NM	NM	NM	NM	892.13	884.25	890.31	890.98	883.69	892.68	890.58	892.24	895.72
11 Lily Pond Road #	928.54	NM	NM	NM	NM	NM	NM	NM	NM	885.73	884.20	884.20	885.01	883.87	885.94	883.01	885.31	889.63
11 Robb Farm Road #	942.63	NM	NM	NM	NM	NM	NM	NM	NM	892.58	890.56	890.63	890.31	890.08	893.14	891.00	892.58	895.85
6 Blue Goose Road #	954.15	NM	NM	NM	NM	NM	NM	NM	NM	890.85	886.20	886.12	886.90	885.57	887.63	884.55	887.26	891.56
6 West Shore Road ^	920.20	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	880.62	881.12	880.01	882.80	880.18	881.85	886.03
38 East Oaks Road ^	926.25	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	879.73	881.04	879.20	881.82	878.73	880.77	885.36
Prairie du Chien Aquifer																		
MW17L	914.65	NI	NI	NI	NI	NI	NI	NI	883.16	880.77	878.79	879.27	881.31	878.52	880.70	876.63	879.25	885.18
MW18L	925.44	NI	NI	NI	NI	NI	NI	NI	NI	NI	875.54	875.53	878.39	874.85	877.31	873.29	875.92	881.19
MW19L	914.18	NI	NI	NI	NI	NI	NI	NI	NI	874.40	872.50	872.28	875.15	872.64	875.26	871.40	873.65	878.47

Notes:

TOC - Top of Casing
ft. AMSL - Feet Above Mean Sea Level
NM - Not Measured
NI - Not Installed
* - Historical/Current Pumping Well
# - Converted Residential Monitoring Well
^ - Active Residential Well

Appendix C

Annual Monitoring Well Sampling Technical Memo

CONESTOGA-ROVERS & ASSOCIATES

1801 Old Highway 8 NW, Suite #114
St. Paul, Minnesota 55112
Telephone: (651) 639-0913 Fax: (651) 639-0923
www.CRAworld.com

MEMORANDUM

TO:	File	REF. NO.:	002012
FROM:	Michael Richie/sb/14 MLR	DATE:	March 13, 2015
CC:	Sarah Illi, CRA		
RE:	**2014 Annual Monitoring Well Sampling Event** **Highway 96 Site White Bear Township, Minnesota**		

Ryan Aamot, Matthew Barnes, and Michael Richie conducted the 2014 Annual Monitoring Well Sampling Event at the Highway 96 Site (Site) from October 6 – October 9, 2014. Additionally, quarterly discharge sampling at extraction wells EW-1B, EW-2 and the Dewatering Sump was conducted by Michael Richie on October 8, 2014. Sampling was conducted in accordance with CRA's "Annual Monitoring Well Sampling Event" letter, which was submitted to the Minnesota Pollution Control Agency (MPCA) on September 10, 2014.

On October 6, 2014, water levels were measured at each monitoring well, the four converted residential monitoring wells, and two active residential monitoring wells, prior to sampling. The groundwater elevations for 2014 are summarized in Table 1.

A sampling summary associated with the October 2014 Annual Monitoring Well Sampling Event is provided in Table 2. Low-flow purging records are included in Attachment A.

Each monitoring location was sampled for analysis of Volatile Organic Compounds (VOCs) and chloride. Samples collected from off-Site monitoring locations (MW-17A, MW-17B, MW-17L, MW-18A, MW-18B, MW-18L, MW-19A, MW-19B, MW-19L, MW-20B, MW-21A, EW-3, and the four converted residential monitoring wells) were submitted to TestAmerica Laboratories in Buffalo, New York for analysis of low-level VOCs (Method 524.2) and chloride (Method 300.0A). Samples collected from on-Site monitoring locations were sent to TestAmerica Laboratories in North Canton, Ohio for analysis of VOCs (Method 8260B) and chloride (300.0A). Additionally, samples collected from EW-1B, EW-2, and the Dewatering Sump were sent to TestAmerica Laboratories in North Canton, Ohio for analysis of pH (Method 150.1), TSS (Method 160.2), and Chemical Oxygen Demand (Method 410.4).

Four duplicates, three rinsate blanks, one field blank, and two matrix spike/matrix duplicate sample sets were collected to fulfill QA/QC requirements. Trip blanks were also submitted with coolers containing VOC samples.

Due to laboratory error (sample container loss), monitoring wells MW-17A, MW-17B, MW-17L, MW-18A, MW-18B, MW-18L, 6 Blue Goose Road, 1 Lily Pond Road, 11 Lily Pond Road, and 11 Robb Farm Road were resampled for VOCs (Method 524.2) on October 27 – 28, 2014.

The appropriate equipment requisition forms and field data record forms were completed and filed accordingly.

TABLE 1

2014 GROUNDWATER ELEVATIONS
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Location	***TOC (ft. AMSL)***	***10/6/2014 WL (ft BTOC)***	***10/6/2014 (ft. AMSL)***
Perched Groundwater Unit			
DEWATERING SUMP * *(On)*	946.71	21.96	924.75
LW1	938.86	6.66	932.20
LW2	945.66	12.22	933.44
LW3	944.82	11.61	933.21
MW1S	950.65	17.34	933.31
MW4U	939.65	25.25	914.40
MW6S	948.44	17.15	931.29
MW10S	935.94	5.20	930.74
MW11S	936.34	3.98	932.36
P1	941.70	8.11	933.59
P2	946.11	15.34	930.77
P3	947.11	16.76	930.35
P4	948.16	17.41	930.75
Glacial Drift (Lower Sand) Aquifer			
EW1	936.66	39.72	896.94
EW1A	938.67	41.36	897.31
EW1B * *(On)*	939.99	46.57	893.42
MW1D	951.02	52.28	898.74
MW4S	940.33	37.76	902.57
MW4D	940.48	42.95	897.53
MW6D	948.15	49.21	898.94
MW10D	935.94	31.44	904.50
MW11D	935.40	31.70	903.70
MW12D	940.52	37.77	902.75
MW13D	937.66	36.10	901.56
MW16D	940.70	42.35	898.35

TABLE 1

2014 GROUNDWATER ELEVATIONS
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Location	***TOC (ft. AMSL)***	***10/6/2014 WL (ft BTOC)***	***10/6/2014 (ft. AMSL)***
Upper St. Peter Sandstone Aquifer			
EW2 * *(On)*	938.67	43.59	895.08
MW7B	942.91	43.11	899.80
MW8B	940.91	43.53	897.38
MW10B	936.64	39.19	897.45
MW12B	939.89	42.48	897.41
MW13B	938.34	40.98	897.36
MW16B	940.71	42.86	897.85
MW17A	914.58	19.22	895.36
MW18A	925.39	34.24	891.15
MW19A	913.56	25.64	887.92
MW21A	909.03	21.13	887.90
Basal St. Peter Sandstone Aquifer			
EW3	913.88	31.31	882.57
MW17B	914.50	25.96	888.54
MW18B	925.24	37.32	887.92
MW19B	913.33	30.90	882.43
MW20B	915.04	32.85	882.19
1 Lily Pond Road #	931.18	35.46	895.72
11 Lily Pond Road #	928.54	38.91	889.63
11 Robb Farm Road #	942.63	46.78	895.85
6 Blue Goose Road #	954.15	62.59	891.56
6 West Shore Road ^	920.20	34.17	886.03
38 East Oaks Road ^	926.25	40.89	885.36

TABLE 1

2014 GROUNDWATER ELEVATIONS
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Location	***TOC (ft. AMSL)***	***10/6/2014 WL (ft BTOC)***	***10/6/2014 (ft. AMSL)***
Prairie du Chien Aquifer			
MW17L	914.65	29.47	885.18
MW18L	925.44	44.25	881.19
MW19L	914.18	35.71	878.47

Notes:

TOC - Top of Casing
WL - Water Level
ft. AMSL - Feet Above Mean Sea Level
ft. BTOC - Feet Below Top of Casing
* - Pumping Well
- Dewatering Sump pumping at a rate of approximately 4.9 gpm
- EW1B pumping at a rate of approximately 10.2 gpm
- EW2 pumping at a rate of approximately 9.9 gpm
- Converted Residential Monitoring Well
^ - Active Residential Well

TABLE 2

MONITORING WELL SAMPLING SUMMARY
OCTOBER 2014
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Well	*Sample No.*	*QA/QC*	*Temperature (ºC)*	*pH*	*Conductivity (mS/cm)*	*DO (mg/L)*	*ORP (mV)*	*Turbidity (NTU)*	*Observations*	*Analytical*
MW1D	W-141008-RA-29	--	11.03	7.82	0.681	1.37	-191	59.2	Clear	P1,P2
MW1S	W-141008-RA-28	--	12.65	7.27	0.857	0.00	-111	127	Cloudy	P1,P2
MW4D	W-141009-RA-39	--	10.61	7.65	1.790	0.37	-202	50.1	Clear	P1,P2
MW4S	W-141009-RA-36	--	10.56	7.25	1.73	0.49	-157	104	Clear	P1,P2
MW4U	W-141009-RA-40	--	9.51	7.52	1.5	4.44	-139	129	Cloudy	P1,P2
MW8B	W-141009-RA-37	DUP (-38)	10.59	7.74	0.753	0.00	-217	0.9	Clear	P1,P2
MW10B	W-141009-RA-32	--	8.91	7.59	0.617	0.23	-142	13.6	Clear	P1,P2
MW10D	W-141009-RA-31	--	10.09	11.35	0.605	0.00	-228	47.1	Clear	P1,P2
MW11D	W-141009-RA-34	R.B. (-33)	10.17	8.20	0.562	0.55	-239	30.8	Clear	P1,P2
MW12B	W-141008-RA-24	--	10.70	7.47	0.568	8.52	-212	2.8	Clear	P1,P2
MW12D	W-141008-RA-23	--	9.85	7.31	0.949	0.39	-159	71.0	Clear	P1,P2
MW13B	W-141007-RA-22	--	10.80	7.47	0.589	0.80	-192	14.2	Clear	P1,P2
MW13D	W-141007-RA-21	--	11.41	7.84	0.822	7.17	-231	4.5	Clear	P1,P2
MW16B	W-141008-RA-25	DUP (-26)	10.73	7.76	0.668	0.13	-196	11.6	Clear	P1,P2
MW16D	W-141008-RA-27	--	11.20	7.02	0.776	0.32	-164	9.8	Clear	P1,P2
MW17A	W-141007-RA-14	--	9.94	7.39	0.876	0.14	-192	4.2	Clear	P1
MW17A	W-141027-RA-14	--	8.82	7.55	0.805	1.20	-188	0.0	Clear	P3
MW17B	W-141007-RA-16	R.B. (-15)	10.43	7.87	0.587	5.58	-228	47.9	Clear	P1
MW17B	W-141027-RA-16	R.B. (-15)	8.90	7.96	0.612	0.14	-198	302	Cloudy	P3
MW17L	W-141007-RA-13	--	10.48	7.40	0.508	0.84	-100	0.0	Clear	P1
MW17L	W-141027-RA-13	--	10.74	9.77	0.223	0.57	-181	4.9	Clear	P3

TABLE 2

MONITORING WELL SAMPLING SUMMARY
OCTOBER 2014
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Well	*Sample No.*	*QA/QC*	*Temperature (ºC)*	*pH*	*Conductivity (mS/cm)*	*DO (mg/L)*	*ORP (mV)*	*Turbidity (NTU)*	*Observations*	*Analytical*
MW18A	W-141007-RA-12	--	11.46	7.57	0.886	0.22	-216	7.5	Clear	P1
MW18A	W-141027-RA-12	--	11.30	7.80	0.848	0.23	-180	17.0	Clear	P3
MW18B	W-141007-RA-10	MS/MSD	10.81	7.67	0.678	0.22	-183	12.9	Clear	P1
MW18B	W-141027-RA-10	MS/MSD	11.09	7.78	0.661	0.22	-187	23.9	Clear	P3
MW18L	W-141007-RA-11	--	11.37	7.37	0.523	0.00	-105	14.5	Clear	P1
MW18L	W-141027-RA-11	--	9.53	8.44	0.517	1.94	-25	23.1	Clear	P3
MW19A	W-141006-RA-04	--	9.62	7.80	0.784	0.11	-210	7.0	Clear	P1,P3
MW19B	W-141006-RA-05	--	9.60	7.71	0.565	0.00	-177	4.9	Clear	P1,P3
MW19L	W-141006-RA-03	R.B. (-02)	9.61	7.35	0.500	0.00	-105	5.0	Clear	P1,P3
MW20B	W-141006-RA-07	DUP (-08)	10.19	8.05	0.581	0.13	-222	4.3	Clear	P1,P3
MW21A	W-141006-RA-01	--	8.12	8.19	0.451	3.89	-222	40.0	Clear	P1,P3
LW1	W-141008-RA-30	--	15.67	6.66	1.57	1.85	-54	50.2	Clear	P1,P2
LW2	W-141009-RA-35	MS/MSD	12.92	6.66	0.149	4.37	-91	460	Cloudy	P1,P2
LW3	W-141009-RA-41	F.B. (-42)	15.07	7.03	1.470	0.00	-123	4.2	Clear	P1,P2
1 Lily Pond #	W-141007-RA-17	--	10.01	7.67	0.674	0.21	-202	3.8	Clear	P1
1 Lily Pond #	W-141028-RA-17	--	9.72	7.67	0.664	0.15	-180	4.2	Clear	P3
11 Lily Pond #	W-141006-RA-09	--	10.28	7.61	0.546	0.17	-181	3.3	Clear	P1
11 Lily Pond #	W-141027-RA-09	--	10.36	7.57	0.539	0.20	-131	4.2	Clear	P3
11 Robb Farm #	W-141007-RA-20	--	10.96	7.59	0.581	0.13	-183	8.7	Clear	P1
11 Robb Farm #	W-141027-RA-20	--	11.29	7.71	0.569	0.18	-171	53.9	Clear	P3
6 Blue Goose #	W-141007-RA-18	DUP (-19)	10.12	7.44	0.623	0.15	-149	4.8	Clear	P1

TABLE 2

MONITORING WELL SAMPLING SUMMARY
OCTOBER 2014
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Well	*Sample No.*	*QA/QC*	*Temperature (ºC)*	*pH*	*Conductivity (mS/cm)*	*DO (mg/L)*	*ORP (mV)*	*Turbidity (NTU)*	*Observations*	*Analytical*
6 Blue Goose #	W-141027-RA-18	DUP (-19)	10.24	7.59	0.633	0.18	-138	4.2	Clear	P3
EW1B	W-141008-MLR-01	--	NM	NM	NM	NM	NM	NM	NR	P1,P2,P4
EW2	W-141008-MLR-02	--	NM	NM	NM	NM	NM	NM	NR	P1,P2,P4
EW3	W-141006-RA-06	--	9.75	7.33	0.605	4.33	-145	11.4	Clear	P1,P3
DEWATERING SUMP	W-141008-MLR-03	--	NM	NM	NM	NM	NM	NM	NR	P1,P2,P4

Notes:

- Converted residential monitoring well.
DUP - Duplicate
FB - Field Blank
MS/MSD - Matrix Spike/Matrix Spike Duplicate
NM - Not Measured
NR - Not Recorded
RB - Rinsate Blank
P1 - Chloride (Method 300.0A)
P2 - VOCs (Method 8260B)
P3 - Low Level VOCs (Method 524.2)
P4 - pH (Method 150.1), Total Suspended Solids (Method 160.2) and Chemical Oxygen Demand (Method 410.4)

Attachment A

Monitoring Well Records for Low Flow Purging

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 8, 2014

Personnel: Michael Richie

Monitoring Well Data:

Well No.: MW-1D

Measurement Point: Top of Casing

Well Depth (ft BTOC): 107

Screen Length (ft): 10

Midscreen Depth (ft BTOC): 102

Well Diameter, D (in): 2

Static Water Level: 52.31

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
14:22	150	52.71	--	8.04	13.48	0.628	-148	5.79	56.7	Clear
14:27	150	52.75	0.04	8.06	11.15	0.635	-204	2.72	54.7	Clear
14:32	150	52.75	0.04	7.97	10.98	0.657	-202	1.85	57.4	Clear
14:37	150	52.75	0.04	7.92	11.09	0.667	-198	1.68	57.2	Clear
14:42	150	52.75	0.04	7.86	10.99	0.678	-194	1.33	57.8	Clear
14:47	150	52.75	0.04	7.82	11.03	0.681	-191	1.37	59.2 *	Clear

Notes:

* - Turbidity is > 5 NTU. Cannot operate pump any slower.

Sample collected because all other parameters are stable.

Sample ID: 14:47 W-141008-RA-29

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 8, 2014

Personnel: Michael Richie

Monitoring Well Data:

Well No.: MW1S

Measurement Point: Top of Casing

Well Depth (ft BTOC): 25

Screen Length (ft): 10

Midscreen Depth (ft BTOC): 20

Well Diameter, D (in): 2

Static Water Level: 17.35

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature (°C)*	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
14:10	200	22.45	--	7.31	12.19	0.817	-131	0.70	230 *	Cloudy
14:25	50	21.30	-1.15	7.22	13.23	0.820	-87	2.00	207	Cloudy
14:30	50	21.62	-0.83	7.28	12.64	0.846	-105	1.41	137	Cloudy
14:35	50	21.72	-0.73	7.31	12.64	0.858	-118	0.00	155	Cloudy
14:40	50	21.84	-0.61	7.28	12.64	0.854	-121	0.00	131	Cloudy
14:45	50	21.92	-0.53	7.27	12.65	0.857	-111	0.00	127 **	Cloudy

Notes:

* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.

** - Turbidity is > 5 NTU. Cannot operate pump any slower.

Sample collected because all other parameters are stable.

Sample ID: 14:45 W-141008-RA-28

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 9, 2014

Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-4D

Measurement Point: Top of Casing

Well Depth (ft BTOC): 90

Screen Length (ft): 10

Midscreen Depth (ft BTOC): 85

Well Diameter, D (in): 2

Static Water Level: 42.90

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
13:25	150	48.01	--	7.41	10.00	1.80	-145	1.05	37.5 *	Clear
13:30	100 **	50.50	2.49	7.46	9.89	1.80	-167	0.81	36.4	Clear
13:35	100	53.12	5.11	7.62	10.31	1.80	-199	0.42	49.0	Clear
13:40	100	56.35	8.34	7.62	10.32	1.80	-199	0.42	49.2	Clear
13:45	100	57.01	9.00	7.64	10.68	1.79	-200	0.42	50.7	Clear
13:50	100	57.35	9.34	7.65	10.63	1.79	-201	0.38	50.3	Clear
13:55	100	57.82	9.81	7.65	10.61	1.79	-202	0.37	50.1 ***	Clear

Notes:

* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.

** -Drawdown > 0.30 feet. Cannot operate pump any slower.

*** - Turbidity is > 5 NTU. Cannot operate pump any slower.

Sample collected because all other parameters are stable.

Sample ID: 13:55 W-141009-RA-39

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 9, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-4S
Measurement Point: Top of Casing
Well Depth (ft BTOC): 48
Screen Length (ft): 10
Midscreen Depth (ft BTOC): 43
Well Diameter, D (in): 2
Static Water Level: 37.78

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
12:38	100	43.53	--	7.44	9,91	1.74	-151	0.62	105	Clear
12:43	100 *	45.53	2.00	7.25	10.56	1.73	-157	0.49	104	Clear
12:48	Pumped Dry **									

Notes:
* -Drawdown > 0.30 feet. Cannot operate pump any slower.
** - Well was pumped dry after ~0.8 gallons. Allowed to recharge.
10/9/14 @ 13:10 - Sample collected.

Sample ID: 13:10 W-141009-RA-36

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name:	Highway 96	Date:	October 9, 2014
Ref. No.:	002012	Personnel:	Michael Richie
			Ryan Aamot

Monitoring Well Data:

Well No.:	MW-4U	Screen Length (ft):	5
Measurement Point:	Top of Casing	Midscreen Depth (ft BTOC):	27
Well Depth (ft BTOC):	30	Well Diameter, D (in):	2
		Static Water Level:	25.21

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
13:42	Bail Dry *	25.21	--	7.52	9.51	1.50	-139	4.44	129	Cloudy

Notes:

* - Not enough water to pump. Well was bailed dry after ~2.0 gallons. Allowed to recharge.

10/9/14 @ 14:10 - Sample collected.

Sample ID:	14:10	W-141009-RA-40

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 9, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-8B
Measurement Point: Top of Casing
Well Depth (ft BTOC): 135
Screen Length (ft): 10
Midscreen Depth (ft BTOC): 130
Well Diameter, D (in): 4
Static Water Level: 43.57

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
12:40	500	44.56	--	7.92	10.59	0.754	-233	1.16	1.0	Clear
12:45	500	44.56	0.00	7.83	10.59	0.759	-226	0.67	1.2	Clear
12:50	500	44.56	0.00	7.80	10.57	0.753	-223	0.31	1.1	Clear
12:55	500	44.56	0.00	7.74	10.60	0.758	-218	0.03	1.2	Clear
13:00	500 *	44.56	0.00	7.74	10.59	0.753	-217	0.00	0.9	Clear

Notes:
* - Flow rate was reduced to 250 mL/min prior to sampling.

Sample ID:	13:00	W-141009-RA-37	
	13:00	W-141009-RA-38	(Duplicate)
	VOCs (8260B) and Chloride (300.0A)		

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name:	Highway 96	Date:	October 9, 2013
Ref. No.:	002012	Personnel:	Michael Richie
			Ryan Aamot

Monitoring Well Data:

Well No.:	MW-10B	Screen Length (ft):	10 + tailpiece (5 ft)
Measurement Point:	Top of Casing (TOC)	Midscreen Depth (ft BTOC):	173
Well Depth (ft BTOC):	183	Well Diameter, D (in):	5
		Static Water Level:	39.21

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
9:33	500	39.87	--	7.70	9.61	0.610	-133	0.21	18.9	Clear
9:38	500	39.87	0.00	7.64	9.77	0.617	-139	0.17	15.0	Clear
9:43	500	39.87	0.00	7.60	9.75	0.617	-141	0.14	14.8 *	Clear
9:48	100	39.75	-0.12	7.60	9.13	0.617	-142	0.21	13.6	Clear
9:53	100	39.75	-0.12	7.59	8.97	0.617	-142	0.22	13.8	Clear
9:58	100	39.75	-0.12	7.59	8.96	0.617	-142	0.23	13.7	Clear
10:03	100	39.75	-0.12	7.59	8.91	0.617	-142	0.23	13.6 **	Clear

Notes:

* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.

** - Turbidity is > 5 NTU. Cannot operate pump any slower.

Sample collected because all other parameters are stable.

Sample ID:	10:12	W-141009-RA-32

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 9, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-10D
Measurement Point: Top of Casing
Well Depth (ft BTOC): 62
Screen Length (ft): 5
Midscreen Depth (ft BTOC): 60
Well Diameter, D (in): 2
Static Water Level: 31.45

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
9:30	100	34.91	--	11.69	10.94	0.695	-165	0.00	44.6 *	Clear
9:35	100 **	36.55	1.64	11.44	10.59	0.686	-181	0.00	44.5	Clear
9:40	100	41.45	6.54	11.48	10.01	0.755	-131	0.00	47.8	Clear
9:45	100	43.45	8.54	11.50	10.01	0.734	-201	0.00	45.1	Clear
9:50	100	44.14	9.23	11.45	10.05	0.651	-216	0.00	46.3	Clear
9:55	100	45.30	10.39	11.40	10.03	0.598	-218	0.00	49.8	Clear
10:00	100	45.91	11.00	11.38	10.03	0.595	-221	0.00	46.4	Clear
10:05	100	46.75	11.84	11.35	10.09	0.605	-228	0.00	47.1 ***	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** -Drawdown > 0.30 feet. Cannot operate pump any slower.
*** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID: 10:10 W-141009-RA-31

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 9, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-11D
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 63
Screen Length (ft): 5
Midscreen Depth (ft BTOC): 60
Well Diameter, D (in): 2
Static Water Level: 31.70

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
10:42	100	34.30	--	7.68	9.17	0.610	-195	2.50	38.2	Clear
10:47	100 *	35.10	0.80	7.76	9.04	0.627	-218	0.49	30.5	Clear
10:52	100	36.95	2.65	7.86	9.92	0.619	-231	0.34	19.4	Clear
10:57	100	39.72	5.42	8.08	10.30	0.571	-233	0.74	21.2	Clear
11:02	100	44.15	9.85	8.10	10.26	0.565	-244	0.57	25.5	Clear
11:07	100	45.64	11.34	8.19	10.20	0.565	-245	0.56	29.1	Clear
11:12	100	46.25	11.95	8.20	10.17	0.562	-239	0.55	30.8 **	Clear

Notes:
* -Drawdown > 0.30 feet. Cannot operate pump any slower.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

	10:25	W-141009-RA-33	(Rinseate Blank)
Sample ID:	11:12	W-141009-RA-34	

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 8, 2014

Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-12B

Measurement Point: Top of Casing (TOC)

Well Depth (ft BTOC): 166

Screen Length (ft): 20

Midscreen Depth (ft BTOC): 156

Well Diameter, D (in): 4

Static Water Level: 42.47

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
9:43	500	42.93	--	7.48	10.73	0.565	-224	14.61	1.5	Clear
9:48	500	42.93	0.00	7.40	10.65	0.565	-206	9.85	0.6	Clear
9:53	500	42.93	0.00	7.43	10.69	0.568	-206	8.93	2.9	Clear
9:58	500	42.93	0.00	7.45	10.69	0.568	-209	8.90	2.3	Clear
10:03	500 *	42.93	0.00	7.47	10.70	0.568	-212	8.52	2.8	Clear

Notes:

* - Flow rate was reduced to 250 mL/min prior to sampling.

