

Evaluation of the 24-Hour Snow Clearing Pilot Project

Policy and Planning Division

Department of Transportation and Works

Executive Summary

During the Winters of 2008-09 and 2009-10, the Government of Newfoundland and Labrador made an annual investment of \$1.7 million to implement a two-year 24-hour snow clearing pilot project on high-traffic road segments throughout the Province. This service was provided on a trial basis five nights a week (Sunday through Thursday nights). The high traffic road segments included were portions of the Trans Canada Highway and major trunk roads estimated to have high overnight and early morning traffic volumes based on their average annual daily traffic volumes.

During the first year of the pilot project stakeholder surveys and focus groups were conducted as well as analysis of weather, traffic and financial data. During the second year of the pilot project, the Department also conducted focus groups with snow plow operators and interviews with dispatchers. Traffic counts were expanded to a 12-hour period conducted seven days a week with additional locations added to those conducted in Phase I of the evaluation. Weather and financial data were also analyzed similar to the evaluation of year 1 of the pilot project.

The effect that implementing 24-hour snow clearing on high-traffic sections of the Trans Canada Highway and major trunk roads had on the overall cost of snow clearing is difficult to determine since many variables, such as weather severity, play a significant role in the amount of time and product spent on the Province's roads. This is especially notable since the two winters over which the pilot project was conducted were milder in nature. While the relationship between the cost of implementing 24-hour snow clearing and improvements in winter road conditions cannot be directly determined, results of the pilot project have been positive overall and indicate that it has improved the conditions of the roads in question for the travelling public.

Background

In Winter 2008-09, a two-year pilot project that provided extended snow and ice removal operations on high-traffic segments of the Trans Canada Highway (TCH) and major trunk roads was initiated. The snow routes that received 24-hour snow clearing throughout the two-year pilot project are presented in Table 1. The pilot project was in effect from November 30, 2008 to April 3, 2009 and December 6, 2009 to April 2, 2010.

The Government of Newfoundland and Labrador invested \$1.7 million annually during 2008-09 and 2009-10 to launch the pilot project, which provided extended snow clearing service (9:30 pm to 4:30 am in the Avalon and Eastern regions and 10:00 pm to 5:00 am in the Central and Western regions) on Sunday through Thursday nights in these pre-determined areas of the Trans Canada Highway and major trunk roads on the island portion of the Province. The pilot project was not implemented in Labrador due to lower traffic volumes. The goals of the pilot project were:

1. To improve the driving conditions for traffic traveling on the TCH and major trunk roads during the overnight hours, and;
2. To improve the driving conditions for traffic traveling on the TCH and major trunk roads during the early morning hours

To evaluate the effectiveness, necessity and long-term sustainability of providing 24-hour snow clearing to high-traffic road segments throughout the Province, a two-phase evaluation was conducted. Various research methodologies were utilized throughout the two phases of the evaluation; Phase I of the evaluation utilized surveys with heavy users of the highway system as well as a focus group with snow plow supervisors across the island portion of the Province. Phase II of the evaluation utilized four focus groups with snow plow operators (one in each region of the Province included in the pilot project) as well as interviews with snow clearing dispatchers in Deer Lake. Both phases of the evaluation also analyzed financial, weather and traffic data to determine the cost-effectiveness of the pilot project and to allow Government to determine if and how the project should be continued in the future.

**Table 1 – Snow Routes Included in the
24-hour Snow Clearing Pilot Project**

Snow Route#	Route	Lane Km
	<u>Avalon Region</u>	
151-01	Route 1 (TCH) – from Logy Bay Road to Foxtrap (Includes the Outer Ring Road)	123.6
151-02	Route 2 (Pitts Memorial Drive/CBS Bypass) – from New Gower Street to Legion Road	104.5
152-01	Route 1 (TCH) – from Foxtrap to Whitbourne	244.0
	<u>Eastern Region</u>	
251-01	Route 1 (TCH) – from Whitbourne to Clarendville	315.2
	<u>Central Region</u>	
351-01	Route 1 (TCH) – from Notre Dame Junction to Gander	164.0
351-02	Route 1 (TCH) – from Notre Dame Junction to Grand Falls Windsor	169.0
351-03	Route 350 (Botwood Highway) – from TCH to Botwood	32.1
	<u>Western Region</u>	
451-01	Route 430 (Great Northern Peninsula Highway) – from Deer Lake to Wiltondale	67.0
	Route 430 (Great Northern Peninsula Highway) – from Wiltondale to Rocky Harbour (through Gros Morne National Park – Parks Canada Jurisdiction)	79.3
	<i>Route Total</i>	<i>146.3</i>
451-02	Route 1 (TCH) – from Corner Brook (Exit 4 – Ring Road) to Deer Lake	199.8
	Route 450/450A (Lewin Parkway/Ring Road)	50.0
	<i>Route Total</i>	<i>249.8</i>
451-03	Route 1 (TCH) – from Corner Brook (Exit 4 – Ring Road) to Stephenville (Exit 3 – White’s Road)	131.7
	Route 460 (Port au Port Highway) – from intersection with TCH to the Stephenville Cold Brook Depot	66.0
	<i>Route Total</i>	<i>197.7</i>
	Total TCH	1,347.3
	Total Trunk Roads	398.9
	<u>Grand Total</u>	<u>1,746.2</u>

Methodology

To evaluate the two-year pilot project the Department utilized a series of qualitative and quantitative methodologies. Snowfall data was collected for each transportation region on the island portion of Province, except for Eastern. Environment Canada collects weather data at each of the National airports in the Province allowing for the analysis of data in St. John's and Gander. Weather data was also obtained and analyzed from the City of Corner Brook, who collects its own weather data, but no weather data is collected in the Eastern Region. The Department also analyzed data from its Road Weather Information Systems (RWIS) located across the Province. This allowed for the analysis of thaw/freeze cycles which are an indicator of the need for ice control.

Nighttime traffic counts were conducted during both winters on the road segments included in the pilot project. In Winter 2009 these were conducted from 9:30 pm to 4:30 am on Thursday, February 5, 2009, Monday, February 23, 2009, and Sunday, March 22, 2009. In Winter 2010 these counts were expanded to include road segments of the TCH that were not included in the 24-hour pilot project to determine if providing 24-hour snow clearing on the entire TCH was warranted. Additional traffic counts were also conducted on Veteran's Memorial Highway based on the Census 2006 Journey to Work (see Appendix E for maps) data which showed high volumes of people commuting to work on this route.

Winter 2010 counts were conducted from 9:00 pm to 9:00 am for a full week period so that time of day and day of week effects could be analyzed. Ideally, all counts would have been conducted for the same one-week period in each region, however inclement weather prohibited this consistency. In such cases, missed counts were conducted during the following week; all counts are therefore representative of a similar time of the winter season. The locations at which these counts were conducted are attached in Appendix C.

Financial data from the Department's administrative systems was also analyzed to compare the costs of provision of snow and ice control. This included costs associated with labour, materials and equipment.

The evaluation of year 1 of the 24-hour snow clearing pilot project utilized stakeholder surveys and focus groups to determine the opinions of heavy users of the highway system and snow clearing supervisors. The stakeholder surveys were conducted to determine the opinions of the general public who drive on the Trans Canada Highway and other major trunk roads on the island during the overnight period. Surveys were administered to employees of Arnold's Cove Fish Plant and Come By Chance Oil Refinery; RNC Traffic Patrol officers in St. John's, Mt. Pearl and Corner Brook; RCMP Traffic Patrol officers in Gander; and long-haul truck drivers (specifically, those passing through Pynns Brook and Goobies weigh scales). The focus group conducted in year 1 of the pilot project consisted of six Operations Supervisors (OPS), Maintenance and Engineering

Project Supervisors (MEPS), and Superintendents of Operations and sought to obtain the opinions of those providing 24-hour snow clearing service. (For a detailed overview of the methodology please refer to the Phase I evaluation report on the Department's web site www.tw.gov.nl.ca/publications/Evaluationof%20PhaseI24HourSnowClearing.pdf).

While the Department had hoped to conduct a detailed review of overtime usage to analyze the effect of 24-hour snow clearing on overtime usage, this is not possible at this time as the payroll system does not capture the level of detail required to do the analysis. Should 24-hour snow clearing be continued, the Department will explore ways to collect the detailed overtime information required to conduct these analyses.

In year 2 the Department also conducted focus groups with the snow plow operators in each of the four regions to assess the opinions of those individuals providing 24-hour snow clearing service. Four focus groups were conducted, one in each region of the Province included in the pilot project. Each group consisted of seven to ten snow plow operators. The focus groups were facilitated by the staff of the Policy and Planning Division. Focus group questions were created by the staff of the Policy and Planning Division in collaboration with the Transportation Branch and are attached in Appendix A. The questions were designed specifically to initiate a group discussion regarding the general thoughts about the pilot project and feedback from those providing the service.

