

July 6, 2007

File: 44250-20/4105A

Jody Shimkus
Project Assessment Director
Environmental Assessment Office
PO Box 9426 Stn Prov Govt
Victoria, BC V8W 9V1

Dear Ms. Shimkus:

Re: South Fraser Perimeter Road Air Quality Update

As a result of dialogue with government agencies reviewing the Application for the South Fraser Perimeter Road (SFPR) and ongoing technical work being undertaken by project teams, the Gateway Program has updated air quality assessment work presented in the Environmental Assessment Application for the South Fraser Perimeter Road project (September 2006).

While the updated assessment indicates a change in current and forecast emissions, as compared to that reported in the Application, the potential project related effects (i.e., the difference between the conditions with and without the project) are of a similar magnitude.

In terms of the updated air quality assessment work the key conclusions contained in the Application are unchanged including:

- Road related emission of most CACs in the SFPR corridor decrease between 2003 and 2021;
- Air quality in the SFPR corridor improves for most parameters between 2003 and 2021;
- Human health risks, associated with air quality, improve between 2003 and 2021;
- There remains a small incremental difference in regional emissions of CACs and GHGs in 2021 with Gateway Program projects as compared to without;
- Regional traffic-related emissions of most CACs, with the exception of NH₃, are expected to decrease between 2003 and 2021 with or without Gateway Program projects;

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- In general, changes in regional emissions of most CACs, as a result of the Gateway Program projects, remain negligible;
- Ambient concentrations remain well below ambient guidelines for most CACs and where exceedences do occur, they also occur in the current (2003) scenario as well as the 2021 without SFPR scenario; and
- The increase in the relative contribution of traffic-related GHG emissions to regional emissions as a result of the Gateway Program projects, remains negligible (0.4%).

In addition, the refined air quality assessment reflects the impact of proposed congestion reduction measures (i.e., tolling and HOV lanes) associated with the Port Mann Highway 1 project.

While the analysis of updated air quality modeling results concludes that the potential effects of the Project, on local and regional air quality and human health, do not change from those reported in the Application, the purpose of this memo is to provide updated versions of the data tables and figures from the Application, relating to air quality, and summarize key changes in the data presented. It includes:

1. Description of the refinements to the air quality modeling and assessment for SFPR;
2. Updated versions of key tables and figures presented in the Application (September, 2006); and
3. A summary of the differences between information and conclusions reported in June, 2007 versus those reported in the Application (September, 2006).

It should also be noted that the SFPR is part of overall Provincial initiatives to reduce vehicle emissions and improve air quality, including but not limited to:

- Reducing GHG emissions by 33 percent by 2020;
- Expanding the transit network reducing GHG emissions;
- Introducing new tail pipe emissions standards to reduce CO₂ by 30 per cent;
- Developing practical options and actions for making BC carbon neutral by 2010;
- Reducing vehicle emissions from congestion related idling;
- Expanding transit, HOV and cycling choices; and
- Tolling the Port Mann Bridge to help limit growth in traffic over time.

1. **Model Refinements**

As a result of ongoing planning and discussion with agencies, some of the inputs that supported the air quality modeling undertaken for SFPR, and reported in the Application (September, 2006), have been refined, including the following:

- **Updated information regarding for the Port Mann Highway 1 Project (PMH1)** - Where portions of SFPR and the Port Mann Highway 1 project cross, emissions from both projects interact at those locations. As such, design assumptions for one project influence air quality estimates for the other. During the initial air assessment for SFPR, traffic modeling did not include PMH1 congestion reduction measures such as tolling and HOV lanes. Since these measures have been confirmed, they have been added into the traffic models, which were used in developing traffic emission estimates for the updated SFPR air quality assessment. In addition to being more correct, this change also provides more consistency in the air quality modeling for the two projects.
- **Revised methodology for estimating GHG emissions** – Through dialogue with the GVRD, MOT has refined the previously approved methodology for predicting greenhouse gas emissions so that it is more consistent with that used by the GVRD for calculating regional emissions of GHGs.
- **Changes in assignment of vehicle classes within the EMME2 traffic model** – The allocation of different vehicle types within the EMME2 model, which is used to generate emissions estimates for SFPR, have been refined in order to provide more consistency with GVRD's approach to forecasting future air emissions. It should be noted that while changes in the assignment of vehicle classes within the traffic model have been undertaken, this does not change the conclusions of noise modeling undertaken for the project as total vehicle volumes and the overall fleet profile (i.e., cars, light truck, heavy trucks etc) has not changed.
- **Addition of the proposed Deltaport Terminal 2 (T2) project to the cumulative effects assessment** – As a result of feedback from federal reviewing agencies, air emissions from the proposed T2 project have been included in the cumulative effects assessment for SFPR.

In 2006 the methodology for assessing project related changes to air quality was applied in a consistent manner to all project related scenarios (i.e., 2003, 2021 with and without the SFPR). The 2007 refinements to the methodology were also applied to all of these scenarios.

2. **Updated Tables and Figures**

The following sections provide revised versions of the summary tables and figures presented in the Application (September 2006) and a short description of the key changes between air quality assessment (local and regional) and human health risk assessment data presented in the Application.

2.1 Regional Air Quality

Table 1e (June 2007)

Summary of traffic-related CAC emissions in the Canadian Lower Fraser Valley, 2003 and 2021

Scenario	Emissions (tonnes/year)						
	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC	NH ₃
Existing Situation 2003	197,077	21,354	519	340	225	15,957	972
Projected 2021 Without Gateway	132,789	6,468	377	185	111	5,770	1,212
Projected 2021 With Gateway	135,255	6,585	383	188	112	5,756	1,233

Table 1e (September 2006)

Summary of traffic-related CAC emissions in the Canadian Lower Fraser Valley, 2003 and 2021 (*Page iii Technical Volume 16*)

Scenario	Emissions (tonnes/year) ¹						
	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC	NH ₃
Existing Situation 2003	186,639	16,958	426	257	164	16,666	1,061
Projected 2021 Without Gateway	135,361	4,994	367	175	100	5,804	1,335
Projected 2021 With Gateway	139,256	5,122	376	179	103	5,827	1,370

Comparison with September 2006 – Key differences between the June 2007 and September 2006 version of Table 1e are as follows:

- Traffic related emissions of VOCs, CO and NH₃ decrease relative to those reported in Application.
- Traffic related emissions of NO_x, PM_{2.5}, PM₁₀, SO₂ increase relative to that reported in the Application.