Sample ID: 10:03 W-141008-RA-24

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 8, 2014

Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-12D

Measurement Point: Top of Casing (TOC)

Well Depth (ft BTOC): 93

Screen Length (ft): 20

Midscreen Depth (ft BTOC): 83

Well Diameter, D (in): 2

Static Water Level: 37.79

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
9:40	100	39.62	--	7.52	10.33	0.917	-170	0.43	61.3	Clear
9:45	100	39.00	-0.62	7.42	10.29	0.939	-167	0.37	70.3	Clear
9:50	100	38.98	-0.64	7.36	10.14	0.947	-165	0.36	74.4	Clear
9:55	100	38.98	-0.64	7.33	9.93	0.946	-163	0.41	71.9	Clear
10:00	100	38.98	-0.64	7.32	9.92	0.947	-162	0.41	71.9	Clear
10:05	100	38.98	-0.64	7.31	9.85	0.949	-159	0.39	71.0 *	Clear

Notes:

* - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID: 10:05 W-141008-RA-23

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 7, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-13B
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 148
Screen Length (ft): 20
Midscreen Depth (ft BTOC): 138
Well Diameter, D (in): 4
Static Water Level: 40.97

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
15:55	500	41.25	--	7.53	10.60	0.592	-205	4.82	8.7	Clear
16:00	500	41.25	0.00	7.50	10.71	0.591	-208	4.02	12.8	Clear
16:05	500	41.25	0.00	7.44	10.94	0.590	-205	4.01	13.9 *	Clear
16:10	200	41.20	-0.05	7.41	10.88	0.589	-186	0.92	13.8	Clear
16:15	200	41.20	-0.05	7.46	10.75	0.590	-188	0.77	14.0	Clear
16:20	200	41.20	-0.05	7.47	10.80	0.589	-192	0.80	14.2 **	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID: 16:20 W-141007-RA-22

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 7, 2014

Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-13D

Measurement Point: Top of Casing (TOC)

Well Depth (ft BTOC): 85

Screen Length (ft): 20

Midscreen Depth (ft BTOC): 75

Well Diameter, D (in): 2

Static Water Level: 36.13

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
15:07	100	38.31	--	7.83	12.99	0.757	-222	8.24	9.8	Clear
15:12	100	39.10	0.79	7.84	12.12	0.808	-227	7.59	5.9	Clear
15:17	100	39.55	1.24	7.84	11.45	0.819	-226	7.75	5.4	Clear
15:22	100	40.75	2.44	7.83	11.33	0.820	-224	7.12	4.3	Clear
15:27	100	41.36	3.05	7.84	11.38	0.818	-230	7.01	4.6	Clear
15:32	100 *	42.00	3.69	7.84	11.41	0.822	-231	7.17	4.5	Clear

Notes:

* -Drawdown > 0.30 feet. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID: 15:32 W-141007-RA-21

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 8, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-16B
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 163
Screen Length (ft): 10
Midscreen Depth (ft BTOC): 158
Well Diameter, D (in): 2
Static Water Level: 42.87

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
10:49	500	43.81	--	7.79	10.66	0.671	-194	0.31	13.3	Clear
10:54	500	43.81	0.00	7.79	10.68	0.668	-195	0.17	12.7 *	Clear
10:59	150	43.57	-0.24	7.77	10.69	0.673	-195	0.14	11.1	Clear
11:04	150	43.57	-0.24	7.76	10.73	0.668	-196	0.13	11.6 **	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID:	11:04	W-141008-RA-25	
	11:05	W-141008-RA-26	(Duplicate)
	VOCs (8260B) and Chloride (300.0A)		

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 8, 2014

Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-16D

Measurement Point: Top of Casing (TOC)

Well Depth (ft BTOC): 83

Screen Length (ft): 10

Midscreen Depth (ft BTOC): 78

Well Diameter, D (in): 2

Static Water Level: 42.37

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
10:50	200	47.31	--	7.07	11.08	0.783	-176	1.98	28.9	Clear
10:55	100	47.41	0.10	7.06	11.15	0.777	-176	1.52	23.3	Clear
11:00	100	47.65	0.34	7.04	11.13	0.775	-173	1.08	17.9	Clear
11:05	100	47.80	0.49	7.04	11.19	0.777	-169	0.69	12.5	Clear
11:10	100	47.80	0.49	7.03	11.15	0.776	-166	0.43	10.7	Clear
11:15	100 *	47.80	0.49	7.02	11.20	0.776	-164	0.32	9.8 **	Clear

Notes:

* -Drawdown > 0.30 feet. Cannot operate pump any slower.

** - Turbidity is > 5 NTU. Cannot operate pump any slower.

Sample collected because all other parameters are stable.

Sample ID: 11:15 W-141008-RA-27

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 7, 2014

Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-17A

Measurement Point: Top of Casing (TOC)

Well Depth (ft BTOC): 107

Screen Length (ft): 10

Midscreen Depth (ft BTOC): 102

Well Diameter, D (in): 2

Static Water Level: 19.23

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
11:51	500	19.99	--	7.67	9.90	0.885	-212	0.26	4.6	Clear
11:56	500	19.99	0.00	7.52	9.97	0.879	-201	0.19	4.8	Clear
12:01	500	20.00	0.01	7.44	10.04	0.872	-196	0.16	4.4	Clear
12:06	500	20.00	0.01	7.39	10.00	0.872	-193	0.16	3.7	Clear
12:11	500 *	20.00	0.01	7.39	9.94	0.876	-192	0.14	4.2	Clear

Notes:

* - Flow rate was reduced to 250 mL/min prior to sampling.

Sample ID:	12:11	W-141007-RA-14

Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 27, 2014

Personnel: Ryan Aamot
Matthew Barnes

Monitoring Well Data:

Well No.: MW-17A

Measurement Point: Top of Casing (TOC)

Well Depth (ft BTOC): 107

Screen Length (ft): 10

Midscreen Depth (ft BTOC): 102

Well Diameter, D (in): 2

Static Water Level: 19.23

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
12:45	500	19.72	--	7.56	8.84	0.805	-188	1.25	0.0	Clear
12:50	500	19.72	0.00	7.55	8.82	0.805	-188	1.21	0.0	Clear
12:55	500 *	19.72	0.00	7.55	8.82	0.805	-188	1.20	0.0	Clear

Notes:

* - Flow rate was reduced to 250 mL/min prior to sampling.

Sample ID:	12:55	W-141027-RA-14

VOCs (524.2)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 7, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-17B
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 192
Screen Length (ft): 10
Midscreen Depth (ft BTOC): 187
Well Diameter, D (in): 2
Static Water Level: 25.94

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
12:40	500	31.11	--	8.23	10.12	0.590	-248	13.41	66.2	Clear
12:45	500	31.11	0.00	8.51	10.37	0.548	-272	12.55	62.1	Clear
12:50	500	31.11	0.00	8.57	10.49	0.545	-308	15.44	61.1 *	Clear
12:55	150	28.50	-2.61	8.70	10.75	0.538	-323	14.31	59.7	Clear
13:00	150	28.50	-2.61	8.23	10.58	0.567	-265	10.01	45.5	Clear
13:05	150	28.50	-2.61	8.03	10.53	0.573	-243	7.79	48.0	Clear
13:10	150	28.50	-2.61	7.95	10.49	0.579	-234	6.06	48.1	Clear
13:15	150	28.50	-2.61	7.90	10.41	0.584	-230	5.61	48.1	Clear
13:20	150	28.50	-2.61	7.87	10.43	0.587	-228	5.58	47.9 **	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

	12:25	W-141007-RA-15	(Rinseate Blank)
Sample ID:	13:20	W-141007-RA-16	

Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name:	Highway 96	Date:	October 27, 2014
Ref. No.:	002012	Personnel:	Ryan Aamot
			Matthew Barnes

Monitoring Well Data:

Well No.:	MW-17B	Screen Length (ft):	10
Measurement Point:	Top of Casing (TOC)	Midscreen Depth (ft BTOC):	187
Well Depth (ft BTOC):	192	Well Diameter, D (in):	2
		Static Water Level:	25.94

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
11:55	500	30.87	--	8.12	8.78	0.612	-204	0.17	510	Cloudy
12:00	500	30.87	0.00	8.03	8.82	0.613	-202	0.13	456	Cloudy
12:05	500	30.87	0.00	8.03	8.82	.6.13	-202	0.13	498 *	Cloudy
12:10	100	30.11	-0.76	7.97	8.88	0.612	-199	0.14	307	Cloudy
12:15	100	30.11	-0.76	7.96	8.87	0.612	-198	0.15	304	Cloudy
12:20	100	30.11	-0.76	7.96	8.90	0.612	-198	0.14	302 **	Cloudy

Notes:

* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.

** - Turbidity is > 5 NTU. Cannot operate pump any slower.

Sample collected because all other parameters are stable.

	12:20	W-141027-RA-15	(Rinseate Blank)
Sample ID:	12:20	W-141027-RA-16	

VOCs (524.2)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 7, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-17L
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 292
Screen Length (ft): 40 (openhole)
Midscreen Depth (ft BTOC): Low-flow pump intake - use 255 ft
Well Diameter, D (in): 4
Static Water Level: 29.47

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
11:50	500	30.80	--	9.35	10.34	0.222	43	0.00	1.7	Clear
11:55	500	30.75	-0.05	7.41	10.40	0.509	-101	1.31	3.4	Clear
12:00	500	30.71	-0.09	7.40	10.47	0.507	-100	0.88	0.0	Clear
12:05	500 *	30.71	-0.09	7.40	10.48	0.508	-100	0.84	0.0	Clear

Notes:
* - Flow Rate was reduced to 250 mL/min prior to sampling.

Sample ID: 12:10 W-141007-RA-13

Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 27, 2014

Personnel: Ryan Aamot
Matthew Barnes

Monitoring Well Data:

Well No.: MW-17L

Measurement Point: Top of Casing (TOC)

Well Depth (ft BTOC): 292

Screen Length (ft): 40 (openhole)

Midscreen Depth (ft BTOC): Low-flow pump intake - use 255 ft

Well Diameter, D (in): 4

Static Water Level: 29.47

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
11:50	500	30.01	--	7.95	11.08	0.222	-39	5.27	78.2	Clear
11:55	500	30.01	0.00	9.75	10.82	0.224	-171	0.58	18.2	Clear
12:00	500	30.01	0.00	9.76	10.81	0.223	-171	0.56	9.1	Clear
12:05	500 *	30.01	0.00	9.77	10.74	0.223	-181	0.57	4.9	Clear

Notes:

* - Flow Rate was reduced to 250 mL/min prior to sampling.

Sample ID: 12:05 W-141027-RA-13

VOCs (524.2)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 7, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW18A
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 116
Screen Length (ft): 10
Midscreen Depth (ft BTOC): 111
Well Diameter, D (in): 2
Static Water Level: 34.25

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature (°C)*	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
10:40	500	34.81	--	7.80	10.99	0.882	-249	1.21	8.1	Clear
10:45	500	34.81	0.00	7.73	11.19	0.887	-240	0.47	7.4	Clear
10:50	500	34.81	0.00	7.63	11.28	0.886	-226	0.19	6.5	Clear
10:55	500	34.81	0.00	7.61	11.29	0.886	-225	0.18	7.0 *	Clear
11:00	100	34.81	0.00	7.59	11.36	0.884	-221	0.19	6.7	Clear
11:05	100	34.51	-0.30	7.56	11.45	0.887	-220	0.21	7.2	Clear
11:10	100	34.51	-0.30	7.57	11.46	0.886	-216	0.22	7.5 **	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID: 11:10 W-141007-RA-12

Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 27, 2014
Personnel: Ryan Aamot
Matthew Barnes

Monitoring Well Data:

Well No.: MW18A
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 116
Screen Length (ft): 10
Midscreen Depth (ft BTOC): 111
Well Diameter, D (in): 2
Static Water Level: 34.25

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature (°C)*	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
10:40	500	34.76	--	7.91	11.06	0.862	-194	0.26	17.9	Clear
10:45	500	34.76	0.00	7.90	11.06	0.862	-192	0.25	17.9	Clear
10:50	500	34.76	0.00	7.89	11.06	0.862	-192	0.25	17.8 *	Clear
10:55	100	34.80	0.04	7.82	11.22	0.854	-184	0.24	17.1	Clear
11:00	100	34.80	0.04	7.81	11.23	0.856	-181	0.22	17.1	Clear
11:05	100	34.80	0.04	7.80	11.30	0.848	-180	0.23	17.0 **	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID: 11:05 W-141027-RA-12

VOCs (524.2)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 7, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW18B
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 196
Screen Length (ft): 10
Midscreen Depth (ft BTOC): 191
Well Diameter, D (in): 2
Static Water Level: 37.34

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature (°C)*	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
9:40	500	41.74	--	8.26	10.66	0.657	-184	0.74	12.6	Clear
9:45	500	41.81	0.07	7.87	10.61	0.664	-191	0.26	11.0	Clear
9:50	500	41.80	0.06	7.78	10.61	0.662	-192	0.22	9.8	Clear
9:55	500	41.74	0.00	7.73	10.63	0.670	-192	0.20	9.5 *	Clear
10:00	200	41.70	-0.04	7.69	10.73	0.675	-180	0.26	12.8	Clear
10:05	200	41.70	-0.04	7.69	10.77	0.676	-181	0.24	12.9	Clear
10:10	200	41.70	-0.04	7.67	10.81	0.678	-183	0.22	12.9 **	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID:	10:10	W-141007-RA-10	MS/MSD

Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 27, 2014
Personnel: Ryan Aamot
Matthew Barnes

Monitoring Well Data:

Well No.: MW18B
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 196
Screen Length (ft): 10
Midscreen Depth (ft BTOC): 191
Well Diameter, D (in): 2
Static Water Level: 37.34

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature (°C)*	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
9:55	500	41.50	--	7.89	10.97	0.645	-197	0.30	36.2	Clear
10:00	500	41.50	0.00	7.88	10.97	0.645	-195	0.30	35.8	Clear
10:05	500	41.50	0.00	7.88	11.00	0.653	-189	0.27	34.7 *	Clear
10:10	100	40.91	-0.59	7.78	11.09	0.660	-187	0.23	25.3	Clear
10:15	100	40.91	-0.59	7.78	11.10	0.661	-187	0.23	24.6	Clear
10:20	100	40.91	-0.59	7.78	11.09	0.661	-187	0.22	23.9 **	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID:	10:20	W-141027-RA-10	MS/MSD

VOCs (524.2)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 7, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW18L
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 281
Screen Length (ft): 18 (open hole)
Midscreen Depth (ft BTOC): 272
Well Diameter, D (in): 4
Static Water Level: 44.28

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature (°C)*	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
9:41	500	45.00	--	7.41	10.86	0.528	-91	1.64	27.5	Clear
9:46	500	45.00	0.00	7.31	10.77	0.528	-97	1.51	16.7	Clear
9:51	500	45.00	0.00	7.36	10.76	0.528	-98	1.17	10.6	Clear
9:56	500	45.00	0.00	7.36	10.75	0.526	-103	1.46	10.6 *	Clear
10:01	100	45.00	0.00	7.38	11.34	0.523	-106	0.14	14.3	Clear
10:06	100	45.00	0.00	7.38	11.37	0.523	-106	0.04	14.5	Clear
10:11	100	45.00	0.00	7.37	11.37	0.523	-105	0.00	14.5 **	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID: 10:11 W-141007-RA-11

Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 27, 2014
Personnel: Ryan Aamot
Matthew Barnes

Monitoring Well Data:

Well No.: MW18L
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 281
Screen Length (ft): 18 (open hole)
Midscreen Depth (ft BTOC): 272
Well Diameter, D (in): 4
Static Water Level: 44.28

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature (°C)*	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
10:00	500	45.12	--	8.50	8.94	0.520	-49	2.12	26.2	Clear
10:05	500	45.12	0.00	8.50	9.06	0.520	-42	2.07	26.1	Clear
10:10	500	45.12	0.00	8.47	9.20	0.519	-37	2.00	26.1	Clear
10:15	500	45.12	0.00	8.47	9.40	0.517	-32	2.00	25.6	Clear
10:20	100	45.12	0.00	8.44	9.28	0.517	-27	1.97	25.5 *	Clear
10:25	100	45.12	0.00	8.44	9.56	0.517	-26	1.94	23.1	Clear
10:30	100	45.12	0.00	8.44	9.53 **	0.517	-25	1.94	23.1 ***	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Temperature affected by ambient conditions. Cannot stabilize due to slow flow rate.
*** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID: 10:30 W-141027-RA-11

VOCs (524.2)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 6, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-19A
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): ~133
Screen Length (ft): 10
Midscreen Depth (ft BTOC): ~128
Well Diameter, D (in): 2
Static Water Level: 25.64

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
10:50	500	26.37	--	8.61	9.52	0.789	-204	2.14	33.2	Clear
10:55	500	26.41	0.04	8.09	9.54	0.786	-213	0.11	18.1	Clear
11:00	500	26.42	0.05	7.94	9.56	0.787	-215	0.07	12.8 *	Clear
11:05	200	26.42	0.05	7.87	9.51	0.789	-215	0.02	10.6	Clear
11:10	200	25.80	-0.57	7.84	9.55	0.783	-215	0.06	8.6	Clear
11:00	200	25.80	-0.57	7.83	9.55	0.789	-213	0.09	7.8	Clear
11:20	200	25.80	-0.57	7.80	9.62	0.784	-210	0.11	7.0 **	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID: 11:21 W-141006-RA-04

VOCs (524.2) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 6, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-19B
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 201
Screen Length (ft): 10
Midscreen Depth (ft BTOC): 196
Well Diameter, D (in): 2
Static Water Level: 30.90

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
11:50	350	31.71	--	7.69	8.80	0.319	-5	0.05	10.3	Clear
12:10	350	31.90	0.19	10.56	9.52	0.289	-161	0.00	4.5	Clear
12:15	350	31.90	0.19	10.32	9.56	0.297	-225	0.00	6.2	Clear
12:20	350	31.90	0.19	7.78	9.58	0.551	-186	0.00	5.0	Clear
12:25	350	31.90	0.19	7.70	9.56	0.562	-180	0.00	4.9	Clear
12:30	350 *	31.90	0.19	7.71	9.60	0.565	-177	0.00	4.9	Clear

Notes:
* - Flow rate was reduced to 250 mL/min prior to sampling.

Sample ID: 12:31 W-141006-RA-05

VOCs (524.2) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 6, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-19L
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 269
Screen Length (ft): 12 (open hole)
Midscreen Depth (ft BTOC): 263
Well Diameter, D (in): 4
Static Water Level: 35.71

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
10:35	500	35.70	--	7.82	9.53	0.454	-215	13.43	54.9	Clear
10:40	500	35.70	0.00	7.58	9.56	0.497	-181	7.11	38.3	Clear
10:45	500	35.70	0.00	7.42	9.58	0.497	-146	5.60	22.9	Clear
10:50	500	35.70	0.00	7.37	9.60	0.499	-130	2.61	16.0	Clear
10:55	500	35.70	0.00	7.36	9.60	0.502	-121	1.40	11.3	Clear
11:00	500	35.70	0.00	7.35	9.61	0.502	-117	1.32	10.7	Clear
11:05	500	35.70	0.00	7.35	9.62	0.500	-118	1.31	10.3 *	Clear
11:10	250	35.70	0.00	7.35	9.63	0.500	-110	0.00	6.4	Clear
11:15	250	35.70	0.00	7.34	9.60	0.501	-105	0.00	5.0	Clear
11:20	250	35.70	0.00	7.35	9.61	0.500	-105	0.00	5.0	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.

	10:03	W-141006-RA-02	(Rinseate Blank)
Sample ID:	11:20	W-141006-RA-03	

VOCs (524.2) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 6, 2014

Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW20B

Measurement Point: Top of Casing (TOC)

Well Depth (ft BTOC): 203

Screen Length (ft): 10

Midscreen Depth (ft BTOC): 198

Well Diameter, D (in): 2

Static Water Level: 33.58

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature (°C)*	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
14:00	500	34.62	--	9.99	9.98	0.597	-225	0.35	15.1	Clear
14:05	500	34.66	0.04	8.32	10.13	0.586	-224	0.19	4.7	Clear
14:10	500	34.68	0.06	8.05	10.17	0.580	-220	0.15	4.4	Clear
14:15	500	34.68	0.06	8.05	10.17	0.580	-220	0.14	4.3	Clear
14:20	500 *	34.68	0.06	8.05	10.19	0.581	-222	0.13	4.3	Clear

Notes:

* - Flow rate was reduced to 250 mL/min prior to sampling.

Sample ID:	14:25	W-141006-RA-07	
		W-141006-RA-08	(Duplicate)
		VOCs (524.2) and Chloride (300.0A)	

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 6, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: MW-21A
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): ~133
Screen Length (ft): 10
Midscreen Depth (ft BTOC): ~128
Well Diameter, D (in): 2
Static Water Level: 21.13

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
9:11	500	21.00	--	8.62	8.99	0.338	-267	9.43	40.0	Clear
9:16	500	21.00	0.00	8.52	8.73	0.369	-261	7.45	36.8 *	Clear
9:21	120	21.00	0.00	8.54	8.52	0.400	-246	2.20	36.0	Clear
9:26	120	21.00	0.00	8.37	8.24	0.417	-236	0.00	41.5	Clear
9:32	120	21.00	0.00	8.37	8.29	0.411	-236	0.00	39.7	Clear
9:37	120	21.00	0.00	8.32	8.02	0.426	-234	0.00	41.6	Clear
9:42	120	21.00	0.00	8.27	8.08	0.440	-229	4.00	40.8	Clear
9:47	120	21.00	0.00	8.24	8.10	0.445	-226	3.85	39.5	Clear
9:52	120	21.00	0.00	8.19	8.12	0.451	-222	3.89	40.0 **	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID: 9:53 W-141006-RA-01

VOCs (524.2) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 8, 2014

Personnel: Michael Richie

Monitoring Well Data:

Well No.: LW-1

Measurement Point: Top of Casing (TOC)

Well Depth (ft BTOC): 18

Screen Length (ft): 5 + tailpiece (2.5 ft)

Midscreen Depth (ft BTOC): 13

Well Diameter, D (in): 2

Static Water Level: 7.02

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
15:23	75	7.25	--	6.77	15.54	1.53	-47	2.62	55.0	Clear
15:28	75	7.25	0.00	6.68	15.71	1.56	-46	2.10	41.9	Clear
15:33	75	7.25	0.00	6.67	15.77	1.57	-52	1.89	53.8	Clear
15:38	75	7.25	0.00	6.66	15.67	1.57	-54	1.85	50.2 *	Clear

Notes:

* - Turbidity is > 5 NTU. Cannot operate pump any slower.

Sample collected because all other parameters are stable.

Sample ID:	15:38	W-141008-RA-30

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name:	Highway 96	Date:	October 9, 2014
Ref. No.:	002012	Personnel:	Michael Richie
			Ryan Aamot

Monitoring Well Data:

Well No.:	LW-2	Screen Length (ft):	5 + tailpiece (2.5 ft)
Measurement Point:	Top of Casing (TOC)	Midscreen Depth (ft BTOC):	17
Well Depth (ft BTOC):	22	Well Diameter, D (in):	2
		Static Water Level:	12.24

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
10:45	500	12.82	--	6.66	13.5	0.147	-92	4.10	496	Cloudy
10:50	500	13.92	1.10	6.66	13.41	0.148	-91	4.14	472	Cloudy
10:55	250	14.40	1.58	6.66	13.38	0.148	-91	4.43	463	Cloudy
11:00	250	14.52	1.70	6.66	12.92	0.149	-91	4.37	460	Cloudy
	Pumped Dry *									

Notes:

* - Well was pumped dry after ~2.0 gallons. Allowed to recharge.

10/9/14 @ 11:35 - Sample collected.

Sample ID:	11:35	W-141009-RA-35	MS/MSD

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 9, 2014

Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: LW-3

Measurement Point: Top of Casing (TOC)

Well Depth (ft BTOC): 21

Screen Length (ft): 5

Midscreen Depth (ft BTOC): 19

Well Diameter, D (in): 2

Static Water Level: 11.60

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
13:35	500	12.38	--	7.10	12.97	1.560	-123	4.11	111	Clear
13:40	500	12.40	0.02	7.10	12.94	1.560	-123	0.00	57.1	Clear
13:45	500	12.41	0.03	7.01	12.83	1.500	-121	0.00	31.1 *	Clear
13:50	250	12.44	0.06	6.99	12.83	1.570	-126	0.00	21.7	Clear
13:55	250	12.40	0.02	7.03	15.03	1.470	-123	0.00	8.7	Clear
14:00	250	12.40	0.02	7.03	15.04	1.470	-123	0.00	9.1	Clear
14:05	250	12.40	0.02	7.03	15.07	1.470	-123	0.00	4.2	Clear

Notes:

* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.

	13:42	W-141009-RA-42	(Field Blank)
Sample ID:	14:05	W-141009-RA-41	

VOCs (8260B) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 7, 2014
Personnel: Michael Richie
Ryan Aamot

Residential Well Data:

Well No.: 1 Lily Pond Road
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 221
Screen Length (ft): 50 (open hole)
Midscreen Depth (ft BTOC): 196
Well Diameter, D (in): 5
Static Water Level: 35.49

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
13:35	500	35.80	--	7.84	9.87	0.678	-192	1.24	5.6	Clear
13:40	500	35.80	0.00	7.73	9.93	0.679	-195	0.34	3.6	Clear
13:45	500	35.80	0.00	7.69	9.99	0.679	-200	0.24	3.5	Clear
13:50	500 *	35.80	0.00	7.67	10.01	0.674	-202	0.21	3.8	Clear

Notes:
* - Flow rate was reduced to 250 mL/min prior to sampling.

Sample ID: 13:50 W-141007-RA-17

Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 28, 2014
Personnel: Ryan Aamot
Matthew Barnes

Residential Well Data:

Well No.: 1 Lily Pond Road
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 221
Screen Length (ft): 50 (open hole)
Midscreen Depth (ft BTOC): 196
Well Diameter, D (in): 5
Static Water Level: 35.49

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
9:30	500	35.72	--	7.68	9.72	0.666	-181	0.16	4.3	Clear
9:35	500	35.72	0.00	7.67	9.72	0.665	-180	0.15	4.2	Clear
9:40	500 *	35.72	0.00	7.67	9.72	0.664	-180	0.15	4.2	Clear

Notes:
* - Flow rate was reduced to 250 mL/min prior to sampling.

Sample ID: 9:40 W-141028-RA-17

VOCs (524.2)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 6, 2014
Personnel: Michael Richie
Ryan Aamot

Residential Well Data:

Well No.: 11 Lily Pond Road
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 211
Screen Length (ft): 35 (open hole)
Midscreen Depth (ft BTOC): 193
Well Diameter, D (in): 4
Static Water Level: 38.91

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
15:15	500	38.99	--	8.33	10.10	0.536	-181	0.61	11.7	Clear
15:20	500	39.00	0.01	7.63	10.25	0.558	-181	0.31	9.4	Clear
15:25	500	39.00	0.01	7.62	10.25	0.547	-181	0.24	6.1	Clear
15:30	500	39.00	0.01	7.62	10.27	0.549	-181	0.22	4.2	Clear
15:35	500	39.00	0.01	7.61	10.28	0.547	-181	0.19	3.2	Clear
15:40	500	39.00	0.01	7.61	10.28	0.547	-181	0.17	3.4	Clear
15:45	500 *	39.00	0.01	7.61	10.28	0.546	-181	0.17	3.3	Clear

Notes:
* - Flow rate was reduced to 250 mL/min prior to sampling.