The evaluation of year 2 of the pilot project also included interviews with four snow plow dispatchers in the Western Region. These individuals receive calls from emergency personnel, and contact the supervisors who dispatch snow clearing equipment when any issues arise on the highway with regards to snow and ice control. These dispatchers also receive any calls the public make to the Snow Lines to report white-out areas or dangerous road segments. Dispatchers were interviewed to determine if providing 24-hour snow clearing resulted in any changes in the number and types of calls received. Dispatcher interview questions are attached in Appendix B.

Results

Traffic Volumes

A summary of the Winter 2009-10 traffic counts is presented in Table 2. Passenger vehicles (PV) and commercial vehicles (CV) are separated in the table to isolate the impact of commercial traffic on total traffic volumes. Similarly, weekday and weekend traffic is presented separately to allow for a comparison of nighttime counts on weekdays and weekends. Sections of the table highlighted in yellow indicate that that particular snow route received 24-hour snow clearing service throughout the duration of the pilot project. Snow routes are displayed in order of descending total average nightly traffic volume on the weekdays (i.e. the first snow route presented saw the highest nightly volume on average throughout the 5 nighttime traffic counts; the last snow route presented saw the lowest nightly volume of traffic averaged across the 5 counts). In addition to the Average Annual Daytime Traffic (AADT) counts and the weekend and weekday average hourly traffic counts by snow route, the table also depicts the estimated cost associated with providing 24-hour snow clearing service on each route. For the road segments that do not currently have snow routes, the cost was determined by combining the 2010-11 salaries for the necessary OPS and HMEOs for 18 weeks (the length of Phase I of the pilot project) with the material and equipment costs associated with each road segment based on its length in lane kilometers for 2008-09. The 2008-09 financial information was chosen to base the calculations on as it was more representative of the length and weather conditions of an average winter season than the shorter, milder winter season experienced in 2009-10.

As can be seen in Table 2, a common trend was for traffic to decline sharply between the hours of 11 pm and 5 am; for this reason, hourly averages for three periods were calculated. Weekend and weekday overnight counts were also analyzed separately as 24-hour service was provided on Sunday through Thursday nights throughout the duration of the pilot project, and the overnight traffic pattern on these nights varied substantially from Friday and Saturday nights.

The data contained in Table 2 demonstrates a strong case for the addition of Veteran's Memorial Highway as it is ranked sixth in regards to total traffic observed between 9 pm and 9 am. The next ranked snow route is the route from Gander to the West Boundary of Terra Nova Park. Although the data reveals a high traffic volume for Gander heading eastbound on the TCH (1,245), the location of the count on Caldwell Street likely contains a large amount of local traffic. The count at Glovertown provides a better indication of the amount of traffic traveling between Gander and Terra Nova Park; this section had much lower traffic volumes (335), which would decrease the priority of this snow route.

Table 2 – Traffic Count Summary

151-01		Route 1 (TCH) from Logy Bay Rd. to Foxtrap															123.6 Lane Km			
		AADT	Weekend Hourly Average						\$60,275			Weekday Hourly Average						\$125,838		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Route 2 Interchange		27,500	471	10	153	5	308	15	3,090	108	3,198	396	18	106	11	1,583	61	7,762	346	8,108
TCH Westbound		12,500	125	11	43	6	178	12	1,221	101	1,322	105	20	36	10	523	46	2,518	287	2,805
151-02		Route 2 (Pitts Memorial Drive) from New Gower Street to Legion Rd.															104.5 Lane Km			
		AADT	Weekend Hourly Average						\$50,841			Weekday Hourly Average						\$102,254		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Route 2 Interchange		n/a	525	1	182	3	261	5	3,187	38	3,225	479	11	102	3	1,424	23	7,266	131	7,397
Route 2 Interchange		n/a	453	3	167	2	257	9	2,937	51	2,988	395	15	82	3	1,168	32	5,955	178	6,133
Kilbride		n/a	383	3	183	2	177	11	2,569	64	2,633	333	5	69	4	963	32	4,928	165	5,093
Kilbride		n/a	309	2	183	2	169	7	2,391	42	2,433	257	5	61	4	1,022	29	4,967	153	5,120
152-01		Route 1 (TCH) from Foxtrap to Whitbourne															244.0 Lane Km			
		AADT	Weekend Hourly Average						\$122,693			Weekday Hourly Average						\$281,885		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Roaches Line		14,556	122	10	35	3	155	12	1,075	84	1,159	91	20	30	12	396	33	1,949	242	2,191
Roaches Line		14,046	58	8	17	3	115	10	677	73	750	47	19	16	11	210	26	1,032	213	1,245
Whitbourne Interchange		7,992	55	9	17	3	112	9	660	71	731	45	19	16	10	208	26	1,017	200	1,217
451-02		Route 1(TCH) from Deer Lake to Corner Brook Exit 4 and Lewin Parkway/Ring Road															249.8 Lane Km			
		AADT	Weekend Hourly Average						\$109,504			Weekday Hourly Average						\$254,820		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Lewin Parkway		12,856	314	14	79	6	119	4	1,577	77	1,654	133	20	39	7	316	19	1,762	161	1,923
Lewin Parkway		11,759	282	3	67	3	102	4	1,375	38	1,413	113	5	29	5	307	19	1,627	116	1,743
Deer Lake		6,737	78	14	57	5	84	7	836	85	921	64	29	52	14	154	29	1,056	259	1,315
Pasadena		5,730	63	14	28	5	48	4	487	71	558	35	24	24	12	124	22	708	212	920
Pasadena		6,790	81	15	35	5	60	5	617	77	694	54	25	28	12	151	25	879	226	1,105
351-01		Route 1(TCH) from Gander to Notre Dame Junction															164.0 Lane Km			
		AADT	Weekend Hourly Average						\$41,046			Weekday Hourly Average						\$86,282		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Gander		13,661	134	11	46	4	91	7	905	76	981	124	14	34	13	313	21	1,706	191	1,897
Veterens Memorial		Route 75 (Veteran's Memorial Highway) and Portion of Route 70 from Route 75 to Carbonear															81.35 Lane Km			
		AADT	Weekend Hourly Average						\$34,256			Weekday Hourly Average						\$77,823		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Intersection Route 70/75		n/a	214	1	46	0	84	2	1,040	10	1,050	165	1	28	1	243	13	1,471	56	1,527
Intersection Route 70/75		n/a	107	1	33	0	60	1	649	8	657	94	1	20	1	200	10	1,104	45	1,149
Intersection Route 70/75		n/a	165	1	28	0	47	1	684	4	688	113	0	19	0	139	6	894	26	920
Roaches Line		7,167	79	2	22	1	67	6	558	32	590	55	5	17	4	252	17	1,223	99	1,322
Bay Roberts		6,585	93	1	26	1	60	4	584	22	606	71	3	16	2	233	16	1,172	82	1,254
Bay Roberts		5,482	103	2	24	1	48	4	541	23	564	73	2	16	2	205	11	1,060	57	1,117
Bay Roberts		4,733	66	2	21	1	55	4	479	24	503	49	4	14	3	202	14	992	82	1,074
TCH		Route 1 (TCH) from Terra Nova West Boundry to Gander															174.2 Lane Km			
		AADT	Weekend Hourly Average						\$55,389			Weekday Hourly Average						\$122,835		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Gander		10,587	80	11	29	4	58	7	569	75	644	75	14	23	13	193	21	1,058	187	1,245
Glovertown		4,815	21	7	4	4	22	5	155	60	215	14	13	2	9	40	14	202	133	335
Glovertown		5,741	37	7	9	4	32	6	256	61	317	24	13	4	9	66	15	338	138	476
351-02		Route 1 (TCH) from Notre Dame Junction to Grand Falls															169.1 Lane Km			
		AADT	Weekend Hourly Average						\$48,232			Weekday Hourly Average						\$104,246		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Botwood		8,996	113	13	27	6	62	6	636	85	721	74	17	18	15	197	19	1,043	199	1,242
Botwood		6,190	67	12	18	6	50	5	443	80	523	46	17	14	15	123	17	664	190	854

