APPENDIX R
Review of Potential Employment and Gross Domestic Product Impacts of a 480-Well Development Scenario

Review of Potential Employment and Gross Domestic Product Impacts of a 480-Well Development Scenario

For the Newfoundland and Labrador
Hydraulic Fracturing Review Panel

EcoTec Consultants
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INTRODUCTION

In October 2014, the Minister of Natural Resources, Government of Newfoundland and Labrador appointed an independent panel to conduct a public review of the socio-economic and environmental implications of hydraulic fracturing in Western Newfoundland. The mandate of the Panel is also to make recommendations on whether or not hydraulic fracturing should be undertaken in Western Newfoundland.

This report has been produced on behalf of The Newfoundland and Labrador Hydraulic Fracturing Review Panel (NLHFRP). The main objective is to quantify the potential economic benefits of two scenarios of hydraulic fracturing in Western Newfoundland. The secondary objective is to compare these benefits with those that could be generated by road construction expenditures and by tourism expenditures. This report will:

- Outline the expected costs for the exploration expenditures (construction) and production of hydrocarbons for two scenarios of hydraulic fracturing. The first scenario (referred to as Scenario 1 in this document) involves the reinjection of waste water in injection wells. The second scenario (Scenario 2) would essentially ship waste water in another country for treatment and disposal.
- Assess the economic benefits expected to be generated by the two scenarios in Newfoundland and Labrador (by region of the province) as well as for the rest of the country;
- Estimate the economic benefits that could be generated by spending $100 million (1) for road construction and (2) a similar amount of tourism expenditures.
- A conclusion will compare the economic benefits of both hydraulic fracturing scenarios with those of road construction and tourism expenditures.

SECTION I – EXPENDITURES

A – Scenario 1 – with Injection

Scenario 1 involves the injection of waste water in the ground with eight disposal wells. Table I.A-1 shows the expenditures and related direct employment for Scenario 1 as provided by the Newfoundland and Labrador Hydraulic Fracturing Review Panel (NLHFRP). Total expenditures for Scenario 1 are estimated at $4.9 Billions, including $4.1 B for capital expenditures (CAPEX) and $0.8 B for operating expenditures (OPEX). The CAPEX phase will last six years and the OPEX phase is expected to last 26 years.

Production well drilling is the largest item in the CAPEX phase with a cost estimated at $3.4 B, including $2.9 B to be spent in Newfoundland and Labrador (NL). Direct employment refers to the workers employed on site to drill the wells and build the various required facilities. It is expected that expenditures made in Newfoundland and Labrador for the CAPEX phase will amount to $3.5 B (86.3 % of total CAPEX). It should be noted that spending money in the province does not mean that the product or service purchased will be provided by a supplier located in the province. For example, buying a pickup truck in Stephenville does not mean that the vehicle in built in the province: it is merely sold by a distributor (local dealership). However, spending money to repair the vehicle will most likely benefit a local automotive repair shop. Direct employment in Newfoundland for the CAPEX phase is estimated at 3,573 person-years by the NLHFRP. A significant number of those person-years is expected to stay in the Port au Port and Stephenville region.

All of the $838.5 Millions for the OPEX phase is expected to be spent in Newfoundland and Labrador, generating an estimated 811 direct person-years of employment in the province over a 26-year period. The total amount to be spent in the province under Scenario 1 is therefore estimated at $4.4 B over a period of 26 years with direct employment estimated at 4,384 person-years of employment.

Table I.A-1. Expenditures and direct employment for Scenario 1 – with Injection, M$.

DESCRIPTION	EXPENDITURES		DIRECT EMPLOYMENT
CAPEX	Total	Newfoundland and Labrador	
Production Well Drilling	$3,380.3	$2,871.3	1,885
Disposal Well Drilling	$74.4	$63.2	41
Central Proc. Facilities & Main Gathering Lines	$80.0	$74.0	240
Central Storage & Loading Facilities	$120.0	$111.0	360
Field Oil and Gas Gathering Lines	$34.3	$31.7	103
Treatment Facilities	$34.3	$31.7	103
Main Processing Lines	$80.0	$74.0	240
Lease and Install Electric Turbines	$40.0	$40.0	0
Electrical Distribution	$40.0	$40.0	0
Marine Terminal;	$150.0	$138.8	451
Pre-development Capex	$50.0	$46.3	150
Total CAPEX	**$4,083.3**	**$3,521.9**	**3,573**
OPEX			
Field Oil Opex (Variable)	$90.0	$90.0	100
Field Oil Opex (Fixed)	$60.0	$60.0	0
Storage & Loading Facilities Opex	$150.0	$150.0	167
Well Opex	$230.4	$230.4	256
Well Abandonment	$48.0	$48.0	53
Field Opex Gas (Fixed)	$22.5	$22.5	0
Field Opex Gas (Variable)	$37.5	$37.5	0
Transport – flowback water from fracture sim.	$22.9	$22.9	51
Transport – production water to injection site	$83.0	$83.0	184
Deep well injection costs	$69.2	$69.2	0
Flowback and produced water – transport costs	$0.0	$0.0	0
Flowback and produced water – treatment costs	$0.0	$0.0	0
Electricity Opex	$25.0	$25.0	0
Total OPEX	**$838.5**	**$838.5**	**811**
GRAND TOTAL – SCENARIO 1 – WITH INJECTION	**$4,921.8**	**$4,360.4**	**4,384**

Source: Newfoundland and Labrador Hydraulic Fracturing Review Panel (NLHFRP).

B – Scenario 2 – without Injection

Scenario 2 involves the treatment and shipment offshore of most waste water generated by the operation of the production wells. Table I.B-1 shows the expenditures and related direct employment for Scenario 2 as provided by the Newfoundland and Labrador Hydraulic Fracturing Review Panel (NLHFRP). Total expenditures for Scenario 2 are estimated at $8.6 Billions, including $4.0 B for capital expenditures (CAPEX) and $4.6 B for operating expenditures (OPEX). The CAPEX phase will last six years and the OPEX phase is expected to last 26 years. The much higher cost for operations, compared to Scenario 1, is due to the high cost of shipping ($3.5 B) waste water offshore for treatment and disposal.