¹ Section 1.2 of Technical Volume 16 (Regional Air Quality Assessment) identifies data sources for CAC and GHG emissions estimates.

Table 2e (June 2007)

Summary of CAC emission changes in the LFV With and Without the Gateway Program

Scenario	Change in Regional Emissions from Existing Situation 2003 (%)						
	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC	NH ₃
Projected 2021 Without Gateway	-9.6	-16.9	+7.3	+7.3	+23.7	-8.8	+23.9
Projected 2021 With Gateway	-9.0	-16.8	+7.4	+7.3	+23.7	-8.8	+24.0
Difference between Projected 2021 Without Gateway and Projected 2021 With Gateway	+0.7	+0.2	+0.03	+0.03	+0.01	-0.02	+0.1

Table 2e (September 2006)

Summary of CAC emission changes in the LFV With and Without the Gateway Program (Page iii Technical Volume 16)

Scenario	Change in Regional Emissions from Existing Situation 2003 (%) ²						
	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC	NH ₃
Projected 2021 Without Gateway	-7.1	-15.4	+8.7	+8.5	+28.4	-11.2	+29.8
Projected 2021 With Gateway	-6.2	-15.3	+8.7	+8.5	+28.4	-11.2	+30.0
Difference between Projected 2021 Without Gateway and Projected 2021 With Gateway	+1.0	+0.2	+0.05	+0.04	+0.01	+0.02	+0.1

Comparison with September 2006 – Key differences between the June 2007 and September 2006 version of Table 2e are as follows:

- The forecast effect of Gateway Program projects on the regional inventory of CAC emissions is either the same or smaller than estimated in September 2006.

² Differences in totals may exist due to rounding of figures.

Table 3e (June 2007)

Predicted changes in regional ambient air quality, 2003 and 2021

Scenario	Change in Regional Annual Average Ambient Concentrations (%)						
	NO ₂	PM ₁₀	PM _{2.5}	SO ₂	VOC	NH ₃	O ₃
Projected 2021 Without Gateway	-15.8	+7.2	+15.9	+13.4	-4.1	+20.9	-1.9
Projected 2021 With Gateway	-15.6	+7.2	+16.0	+13.4	-4.1	+21.0	-1.9
Difference between Projected 2021 Without Gateway and Projected 2021 With Gateway	+0.1	+0.04	+0.08	+0.01	-0.01	+0.1	+0.004

Table 3e (September 2006)

Predicted changes in regional ambient air quality, 2003 and 2021 (*Page iv Technical Volume 16*).

Scenario	Change in Regional Annual Average Ambient Concentrations (%) ³						
	NO ₂	PM ₁₀	PM _{2.5}	SO ₂	VOC	NH ₃	O ₃ ⁴
Projected 2021 Without Gateway	-14.3	+9.2	+19.9	+16.1	-5.2	+26.0	-2.1
Projected 2021 With Gateway	-14.2	+9.2	+19.9	+16.1	-5.2	+26.2	-2.1
Difference between Projected 2021 Without Gateway and Projected 2021 With Gateway	+0.1	+0.03	+0.02	+0.01	+0.01	+0.2	+0.01

Comparison with September 2006 – Key differences between the June 2007 and September 2006 version of Table 3e are as follows:

- The forecast effect of Gateway Program projects on regional ambient air quality is greater for PM_{2.5} and PM₁₀ but either smaller or unchanged for all other CACs compared to the September 2006 estimate.

³ Note: Differences in totals may exist due to rounding of figures.

⁴ The metric for the predicted ambient O₃ concentrations is the mean daily maximum concentration during the “ozone season” (May-September).

Table 5-2 (June 2007)

Proportion of GHG emissions from regional traffic with and without the proposed Gateway Program compared to total LFV emissions.

Scenario	Traffic-related Emissions in the Canadian LFV (kt/y)	Total Emissions from All Sources in the LFV ¹	Traffic-related Emissions % of Total LFV Emissions
Existing Situation 2003	6,696	26,352	25.4
Projected 2021 Without Gateway	8,261	30,594	27.0
Projected 2021 With Gateway	8,437	30,769	27.4

Table 5-2 (September 2006)

Proportion of GHG emissions from regional traffic with and without the proposed Gateway Program compared to total LFV emissions (*Page 47 Technical Volume 16*).

Scenario	Traffic-related Emissions in the Canadian LFV (kt/y)	Total Emissions from All Sources in the LFV	Traffic-related Emissions % of Total LFV Emissions
Existing Situation 2003	4,365	23,358	18.7
Projected 2021 Without Gateway	5,618	27,972	20.1
Projected 2021 With Gateway	5,742	28,095	20.4

Comparison with September 2006 – Key differences between the June 2007 and September 2006 version of Table 5-2 are as follows:

- The forecast contribution of the Gateway program to the relative contribution of traffic-related emissions to total regional GHG emissions increases marginally to 0.4%.

2.2 Local Air Quality

Table 13 - 2003 Existing Conditions (June 2007)

Existing roads 2003: Summary of maximum and 98th percentile predicted concentrations within the three divisions of the modelling domain. All values are reported in µg/m³. Shaded cells exceed guidelines when background values are added.