Sample ID: 15:45 W-141006-RA-09

Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 27, 2014
Personnel: Ryan Aamot
Matthew Barnes

Residential Well Data:

Well No.: 11 Lily Pond Road
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 211
Screen Length (ft): 35 (open hole)
Midscreen Depth (ft BTOC): 193
Well Diameter, D (in): 4
Static Water Level: 38.91

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
14:45	500	38.84	--	8.36	10.16	0.447	-143	0.83	5.7	Clear
14:50	500	38.84	0.00	7.57	10.36	0.539	-131	0.21	5.8	Clear
14:55	500	38.84	0.00	7.57	10.36	0.537	-131	0.21	4.1	Clear
15:00	500 *	38.84	0.00	7.57	10.36	0.539	-131	0.20	4.2	Clear

Notes:
* - Flow rate was reduced to 250 mL/min prior to sampling.

Sample ID: 15:00 W-141027-RA-09

VOCs (524.2)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96

Ref. No.: 002012

Date: October 7, 2014

Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: 11 Robb Farm Road

Measurement Point: Top of Casing (TOC)

Well Depth (ft BTOC): 234

Screen Length (ft): 48 (open hole)

Midscreen Depth (ft BTOC): 210

Well Diameter, D (in): 4

Static Water Level: 46.78

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
15:00	500	46.82	--	7.66	10.36	0.580	-169	1.07	74.7	Clear
15:05	500	46.82	0.00	7.63	10.36	0.581	-172	1.00	17.9	Clear
15:10	500	46.82	0.00	7.60	10.40	0.581	-179	0.18	8.9	Clear
15:15	500	46.82	0.00	7.59	10.46	0.581	-182	0.16	9.6	Clear
15:20	500	46.82	0.00	7.59	10.48	0.581	-182	0.14	8.9	Clear
15:25	500	46.82	0.00	7.59	10.48	0.581	-182	0.19	9.2 *	Clear
15:30	250	46.82	0.00	7.59	10.96	0.581	-183	0.14	9.1	Clear
15:35	250	46.82	0.00	7.59	10.96	0.581	-183	0.13	8.7	Clear
15:40	250	46.82	0.00	7.59	10.96	0.581	-183	0.13	8.7 **	Clear

Notes:

* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.

** - Turbidity is > 5 NTU. Cannot operate pump any slower.

Sample collected because all other parameters are stable.

Sample ID: 15:40 W-141007-RA-20

Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 27, 2014
Personnel: Ryan Aamot
Matthew Barnes

Monitoring Well Data:

Well No.: 11 Robb Farm Road
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 234
Screen Length (ft): 48 (open hole)
Midscreen Depth (ft BTOC): 210
Well Diameter, D (in): 4
Static Water Level: 46.78

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
13:10	500	46.90	--	8.07	10.49	0.569	-167	0.45	44.5	Clear
13:15	500	46.90	0.00	7.90	10.5	0.569	-167	0.35	45.1	Clear
13:20	500	46.90	0.00	7.89	10.50	0.569	-167	0.33	45.2 *	Clear
13:25	100	46.99	0.09	7.72	11.19	0.569	-171	0.18	54.9	Clear
13:30	100	46.99	0.09	7.71	11.27	0.569	-171	0.18	55.0	Clear
13:35	100	46.99	0.09	7.71	11.29	0.569	-171	0.18	53.9 **	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID: 13:55 W-141027-RA-20

VOCs (524.2)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 7, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: 6 Blue Goose Road
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 232
Screen Length (ft): 36 (open hole)
Midscreen Depth (ft BTOC): 214
Well Diameter, D (in): 4
Static Water Level: 62.57

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
14:12	500	63.55	--	7.68	10.00	0.633	-150	0.47	44.5	Clear
14:17	500	63.55	0.00	7.52	10.02	0.627	-147	0.23	34.2	Clear
14:22	500	63.55	0.00	7.45	10.10	0.626	-148	0.17	21.0	Clear
14:27	500 *	63.55	0.00	7.44	10.12	0.623	-149	0.15	4.8	Clear

Notes:
* - Flow rate was reduced to 250 mL/min prior to sampling.

Sample ID:	14:30	W-141007-RA-18	
	14:31	W-141007-RA-19	(Duplicate)
	Chloride (300.0A)		

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 27, 2014
Personnel: Ryan Aamot
Matthew Barnes

Monitoring Well Data:

Well No.: 6 Blue Goose Road
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 232
Screen Length (ft): 36 (open hole)
Midscreen Depth (ft BTOC): 214
Well Diameter, D (in): 4
Static Water Level: 62.57

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
14:10	500	63.40	--	7.95	9.96	0.633	-140	1.31	25.9	Clear
14:15	500	63.40	0.00	7.59	10.22	0.632	-138	0.19	20.1	Clear
14:20	500	63.40	0.00	7.59	10.20	0.633	-138	0.19	11.4	Clear
14:25	500 *	63.40	0.00	7.59	10.24	0.633	-138	0.18	4.2	Clear

Notes:
* - Flow rate was reduced to 250 mL/min prior to sampling.

Sample ID:	14:25	W-141027-RA-18	
	14:25	W-141027-RA-19	(Duplicate)
	VOCs (524.2)		

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name:	Highway 96	Date:	October 8, 2014
Ref. No.:	002012	Personnel:	Michael Richie

Monitoring Well Data:

Well No.:	EW1B	Screen Length (ft):	10 + tailpiece (2 ft)
Measurement Point:	Top of Casing (TOC)	Midscreen Depth (ft BTOC):	N/A (GRAB)
Well Depth (ft BTOC):	97 (pump set ~ 84 ft BTOC)	Well Diameter, D (in):	6
		Pumping Water Level:	46.90

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*

Notes:
GRAB SAMPLE

Sample ID:	14:07	W-141008-MLR-01

VOCs (8260B), Chloride (300.0A), pH (150.1), TSS (160.2) and COD (410.4)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name:	Highway 96	Date:	October 8, 2014
Ref. No.:	002012	Personnel:	Michael Richie

Monitoring Well Data:

Well No.:	EW2	Screen Length (ft):	10 + tailpiece (5 ft)
Measurement Point:	Top of Casing (TOC)	Midscreen Depth (ft BTOC):	N/A (GRAB)
Well Depth (ft BTOC):	140 (pump set ~ 89 ft BTOC)	Well Diameter, D (in):	6
		Pumping Water Level:	43.91

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*

Notes:
GRAB SAMPLE

Sample ID:	14:10	W-141008-MLR-02

VOCs (8260B), Chloride (300.0A), pH (150.1), TSS (160.2) and COD (410.4)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Highway 96
Ref. No.: 002012
Date: October 6, 2014
Personnel: Michael Richie
Ryan Aamot

Monitoring Well Data:

Well No.: EW3
Measurement Point: Top of Casing (TOC)
Well Depth (ft BTOC): 203
Screen Length (ft): 10 + tailpiece (5 ft)
Midscreen Depth (ft BTOC): 193
Well Diameter, D (in): 6
Static Water Level: 31.31

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*
12:35	300	31.71	--	7.35	9.56	0.611	-144	5.30	18.7	Clear
13:05	300	31.82	0.11	7.32	10.03	0.607	-137	5.00	13.6	Clear
13:10	300	31.85	0.14	7.32	9.99	0.606	-141	5.04	11.9 *	Clear
13:15	200	31.85	0.14	7.32	9.81	0.605	-143	4.58	12.8	Clear
13:20	200	31.85	0.14	7.33	9.75	0.605	-144	4.46	11.5	Clear
13:25	200	31.85	0.14	7.33	9.75	0.605	-145	4.33	11.4 **	Clear

Notes:
* - Turbidity is > 5 NTU. Lowered flow rate and restabilized parameters.
** - Turbidity is > 5 NTU. Cannot operate pump any slower.
Sample collected because all other parameters are stable.

Sample ID: 13:25 W-141006-RA-06

VOCs (524.2) and Chloride (300.0A)

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name:	Highway 96	Date:	October 8, 2014
Ref. No.:	002012	Personnel:	Michael Richie

Monitoring Well Data:

Well No.:	DEWATERING SUMP	Screen Length (ft):	9
Measurement Point:	Top of Casing (TOC)	Midscreen Depth (ft BTOC):	N/A (GRAB)
Well Depth (ft BTOC):	41 (pump set ~ 30 ft BTOC)	Well Diameter, D (in):	8
		Pumping Water Level:	22.21

Time	*Flow Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level (ft)*	*pH*	*Temperature* (°C)	*Conductivity (mS/cm)*	*ORP (mV)*	*DO (mg/L)*	*Turbidity (NTU)*	*Observations*

Notes:
GRAB SAMPLE

Sample ID:	14:13	W-141008-MLR-03

VOCs (8260B), Chloride (300.0A), pH (150.1), TSS (160.2) and COD (410.4)

Appendix D

Documentation of Site Cleanup Levels

Appendix D.1

Amended Table 1
(From 1993 MDD)

	AMENDED TABLE 1			October 10, 1994
HIGHWAY 96 DUMP	GROUNDWATER CLEANUP LEVELS			
		HRL(2)	MCL(3)	LEVEL
		ug/l	ug/l	ug/l
MATRIX/COMPOUND	CARC. (1)			
METALS				
Barium		2000	2000	2000
Beryllium	c	0.08	1	0.08
Cadmium		4	5	4
Chromium VI		100	100	100
Chromium III		20000		20000
Copper		1000	1300	1000
Manganese		100	..	100
Mercury		2	2	2
Thallium		0.6	2/1	0.6
Zinc		2000	5000	2000
VOLATILE ORGANICS				
Acetone		700		700
Benzene	c	10	5	5
Bromodichloromethane	c	6	100	6
Bromoform	c	40	100	40
Bromomethane		10		10
Carbon Tetrachloride	c	3	5	3
Chlorobenzene		100		100
Chloroform	c	60	100	60
Dibromochloromethane		10		10
Dichlorodifluoromethane		1000		1000
1,1-Dichloroethane		70		70
1,2-Dichloroethane	c	4	5	4
1,1-Dichloroethene		6	7	6
1,2-Dichloroethene, trans		100	100	100
1,2-Dichloroethene, cis		70	70	70
1,2-Dichloropropane	c	5	5	5
1,3-Dichloropropene (cis-, trans-, mix)	c	2		2
Ethylbenzene		700	700	700
Ethyl Ether		1000		1000
Isopropylbenzene (cumene)		300		300
Methyl Ethyl Ketone (MEK, 2-butanone)		4000		4000
Methyl Isobutyl Ketone (MIBK)		300		300
Methylene Chloride (Dichloromethane)	c	50	5	5
1,1,1,2-Tetrachloroethane	c	70		70
1,1,2,2-Tetrachloroethane	c	2		2
1,1,2,2-Tetrachloroethene	c	7	5	5
Toluene		1000	1000	1000
1,2,4-Trichlorobenzene			70	70
1,1,1-Trichloroethane		600	200	200
1,1,2-Trichloroethane		3	5	3
1,1,2-Trichloroethene (TCE)	c	30	5	5
Trichlorofluoromethane		2,000		2000
1,1,2-Trichloro-1,2,2-trifluoroethane		200000		200,000
Vinyl Chloride	c	0.2	2	2*
Xylenes (total)		10000	10000	10000
SEMI-VOLATILE ORGANICS				
PAHs (total carcinogenic) (6)	c	0.03		0.03
NOTES:				
* - The clean-up level for vinyl chloride was adjusted for Site specific reasons. It is not MCL based.				
(1) Carcinogeneity - A "c" denotes a potential carcinogen.				
(2) HRL - Health Risk Limit established by the MN Department of Health.				
(3) MCL - Federal Maximum Contaminant Level				

Appendix D.2

2008 MDD Amendment

EXECUTIVE SUMMARY

This Minnesota Decision Document ("MDD") Amendment documents the selection of a remedy by the Minnesota Pollution Control Agency ("MPCA") for the Highway 96 Dump Superfund Site (the "Site") in North Oaks, Minnesota, under the Minnesota Environmental Response and Liability Act ("MERLA"), Minn. Stat. §115B.01- 115B.20.

In 1993, the MPCA selected a remedial action and cleanup levels for the Site, which identified selected remedies for three operable units associated with the Site:

- Operable Unit 1 - Source Control
- Operable Unit 2 - Groundwater Remediation
- Operable Unit 3 - Residential Drinking Water (east of Gilfillan Lake)

Since 1993, Reynolds Metals Company and Whirlpool Corporation, the Responsible Parties (RPs), have implemented the selected remedies for Operable Units 1, 2 and 3 pursuant to the MDD and under the direction of the MPCA.

On February 19, 2008, the MPCA issued a Proposed Plan Fact Sheet setting forth the proposed remedial action to address contamination at Operable Unit 4, which includes homes west of Gilfillan Lake with wells that could potentially be impacted by vinyl chloride contamination from the Site. Operable Unit 4 was established based on residential well monitoring conducted since 2004, which detected low level vinyl chloride contamination in four wells west of the Lake. The MPCA, in a public notice published in the Shoreview News on February 19, 2008, invited the public to comment on the proposed cleanup at the site and notified the public that at the end of the public comment period the MPCA would review all comments and approve, reject, or modify the proposed remedy outlined in the draft MDD Amendment. The MPCA's proposed remedy in the draft MDD Amendment is a new residential well drilled into a deeper aquifer in conjunction with long-term ground water monitoring.

On February 26, 2008, at the East Recreational Center in North Oaks, the MPCA held a public meeting to discuss the draft MDD Amendment. Approximately sixty-five (65) citizens attended the public meeting, including Senator Sandy Rummel, Representative Paul Gardner, the Mayor of North Oaks, members of the North Oaks City Council, and representatives for the Responsible Parties.

During the draft MDD Amendment's public comment period, the MPCA received fifteen (15) timely submittals from the public. These submittals contained multiple comments and questions. On April 1, 2008, after the end of the public comment period, the MPCA also received a submittal from Representative Paul Gardner. The MPCA reviewed the comments and submittals and prepared a MDD Amendment, which takes those comments and submittals into account and includes a summary of the MPCA responses ("Responsiveness Summary Document").

TABLE OF CONTENTS

1.0 INTRODUCTION
- 1.1 Statement of Purpose

2.0 SITE CHARACTERIZATION
- 2.1 Regulatory History
- 2.2 Contaminants of Concerns and Cleanup Standards
- 2.3 Exposure Assessment
- 2.4 Human Health and Ecological Risks

3.0 RESPONSE ACTION OBJECTIVES
- 3.1 Response Action Objective
- 3.2 Long Term Assurance of Protectiveness
- 3.3 Institutional Controls
- 3.4 Long-Term Monitoring
- 3.5 Planned Use of the Property

4.0 REMEDY SELECTION CRITERIA AND DETAILED ANALYSIS OF RESPONSE ACTION ALTERNATIVES
- 4.1 Remedy Selection Criteria
  - 4.1.1 Threshold Criteria
  - 4.1.2 Balancing Criteria
    - Long-Term Effectiveness
    - Implementability
    - Short-Term Risks
    - Cost Effectiveness
    - Reduction of Toxicity, Mobility, or Volume (TMV) through Treatment
  - 4.1.3 Community Acceptance
- 4.2 Documents Reviewed
- 4.3 Summary of Response Action Alternatives
  - 4.3.1 Two Scenarios
    - Scenario A
    - Scenario B
- 4.4 Analysis of Alternatives
  - 4.4.1 Alternative A - No Action
  - 4.4.2 Alternative A2 - Long Term Ground Water Monitoring Program for Residential Wells and Monitoring Wells
  - 4.4.3 Alternative A3 - Installation and Operation of Pumpout System in Ski Lane Ravine Area
  - 4.4.4 Alternative B1 - No Action
  - 4.4.5 Alternative B2 - Installation of Carbon Filter at Homes With Well Advisory
  - 4.4.6 Alternative B3 - Installation of New Residential Well Into Deeper Aquifer at Homes with Well Advisory
  - 4.4.7 Alternative B4 - Installation of Municipal Water System for Homes with Well Advisory

5.0 SELECTED RESPONSE ACTION ALTERNATIVE AND CONCEPTUAL DESIGN
5.1 Remedial Action Elements
5.1.1 Installation of a New Residential Well Into a Deeper Aquifer At Homes with Well Advisory
5.1.2 Long Term Ground Water Monitoring
5.2 Other Considerations under Minnesota Environmental Response and Liability Act
5.2.1 Long Term Assurance of Protectiveness
5.2.2 Long Term Monitoring
5.2.3 Planned Use of the Property
6.0 ESTABLISHMENT OF RESPONSE ACTION OBJECTIVES AND CLEANUP LEVELS
7.0 RESPONSIVENESS SUMMARY
8.0 FINDINGS AND DETERMINATIONS
8.1 Minnesota Environmental Response and Liability Act
8.1.1 Procedures
8.1.2 The Remedy is Reasonable and Necessary to Protect Public Health and Welfare and the Environment
8.1.3 Other MERLA Determinations
8.1.4 Remedy is Not Inconsistent with CERCLA and NCP
8.1.5 Other Determinations in MDD Amendment
8.2 Selection of Remedy

MINNESOTA DECISION DOCUMENT AMENDMENT

1.0 INTRODUCTION

1.1 Statement of Purpose

This Minnesota Decision Document (MDD) Amendment to the 1993 MDD presents the selected remedial action and cleanup levels for the Highway 96 Dump Superfund site (Highway 96 Site), and summarizes the facts and determinations made by the Minnesota Pollution Control Agency (MPCA) in approving the selected response actions. In 1993, MPCA issued a MDD, which identified selected remedies for three operable units associated with the Site:

- Operable Unit 1 – Source Control
- Operable Unit 2 – Ground Water Remediation
- Operable Unit 3 - Residential Drinking Water (east of Gilfillan Lake)

Since 1993, Reynolds Metals Company and Whirlpool Corporation, the RPs, have implemented the selected remedies for Operable Units 1, 2 and 3 pursuant to the MDD and under the direction of the MPCA.

The MDD Amendment selects a remedy for the following additional Operable Unit associated with the Site:

- Operable Unit 4 – Residential Drinking Water (west of Gilfillan Lake)

The MPCA established Operable Unit 4 based on residential well monitoring conducted since 2004, which detected low level (i.e., less than or equal to the health-based standard) vinyl chloride contamination in four wells west of Gilfillan Lake. This new Operable Unit includes approximately eighty-two (82) homes west of the lake with wells that could potentially be impacted by vinyl chloride contamination from the Highway 96 Dump Site.

The remedial actions and obligations of the RPs identified in the 1993 MDD for Operable Units 1, 2, and 3 will continue to be implemented, and will not be altered by the establishment of Operable Unit 4 or the MDD Amendment.

This MDD Amendment:

- Summarizes historical Site investigation, and remedial action activities conducted by the RPs in accordance with the 1993 MDD;
- Summarizes current groundwater conditions associated with Operable Unit 4 and potential changes at the Site;
- Discusses the risks to human health and the environment that may be present at the Site;
- Outlines the remedial action alternatives evaluated in the July 2007 Feasibility Study (FS) Report; and
- Identifies the MPCA's selected remedial action plan for Operable Unit 4 and explains why the MPCA selected this remedy.

This MDD Amendment summarizes all remedial action alternatives evaluated to date for the Highway 96 Dump Site Operable Unit 4. All alternatives summarized in this Proposed Plan are more thoroughly described in the July 2007 FS Report, the MPCA's September 25, 2007 FS comment letter, the RP's October 25, 2007 response to MPCA's FS comments letter, and the MPCA's November 7, 2007 FS Report and Response to Comments.

The Commissioner or his delegate has determined the response actions set forth in this Decision Document Amendment are reasonable and necessary to protect the public health and welfare and the environment from the release and threatened release of hazardous substances and/or pollutants and contaminants from the Highway 96 Site.

1.2 Site Location

The Highway 96 Dump Superfund Site is located at 935 East Highway 96, White Bear Township, Minnesota.

1.3 Site Background and Information

From the 1920s to 1973, the Highway 96 Dump Superfund Site, located north of Highway 96 and west of Allendale Drive in White Bear Township, Minnesota, operated as a small unpermitted open dump, with periodic burning to reduce volume. The dump accepted primarily solid waste. In the late 1960s, the dump owners and operators ran a business involving the transport of waste paints and solvents to other facilities for recycling. Some waste paints and solvents were disposed of at the Site.

In 1986, the U.S. Environmental Protection Agency (U.S. EPA) discovered that ground water beneath the Site was contaminated with volatile organic compounds (VOC) including industrial, solvent-like chemicals. As a result of the discovery, the MPCA identified RPs including Reynolds Metal Company, Whirlpool Corporation, Mrs. Helen A. Krawczewski, and Red Arrow Waste Disposal Company. The MPCA requested the RPs investigate and clean up the contamination. Additional investigations found waste in drums, soil contamination, and landfill gas below the surface. These investigations also better defined the extent of the ground water contamination.

Remediation of the Site commenced in 1987 and consisted of four major remedial components: source remediation, ground water remediation, alternate water supply, and ground water monitoring. The RPs completed three interim response actions (IRAs). In 1987 – 1988, the RPs removed waste drums from the north- and south disposal areas (NDA and SDA). In 1989, the RPs installed an extraction well at the NDA to capture contaminated ground water. In 1993, the RPs removed additional waste drums from the SDA and consolidated the NDA and SDA into the Consolidated Waste Area (CWA). In 1994, the RPs installed a leachate collection well directly under the CWA to collect the leachate before it reached deeper, drinking-water aquifers. However, prior to the installation of the ground-water extraction system, the ground-water plume migrated from the CWA to the west beyond the capture zone of the extraction well, in the direction of Gilfillan Lake.

In 1993, the Minnesota Department of Health (MDH) issued drinking water advisories to 12 homes on the east side of Gilfillan Lake because vinyl chloride was detected in the well water at levels exceeding the existing health-based risk levels. Vinyl chloride is a VOC that has been found in ground water at the Site and is often found in old dumps and landfills containing municipal and/or industrial waste.

Pursuant to the MDD, the RPs took action to address this off-site contamination. In 1994, the 12 homes with private wells subject to an MDH well advisory were connected to the White Bear Township municipal water system. Other alternatives would have been equally effective at protecting human health; however, municipal water was selected because nearby developments were interested in using municipal water. Thus, the municipal system was a joint project and was partially funded by sources other than the RPs. As a result of this joint project, 48 additional homes on the East side of Gilfillan Lake were connected to the White Bear Township municipal water system.

Residential wells within the area where homes were connected to the municipal water supply were sealed with cement or grout. At that time five residential wells on the east side of Gilfillan Lake were converted to long-term ground water monitoring wells. One of these monitoring wells was sealed in 2000. Long-term site plans required by the MPCA in the MDD included ongoing monitoring of the four remaining monitoring wells and periodic monitoring of residential wells in homes that had not been connected to the municipal water system on the east side of Gilfillan Lake.

In 1993, at the time the remedial action was selected, vinyl chloride was detected at one residential well on the west side of Gilfillan Lake. The concentration was below the level warranting a MDH drinking water advisory. However, as a precautionary measure, the MDD required this residential well and approximately ten other locations on the west side of Gilfillan Lake be sampled periodically for VOCs. Between 1994 and 2000, the wells were sampled annually, and from 2000 to 2004, the wells were sampled every two years. Vinyl chloride was not detected in any of the residential wells on the west side of Gilfillan Lake between 1994 and 2003.

In October 2004, as part of the routine monitoring established in 1993, two residential wells west of Gilfillan Lake showed vinyl chloride concentrations at levels just below the MDH Health Risk Limit (HRL) of 0.2 micrograms-per-liter (ug/l). Vinyl chloride had not been detected in either of these wells since 1993. In April 2005, a third residential well on the west side of the lake showed detectable vinyl chloride and in October 2007 a fourth home was found to have detectable levels of vinyl chloride. However, only one of the four well owners has received an MDH well advisory. The well advisory was issued in May of 2005 based on the additivity of vinyl chloride and chloroform; two hazardous VOCs detected in the well. On January 30, 2007, MDH rescinded the well advisory after sampling showed that the contamination level had dropped. However, on August 15, 2007, after results of the April-May 2007 sampling event, MDH reissued the well advisory to the same well owner.

The RPs are currently conducting a revised ground water monitoring program, which includes both residential wells and monitoring wells. Since October 2004, many of the homes on the West side of Gilfillan Lake have been sampled several times. Additional monitoring wells have been established on the east and west side of Gilfillan Lake and the vertical section of the St. Peter Aquifer has been profiled.

At this time, no other MDH well advisories have been issued. After three and a half years of intensified ground water monitoring by the RPs, there has been no indication of an increasing plume size or increasing vinyl chloride concentrations.

Based on sampling results, the contamination in the St. Peter Aquifer has not yet reached the Ski Lane Ravine area of North Oaks. Vinyl chloride contamination has only been detected in a narrow band of residential wells from 12 West Shore Road to 2 Hummingbird Hill, and, to date, concentrations have not exceeded the HRL of 0.2 ug/l. The only MDH well advisory was issued due to additivity of two VOCs (including vinyl chloride).

2.0 SITE CHARACTERIZATION

The MPCA has scored and ranked the Highway 96 Site in accordance with criteria prescribed by the U.S. EPA, using the Hazard Ranking System Score (HRS Score). The HRS Score for the Highway 96 Dump Superfund Site is 31. The Site was listed on the Minnesota Permanent List of Priorities (PLP) in October 1985.

2.1 Regulatory History

In 1986, the MPCA sent Requests for Information (RFI) to Red Arrow Waste Disposal Services, Reynolds Metals Company and Whirlpool Corporation. The MPCA issued a Request for Response Action (RFRA) to Red Arrow Waste Disposal Services, Reynolds Metals Company and Whirlpool Corporation on July 22, 1986. The MPCA issued a RFRA to Mrs. Helen Krawczewski on May 25, 1993.