Production well drilling is the largest item in the CAPEX phase with a cost estimated at $3.4 B, including $2.9 B to be spent in Newfoundland and Labrador (NL). Expenditures made in Newfoundland and Labrador for the CAPEX phase are estimated at $3.5 B. Direct employment in Newfoundland for the CAPEX phase is estimated at 3,542 person-years by the NLHFRP, a number slightly lower than for Scenario 1 due to a reduced workload for disposal well drilling. A significant number of those person-years is expected to stay in the Port au Port and Stephenville region.

Out of a total estimated at $4.6 B for OPEX, the share that will be spent in the province is estimated at $694.6 M, generating 627 direct person-years of employment in the province over a 26-year period. The total amount to be spent in the province under Scenario 2 is therefore estimated at $4.2 B over a period of 26 years with direct employment estimated at 4,169 person-years of employment.

Table I.B-1. Expenditures and direct employment for Scenario 2 – without Injection, M$.

DESCRIPTION	EXPENDITURES		DIRECT EMPLOYMENT
CAPEX	Total	Newfoundland and Labrador	
Production Well Drilling	$3,380.3	$2,871.5	1,885
Disposal Well Drilling	$18.6	$15.6	10
Central Proc. Facilities & Main Gathering Lines	$80.0	$74.0	240
Central Storage & Loading Facilities	$120.0	$111.0	360
Field Oil and Gas Gathering Lines	$34.3	$31.7	103
Treatment Facilities	$34.3	$31.7	103
Main Processing Lines	$80.0	$74.0	240
Lease and Install Electric Turbines	$40.0	$40.0	0
Electrical Distribution	$40.0	$40.0	0
Marine Terminal;	$150.0	$138.8	451
Pre-development Capex	$50.0	$46.3	150
TOTAL CAPEX	$4,027.5	$3,474.5	3,542
OPEX			
Field Oil Opex (Variable)	$90.0	$90.0	100
Field Oil Opex (Fixed)	$60.0	$60.0	0
Storage & Loading Facilities Opex	$150.0	$150.0	167
Well Opex	$230.4	$230.4	256
Well Abandonment	$48.0	$48.0	53
Field Opex Gas (Fixed)	$22.5	$22.5	0
Field Opex Gas (Variable)	$37.5	$37.5	0
Transport – flowback water from fracture sim.	$22.9	$22.9	51
Transport – production water to injection site	$0.0	$0.0	0
Deep well injection costs	$0.0	$0.0	0
Flowback and produced water – transport costs	$3,459.0	$0.0	0
Flowback and produced water – treatment costs	$415.1	$8.3	0
Electricity Opex	$25.0	$25.0	0
Total OPEX	**$4,560.3**	**$694.6**	**627**
GRAND TOTAL – SCENARIO 2 – WITHOUT INJECTION	**$8,587.8**	**$4,169.1**	**4,169**

Source: Newfoundland and Labrador Hydraulic Fracturing Review Panel (NLHFRP).

SECTION II– ECONOMIC IMPACTS

A – Scenario 1 – with Injection

Employment

The employment that could be generated by Scenario 1 CAPEX phase expenditures is shown in Table II.A-1. Direct employment by region of Newfoundland and Labrador was calculated by taking the NLHFRP estimate for Port au Port and Stephenville region (1,320) and subtracting it from the NLHFRP estimate for total direct employment (3,573) for Newfoundland and Labrador. The remaining 2,253 jobs (person-years) along with their salaries and benefits were distributed to the other nine regions of the province according to the total population of each region. This is also how direct employment was calculated by region for Scenario 2.

In addition to the 3,573 direct person-years, another 2,278 indirect (employees of suppliers) and 761 induced (generated by household expenditures) person-years of employment could be generated for Newfoundland and Labrador residents, for a total of 6,611 over six years. It should be noted that these workers may be (i) working for Newfoundland and Labrador based construction firms, (ii) working for firms from outside the province coming to deal with specific aspects of the CAPEX phase or provide engineering supervision. Employment in other provinces generated by the expenditures in Newfoundland and Labrador is estimated at 20,446, for a grand total of 27,057 for the country as a whole.

Table II.A-1. Employment generated by Scenario 1 – CAPEX expenditures by geographical area, person-years.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	1,227	794	318	2,338
Burin Peninsula	93	10	15	118
Burgeo-Channel-Port aux Basques	70	44	17	131
Port au Port-Stephenville	**1,320**	**434**	**119**	**1,873**
Corner Brook-Deer Lake	186	492	105	784
Gander-Grand Falls-Windsor	169	107	47	323
Bonavista-Clarenville	153	48	34	235
Baie Verte-Lewisporte-Twillingate	160	190	43	394
Northern Peninsula	72	53	22	146
Labrador	123	107	40	270
Total Newfoundland and Labrador	**3,573**	**2,278**	**761**	**6,611**
Other provinces	0	15,587	4,858	20,446
Canada	**3,573**	**17,865**	**5,619**	**27,057**

Source: Newfoundland and Labrador Hydraulic Fracturing Review Panel (for total direct employment in the province and direct employment in the Port au Port and Stephenville region) and EcoTec Consultants.

The Avalon Peninsula is expected to have the highest number of person-years with 2,338 (35.4 %), thanks to a large population with skilled workers and a fairly strong network of suppliers for non-residential construction and oil and gas infrastructure. The Port au Port and Stephenville region is in second place with 1,873 (28.3 %) followed by the Corner Brook-Deer Lake region which benefits from its relatively close proximity to the drilling sites with 784 person-years (11.9 %). The remaining 1,616 (24.4 %) is spread among the remaining seven regions of the province.

The employment that could be generated by Scenario 1 OPEX phase expenditures is shown in Table II.A-2. In addition to the 811 direct person-years, another 808 indirect and 238 induced person-years of employment could be generated for Newfoundland and Labrador residents, for a total of 1,857 over 26 years. Employment in other

provinces generated by the expenditures in Newfoundland and Labrador is estimated at 1,997, for a grand total of 3,854 for Canada. The Newfoundland and Labrador content is much higher for operations (48.2 %) than it is for the CAPEX phase because the latter has more import content including drilling crews, specialized machinery and engineering services, etc. coming from the rest of the country.

