

APPENDIX 5

Physical Environment

LIST OF APPENDICES

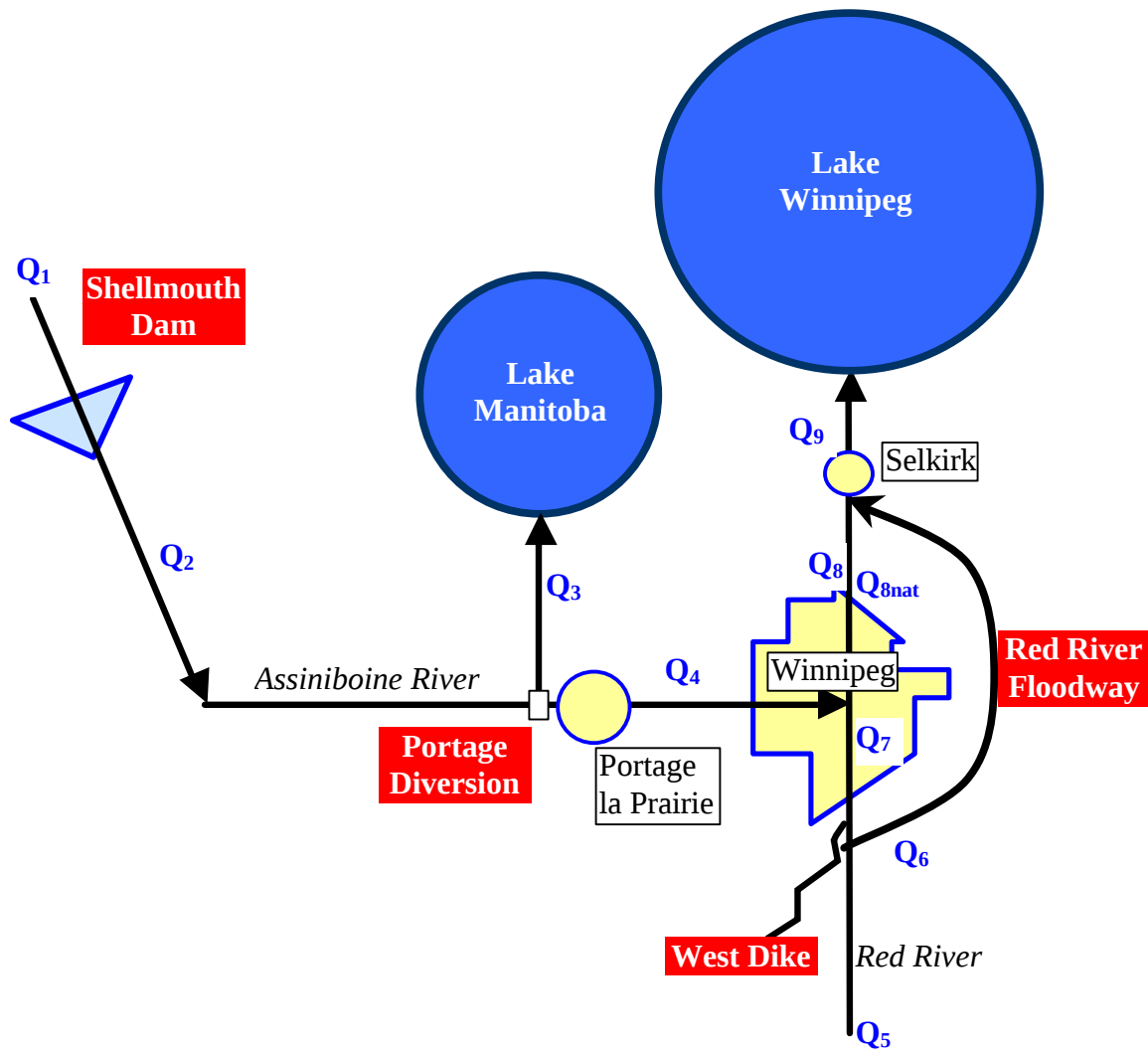
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APPENDIX 5A

Detailed Description of Peak Flows in the Red River

Table 5A - 1
Summary of Peak Water Level Flows for the Floodway Expansion Project