Pollutant	Averaging Period	Background	Maximum Concentration			98 th Percentile			Ambient Guidelines
			Division ⁵			Division			
			1	2	3	1	2	3	
SO ₂	1-hour	12	19	25	18	9	11	13	450
	24-hour	9	4	5	6	3	3	4	125
	Annual	3	1	2	2	N/A	N/A	N/A	25
VOC	1-hour	N/A	1959	1351	2073	1062	577	1182	N/A
	24-hour	N/A	468	261	480	379	169	384	N/A
	Annual	N/A	197	73	192	N/A	N/A	N/A	N/A
NO _x	1-hour	70	1693	2277	1618	784	903	1097	200
	24-hour	56	368	375	495	288	261	329	200
	Annual	29	120	116	146	N/A	N/A	N/A	40
NO ₂ (Ozone Limit Method)	1-hour	70	298	357	291	207	219	239	200
	24-hour	56	166	167	217	152	144	183	200
	Annual	29	90	83	123	N/A	N/A	N/A	40
NO ₂ (NO/NO ₂ Ratio)	1-hour	70	154	164	152	130	134	140	200
	24-hour	56	82	83	90	77	74	80	200
	Annual	29	44	44	47	N/A	N/A	N/A	40
PM ₁₀	24-hour	27	9	9	13	7	7	9	50
	Annual	13	3	3	4	N/A	N/A	N/A	20
PM _{2.5}	24-hour	15	6	7	9	5	4	6	25
	Annual	5	2	2	3	N/A	N/A	N/A	12
CO	1-hour	1706	14607	20570	17017	6686	8414	9579	14300
	8-hour	1515	5266	4540	6112	2896	3087	3919	5500
NH ₃	1-hour	N/A	71	99	74	31	41	45	N/A
	24-hour	N/A	14	17	20	11	12	13	N/A
	Annual	N/A	5	5	6	N/A	N/A	N/A	N/A
Road Dust PM ₁₀	24-hour	27	22	21	26	17	15	18	50
	Annual	13	7	6	8	N/A	N/A	N/A	20
Road Dust PM _{2.5}	24-hour	15	5	5	6	4	3	4	25
	Annual	5	2	2	2	N/A	N/A	N/A	12
Diesel PM _{2.5}	24-hour	15	4	6	6	3	4	4	25
	Annual	5	1	2	2	N/A	N/A	N/A	12

⁵ Division 1 (Deltaport Way to 80th), Division 2 (80th St, to Elevator Road), Division 3 (Elevator Road to 136th), Division 4 (136th to Golden Ears Bridge Connector).

Table 13 - 2003 Existing Conditions (September 2006)

Existing roads 2003: Summary of maximum and 98th percentile predicted concentrations within the three divisions of the modelling domain. All values are reported in $\mu\text{g}/\text{m}^3$. Shaded cells exceed guidelines with background values added (Page 39 Technical Volume 7).

Pollutant	Averaging Period	Background	Maximum Concentration			98 th Percentile			Ambient Guidelines
			Division			Division			
			1	2	3	1	2	3	
SO ₂	1-hour	12	14	12	9	5	5	6	450
	24-hour	9	3	2	3	2	1	3	125
	Annual	3	1	1	1	N/A	N/A	N/A	25
VOC	1-hour	N/A	2028	1343	2079	1005	309	1201	N/A
	24-hour	N/A	502	284	484	386	173	388	N/A
	Annual	N/A	194	76	194	N/A	N/A	N/A	N/A
NO _x	1-hour	70	1420	1513	1116	518	606	690	200
	24-hour	56	283	251	312	188	175	208	200
	Annual	29	86	77	93	N/A	N/A	N/A	40
(Ozone Limit Method) NO ₂	1-hour	70	271	280	241	181	190	198	200
	24-hour	56	152	154	160	136	127	132	200
	Annual	29	74	63	75	N/A	N/A	N/A	40
(NO/NO ₂ Ratio) NO ₂	1-hour	70	148	150	140	119	123	126	200
	24-hour	56	76	73	78	67	66	69	200
	Annual	29	40	38	41	N/A	N/A	N/A	40
PM ₁₀	24-hour	27	6	6	8	5	4	5	50
	Annual	13	2	2	2	N/A	N/A	N/A	20
PM _{2.5}	24-hour	15	4	4	4	3	2	3	25
	Annual	5	1	1	1	N/A	N/A	N/A	12
CO	1-hour	1706	15264	18597	15270	5996	7539	8575	14300
	8-hour	1515	5346	4065	5510	2585	2771	3371	5500
NH ₃	1-hour	N/A	72	102	77	31	42	47	N/A
	24-hour	N/A	15	17	21	11	12	14	N/A
	Annual	N/A	5	5	6	N/A	N/A	N/A	N/A
Road Dust PM ₁₀	24-hour	27	22	20	26	17	14	18	50
	Annual	13	7	6	8	N/A	N/A	N/A	20
Road Dust PM _{2.5}	24-hour	15	5	5	25	4	3	4	25
	Annual	5	2	2	2	N/A	N/A	N/A	12
Diesel PM _{2.5}	24-hour	15	2	2	2	1	1	1	25
	Annual	5	1	1	0.5	N/A	N/A	N/A	12

Table 14 - 2021 Without SFPR (June 2007)

Existing roads 2021 (without SFPR): Summary of maximum and 98th percentile predicted concentrations within the three divisions of the modelling domain. All values are reported in µg/m³. Shaded cells exceed guidelines when background values are added.

