CONESTOGA-ROVERS
& ASSOCIATES

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October 25, 2007

Reference No. 002012

Mr. Doug Wetzstein
MINNESOTA POLLUTION CONTROL AGENCY
Remediation Division
Superfund and Emergency Response Section
520 Lafayette Road
St. Paul, Minnesota 55155-4194

Dear Mr. Wetzstein:

Re: MPCA Comments
Feasibility Study for North Oaks - West of Gilfillan Lake
Highway 96 Site - White Bear Township, Minnesota

On behalf of Whirlpool Corporation and Reynolds Metals Company, Conestoga-Rovers & Associates (CRA) has prepared the following response to the Minnesota Pollution Control Agency's (MPCA's) letter dated September 25, 2007 regarding comments to CRA's Feasibility Study Report for volatile organic compounds (VOCs) in groundwater, west of Gilfillan Lake, in North Oaks, Minnesota.

In the September 25, 2007 letter, MPCA requested that CRA address the following comments:

MPCA Comment No. 1

Alternative A2 Long-Term Monitoring. This alternative includes the installation of four additional upper St. Peter aquifer monitoring wells. The MPCA requests that the RPs install another directionally drilled monitoring well under Gilfillan Lake in Geographic Area 3. The well should be placed along the west shore of Gilfillan Lake, and be drilled from an area between 8 West Shore Road and 10 West Shore Road. The MPCA requests that you add this recommended well to the Alternative, and modify the cost analysis, as needed.

Response:

An angle well in Area 3 is not considered necessary given the existing monitoring well network present in Area 3. However, Whirlpool and Reynolds will agree to install the requested angle well provided access can be obtained.

The angle well installation proposed on the NOHOA-owned property between 8 West Shore Road and 10 West Shore Road, as identified by MPCA, is physically inaccessible. The property is essentially a small bay connected to Gilfillan Lake, and is almost entirely covered by water.

On October 10, 2007, CRA and a well drilling contractor reviewed potential drilling locations along the western shoreline of Gilfillan Lake. Only three locations, one per geographical area, were deemed as potentially feasible for the angle well installation. The three locations are 10 Poplar Lane (Area 3), 4 Poplar Lane (Area 4), and 2 West Shore Road/4 West Shore Road (Area 5). Installation of

angle wells on these properties would be dependant on access approval from the respective property owner. If access cannot be reasonably obtained at these locations, then no angle wells will be installed in those geographic areas.

Figure 4.1 and the cost estimates associated with Alternatives A2, A3, B2, B3, and B4 have been revised to reflect installation of an angle well in Area 3. Revised versions of Figure 4.1 and Tables 4.1 through 5.5 are attached.

MPCA Comment No. 2
Alternative A3 Groundwater Extraction and Monitoring. MPCA understands that if a pipeline is needed to convey water to Gilfillan Lake, the pipeline would need to be installed underground. Please modify the Alternative accordingly or provide an explanation why the pipeline should not be installed underground.

Response:
If a discharge line (forcemain) is needed to convey extracted groundwater to Gilfillan Lake, the forcemain would be installed underground. In the Feasibility Study Report, CRA made no reference to the forcemain being aboveground, but did not explicitly state that the forcemain would be underground. Therefore, references to the forcemain in Sections 4.3.1 and 4.3.7, on Figure 4.5, and in Table 4.3b, have been revised to include "underground" in the description. Revised versions of Figure 4.5 and Table 4.3b are attached.

MPCA Comment No. 3
Alternative B2 Residential Carbon Filer and Monitoring, Section 5.2.6. The second sentence in this section indicates minimal impact to residents during installation of carbon filters ***and additional monitoring wells*** *(italicized [bold] for emphasis). To be consistent with the other sections (5.2.2, 5.2.3 etc) "and additional monitoring wells" should be removed from this sentence.*

Response:
Reference to *"and additional monitoring wells"* was included in Section 5.2.6 because additional monitoring wells would be installed under the long-term monitoring program, which is part of Alternative B2. Since the long-term monitoring program is common to all Alternatives (with the exception of Alternatives A1 and B1 - "No Further Action"), references *to "and additional monitoring wells"* are also included in related sections associated with Alternatives A3, B3, and B4.

MPCA Comment No. 4
Alternative B4 Municipal Water and Monitoring. The MPCA requests that this alternative be modified to loop the water line to assure water quality and pressure maintenance. The system should include a booster and circulation pump. Please modify the cost estimates and effectiveness accordingly.

Response:

As requested, the cost estimates associated with Alternative B4 have been revised to reflect a recirculation line for the 3 Home Scenario and to reflect a looped system for the 33 Home Scenario. Small in-home booster systems have been added for the 3 Home Scenario (Alternative B4a) and a booster station has been added to the 33 and 82 Home Scenarios (Alternatives B4b and B4c), respectively. Revised versions of Figure 5.5 and Tables 5.1, 5.4a through 5.4c, and 5.5 are attached. However, based on TKDA's watermain extension system analysis, provided in Appendix C of the Feasibility Study Report, a looped system, booster station, and a circulation pump would not be required to provide adequate water quality and pressure maintenance. The only operational issue identified was the low system demand and its affect on residual chlorine levels associated with the 3-home scenario. As discussed in Section 5.4.7, this issue would be eliminated by routine flushing of the system.