In 1991, the Minnesota Department of Health (MDH) completed a Health Consultation on the Site. Based on detections of vinyl chloride and other VOCs above applicable health-based standards in ground water on the east side of Gilfillan Lake, the Health Consultation concluded that the Site is a potential health concern due to potential risks posed by the ingestion of contaminated ground water.

The MPCA issued a MDD for the Site on October 7, 1993. In short, the MDD required the following:

- Removal of Drums from the waste areas
- Consolidation of the South Disposal Area onto the North Disposal Area
- A final cover of two feet of suitable soil
- Drainage and filling of the North Pond
- Continued operation of the North Disposal Area Extraction Well
- A monitoring plan for continued on and off-site monitoring
- Municipal water connections to be provided to North Oaks residents who had been issued a drinking water advisory by MDH
- The proper closure of wells once a home was connected to the municipal system
- Monitoring of residential wells

On January 9, 1995, the MPCA executed a Consent Order with Reynolds Metals Company and Whirlpool Corporation, Red Arrow Waste Disposal Service and Helen Krawczewski obligating the Responsible Parties to implement the MDD and to implement the Response Action Plan attached to the Consent Order. The Consent Order changed the ground water cleanup level for vinyl chloride from 0.1 ug/l (MDH "Recommended Allowable Limit" for vinyl chloride stipulated in the 1993 MDD) to 0.2 ug/l. This change made the cleanup level consistent with the HRL for vinyl chloride established by MDH. The Consent Order also required the RPs to pay for past and future MPCA costs.

On January 11, 2000, the MPCA and the RPs executed an Amendment No. 1 to the Consent Order. This Amendment addressed issues regarding Helen Krawczewski's sale of the site to Kraft 96 for development. This Amendment set up requirements for the sale of property and required restrictions and covenants on any sold properties. The Amendment also preserved MPCA's right to access these properties and allowed for a one year extraction well pilot test.

On May 29, 2001, the MPCA and the RPs executed an Amendment No. 2 to the Consent Order. The Amendment required Mark of Excellence Homes, Inc. to acquire an interest in a portion of the site slated for development, and bound Mark of Excellence Homes, Inc. to the terms and conditions of the Consent Order.

After the October 2004 detection of vinyl chloride in two residential wells on the west side of Gilfillan Lake, the MPCA requested that the RPs conduct a six month residential well study to investigate the nature and extent of vinyl chloride contamination on the west side of the lake. In March 2005, as an interim response measure, the RPs began supplying bottled water to the residences with detections of vinyl chloride in their wells.

In May 2005, the MDH issued a drinking water well advisory for one home west of Gilfillan Lake because of the presence of multiple contaminants in the ground water, including vinyl chloride. In March 2005, the RPs began supplying this home and two other homes west of the Lake with bottled water. As an interim long-term measure, in April 2006 the MPCA ordered the RPs to install a carbon filter on the well of the home that received the MDH well advisory. To date, the homeowner with the well advisory has not agreed to allow the RPs to install a carbon filter on the residential well.

In a September 1, 2005 letter, the MPCA approved several interim measures to be completed by the RPs, including installation of new monitoring wells east and west of Gilfillan Lake, and the installation of a new extraction well (EW-2) at the Site (i.e., in Source Control Operable Unit 1). Additionally, the MPCA set up a phased approach to approve, reject, or modify additional response actions that may be necessary based on new information.

In 2006, MDH evaluated residential well data from the west side of Gilfillan Lake. The Health Consultation dated March 28, 2006 stated that "because no exposures above existing health-based criteria are taking place, and routine monitoring of private and public wells in the area of concern in southeast North Oaks is occurring, the situation represents no apparent public health hazard at this time".

On October 2, 2006, the MPCA approved a revised two-year residential well monitoring plan. On October 16, 2006, the MPCA approved an investigation plan and a geophysical logging plan for residential wells for the area west of Gilfillan Lake. The MPCA also approved a geophysical survey work plan for the area underlying Gilfillan Lake on February 1, 2007.

On June 8, 2007, the MPCA requested that the RPs prepare and submit to the MPCA a FS addressing two potential scenarios for Operable Unit 4:

(1) remedial action alternatives where the concentrations of vinyl chloride and other Site-related VOCs in water samples from residential wells west of Gilfillan Lake remain at or below the MDH HRLs; and

(2) remedial action alternatives where the concentrations of vinyl chloride and/or other Site-related VOCs in water samples from residential wells west of Gilfillan Lake (singly, or through additivity) exceed the MDH HRLs and a well advisory is issued by the Minnesota Department of Health.

On September 25, 2007, after receiving comments on the FS from the City of North Oaks, the MPCA requested the RPs modify the FS. The RPs responded on October 25, 2007 with responses to the MPCA comments. The MPCA approved the FS with modifications on November 7, 2007.

The MPCA published a Proposed Plan Fact Sheet on February 19, 2008, and requested the public to comment on the recommended remedy for Operable Unit 4. The public comment period ended on March 21, 2008.

2.2 Contaminants of Concern and Cleanup Standards

Contaminants of concern at the Site include the following VOCs: 1,1-dichloroethane (DCA), benzene, toluene, trichloroethene, methyl ethyl ketone (MEK), trans-1,2-dichloroethene (DCE), and vinyl chloride, which are hazardous substances under MERLA. VOCs at the Site derive from waste paints and solvents.

In 1994, MDH enacted a HRL for vinyl chloride of 0.2 ug/L. A HRL is a promulgated rule that sets a health standard for vinyl chloride and represents a level of contamination in drinking water that MDH considers acceptable for daily human consumption over a lifetime. The HRLs are health-based criteria and are often used by the MPCA, as a regulatory agency, as the basis for decisions regarding the investigation and remediation of contaminated ground water. This HRL is the cleanup standard used by the MPCA for vinyl chloride for OU4. See the MPCA Remediation Program's table of drinking water criteria at http://www.pca.state.mn.us/publications/risk-drinkingwatercriteria.xls.

2.3 Exposure Assessment

The objective of the exposure assessment is to evaluate potential human exposures to contaminants of concern in the environmental media. Using the following principles, the exposure assessment will influence the scope of the potential remedial actions.

1) Exposure pathways that are determined to be "complete" present a potential for receptors to contact contaminants of concern.

2) If exposures are of sufficient magnitude and duration, adverse health effects could result.

3) Pathways determined to be "incomplete" represent situations where exposure is unlikely to occur.

4) Without contact or exposure to contaminants of concern, there is little risk of associated adverse health effects, even in areas where chemicals were detected.

Ground Water contamination associated with the Site has been detected by routine monitoring of private wells in the city of North Oaks. Four private wells have had detections of vinyl chloride at concentrations at or just below the current HRL for vinyl chloride of 0.2 ug/L; the occupants of one of the homes with vinyl chloride in the residential well were issued a drinking water advisory letter by MDH in May 2005 because of the combined presence of vinyl chloride and two other possible carcinogens. The residences with vinyl chloride detections are being provided with bottled water as an interim response action. Because no exposures above existing health-based criteria are taking place, and routine monitoring of private and public wells in the area of concern in southeast North Oaks is occurring, the situation represents no apparent public health hazards.

2.4 Human Health and Ecological Risks

Data obtained during the RI and subsequent investigations conducted at the Site were used to evaluate potential receptor pathways and risks to human health and the environment associated with the contaminants of concern. To date, only four residential wells have shown vinyl chloride detections, and all four detections are at or below the HRL (0.2 ug/L). Ground Water in the St. Peter Sandstone is most commonly used as a potable water supply in North Oaks, and there could be potential future exposure to contaminants of concern in this aquifer. Therefore, the ground water exposure pathway is complete for human receptors.

As an interim measure, the RPs are currently providing bottled water to the four residences that have had vinyl chloride detections in well water. Thus, there are no current human receptors. Potential future human receptors include residents of the area encompassed by Operable Unit 4. See Figure 1, attached hereto and herein incorporated by reference. This area includes eighty-two (82) homes.

3.0 RESPONSE ACTION OBJECTIVES

3.1 Response Action Objective

Remedial actions for releases and threatened releases of hazardous substances, and pollutants or contaminants, must be selected and carried out in compliance with State legal requirements. The general legal standard that must be met by any remedial action selected and implemented under MERLA is that the remedial action must protect public health and welfare and the environment. Minn. Stat. §§115B.17, subd. 1. The response action objective at this Site is to limit human exposure to contaminants of concern in the soil and ground water.

A remedy, as defined under MERLA, must include requirements for remedy monitoring and maintenance, institutional controls, and other measures that are reasonably necessary to assure the protectiveness of the selected remedy over the long term. MERLA also requires the MPCA to consider the planned use of the property where the release is located when determining the appropriate standards to be achieved by a remedy. These issues are discussed in detail below.

Finally, MERLA requires the MPCA to make specific determinations when a remedy involves off-site transportation and disposal of contamination, as such activities are not considered part of a remedy unless the MPCA makes certain determinations about the remedy. This MERLA determination, as it would apply to the Site remedy, is discussed in Section 6.

3.2 Long Term Assurance of Protectiveness

A MERLA remedy must include measures that are reasonably required to assure the ongoing protectiveness of a remedy once the components of the remedy have been constructed and have entered their operational phase. Such measures may include, but are not limited to, institutional controls, and monitoring and maintenance requirements. This section discusses the measures that the MPCA determines are reasonably necessary to assure long-term protectiveness of the remedy considered for the purposes of this MDD Amendment.

3.3 Institutional Controls

Institutional controls are legally enforceable restrictions, conditions or controls on the use of property, ground water or surface water at a Superfund Site that are reasonably required to assure the protectiveness of a remedy or other response actions taken at the site. Institutional controls include restrictions, conditions, or controls enforceable by contract, easement, restrictive covenant, statute, ordinance, or rule, including official controls such as zoning, building codes, and official maps. An Affidavit required under Minn. Stat. §§115B.16, subd. 2, or similar notice of a release recorded with real property records is also an institutional control.

3.4 Long-Term Monitoring

Long-term monitoring is required to ascertain plume stability and provide data to show that contamination in ground water is not continuing to migrate. The monitoring provides data to confirm that the selected Site remedy associated with ground water contamination will continue to be protective.

3.5 Planned Use of the Property

In a provision entitled "Cleanup Standards" (Minn. Stat. §115B.17, subd. 2a), MERLA provides that when the MPCA determines the standards to be achieved by response actions to protect public health and welfare and the environment from a release of hazardous substances, the agency must consider the planned use of the property where the release is located. The purpose of this provision of MERLA is to allow the MPCA to select cleanup standards that provide a level of protection that is compatible with the uses of the property that can be reasonably foreseen**.**

4.0 REMEDY SELECTION CRITERIA AND DETAILED ANALYSIS OF RESPONSE ACTION ALTERNATIVES

This section presents the criteria used by the MPCA to select a remedy for the Site and presents the MPCA's evaluation of each of the seven (7) remedy alternatives based upon those criteria.

4.1 Remedy Selection Criteria

The MPCA divides the remedy selection criteria into three categories: the threshold criteria, balancing criteria, and community acceptance. The remedy selection criteria are described in detail below.

4.1.1 Threshold Criteria

To be selected by the MPCA, a remedy alternative must meet two threshold criteria. First, the remedy alternative must provide overall protection of public health and welfare and the environment. This criteria is met if the alternative will achieve the cleanup levels identified in Section 2 and other legally applicable requirements are met. Second, the remedy alternative must comply with applicable or relevant and appropriate requirements (ARARs), meaning that a remedy must comply with all rules and permits and local requirements.

4.1.2 Balancing Criteria

Remedial alternatives that meet the threshold criterion of overall protection of public health and welfare and the environment and compliance with ARARs are further evaluated by weighing them against the balancing criteria below.

Long-Term Effectiveness. Long-term effectiveness is the ability of an alternative to maintain the desired level of protection of public health and welfare and the environment over time. Alternatives that significantly alter the hazardous substances or pollutants or contaminants to produce significant reductions in toxicity, mobility, or volume through treatment will be preferred. In addition, the ability of the alternative to obtain and/or manage treatment residuals, minimize transfer of contaminants to another environmental media, and maintain established cleanup levels over time are evaluated in determining long-term effectiveness.

Implementability. The MPCA considers the technical and administrative feasibility of implementing the alternative and the availability of services and materials that affect the ability to implement the alternative.

Short-Term Risks. The short-term risks that may be posed as a result of constructing and implementing each remedial alternative are considered and weighed against the ultimate long-term benefits of implementing that alternative.

Cost Effectiveness. The complete cost breakdown of implementation of the alternative, including the projected costs of any long-term monitoring, operation and maintenance costs, and response action dismantling are considered. The future costs to replace the alternative or respond to a future release are considered in the evaluation of the alternative.

Reduction of Toxicity, Mobility, or Volume (TMV) Through Treatment. This criteria addresses the statutory preference for selecting remedial actions, which implement treatment technologies that permanently and significantly reduce the TMV of the hazardous contaminants. This preference is satisfied when treatment is implemented to reduce the principal threats at a site through destruction of hazardous compounds, reduction in the total mass of the contaminant, irreversible reduction in contaminant mobility, or reduction in the total volume of contaminated media.

4.1.3 Community Acceptance

Community acceptance assesses the degree of acceptance or opposition interested persons in the community have regarding the proposed remedy. State acceptance is a determination of the acceptability a remedial alternative will have by achieving remedial goals within the framework of State laws, rules, and regulations.

Public comments are considered during the remedy development and selection process. Community participation is encouraged as early as possible and public notice is provided prior to the remedy selection. The Site Remediation program is an open process wherein the MPCA receives and considers public comments and correspondence throughout the management of a Superfund Site.

4.2 Documents Reviewed

The MPCA based its decision on the files, records and proceedings of the MPCA related to the Site, including, but not limited to, the formal reports set forth below (Site Documents). The Site Documents describe the Highway 96 Site characteristics, describe the regulatory requirements for the Site, evaluate recommended response action alternatives, and describe the effectiveness and cost analysis of various response actions for the Site:

- Evaluation Report; White Bear Lake Township Dump Site; Ramsey County, Minnesota. December 1986 by Conestoga-Rovers & Associates.
- White Bear Lake Township Dump Site – Phase I Sampling Results and Preliminary Data Assessment/ Phase II Work Plan. July 29, 1987. Conestoga-Rovers & Associates.
- Alternatives Analysis Report; White Bear Lake Township Dump Site; White Bear Township, Minnesota. October 1988. Conestoga-Rovers & Associates.
- Detailed Analysis Report; Highway 96 Dump; White Bear Township, Minnesota. April 1989. Conestoga-Rovers & Associates.
- Public Health Consultation for the Highway 96 Dump and North Oaks Ground Water Contamination. June 1993. Minnesota Department of Health.
- 1993 Minnesota Decision Document for the Highway 96 Dump Site.
- 1995 Consent Order between the MPCA and Reynolds Metals Company and Whirlpool Corporation, Red Arrow Waste Disposal Service and Helen Krawczewski.
- 2000 Amendment Number One to the Consent Order between the MPCA and Reynolds Metals Company and Whirlpool Corporation, Red Arrow Waste Disposal Service, Helen Krawczewski and Kraft 96.
- 2001 Amendment Number Two to the Consent Order between the MPCA and Reynolds Metals Company and Whirlpool Corporation, Red Arrow Waste Disposal Service, Helen Krawczewski, Kraft 96 and Mark of Excellence Inc.
- Ground Water and Residential Well Evaluation North Oaks, Minnesota. June 2005. Conestoga-Rovers & Associates.
- September 1, 2005 MPCA letter to Conestoga-Rovers & Associates.
- Ground Water and Residential Well Evaluation North Oaks, Minnesota; June 2005- January 2006. February 2006. Conestoga-Rovers and Associates.
- Health Consultation, North Oaks Private Well Contamination Associated with the Highway 96 Dump, March 28, 2006, Agency for Toxic Substances and Disease Registry.
- Ground Water and Residential Well Evaluation North Oaks, Minnesota; February 2006-January 2007. February 2007. Conestoga-Rovers and Associates.
- 2006 Annual Monitoring Report, Highway 96 Site. March 2007. Conestoga-Rovers and Associates.
- Feasibility Study VOCs in Ground Water – West of Gilfillan Lake North Oaks, Minnesota. July 2007. Conestoga-Rovers and Associates.
- Response to Comments regarding the FS. Letter: October 25, 2007 Conestoga-Rovers and Associates.
- 2007 Annual Monitoring Report, Highway 96 Site. March 2008. Conestoga-Rovers and Associates

4.3 Summary of Response Action Alternatives

The response action alternatives considered in the FS, dated July 2007, include alternatives set forth under two scenarios, as follows:

4.3.1 Two Scenarios

A. Scenario A: Where the concentrations of vinyl chloride and other Site-related VOCs in water samples from residential wells west of Gilfillan Lake (singly or through additivity) remain at or below the MDH HRLs, the FS proposed the following response actions:

1) No Action;
2) Long-term ground water monitoring program for residential wells and monitoring wells; and
3) Installation and operation of a pumpout system in the Ski Lane ravine area.

B. Scenario B: Where the concentrations of vinyl chloride and/or other Site-related VOCs in water samples from residential wells west of Gilfillan Lake (singly, or through additivity) exceed the MDH HRLs, and at least one well advisory is issued by the MDH, the FS proposed the following response actions:

1) No Action;
2) Installation of a carbon filter at the home(s) with a well advisory;
3) Installation of a new well into a different/deeper aquifer at the homes with a well advisory; and
4) Installation of a municipal water system for the home(s) that have received a well advisory.

A long-term ground water monitoring program can be required as part of Alternatives 2, 3, and 4 under this scenario. In addition, alternatives 2, 3, and 4 can include a pumpout system (listed as Alternative A3 above).

4.4 Analysis of Alternatives

The FS evaluated the alternatives for the two scenarios (set forth in section 4.3.1 above) against the criteria set forth in section 4.1 above and compared and contrasted alternatives. After the FS was submitted and approved with modifications, the MPCA reviewed the modified FS to determine which alternatives are reasonable and necessary and best address Site concerns.

4.4.1 Alternative A1 - No Action

Alternative A1, the “No Action” alternative, is included in the screening of alternatives as a baseline for comparison with the active response actions considered. Under this alternative, the response actions and monitoring program at the landfill would continue and monitoring of residential and monitoring wells in North Oaks would be discontinued.

This alternative does not meet the threshold criterion of adequately protecting public health or welfare or the environment from potential risks at the Site, nor does it comply with ARARs. Therefore, the MPCA dropped this alternative from further consideration.

4.4.2 Alternative A2 - Long-term ground water monitoring program for residential wells and monitoring wells

Alternative A2 is a continuation of the interim long-term ground water monitoring program. This Alternative includes the proposed installation of two or three angled monitoring wells near the west shore of Gilfillan Lake to aid in determining ground water quality beneath Gilfillan Lake. This Alternative could be considered as the only Response Action or could be combined with another alternative. Long-term monitoring can serve as an early detection system and can be used to determine, in advance, if additional response actions are necessary to protect down gradient receptors. This Alternative meets the threshold criteria of overall protection of human health and compliance with ARARs. Since most of the wells are already in place, this remedy is relatively easy to implement, with a relatively low cost. Obtaining access to residential property for the placement of the additional monitoring wells could be a potentially complicating factor.

4.4.3 Alternative A3 - Installation and operation of a pumpout system in the Ski Lane Ravine Area

Alternative A3, the Ski Lane Ravine pumpout system, considered possible well locations, water disposal options, and timing for operation of the pumpout system. The FS considered any potential impacts of the system on nearby wells and air quality. The pumpout alternative also included a ground water monitoring program (as listed for Alternative A2). The pumpout system is considered an option that could be combined with any of the Alternatives listed in Scenario B. This Alternative can be implemented in order to protect downgradient receptors (e.g., residents on Ski Lane).

This Alternative meets the threshold criteria, but may have some short-term impacts due to potential changes in local ground water flow patterns and may be difficult to implement. In addition, this Alternative is the least cost effective of the Alternatives in Scenario A.

4.4.4 Alternative B1 - No Action

Alternative B1, the “No Action” alternative, is included in the screening of alternatives as a baseline for comparison with the active response actions considered. Under this alternative, the response actions and monitoring program at the landfill would continue and monitoring of residential and monitoring wells in North Oaks would be discontinued. This alternative does not meet the threshold criteria of adequately protecting public health or welfare or the environment from potential risks at the Site, nor does it comply with ARARs. Therefore, the MPCA dropped this alternative from further consideration.

4.4.5 Alternative B2 - Installation of a carbon filter at the home(s) with a well advisory

Alternative B2 would require the installation of whole-house carbon treatment units inside the home where vinyl chloride or another Site-related VOC (See Section 2.2. above), exceeds its respective HRL in the residential well and a well advisory is issued by MDH. The carbon treatment units would remove VOC contamination from drinking water and from water used for other purposes in the home. This remedy requires regular monitoring to verify that the carbon is effectively removing VOCs, as well as regular change-out of spent carbon filters. This alternative meets the threshold criterion, is easily implementable, and has relatively few short-term risks and reasonable potential long-term costs associated with filter change-out. However, this Alternative would require long-term involvement between the homeowner, the MPCA, MDH, and the RPs to accomplish ongoing maintenance of the treatment system, sampling, and data reporting.

4.4.6 Alternative B3 - Installation of a new residential well into a different/deeper aquifer for homes with a well advisory

Alternative B3 requires the installation of a new residential well into the Prairie du Chien Aquifer for any residence in OU4 where vinyl chloride or another Site-related VOC (See Section 2.2. above) exceeds its respective HRL in the residential well and a well advisory is issued by MDH. The new well(s) would be monitored under the long-term monitoring program established in Alternative A2. Analytical data from approximately ten wells in the southeastern portion of North Oaks show that the Prairie du Chien Aquifer is not contaminated by vinyl chloride from the Site. This same aquifer is used for drinking water by many homes and municipalities in the Twin Cities metropolitan area. At the time of the installation of the new deeper well, the old residential well will be permanently sealed in accordance with MDH rules, unless the MPCA determines that the old well should be converted to a monitoring well. This Alternative meets the threshold criterion, has minimal short-term risks, is easily implementable, is relatively cost-effective, and is a proven method of providing a potable water supply.

The advantages of this remedial approach include:

- High long-term effectiveness because the deeper well in the Prairie du Chien or Jordan aquifer provides clean water to the residents;
- Technical feasibility because of available access to the deeper aquifer;
- Low short-term risks when proper safety controls are followed during well installation;
- Lower costs to install and maintain new/deeper residential wells compared to a municipal water supply system or long-term use of a carbon filter;
- Higher community acceptance because there is little disruption of the area during well installation;
- Continued beneficial use of the residential property and protection of the residents' health;
- Compliance with ARARs; and
- Overall protection of human health and the environment.

Installation of a deeper residential well into an uncontaminated aquifer does not remove contaminants from the ground water, nor does it reduce toxicity or mobility of the contaminants.

4.4.7 Alternative B4 - Installation of a municipal water system for homes with a well advisory

Alternative B4 would require the installation of a municipal water system. The most feasible scenario would be to connect homes with well advisories to the existing water line, which ends on the south side of Gilfillan Lake. This Alternative meets the threshold criteria, but would have short-terms risks to the community during construction of the water system. In addition, this Alternative is not easy to implement as it would require a new or amended agreement between White Bear Township and North Oaks, City Engineer review and approval of a design, North Oaks Home Owner's Association (NOHOA) approvals for roadway and utility easements, design approval by MDH, North Oaks, NOHOA and White Bear Township, and individual agreements with property owners. This Alternative is the least cost-effective of the Scenario B alternatives, particularly if there are only a few residences with well advisories.

5.0 SELECTED RESPONSE ACTION ALTERNATIVE AND CONCEPTUAL DESIGN

Having evaluated the remedy alternatives presented in the FS, the MPCA has determined that Alternative 4.4.2 and 4.4.6, installation of a new residential well into a different/deeper aquifer at the homes with a well advisory in conjunction with long-term ground water monitoring best satisfies those criteria for selection as the remedial action at the Site. In addition, in the event that vinyl chloride or another Site-related VOC (See Section 2.2 above) exceeds its respective HRL in any of the Ski Lane Ravine monitoring wells, and is confirmed with a follow-up sample within 30 days, the MCPA has determined that Alternative A3, installation and operation of a pumpout system in the Ski Lane ravine area, should be implemented as a supplemental response action at the Site.

This selected remedy includes the remedy components described in Section 4.4.2 and 4.4.6. This Section also describes how the selected remedy satisfies other requirements that must be addressed under MERLA.

The MPCA has determined that implementation of the selected remedy is reasonable and necessary to protect the public health or welfare from actual or threatened releases of hazardous substances into the environment at the Site. The selected remedy must be implemented to meet the Response Action Objective (RAO) identified for that alternative. Prior to implementation of the selected remedial action, the Responsible Party must obtain MPCA approval of a final Remedial Design/Response Action Plan.

5.2 Remedial Action Elements

The selected remedial action shall include the following elements:

5.2.1 Installation of a New Residential Well into a Deeper Aquifer at the Homes with a Well Advisory

The St. Peter Sandstone is the primary source of drinking water in North Oaks and is the aquifer in North Oaks that is impacted by vinyl chloride contamination from the Site. The homes that receive well advisories will be provided with new wells in a deeper aquifer.

The Prairie du Chien aquifer is the next deeper aquifer below the St. Peter. Based on monitoring data from North Oaks, and specifically from the Gilfillan Lake area, the Prairie du Chien aquifer is not impacted by vinyl chloride contamination from the Site. Therefore, homes in Operable Unit 4 that receive well advisories will be provided with new Prairie du Chien aquifer wells. MDH-licensed well drillers will install these new wells approximately 100 feet deeper than the old St. Peter wells. During well installation, the drillers will take precautions to seal off the St. Peter from the Prairie du Chien aquifer, to assure that contamination does not spread from the St. Peter into the Prairie du Chien.

5.2.2. Long-Term Ground Water Monitoring

To help establish and confirm ground water contamination plume stability, additional ground water monitoring is required, including the following:

- Semi-annual sampling of thirty-three (33) residential wells located in Geographic Area 3 - west of Gilfillan Lake (See Figure 2 attached hereto and herein incorporated by reference;
- Annual sampling of twenty (20) residential wells located in Geographic Area 4 - north and west of Gilfillan Lake and fourteen (14) residential wells located in Geographic Area 5 - west of Gilfillan Lake (residential wells located along the shoreline of Gilfillan Lake, including wells along West Shore Road and Duck Pass);
- Biennial sampling of eleven (11) residential wells located in Geographic Area 4 - east and west of Gilfillan Lake and four (4) residential wells located in Geographic Area 5 - west of Gilfillan Lake;
- Annual sampling of the nine (9) off-Site monitoring wells and four (4) converted residential monitoring wells located in North Oaks;
- In addition, four to five new upper St. Peter Sandstone aquifer monitoring wells would be installed west of Gilfillan Lake as part of an expanded monitoring program; two of these wells would be installed in the Ski Lane Ravine and two to three wells would be installed at an angle under the west shore of Gilfillan Lake;
- A monitoring period of approximately twenty (20) years is planned; however, the MPCA will determine the appropriate scope and frequency of monitoring.