Pollutant	Averaging Period	Background	Maximum Concentration			98th Percentile			Ambient Guidelines
			Division			Division			
			1	2	3	1	2	3	
SO ₂	1-hour	12	7	12	8	3	4	5	450
	24-hour	9	1	2	2	1	1	1	125
	Annual	3	0.5	0.5	1	N/A	N/A	N/A	25
VOC	1-hour	N/A	501	571	601	292	192	312	N/A
	24-hour	N/A	128	84	147	104	57	92	N/A
	Annual	N/A	54	25	43	N/A	N/A	N/A	N/A
NO _x	1-hour	70	429	739	457	198	228	296	200
	24-hour	56	92	97	118	72	67	83	200
	Annual	29	33	30	31	N/A	N/A	N/A	40
NO ₂ (Ozone Limit Method)	1-hour	70	172	203	175	149	152	159	200
	24-hour	56	88	97	101	70	63	77	200
	Annual	29	33	29	30	N/A	N/A	N/A	40
NO ₂ (NO/NO ₂ Ratio)	1-hour	70	114	128	115	96	99	105	200
	24-hour	56	54	55	59	50	49	53	200
	Annual	29	30	29	29	N/A	N/A	N/A	40
PM ₁₀	24-hour	27	5	6	7	4	4	5	50
	Annual	13	2	2	2	N/A	N/A	N/A	20
PM _{2.5}	24-hour	15	3	3	3	2	2	2	25
	Annual	5	1	1	1	N/A	N/A	N/A	12
CO	1-hour	1706	8691	15583	9971	3683	4867	6480	14300
	8-hour	1515	2670	2631	3988	1541	1806	2292	5500
NH ₃	1-hour	N/A	77	138	91	33	44	59	N/A
	24-hour	N/A	15	18	23	12	13	16	N/A
	Annual	N/A	5	5	6	N/A	N/A	N/A	N/A
Road Dust PM ₁₀	24-hour	27	22	24	32	17	16	23	50
	Annual	13	7	8	8	N/A	N/A	N/A	20
Road Dust PM _{2.5}	24-hour	15	5	6	8	4	4	5	25
	Annual	5	2	2	2	N/A	N/A	N/A	12
Diesel PM _{2.5}	24-hour	15	0.9	1.2	0.8	0.7	0.7	0.5	25
	Annual	5	0.3	0.3	0.2	N/A	N/A	N/A	12

Table 14 - 2021 With SFPR (September 2006)

Existing Roads 2021 (without SFPR): summary of maximum and 98th percentile predicted concentrations within the three divisions of the modelling domain. All values are reported in $\mu\text{g}/\text{m}^3$. Shaded cells guidelines with background values added (Page 40 Technical Volume 7).

Pollutant	Averaging Period	Background	Maximum Concentration			98 th Percentile			Ambient Guidelines
			Division			Division			
			1	2	3	1	2	3	
SO ₂	1-hour	12	6	11	7	3	3	4	450
	24-hour	9	1	1	2	1	1	1	125
	Annual	3	0.4	0.4	0.5	N/A	N/A	N/A	25
VOC	1-hour	N/A	493	540	575	287	180	298	N/A
	24-hour	N/A	126	79	141	102	53	88	N/A
	Annual	N/A	53	23	41	N/A	N/A	N/A	N/A
NO _x	1-hour	70	301	516	324	136	161	214	200
	24-hour	56	62	68	84	49	47	59	200
	Annual	29	22	21	22	N/A	N/A	N/A	40
(Ozone Limit Method) NO ₂	1-hour	70	159	181	161	136	145	150	200
	24-hour	56	62	68	81	49	46	58	200
	Annual	29	22	21	22	N/A	N/A	N/A	40
(NO/NO ₂ Ratio) NO ₂	1-hour	70	105	119	107	88	92	98	200
	24-hour	56	48	50	53	45	44	48	200
	Annual	29	26	26	26	N/A	N/A	N/A	40
PM ₁₀	24-hour	27	4	5	6	4	4	5	50
	Annual	13	1	2	2	N/A	N/A	N/A	20
PM _{2.5}	24-hour	15	2	2	3	2	2	2	25
	Annual	5	1	1	1	N/A	N/A	N/A	12
CO	1-hour	1706	8507	15226	9676	3606	4726	6377	14300
	8-hour	1515	2614	2560	3936	1506	1752	2228	5500
NH ₃	1-hour	N/A	81	145	95	34	46	61	N/A
	24-hour	N/A	15	19	24	12	13	17	N/A
	Annual	N/A	5	6	6	N/A	N/A	N/A	N/A
Road Dust PM ₁₀	24-hour	27	22	24	32	17	16	23	50
	Annual	13	7	8	8	N/A	N/A	N/A	20
Road Dust PM _{2.5}	24-hour	15	5	6	8	4	4	5	25
	Annual	5	2	2	2	N/A	N/A	N/A	12
Diesel PM _{2.5}	24-hour	15	0.4	1	0.2	0.3	0.3	0.2	25
	Annual	5	0.1	0.2	0.1	N/A	N/A	N/A	12

Table 15 - 2021 With SFPR (June 2007)

SFPR 2021: Summary of maximum predicted and 98th percentile concentrations within the four divisions of the modelling domain. All values are reported in $\mu\text{g}/\text{m}^3$. Shaded cells exceed guidelines with background values added.

Pollutant	Averaging Period	Background	Maximum Concentration				98th Percentile				Ambient Guidelines
			Division				Division				
			1	2	3	4	1	2	3	4	
SO ₂	1-hour	12	8	11	9	11	3	3	4	3	450
	24-hour	9	1	1	2	1	1	1	1	1	125
	Annual	3	1	0	1	1	N/A	N/A	N/A	N/A	25
VOC	1-hour	N/A	585	535	479	547	204	158	251	142	N/A
	24-hour	N/A	91	67	99	67	62	47	71	45	N/A
	Annual	N/A	30	22	35	26	N/A	N/A	N/A	N/A	N/A
NO _x	1-hour	70	505	669	493	615	193	197	253	223	200
	24-hour	56	84	80	102	100	67	57	69	77	200
	Annual	29	31	26	31	41	N/A	N/A	N/A	N/A	40
NO ₂ (Ozone Limit Method)	1-hour	70	180	196	178	190	148	149	154	151	200
	24-hour	56	81	78	89	93	64	56	64	76	200
	Annual	29	31	26	30	41	N/A	N/A	N/A	N/A	40
NO ₂ (NO/NO ₂ Ratio)	1-hour	70	118	126	117	123	96	96	101	99	200
	24-hour	56	53	52	56	56	49	47	50	52	200
	Annual	29	29	27	29	32	N/A	N/A	N/A	N/A	40
PM ₁₀	24-hour	27	5	5	6	5	4	3	4	4	50
	Annual	13	2	2	2	2	N/A	N/A	N/A	N/A	20
PM _{2.5}	24-hour	15	2	2	3	3	2	2	2	2	25
	Annual	5	1	1	1	1	N/A	N/A	N/A	N/A	12
CO	1-hour	1706	10674	13829	11071	12726	4005	3901	5712	3666	14300
	8-hour	1515	2914	2401	3784	2303	1631	1516	2204	1432	5500
NH ₃	1-hour	N/A	86	124	97	122	34	35	50	34	N/A
	24-hour	N/A	15	15	20	15	12	10	14	11	N/A
	Annual	N/A	5	5	6	6	N/A	N/A	N/A	N/A	N/A
Road Dust PM ₁₀	24-hour	27	22	21	28	22	17	15	19	17	50
	Annual	13	8	7	9	9	N/A	N/A	N/A	N/A	20
Road Dust PM _{2.5}	24-hour	15	5	5	7	5	4	4	4	4	25
	Annual	5	2	2	2	2	N/A	N/A	N/A	N/A	12
Diesel PM _{2.5}	24-hour	15	1	1	1	1	1	1	0	1	25
	Annual	5	0.3	0.2	0.3	1	N/A	N/A	N/A	N/A	12