Location	Location #	Maximum Water Level (ft)							
		1 in 100 Yr Flood		1 in 120 Yr Flood		1 in 225 Yr Flood		1 in 700 Yr Flood	
		Existing Floodway	Expanded Floodway	Existing Floodway	Expanded Floodway	Existing Floodway	Expanded Floodway	Existing Floodway	Expanded Floodway
					Start of Rule 2	Start of Rule 3			Start of Rule 3
Natural Red River Flow at James (cfs)	Q _{nat}	163,000	163,000	174,000	174,000	207,000	207,000	270,000	270,000
Floodway Inlet Elevation (ft)		770.5	769.6	772.3	769.9	778.0	774.6	778.0	778.0
Shellmouth Reduction (cfs)	Q _{sh}	5,000	5,000	9,600	9,600	10,500	10,500	11,900	11,900
Assiniboine River Downstream of Shellmouth Dam (cfs)	Q ₂	11,000	11,000	16,600	16,600	17,800	17,800	21,500	21,500
Portage Diversion (cfs)	Q ₃	11,000	11,000	15,600	15,600	16,800	16,800	20,500	20,500
Assiniboine River Downstream of Portage Diversion (cfs)	Q ₄	3,000	3,000	1,700	1,700	1,900	1,900	2,300	2,300
Red River Upstream of Floodway Inlet (cfs)	Q ₅	142,800	143,400	143,000	147,000	163,000	167,000	220,000	213,000
Red River Floodway (cfs)	Q ₆	69,000	75,000	75,300	77,500	97,000	102,000	96,600	143,000
Flow over Inlet Structure Gates (cfs)	Q _{7a}	74,000	69,000	71,000	69,500	65,000	67,000	127,000	71,000
Red River in Winnipeg - Upstream of the Forks (cfs)	Q ₇	77,700	72,000	73,200	73,500	71,000	71,700	121,000	78,000
Red River in Winnipeg - Forks to Lockport (cfs)	Q ₈	80,000	75,600	74,500	75,500	73,000	73,000	123,000	80,000
Red River Downstream of Floodway Outlet (cfs)	Q ₉	149,000	150,000	151,000	155,000	175,000	177,000	219,000	226,000
Red River Downstream of Cooks Creek (cfs)	Q ₁₀	152,000	153,000	154,000	158,000	178,000	180,000	222,000	229,000
Mike-11 Run Ref. Number		BA054y2	BA176	BJ444	BJ428	BJ309ac	BJ315h	BH315e4	BH320



Locations of Peak Flow Data
Figure 5A-1

peakflow.doc

APPENDIX 5B

Differences in Water Level Elevations for the Existing and Expanded Floodway for Various Flood Events

Table 5B – 1
Summary of Differences in Water Levels in the Existing and Expanded Floodway for
Various Flood Events

Location	Maximum Difference in Water Level between the Existing and the Expanded Floodway			
	1:100 Year Flood	1:120 Year Flood	1:225 Year Flood	1:700 Year Flood
Emerson	0	0	0	0
Letellier	0	0	0	0
St. Jean Baptiste	0	0	0	0
Morris	0	0	0	0
St. Pierre-Jolys	0	0	0	0
Rosenort	0	0	0	0
Aubigny	0	0	0	0
Brunkild	0	0	-0.02 m (-0.06 ft)	0
Avonlea Corner	-0.02 m (-0.06 ft)	+0.09 m (+0.28 ft)	-0.13 m (-0.44 ft)	0
Ste. Agathe	0	0	-0.50 m (-1.63 ft)	0
Niverville	-0.12 m (-0.38 ft)	-0.16 m (-0.52 ft)	-0.80 m (-2.62 ft)	0
St. Adolphe	-0.14 m (-0.46 ft)	-0.32 m (-1.06 ft)	-0.89 m (-2.91 ft)	0
Grande Pointe	-0.36 m (-1.17 ft)	-0.69 m (-2.28 ft)	-1.04 m (-3.43 ft)	0
Floodway Inlet (Turnbull Dr.)	-0.29 m (-0.96 ft)	-0.75 m (-2.46 ft)	-1.07 m (-3.50 ft)	0
James Avenue	-0.36 m (-1.17 ft)	+0.09 m (+0.28 ft)	+0.01 m (+0.03 ft)	-1.60 m (-5.26 ft)
North Perimeter Bridge	-0.19 m (-0.62 ft)	+0.08 m (+0.26 ft)	+0.02 m (+0.07 ft)	-1.23 m (-4.04 ft)
St. Andrews Church	-0.05 m (-0.16 ft)	+0.11 m (+0.36 ft)	+0.05 m (+0.16 ft)	-0.24 m (-0.79 ft)
St. Andrews Lock & Dam	+0.03 m (+0.10 ft)	+0.13 m (+0.43 ft)	+0.02 m (+0.20 ft)	+0.16 m (+0.52 ft)
Red River at Floodway Outlet	+0.05 m (+0.16 ft)	+0.12 m (+0.39 ft)	+0.06 m (+0.20 ft)	+0.27 m (+0.89 ft)
Lower Fort Garry	+0.02 m (+0.07 ft)	+0.08 m (+0.26 ft)	+0.04 m (+0.13 ft)	+0.13 m (+0.43 ft)
Selkirk Bridge	+0.02 m (+0.07 ft)	+0.08 m (+0.26 ft)	+0.04 m (+0.13 ft)	+0.13 m (+0.43 ft)
PTH 4 Bridge	+0.02 m (+0.07 ft)	+0.07 m (+0.23 ft)	+0.04 m (+0.13 ft)	+0.10 m (+0.33 ft)
Breezy Point	0	+0.02 m (+0.07 ft)	+0.01 m (+0.03 ft)	+0.05 m (+0.16 ft)