251-01		Route 1 (TCH) from Whitbourne to Clarenville													315.2 Lane Km					
		AADT	Weekend Hourly Average						\$106,306			Weekday Hourly Average						\$232,400		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Whitbourne Interchange	TCH Westbound	8,124	54	9	19	3	121	10	704	78	782	47	18	16	10	200	32	994	224	1,218
Arnolds Cove	TCH Eastbound	7,746	32	9	10	5	75	16	423	113	536	34	15	11	8	114	24	590	176	766
Arnolds Cove	TCH Westbound	7,703	36	9	10	5	89	15	486	105	591	35	15	11	8	134	21	672	164	836
Clarenville	TCH Eastbound	5,368	78	7	11	3	84	5	557	49	606	41	12	7	8	117	18	595	142	737
TCH			Route 1 (TCH) from Grand Falls to Deer Lake													478.1 Lane Km				
		AADT	Weekend Hourly Average						\$144,586			Weekday Hourly Average						\$320,282		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Deer Lake	TCH Eastbound	8,166	35	13	50	4	67	6	639	76	715	35	25	49	10	99	19	761	189	950
Springdale	TCH Eastbound	4,603	27	7	6	6	18	5	159	70	229	13	17	6	11	27	12	169	145	314
Springdale	TCH Westbound	3,498	52	7	10	6	27	5	272	72	344	26	17	7	12	56	14	317	162	479
451-03			Route 1 (TCH) from Corner Brook to Stephenville													197.7 Lane Km				
		AADT	Weekend Hourly Average						\$82,553			Weekday Hourly Average						\$187,442		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Corner Brook	TCH Westbound	4,660	83	14	24	5	45	5	490	78	568	50	19	15	5	116	18	654	138	792
Stephenville	TCH Eastbound	2,213	22	10	8	4	24	3	192	51	243	17	16	6	3	63	10	326	94	420
Stephenville	Route 460 to Stephenville	1,309	16	0	6	0	18	0	139	1	140	14	0	5	0	48	2	248	10	258
451-01			Route 430 (Northern Peninsula Highway) from Deer Lake to Rocky Harbour													146.3 Lane Km				
		AADT	Weekend Hourly Average						\$56,099			Weekday Hourly Average						\$121,307		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
TCH at Route 430	To Northern Peninsula	7,937	87	1	28	1	42	1	509	10	519	74	7	22	7	101	14	681	114	795
351-03			Route 350 (Botwood Highway) TCH to Botwood													32.1 Lane Km				
		AADT	Weekend Hourly Average						\$25,049			Weekday Hourly Average						\$46,289		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Botwood	To Botwood	5,939	98	1	22	1	38	2	478	14	492	64	2	12	1	120	8	679	40	719
TCH			Route 1 (TCH) from Clarenville to Terra Nova East Boudry													94.9 Lane Km				
		AADT	Weekend Hourly Average						\$36,904			Weekday Hourly Average						\$74,533		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Clarenville	TCH Westbound	5,769	70	7	10	3	64	5	453	48	501	28	13	5	8	77	14	395	131	526
Bonavista Overpass	TCH Eastbound	5,556	34	7	6	2	31	6	228	50	278	22	12	4	8	61	15	314	132	446
Bonavista Overpass	TCH Westbound	5,285	32	7	5	2	29	6	213	51	264	21	13	4	8	50	15	264	134	398
TCH			Route 1(TCH) from Stephenville to Port aux Basques													446.8 Lane Km				
		AADT	Weekend Hourly Average						\$184,838			Weekday Hourly Average						\$420,912		
Count Location			9-11pm		11pm-5am		5-9am		Average Total Overnight			9-11pm		11pm-5am		5-9am		Average Total Overnight		
Direction			PV	CV	PV	CV	PV	CV	PV	CV	SUM	PV	CV	PV	CV	PV	CV	PV	CV	SUM
Stephenville	TCH Westbound	2,890	7	10	2	4	7	3	57	51	108	4	15	2	3	16	9	83	84	167

The overnight traffic flow maps attached in Appendix D were completed to show the number of vehicles traveling across the road segments included in the pilot project, as well as locations where additional counts were conducted to provide insight into potential future route considerations. These counts were conducted between the hours of 9:00 pm and 9:00 am during Winter 2009-10.

The overnight traffic counts had similar patterns throughout the island portion of the Province, being relatively low after 11 pm and then sharply increasing around 6 am as the morning commute begins. Peak hours for traffic during the morning commute varied slightly by location, although they generally fell within the 7:30 to 8:30 am range. Saturday and Sunday mornings tended to have a lower traffic volume during the early morning as compared to those during the weekdays.

Financial Information

As shown in Table 3, the total cost of snow clearing operations on the island portion of the Province in 2008-09 was \$51.5 million (reported in 2009-10 dollars). Material and equipment usage costs were obtained from the Highway Maintenance Management System (HMMS), and salaries were taken from the Report on the Program Expenditures and Revenues and updated to be consistent with 2009-10 salaries by applying the pay scale increases found in their respective collective bargaining agreements. Of the \$51.5 million spent across the Island in 2008-09 on snow and ice removal, 31.2% was spent on labour, 29.6% on materials and 30.1% on equipment.

Table 3 – Overview of Costing (in 2009-10\$) for Island Snow and Ice Removal Operations (2008-09)

Region	Total Lane Km	Total Road Km	Salaries	Material Cost	Equipment Usage Cost	Total Cost	Cost Per Lane Km
Avalon	3,806.7	1,811.9	\$3,841,707.08	\$3,745,294.03	\$3,996,515.29	\$11,583,516.40	\$3,042.93
Eastern	3,353.7	1,682.1	\$3,478,650.85	\$3,361,025.96	\$4,925,151.81	\$11,764,828.63	\$3,508.01
Central	4,698.9	2,343.4	\$3,612,481.69	\$3,118,911.16	\$4,362,555.28	\$11,093,948.13	\$2,360.97
Western	4,549.2	2,266.2	\$5,154,356.59	\$5,033,497.86	\$6,859,938.31	\$17,047,792.77	\$3,747.43
Island Total	16,408.5	8,103.6	\$16,087,196.23	\$15,258,729.01	\$20,144,160.68	\$51,490,085.92	\$3,138.01

As shown in Table 4, the total cost of snow clearing operations across the island portion of the Province in 2009-10 was \$48.6 million. Similar to 2008-09, material and equipment usage costs were obtained from the Highway Maintenance Management System (HMMS), and salaries were obtained from 2009-10 Budget Preparation and Monitoring System. Of the \$48.6 million spent across the Island in 2009-10 on snow

and ice removal, 33.4% was spent on labour, 29.6% on materials and 37.0% on equipment.

Table 4 – Overview of Costing for Island Snow and Ice Removal Operations (2009-10)

Region	Total Lane Km	Total Road Km	Salaries	Material Cost	Equipment Usage Cost	Total Cost	Cost Per Lane Km
Avalon	3,806.7	1,811.9	\$3,904,777.00	\$3,066,498.73	\$3,600,001.33	\$10,571,277.06	\$2,777.02
Eastern	3,353.7	1,682.1	\$3,538,840.00	\$2,870,201.78	\$4,370,280.19	\$10,778,078.97	\$3,213.79
Central	4,698.9	2,343.4	\$3,646,648.00	\$3,274,503.46	\$3,907,314.86	\$10,852,899.32	\$2,309.67
Western	4,549.2	2,266.2	\$5,125,956.00	\$5,170,168.32	\$6,126,163.69	\$16,422,288.01	\$3,609.93
Island Total	16,408.5	8,103.6	\$16,216,221.00	\$14,381,372.29	\$18,003,760.07	\$48,601,353.36	\$2,963.38

It should be noted that the variation in the cost of snow and ice removal operations among the regions in both 2008-09 and 2009-10 is to be anticipated due to regional difference in materials, weather conditions and composition of the heavy equipment fleet. These include:

- Variation in the mixtures of salt and sand (which have different costs depending on the relative proportions of salt and sand in the mixture). This variation in salt and sand mixtures is reflective of the differing weather conditions in the regions. Avalon Region, for example, uses a higher concentration of salt which is much more costly than the salt/sand alternative; thus, resulting in a higher material cost per lane kilometer.
- Regions such as Western, which generally have higher amounts of snowfall, require more trips by the plows in order to clear this snow, thus, resulting in a higher cost per lane kilometer in terms of equipment usage.
- The heavy equipment fleet varies by region with Western Region having a higher percentage of loaders than other regions; thus, resulting in differing equipment usage costs per lane kilometer due to varying depreciation, maintenance and fuel consumption costs.

Comparing Tables 3 and 4, it can be seen that there was a decrease in the total cost of winter operations of approximately \$2.9 million in the second year of the pilot project. This was largely due to the milder winter experienced in 2009-10 compared to 2008-09, as the decrease in expenditure in year 2 of the pilot project is limited to material and equipment usage; there is less need for the snow removal equipment to be on the roads applying salt/sand when the weather is milder. Information presented in the weather data analysis further supports this argument.

Table 5 presents the costs (reported in 2009-10\$) associated with the snow routes during the overnight hours during year 1 of the pilot project (2008-09). As noted previously, the material and equipment usage costs were obtained from HMMS. The

salaries were computed by calculating the top of the salary scale of a Highway Maintenance Equipment Operator and an Operations Supervisor for 18 weeks (the length of the 24-hour snow clearing pilot project in 2008-09), and multiplying the number of employees by their 18 week salary for each region.

Table 5 – Overview of Costing (in 2009-10\$) for Nighttime Snow and Ice Removal Operations (2008-09)

Region	Total Lane Km	Total Road Km	Salaries	Material Cost	Equipment Usage Cost	Total Cost	Cost Per Lane Km
Avalon	472.1	122.4	\$143,358.76	\$197,826.59	\$103,366.11	\$444,551.46	\$941.65
Eastern	315.2	107.5	\$64,161.43	\$75,205.71	\$44,135.87	\$183,503.01	\$582.18
Central	365.2	120.8	\$94,233.24	\$152,111.03	\$70,712.96	\$317,057.23	\$868.17
Western	593.8	294.9	\$109,269.14	\$214,146.98	\$219,271.04	\$542,687.16	\$913.92
Island Total	1,746.3	645.6	\$411,022.56	\$639,290.31	\$437,485.98	\$1,487,798.85	\$851.97

Table 5 also displays the cost per lane kilometer of the overnight routes in each of the four regions included in the pilot project as well as a provincial average. The provincial average cost per lane kilometer for the overnight shift in 2008-09 was approximately \$852.00. The breakdown of the total cost shows that overall, 28% was accounted for by salaries, 43% by materials and 29% by equipment usage costs. The total cost of the overnight routes in 2009-10 dollars was approximately \$1.49 million, which represented 2.9% of the total provincial snow and ice control expenditure in 2008-09.