Table 15 - 2021 With SFPR (September 2006)

SFPR 2021: summary of maximum predicted and 98th percentile concentrations within the four divisions of the modelling domain. All values are reported in $\mu\text{g}/\text{m}^3$. Shaded cells exceed guidelines with background values added. (Page 41 Technical Volume 7).

Pollutant	Averaging Period	Background	Maximum Concentration				98 th Percentile				Ambient Guidelines
			Division				Division				
			1	2	3	4	1	2	3	4	
SO ₂	1-hour	12	7	9	7	15	3	3	4	4	450
	24-hour	9	1	1	2	2	1	1	1	1	125
	Annual	3	0.4	0.4	0.5	1	N/A	N/A	N/A	N/A	25
VOC	1-hour	N/A	637	507	462	764	220	149	241	220	N/A
	24-hour	N/A	101	64	95	103	67	46	69	74	N/A
	Annual	N/A	34	21	34	39	N/A	N/A	N/A	N/A	N/A
NO _x	1-hour	70	374	458	357	748	144	133	185	215	200
	24-hour	56	64	55	74	101	50	39	50	72	200
	Annual	29	23	18	22	38	N/A	N/A	N/A	N/A	40
(Ozone Limit Method) NO ₂	1-hour	70	166	175	165	204	143	133	148	150	200
	24-hour	56	62	54	72	100	50	39	50	72	200
	Annual	29	23	18	22	37	N/A	N/A	N/A	N/A	40
(NO/NO ₂ Ratio) NO ₂	1-hour	70	110	115	109	129	90	88	95	98	200
	24-hour	56	49	47	51	56	45	42	45	51	200
	Annual	29	27	24	26	31	N/A	N/A	N/A	N/A	40
PM ₁₀	24-hour	27	5	4	6	8	4	3	4	5	50
	Annual	13	2	1	2	3	N/A	N/A	N/A	N/A	20
PM _{2.5}	24-hour	15	2	2	3	4	2	1	2	3	25
	Annual	5	1	1	1	1	N/A	N/A	N/A	N/A	12
CO	1-hour	1706	11084	13087	10817	21768	4076	3707	5596	6257	14300
	8-hour	1515	2990	2272	3648	4566	1679	1436	2142	2744	5500
NH ₃	1-hour	N/A	95	127	103	212	37	36	53	61	N/A
	24-hour	N/A	16	15	21	28	13	11	14	20	N/A
	Annual	N/A	6	5	6	11	N/A	N/A	N/A	N/A	N/A
Road Dust PM ₁₀	24-hour	27	22	21	28	39	18	15	19	28	50
	Annual	13	8	7	9	15	N/A	N/A	N/A	N/A	20
Road Dust PM _{2.5}	24-hour	15	5	5	7	9	4	4	4	7	25
	Annual	5	2	2	2	3	N/A	N/A	N/A	N/A	12
Diesel PM _{2.5}	24-hour	15	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	25
	Annual	5	0.1	0.1	0.1	0.1	N/A	N/A	N/A	N/A	12

Comparison with September 2006 – Key differences between the June 2007 and September 2006 versions of Tables 13-15 are as follows:

Table 13 (2003 – Existing Conditions):

- Absolute concentrations of most CACs are higher, with a small number remaining in the same range or improving (i.e., decreasing) (i.e., 24 hour NO₂, VOC and NH₃).
- There are additional exceedances of some guidelines (i.e., 98th percentile for 24-hour NO₂ ozone limited and 98th percentile for 1-hour NO₂ ratio method).

Table 14 (2021 without SFPR):

- Concentrations of CACs remain improved compared to the 2003 scenario.
- Exceedances of guidelines continue to exist but the total number of exceedences is reduced from 2003 and the magnitude of the remaining exceedences, compared to 2003, is smaller.
- An increase in Diesel PM_{2.5} concentration occurs but is small in absolute terms (e.g., 0.1 to 0.3 g/m³) and continues to be well below ambient guidelines (12 g/m³). Similarly, the Diesel PM_{2.5} concentrations are well within guidelines.

Table 15 (2021 with SFPR):

- Model results for CAC concentrations increase in some cases or remain relatively unchanged, with some increases and some decreases for CAC concentrations. The magnitude of change is similar to the 2021 without SFPR scenario.
- The magnitude of exceedances of ambient guidelines that remain continues to be reduced relative to 2003.
- Similar to 2021 without SFPR, the absolute increase in PM_{2.5} concentrations is small and remains well below ambient guidelines.
- Virtually all CAC emissions in Division 4 (Bridgeview to Golden Ears Bridge) are lower relative to the 2006 study and there are fewer exceedances of guidelines.
- Reduction in exceedances of guidelines in Division 4 are a result of the inclusion of congestion reduction measures for the PMH1 project, demonstrating their effectiveness.
- Refined modeling shows a decrease in ammonia (NH₃) concentrations in Division 1 (Ladner) relative to 2006 findings.

2.3 Human Health (Modeling June 2007)

Table 33 (June 2007)

Median acute hazard quotients for all affected organ systems based on the worst-case (maximum 1-hour) ground level concentrations.