Table II.A-2. Employment generated by Scenario 1 – OPEX expenditures by geographical area, person-years.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	88	360	95	542
Burin Peninsula	7	7	4	18
Burgeo-Channel-Port aux Basques	5	7	5	17
Port au Port-Stephenville	**649**	**264**	**65**	**979**
Corner Brook-Deer Lake	13	69	25	107
Gander-Grand Falls-Windsor	12	26	11	50
Bonavista-Clarenville	11	14	8	33
Baie Verte-Lewisporte-Twillingate	12	25	9	46
Northern Peninsula	5	11	6	22
Labrador	9	25	10	44
Total Newfoundland and Labrador	**811**	**808**	**238**	**1,857**
Other provinces	0	1,398	598	1,997
Canada	**811**	**2,206**	**836**	**3,854**

Source: Newfoundland and Labrador Hydraulic Fracturing Review Panel (for total direct employment in the province and direct employment in the Port au Port and Stephenville region) and EcoTec Consultants.

The highest amount of employment is expected to be for Port au Port and Stephenville residents with 979 (52.7 %) with the Avalon Peninsula in second place with 542 person-years (29.2 %) and Corner Brook-Deer Lake region in third position with 107 person-years (5.8 %). The remaining 229 (12.3 %) is spread among the remaining seven regions of the province.

Table II.A-3 shows the total employment expected to be generated by Scenario 1, including both CAPEX and OPEX phases. Total employment in Newfoundland and Labrador is expected to reach 8,468 person-years over the 26-year period. This number includes 4,384 direct person-years, 3,086 indirect and 999 induced. Employment in other provinces generated by the expenditures in Newfoundland and Labrador is estimated at 22,442, which brings the national total to 30,911. These numbers are equivalent to 1.9 person-years per M$ spent in Newfoundland and Labrador and 7.1 per M$ for Canada as a whole.

Table II.A-3. Employment generated by Scenario 1 – total expenditures by geographical area, person-years.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	1,315	1,153	412	2,881
Burin Peninsula	100	16	19	136
Burgeo-Channel-Port aux Basques	75	51	22	148
Port au Port-Stephenville	**1,969**	**698**	**185**	**2,851**
Corner Brook-Deer Lake	199	562	130	891
Gander-Grand Falls-Windsor	181	133	59	373
Bonavista-Clarenville	164	62	42	268
Baie Verte-Lewisporte-Twillingate	172	215	53	440
Northern Peninsula	77	64	27	168
Labrador	132	132	49	314
Total Newfoundland and Labrador	**4,384**	**3,086**	**999**	**8,468**
Other provinces	0	16,985	5,457	22,442
Canada	**4,384**	**20,071**	**6,456**	**30,911**

Source: Newfoundland and Labrador Hydraulic Fracturing Review Panel (for total direct employment in the province and direct employment in the Port au Port and Stephenville region) and EcoTec Consultants.

Gross Domestic Product

Employment is the measure by which the impact on the labour market is measured while the Gross Domestic Product (GDP) is the best measure for impacts in dollar terms. It does relate to the value added generated within an economy and is widely used to measure the size, and growth rate, of national and provincial economies.

It is estimated that the CAPEX phase of Scenario 1 will generate $2.8 B in total GDP for Canada, including $695.2 M in Newfoundland and Labrador and $2.1 B in the rest of the country (Table II.A-4). Direct GDP in Newfoundland and Labrador is expected to amount to $402.6 M. Indirect GDP is estimated at $188.2 M for the province and $1.6 B for the rest of Canada for a total of $1.8 B. Induced GDP for industries supplying households needs amounts to $642.5 M, including $104.4 M for Newfoundland and Labrador and $538.1 for other provinces.

About $267.4 M in GDP is expected to be generated in the Port au Port and Stephenville region (38.5 % of total provincial GDP) with $216.5 M in the Avalon Peninsula (31.1 %) and $69.8 M in Corner Brook-Deer Lake region (10.0 %). The remaining 20.4 % ($141.5 M) is distributed across the rest of the province.

Table II.A-4. Gross Domestic Product generated by Scenario 1 – CAPEX expenditures by geographical area, M$.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	$101.4	$72.1	$42.9	$216.5
Burin Peninsula	$7.7	$0.7	$2.0	$10.4
Burgeo-Channel-Port aux Basques	$5.8	$3.1	$2.1	$11.0
Port au Port-Stephenville	**$216.2**	**$29.6**	**$21.5**	**$267.4**
Corner Brook-Deer Lake	$15.4	$41.0	$13.4	$69.8
Gander-Grand Falls-Windsor	$14.0	$9.2	$5.8	$29.0
Bonavista-Clarenville	$12.6	$3.6	$4.0	$20.2
Baie Verte-Lewisporte-Twillingate	$13.3	$14.9	$5.3	$33.5
Northern Peninsula	$5.9	$4.4	$2.5	$12.8
Labrador	$10.2	$9.5	$5.0	$24.7
Total Newfoundland and Labrador	**$402.6**	**$188.2**	**$104.4**	**$695.2**
Other provinces	$0.0	$1,597.6	$538.1	$2,135.7
Canada	**$402.6**	**$1,785.7**	**$642.5**	**$2,830.9**

Source: EcoTec Consultants.

The OPEX phase of Scenario 1 is expected to generate $846.0 M in national GDP, including $643.7 M in Newfoundland and Labrador and $202.2 M in the rest of the country (Table II.A-5). Direct GDP in Newfoundland and Labrador is expected to reach $534.8 M with indirect GDP at $78.7 M for the province and $138.1 M for the rest of the country (total of $216.9 M). Induced GDP is assessed at $94.3 M, including $30.2 M for Newfoundland and Labrador and $64.1 M for other provinces.

A total of $555.6 M in GDP is expected to be generated in the Port au Port and Stephenville region (86.3 % of total provincial GDP) with $57.0 M in the Avalon Peninsula (8.9 %). The remaining $30.1 M (4.7 %) is distributed across the rest of the province.