MPCA Comment No. 5
Section 5.5.4 Reduction of TMV through Treatment. On page 31 for Alternative B2 (Carbon Filters) the Report states that Alternative B2 would reduce the TMV through treatment in potable water used at the residence. The comparison in Section 5.5.4 should therefore indicate that Alternative B2 provides some minimal reduction in TMV.

Response:
Section 5.5.4, Comparative Analysis of Alternatives - MPCA Scenario B, Reduction of TMV Through Treatment, should be revised to read as follows:

> *"All Alternatives under MPCA Scenario B would provide reduction of TMV through natural processes. Alternative A2 would also provide reduction of TMV through treatment of potable water used at the residence."*

MPCA Comment No. 6
The "B" alternatives do not include the installation of the groundwater extraction system , as described in Alternative A3. A statement should be added to the Report to indicate that Alternative A3 could be added to any of the "B" Alternatives, and that the corresponding costs would increase as shown in the cost analysis for Alternative 3.

Response:
Installation of a groundwater extraction system under Scenario B was not evaluated because the MPCA did not request it as per your letter dated June 7, 2007 that outlined the scenarios and alternatives to be included in the Feasibility Study.

Installation of a groundwater extraction system (Alternative A3) could be added to any of the "B" Alternatives (with the exception of Alternative B1 - No Further Action). Alternatives A3 and B2, B3 and B4 already include costs associated with the long-term monitoring program. Therefore, the cost increase to install a groundwater extraction system under Alternative B2, B3, or B4 would be

$407,207 or $449,227 (present worth), depending on whether groundwater would be discharged to an infiltration gallery or to Gilfillan Lake via an underground forcemain, respectively.

The responses provided in this letter along with the attached revised figures and tables should suffice as documentation of MPCA's required modifications to the original Feasibility Study Report, submitted on July 26, 2007. Based on the straight-forward nature of the modifications, a revised Feasibility Study Report will not be issued.

If you have any questions or require additional information, please contact me at (651) 639-0193.

Sincerely,

CONESTOGA-ROVERS & ASSOCIATES

Ron Frehner, P.E.

SI/ma/5
Enc.

c.c.: Fred Campbell; Minnesota Pollution Control Agency
Nile Fellows; Minnesota Pollution Control Agency
Carmen Netten; Attorney General's Office
Jim Kelly; Minnesota Department of Health
Mayor Tom Watson; City of North Oaks
Lugene Olson; North Oaks Homeowners' Association
Senator Sandy Rummel
Representative Paul Gardner
Representative Carol McFarlane
Highway 96 Group

AREA 2

AREA 4

AREA 3

AREA 5

AREA 1

MW21A
MW19L
MW19A
MW20B
MW19B
MW22A
MW18A
MW18B
MW18L
MW24A
MW23A
MW16B
MW16D
MW12D
MW12B
MW13D
MW13B
MW17L
MW17B
MW17A

0 200 600ft

LEGEND

- GEOGRAPHIC AREAS
- MONITORING WELL LOCATION (ANNUAL SAMPLING)
- PROPOSED MONITORING WELL LOCATION (ANNUAL SAMPLING)
- CONNECTED TO MUNICIPAL WATER SUPPLY
- * CONVERTED RESIDENTIAL MONITORING WELL LOCATION (ANNUAL SAMPLING)
- RESIDENTIAL WELL LOCATION (SEMI-ANNUAL SAMPLING)
- RESIDENTIAL WELL LOCATION (ANNUAL SAMPLING)
- RESIDENTIAL WELL LOCATION (BIENNIAL SAMPLING)

