



APPENDIX 10

Supplemental Air Quality Information

**Environmental Assessment of
Canadian Strategic Infrastructure Funded
Upgrades to the City of Winnipeg
Water Pollution Control Centres**

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**APPENDIX 10A
Review of Study Area
Air Quality**

1.0 EXISTING CITY OF WINNIPEG AIR QUALITY CONDITIONS

Manitoba Conservation has collected air quality data at a downtown location (between Scotia Street and Jefferson Avenue) in the City of Winnipeg. Air quality data from 1995 to 2004 represent the baseline air quality utilized in this assessment. Parameters measured at this sampling location are carbon monoxide, nitrogen dioxide, nitric oxides, nitrogen oxides, oxidants ozone and inhalable particulates. Figures 1-1, 1-2 and 1-3 illustrate historic Winnipeg ambient air quality. Detailed air quality data are presented in Attachment 10A.

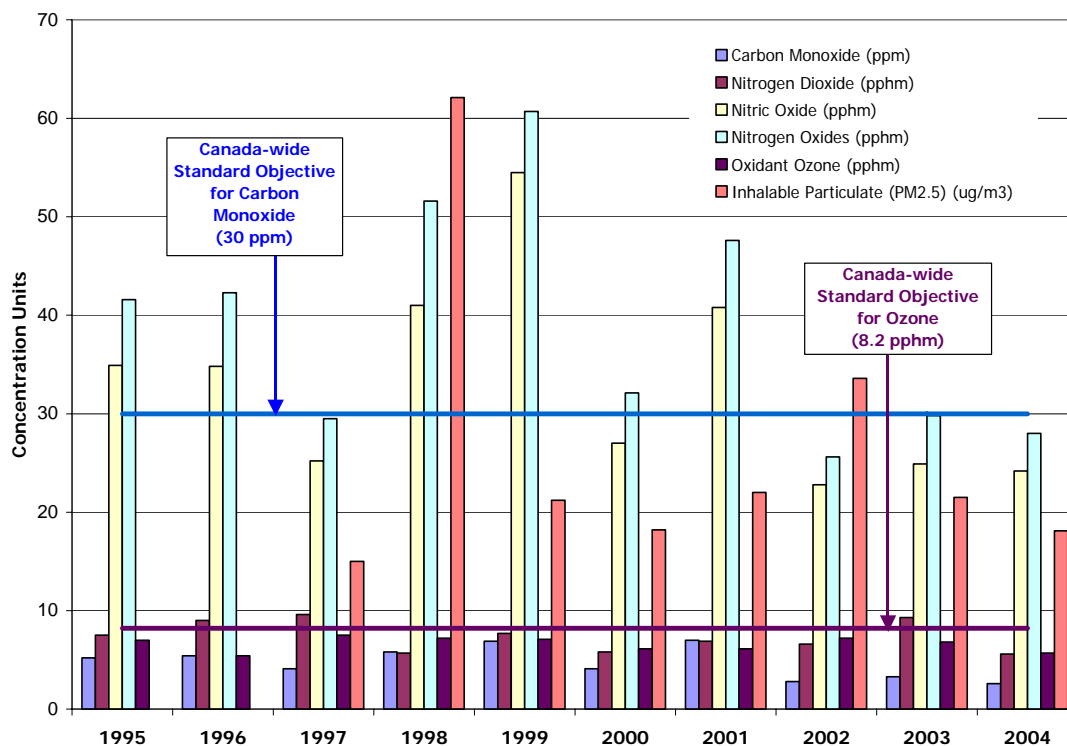


Figure 1-1 Annual Mean Pollution Concentrations for Winnipeg Air Quality (1995-2004)