Table 5B-2
Summary of Peak Water Levels Along the Red River

		Maximum Water Level (ft)											
		1 in 100 Yr Flood			1 in 120 Yr Flood			1 in 225 Yr Flood			1 in 700 Yr Flood		
Location		Existing Floodway	Expanded Floodway	Difference (Exp - Exist)	Existing Floodway	Expanded Floodway	Difference (Exp - Exist)	Existing Floodway	Expanded Floodway	Difference (Exp - Exist)	Existing Floodway	Expanded Floodway	Difference (Exp - Exist)
Emerson	Upstream of Floodway Inlet Structure	792.81	792.81	0.00	793.00	793.00	0.00	793.81	793.81	0.00	794.54	794.54	0.00
Letellier		787.27	787.27	0.00	787.29	787.29	0.00	788.30	788.30	0.00	789.08	789.08	0.00
St. Jean Baptiste		784.37	784.37	0.00	784.04	784.04	0.00	785.00	785.00	0.00	785.59	785.59	0.00
Morris		783.17	783.17	0.00	783.06	783.06	0.00	783.47	783.47	0.00	784.32	784.32	0.00
St. Pierre-Jolys		781.26	781.26	0.00	780.90	780.90	0.00	782.20	782.20	0.00	783.01	783.01	0.00
Rosenort		783.08	783.08	0.00	782.97	782.97	0.00	783.32	783.32	0.00	784.12	784.12	0.00
Aubigny		781.20	781.20	0.00	781.13	781.13	0.00	781.47	781.47	0.00	782.21	782.21	0.00
Brunkild		783.19	783.19	0.00	783.01	783.01	0.00	783.43	783.37	-0.06	784.12	784.12	0.00
Avonlea Corner		778.08	778.02	-0.06	777.74	778.02	0.28	778.79	778.35	-0.44	779.37	779.37	0.00
Ste. Agathe		776.07	776.07	0.00	776.00	776.00	0.00	778.77	777.15	-1.63	779.26	779.26	0.00
Niverville		773.82	773.44	-0.38	773.90	773.38	-0.52	778.42	775.80	-2.62	778.59	778.59	0.00
St. Adolphe		772.59	772.14	-0.46	773.24	772.18	-1.06	778.31	775.40	-2.91	778.38	778.38	0.00
Grande Pointe		770.92	769.75	-1.17	772.38	770.10	-2.28	778.13	774.70	-3.43	778.00	778.00	0.00
Floodway Inlet (Turnbull Dr.)		770.52	769.56	-0.96	772.26	769.80	-2.46	778.07	774.57	-3.50	777.91	777.91	0.00
James Avenue	Through Winnipeg	752.06	750.89	-1.17	751.99	752.27	0.28	752.27	752.30	0.03	760.56	755.30	-5.26
North Perimeter Bridge		748.72	748.10	-0.62	747.97	748.23	0.26	748.52	748.59	0.07	755.58	751.54	-4.04
St. Andrews Church		741.08	740.91	-0.16	740.94	741.31	0.36	742.75	742.91	0.16	747.70	746.92	-0.79
St. Andrews Lock & Dam		738.81	738.91	0.10	739.01	739.44	0.43	741.37	741.57	0.20	745.47	746.00	0.52
Red River at Floodway Outlet	Down-stream of Floodway Outlet	738.42	738.58	0.16	738.68	739.07	0.39	741.11	741.31	0.20	744.82	745.70	0.89
Lower Fort Garry		729.53	729.59	0.07	729.66	729.92	0.26	731.27	731.40	0.13	734.06	734.48	0.43
Selkirk Bridge		729.53	729.59	0.07	729.66	729.92	0.26	731.27	731.40	0.13	734.06	734.48	0.43
PTH 4 Bridge		726.67	726.74	0.07	726.80	727.03	0.23	728.22	728.35	0.13	730.68	731.00	0.33
Breezy Point		721.06	721.06	0.00	721.10	721.16	0.07	721.65	721.69	0.03	722.97	723.13	0.16
James Avenue Level (Mike-11)		24.49	23.32	-	24.42	24.70	-	24.70	24.73	-	33.60	27.73	-
Mike-11 Run Ref. Number		BA054y2	BA176	-	BJ444	BJ428	-	BJ309ac	BJ315h	-	BH315e4	BH320	-