figure 4.1

ALTERNATIVE A2
LONG-TERM MONITORING
North Oaks, Minnesota

02012-00(WETZ005)GN-SP010 OCT 25/2007

LEGEND

PROPOSED GROUNDWATER EXTRACTION SYSTEM LOCATION

PROPOSED UNDERGROUND DISCHARGE LINE

N

0 100 200 300

Feet

figure 4.5

POTENTIAL LOCATION OF UNDERGROUND DISCHARGE LINE
ALTERNATIVE A3
GROUNDWATER EXTRACTION SYSTEM
North Oaks, Minnesota

2012-00(WETZ005)GIS-SP001 OCT 25/2007

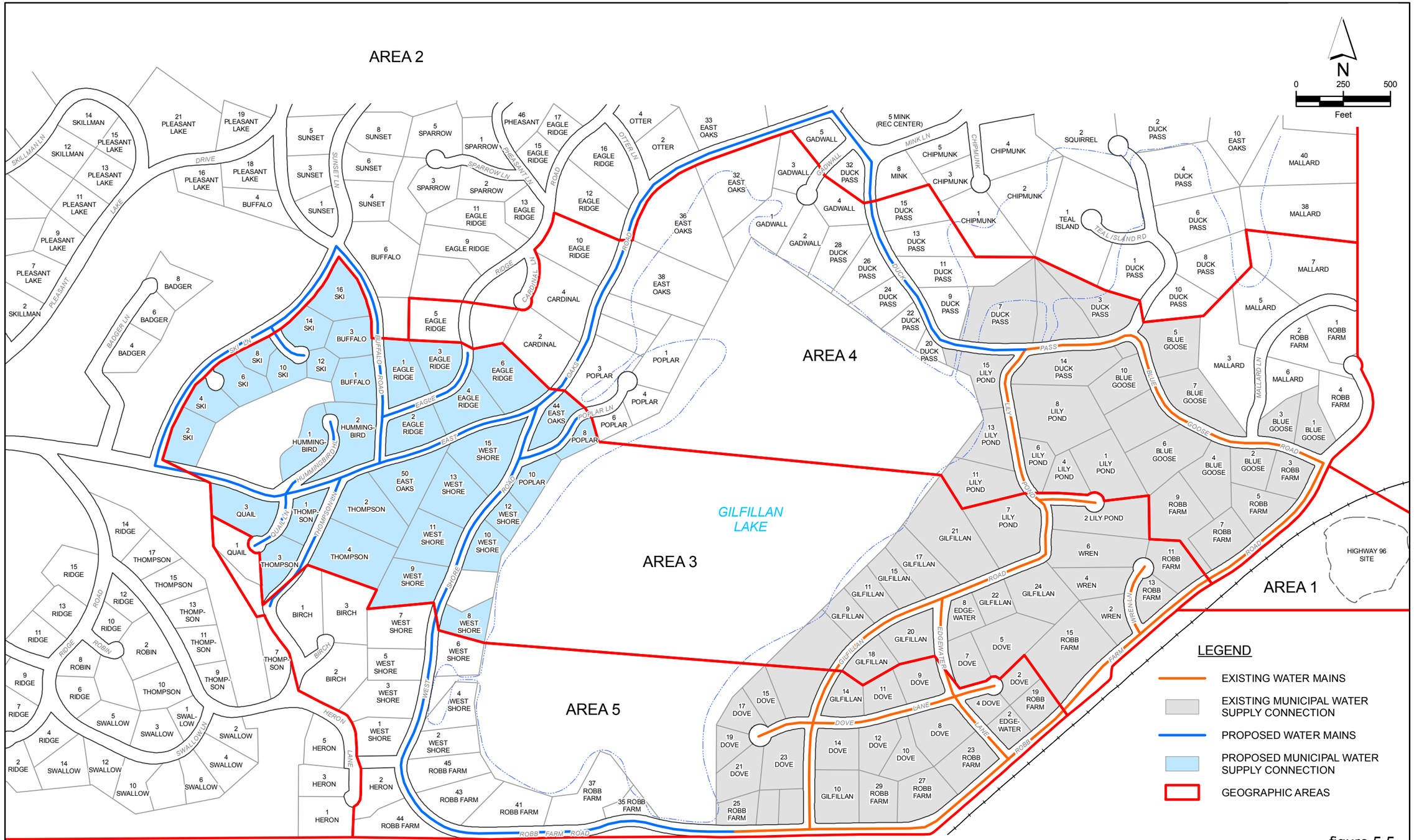

figure 5.5

16,000 LINEAR FEET OF WATER MAIN

33 CONNECTIONS

ALTERNATIVE B4b
MUNICIPAL WATER SYSTEM (33 HOMES)
North Oaks, Minnesota

2012-00(WETZ005)GIS-SP002 OCT 25/2007

TABLE 4.1
(revised 10/25/2007)
SUMMARY OF COST ESTIMATES
MPCA SCENARIO A
NORTH OAKS, MINNESOTA

Alternative	*Description*		*Total Cost*
A1	No Further Remediation	$	0
A2	Long-Term Monitoring	$	739,364
A3a	Groundwater Extraction (Discharge to Infiltration Gallery) and Monitoring	$	1,146,591
A3b	Groundwater Extraction (Discharge to Gilfillan Lake) and Monitoring	$	1,188,591

TABLE 4.2
(revised 10/25/2007)
COST ESTIMATE - ALTERNATIVE A2
LONG-TERM MONITORING
NORTH OAKS, MINNESOTA

Item	*Description*	*Quantity*	*Unit*	*Unit Cost*	*Total Cost*
Capital Costs					
1.	Upper St. Peter Sandstone Aquifer Monitoring Well under Gilfillan Lake (angle well from shoreline)	3	EA	$ 44,000	$ 132,000
2.	Upper St. Peter Sandstone Aquifer Monitoring Well in Ski Lane Ravine	2	EA	$ 9,000	$ 18,000
				Subtotal - Capital Costs	**$ 150,000**
Annual Costs					
1.	Residential Well Sampling	1	LS/YR	$ 35,000	$ 35,000
2.	Off-Site Monitoring Well and Converted Residential Monitoring Well Sampling	1	LS/YR	$ 9,000	$ 9,000
				Subtotal - Annual Costs	**$ 44,000**
				Present Worth of Annual Costs (20 yrs @ 7%)	**$ 466,137**
				Subtotal - Capital Costs and Present Worth of Annual Costs	**$ 616,137**
				Contingency (20%)	**$ 123,227**
				TOTAL	**$ 739,364**

TABLE 4.3a

(revised 10/25/2007)