Table 6 presents the costs associated with the snow routes during the overnight hours during 2009-10. As noted previously, the material and equipment usage costs were obtained from HMMS. Since no additional employees were hired for the second year of the pilot project, the salaries from 2008-09 were inflated by 4% to reflect the pay scale increase found in the collective bargaining agreement. Salaries were then adjusted to reflect the variance in the length of the season for the overnight service between 2008-09 (18 Weeks) and 2009-10 (17 Weeks).

Table 6 – Overview of Costing for Nighttime Snow and Ice Removal Operations (2009-10)

Region	Total Lane Km	Total Road Km	Salaries	Material Cost	Equipment Usage Cost	Total Cost	Cost Per Lane Km
Avalon	472.1	122.4	\$135,394,398	\$197,826.59	\$103,366.11	\$436,587.08	\$925
Eastern	315.2	107.5	\$60,596.90	\$75,205.71	\$44,135.87	\$179,938.48	\$571
Central	365.2	120.8	\$88,998.06	\$152,111.03	\$70,712.96	\$311,822.05	\$854
Western	593.8	294.9	\$103,198.63	\$214,146.98	\$219,271.04	\$536,616.65	\$904
Island Total	1,746.3	645.6	\$388,187.97	\$639,290.31	\$437,485.98	\$1,464,964.26	\$839

Note: Table 4 includes costing for nighttime only (a subset of the overall costing reported in Table 3).

The substantive difference in cost per lane km compared to Table 3 is due to a number of factors including:

- Nighttime snow and ice removal occurs only 40 hours per week (8 hours a day, 5 days a week) compared to the overall snow clearing operations which typically cover 119 hours per week (17 hours a day, 7 days a week plus nighttime operations, where applicable, and overtime).
- It should also be noted that an individual plow covers a longer segment of road in the nighttime than the daytime.

Table 6 also displays the cost per lane kilometer of the overnight routes in each of the four regions included in the pilot project as well as a provincial average. The provincial average cost per lane kilometer for the overnight shift was \$839. The costs associated with year 2 were similar to those of year 1; the minor discrepancies that were evident between the two years were expected due to differences between the two winters with respect to weather conditions and personnel changes and the length of the extended service. The breakdown of the total cost shows that overall 26% was accounted for by salaries, 44% by materials and 30% by equipment usage costs. The total cost of the overnight routes in 2009-10 was approximately \$1.46 million, which represents 3.0% of the total provincial snow and ice control expenditure.

Table 7 presents the equipment usage hours obtained from HMMS for the number of hours that various snow and ice control equipment was on the road during a given season. The data indicates that the number of hours that snow clearing equipment spent on the road in 2009-10 was lower than in 2008-09. As can be seen Table 5, the reduction of 37,748 hours of equipment usage in 2009-10 compared to 2008-09 accounted for a decrease of just over \$2 million in 2009-10. This variability could be accounted for by a number of factors, despite the fact that a similar level of service was provided in 2008-09 and 2009-10 (i.e. weather differences, changes in the equipment fleet, etc.).

Table 7 – Equipment Usage Hours (Full Season – Day and Night Operations)

Equipment Usage Hours							
Region	2005-06	2006-07	2007-08	2008-09	2009-10	1-year Change 2008-09 to 2009-10	1-year Cost Diff 2008-09 to 2009-10
Avalon	39,046	49,448	55,825	47,855	43,109	-5,047	-\$370,142.68
Eastern	51,979	63,070	74,002	63,714	56,087	-7,627	-\$555,051.62
Central	56,108	56,471	73,400	56,186	49,561	-6,625	-\$455,210.34
Western	68,594	81,826	94,632	96,068	77,543	-18,524	-\$734,116.62
Total	215,727	250,815	297,859	263,747	225,999	-37,748	-\$2,114,521.26

Table 8 shows the total cost of snow and ice removal throughout the island portion of the Province from 2005-06 to 2009-10. Similar to the Phase I of the evaluation of the pilot project, material and equipment usage costs were obtained from HMMS and inflated by applying the 2009-10 per unit cost to the total units consumed in that year. Salaries for the 2009-10 season were obtained from the Budget Preparation and Monitoring System; salaries for previous years were taken from the Report on the Program Expenditures and Revenues and updated to be consistent with 2009-10 salaries by applying the pay scale increases found in their respective collective bargaining agreements.

Table 8 – Yearly Island Snow and Ice Removal Costs (in 2009-10\$)

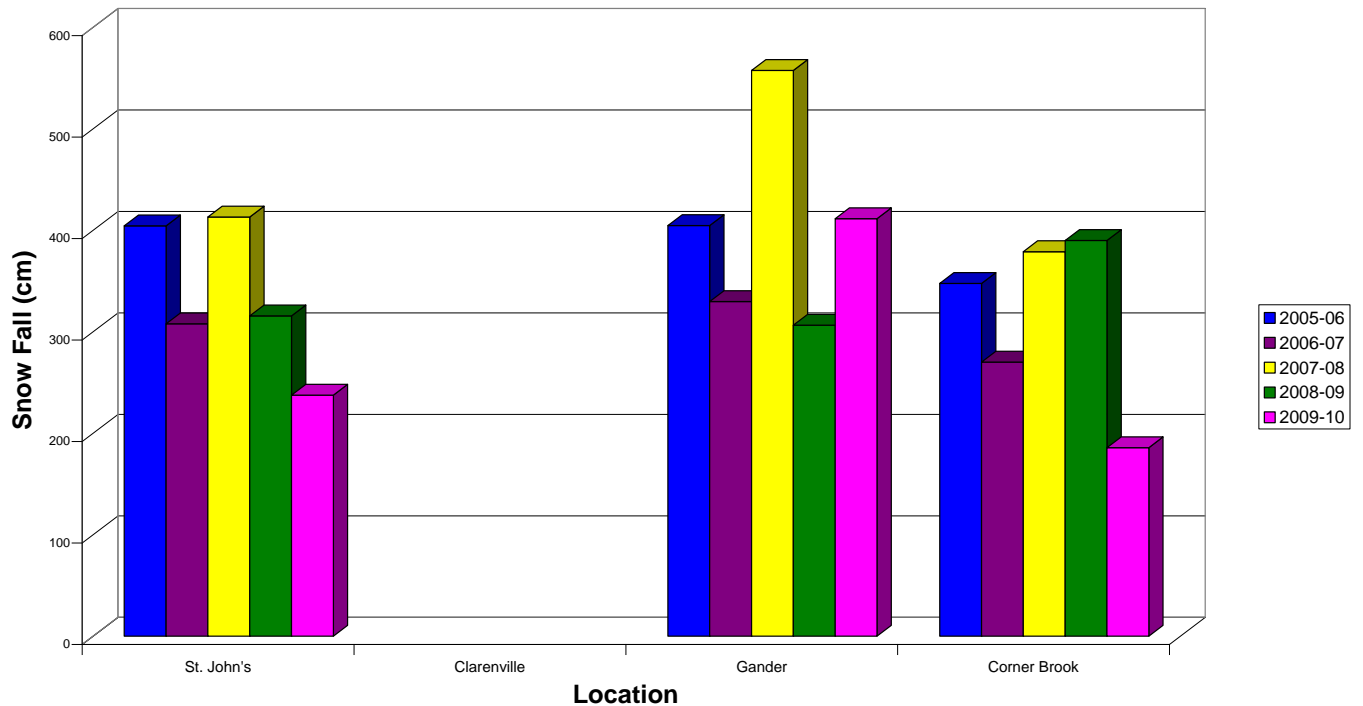
Year	Total Cost (2009\$)	Total Cost (real \$)	Cost/lane km (2009\$)	Cost/lane km (real \$)
2005-06	\$41,463,492.20	\$28,128,591.09	\$2,526.95	\$1,714.27
2006-07	\$46,584,363.37	\$40,861,357.08	\$2,839.04	\$2,490.26
2007-08	\$54,392,897.85	\$51,379,250.24	\$3,314.92	\$3,131.26
2008-09	\$51,490,085.92	\$50,130,792.91	\$3,138.01	\$3,055.17
2009-10	\$48,601,353.36	\$48,601,353.36	\$2,963.38	\$2,963.38

Note: Equipment rates were reviewed and adjusted in 2006-07; thus, resulting in a significant increase in the real cost per lane km from 2005-06 to 2006-07

Weather Information

Snowfall data for the past five fiscal years was obtained from Environment Canada for St. John's and Gander and from the City of Corner Brook and is reported in Figure 1. It should be noted, however, that snowfall data for Corner Brook was obtained at an area of low elevation in the City's downtown from a different source than the other regions. Therefore, this data may not necessarily be representative of the Western Region as a whole. Snowfall data is not available for Clarenville.