NOTES:

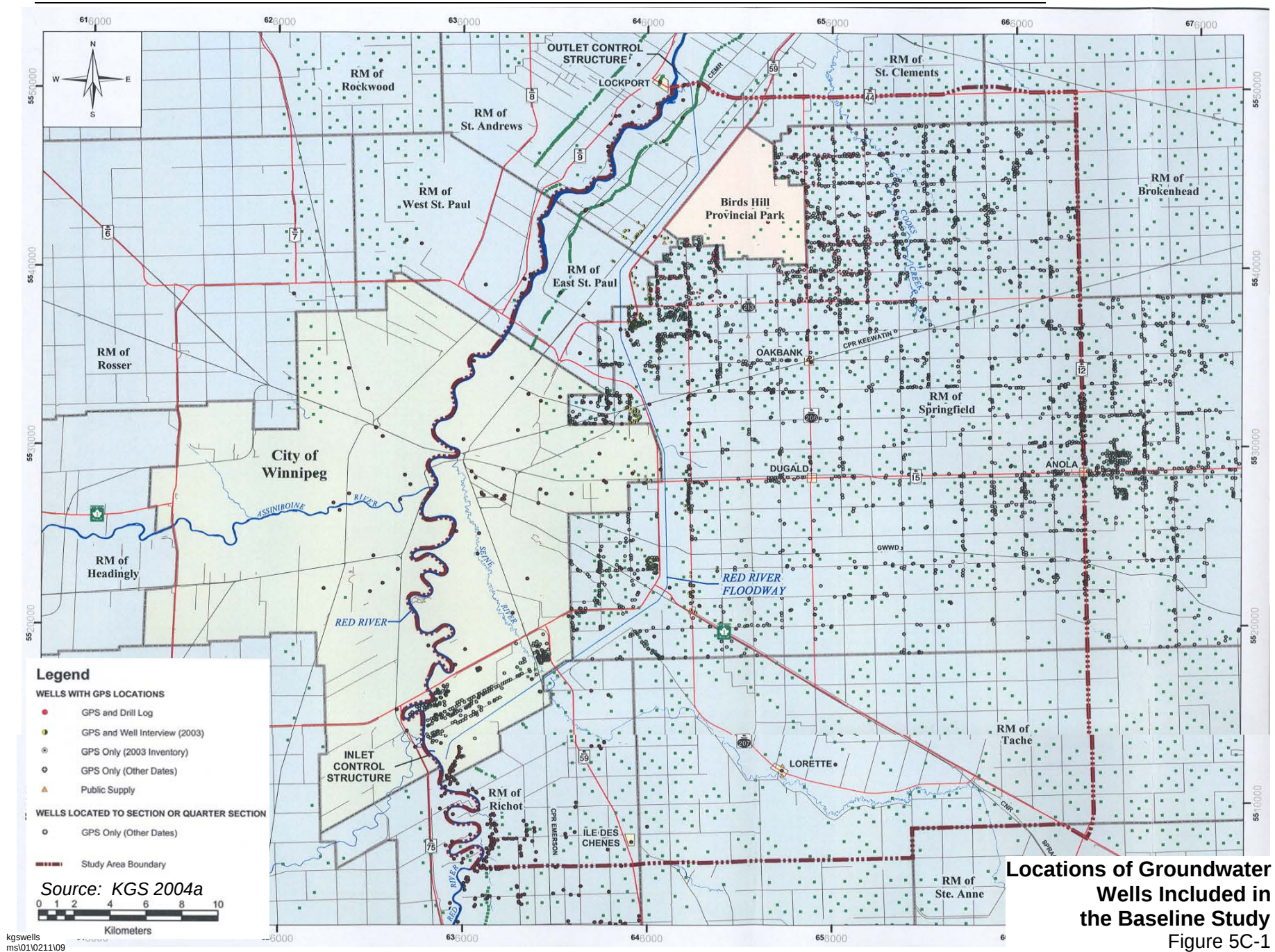
- 1) Values in blue shading are from MIKE-11 Model results
- 2) Values in orange shading are from Acres Backwater Model using Mike-11 Flows
- 3) James Avenue Level from Mike-11 model estimated at Mike-11 cross section 32978
- 4) Frequency relationships relative to Natural Flow at James Avenue
- 5) Water Levels upstream of the inlet structure for the 1 in 225 year - existing Floodway are at 778 ft, however this level upstream of the Inlet for existing conditions carries unacceptable risk to the flood protection works.
- 6) Water levels in the city for the 1 in 700 year flood - expanded Floodway are controlled at 2 ft above 24.5 ft JAPSD which accounts for either permanent or emergency temporary raising of the Primary Dykes.