COST ESTIMATE - ALTERNATIVE A3a

GROUNDWATER EXTRACTION (DISCHARGE TO INFILTRATION GALLERY) AND MONITORING

NORTH OAKS, MINNESOTA

Item	*Description*	*Quantity*	*Unit*	*Unit Cost*	*Total Cost*
Capital Costs					
1.	Upper St. Peter Sandstone Aquifer extraction well	1	EA	$ 40,000	$ 40,000
2.	Commission Groundwater Extraction System	1	LS	$ 34,000	$ 34,000
3.	Infiltration Gallery in Ski Lane Ravine	1	LS	$ 45,000	$ 45,000
4.	Upper St. Peter Sandstone Aquifer Monitoring Well under Gilfillan Lake (angle well from shoreline)	3	EA	$ 44,000	$ 132,000
5.	Upper St. Peter Sandstone Aquifer Monitoring Well in Ski Lane Ravine	2	EA	$ 9,000	$ 18,000
			Subtotal - Capital Costs		**$ 269,000**
Annual Costs					
1.	O&M of Groundwater Extraction System	1	LS/YR	$ 20,800	$ 20,800
2.	Residential Well Sampling	1	LS/YR	$ 35,000	$ 35,000
3.	Off-Site Monitoring Well and Converted Residential Monitoring Well Sampling	1	LS/YR	$ 9,000	$ 9,000
			Subtotal - Annual Costs		**$ 64,800**
			Present Worth of Annual Costs (20 yrs @ 7%)		**$ 686,492**
			Subtotal - Capital Costs and Present Worth of Annual Costs		**$ 955,492**
			Contingency (20%)		**$ 191,098**
			TOTAL		**$ 1,146,591**

TABLE 4.3b

(revised 10/25/2007)

COST ESTIMATE - ALTERNATIVE A3b

GROUNDWATER EXTRACTION (DISCHARGE TO GILFILLAN LAKE) AND MONITORING

NORTH OAKS, MINNESOTA

Item	*Description*	*Quantity*	*Unit*	*Unit Cost*	*Total Cost*
Capital Costs					
1.	Upper St. Peter Sandstone Aquifer extraction well	1	EA	$ 40,000	$ 40,000
2.	Commission Groundwater Extraction System	1	LS	$ 34,000	$ 34,000
3.	Underground Discharge Forcemain to Gilfillan Lake	1	LS	$ 80,000	$ 80,000
4.	Upper St. Peter Sandstone Aquifer Monitoring Well under Gilfillan Lake (angle well from shoreline)	3	EA	$ 44,000	$ 132,000
5.	Upper St. Peter Sandstone Aquifer Monitoring Well in Ski Lane Ravine	2	EA	$ 9,000	$ 18,000
			Subtotal - Capital Costs		**$ 304,000**
Annual Costs					
1.	O&M of Groundwater Extraction System	1	LS/YR	$ 20,800	$ 20,800
2.	Residential Well Sampling	1	LS/YR	$ 35,000	$ 35,000
3.	Off-Site Monitoring Well and Converted Residential Monitoring Well Sampling	1	LS/YR	$ 9,000	$ 9,000
			Subtotal - Annual Costs		**$ 64,800**
			Present Worth of Annual Costs (20 yrs @ 7%)		**$ 686,492**
			Subtotal - Capital Costs and Present Worth of Annual Costs		**$ 990,492**
			Contingency (20%)		**$ 198,098**
			TOTAL		**$ 1,188,591**

TABLE 4.4
(Revised 10/25/07)
SUMMARY OF COMPARITIVE ANALYSIS OF ALTERNATIVES
MPCA SCENARIO A
NORTH OAKS, MINNESOTA

	Overall Protection of Human Health and the Environment	*Compliance with ARARs*	*Long-Term Effectiveness and Permanence*	*Reduction of Toxicity, Mobility, or Volume Through Treatment*	*Short-Term Effectiveness*	*Implementability*	*Cost Effectiveness*
Alternative A1 - No Further Action	Protective of human health, as under MPCA Scenario A, no HRLs are exceeded. Environmental protection not applicable due to lack of receptors. Status would not be evaluated, because monitoring is not provided.	Not compliant with chemical-specific ARARs because monitoring is not provided. No location or action-specific ARARs are associated with this alternative.	Long-term effectiveness is not attained, because monitoring is not provided.	No reduction of TMV through active treatment, because no further action would be taken. Reduces TMV in aquifer over time through natural processes. Reduction of TMV would not be evaluated, because monitoring is not provided.	There would be no short-term impacts because no further action would be taken.	Does not apply to this alternative, because no father action would be taken.	Present Worth - $0
Alternative A2 - Long-Term Monitoring	Protective of human health, as under MPCA Scenario A, no HRLs are exceeded. Environmental protection not applicable due to lack of receptors. Status would be evaluated through monitoring.	Compliant with chemical-specific ARARs, as under MPCA Scenario A, no HRLs are exceeded. Compliant with action-specific ARARs for installation of monitoring wells, sampling, and analysis. No location-specific ARARs are associated with this alternative.	Long-term effectiveness would be evaluated through monitoring.	No reduction of TMV through active treatment. Reduces TMV in aquifer over time through natural processes. Reduction of TMV would be evaluated through monitoring.	Minimal impact incurred to residents and environment during installation of additional monitoring wells. No impact to workers during sampling activities.	Installation of monitoring wells is an established procedure and is readily implemented by licensed well drillers. Monitoring is also an established procedure and is readily implemented. Alternative requires agreements and coordination with NOHOA and property owners.	Present Worth - $739,364
Alternative A3 - Groundwater Extraction and Monitoring	Protective of human health, as under MPCA Scenario A, no HRLs are exceeded. Environmental protection not applicable due to lack of receptors, unless extraction system is constructed in wetlands. Status would be evaluated through monitoring.	Compliant with chemical-specific ARARs, as under MPCA Scenario A, no HRLs are exceeded. Compliant with action-specific ARARs for construction and operation of extraction system, installation of monitoring wells, sampling, and analysis. No location-specific ARARs are associated with this alternative, unless the extraction system in constructed in wetlands.	The objective of this alternative is to prevent migration of groundwater with VOC concentrations above HRLs. Under MPCA Scenario A, no HRLS are exceeded, therefore there is no way to evaluate the effectiveness or permanence of this alternative.	Reduces TMV through treatment by hydraulic extraction and treatment of extracted groundwater. Reduces TMV in aquifer over time through natural processes. Reduction of TMV would be evaluated through monitoring.	Minimal to moderate impact incurred to residents and environment during installation of monitoring wells, extraction wells, and treatment system. Extraction system may change groundwater flow patterns and cause additional well locations to become impacted.	Construction and operation of groundwater extraction systems would take several months to implement due to design, approval and construction times. Infiltration of treated groundwater may be limited by existing subsurface geology. Discharge of treated groundwater to Gilfillan Lake may be difficult because of access. Alternative requires agreements and coordination with NOHOA, the City, and property owners.	Present Worth - $1,146,591 (discharge to infiltration gallery) $1,188,591 (discharge to Gilfillan Lake)