5.3 Other Considerations Under Minnesota Environmental Response and Liability Act

5.3.1 Long Term Assurance of Protectiveness

5.3.1.1 Long Term Monitoring

The remedy shall be implemented as set forth in the approved FS and in accordance with a long-term monitoring plan approved by the MPCA as part of the final RD/RA Plan. These plans shall meet all of the requirements set forth in the Response Action Objective for the selected remedy and other requirements set forth in this MDD Amendment.

5.3.1.2 Planned Use of the Property

MERLA provides that, in determining the standards to be achieved by response actions to protect public health and welfare and the environment from a release of hazardous substances, the MPCA must consider the planned use of the property where the release is located. The purpose of this provision of MERLA is to allow the MPCA to select cleanup standards that provide a level of protection that is compatible with the uses of the Site that can be reasonably foreseen. As set forth in this MDD Amendment, and based upon the factors that the MPCA is required to consider, the MPCA has determined that cleanup to 0.2 ug/L in ground water is appropriate at this Site and would provide protection of public health and welfare and the environment that is consistent with the current and planned residential use of the property.

6.0 ESTABLISHMENT OF RESPONSE ACTION OBJECTIVES AND CLEANUP LEVELS

The Response Action Objectives for Operable Unit 4 are to protect the public from exposure to ground water contamination, which exceeds the HRLs, and to protect residential wells from the release or threatened release of contaminated ground water, using reasonable and necessary response actions. An additional response action objective is to provide safe drinking water for the residents in Operable Unit 4 of North Oaks who have received drinking water advisories.

Since one or more of the above response actions are required in the event of an MDH well advisory and since the well advisory is precipitated by a HRL exceedance (singly or through additivity) in a residential well, the HRLs are therefore the criteria that dictate a response action. Thus, the HRLs for the site-related contaminants, including benzene, toluene, MEK, DCA, DCE, and vinyl chloride, are the appropriate cleanup/action levels for the Site, and are provided in Table 1, attached hereto and herein incorporated by reference**.** These cleanup levels apply to the quality of water in the new residential wells required by the remedial action. It is important to acknowledge that future HRL revisions may require additional response actions.

7.0 RESPONSIVENESS SUMMARY

Pursuant to Minn. Stat. § 115B.17, subd. 2b (2006), the MPCA issued a public notice on February 19, 2008 describing the recommended response action. The notice was sent to the Shoreview News paper for publication on February 19, 2008. The MPCA accepted comments regarding the selected response action until March 21, 2008.

On February 26, 2008, at the East Recreational Center in North Oaks, the MPCA held a public meeting to discuss the draft MDD Amendment. Approximately sixty-five (65) citizens attended the public meeting, including Senator Sandy Rummel, Representative Paul Gardner, the Mayor of North Oaks, members of the North Oaks City Council, and representatives for the Responsible Parties. Questions during the meeting focused primarily on the reasons for amending the 1993 MDD, and the two potential contingency remedies: municipal water and the Ski Lane Ravine pumpout system.

During the comment period, the MPCA received letters and electronic mail (e-mail) from 15 residents, the City of North Oaks, Reynolds Metals Company and Whirlpool Corporation. On April 1, 2008, after the comment period ended, the MPCA received written comments from State Representative Paul Gardner. Many of the letters and e-mails contained multiple comments. The attached Responsiveness Summary lists the comments/questions and the MPCA responses.

8.0 FINDINGS AND DETERMINATIONS

Based upon all of the files, records and proceedings of the MPCA related to the proposed remedial action at the Highway 96 Dump Superfund Site, including but not limited to the documents identified in Section 4.2 (Site Documents) and other documents referred to in this MDD Amendment, the MPCA makes the determinations set forth herein.

8.1.1 Minnesota Environmental Response and Liability Act

1. The MPCA has authority to take, or require responsible persons to take, response actions to address releases and threatened releases of hazardous substances to the environment at and from the Highway 96 Dump Superfund Site under Minn. Stat. §§115B.01 to 115B.20 of the Minnesota Environmental Response and Liability Act ("MERLA").

2. The MPCA has authority to determine what response actions are reasonable and necessary to protect public health and welfare and the environment under MERLA, Minn. Stat. §§115B.17, subd. 1 and 115B.18.

3. Under MERLA, the MPCA executed a Consent Order dated January 9, 1995 with the Responsible Party ordering investigation and remedial action at the Highway 96 Dump Superfund Site.

4. The Minnesota Decision Document dated 1993 documented the selection of a remedy by the MPCA for the east side of Gilfillan Lake at the Highway 96 Dump Superfund Site in North Oaks, Minnesota.

5. Any decision under MERLA, including a decision to select a remedy to address a release of hazardous substances, may be made by the MPCA Commissioner pursuant to Minn. Stat. §§116.03, subd. 1(c).

8.1.2 Procedures

1. Procedures for addressing the release and threatened release associated with the remedial action at the Site, including site investigation, evaluation of alternative remedies, and selection and implementation of a remedy, are outlined in the 1993 MDD and the 1995 Consent Order.

2. Additional procedures for selecting and implementing a remedy for the remedial action are set forth in MERLA.

3. The MPCA has followed all of the required procedures for selecting the remedy that is selected in this Minnesota Decision Document Amendment.

4. The MPCA has reviewed and approved, with modifications, the FS submitted by the Responsible Party.

5. In reviewing and approving the FS the MPCA considered the public and property owner comments received relating to this Site.

6. The MPCA prepared a proposed plan (Draft MDD Amendment) stating the MPCA's preferred remedy for the Site, provided public notice of the availability of the Draft MDD Amendment, provided thirty days for public comment on the Draft MDD Amendment, and responded to all timely and untimely public comments received on the Draft MDD.

8.1.3 The Remedy is Reasonable and Necessary to Protect Public Health and Welfare and the Environment

1. The remedial action selected in this MDD Amendment for the Site is reasonable and necessary to protect the public health and welfare and the environment from the release and threatened release of hazardous substances as provided in MERLA and further findings and determinations as set forth in this MDD Amendment.

2. The MPCA established a response action objective and cleanup levels for the site in accordance with state law and the MPCA Risk-Based Site Evaluation Manual, October 1998.

3. The cleanup levels established and identified in this MDD Amendment constitute the standards that must be achieved by the remedial action in order to protect public health and welfare and the environment from releases and threatened releases of hazardous substances at and from the Site.

4. Criteria for selecting the remedial action are set forth in this MDD Amendment. The remedy selection criteria consist of: the threshold criterion of protection of public health and welfare and the environment and compliance with ARARs; the balancing criteria of long-term effectiveness, implementability, short-term risks, and cost-effectiveness; and the additional criterion of community acceptance.

5. The MPCA reviewed the remedy alternatives evaluated in the FS in accordance with the remedy selection criteria.

6. The selected remedy meets the threshold criterion of protection of public health and welfare and the environment because, when the remedy is implemented in accordance with the requirements in the MDD Amendment, it will meet the site-specific cleanup levels established by the MPCA and other legal requirements applicable to the remedy.

7. The MPCA compared the selected remedy to the other remedial alternatives evaluated in the FS and determined that the selected remedy provides the best balance among the balancing criteria in consideration of the Site circumstances and public acceptance.

8.1.4 Other MERLA determinations

1. The MPCA's notice of the proposed selection of the remedial action and opportunity for public comment meets the requirements of Minn. Stat. §115B.17, subd. 2b.

2. In setting the standards to be achieved by the remedy selected in this MDD Amendment, the MPCA considered the planned use of the property where the release is located, in accordance with Minn. Stat. §§115B.17, subd. 2a.

3. Pursuant to Minn. Stat. §§115B.02, subd. 16(c), the MPCA determines that installation of a new residential well into a deeper aquifer for homes in OU4 that are issued a well advisory in conjunction with a long-term ground water monitoring program is necessary to protect the public health or welfare or the environment from a present or potential risk that may be created by further exposure to the continued presence of the contaminants of concern. In addition, the MPCA determines that, in the event that vinyl chloride or another Site-related VOC (See Section 2.2 above) exceeds its respective HRL in any of the Ski Lane Ravine monitoring wells, and is confirmed with a follow-up sample within thirty (30) days, that installation and operation of a pumpout system in the Ski Lane Ravine area should be implemented as a supplemental response action at the Site, and is necessary to protect the public health or welfare or the environment.

8.1.5 The Remedy is Not Inconsistent with CERCLA and the NCP

The MPCA determines that the remedy selected in this MDD Amendment is not inconsistent with the Federal Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9601 et seq (CERCLA) and the National Contingency Plan, 40 C.F.R. Part 300 (NCP).

8.1.6 Other Determinations in this MDD Amendment

To the extent that the remedy selected in this MDD Amendment is based on or is supported by any determinations made in other sections of this MDD Amendment, those determinations are incorporated into the determinations in this Section 8.

8.2 Selection of Remedy

1. The MPCA selects the installation of a new residential well into a deeper aquifer for homes in OU4 that are issued a well advisory in conjunction with a long-term ground water monitoring program as the remedy for Operable Unit 4 at the Highway 96 Dump Superfund Site. In addition, the MPCA selects, in the event that vinyl chloride or another Site-related VOC (See Section 2.2 above) exceeds its respective HRL in any of the Ski Lane Ravine monitoring wells, and is confirmed with a follow-up sample within thirty (30) days, that installation and operation of a pumpout system in the Ski Lane Ravine area should be implemented as a supplemental response action at the Site, and is necessary to protect the public health or welfare or the environment. The selected remedy shall be implemented in compliance with the response action objective, cleanup levels, and other requirements specified in this MDD Amendment.

2. This MDD Amendment is incorporated in and made an integral part of the Consent Order and shall be implemented in accordance with an MPCA-approved Remedial Design/Response Action Plan and Amendments.

Brad Moore

Brad Moore
Commissioner
Minnesota Pollution Control Agency

8/26/08
Date

AG: #2266214-v1

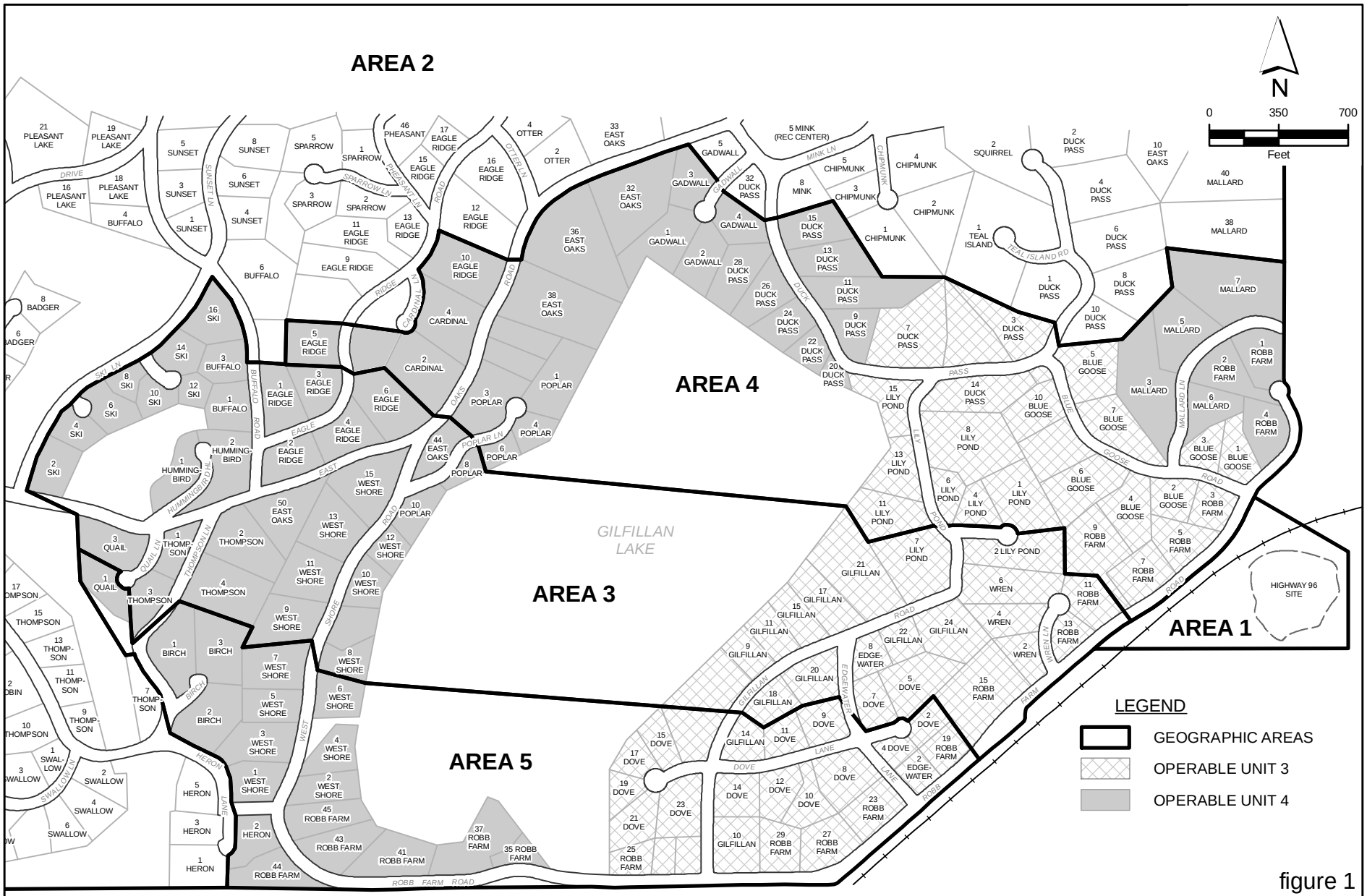


figure 1

GEOGRAPHIC AREAS AND OPERABLE UNITS
(NORTH OAKS, MINNESOTA)
Highway 96 Landfill Site

2012-00(MISC023)GIS-SP001 JAN 30/2008

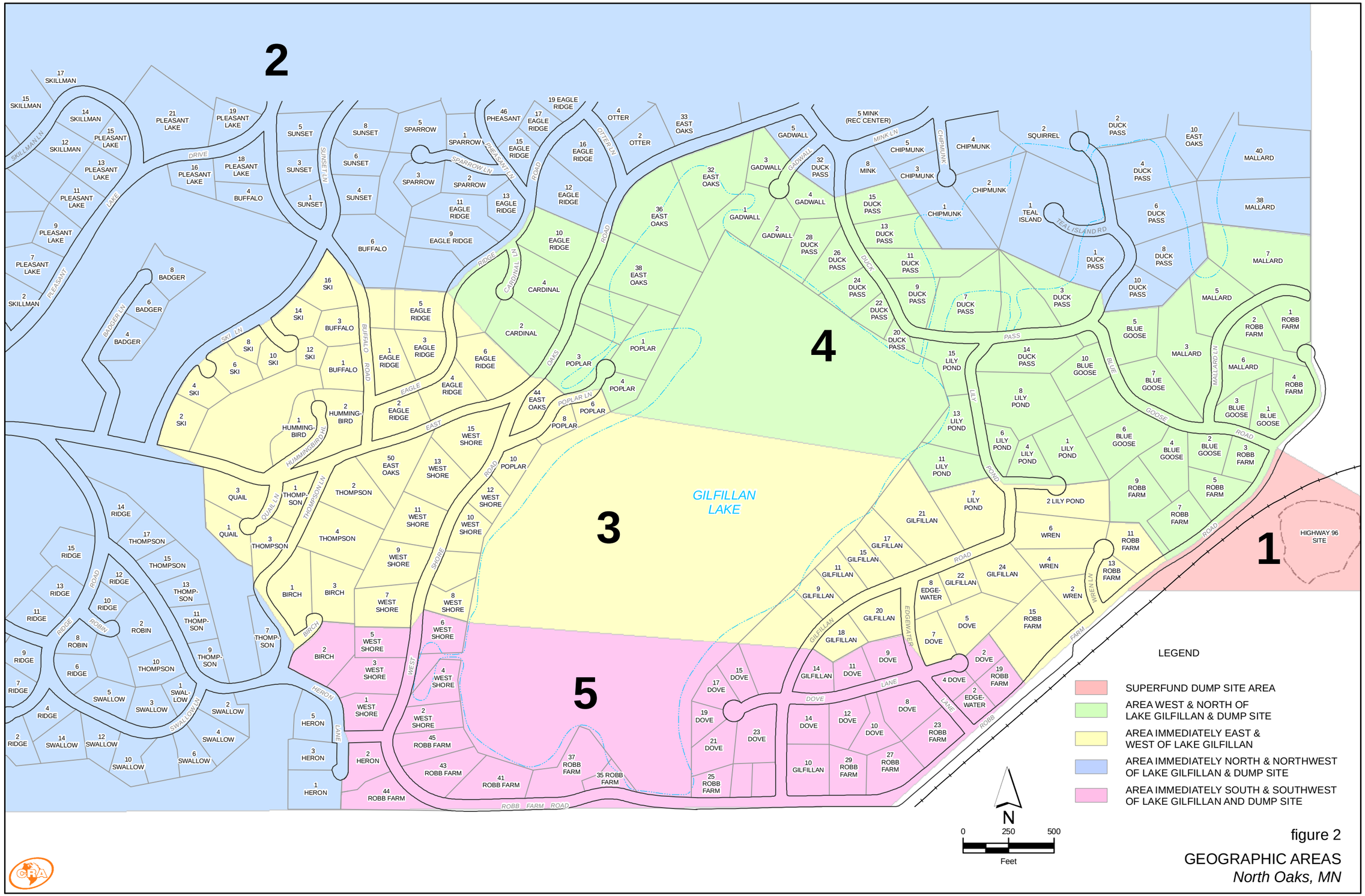


figure 2

GEOGRAPHIC AREAS

North Oaks, MN

2012-00(TEMP001)GIS-SP003 AUG 28/2005

TABLE 1

Highway 96 Dump Site Ground Water Cleanup Goals

Volatile Organic Compound (VOC)	Cleanup Goal	Source
1,1,2-Trichloroethene (TCE)	5 ug/l	Minnesota Department of Health, Health Risk Limit
Vinyl chloride	0.2 ug/l	"
trans-1,2-Dichloroethene (DCE)	100 ug/l	"
1,1-Dichloroethane (DCA)	70 ug/l	"
Benzene	5 ug/l	"
Toluene	1000 ug/l	"
Methyl Ethyl Ketone (MEK)	4000 ug/l	"

RESPONSIVENESS SUMMARY

1. PUBLIC COMMENT: What is the rationale for amending the 1993 Minnesota Decision Document for the Highway 96 Dump Superfund Site?

Five letters asked this question: Eisenschenk, Madill, Tiffany, Wiley and the City Council for the City of North Oaks. (See Public Comment List attached hereto and herein incorporated by reference)

Public comments questioned the rationale for amending the Minnesota Decision Document (MDD) and whether it would be more appropriate to enforce the terms and conditions of the existing MDD.

Minnesota Pollution Control Agency RESPONSE:

In 1993 the Minnesota Pollution Control Agency (MPCA) selected a remedial action for three operable units associated with the Site:

- Operable Unit 1 - Source Control;
- Operable Unit 2 – Ground Water Remediation; and
- Operable Unit 3 - Residential Drinking Water (east of Gilfillan Lake).

Since 1993, the Responsible Parties RPs ("Whirlpool and Reynolds"), have implemented the selected remedies for Operable Units 1, 2, and 3 pursuant to the MDD and under the direction of the MPCA. One component of the remedy included a municipal water system that was sized to provide clean water to the twelve homes that received Minnesota Department of Health (MDH) well advisories on the east side of Gilfillan Lake and allowed for additional connections on the east side of Gilfillan Lake. However, the system was not intended to provide service to the west side of Gilfillan Lake and the piping for the system ends at the southern end of the Lake.

At the time the remedy was selected in the 1993 MDD, the MPCA expected the vinyl chloride contamination that was detected in one well on the west side of Gilfillan Lake (at 0.075 ug/l) to eventually and completely attenuate. As a result, the MPCA did not anticipate that any response action, beyond long-term monitoring, would be required on the west side of Gilfillan Lake. Thus, the scope of the remedy under the 1993 MDD did not encompass any action on the West side of Gilfillan Lake other than the long-term monitoring.

Since 2004, new information has been obtained regarding the extent and magnitude of the vinyl chloride ground water contamination on the west side of Gilfillan Lake. Based on residential well monitoring conducted since 2004, which detected low level (i.e., less than or equal to the health-based standard) vinyl chloride contamination in four wells west of Gilfillan Lake, the MPCA established Operable Unit 4 - Residential Drinking Water/west of Gilfillan Lake. This new operable unit includes homes west of the lake that could potentially be impacted by vinyl chloride contamination from the Site. The MDD Amendment is needed to address the remedial actions and obligations of the RPs for this new Operable Unit 4. The MDD Amendment does not alter any of the RPs' previous obligations under the 1993 MDD.

2. PUBLIC COMMENT: Why did the MPCA establish a new operable unit for the Site?

This question was asked in two letters: Eisenschenk and Heberlein.

Public comments questioned the basis for distinguishing Operable Unit 3 (east side of Gilfillan lake) and Operable Unit 4 (west side of Gilfillan Lake).

MPCA RESPONSE:

Operable units are defined portions of a Superfund Site and can be delineated by geographic areas, remedial action, or medium such soil, ground water or air. Because new information detected low level contamination in four wells on the west side of Gilfillan Lake, which is not included in Operable Unit 3 of the 1993 MDD, and because this area is a distinct geographic area, the MPCA established OU4 on the west side of Gilfillan Lake.

See also MPCA Response to Public Comment 1.

3. PUBLIC COMMENT: The MPCA should require the Responsible Parties to install a Municipal Water System for the homes on the west side of Gilfillan Lake.

This comment was made in eleven letters: Chua, Drassal, Forgosh, Knopf, Kulenkamp, Ohannesian, Olson, Tiffany, Wiley, the City Council for the City of North Oaks, and Madill.

Public comments indicated that some residents of North Oaks feel the most appropriate remedial action for the west side of Gilfillan Lake is municipal water. At least one citizen encouraged the MPCA, the City of North Oaks City Council, the residents of North Oaks, and the RPs to discuss a joint solution for installing municipal water on the west side of Gilfillan Lake.

MPCA RESPONSE:

The Feasibility Study reviewed installation of a municipal water system for homes with a well advisory as a remedial action (See Alternative B4). The most feasible scenario for such installation would be to connect homes with well advisories to the existing water line, which ends on the south side of Gilfillan Lake. Although this remedy would meet the threshold criteria, it would have short-term risks to the community during construction of the water system. In addition, this remedial action would require a new or amended agreement between White Bear Township and North Oaks, City Engineer review and approval of a design, North Oaks Home Owner's Association (NOHOA) approvals for roadway and utility easements, MDH design approval, and individual agreements with property owners. This alternative was also the least cost-effective of the Scenario B alternatives, particularly if there are only a few residences with well advisories.

See also MPCA Response to Public Comment 6.

4. PUBLIC COMMENT: Extraction wells in the Ski Lane Ravine area should be installed immediately and the criteria for starting-up these extraction wells need to be better defined.

Two letters expressed this concern**:** Apland and Olson.

Public comment indicated the installation of the extraction wells in the Ski Lane Ravine Area should be immediate and not delayed by waiting for data obtained through a long-term monitoring program. In addition, the comment indicated that the criteria for implementing the extraction system need to be better defined.

MPCA RESPONSE:

The proposed Ski Lane Ravine extraction well is an option for remedial action that is contingent upon the continued westward spread of vinyl chloride or another Site-related VOCs ground water plume, and is mainly intended to protect the residents along Ski Lane and other well owners to the west. Currently, the plume has reached Hummingbird Hill at concentrations at or below the HRL, and may not reach the Ravine before it is completely attenuated by natural processes.

Since the plume has already impacted residential wells between the west shore of Gilfillan Lake and Hummingbird Hill, and since these concentrations of vinyl chloride (i.e., near the HRL value of 0.2 ug/L) do not pose an acute threat to human health, using the HRL concentration at the Ravine as a trigger for activating the Ski Lane Ravine extraction well is reasonable.

MPCA and MDH protocols require confirmation of a HRL exceedance. Thirty (30) days is a reasonable time frame to schedule and collect a confirmation sample once a HRL exceedance is detected. Waiting until the next sampling event may unnecessarily delay sample confirmation and subsequent implementation of a remedy.

If implemented, the Ski Lane Ravine ground water extraction remedy would generate large volumes of water that may need treatment before disposal. Therefore, it is prudent to verify that this remedy is truly necessary before implementing the remedy and activate the extraction system only if it is necessary to protect potential receptors along Ski Lane and other receptors to the west.

The MDD Amendment has been modified to address concerns about the monitoring program and installation of extraction wells. Specifically, a third monitoring well is to be installed near the west shore of Gilfillan Lake, and the triggers and implementation schedule for the Ski Lane extraction well system have been slightly altered. The selected options, including the Ski Lane extraction well system, are specific enough to address most foreseeable situations.

See also MPCA Response to Public Comment 8.

5. PUBLIC COMMENT: Operating an extraction well system in the Ski Lane Ravine area would lead to contamination of nearby residential wells that are currently uncontaminated.

Two letters expressed this concern: Madill and Mann.

Public comment expressed the concern that extraction wells in the Ski Lane Ravine area could possibly change local ground water flow patterns and cause contamination in nearby residential wells that are not currently contaminated or cause nearby residential wells to go dry.

MPCA RESPONSE:

Although the FS, on its surface, may validate the public's concerns regarding the potential effects of the Ski Lane Ravine extraction well system on nearby residential wells, it is important to note that available data suggests that only one or two wells may potentially be impacted by vinyl chloride contamination. Any impacted residential wells would soon be identified by the long-term monitoring program. As a result, any nearby residential wells that become contaminated above the HRL(s) would be covered by the selected remedy (i.e., a new deeper well). Since the St. Peter is a productive, regional aquifer (i.e., it is present in a large area), it is highly unlikely that the extraction well system would cause any residential wells to go dry.