Table II.A-5. Gross Domestic Product generated by Scenario 1 – OPEX expenditures by geographical area, M$.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	$7.9	$37.8	$11.3	$57.0
Burin Peninsula	$0.6	$0.6	$0.4	$1.6
Burgeo-Channel-Port aux Basques	$0.5	$0.6	$0.4	$1.5
Port au Port-Stephenville	**$520.2**	**$25.1**	**$11.3**	**$556.6**
Corner Brook-Deer Lake	$1.2	$5.9	$2.6	$9.7
Gander-Grand Falls-Windsor	$1.1	$2.3	$1.1	$4.5
Bonavista-Clarenville	$1.0	$1.1	$0.8	$2.9
Baie Verte-Lewisporte-Twillingate	$1.0	$2.0	$0.9	$3.9
Northern Peninsula	$0.5	$0.9	$0.5	$1.8
Labrador	$0.8	$2.3	$1.0	$4.2
Total Newfoundland and Labrador	**$534.8**	**$78.7**	**$30.2**	**$643.7**
Other provinces	$0.0	$138.1	$64.1	$202.2
Canada	**$534.8**	**$216.9**	**$94.3**	**$846.0**

Source: EcoTec Consultants.

When both CAPEX and OPEX phases of Scenario 1 are added together, the GDP reaches $3.7 B in Canada, including $1.3 B in Newfoundland and Labrador and about $2.3 B in the rest of the country (Table II.A-6). Direct GDP in Newfoundland and Labrador is $937.4 M with indirect GDP at $266.9 M for the province and $1.7 B for the rest of the country (total of $2.0 B). Induced GDP is estimated at $736.9 M, including $134.6 M for Newfoundland and Labrador and $602.2 M for other provinces.

A total of $823.9 M in GDP is expected to be generated in the Port au Port and Stephenville region (61.5 % of total provincial GDP) with $273.6 M in the Avalon Peninsula (20.4 %) and $79.5 M in the Corner Brook-Deer Lake region (5.9 %). The remaining $161.9 M (12.1 %) is distributed across the rest of the province.

Table II.A-6. Gross Domestic Product generated by Scenario 1 – total expenditures by geographical area, M$.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	$109.4	$110.0	$54.2	$273.6
Burin Peninsula	$8.3	$1.3	$2.4	$12.0
Burgeo-Channel-Port aux Basques	$6.3	$3.8	$2.5	$12.5
Port au Port-Stephenville	**$736.4**	**$54.7**	**$32.8**	**$823.9**
Corner Brook-Deer Lake	$16.6	$46.9	$16.0	$79.5
Gander-Grand Falls-Windsor	$15.1	$11.5	$6.9	$33.5
Bonavista-Clarenville	$13.6	$4.7	$4.8	$23.1
Baie Verte-Lewisporte-Twillingate	$14.3	$16.9	$6.2	$37.4
Northern Peninsula	$6.4	$5.2	$3.0	$14.6
Labrador	$11.0	$11.8	$6.0	$28.8
Total Newfoundland and Labrador	**$937.4**	**$266.9**	**$134.6**	**$1,338.9**
Other provinces	$0.0	$1,735.7	$602.2	$2,337.9
Canada	**$937.4**	**$2,002.6**	**$736.9**	**$3,676.8**

Source: EcoTec Consultants.

Government Tax Revenues

Another important measure of potential economic benefits generated by Scenario 1 expenditures is the amount of tax revenues collected by senior levels of government. As shown in Table II.A-7, it is estimated that the CAPEX phase would generate about $68.5 M in tax revenues for the provincial and $68.9 M for the federal government for a total of $137.5 M. It should the noted that tax revenues assessed in this report do not include any royalty revenues. Federal tax revenues are those revenues collected in Newfoundland and Labrador.

Tax revenues from OPEX would amount to $42.2 M for the province and $48.2 M for the federal government. Hence, total tax revenues for the province under Scenario 1 are estimated at $110.7 M with the federal government getting $117.1 M, for a total of $227.9 M. The most important source of revenues for the provincial government would be sales and excise taxes with revenues estimated at $56.3 M, followed by income tax ($33.7 M) and the tax on corporate profits ($20.7 M). The number one source of revenues for the federal government would be personal income tax with $55.6 M, with the tax on corporate profits in second place at $35.4 M and sales and excise taxes at $26.2 M.

Table II.A-7. Tax revenues generated by Scenario 1 expenditures, M$.

NEWFOUNDLAND AND LABRADOR	CAPEX	OPEX	TOTAL
Income Tax	$25.7	$8.0	$33.7
Sales and excise taxes	$37.1	$19.2	$56.3
Tax on corporate profits	$5.8	$14.9	$20.7
Total provincial government	**$68.5**	**$42.2**	**$110.7**
FEDERAL GOVERNMENT			
Income Tax	$41.8	$13.8	$55.6
Sales and excise taxes	$17.3	$8.9	$26.2
Tax on corporate profits	$9.9	$25.5	$35.4
Total federal government	**$68.9**	**$48.2**	**$117.1**
TOTAL BOTH GOVERNMENTS	**$137.5**	**$90.4**	**$227.9**

Source: EcoTec Consultants.

B – Scenario 2 – without Injection

Employment

Scenario 2 entails some treatment of waste water and its transportation by marine vessels to an offshore location for final treatment and disposal. Table II.B-1 provides the estimates of employment likely to be generated by expenditures in Newfoundland and Labrador. Direct employment was estimated by NLHFRP at 3,542 person-years equivalent, including 1,308 in the Port au Port and Stephenville region.

In addition to direct employment, another 2,150 indirect and 752 induced person-years of employment could be generated for Newfoundland and Labrador residents, for a total of 6,544 over six years. These workers may be working for Newfoundland and Labrador based construction firms and working for firms from outside the province coming to deal with specific aspects of the CAPEX phase or provide engineering supervision. Employment in other provinces generated by the expenditures is estimated at 20,173, for a grand total of 26,717 for Canada.

Table II.B-1. Employment generated by Scenario 2 – CAPEX expenditures by geographical area, person-years.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	1,216	785	314	2,315
Burin Peninsula	92	10	15	117
Burgeo-Channel-Port aux Basques	69	43	17	129
Port au Port-Stephenville	**1,308**	**430**	**118**	**1,855**
Corner Brook-Deer Lake	185	485	104	774
Gander-Grand Falls-Windsor	168	105	47	319
Bonavista-Clarenville	151	47	33	232
Baie Verte-Lewisporte-Twillingate	159	188	43	389
Northern Peninsula	71	52	22	145
Labrador	122	106	39	267
Total Newfoundland and Labrador	**3,542**	**2,250**	**752**	**6,544**
Other provinces	0	15,377	4,796	20,173
Canada	**3,542**	**17,627**	**5,548**	**26,717**

Source: Newfoundland and Labrador Hydraulic Fracturing Review Panel (for total direct employment in the province and direct employment in the Port au Port and Stephenville region) and EcoTec Consultants.