TABLE 5.1

(revised 10/25/2007)

SUMMARY OF COST ESTIMATES

MPCA SCENARIO B

NORTH OAKS, MINNESOTA

Alternative	*Description*		*Total Cost*
B1	No Further Remediation	$	0
B2a	Residential Carbon Filter (3 homes) and Monitoring	$	807,687
B2b	Residential Carbon Filter (33 homes) and Monitoring	$	1,427,348
B2c	Residential Carbon Filter (82 homes) and Monitoring	$	2,553,877
B3a	New/Deeper Residential Well (3 homes) and Monitoring	$	799,731
B3b	New/Deeper Residential Well (33 homes) and Monitoring	$	1,339,839
B3c	New/Deeper Residential Well (82 homes) and Monitoring	$	2,336,430
B4a	Municipal Water (3 homes) and Monitoring	$	1,378,935
B4b	Municipal Water (33 homes) and Monitoring	$	2,462,236
B4c	Municipal Water (82 homes) and Monitoring	$	3,342,234

TABLE 5.2a

(revised 10/25/2007)

COST ESTIMATE - ALTERNATIVE B2a
RESIDENTIAL CARBON FILTER (3 HOMES) AND MONITORING
NORTH OAKS, MINNESOTA

Item	*Description*	*Quantity*	*Unit*	*Unit Cost*	*Total Cost*
Capital Costs					
1.	Residential Carbon Filter System	3	EA	$ 4,500	$ 13,500
2.	Upper St. Peter Sandstone Aquifer Monitoring Well under Gilfillan Lake (angle well from shoreline)	3	EA	$ 44,000	$ 132,000
3.	Upper St. Peter Sandstone Aquifer Monitoring Well in Ski Lane Ravine	2	EA	$ 9,000	$ 18,000
				Subtotal - Capital Costs	**$ 163,500**
Annual Costs					
1.	O&M of Carbon Filter System	3	EA/YR	$ 1,700	$ 5,100
2.	Residential Well Sampling	1	LS/YR	$ 34,000	$ 34,000
3.	Off-Site Monitoring Well and Converted Residential Monitoring Well Sampling	1	LS/YR	$ 9,000	$ 9,000
				Subtotal - Annual Costs	**$ 48,100**
				Present Worth of Annual Costs (20 yrs @ 7%)	**$ 509,572**
				Subtotal - Capital Costs and Present Worth of Annual Costs	**$ 673,072**
				Contingency (20%)	**$ 134,614**
				TOTAL	**$ 807,687**

TABLE 5.2b

(revised 10/25/2007)

COST ESTIMATE - ALTERNATIVE B2b
RESIDENTIAL CARBON FILTER (33 HOMES) AND MONITORING
NORTH OAKS, MINNESOTA

Item	*Description*	*Quantity*	*Unit*	*Unit Cost*	*Total Cost*
Capital Costs					
1.	Residential Carbon Filter System	33	EA	$ 4,500	$ 148,500
2.	Upper St. Peter Sandstone Aquifer Monitoring Well under Gilfillan Lake (angle well from shoreline)	3	EA	$ 44,000	$ 132,000
3.	Upper St. Peter Sandstone Aquifer Monitoring Well in Ski Lane Ravine	2	EA	$ 9,000	$ 18,000
				Subtotal - Capital Costs	**$ 298,500**
Annual Costs					
1.	O&M of Carbon Filter System	33	EA/YR	$ 1,700	$ 56,100
2.	Residential Well Sampling	1	LS/YR	$ 19,000	$ 19,000
3.	Off-Site Monitoring Well and Converted Residential Monitoring Well Sampling	1	LS/YR	$ 9,000	$ 9,000
				Subtotal - Annual Costs	**$ 84,100**
				Present Worth of Annual Costs (20 yrs @ 7%)	**$ 890,957**
				Subtotal - Capital Costs and Present Worth of Annual Costs	**$ 1,189,457**
				Contingency (20%)	**$ 237,891**
				TOTAL	**$ 1,427,348**

TABLE 5.2c

(revised 10/25/2007)