Figure 1 - Annual Snowfall (cm) by Fiscal Year

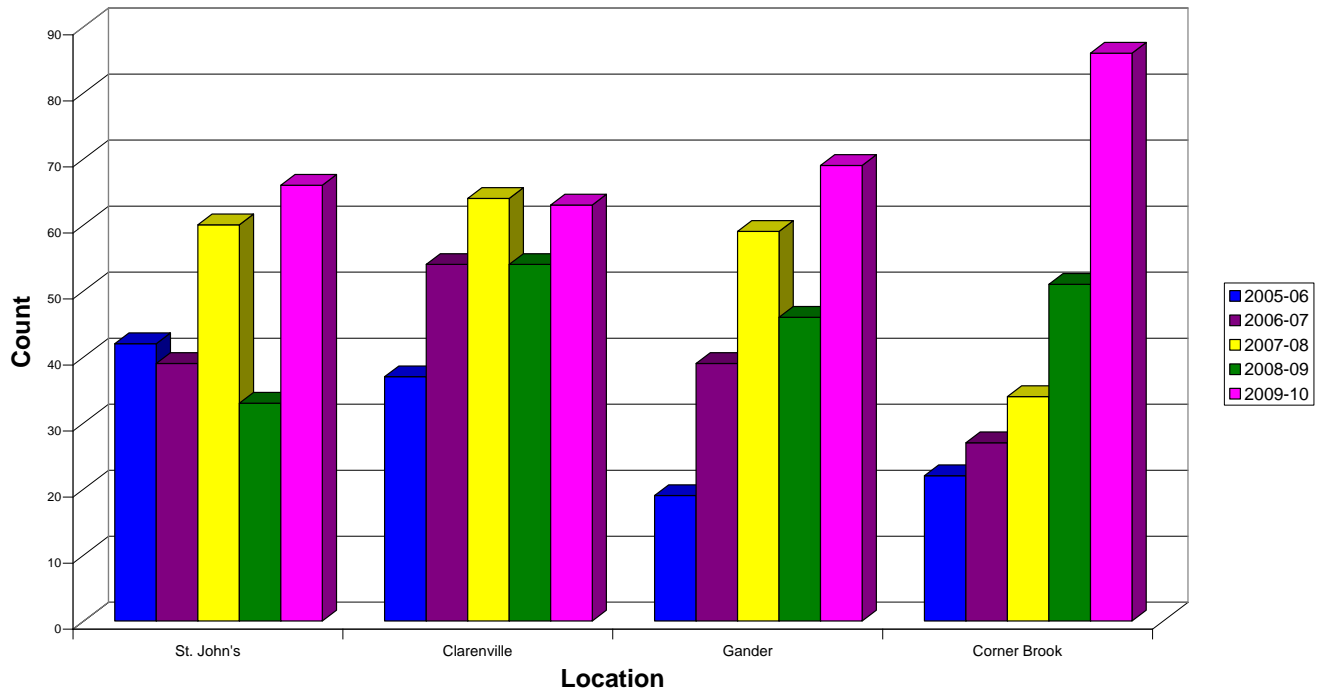


Source: Environment Canada. Historical Climate Data. www.weatheroffice.gc.ca. Retrieved on May 12, 2010 (St. John's and Gander); City of Corner Brook (Corner Brook).

As can be seen in Figure 1, aside from the Central Region, there was less snowfall recorded in 2009-10 than in the previous four years.

Thaw/freeze cycles (defined as a cycle consisting of for continuous hours of thawed pavement, followed by a frost event) were also obtained from the Road Weather Information System (RWIS) stations along the TCH for St. John's, Clarenville, Gander, and Corner Brook. The number of cycles per fiscal year for 2005-06 to 2009-10 is reported in Figure 2.

Figure 2 - Number of Thaw/Freeze Cycles by Fiscal Year



Note: 2005-06 Thaw/Freeze Data was not collected until January 2006 (February in Gander)

Source: AMEC Road Weather Information System Stations, 2010.

As can be seen in Figure 2, there were more thaw/freezing cycles in 2009-10 than in 2008-09 in all regions. In fact, with the exception of Clarenville, 2009-10 had the most thaw/freezing cycles of the last five years.

According to Figures 1 and 2, in general, there was less snow and more thaw/freezing cycles experienced across the island portion of the Province in 2009-10 than in 2008-09. Although weather severity does contribute to the amount of product used, the number of hours the equipment is on the road, and hence, the total cost to provide 24-hour snow clearing services, the relationship between weather and cost is by no means a direct causal one. It should be noted, however, that 2009-10 was an extremely mild winter, and therefore it is difficult to predict the cost of 24-hour snow clearing for future winters. Therefore, costing for Winter 2008-09, although also mild compared to previous winters in Newfoundland and Labrador, was used to calculate the cost associated with all options considered for the provision of 24-hour snow clearing in the future since it represents a more typical winter than Winter 2009-10.

Stakeholder Survey Results

Last Winter, 246 surveys were administered to the 'heavy user' groups selected to participate throughout the Province. Of the 246 participants, 14 indicated that they did not drive on the Province's highways during the overnight/early morning hours. These participants were therefore not included in the analyses, resulting in a sample size of 232. (For a detailed overview of the findings please refer to the Phase I evaluation report on the Department's web site www.tw.gov.nl.ca/publications/Evaluationof%20PhaseI24HourSnowClearing.pdf).

In general, opinions regarding the overall condition of the highway were positive; approximately 60% of participants indicated that the condition of the Province's highway system during Winter 2008-09 was either much or somewhat improved compared to previous winters, approximately 30% stated that there was no change, and approximately 10% of respondents thought the highways were in much or somewhat worse condition than in previous winters.

Similar results were obtained regarding the timeliness of snow and ice removal; 58% of respondents stated that the timeliness of snow removal was either much or somewhat improved during Winter 2008-09 compared to previous winters, 34% thought there was no change from previous winters, and 8% indicated that the timeliness of snow and ice removal was much or somewhat worse in 2008-09 compared to previous winters.

Although a formal qualitative analysis was not conducted for the open-ended question, trends seen in the additional comments of 'heavy users' of the Province's highway system included:

- The vast majority said that the entire TCH should be cleared
- Off ramps need to be cleared to be able to benefit from the additional snow clearing on the highways
- Vast improvements seen during the early morning hours compared to previous winters
- Peace of mind knowing equipment is on the highways
- West Coast is more severe (Corner Brook – Port aux Basques mentioned by a number of respondents)
- Selection criteria for inclusion in the pilot project should have been based on weather conditions and snowfall in various areas

Supervisor Focus Group

A number of themes emerged from the focus group conducted with snow clearing supervisors in 2008-09. These related to improved road conditions and safety, reduction in complaints, improved response time, increased flexibility, lack of 24-hour coverage on the Friday and Saturday nights, and some maintenance and equipment availability issues due to the equipment being on the road all the time. (For a detailed overview of the findings please refer to the Phase I evaluation report on the

Department's web site
www.tw.gov.nl.ca/publications/Evaluationof%20PhaseI24HourSnowClearing.pdf).

Snow Plow Operator Focus Groups

Although the focus group with the supervisors allowed the opinions of snow plow operators to be heard indirectly (through their supervisors), it was determined that an assessment of the opinions of those directly providing the service should be conducted in Phase II. Themes that emerged from the four focus groups conducted with the operators across the Island included:

Road conditions

- Less snow and ice buildup
- Fewer cars stuck
- Better conditions early in the morning
- Major improvement in black ice
- Easy to see a difference between road segments who receive and do not receive 24-hour snow clearing

Complaints

- Reduction in calls from stranded motorists, RCMP, emergency vehicles; overall number of complaints decreased

Advantages

- Increased safety
- Trucks are warmed up in the morning; response times are faster
- Morning commute is improved
- Emergency vehicles can get through faster
- Less escorts from trucks necessary to get ambulances through
- Less abandoned vehicles

Disadvantages

- Need more night time operators
- Night routes too long – should match day shift routes
- Communication issues between snow plow operators and foremen
- Less overtime for people who want it
- Wear and tear on the plows
- Days not plowed 24 hours, more to plow the following day
- Speed increases as the road conditions improve – safety issue
- Shifts become monotonous (all nights, all days, etc)

How to Improve 24-Hour Snow Clearing

- Make it seven days a week
- More coverage, more trucks, and more people

- More clear expectations; better communication to the public and the operators
- Need more advertising
- Splitting the shifts would be an advantage for the operators (some nights/some days)

These results were similar to the opinions received from the snow clearing supervisors; the main point heard from the majority of snow clearing operators and supervisors was that they felt that providing 24-hour snow clearing has improved the safety of our heavy traffic highways and trunk roads, and that it should be continued in the future, and expanded so that the entire TCH is covered seven days per week.