Segment	Developmental	Cardio-vascular	Blood	Eye	Nervous	Immune	Reproductive	Respiratory
Existing Roads 2003								
Deltaport Way to 80th St	0.001	0.06	0.001	0.71	0.001	0.03	0.001	1.11
80th St to Highway 91	0.002	0.08	0.002	0.86	0.002	0.04	0.002	1.31
Highway 91 to Highway 1a	0.001	0.05	0.001	0.64	0.001	0.03	0.001	1.01
2021 Without SFPR								
Deltaport Way to 80th St	0.000	0.03	0.000	0.24	0.000	0.01	0.000	0.45
80th St to Highway 91	0.001	0.05	0.001	0.30	0.001	0.01	0.001	0.56
Highway 91 to Highway 1a	0.000	0.03	0.000	0.17	0.000	0.01	0.000	0.30
2021 With SFPR								
Deltaport Way to 80th St	0.000	0.03	0.000	0.19	0.000	0.01	0.000	0.37
80th St to Highway 91	0.001	0.05	0.001	0.26	0.001	0.01	0.001	0.51
Highway 91 to Highway 1a	0.000	0.04	0.000	0.26	0.000	0.01	0.000	0.49
Highway 1a to new Fraser River Crossing	0.001	0.05	0.001	0.30	0.001	0.01	0.001	0.59

Table 33 (September 2006)

Median acute hazard quotients for all affected organ systems based on the worst-case (maximum 1-hour) ground level concentrations. (Page 89 Technical Volume 7).

Segment	Develop-mental	CV	Blood	Eye	Nervous	Immune	Reproductive	Respiratory
Existing Roads 2003								
Deltaport Way to 80 th St	0.004	0.13	0.004	0.55	0.004	0.03	0.004	1.4
80 th St to Highway 91	0.005	0.15	0.005	0.63	0.005	0.03	0.005	1.5
Highway 91 to Highway 1a	0.004	0.10	0.004	0.43	0.004	0.02	0.004	1.2
2021 Without SFPR								
Deltaport Way to 80 th St	0.001	0.07	0.001	0.159	0.001	0.008	0.001	0.30
80 th St to Highway 91	0.001	0.09	0.001	0.198	0.001	0.010	0.001	0.38
Highway 91 to Highway 1a	0.001	0.05	0.001	0.118	0.001	0.006	0.001	0.33
2021With SFPR								
Deltaport Way to 80 th St	0.001	0.06	0.001	0.14	0.001	0.007	0.001	0.43
80 th St to Highway 91	0.001	0.08	0.001	0.18	0.001	0.008	0.001	0.56
Highway 91 to Highway 1a	0.001	0.08	0.001	0.17	0.001	0.008	0.001	0.53
Highway 1a to new Fraser River Crossing	0.001	0.10	0.001	0.19	0.001	0.009	0.001	0.64

Comparison with September 2006 – Key differences between the June 2007 and September 2006 versions of Table 33 are as follows:

- All hazard quotients for all organ systems and all scenarios (2003, 2021 with and without SFPR) continue to decrease between 2003 and 2021 with or without SFPR;
- A similar level of risk is predicted in the 2021 with and the 2021 without SFPR scenarios;
- Virtually no difference in hazard quotients exist between 2021 with and without SFPR scenarios;
- Hazard quotients decrease for 6 of 8 organ systems (i.e., development, cardiovascular, blood, nervous system, reproductive and respiratory systems); and
- Hazard quotients for eyes and immune systems increase across all scenarios but remain below the hazard quotient of 1.0⁶.

⁶ Hazard quotients of less than 1.0 are below the level where health effects are anticipated.

Table 34 (June 2007)

Median chronic hazard quotient for all affected organ systems based on the predicted ground level concentrations.

Scenario	Developmental	Eye	Blood	Nervous	Reproductive	Respiratory
Existing Roads 2003						
Deltaport Way to 80th St	0.006	0.24	0.006	0.006	0.016	0.32
80th St to Highway 91	0.009	0.40	0.009	0.009	0.025	0.53
Highway 91 to Highway 1a	0.006	0.23	0.006	0.006	0.016	0.28
Existing Roads 2021						
Deltaport Way to 80th St	0.002	0.08	0.002	0.002	0.004	0.10
80th St to Highway 91	0.003	0.13	0.003	0.003	0.007	0.16
Highway 91 to Highway 1a	0.002	0.06	0.002	0.002	0.004	0.07
2021 Gateway Improvement Option						
Deltaport Way to 80th St	0.002	0.08	0.002	0.002	0.004	0.10
80th St to Highway 91	0.003	0.12	0.003	0.003	0.007	0.16
Highway 91 to Highway 1a	0.003	0.11	0.003	0.003	0.006	0.13
Highway 1a to new Fraser River Crossing	0.003	0.15	0.003	0.003	0.008	0.19

Table 34 (September 2006)

Median chronic hazard quotients for all affected organ systems based on the predicted ground level concentrations (Page 95 Technical Volume 7).