COST ESTIMATE - ALTERNATIVE B2c
RESIDENTIAL CARBON FILTER (82 HOMES) AND MONITORING
NORTH OAKS, MINNESOTA

Item	*Description*	*Quantity*	*Unit*	*Unit Cost*	*Total Cost*
Capital Costs					
1.	Residential Carbon Filter System	82	EA	$ 4,500	$ 369,000
2.	Upper St. Peter Sandstone Aquifer Monitoring Well under Gilfillan Lake (angle well from shoreline)	3	EA	$ 44,000	$ 132,000
3.	Upper St. Peter Sandstone Aquifer Monitoring Well in Ski Lane Ravine	2	EA	$ 9,000	$ 18,000
				Subtotal - Capital Costs	**$ 519,000**
Annual Costs					
1.	O&M of Carbon Filter System	82	EA/YR	$ 1,700	$ 139,400
2.	Residential Well Sampling	1	LS/YR	$ 3,500	$ 3,500
3.	Off-Site Monitoring Well and Converted Residential Monitoring Well Sampling	1	LS/YR	$ 9,000	$ 9,000
				Subtotal - Annual Costs	**$ 151,900**
				Present Worth of Annual Costs (20 yrs @ 7%)	**$ 1,609,231**
				Subtotal - Capital Costs and Present Worth of Annual Costs	**$ 2,128,231**
				Contingency (20%)	**$ 425,646**
				TOTAL	**$ 2,553,877**

TABLE 5.3a

(revised 10/25/2007)

COST ESTIMATE - ALTERNATIVE B3a

NEW/DEEPER RESIDENTIAL WELL (3 HOMES) AND MONITORING

NORTH OAKS, MINNESOTA

Item	*Description*	*Quantity*	*Unit*	*Unit Cost*	*Total Cost*
Capital Costs					
1.	New/Deep Residential Well	3	EA	$ 19,000	$ 57,000
2.	Seal Existing Well	3	EA	$ 1,300	$ 3,900
3.	Upper St. Peter Sandstone Aquifer Monitoring Well under Gilfillan Lake (angle well from shoreline)	3	EA	$ 44,000	$ 132,000
4.	Upper St. Peter Sandstone Aquifer Monitoring Well in Ski Lane Ravine	2	EA	$ 9,000	$ 18,000
			Subtotal - Capital Costs		**$ 210,900**
Annual Costs					
1.	Residential Well Sampling	1	LS/YR	$ 34,000	$ 34,000
2.	Off-Site Monitoring Well and Converted Residential Monitoring Well Sampling	1	LS/YR	$ 9,000	$ 9,000
			Subtotal - Annual Costs		**$ 43,000**
			Present Worth of Annual Costs (20 yrs @ 7%)		**$ 455,543**
			Subtotal - Capital Costs and Present Worth of Annual Costs		**$ 666,443**
			Contingency (20%)		**$ 133,289**
			TOTAL		**$ 799,731**

TABLE 5.3b

(revised 10/25/2007)

COST ESTIMATE - ALTERNATIVE B3b

NEW/DEEPER RESIDENTIAL WELL (33 HOMES) AND MONITORING

NORTH OAKS, MINNESOTA

Item	*Description*	*Quantity*	*Unit*	*Unit Cost*	*Total Cost*
Capital Costs					
1.	New/Deep Residential Well	33	EA	$ 19,000	$ 627,000
2.	Seal Existing Well	33	EA	$ 1,300	$ 42,900
3.	Upper St. Peter Sandstone Aquifer Monitoring Well under Gilfillan Lake (angle well from shoreline)	3	EA	$ 44,000	$ 132,000
4.	Upper St. Peter Sandstone Aquifer Monitoring Well in Ski Lane Ravine	2	EA	$ 9,000	$ 18,000
			Subtotal - Capital Costs		**$ 819,900**
Annual Costs					
1.	Residential Well Sampling	1	LS/YR	$ 19,000	$ 19,000
2.	Off-Site Monitoring Well and Converted Residential Monitoring Well Sampling	1	LS/YR	$ 9,000	$ 9,000
			Subtotal - Annual Costs		**$ 28,000**
			Present Worth of Annual Costs (20 yrs @ 7%)		**$ 296,632**
			Subtotal - Capital Costs and Present Worth of Annual Costs		**$ 1,116,532**
			Contingency (20%)		**$ 223,306**
			TOTAL		**$ 1,339,839**

TABLE 5.3c

(revised 10/25/2007)

COST ESTIMATE - ALTERNATIVE B3c

NEW/DEEPER RESIDENTIAL WELL (82 HOMES) AND MONITORING

NORTH OAKS, MINNESOTA

Item	*Description*	*Quantity*	*Unit*	*Unit Cost*	*Total Cost*
Capital Costs					
1.	New/Deep Residential Well	82	EA	$ 19,000	$ 1,558,000
2.	Seal Existing Well	82	EA	$ 1,300	$ 106,600
3.	Upper St. Peter Sandstone Aquifer Monitoring Well under Gilfillan Lake (angle well from shoreline)	3	EA	$ 44,000	$ 132,000
4.	Upper St. Peter Sandstone Aquifer Monitoring Well in Ski Lane Ravine	2	EA	$ 9,000	$ 18,000
			Subtotal - Capital Costs		**$ 1,814,600**
Annual Costs					
1.	Residential Well Sampling	1	LS/YR	$ 3,500	$ 3,500
2.	Off-Site Monitoring Well and Converted Residential Monitoring Well Sampling	1	LS/YR	$ 9,000	$ 9,000
			Subtotal - Annual Costs		**$ 12,500**
			Present Worth of Annual Costs (20 yrs @ 7%)		**$ 132,425**
			Subtotal - Capital Costs and Present Worth of Annual Costs		**$ 1,947,025**
			Contingency (20%)		**$ 389,405**
			TOTAL		**$ 2,336,430**

TABLE 5.4a

(revised 10/25/2007)