Dispatcher Interviews

The opinions of dispatchers were also sought since these individuals deal directly with the public, emergency personnel, and snow clearing supervisors. The dispatchers answer the calls to the Snow Lines, as well as contact the supervisors who dispatch snow clearing equipment when any issues arise on the highway with regards to snow and ice control. Themes that emerged from the dispatcher interviews included:

Road Conditions

- Much improved since pilot project onset

Complaints/Public Feedback

- Not as many complaints
- Only complaint about areas not covered
- People seem to feel more confident in driving on the roads knowing there is a dedicated snow clearing service in place

Advantages

- Increased response times for emergency vehicles
- Increased safety
- Benefit to traffic to the airport and hospital
- Less accidents
- Less stress for the dispatchers (fewer calls)

Disadvantages

- Lack of advertising; a lot of people don't know it is happening

How to Improve 24-hour Snow Clearing

- Entire TCH should be covered

The themes that emerged in the interviews with the Dispatchers mirrored the opinions of both groups of individuals providing 24-hour snow clearing service (snow clearing supervisors and operators) and heavy users of our provincial highway system (long-distance truck drivers and commuters).

Conclusions/Recommendations

Based on the results of the evaluation of the 24-hour snow clearing pilot project, the 24-hour snow clearing pilot project can be deemed to have been a success and, therefore, should be continued. Although it is difficult to determine a direct causal relationship between expenditures and the many interrelated factors that contribute to the cost associated with providing 24-hour snow clearing service, the results obtained from surveys with heavy users of our highway system, focus groups with snow clearing operators and supervisors, and interviews with dispatchers suggest that the pilot project improved the safety and quality of life of our Province's residents. This is consistent with the results obtained from the interviews with heavy users of the provincial highway system and focus groups with snow clearing supervisors conducted in the first year of the evaluation of the pilot project. Providing 24-hour snow clearing on high traffic sections of the TCH and major trunk roads, will certainly positively contribute to the Department's goal of having improved the condition and maintenance of the Province's roads and bridges by March 31, 2011. As such, it is recommended that 24-hour snow clearing continue to be provided on high-traffic routes for the long-term and that the service be monitored to determine if any changes to the routes receiving the service may be required over time.

Appendix A

Operators Focus Group Questions

Thinking about the sections of road in your jurisdiction that receive 24-hour snow clearing...

1. Have road conditions changed since implementing the pilot project compared to previous years?
2. Have you noticed any changes in the condition of road segments early in the morning since implementing the pilot project compared to previous years?
3. How would you compare the overall condition of segments of the TCH included in the 24-hour snow clearing pilot project to those not included in the pilot project?
4. What have been the advantages associated with providing 24-hour snow clearing?
5. What have been the disadvantages associated with providing 24-hour snow clearing?
6. What suggestions would you make to improve 24-hour snow clearing?

Appendix B

Dispatcher Interview Questions

Thinking about the sections of road in your jurisdiction that receive 24-hour snow clearing...

1. How have road conditions changed since implementing the pilot project compared to previous years?
2. Has there been a change in the number and type of complaints you have been receiving since implementing the pilot project?
3. What has general feedback from the public been like with regards to the pilot project?
4. What have been the advantages associated with providing 24-hour snow clearing?
5. What have been the disadvantages associated with providing 24-hour snow clearing?
6. What suggestions would you make to improve 24-hour snow clearing?

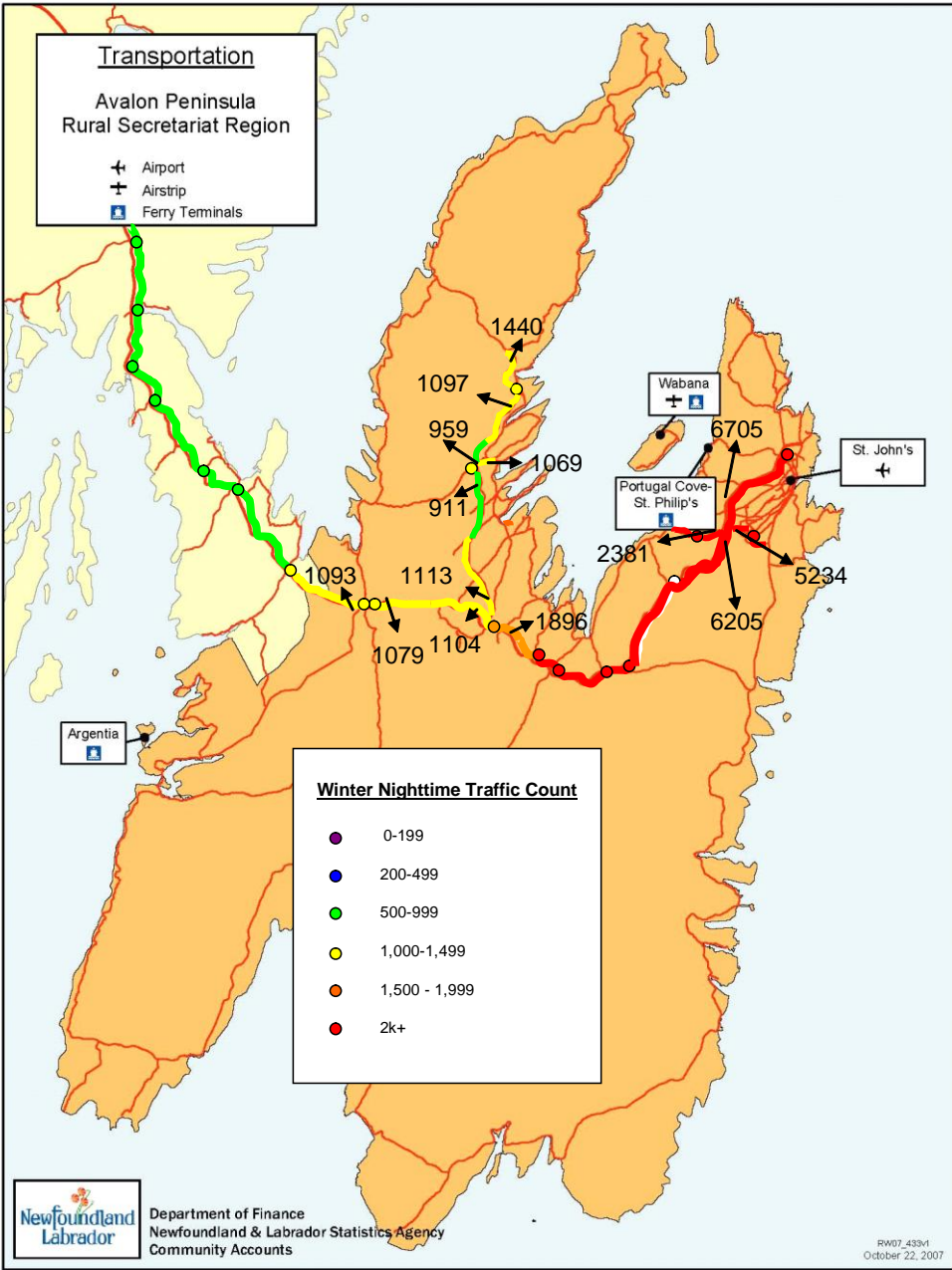
Appendix C

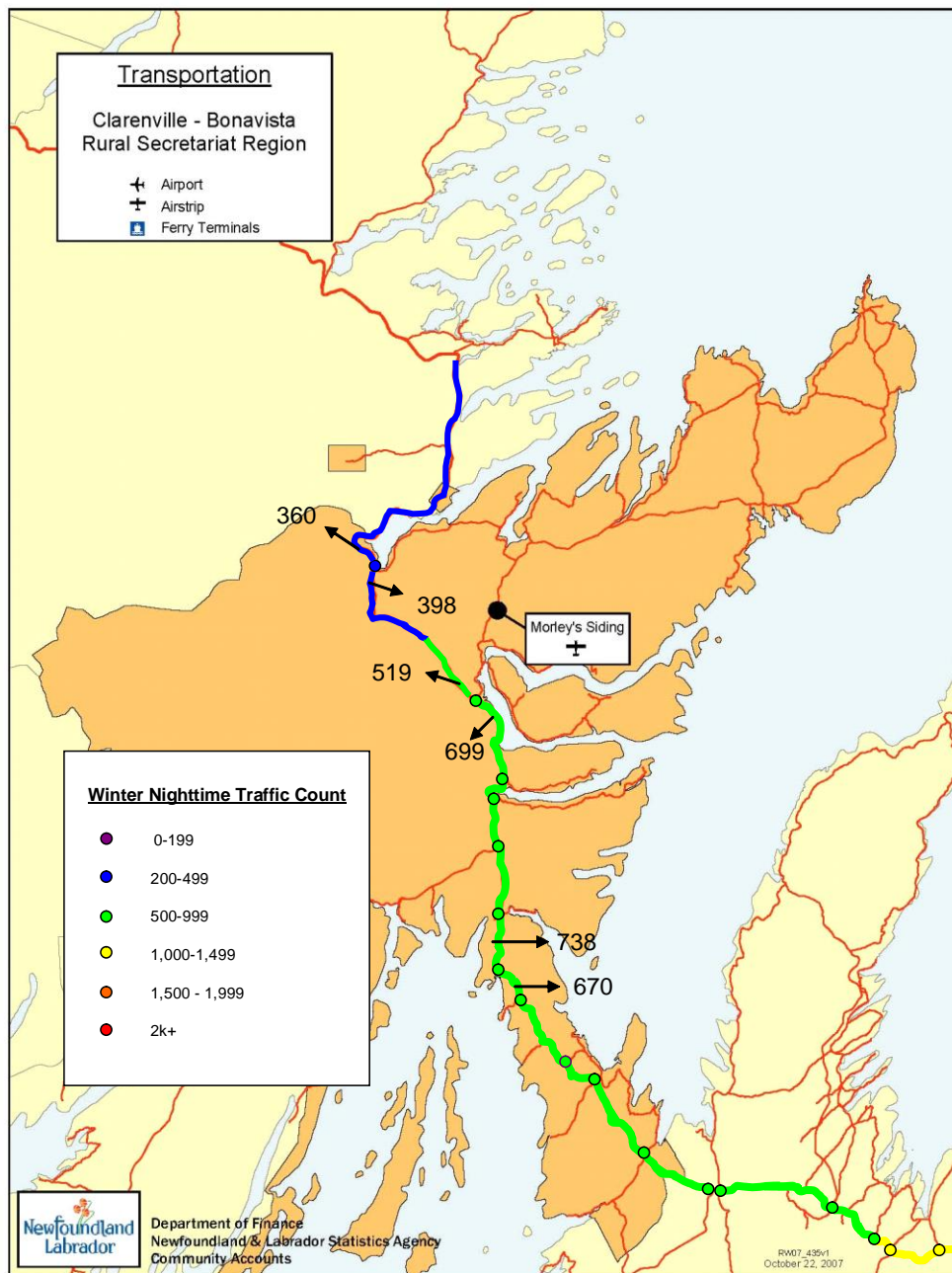
Nighttime Traffic Count Sites – Winter 2010