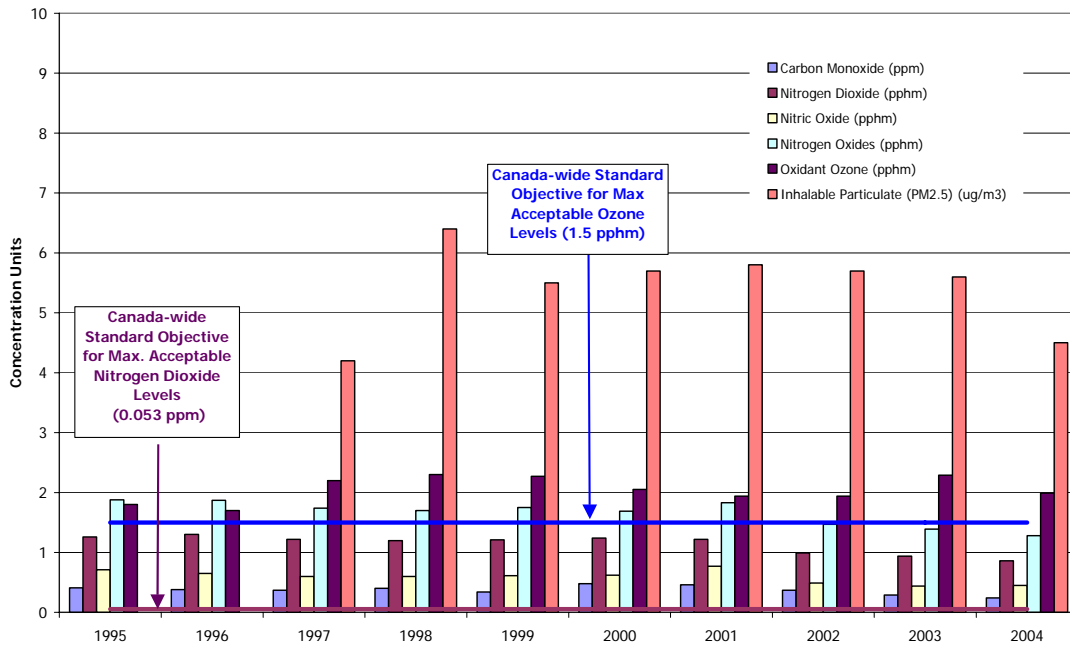


Figure 1-2 Annual Maximum 1-Hour Pollution Concentrations for Winnipeg Air Quality (1995-2004)

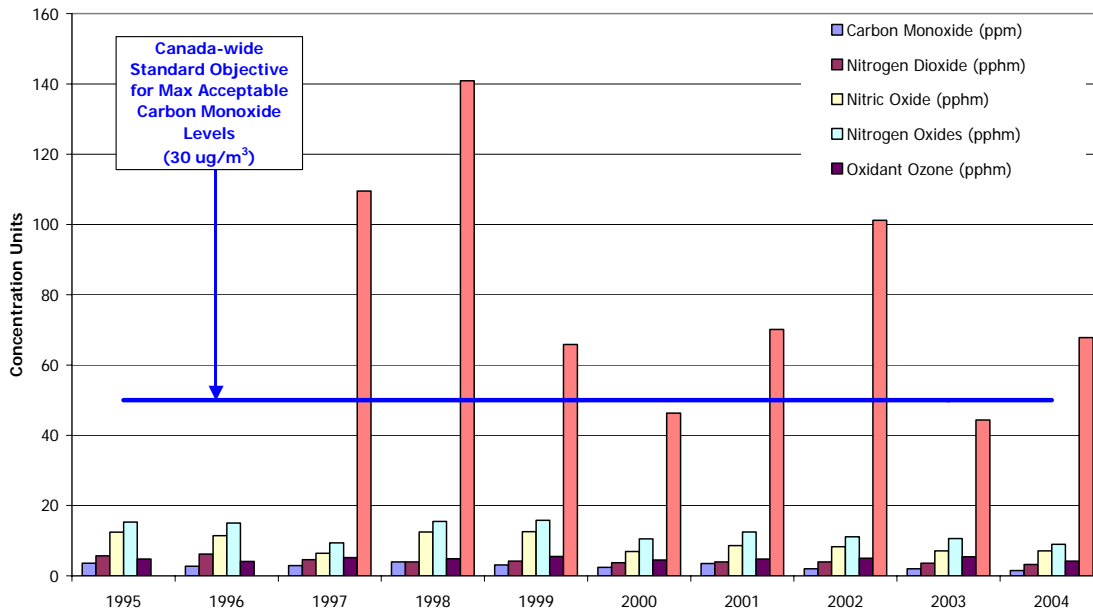


Figure 1-3 Annual Maximum 24-Hour Pollution Concentrations for Winnipeg Air Quality (1995-2004)

In general, Winnipeg air quality is considered “good” as outlined by the Air Quality Index (AQI)¹ with the exception of a few exceedances of provincial and federal standards (Manitoba Conservation 2005 and CCME 2000). Additional information regarding observed levels for each parameter includes:

- **Nitrogen dioxide** concentrations are fairly constant throughout the monitoring period. Overall pollutant levels significantly exceeded the maximum acceptable levels for 1-hour average, 24-hour average and annual mean. For example, the average 1996 nitrogen oxide concentration is 1.3 ppm (part per million), while the maximum acceptable nitrogen dioxide level is 0.053 ppm.
- **Ozone** concentrations in downtown Winnipeg are fairly constant throughout the period of monitoring. It is evident that overall average ozone levels exceeded the annual mean maximum acceptable level (Figure 1-1); however, no exceedance is observed for 1-hour maximum acceptable level (Figure 1-2).
- **Inhalable particulates** concentrations greater than 2.5 microns vary from year to year. The 24-hour maximum acceptable level was exceeded a number of times between 1997 and 2004 (Figure 1-3); however, it should be noted that no inhalable particulate was measured in 1995 and 1996.
- **Nitric oxide and nitrogen oxide** concentrations are fairly constant throughout the period of monitoring. Annual mean nitric oxide concentrations range between 0.44 and 0.77 pphm (part per hundred million), while corresponding nitrogen oxide concentrations range between 1.28 and 1.88 pphm. Currently, there is no guideline for nitric oxide and nitrogen oxide in Manitoba.

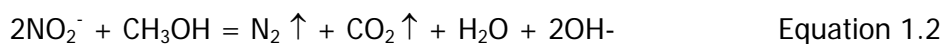
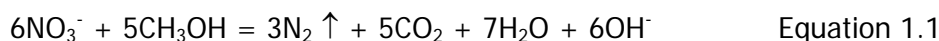
¹ The AQI is a system utilized for rating air quality in urban area that provides the public with a general idea of air quality in their community (Manitoba Conservation 1995).

2.0 EXISTING CITY OF WINNIPEG NOISE CONDITIONS

No noise data is currently available for Winnipeg ambient noise levels; however, noise levels are expected to be variable with intermittent higher noise levels in high traffic areas and lower noise levels in rural residential areas.

3.0 ESTIMATE OF POTENTIAL EMISSION

Methanol is a preferred carbon source for the centrate nutrient removal at NEWPCC. However, application of the stipulated compound during the denitrification process generates carbon dioxide by-product as shown in equations 1.0 through 1.2.



According to the centrate treatment functional design (Earth Tech 2006), the amount of methanol required for the denitrification process is estimated at 10.9 tonnes/day. This amount of methanol would potentially produce carbon dioxide emissions as much as 15,000 kg CO₂/day. It should be noted that the carbon dioxide emission estimate is calculated based on methanol molar mass of 32 g/mol and carbon dioxide molar mass of 44 g/mol.

4.0 REFERENCES

Canadian Council of Ministers on the Environment (CCME). 2000. Canada-wide Standards. Available from http://www.ccme.ca/publications/list_publications.html#link1.

Earth Tech. 2006. Centrate Nutrient Treatment Nitrogen Removal Facility Functional Design Report. Report to the City of Winnipeg Water and Waste Department. Prepared by Earth Tech (Canada) Inc. March 2006.

Manitoba Conservation. 2005. Objectives and Guidelines for Various Air Pollutants: Ambient Air Quality Criteria (*updated July, 2005*) available from http://www.gov.mb.ca/conservation/airquality/aq-criteria/ambientair_e.html

Manitoba Conservation. 1995. Winnipeg Air Quality Index. Available from http://www.gov.mb.ca/conservation/airquality/brochures/wpgindex_e.html. June 1995.

Manitoba Conservation 2005. Air quality objectives and guidelines Ambient Air Quality Criteria Table. Downloaded from <http://www.gov.mb.ca/conservation/airquality/aq-criteria/ambientair-table.html> on June 16, 2005.

Attachment 10A-A
Winnipeg Air Quality
Monitoring
(1995-2004)

Table A-1 1995 Winnipeg Air Quality Monitoring									
Parameter	1995								
	Annual Mean	Maximum Data Values		Total # Samples Above Maximum Desirable Level		Total # Samples Above Maximum Acceptable Level		Total # Samples Above Maximum Tolerable Level	
		1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
Carbon Monoxide (ppm)	0.41	5.2	3.6	0	0	0	0	--	0
Nitrogen Dioxide (pphm)	1.26	7.5	5.7	--	--	0	0	0	--
Nitric Oxide (pphm)	0.71	34.9	12.4	--	--	--	--	--	--
Nitrogen Oxides (pphm)	1.88	41.6	15.3	--	--	--	--	--	--
Oxidant Ozone (pphm)	1.8	7	4.8	148	~	0	~	0	--
Inhalable Particulate (PM _{2.5}) (ug/m ³)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a = no data available for this parameter; "--" = No guideline or objective; "~" = Under review