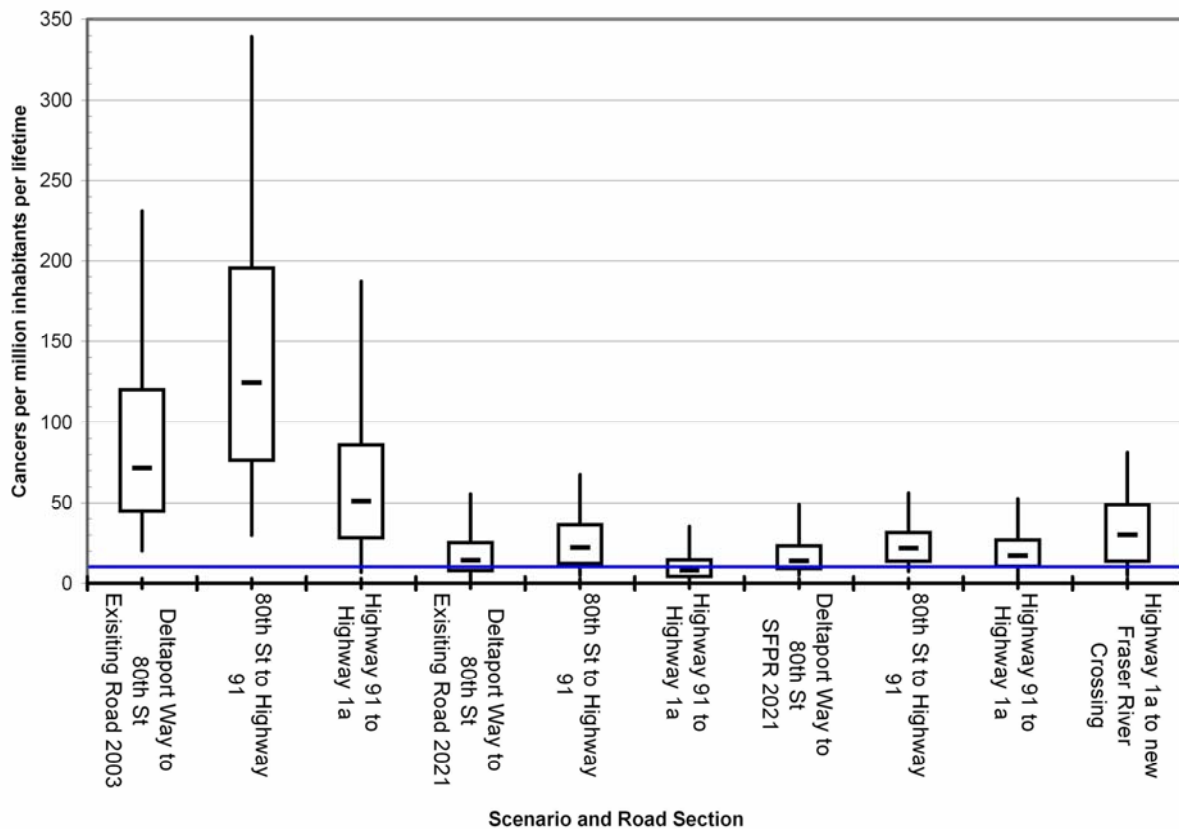
Scenario	Developmental	Eye	Blood	Nervous	Reproductive	Respiratory
Existing Roads 2003						
Deltaport Way to 80th St	0.006	0.18	0.006	0.006	0.013	0.22
80th St to Highway 91	0.009	0.29	0.009	0.009	0.021	0.36
Highway 91 to Highway 1a	0.005	0.16	0.005	0.005	0.080	0.19
Existing Roads 2021						
Deltaport Way to 80th St	0.002	0.05	0.002	0.002	0.003	0.06
80th St to Highway 91	0.003	0.09	0.003	0.003	0.006	0.11
Highway 91 to Highway 1a	0.001	0.04	0.001	0.001	0.003	0.05
2021 Gateway Improvement Option						
Deltaport Way to 80th St	0.002	0.05	0.002	0.002	0.004	0.07
80th St to Highway 91	0.003	0.08	0.003	0.003	0.006	0.12
Highway 91 to Highway 1a	0.002	0.07	0.002	0.002	0.005	0.09
Highway 1a to new Fraser River Crossing	0.003	0.10	0.003	0.003	0.007	0.12

Comparison with September 2006 – Key differences between the June 2007 and September 2006 versions of Table 34 are as follows:

- There continues to be virtually no difference in hazard quotients between 2021 with and without SFPR scenarios;
- All hazard quotients for all organ systems and all scenarios improve between 2003 and 2021 with or without SFPR scenarios;
- A similar level of risk is predicted in the 2021 with and the 2021 without SFPR scenarios; and
- Hazard quotients for all organ systems (i.e., development, eye, blood, nervous system, reproductive and respiratory) increase, relative to that reported in 2006, for all scenarios but remain well below the hazard quotient of 1.0.

Figure 30 (June 2007)

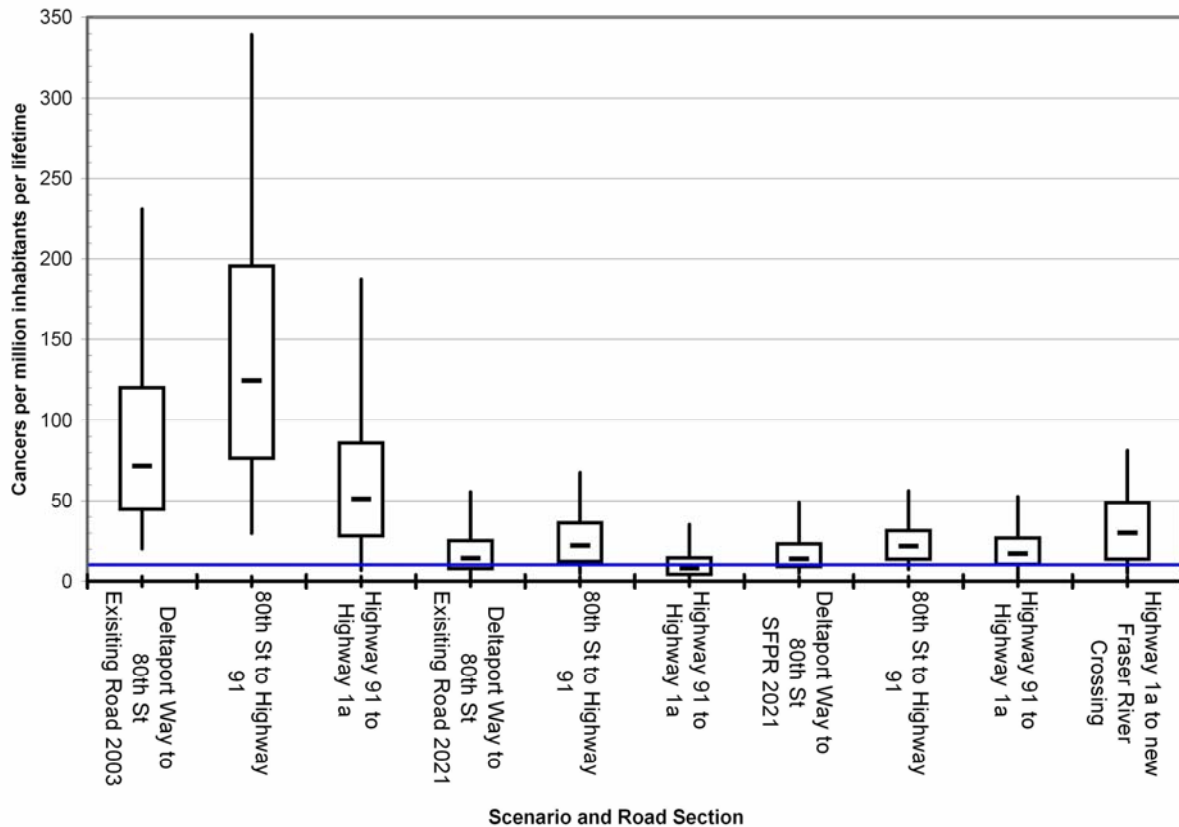
Predicted incremental lifetime cancer risk in the existing roads (2003 and 2021) and the 2021 Gateway scenario. Whisker plots⁷ represent the 5th, 25th, 50th, 75th and 95th percentiles; the line indicates the risk threshold of 10 additional cancers per million inhabitants per lifetime.