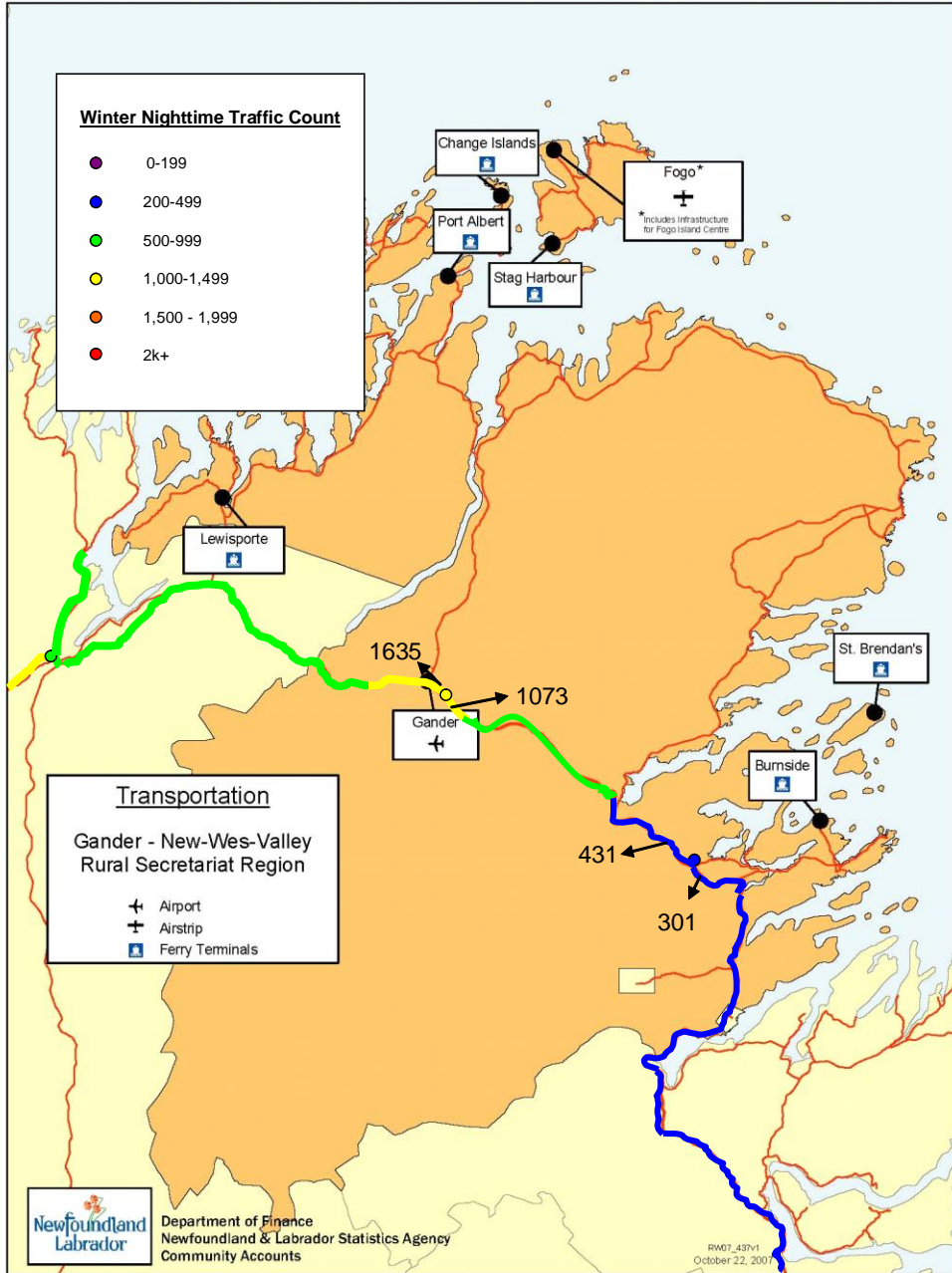
Phase II Overnight Traffic Counts (9pm - 9am)	
Location	Start Date
Region 1	
TCH at Route 2 Interchange	Feb-15
Route 2 at Kilbride Interchange	Feb-15
TCH at Route Roaches Line	Feb-15
Bay Roberts Interchange	Feb-15
Interchange Route 70-75	Feb-27
TCH at Whitbourne Interchange	Feb-15
Region 2	
TCH at Arnolds Cove	Feb-20
TCH at Manitoba Drive	Feb-21
TCH at Bonavista Exit	Feb-20
TCH at Glovertown Exit	Feb-20
Region 3	
TCH at Caldwell St.	Feb-20
TCH at Route 350	Feb-20
TCH at Springdale	Feb-20
Region 4	
TCH at Route 430	Feb-21
TCH at Pasadena Interchange	Feb-21
TCH at Lewin Parkway	Feb-21
TCH at Route 460	Feb-21