COST ESTIMATE - ALTERNATIVE B4a
MUNICIPAL WATER (3 HOMES) AND MONITORING
NORTH OAKS, MINNESOTA

Item	*Description*	*Quantity*	*Unit*	*Unit Cost*	*Total Cost*
Capital Costs					
1.	Mobilization	1	LS	$ 25,884	$ 25,884
2.	Watermain (8-inch)	5,000	LF	$ 45	$ 225,000
3.	Recirculation Line (2-inch)	5,000	LF	$ 10	$ 50,000
4.	In-house Booster Pump	3	EA	$ 2,000	$ 6,000
5.	Valves and Tees	3	EA	$ 2,450	$ 7,350
6.	Hydrants	3	EA	$ 6,300	$ 18,900
7.	Connections	3	EA	$ 4,650	$ 13,950
8.	Water Availability Charge	3	EA	$ 2,250	$ 6,750
9.	Seal Existing Well	3	EA	$ 1,300	$ 3,900
10.	Restoration	1	LS	$ 66,370	$ 66,370
11.	Engineering Design and Construction Oversight	1	LS	$ 119,466	$ 119,466
12.	Upper St. Peter Sandstone Aquifer Monitoring Well under Gilfillan Lake (angle well from shoreline)	3	EA	$ 44,000	$ 132,000
13.	Upper St. Peter Sandstone Aquifer Monitoring Well in Ski Lane Ravine	2	EA	$ 9,000	$ 18,000
				Subtotal - Capital Costs	**$ 693,570**
Annual Costs					
1.	Residential Well Sampling	1	LS/YR	$ 34,000	$ 34,000
2.	Off-Site Monitoring Well and Converted Residential Monitoring Well Sampling	1	LS/YR	$ 9,000	$ 9,000
				Subtotal - Annual Costs	**$ 43,000**
				Present Worth of Annual Costs (20 yrs @ 7%)	**$ 455,543**
				Subtotal - Capital Costs and Present Worth of Annual Costs	**$ 1,149,113**
				Contingency (20%)	**$ 229,823**
				TOTAL	**$ 1,378,935**

TABLE 5.4b

(revised 10/25/2007)

COST ESTIMATE - ALTERNATIVE B4b
MUNICIPAL WATER (33 HOMES) AND MONITORING
NORTH OAKS, MINNESOTA

Item	*Description*	*Quantity*	*Unit*	*Unit Cost*	*Total Cost*
Capital Costs					
1.	Mobilization	1	LS	$ 76,440	$ 76,440
2.	Watermain (8-inch)	16,195	LF	$ 45	$ 728,775
3.	Watermain (6-inch)	180	LF	$ 35	$ 6,300
4.	Booster Station and Circulation Pump	1	LS	$ 100,000	$ 100,000
5.	Valves and Tees	6	EA	$ 2,450	$ 14,700
6.	Hydrants	6	EA	$ 6,300	$ 37,800
7.	Connections	33	EA	$ 4,650	$ 153,450
8.	Water Availability Charge	33	EA	$ 2,250	$ 74,250
9.	Seal Existing Well	33	EA	$ 1,300	$ 42,900
10.	Restoration	1	LS	$ 115,818	$ 115,818
11.	Engineering Design and Construction Oversight	1	LS	$ 254,799	$ 254,799
12.	Upper St. Peter Sandstone Aquifer Monitoring Well under Gilfillan Lake (angle well from shoreline)	3	EA	$ 44,000	$ 132,000
13.	Upper St. Peter Sandstone Aquifer Monitoring Well in Ski Lane Ravine	2	EA	$ 9,000	$ 18,000
				Subtotal - Capital Costs	**$ 1,755,231**
Annual Costs					
1.	Residential Well Sampling	1	LS/YR	$ 19,000	$ 19,000
2.	Off-Site Monitoring Well and Converted Residential Monitoring Well Sampling	1	LS/YR	$ 9,000	$ 9,000
				Subtotal - Annual Costs	**$ 28,000**
				Present Worth of Annual Costs (20 yrs @ 7%)	**$ 296,632**
				Subtotal - Capital Costs and Present Worth of Annual Costs	**$ 2,051,863**
				Contingency (20%)	**$ 410,373**
				TOTAL	**$ 2,462,236**

TABLE 5.4c

(revised 10/25/2007)

COST ESTIMATE - ALTERNATIVE B4c
MUNICIPAL WATER (82 HOMES) AND MONITORING
NORTH OAKS, MINNESOTA

Item	*Description*	*Quantity*	*Unit*	*Unit Cost*	*Total Cost*
Capital Costs					
1.	Mobilization	1	LS	$ 119,180	$ 119,180
2.	Watermain (8-inch)	20,210	LF	$ 45	$ 909,450
3.	Watermain (6-inch)	290	LF	$ 35	$ 10,150
4.	Booster Station and Circulation Pump	1	LS	$ 100,000	$ 100,000
5.	Valves and Tees	13	EA	$ 2,450	$ 31,850
6.	Hydrants	13	EA	$ 6,300	$ 81,900
7.	Connections	82	EA	$ 4,650	$ 381,300
8.	Water Availability Charge	82	EA	$ 2,250	$ 184,500
9.	Seal Existing Well	82	EA	$ 1,300	$ 106,600
10.	Restoration	1	LS	$ 180,575	$ 180,575
11.	Engineering Design and Construction Oversight	1	LS	$ 397,265	$ 397,265
12.	Upper St. Peter Sandstone Aquifer Monitoring Well under Gilfillan Lake (angle well from shoreline)	3	EA	$ 44,000	$ 132,000
13.	Upper St. Peter Sandstone Aquifer Monitoring Well in Ski Lane Ravine	2	EA	$ 9,000	$ 18,000
				Subtotal - Capital Costs	**$ 2,652,770**
Annual Costs					
1.	Residential Well Sampling	1	LS/YR	$ 3,500	$ 3,500
2.	Off-Site Monitoring Well and Converted Residential Monitoring Well Sampling	1	LS/YR	$ 9,000	$ 9,000
				Subtotal - Annual Costs	**$ 12,500**
				Present Worth of Annual Costs (20 yrs @ 7%)	**$ 132,425**
				Subtotal - Capital Costs and Present Worth of Annual Costs	**$ 2,785,195**
				Contingency (20%)	**$ 557,039**
				TOTAL	**$ 3,342,234**