The Avalon Peninsula is likely to have the highest number of person-years with 2,315 (35.4 %), thanks to a large population with skilled workers and a fairly strong network of suppliers for non-residential construction and oil and gas infrastructure. The Port au Port and Stephenville region is in second place with 1,855 (28.3 %) followed by the Corner Brook-Deer Lake region with 774 person-years (11.8 %). The remaining 1,600 (24.4 %) is spread among the remaining seven regions of the province.

The employment that could be generated by the OPEX phase of Scenario 2 is shown in Table II.B-2. In addition to the 627 direct person-years, another 729 indirect and 203 induced person-years of employment could be generated for Newfoundland and Labrador residents, for a total of 1,558 over 26 years. Employment in other provinces is estimated at 1,661, for a grand total of 3,220 for Canada. As usual, the Newfoundland and Labrador content is much higher for operations (48.4 %) than it is for the CAPEX phase.

The highest number of jobs would be for Port au Port and Stephenville residents with 825 (53.0 %) followed by residents of the Avalon Peninsula with 454 person-years (29.1 %) and and the Corner Brook-Deer Lake region with 90 person-years (5.8 %). The remaining 189 person-years (12.1 %) are distributed between the remaining seven regions of the province.

Table II.B-2. Employment generated by Scenario 2 – OPEX expenditures by geographical area, person-years.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	69	305	80	454
Burin Peninsula	5	6	3	15
Burgeo-Channel-Port aux Basques	4	6	4	14
Port au Port-Stephenville	**501**	**267**	**56**	**825**
Corner Brook-Deer Lake	11	58	21	90
Gander-Grand Falls-Windsor	9	22	10	41
Bonavista-Clarenville	8	13	7	28
Baie Verte-Lewisporte-Twillingate	9	21	8	38
Northern Peninsula	4	8	5	17
Labrador	7	22	8	37
Total Newfoundland and Labrador	**627**	**729**	**203**	**1,558**
Other provinces	0	1,159	502	1,661
Canada	**627**	**1,888**	**704**	**3,220**

Source: Newfoundland and Labrador Hydraulic Fracturing Review Panel (for total direct employment in the province and direct employment in the Port au Port and Stephenville region) and EcoTec Consultants.

Table II.B-3 shows the total employment expected to be generated by Scenario 2, including both CAPEX and OPEX phases. Total employment in Newfoundland and Labrador is expected to reach 8,103 person-years over the 26-year period. This number includes 4,169 direct person-years, 2,979 indirect and 955 induced. Employment in other provinces generated by the expenditures in Newfoundland and Labrador is estimated at 21,814 which brings the national total to 29,937. These numbers are equivalent to 1.9 person-years per M$ spent in Newfoundland and Labrador and 7.2 per M$ for Canada as a whole.

Table II.B-3. Employment generated by Scenario 2 – total expenditures by geographical area, person-years.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	1,285	1,090	395	2,770
Burin Peninsula	97	16	19	132
Burgeo-Channel-Port aux Basques	73	49	21	144
Port au Port-Stephenville	**1,809**	**697**	**174**	**2,680**
Corner Brook-Deer Lake	196	543	125	864
Gander-Grand Falls-Windsor	177	128	56	361
Bonavista-Clarenville	159	60	40	260
Baie Verte-Lewisporte-Twillingate	168	209	51	427
Northern Peninsula	75	60	26	162
Labrador	129	128	47	304
Total Newfoundland and Labrador	**4,169**	**2,979**	**955**	**8,103**
Other provinces	0	16,536	5,298	21,834
Canada	**4,169**	**19,516**	**6,252**	**29,937**

Source: Newfoundland and Labrador Hydraulic Fracturing Review Panel (for total direct employment in the province and direct employment in the Port au Port and Stephenville region) and EcoTec Consultants.

Gross Domestic Product

Although a bit lower than Scenario 1, the GDP likely to be generated by Scenario 2 would still be significant with a total estimated at $2.8 B for the whole country, including $688.6 M in Newfoundland and Labrador and $2.1 B in other provinces and the territories (Table II.B-4). Direct GDP in Newfoundland and Labrador is expected to amount to $399.4 M. Indirect GDP is estimated at $185.9 M for the province and $1.6 B for the rest of Canada for a total of $1.8 B. Induced GDP would amount to $634.4 M, including $103.3 M for Newfoundland and Labrador and $531.1 for other provinces.

The Port au Port and Stephenville region would benefit from about $265.3 M in total GDP (38.5 % of total provincial GDP) with another $214.4 M generated in the Avalon Peninsula (31.1 %) and $68.9 M in Corner Brook-Deer Lake region (10.0 %). The remaining 20.3 % ($140.0 M) is distributed across the rest of the province.

Table II.B-4. Gross Domestic Product generated by Scenario 2 – CAPEX expenditures by geographical area, M$.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	$100.5	$71.3	$42.5	$214.4
Burin Peninsula	$7.6	$0.7	$2.0	$10.3
Burgeo-Channel-Port aux Basques	$5.8	$3.1	$2.1	$10.9
Port au Port-Stephenville	**$214.7**	**$29.3**	**$21.3**	**$265.3**
Corner Brook-Deer Lake	$15.2	$40.4	$13.2	$68.9
Gander-Grand Falls-Windsor	$13.9	$9.1	$5.7	$28.7
Bonavista-Clarenville	$12.5	$3.5	$3.9	$20.0
Baie Verte-Lewisporte-Twillingate	$13.1	$14.7	$5.3	$33.1
Northern Peninsula	$5.9	$4.3	$2.5	$12.6
Labrador	$10.1	$9.4	$4.9	$24.4
Total Newfoundland and Labrador	**$399.4**	**$185.9**	**$103.3**	**$688.6**
Other provinces	$0.0	$1,575.6	$531.1	$2,106.7
Canada	***$399.4***	***$1,761.4***	***$634.4***	***$2,795.3***

Source: EcoTec Consultants.