With that said, it is also important to note that the magnitude of any potential impacts to the nearby wells is hard to predict and these nearby wells may never be contaminated above the HRL(s). This extraction well remedy would be implemented only if monitoring data show that the plume has reached the Ski Lane Ravine area with vinyl chloride or another Site-related VOC in concentrations exceeding its respective HRL.

6. PUBLIC COMMENT: The language regarding the potential implementation of a municipal water system is vague.

Five letters expressed this concern: Beatty, Chua, Heberlein, Olson, Reynolds and Whirlpool.

Public comments indicated that MDD Amendment language addressing the potential installation of a municipal water system was vague.

MPCA RESPONSE:

The MDD Amendment has been modified to clarify that, for each residential well in Operable Unit 4 (See Figure 1, attached hereto and herein incorporated by reference) where the concentrations of vinyl chloride and other site-related VOCs in water samples (singly or through additivity) exceed the MDH HRLs and a well advisory is issued by MDH, the selected remedial action option is Alternative B3 (New/Deeper Residential Well and Long-Term Monitoring). Currently (April 2008), there is only one well that requires the selected remedy.

If, in the future, well advisories are issued to homes "scattered" throughout Geographic Areas 3, 4, and 5, the selected remedy for Operable Unit 4 will be revisited and, if necessary, supplemental remedial action may be selected (e.g., a municipal water system).

7. PUBLIC COMMENT: A new long-term solution or final decision is needed.

Two letters made this comment: Beatty and the City Council for the City of North Oaks.

Public comments requested the MPCA implement a final solution at the Site that would address the concerns of the citizens of North Oaks and supplement the 1993 MDD with new findings, a new alternative remedy (e.g., Granular Activated Carbon (GAC) filter), and additional monitoring and extraction well plans.

MPCA RESPONSE:

The MDD Amendment has been modified to address the concerns expressed in the comments. The selected remedy, the installation of new deeper wells into the Prairie du Chien aquifer, will resolve the issue of contamination in residential wells. Monitoring data from Prairie du Chien wells in the area show that the Prairie du Chien is an aquifer that has not been contaminated with vinyl chloride from the Site. It is the aquifer used by White Bear Township to provide water for homes on the east side of Gilfillan Lake.

The MPCA cannot foresee all possible contamination scenarios that may occur at the Site, nor take every scenario into account in the body of the MDD Amendment. However, if data indicate a change in what is currently known about OU4, or new or different information becomes available, (e.g., if residential wells in Geographic Area 2 are threatened or impacted by the Site), the MPCA will revisit the selected remedy and, if necessary, select a supplemental remedial action.

8. PUBLIC COMMENT: Concern about future plume movement towards the west, and vertically downward (potential impacts to the Prairie du Chien aquifer).

Four letters made this comment: Chua, Drassal, Heberlein, and Madill.

Public comment indicated concern with migration of the contaminant plume and whether drilling deeper residential wells poses a potential risk of pushing the contamination from the St. Peter aquifer into the subjacent Prairie du Chien aquifer. In addition, public comment expressed concern regarding ground water contamination that may currently underlie Gilfillan Lake.

MPCA RESPONSE:

Site ground water data indicate that vinyl chloride contamination is naturally decreasing as it moves downgradient (westward) from the source (i.e., the Dump Site). This is due to the action of a number of physical, chemical and biological processes that are constantly occurring in ground water. Thus, October 2007 vinyl chloride concentrations in the St. Peter Aquifer at the Dump site were 2.6 ug/L (extraction well EW-2), compared with 0.9 ug/L at 8 Edgewater Lane (monitoring well MW-17A on east side of Gilfillan Lake) and 0.2 ug/L at 12 West Shore Road (residential well on west side of Gilfillan Lake).

When well drillers install a Prairie du Chien well, the equipment (e.g., well casing) and supplies (e.g., bentonite grout) used in the process seal off the upper aquifers. The Prairie du Chien well would only withdraw water from the deeper aquifer and not from the shallower aquifers (e.g., the St. Peter and the Quaternary/Glacial drift).

Water quality data from Prairie du Chien wells in the North Oaks area indicate that the Prairie du Chien aquifer has not been contaminated by the vinyl chloride from the Dump Site and is an appropriate water source. In the Gilfillan Lake area, recent samples from ten wells open to the Prairie du Chien aquifer have not shown any detectable vinyl chloride or site-related contamination. Notably, the Prairie du Chien aquifer is the source for the White Bear Township municipal water system that supplies water to 60 homes on the east side of Gilfillan Lake.

In addition, the ground water flow rate and the approximate time of waste disposal at the Site are only estimates. Data, including the earliest detection of vinyl chloride on the west side of Gilfillan Lake (1993), the start-up date for the extraction well at the Site (1989), and the reappearance of vinyl chloride in West Shore Road wells (2004) still do not allow an accurate prediction of the spatial or temporal extent of the ground water plume. Currently, the monitoring network (including residential and monitoring wells) is the best tool for evaluating the plume. The network will be substantially enhanced if the proposed monitoring wells along the west shore of Gilfillan Lake are installed.

9. PUBLIC COMMENT: The Responsible Parties should install a ground water extraction system on the shoreline on the west side of Gilfillan Lake.

Five letters made this comment: Knopf, Madill, Ohannesian, Olson, and the City Council of the City of North Oaks.

The public suggests placement of an extraction well on the west shoreline of Gilfillan Lake to protect homes from contamination that may be under the lake and moving toward the west shore.

MPCA RESPONSE:

Locations other than the Ski Lane Ravine were considered for placement of a ground water extraction system (e.g., along the western shoreline of Gilfillan Lake). However, none of the other locations would prevent the westward migration of VOCs already present in Area 3 west of Gilfillan Lake. In addition, an extraction, treatment, and discharge system requires an area of approximately one acre. Hence, the lack of space on private property would prevent the installation of an extraction system on residential properties.

10. PUBLIC COMMENT: Concern regarding State's non-degradation policy.

One letter made this comment: Apland.

Public comment expressed concern that the proposed selected remedial action would violate a policy of non-degradation of waters of the state.

MPCA RESPONSE:

The overarching non-degradation policy set forth in Minn. R. 7060.0500 states the following: "It is the policy of the agency that the disposal of sewage, industrial waste, and other wastes shall be controlled as may be necessary to ensure that to the maximum practicable extent the underground waters of the state are maintained at their natural quality unless a determination is made by the agency that a change is justifiable by reason of necessary economic or social development and will not preclude appropriate beneficial and future uses of the waters."

The underground waters at the Site were degraded by hazardous substances. The MPCA, in response to this degradation, required the RPs to install extraction wells (as described below), remove buried waste and drums, and install vents at the Dump Site. Thus, the MPCA minimized the spread of pollutants by prohibiting further discharges of wastes thereto and maximized the possibility of rehabilitating degraded waters for their priority use. *See* Minn. R. 7060.0400.

In 1989, the Responsible Parties (RPs) installed a pumpout well near the Highway 96 Dump to prevent ground water contamination from moving west beyond the boundaries of the dump property. The system now includes two pumpout wells (one is a backup) and a sump collection well, and continues to prevent the westward migration of leachate and contaminated ground water.

The MPCA will require an off-site, downgradient pumpout system to be installed in the Ski Lane Ravine if the VOC contamination reaches the Ravine. Installing a pump and treat system at this location would protect residential wells in on Ski Lane and other areas to the west.

Locations other than the Ski Lane Ravine were considered for placement of a groundwater extraction system (e.g., along the western shoreline of Gilfillan Lake). However, none of the other locations would prevent the westward migration of VOCs already present in Area 3 west of Gilfillan Lake. In addition, an extraction, treatment, and discharge system requires an area of approximately one acre. Hence, the lack of space on private property would prevent the installation of an extraction system on residential properties.

11. PUBLIC COMMENT: What are the requirements for well advisories?

Two letters made this comment: Apland and Madill.

Public comment requested the MPCA clarify which specific event would trigger a well advisory by the Minnesota Department of Health.

MPCA RESPONSE:

The Minnesota Department of Health (MDH) is authorized to issue well advisories. Generally, when samples from a domestic/private well exceed the HRL for a contaminant and the result is confirmed with an additional sample, MDH sends a well advisory letter to the well owner. The letter recommends that the owner not use the well water for drinking or cooking.

In the case where there are multiple contaminants in a well, and none of the contaminants individually exceed a HRL, and if two or more compounds have the same "endpoint" (e.g., kidney cancer), MDH generally will calculate the additivity of the compounds. MDH uses a formula that weights the compounds and then adds the risk values to see if the total risk exceeds MDH guidance value. Specific questions regarding MDH well advisories should be directed to James Kelly (MDH).

12. PUBLIC COMMENT: Where will the MPCA locate the proposed monitoring wells under Gilfillan Lake?

One letter asked this question: Apland.

Public comment indicated concern that two wells would not adequately cover the potential width of the plume. The citizen requested details regarding the placement of the wells.

MPCA RESPONSE:

The RPs are currently seeking access from property owners on the west shore of Gilfillan Lake to install these angle monitoring wells, so at this time it is not possible to provide precise locations for the proposed monitoring wells. In its October 11, 2007 letter to the RPs, the MPCA asked the RPs to place one of these wells in Geographic Area 3 (i.e. the 8 -10 West shore Road are). The response from the RPs on October 25, 2007 indicated that, due to the presence of a small embayment, the location was not usable for a well, but that 10 Poplar Lane was a potential location for such a well. Currently (July 2008), the RPs are actively negotiating access with the property owners at two of the three potential well locations. The third property owner denied access for the well.

The main purpose for these wells is to provide an "early warning system" for the detection of residual vinyl chloride contamination that came from the Dump site. Installing these wells will provide more data regarding ground water contamination that may be present in the St. Peter Aquifer under Gilfillan Lake. It has been estimated that these wells will provide an indication of ground water quality approximately two years before ground water arrives at residential wells near the west shore of Gilfillan lake. This "early warning" would facilitate selection of appropriate residential well sampling locations and times, so that potential/future response actions (e.g., provision of bottled water) could be implemented as soon as possible.

13. PUBLIC COMMENT: Please clarify the ground water monitoring program.

One letter made this comment: Ohannesian.

Public comment recommended long-term monitoring of selected areas in geographic areas 2, 3, 4, and 5 to monitor the movement of the plume and the efficacy of the plume extraction.

MPCA RESPONSE:

The MDD Amendment includes long-term monitoring (Alternative A2) in Geographic Areas 1, 3, 4, and 5. Monitoring in Geographic Area 2 would only be necessary if monitoring results in the other Areas indicate that contamination could reach Area 2. The Feasibility Study assumed a 20 year time period for monitoring, and this would be dictated by monitoring results.

14. PUBLIC COMMENT: Please compare the cost of a municipal water system to installation of deeper wells.

One letter made this comment: Chua.

Public comment indicated that the total cost difference between installing and monitoring residential wells and installing and monitoring municipal water was approximately $500,000. The citizen requested clarification of the MPCA's calculations with regard to the total cost difference.

MPCA RESPONSE:

The cost to drill a new deeper well is estimated at $19,000 and the cost of abandoning the old well is estimated at $1,300; for a total cost of approximately $20,000 per residential well. Twenty-seven (27) new deeper wells could be installed for the price of municipal water service to three homes.

However, the MPCA recognizes that cost is just one factor in selecting a remedy for the Site. The selection of a remedial action is weighed against seven other criteria, all of which were considered in selecting the remedial action for Operable Unit 4.

Notably, the selected remedy of installing a deeper well when a well advisory is issued is often used at other sites, and provides a clean source of drinking water that is protective of human health.

15. PUBLIC COMMENT: Property values may be affected by the contamination.

Three letters made this comment: Drassal, Forgosh, and Wiley.

Public comment expressed concern that property values would be adversely affected by the disclosure of ground water contamination.

MPCA RESPONSE:

The MPCA acknowledges that property values are of concern to the residents of North Oaks. The MPCA is charged with protecting human health and the environment. Monitoring and sampling to check for and detect ground water contamination is a necessary part of assuring that releases such as that from the Highway 96 Dump Site are appropriately addressed. The primary focus of the MPCA's efforts at this Site is to select a remedy that will protect the health of the residents who receive MDH well advisories by providing potable water and by containing the ground water plume.

Although the MPCA did not select installation of a municipal drinking water system as the remedial action for OU4, the MPCA is not opposed to the City installing a municipal drinking water system. The municipal system that was installed on the east side of Gilfillan Lake in 1994 was the result of a cooperative effort involving the City of North Oaks, the North Oaks Company, the RPs, and White Bear Township. Although the current number of well advisories on the west side of Gilfillan Lake (1) is much less than the number of advisories in 1993 on the east side (12), which prompted municipal water as part of the remedy, a similar cooperative effort could be pursued in order to provide municipal water for the west side of Gilfillan Lake, which may alleviate citizen concern regarding property values. However, the 1993 MDD required a municipal water system remedy, while the 2008 MDD Amendment does not require a municipal water system remedy. Thus, the current regulatory setting for a cooperative effort to install such a remedy is notably different from that in 1994.

16. PUBLIC COMMENT: Is the MPCA advocating the utilization of natural attenuation as a remedial action?

One letter made this comment: Eisenschenk.

Public comment indicated that natural attenuation was not appropriate as a remedial action at this Site.

MPCA RESPONSE:

It is important to distinguish between the Natural Attenuation (NA) process and Natural Attenuation as a remedial action. The MPCA has, on several occasions (e.g., North Oaks City Council meetings), discussed the issue of natural attenuation (NA) as it relates to ground water contamination at the Site. In that context, the MPCA was utilizing a working hypothesis that is suggested by the available information: Site ground water data indicate that vinyl chloride contamination is naturally attenuating as it moves downgradient (westward).

The "Ground Water and Residential Well Evaluation" report, dated June 2005, which was submitted to the MPCA by Conestoga-Rovers and Associates, Inc. (CRA) on behalf of the RPs, included a similar working hypothesis involving NA. The CRA report stated:

> "It seems likely that this apparent 'pocket' of vinyl chloride that has been detected west of Gilfillan Lake is the remnant of some elevated vinyl chloride concentrations that were detected at 15 Gilfillan Road, 17 Gilfillan Road, and 22 Gilfillan Road in 1993 and 1994. At that time, vinyl chloride was detected in those wells, which are east of the lake and considerably distant from the currently contaminated west shore wells, at concentrations of approximately 2 ug/L. Ground Water moves westward within the St. Peter Aquifer and vinyl chloride concentrations generally dissipate over distance and time as a result of natural attenuation processes."

However, the RPs have not proposed a NA remedy at the Site, nor has the MPCA approved or considered a formal NA remedy at the Site, especially with regard to the NA remedial action as described in MPCA guidance documents. In addition, a NA remedy was not included as an alternative in the July 2007 Feasibility Study, and is not part of the MDD Amendment.

In the future, it is possible that NA could become part of the remedy for the Site. If the RPs propose a NA remedy, and it is approved by the MPCA, the Agency will require that the RPs follow MPCA's NA guidance.

17. PUBLIC COMMENT: Consultants hired by the Responsible Parties are not acceptable to do the work.

One letter made this comment: Eisenschenk.

Public comment questioned whether the consultant hired by the RPs, CRA, is qualified to sample the ground water under Gilfillan Lake given the sampling CRA conducted previously with regard to monitoring and drinking water wells. Public comment also questioned the reasons for differences in results between dedicated monitoring wells and residential drinking water wells.

MPCA RESPONSE:

It is important to recognize that drinking water wells and monitoring wells are constructed differently and for different purposes. As a result, it may be difficult to directly compare sampling results from those two kinds of wells. It is also important to recognize that ground water contamination plumes are three dimensional features, and are not as regular and predictable in shape and character as might be expected.

CRA, the consulting firm that has conducted the investigation and remediation at the Site since 1986, used a protocol, in sampling ground water during monitoring well installation procedures in North Oaks, that is approved by the U.S. Environmental Agency (U.S. EPA).

The analytical laboratory used by CRA to analyze monitoring well water samples is certified by the MDH and/or the U.S. EPA. Laboratory sample data are reviewed for quality assurance and quality control by the laboratory and by CRA. Additionally, before the data are approved, MPCA staff reviews sample results to see if there are any quality concerns.

18. PUBLIC COMMENT: What are the potential impacts to the St. Peter aquifer and residential wells?

One letter had this question: Mann.

Public comment questioned how many people in North Oaks are dependent on the St. Peter Aquifer for water and how the proposed extraction would affect their residential wells.

MPCA RESPONSE:

Based on available information in the County Well Index, one of the State's well databases, most residential wells in North Oaks draw water from the St. Peter aquifer. As indicated in the Feasibility Study, one or two nearby residential wells could potentially be impacted by the operation of the Ski Lane extraction well system. According to the FS, the proposed extraction well system would pump approximately 20-40 gallons per minute. In comparison, a typical residential well pumps approximately 3-10 gallons per minute. Since the St. Peter is a productive, regional aquifer, it is highly unlikely that the extraction well system would cause any residential wells to go dry. If the extraction system discharges water to Gilfillan Lake, the water will first be highly aerated by a vented manhole with a blower. It is likely that any vinyl chloride contamination would be removed by these aeration processes before the water is discharged to Gilfillan Lake.

19. PUBLIC COMMENT: What is the method of reporting laboratory results for residential water samples?

One letter made this comment: Olson.

Public comment questioned whether testing or reporting is done differently when the vinyl chloride sample is above 0.2 ug/L.

MPCA RESPONSE:

Standard reporting procedures at the MDH laboratory (the lab now used for all residential well samples) only require reporting vinyl chloride concentrations to one decimal place (tenths of ug/L). At the MPCA's request, MDH has agreed to estimate vinyl chloride concentrations (in hundredths) below the reporting level (0.2 ug/L). The two decimal places (hundredths) estimated for vinyl chloride detections below 0.2 ug/L are mainly used to help define the extent of the plume. It is important to recognize that these numbers below 0.2 ug/L are unofficial estimates.

20. PUBLIC COMMENT: What are the time frames for response actions?

One letter made this comment: Olson.

Public comment questioned when the MPCA would set a time frame for corrective action once the well advisories, if any, have been issued.

MPCA RESPONSE:

The MPCA will require the RPs to contact the affected home owners within ten (10) days after the RPs are informed of a well advisory. The RPs will be expected to set up a reasonable time frame in consultation with the home owner to implement the remedy. The RPs will then be required to notify the MPCA as to when the remedy will be implemented. It is expected that a 30 day window allows sufficient time to install the remedial action.

21. PUBLIC COMMENT: Please explain how the remedial action for the Site is selected.

One letter made this comment: Olson.

Public comment questioned why the MPCA asked for public comment when the remedial action appeared to have been selected.

MPCA RESPONSE:

The MPCA, in selecting a remedial action for Operable Unit 4, followed a process that is patterned after the federal Superfund process. As a precursor to the remedy selection process, the MPCA required the RPs to conduct a Feasibility Study examining potential remedial actions for OU4. Prior to requesting the RPs to examine cleanup alternatives for OU4, the MPCA sought comments on the scope of the Feasibility Study from the City. After the Feasibility Study was approved by the MPCA, the MPCA reviewed the cleanup alternatives and set forth its preferred remedy in a Proposed Plan.

On February 19, 2008, before selecting a remedy for OU4, the MPCA issued a Proposed Plan Fact Sheet setting forth the proposed remedial action to address contamination at Operable Unit 4, which includes homes west of Gilfillan Lake with wells that could potentially be impacted by vinyl chloride contamination from the Site.

In a public notice published in the Shoreview News on February 19, 2008, the MPCA invited the public to comment on the proposed remedy for OU4 and notified the public that at the end of the public comment period the MPCA would review all comments and approve, reject, or modify the proposed remedy outlined in the draft MDD Amendment.

On February 26, 2008, at the East Recreational Center in North Oaks, the MPCA held a public meeting to discuss the proposed remedial action. Approximately sixty-five (65) citizens attended the public meeting, including Senator Sandy Rummel, Representative Paul Gardner, the Mayor of North Oaks, members of the North Oaks City Council, and representatives for the Responsible Parties.

On April 1, 2008, after the end of the public comment period, the MPCA also received a submittal from Representative Paul Gardner. The MPCA reviewed the comments and submittals and prepared a MDD Amendment which takes those comments and submittals into account and includes a summary of the MPCA responses.

The MPCA maintains an "open" process with regard to Superfund matters and accepts public comments throughout the cleanup process.

22. PUBLIC COMMENT: Will the MPCA provide community education on available purification systems?

One letter made this comment: Olson.

Public comment questioned whether the MPCA would provide community education for the residents addressing use of a purification system to treat well water.

MPCA RESPONSE:

The MPCA or MDH could work with the individual home owners to provide information on carbon filtration if a home owner requests. However, at this time the contamination affects a small number of homes and the selected remedy is not carbon filtration. Thus a community-wide education program will not be offered.

23. PUBLIC COMMENT: The ground water containment system at the Site is not adequate.

One letter made this comment: Tiffany.

Public comment indicated that the containment system at the Site is inadequate to capture the contaminants that had been released from the Site.

MPCA RESPONSE:

Based on monitoring well data from the Site and from the down gradient/residential area on the east side of Gilfillan Lake, the ground water extraction system at the site is working as designed, and is capturing contaminated ground water before it leaves the Site. The system was upgraded in 2005 when a new pumpout well was installed. The contamination that has been detected in residential wells on the west side of Gilfillan Lake had already moved away from the site before the extraction system was installed in 1989.

24. PUBLIC COMMENT: Is the MPCA engaged in rulemaking?

One letter made this comment: Tiffany.

Public comment stated: "Please answer for me if you or other members of the MPCA think that the state of Minnesota, in delegating authority to the MPCA on rulemaking and administration of the details surrounding the brokering of agreements concerning contamination sites expects this state agency should practice ex post facto rulemaking?"

MPCA RESPONSE:

The MPCA has authority to take, or require responsible persons to take, response actions to address releases and threatened releases of hazardous substances to the environment at and from the Highway 96 Dump Superfund Site under Minn. Stat. §§115B.01 to 115B.20 of the Minnesota Environmental Response and Liability Act ("MERLA"). The MPCA has authority to determine what response actions are reasonable and necessary to protect public health and welfare and the environment under MERLA, Minn. Stat. §§115B.17, subd. 1 and 115B.18. Any decision under MERLA, including a decision to select a remedy to address a release of hazardous substances, may be made by the MPCA Commissioner pursuant to Minn. Stat. §§116.03, subd. 1(c).

25. PUBLIC COMMENT: Why didn't the MPCA present more technical information at the public meeting?

One letter had this question: Olson.

Public comment questioned why the MPCA did not present the same format of technical information as presented in the public meeting by Mr. Heberlein and whether the MPCA agreed with Mr. Heberlein's assessment.

MPCA RESPONSE:

Detailed technical information is and has been available from the MPCA on numerous occasions, including City Council meetings. The purpose of the public meeting was to provide the public the opportunity to ask questions and provide comments on the Proposed Plan and all the data that had been presented to date. At the public meeting, the MPCA was focused on hearing and responding to the concerns of the public.

Mr. Heberlein provided interesting information at the public meeting. However, it is important to understand that the information presented by Mr. Heberlein is based on estimates. Based on estimated ground water flow rates, it is possible that an additional volume of contaminated ground water underlies Gilfillan Lake and may eventually reach the west side of the Lake. However, the concentration of contaminants in ground water that may reach the west side of Gilfillan Lake is not known and natural processes tend to reduce contaminant concentrations as ground water moves westward (downgradient). At this time, long-term monitoring is an appropriate remedial action.

26. PUBLIC COMMENT: One residential well owner stated he was unable to understand the laboratory reports and the MPCA failed to contact him with the appropriate information.

One letter made this comment: Forgosh.

Public comment indicated that the residential well testing results set forth in the MPCA letter to the well owner were confusing and the MPCA failed to provide information regarding these test results.

MPCA RESPONSE:

The MPCA contacted this citizen and was provided the name of a staff person at the MPCA to call in the event that individual had additional questions regarding sampling or any other Site issue. The MPCA lists the appropriate contact person in each letter it sends to residential well owners concerning laboratory results.