TABLE 5.5
(revised 10/25/07)
SUMMARY OF COMPARITIVE ANALYSIS OF ALTERNATIVES
MPCA SCENARIO B
NORTH OAKS, MINNESOTA

	Overall Protection of Human Health and the Environment	*Compliance with ARARs*	*Long-Term Effectiveness and Permanence*	*Reduction of Toxicity, Mobility, or Volume Through Treatment*	*Short-Term Effectiveness*	*Implementability*	*Cost Effectiveness*
Alternative B1 - No Further Action	Not protective of human health because no action proposed to address HRL exceedences. Environmental protection not applicable due to lack of receptors. Status would not be evaluated because monitoring is not provided.	Not compliant with chemical-specific ARARs due to HRL exceedences. No location or action-specific ARARs are associated with this alternative.	Long-term effectiveness is not attained because monitoring is not provided and no further action is proposed to address HRL exceedences.	No reduction of TMV through active treatment, because no further action would be taken. Reduces TMV in aquifer over time through natural processes. Reduction of TMV would not be evaluated, because monitoring is not provided.	There would be no short-term impacts because no further action would be taken.	No implementation is required because no further action would be taken.	Present Worth - $0
Alternative B2 - Residential Carbon Filter and Monitoring	Protective of human health as exposure to impacted groundwater is eliminated by provision of carbon filter. Environmental protection not applicable due to lack of receptors. Status would be evaluated through monitoring.	Compliant with chemical-specific ARARs (HRLs) and action-specific ARARs for installation of monitoring wells, sampling, and analysis. No location-specific ARARs are associated with this alternative.	Carbon filters are a proven technology for use as a long-term or permanent remedy. Long-term effectiveness would be evaluated through monitoring.	Reduces TMV through treatment in potable water by provision of carbon filter. Reduces TMV in aquifer over time through natural processes. Reduction of TMV would be evaluated through monitoring.	Minimal impact incurred to residents during installation of carbon filters and additional monitoring wells. No impact to environment or workers during sampling activities.	Installation and maintenance of carbon filters is an established procedure and is readily implemented. This alternative would require agreements with property owners and NOHOA. This alternative also requires long-term coordination with the property owner related to maintenance of the carbon filters.	Present Worth - $807,687 (3 homes) $1,427,348 (33 homes) $2,553,877 (82 homes)
Alternative B3 - New/Deeper Residential Well and Monitoring	Protective of human health as exposure to impacted groundwater is eliminated by provision of a new/deeper well. Environmental protection not applicable due to lack of receptors. Status would be evaluated through monitoring.	Compliant with chemical-specific ARARs (HRLs) and action -specific ARARs for installation of residential wells and monitoring wells, sampling, and analysis. No location-specific ARARs are associated with this alternative.	New/deeper residential wells are a proven technology for use as a permanent remedy. Long-term effectiveness would be evaluated through monitoring.	No reduction of TMV through active treatment. Reduces TMV in aquifer over time through natural processes. Reduction of TMV would be evaluated through monitoring.	Minimal impact incurred to residents during installation of new/deeper residential wells and additional monitoring wells. No impact to environment or workers during sampling activities.	Installation of residential wells and monitoring wells is an established procedure and is readily implemented by licensed well drillers. This alternative would require agreements and coordination with property owners and NOHOA.	Present Worth - $799,731 (3 homes) $1,339,839 (33 homes) $2,336,430 (82 homes)
Alternative B4 - Municipal Water and Monitoring	Protective of human health as exposure to impacted groundwater is eliminated by provision of municipal water. Environmental protection not applicable due to lack of receptors, unless watermains are constructed through wetlands. Status would be evaluated through monitoring.	Compliant with chemical-specific ARARs (HRLs) and action -specific ARARs for watermain construction, installation of monitoring wells, sampling, and analysis. No location-specific ARARs are associated with this alternative, unless watermains are constructed through wetlands.	Provision of municipal water is a proven technology for use as a permanent remedy. Long-term effectiveness would be evaluated through monitoring.	No reduction of TMV through active treatment. Reduces TMV in aquifer over time through natural processes. Reduction of TMV would be evaluated through monitoring.	Moderate impact incurred to residents during installation of municipal water and additional monitoring wells. No impact to environment or workers during sampling activities.	Installation of municipal water is an established procedure, but would take 6 to 12 months to implement due to design, approval, and construction time. This alternative would require agreements and coordination with the City, property owners, and NOHOA.	Present Worth - $1,378,935 (3 homes) $2,462,236 (33 homes) $3,342,234 (82 homes)