The OPEX phase of Scenario 1 is expected to generate $706.6 M in national GDP, including $539.1 M in Newfoundland and Labrador and $167.5 M in the rest of the country (Table II.B-5). Direct GDP in Newfoundland and Labrador is expected to reach $442.3 M with indirect GDP at $71.2 M for the province and $113.8 M for the rest of the country (total of $185.1 M). Induced GDP is assessed at $79.2 M, including $25.5 M for Newfoundland and Labrador and $53.7 M for other provinces.

A total of $466.1 M in GDP is expected to be generated in the Port au Port and Stephenville region (86.5 % of total provincial GDP) with $48.0 M in the Avalon Peninsula (8.9 %). The remaining $25.0 M (4.6 %) is distributed across the rest of the province.

Table II.B-5. Gross Domestic Product generated by Scenario 2 – OPEX expenditures by geographical area, M$.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	$6.1	$32.3	$9.5	$48.0
Burin Peninsula	$0.5	$0.6	$0.3	$1.4
Burgeo-Channel-Port aux Basques	$0.4	$0.6	$0.3	$1.3
Port au Port-Stephenville	**$431.0**	**$25.5**	**$9.5**	**$466.1**
Corner Brook-Deer Lake	$0.9	$4.9	$2.2	$8.0
Gander-Grand Falls-Windsor	$0.8	$2.0	$0.9	$3.8
Bonavista-Clarenville	$0.8	$1.0	$0.7	$2.4
Baie Verte-Lewisporte-Twillingate	$0.8	$1.7	$0.7	$3.2
Northern Peninsula	$0.4	$0.7	$0.4	$1.5
Labrador	$0.6	$2.0	$0.9	$3.5
Total Newfoundland and Labrador	**$442.3**	**$71.2**	**$25.5**	**$539.1**
Other provinces	$0.0	$113.8	$53.7	$167.5
Canada	**$442.3**	**$185.1**	**$79.2**	**$706.6**

Source: EcoTec Consultants.

The combined total of CAPEX and OPEX phases for Scenario 2 is estimated at about $3.5 B in Canada, including $1.2 B in Newfoundland and Labrador and $2.3 B in the rest of the country (Table II.B-6). Direct GDP in Newfoundland and Labrador is $841.7 M with indirect GDP at $257.1 M for the province and $1.7 B for the rest of the country (total of $1.9 B). Induced GDP is estimated at $713.7 M, including a total of $128.8 M for Newfoundland and Labrador and $584.9 M for other provinces.

A total of $731.4 M in GDP is expected to be generated in the Port au Port and Stephenville region (59.6 % of total provincial GDP) with $262.3 M in the Avalon Peninsula (21.4 %) and $76.9 M in the Corner Brook-Deer Lake region (6.3 %). The remaining $157.1 M (12.8 %) is distributed across the rest of the province.

Table II.B-6. Gross Domestic Product generated by Scenario 2 – total expenditures by geographical area, M$.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	$106.7	$103.7	$52.0	$262.3
Burin Peninsula	$8.1	$1.3	$2.3	$11.7
Burgeo-Channel-Port aux Basques	$6.1	$3.7	$2.4	$12.2
Port au Port-Stephenville	**$645.8**	**$54.8**	**$30.8**	**$731.4**
Corner Brook-Deer Lake	$16.2	$45.3	$15.4	$76.9
Gander-Grand Falls-Windsor	$14.7	$11.1	$6.7	$32.4
Bonavista-Clarenville	$13.3	$4.5	$4.6	$22.4
Baie Verte-Lewisporte-Twillingate	$13.9	$16.4	$6.0	$36.3
Northern Peninsula	$6.2	$5.0	$2.9	$14.1
Labrador	$10.7	$11.4	$5.8	$27.9
Total Newfoundland and Labrador	**$841.7**	**$257.1**	**$128.8**	**$1,227.7**
Other provinces	$0.0	$1,689.4	$584.9	$2,274.2
Canada	**$841.7**	**$1,946.5**	**$713.7**	**$3,501.9**

Source: EcoTec Consultants

Government Tax Revenues

An important measure of potential economic benefits generated by Scenario 2 expenditures is the amount of tax revenues collected by senior levels of government. As shown in Table II.B-7, it is estimated that the CAPEX phase would generate about $67.8 M in tax revenues for the provincial and $68.3 M for the federal government for a total of $136.1 M, an amount slightly lower than the tax revenues expected under Scenario 1. Tax revenues assessed in this report do not include any royalty revenues while federal tax revenues are those revenues collected in Newfoundland and Labrador.

Tax revenues from OPEX would amount to $32.1 M for the province and $38.7 M for the federal government. Hence, total tax revenues for the province under Scenario 2 are estimated at $99.9 M with the federal government collecting $107.0 M, for a total of $206.9 M. The most important source of revenues for the provincial government would be sales and excise taxes with revenues estimated at $49.5 M, followed by income tax ($31.9 M) and the tax on corporate profits ($18.5 M). The number one source of revenues for the federal government would be personal income tax with $52.4 M, with the tax on corporate profits in second place at $31.5 M and sales and excise taxes at $23.0 M.

Table II.B-7. Tax revenues generated by Scenario 2 expenditures, M$.

NEWFOUNDLAND AND LABRADOR	CAPEX	OPEX	TOTAL
Income Tax	$25.4	$6.4	$31.9
Sales and excise taxes	$36.6	$12.9	$49.5
Tax on corporate profits	$5.7	$12.7	$18.5
Total provincial government	**$67.8**	**$32.1**	**$99.9**
FEDERAL GOVERNMENT			
Income Tax	$41.5	$11.0	$52.4
Sales and excise taxes	$17.0	$6.0	$23.0
Tax on corporate profits	$9.8	$21.7	$31.5
Total federal government	**$68.3**	**$38.7**	**$107.0**
Total both governments	**$136.1**	**$70.7**	**$206.9**

Source: EcoTec Consultants

C – Expenditures on Road Construction

This section provides the economic benefits likely to be generated in Newfoundland and Labrador and Canada by an investment of $100 M for road construction in the Port au Port and Stephenville region. Table II.C-1 shows that the impact on employment is expected to reach 912 in the province, including 623 person-years in Port au Port and Stephenville region (68.3 %), 141 in the Avalon Peninsula (15.5 %) and 66 (7.2 %) in Corner Brook-Deer Lake. The remaining 82 person-years (9.0 %) are spread throughout the rest of the province. Another 310 person-years would be created elsewhere in Canada, for a national total of 1,222 person-years.