Table A-2 1996 Winnipeg Air Quality Monitoring									
Parameter	1996								
	Annual Mean	Max. Data Values		Total # Samples Above Maximum Desirable Level		Total # Samples Above Maximum Acceptable Level		Total # Samples Above Maximum Tolerable Level	
		1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
Carbon Monoxide (ppm)	0.38	5.4	2.7	0	0	0	0	--	0
Nitrogen Dioxide (pphm)	1.3	9	6.2	--	--	0	0	0	--
Nitric Oxide (pphm)	0.65	34.8	11.4	--	--	--	--	--	--
Nitrogen Oxides (pphm)	1.87	42.3	15	--	--	--	--	--	--
Oxidant Ozone (pphm)	1.7	5.4	4.1	6	5279	0	888	0	--
Inhalable Particulate (PM _{2.5}) (ug/m ³)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a = no data available for this parameter; "--" = No guideline or objective; "~" = Under review

Table A-3 1997 Winnipeg Air Quality Monitoring									
Parameter	1997								
	Annual Mean	Maximum Data Values		Total # Samples Above Maximum Desirable Level		Total # Samples Above Maximum Acceptable Level		Total # Samples Above Maximum Tolerable Level	
		1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
Carbon Monoxide (ppm)	0.37	4.1	2.9	0	0	0	0	--	0
Nitrogen Dioxide (pphm)	1.22	9.6	4.6	--	--	0	0	0	--
Nitric Oxide (pphm)	0.6	25.2	6.4	--	--	--	--	--	--
Nitrogen Oxides (pphm)	1.74	29.5	9.4	--	--	--	--	--	--
Oxidant Ozone (pphm)	2.2	7.5	5.2	174	~	0	~	0	--
Inhalable Particulate (PM _{2.5}) (ug/m ³)	4.2	15	109.5	--	--	--	--	--	--

n/a = no data available for this parameter; "--" = No guideline or objective; "~" = Under review

Table A-4 1998 Winnipeg Air Quality Monitoring									
Parameter	1998								
	Annual Mean	Maximum Data Values		Total # Samples Above Maximum Desirable Level		Total # Samples Above Maximum Acceptable Level		Total # Samples Above Maximum Tolerable Level	
		1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
Carbon Monoxide (ppm)	0.4	5.8	4	0	0	0	0	--	0
Nitrogen Dioxide (pphm)	1.2	5.7	4	--	--	0	0	0	--
Nitric Oxide (pphm)	0.6	41	12.5	--	--	--	--	--	--
Nitrogen Oxides (pphm)	1.7	51.6	15.5	--	--	--	--	--	--
Oxidant Ozone (pphm)	2.3	7.2	4.9	200	~	0	~	0	--
Inhalable Particulate (PM _{2.5}) (ug/m ³)	6.4	62.1	140.9	--	--	--	--	--	--

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Table A-5 1999 Winnipeg Air Quality Monitoring									
Parameter	1999								
	Annual Mean	Maximum Data Values		Total # Samples Above Maximum Desirable Level		Total # Samples Above Maximum Acceptable Level		Total # Samples Above Maximum Tolerable Level	
		1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
Carbon Monoxide (ppm)	0.34	6.9	3.1	0	--	0	0	--	0
Nitrogen Dioxide (pphm)	1.21	7.7	4.2	--	--	0	0	0	--
Nitric Oxide (pphm)	0.61	54.5	12.6	--	--	--	--	--	--
Nitrogen Oxides (pphm)	1.75	60.7	15.8	--	--	--	--	--	--
Oxidant Ozone (pphm)	2.27	7.1	5.5	233	~	0	~	0	--
Inhalable Particulate (PM _{2.5}) (ug/m ³)	5.5	21.2	65.8	--	--	--	--	--	--

n/a = no data available for this parameter; "--" = No guideline or objective; "~" = Under review