AG: #2264843-v3

ATTACHMENT 1
PUBLIC COMMENT LIST

Jeffrey Apland

Carol Beatty

Cindy Buyck Chua

Terry Drassal

Mark Eisenschenk

Les & Meredity Forgosh

Joachim Heberlein

Chris Knopf

Delano & Emily Kulenkamp

Mary & Jack Madill

Chris Mann

Judy T. Ohannesian

Lugene Olson

Douglas Tiffany

Margaret & Don Wiley

City Council of the City of North Oaks by Mayor Watson

Reynolds Metals Company and Whirlpool Corporation

Paul Gardner, State Representative District 53A

Appendix E

Historical Data Summary

Electronic Data File Available At
The Minnesota Pollution Control Agency

Appendix F

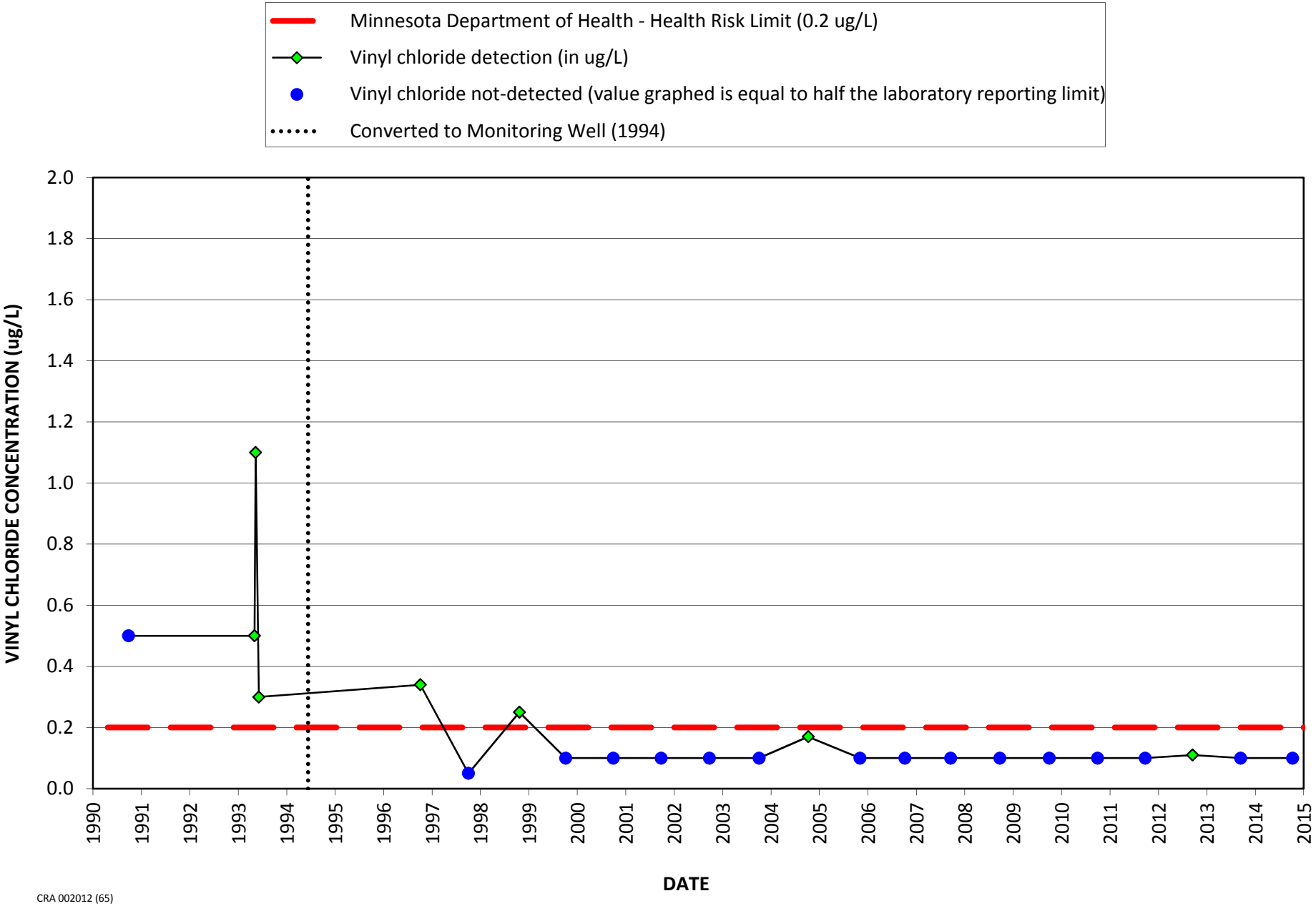
Laboratory Analytical Reports and Data Quality Assessment and Validation Memos

Laboratory Analytical Reports and Data Quality Assessment and Validation Memos Available On File At The Minnesota Pollution Control Agency

Appendix G

Graphs of Vinyl Chloride Detections in Off Site Monitoring Well and Residential Well Locations

VINYL CHLORIDE CONCENTRATIONS
1 LILY POND
NORTH OAKS, MINNESOTA

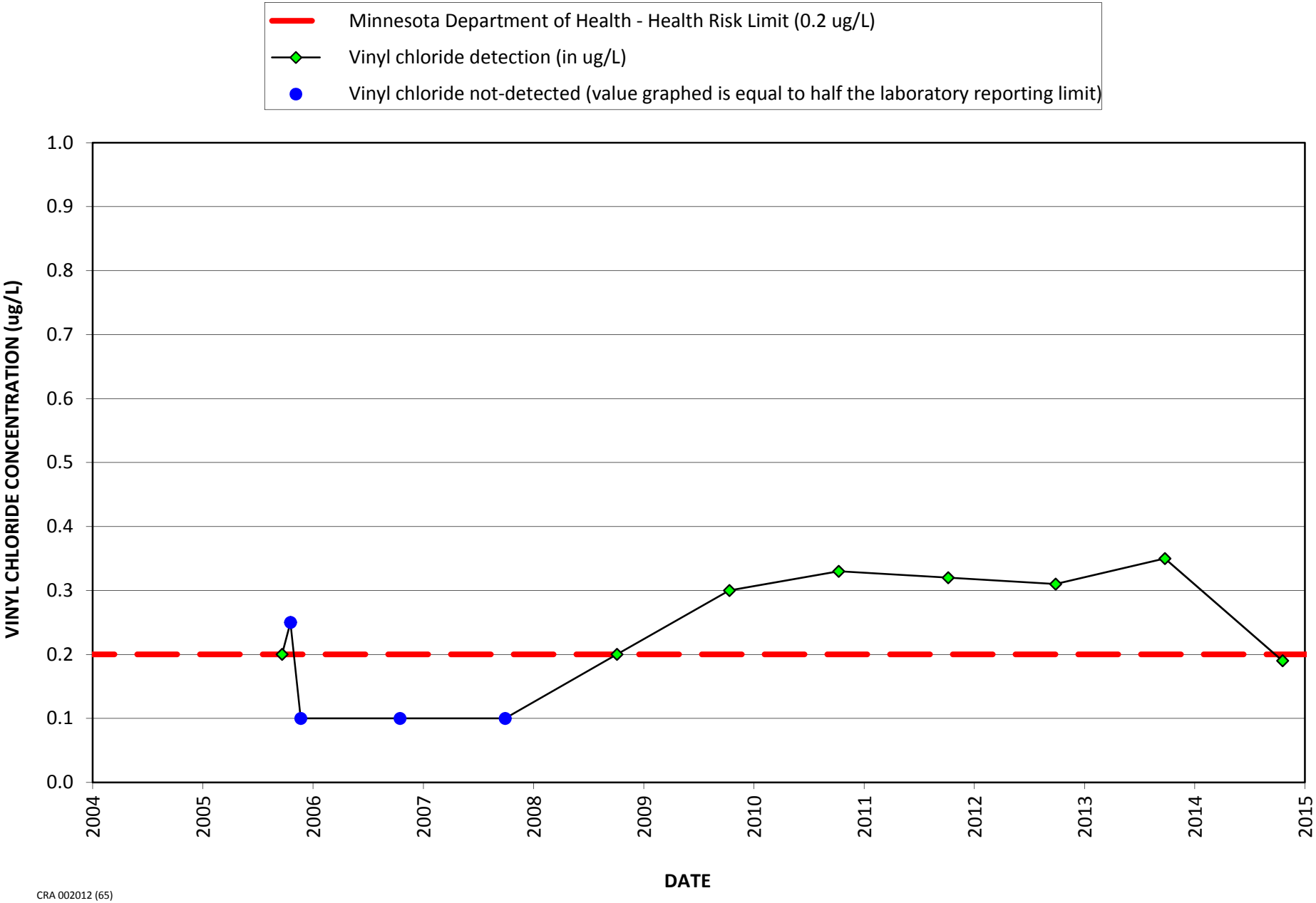


CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
MW17A
NORTH OAKS, MINNESOTA

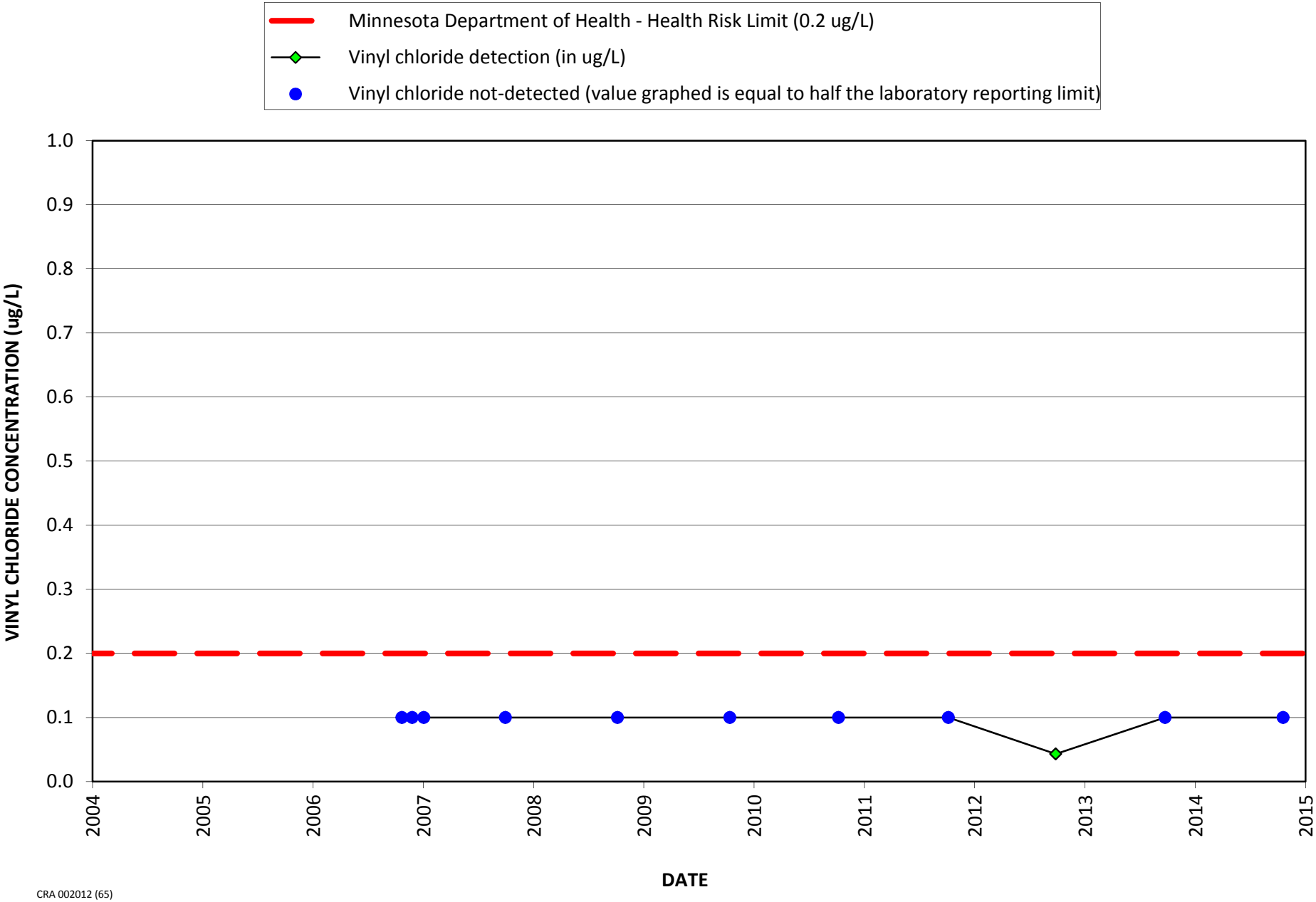
CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
MW17B
NORTH OAKS, MINNESOTA



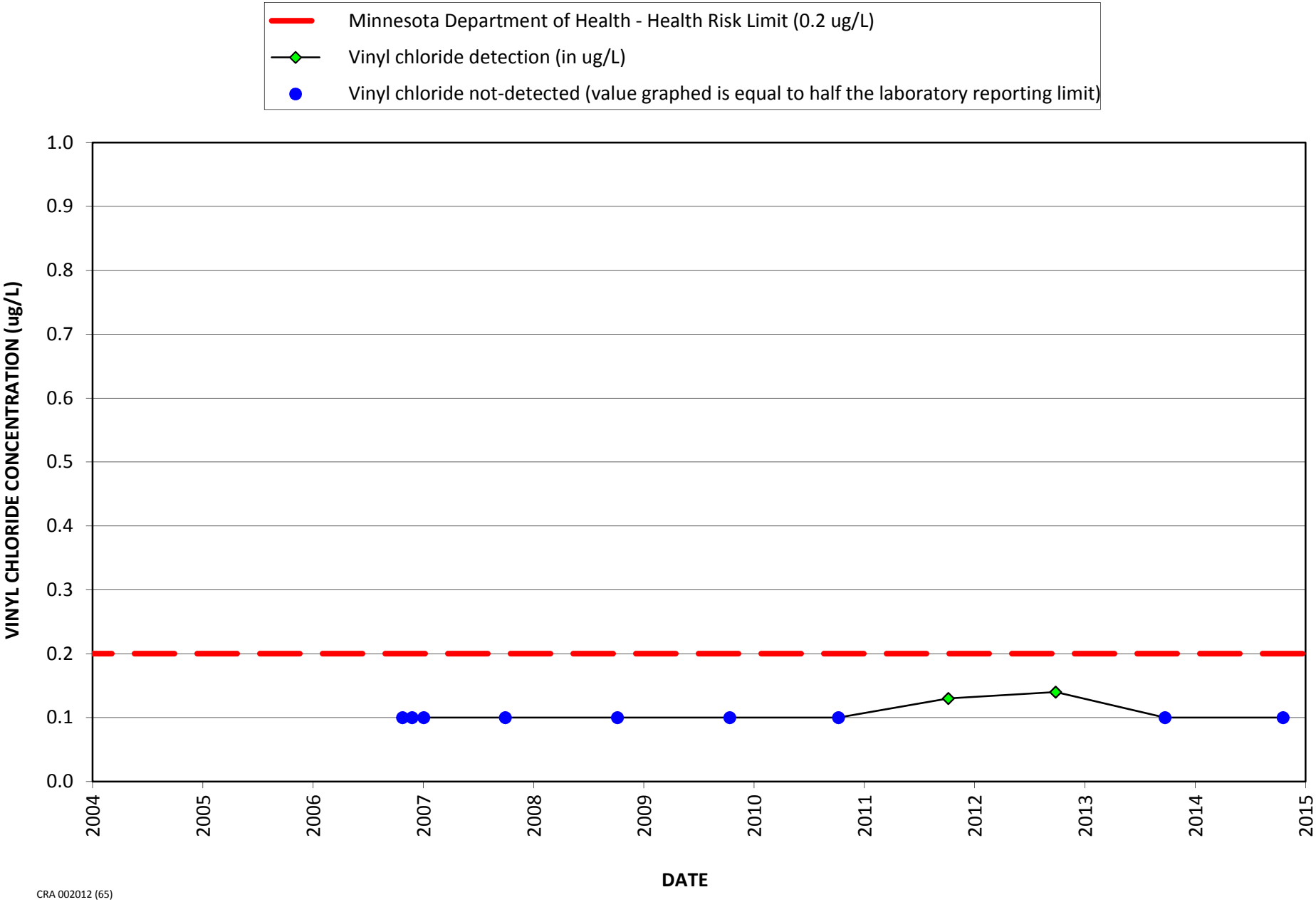
CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
MW18A
NORTH OAKS, MINNESOTA



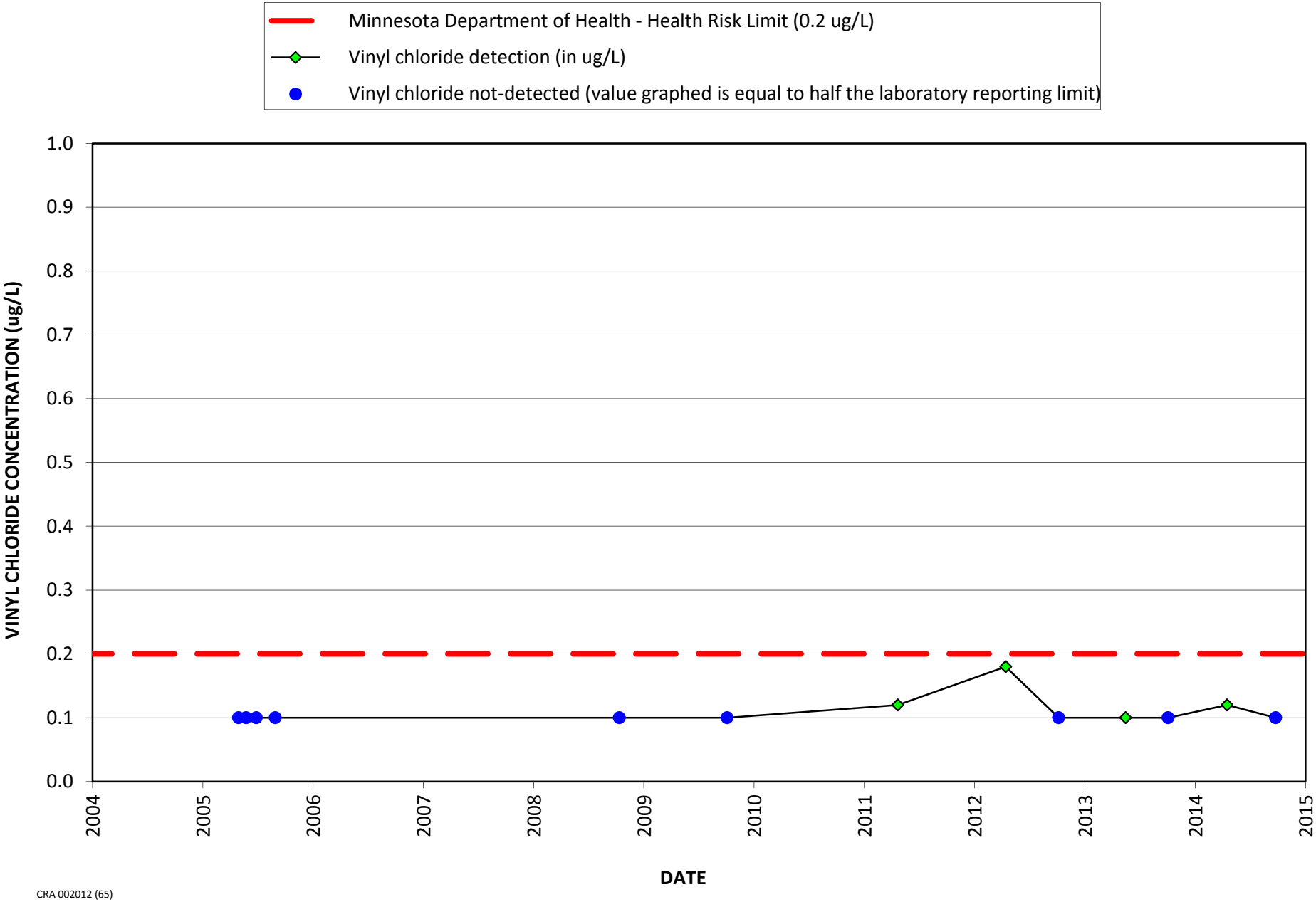
CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
MW18B
NORTH OAKS, MINNESOTA



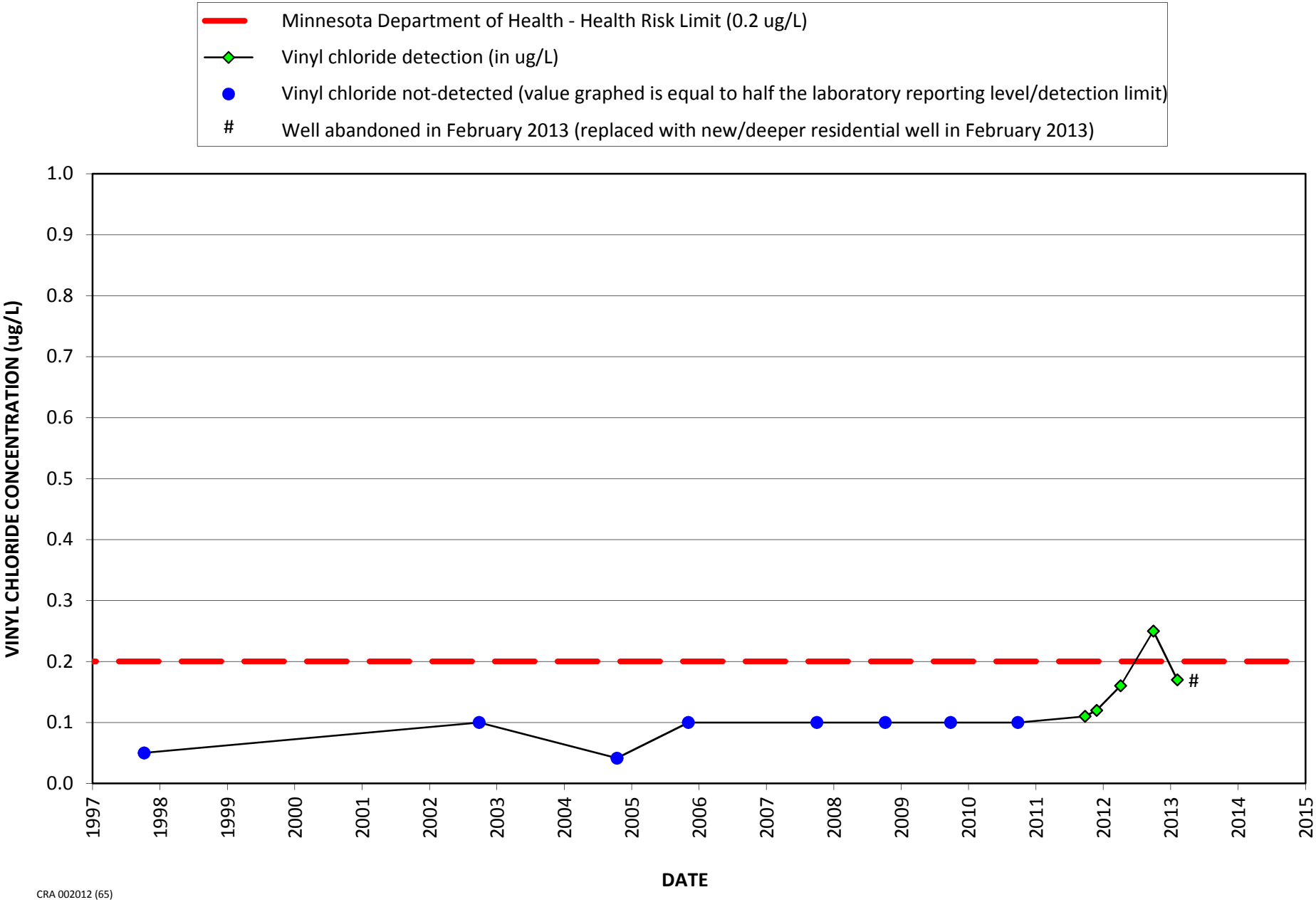
CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
50 EAST OAKS ROAD
NORTH OAKS, MINNESOTA



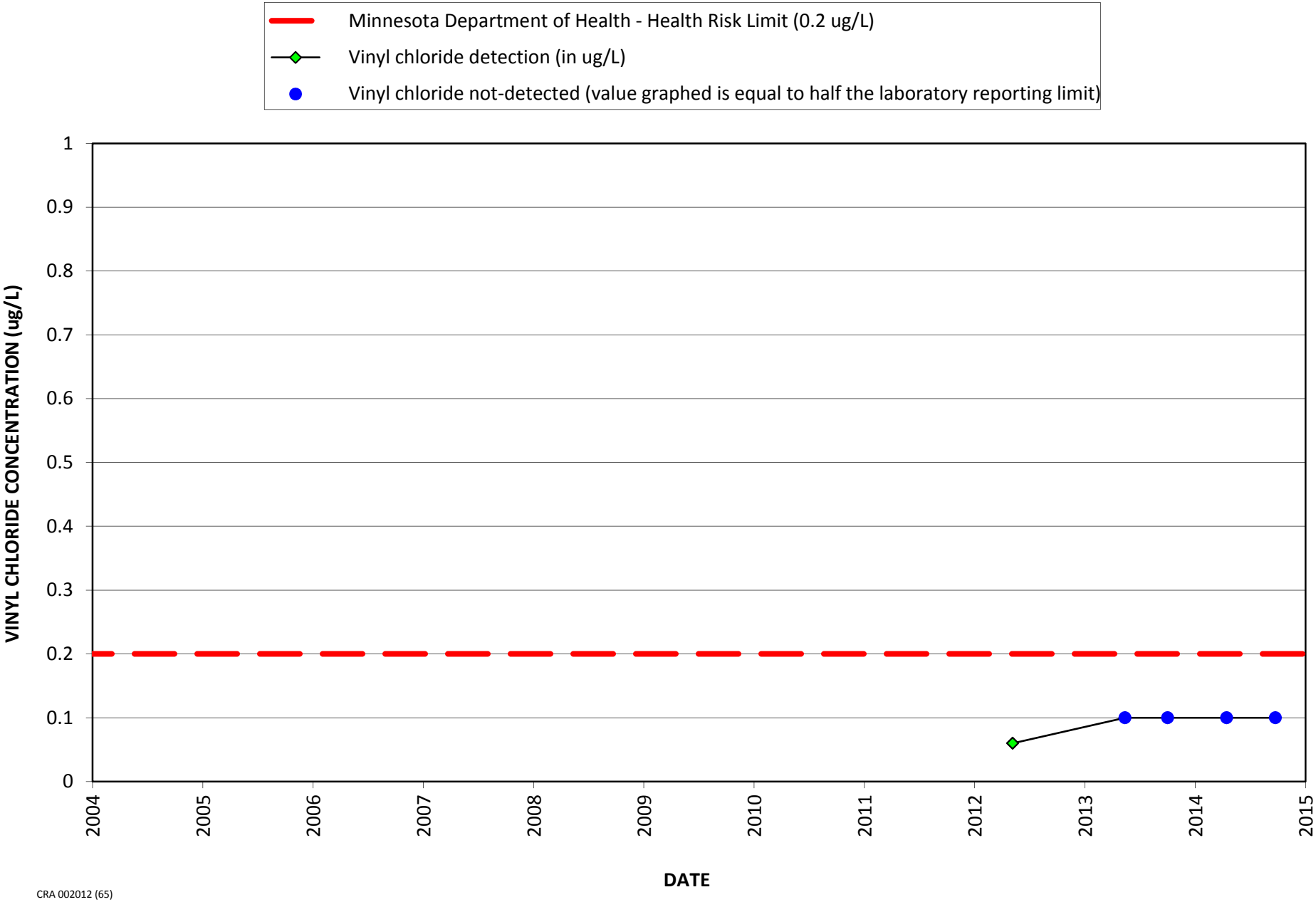
CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
2 HERON LANE (OLD WELL)
NORTH OAKS, MINNESOTA