Table II.C-1. Employment generated by $100 millions in road construction expenditures by geographical area, person-years.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	0	103	38	141
Burin Peninsula	0	1	2	3
Burgeo-Channel-Port aux Basques	0	2	2	4
Port au Port-Stephenville	**532**	**50**	**41**	**623**
Corner Brook-Deer Lake	0	52	14	66
Gander-Grand Falls-Windsor	0	7	5	12
Bonavista-Clarenville	0	3	3	6
Baie Verte-Lewisporte-Twillingate	0	18	6	24
Northern Peninsula	0	2	2	4
Labrador	0	22	6	28
Total Newfoundland and Labrador	**532**	**260**	**119**	**912**
Other provinces	0	184	126	310
Canada	**532**	**445**	**245**	**1,222**

Source: EcoTec Consultants

Table II.C-2 shows the expected GDP generated by $100 M in road construction. Total provincial GDP generated is expected to amount to $76.9 M, including $50.4 M in Port au Port and Stephenville region (65.5 %), $13.5 M in the Avalon Peninsula (17.6 %) and $5.8 M in Corner-Brook-Deer Lake area (7.5 %). The rest of the province shares $7.2 M (9.4 %). With $32.7 M in other provinces and territories, total GDP for Canada is expected to reach $109.5 M.

Table II.C-2. Gross Domestic Product generated by $100 millions in road construction expenditures by geographical area, M$.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	$0.0	$9.4	$4.1	$13.5
Burin Peninsula	$0.0	$0.1	$0.1	$0.2
Burgeo-Channel-Port aux Basques	$0.0	$0.1	$0.2	$0.3
Port au Port-Stephenville	**$40.4**	**$3.7**	**$6.3**	**$50.4**
Corner Brook-Deer Lake	$0.0	$4.3	$1.5	$5.8
Gander-Grand Falls-Windsor	$0.0	$0.6	$0.5	$1.1
Bonavista-Clarenville	$0.0	$0.2	$0.3	$0.5
Baie Verte-Lewisporte-Twillingate	$0.0	$1.7	$0.5	$2.2
Northern Peninsula	$0.0	$0.1	$0.2	$0.3
Labrador	$0.0	$2.0	$0.6	$2.6
Total Newfoundland and Labrador	**$40.4**	**$22.1**	**$14.3**	**$76.9**
Other provinces	$0.0	$19.6	$13.1	$32.7
Canada	**$40.4**	**$41.7**	**$27.4**	**$109.5**

Source: EcoTec Consultants

Government revenues from a $100 M investment in road construction are expected to total $6.7 M for the provincial government and $6.3 M for the federal government for a cumulative total of $13.0 M (see Table II.C-3).

Table II.C-3. Tax revenues generated by $100 millions in road construction expenditures by geographical area, M$.

NEWFOUNDLAND AND LABRADOR	DIRECT	INDIRECT	INDUCED	TOTAL
Income Tax	$1.8	$0.5	$0.3	$2.5
Sales and excise taxes	$1.3	$0.3	$2.0	$3.6
Tax on corporate profits	$0.2	$0.2	$0.2	$0.6
Total provincial government	**$3.3**	**$1.0**	**$2.4**	**$6.7**
FEDERAL GOVERNMENT				
Income Tax	$2.6	$0.7	$0.4	$3.6
Sales and excise taxes	$0.6	$0.1	$0.9	$1.7
Tax on corporate profits	$0.4	$0.4	$0.3	$1.0
Total federal government	**$3.5**	**$1.2**	**$1.6**	**$6.3**
Total both governments	**$6.9**	**$2.1**	**$4.0**	**$13.0**

Source: EcoTec Consultants

D – Tourism Expenditures

This section looks at the economic benefits likely to flow from $100 M in tourism expenditures in both the Northern Peninsula where the Gros Morne National park is located ($70 M) and the Port au Port and Stephenville region ($30 M). The distribution between the two regions is based on an average of provincial data about total rooms sold by Economic zone and the percentage of nights for non-resident tourists. This approach was designed to spread the direct tourism expenditures according to existing patterns in Western Newfoundland and Labrador.

As shown in Table II.D-1, a total of 882 person-years would be generated within the province, including 461 (52.3 %) in the Northern Peninsula area, 171 (19.4 %) in the Port au Port and Stephenville region and 108 in the Avalon Peninsula (12.2 %). Another 112 person-years (12.7 %) is distributed in other regions within the province.

Table II.D-1. Employment generated by $100 millions in tourism expenditures by geographical area, person-years.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	55	26	27	108
Burin Peninsula	3	1	1	5
Burgeo-Channel-Port aux Basques	2	1	1	5
Port au Port-Stephenville	**171**	**14**	**16**	**201**
Corner Brook-Deer Lake	29	10	10	49
Gander-Grand Falls-Windsor	10	4	4	19
Bonavista-Clarenville	3	2	3	8
Baie Verte-Lewisporte-Twillingate	5	3	3	11
Northern Peninsula	400	27	34	461
Labrador	7	4	4	15
Total Newfoundland and Labrador	**686**	**93**	**103**	**882**
Other provinces	141	174	154	469
Canada	**827**	**267**	**257**	**1,350**

Source: EcoTec Consultants.

Table II.D-2 shows the expected GDP generated by the tourism expenditures: $63.3 M in Newfoundland and Labrador and $46.3 M in other provinces for a total of $109.6 M. The region with the highest GDP is the Northern Peninsula with $30.2 M (47.7 %) followed by Port au Port and Stephenville with $13.3 M (21.0 %) and the Avalon Peninsula with $10.2 M (16.1 %). The remainder ($9.6 M for 15.2 %) is generated elsewhere in the province.

Table II.D-2. Gross Domestic Product generated by $100 millions in tourism expenditures by geographical area, M$.