⁷ 95th percentile (top of vertical line); 5th percentile (bottom of vertical line); 75th percentile (top of box); 25th percentile (bottom of box); and 50th percentile (horizontal line in box).

Figure 30 (September 2006)

Predicted incremental lifetime cancer risk in the existing roads (2003 and 2021) and the 2021 Gateway scenario. Whisker plots represent the 5th, 25th, 50th, 75th and 95th percentiles; the line indicates the risk threshold of 10 additional cancers per million inhabitants per lifetime⁸ (Page 102 Technical Volume 7).



Comparison with September 2006 – Key differences between the June 2007 and September 2006 versions of Figure 30 are as follows:

- Cancer risk continues to decrease dramatically between 2021 and 2003 for both with and without SFPR scenarios.
- The number of areas where the cancer risk threshold² of 10 is exceeded increases relative to that reported in 2006.
- A similar reduction in cancer risk, from existing conditions, is expected in the 2021 with and the 2021 without SFPR scenarios.

⁸ The scale for this figure has been changed so that June 2007 and September 2006 versions have consistent scales.

Table 35 (June 2007)

Predicted acute PM related mortality per million inhabitants per year exposed to the 98th percentile 24-hour average concentration.

	Existing roads 2003	2021 without SFPR	2021 with SFPR
PM₁₀			
Deltaport Way to 80 th St	5.5	2.6	2.7
80 th St to Highway 91	10.1	4.6	4.4
Highway 91 to Highway 1a	4.4	2.1	3.5
Highway 1a to New Fraser River Crossing			5.5
PM_{2.5}			
Deltaport Way to 80 th St	3.9	1.3	1.3
80 th St to Highway 91	7.3	2.3	2.2
Highway 91 to Highway 1a	3.0	1.0	1.8
Highway 1a to New Fraser River Crossing			2.8

Table 35 (September 2006)

Predicted acute PM related mortality per million inhabitants per year exposed to the 98th percentile 24 hour average concentration (Page 114 Technical Volume 7).

	Existing Roads 2003	Existing Roads 2021	Gateway 2021
PM₁₀			
Deltaport Way to 80 th St	3.6	2.2	2.3
80 th St to Highway 91	6.0	3.9	3.7
Highway 91 to Highway 1a	2.8	1.9	3.0
Highway 1a to New Fraser River Crossing			4.6
PM_{2.5}			
Deltaport Way to 80 th St	2.3	1.1	1.1
80 th St to Highway 91	3.7	1.9	1.8
Highway 91 to Highway 1a	1.6	0.9	1.4
Highway 1a to New Fraser River Crossing			2.2

Comparison with September 2006 – Key differences between the June 2007 and September 2006 versions of Table 35 are as follows:

- For all years, PM related mortality (mortalities per million inhabitants per year) is higher for both PM_{2.5} and PM₁₀; however, PM related mortality continues to decrease between 2003 and 2021 (with and without SFPR).

3. Conclusion

In general, while the absolute values associated with earlier air quality assessment work change, the potential project related effects (i.e., the difference between the conditions with and without the project) are of a similar magnitude and the key conclusions remain valid including:

- Road related emission of most CACs in the SFPR corridor decrease between 2003 and 2021;
- Air quality in the SFPR corridor improves for most parameters between 2003 and 2021;
- Ambient concentrations remain well below ambient guidelines for most CACs and where exceedences do occur, they also occur in the current (2003) scenario as well as the 2021 without SFPR scenario;
- Human health risks, associated with air quality, decrease between 2003 and 2021;
- There remains a small incremental difference in regional emissions of CACs and GHGs in 2021 with Gateway Program projects as compared to without;
- Regional emissions of most CACs, with the exception of NH₃, are expected to decrease between 2003 and 2021 with or with SFPR or other Gateway Program projects;
- Changes in regional emissions of most CACs, as a result of the Gateway Program projects, remain negligible; and
- Increases in regional emissions of GHGs as a result of the Gateway Program projects, remain negligible (0.4%).

In addition, the refined air quality assessment reflects the impacts of proposed congestion reduction measures (i.e., tolling and HOV lanes) associated with the Port Mann Highway 1 project.

As the extent and magnitude of changes to air quality, as a result of the SFPR project, has not changed from that reported in the September 2006 Application, the conclusions reported in the Application, that the SFPR will not result in significant adverse effects to air quality or human health, remain valid.

Ms. Jody Shimkus
July 6, 2007
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Healthy communities need a vibrant economy, good transit options and an efficient transportation system. The Gateway Program, including the SFPR, brings significant transportation and economic benefits, with little to no impact on air quality. In addition, the Province is working to further improve air quality as part of the Gateway Program and the Pacific Gateway Strategy.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Malcolm Smith". The signature is fluid and cursive, with a large initial "M" and "S".

Malcolm Smith
Manager, Environment
South Fraser Perimeter Road

Copy: Geoff Freer, South Fraser Perimeter Road, Project Director