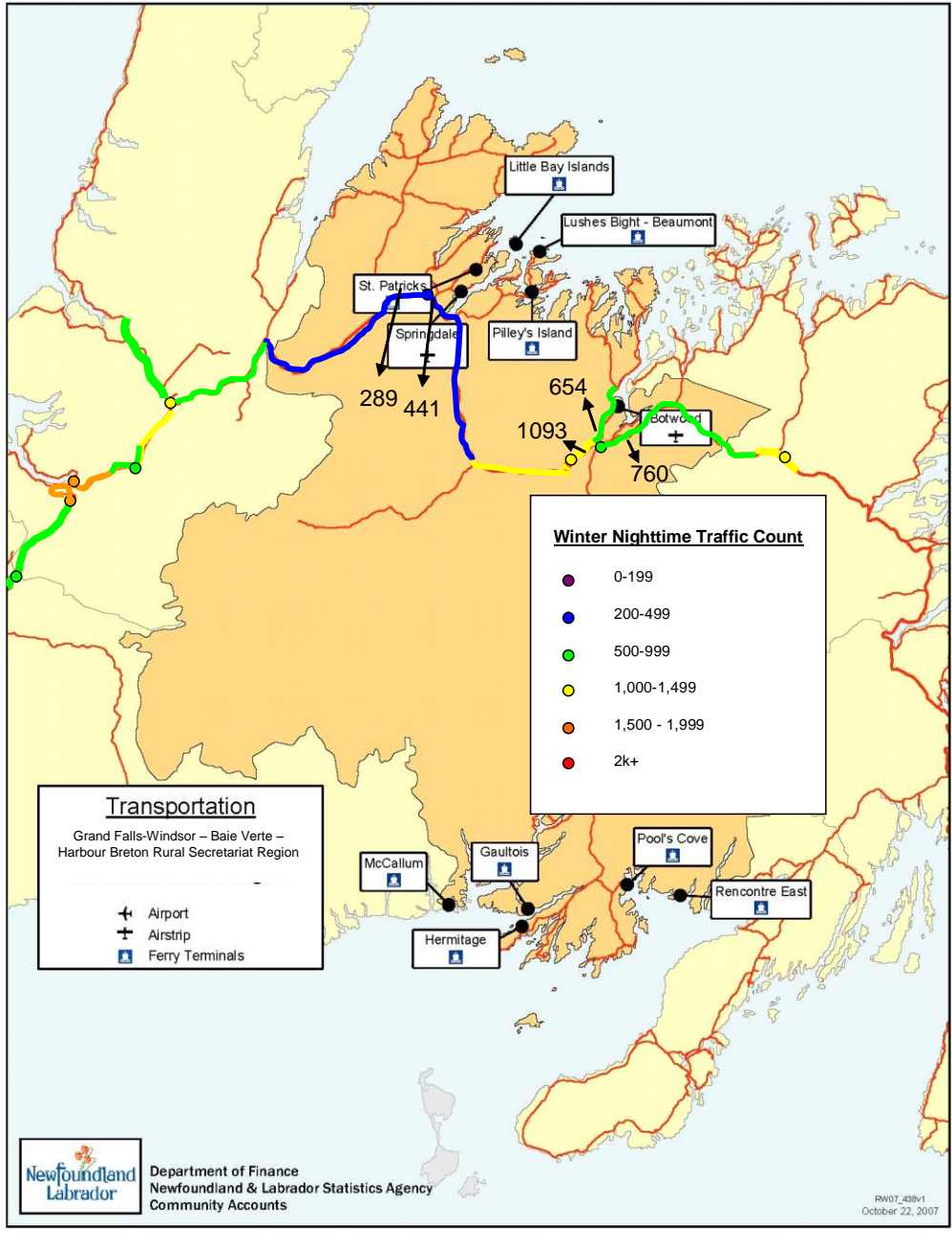
Appendix D

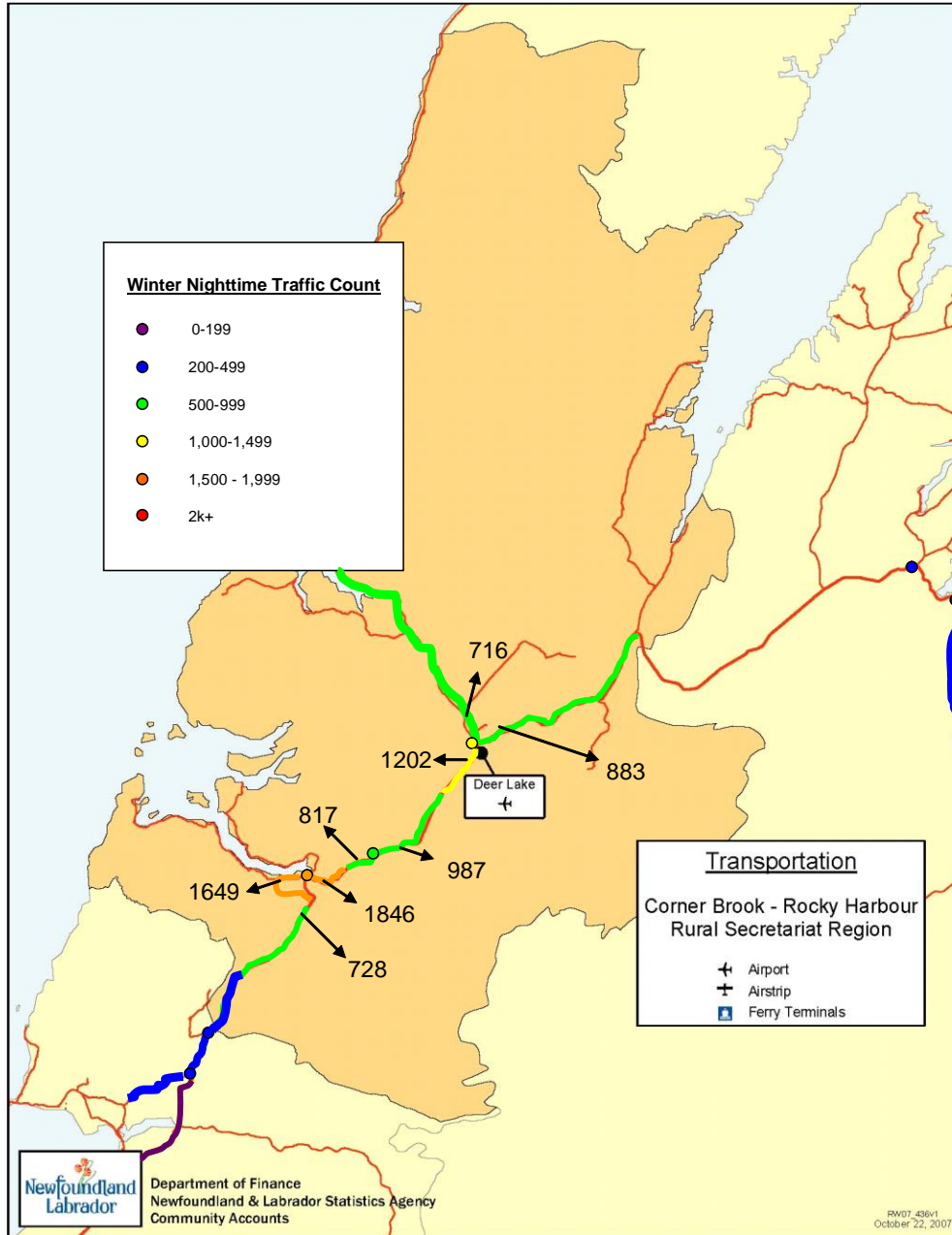
Winter 2010 Traffic Count Maps

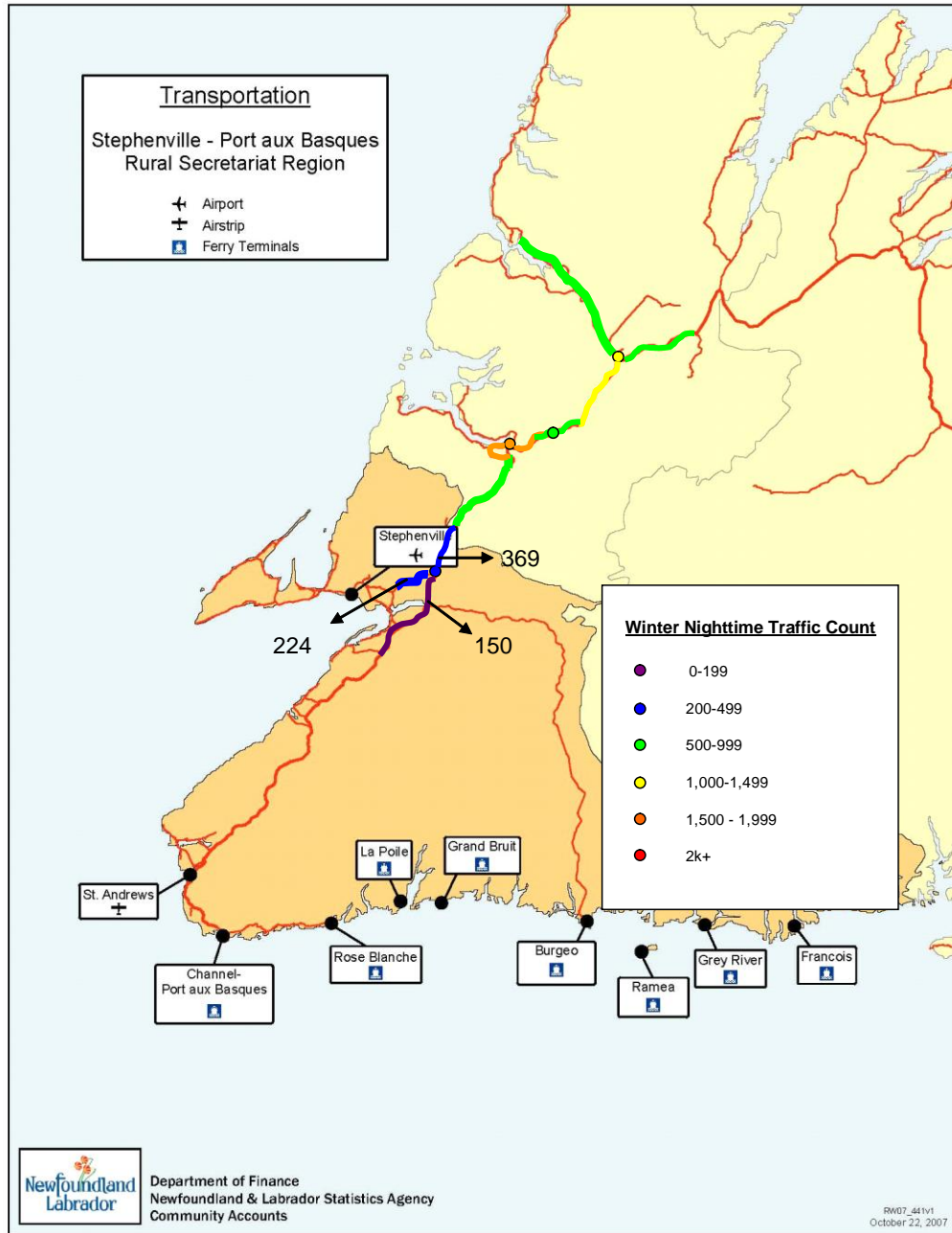












Appendix E

Journey to Work Maps