Source: KGS Group 2004

APPENDIX 5C

Locations of Groundwater Wells Used in Baseline Groundwater Investigations

Proposed Floodway Expansion Project ENVIRONMENTAL ASSESSMENT



**Locations of Groundwater
Wells Included in
the Baseline Study**
Figure 5C-1

APPENDIX 5D

Baseline Air Quality Data for the City of Winnipeg

Table 5D – 1
Summary of Baseline Air Quality in the City of Winnipeg for the Year 2000

Parameter	2000								
		Maximum data values		Total # samples above Maximum Desirable Level		Total # samples above Maximum Acceptable Level		Total # samples above Maximum Tolerable Level	
	Annual mean	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
CO (ppm)	0.48	4.1	2.4	0	0	0	0	None ¹	0
NO ₂ (pphm)	1.24	5.8	3.7	None ¹	None ¹	0	0	0	None ¹
NO (pphm)	0.62	27.0	6.9	None ¹					
NO _x (pphm)	1.69	32.1	10.5	None ¹					
O ₃ (pphm)	2.05	6.1	4.5	48	Numerous exceedances	0	Numerous exceedances	0	None ¹
PM _{2.5} (ppm)	5.7	18.2	46.3	None ¹					
Annual Arith/Geo mean	28/23	N/A ²	73	None ¹	None ¹	None ¹	0	None ¹	None ¹

Notes:

1. No stipulated objective or guidelines were available
2. No data available for this parameter

Table 5D – 2
Summary of Baseline Air Quality in the City of Winnipeg for the Year 2001

Parameter	2001								
		Maximum data values		Total # samples above Maximum Desirable Level		Total # of samples above Maximum Acceptable Level		Total # of samples above Maximum Tolerable Level	
	Annual mean	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
CO (ppm)	0.46	7.0	3.5	0	0	0	0	None ¹	0
NO ₂ (pphm)	1.22	6.9	4.0	None ¹	None ¹	0	0	0	None ¹
NO (pphm)	0.77	40.8	8.6	None ¹					
NO _x (pphm)	1.83	47.6	12.5	None ¹					
O ₃ (pphm)	1.94	6.1	4.8	35	Numerous exceedances	0	Numerous exceedances	0	None ¹
PM _{2.5} (ppm)	5.8	22.0	70.1	None ¹					
TSP (ppm) Annual Arith/Geo meanr	30/25	N/A ²	155	None ¹	None ¹	None ¹	3	None ¹	None ¹

Notes:

1. No stipulated objective or guidelines were available
2. No data available for this parameter