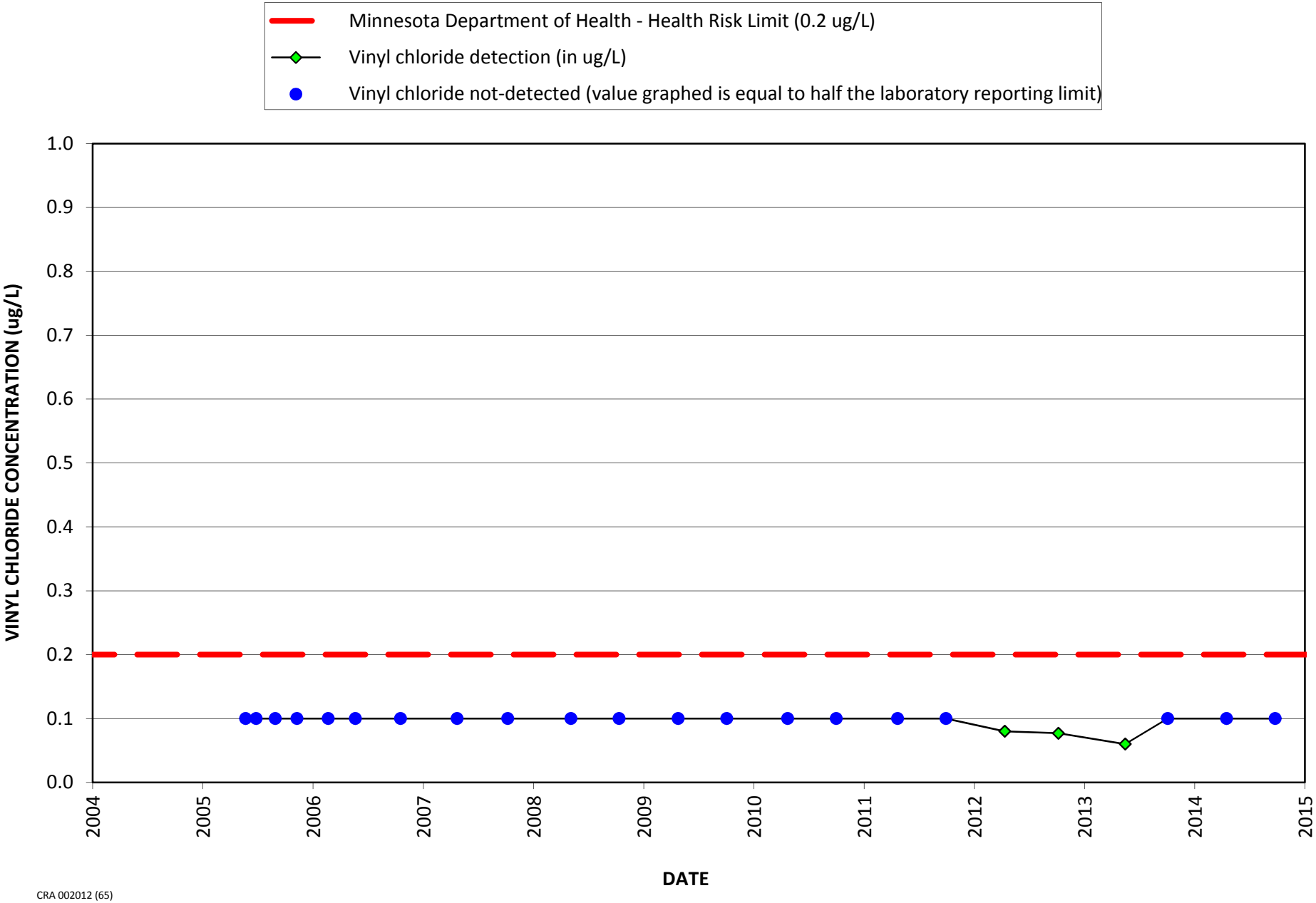
CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
3 HERON LANE
NORTH OAKS, MINNESOTA



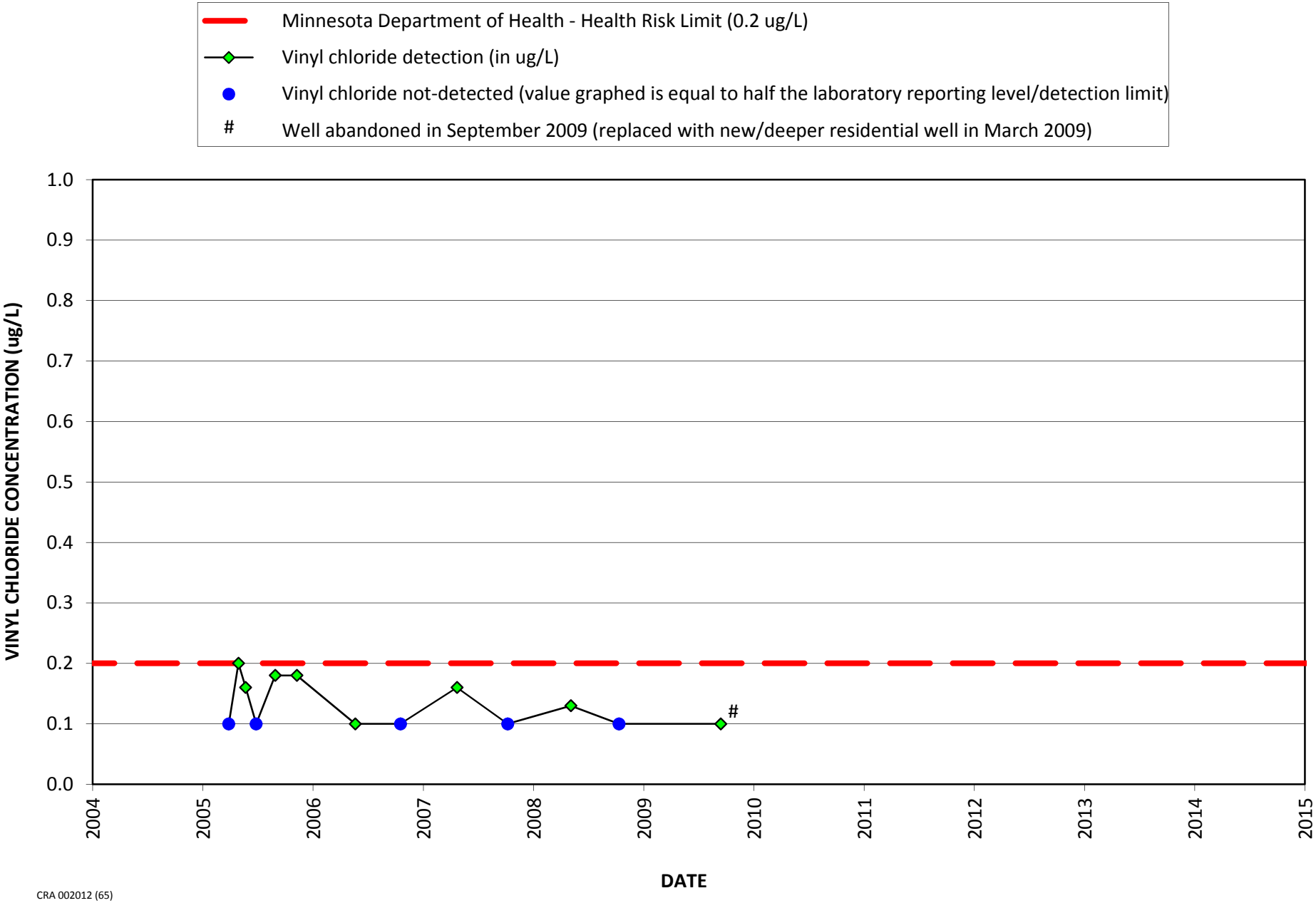
CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
1 HUMMINGBIRD HILL
NORTH OAKS, MINNESOTA



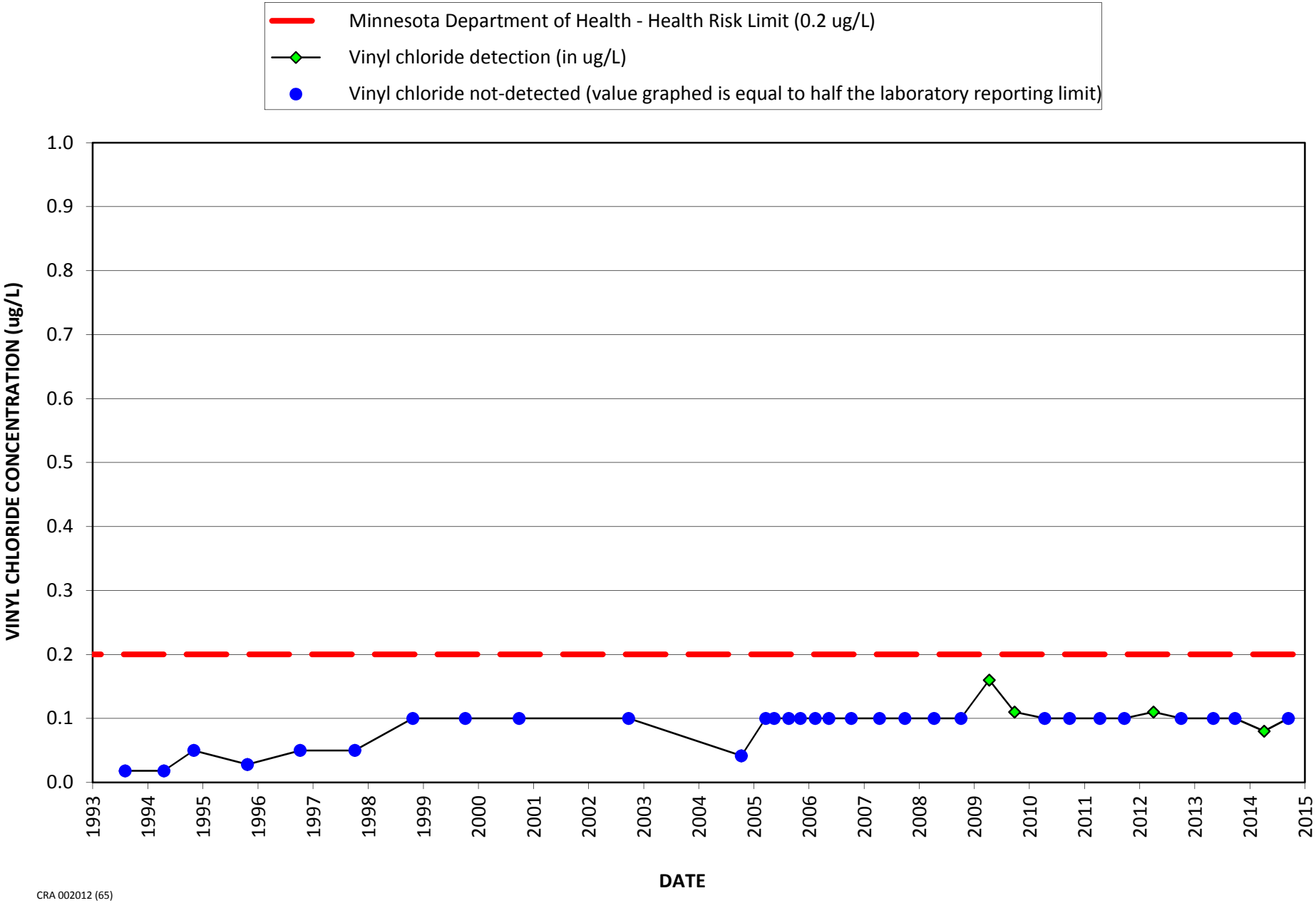
CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
2 HUMMINGBIRD HILL (OLD WELL)
NORTH OAKS, MINNESOTA



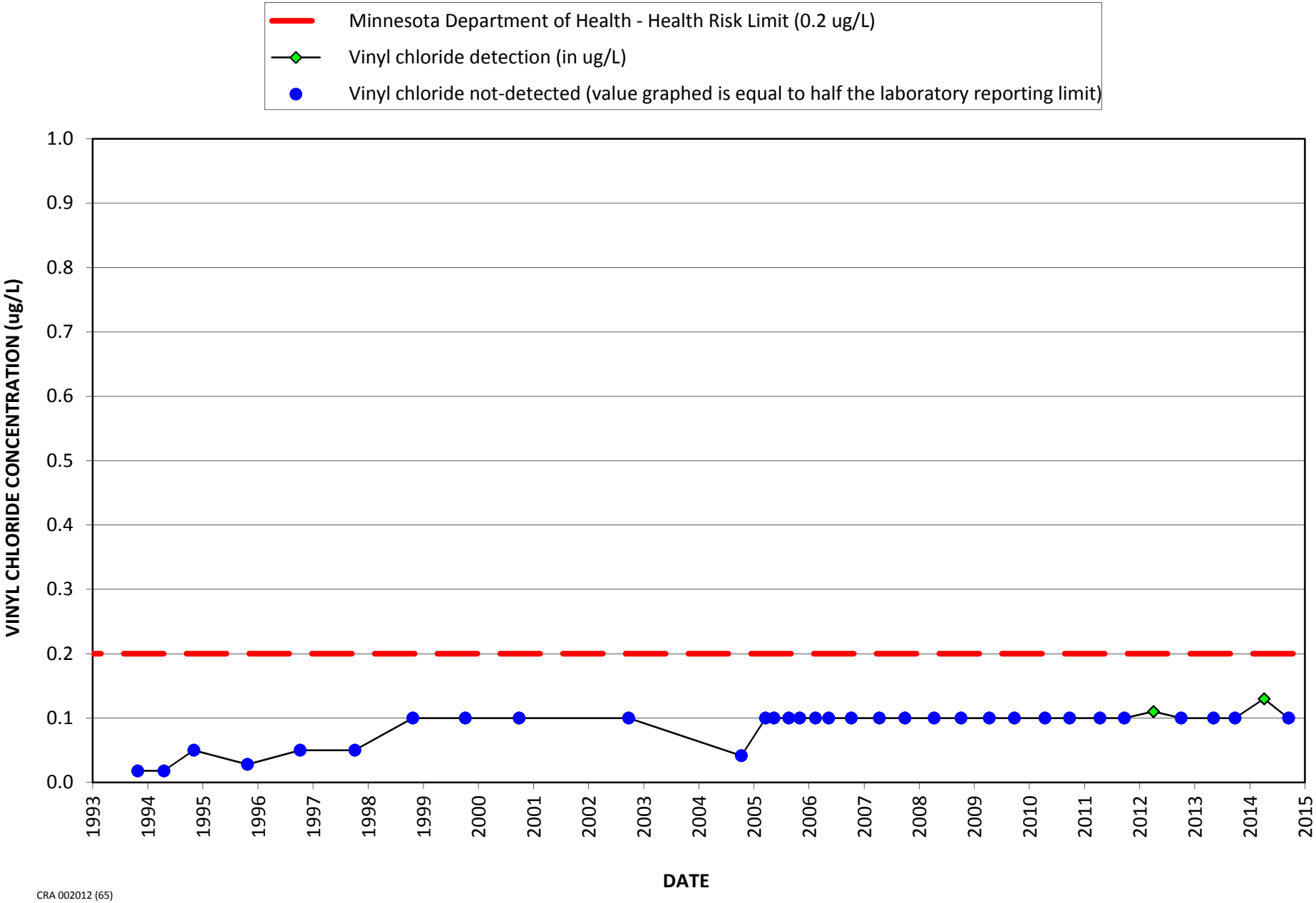
CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
10 WEST SHORE ROAD
NORTH OAKS, MINNESOTA



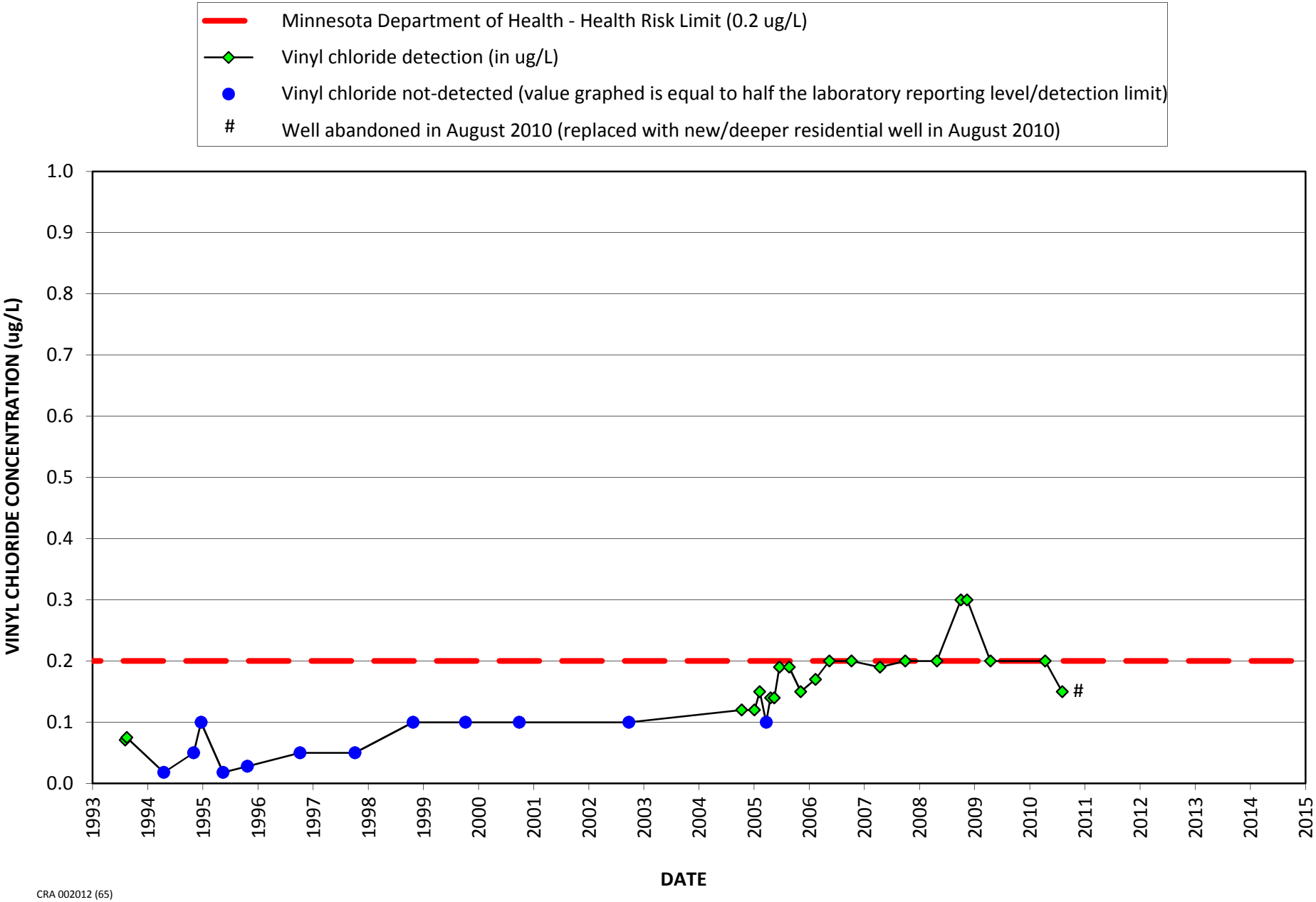
CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
11 WEST SHORE ROAD
NORTH OAKS, MINNESOTA



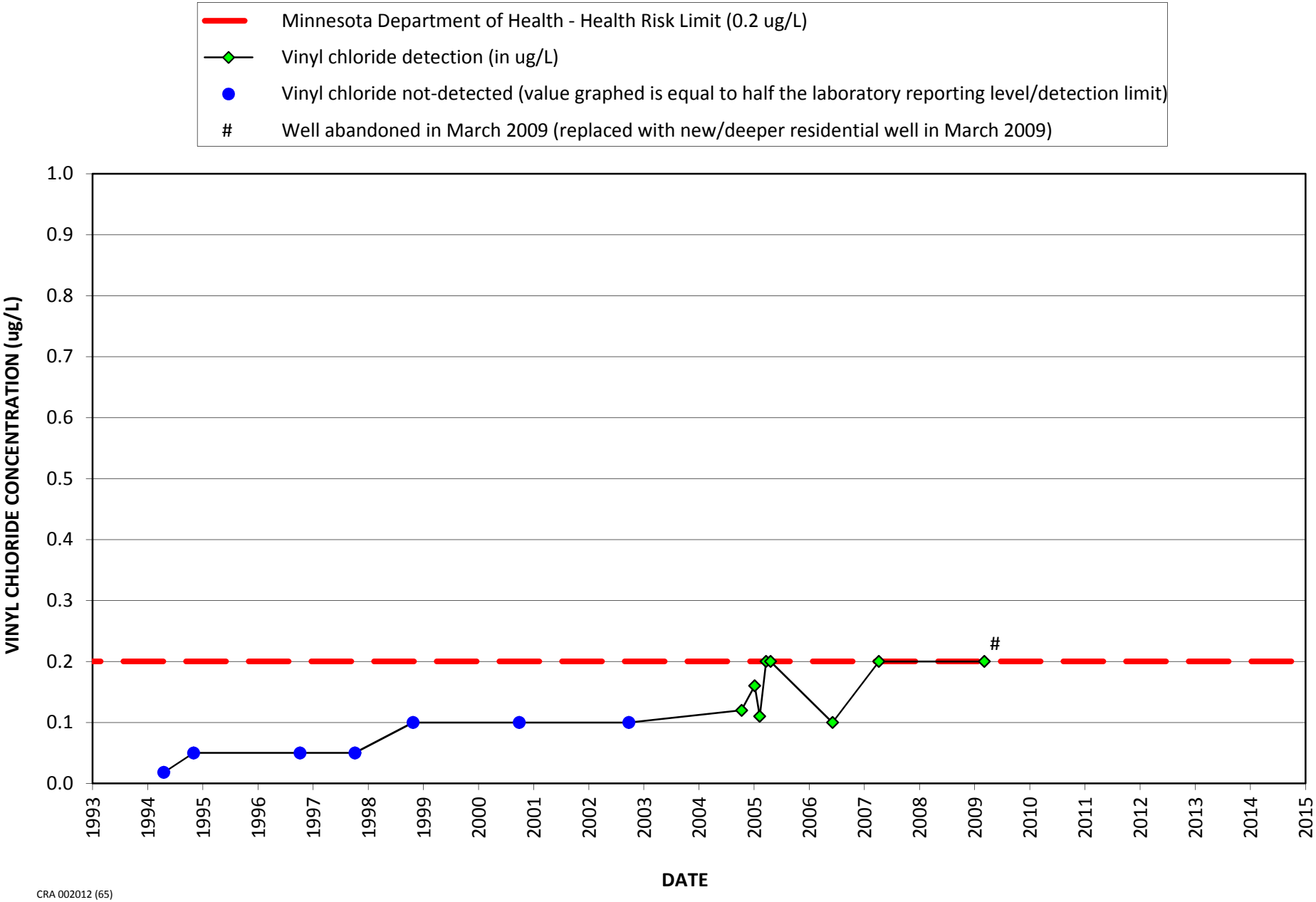
CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
12 WEST SHORE ROAD (OLD WELL)
NORTH OAKS, MINNESOTA



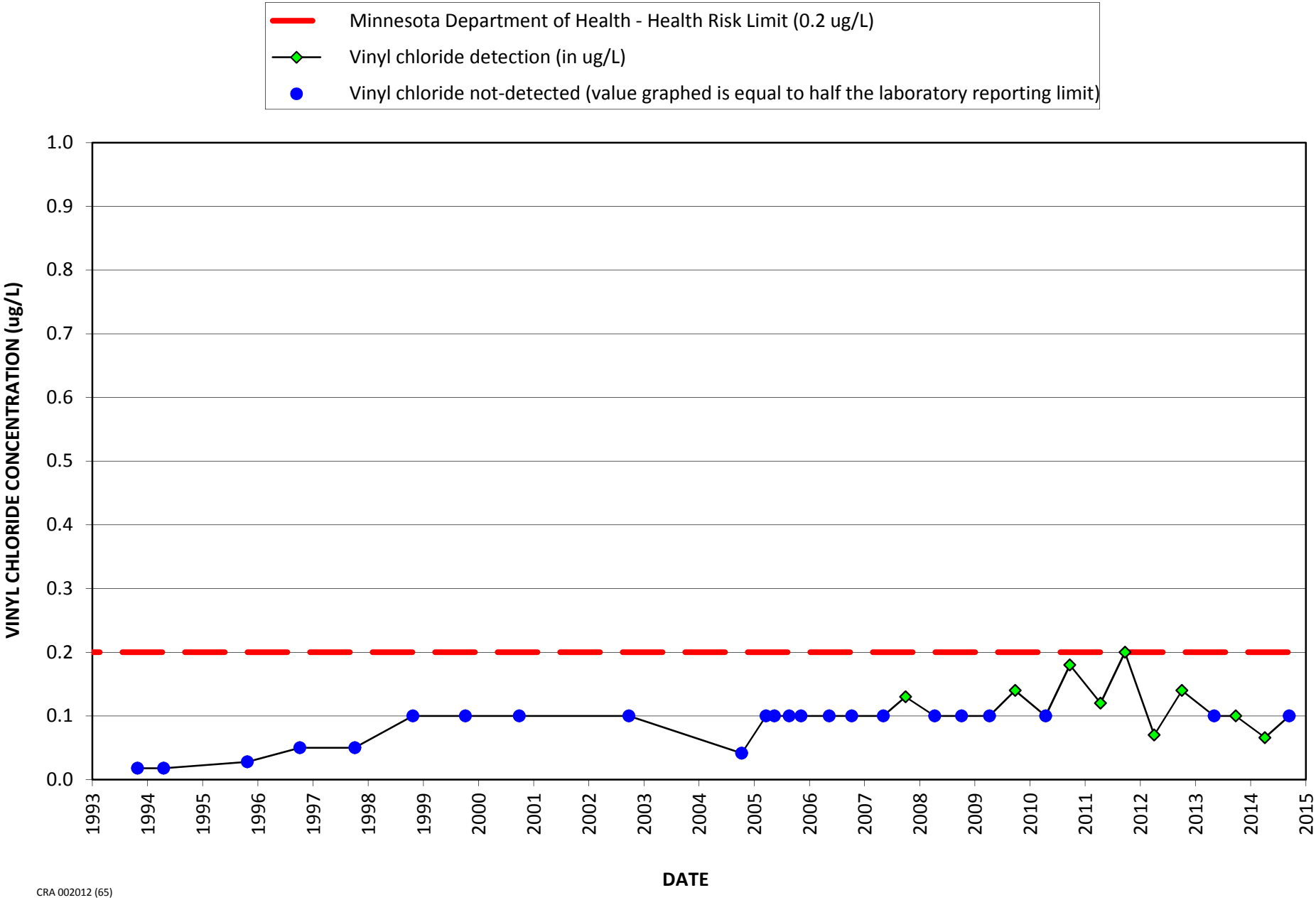
CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
13 WEST SHORE ROAD (OLD WELL)
NORTH OAKS, MINNESOTA



CRA 002012 (65)

VINYL CHLORIDE CONCENTRATIONS
15 WEST SHORE ROAD
NORTH OAKS, MINNESOTA



CRA 002012 (65)