Table A-6 2000 Winnipeg Air Quality Monitoring									
Parameter	2000								
	Annual Mean	Maximum Data Values		Total # Samples Above Maximum Desirable Level		Total # Samples Above Maximum Acceptable Level		Total # Samples Above Maximum Tolerable Level	
		1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
Carbon Monoxide (ppm)	0.48	4.1	2.4	0	0	0	0	--	0
Nitrogen Dioxide (pphm)	1.24	5.8	3.7	--	--	0	0	0	--
Nitric Oxide (pphm)	0.62	27	6.9	--	--	--	--	--	--
Nitrogen Oxides (pphm)	1.69	32.1	10.5	--	--	--	--	--	--
Oxidant Ozone (pphm)	2.05	6.1	4.5	48	~	0	~	0	--
Inhalable Particulate (PM _{2.5}) (ug/m ³)	5.7	18.2	46.3	--	--	--	--	--	--

n/a = no data available for this parameter; "--" = No guideline or objective; "~" = Under review

Table A-7 2001 Winnipeg Air Quality Monitoring									
Parameter	2001								
	Annual Mean	Maximum Data Values		Total # Samples Above Maximum Desirable Level		Total # Samples Above Maximum Acceptable Level		Total # Samples Above Maximum Tolerable Level	
		1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
Carbon Monoxide (ppm)	0.46	7	3.5	0	0	0	0	--	0
Nitrogen Dioxide (pphm)	1.22	6.9	4	--	--	0	0	0	--
Nitric Oxide (pphm)	0.77	40.8	8.6	--	--	--	--	--	--
Nitrogen Oxides (pphm)	1.83	47.6	12.5	--	--	--	--	--	--
Oxidant Ozone (pphm)	1.94	6.1	4.8	35	~	0	~	0	--
Inhalable Particulate (PM _{2.5}) (ug/m ³)	5.8	22	70.1	--	--	--	--	--	--

n/a = no data available for this parameter; "--" = No guideline or objective; "~" = Under review

Table A-8 2002 Winnipeg Air Quality Monitoring									
Parameter	2002								
	Annual Mean	Maximum Data Values		Total # Samples Above Maximum Desirable Level		Total # Samples Above Maximum Acceptable Level		Total # Samples Above Maximum Tolerable Level	
		1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
Carbon Monoxide (ppm)	0.37	2.8	2	0	0	0	0	--	0
Nitrogen Dioxide (pphm)	0.99	6.6	4	--	--	0	0	0	--
Nitric Oxide (pphm)	0.49	22.8	8.3	--	--	--	--	--	--
Nitrogen Oxides (pphm)	1.47	25.6	11.1	--	--	--	--	--	--
Oxidant Ozone (pphm)	1.94	7.2	5	55	--	0	--	0	--
Inhalable Particulate (PM _{2.5}) (ug/m ³)	5.7	33.6	101.2	--	--	--	--	--	--

n/a = no data available for this parameter; "--" = No guideline or objective; "~" = Under review

Table A-9 2003 Winnipeg Air Quality Monitoring									
Parameter	2003								
	Annual Mean	Max. Data Values		Total # Samples Above Maximum Desirable Level		Total # Samples Above Maximum Acceptable Level		Total # Samples Above Maximum Tolerable Level	
		1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
Carbon Monoxide (ppm)	0.29	3.3	2	0	0	0	0	--	0
Nitrogen Dioxide (pphm)	0.94	9.3	3.6	--	--	0	0	0	--
Nitric Oxide (pphm)	0.44	24.9	7.12	--	--	--	--	--	--
Nitrogen Oxides (pphm)	1.39	29.8	10.62	--	--	--	--	--	--
Oxidant Ozone (pphm)	2.29	6.8	5.4	273	~	0	~	0	--
Inhalable Particulate (PM _{2.5}) (ug/m ³)	5.6	21.5	44.3	--	--	--	--	--	--

n/a = no data available for this parameter; "--" = No guideline or objective; "~" = Under review

Table A-10 2004 Winnipeg Air Quality Monitoring									
Parameter	2004								
	Annual Mean	Max. Data Values		Total # Samples Above Maximum Desirable Level		Total # Samples Above Maximum Acceptable Level		Total # Samples Above Maximum Tolerable Level	
		1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
Carbon Monoxide (ppm)	0.24	2.6	1.47	0	0	0	0	--	0
Nitrogen Dioxide (pphm)	0.86	5.6	3.25	--	--	0	0	0	--
Nitric Oxide (pphm)	0.45	24.2	7.09	--	--	--	--	--	--
Nitrogen Oxides (pphm)	1.28	28	8.98	--	--	--	--	--	--
Oxidant Ozone (pphm)	1.99	5.7	4.2	6	~	0	~	0	~
Inhalable Particulate (PM _{2.5}) (ug/m ³)	4.5	18.1	67.8	--	--	--	0	--	--

n/a = no data available for this parameter; "--" = No guideline or objective; "~" = Under review