	DIRECT	INDIRECT	INDUCED	TOTAL
Avalon Peninsula	$4.7	$2.5	$3.0	$10.2
Burin Peninsula	$0.2	$0.1	$0.1	$0.4
Burgeo-Channel-Port aux Basques	$0.1	$0.1	$0.1	$0.4
Port au Port-Stephenville	**$10.4**	**$0.9**	**$2.0**	**$13.3**
Corner Brook-Deer Lake	$2.3	$0.8	$1.1	$4.3
Gander-Grand Falls-Windsor	$0.8	$0.3	$0.4	$1.6
Bonavista-Clarenville	$0.2	$0.2	$0.2	$0.7
Baie Verte-Lewisporte-Twillingate	$0.4	$0.2	$0.3	$0.9
Northern Peninsula	$24.1	$1.8	$4.3	$30.2
Labrador	$0.6	$0.3	$0.4	$1.3
Total Newfoundland and Labrador	**$44.0**	**$7.3**	**$12.0**	**$63.3**
Other provinces	$13.5	$16.6	$16.2	$46.3
Canada	**$57.5**	**$23.9**	**$28.2**	**$109.6**

Source: EcoTec Consultants.

The $100 M in tourism expenditures is expected to generate government revenues of $5.1 M for the provincial government and $4.2 M for the federal government for a total of $9.3 M (see Table II.D-3). Income tax revenues are low because wages in the tourism industry are at the bottom of the salary scale and are therefore subjected to lower tax rates.

Table II.D-3. Tax revenues generated by $100 millions in tourism expenditures by geographical area, M$.

NEWFOUNDLAND AND LABRADOR	DIRECT	INDIRECT	INDUCED	TOTAL
Income Tax	$0.6	$0.2	$0.2	$1.1
Sales and excise taxes	$1.8	$0.2	$1.5	$3.4
Tax on corporate profits	$0.4	$0.1	$0.1	$0.6
Total provincial government	**$2.8**	**$0.5**	**$1.8**	**$5.1**
FEDERAL GOVERNMENT				
Income Tax	$0.8	$0.3	$0.3	$1.5
Sales and excise taxes	$0.8	$0.1	$0.7	$1.6
Tax on corporate profits	$0.7	$0.1	$0.3	$1.1
Total federal government	**$2.4**	**$0.6**	**$1.3**	**$4.2**
Total both governments	**$5.2**	**$1.0**	**$3.1**	**$9.3**

Source: EcoTec Consultants.

CONCLUSION

Hydraulic fracturing in Western Newfoundland has the potential to generate significant economic benefits spread over a period spanning a 26-year period. As the economy of Western Canada has cooled off over the last year, many residents of Newfoundland and Labrador working in the oil and gas industry have found themselves unemployed. Therefore, hydraulic fracturing on the island is a timely match for the Newfoundland and Labrador workforce that has the potential to provide meaningful economic benefits for the province and Canada as a whole.

However, as Table 1 below shows, other economic activities can also generate significant economic benefits. This is especially true when looking at economic benefits per dollar spent in Newfoundland and Labrador. Employment per million of dollars initially spent in the province vary from a low of 1.9 person-year per M$ for both Scenario 1 and 2 for hydraulic fracturing to a high of 8.8 and 9.1 for road construction and tourism expenditures respectively.

The main reason for such discrepancies is the high import content of specialized machinery, equipment and engineering services required by hydraulic fracturing. This also implies bringing some specialized workers from other parts of the country. This is not a factor when it comes to road construction and the tourism industry, obviously: most inputs required to build a road or operate a hotel can be found in the province.

Table 1. Economic benefits per dollar spent, person-years and dollars.

STATISTICS	SCENARIO 1	SCENARIO 2	ROAD CONSTRUCTION	TOURISM EXPENDITURES
Employment (per M$ spent)	1.9	1.9	9.1	8.8
GDP	$0.31	$0.29	$0.77	$0.63
Provincial Tax Revenues	$0.03	$0.02	$0.07	$0.05
Federal Tax Revenues	$0.03	$0.03	$0.06	$0.04

Source: EcoTec Consultants

The differential between hydraulic fracturing scenarios and the other two activities is also found, but to a lower degree, for GDP and tax revenues. The amount of GDP generated per dollar spent is $0.30 (on average) for hydraulic fracturing, $0.63 for tourism and $0.77 for road construction. Provincial tax revenues amount to only $0.02 to $0.03 per dollar spent under the scenarios for hydraulic fracturing ($0.03 for federal revenues). This seems low, but it does not include any royalty regime. Provincial tax revenues represent $0.07 per dollar spent for road construction and $0.05 for tourism. Federal revenues are $0.06 and $0.04 respectively.

Comparing side by side hydraulic fracturing, road construction and tourism expenditures is a bit like comparing apples and oranges: they each have a place in a modern economy with different economic drivers. As such, the comparison is merely shedding some light on economic benefits per dollar spent and is not meant to settle any argument over the impact on society or the environment.

ANNEX A – Economic Impact Model

The potential economic benefits generated by both scenarios for hydraulic fracturing, road construction and tourism expenditures have been calculated using an economic impact model developed by EcoTec Consultants. This model is dynamic and is based on an Input-Output algorithm core supplemented by econometric modules. All data used in the impact model come from either Statistics Canada or the Canada Revenue Agency.

Input-Output (IO) models are widely used to calculate economic impacts throughout Canada. These models provide a fairly accurate representation of the national, provincial or regional economy. By following the path taken by initial

expenditures throughout the economy, IO models are able to estimate total sales and employment by industry as well as government tax revenues.

The economic impact model developed by EcoTec Consultants has unique abilities, including the assessment of economic benefits at the county level anywhere in the country. These models have been used across Canada over the last 33 years to estimate economic benefits for a wide range of impact scenarios. They have been used extensively to estimate the economic impacts of oil and gas projects, road construction and tourism activities.

Here are some definitions of a few terms used in this report.

Direct Impacts

In the case of hydraulic fracturing expenditures, direct economic impacts refer to the expenditures in Newfoundland and Labrador for all activities, including drilling crews working on site (for construction phase) as well as the money spent to operate the production sites once operational. Direct impacts for road construction are essentially the expenditures undertaken to build roads, including crews on site. Direct tourism impacts related to the expenditures made by tourists at hotels, restaurants, national parks and other tourism-related businesses and their employees.

Indirect Impacts

The indirect impacts are essentially the suppliers hydraulic fracturing, road construction and tourism activities who do not work on-site. For example, a concrete plant providing truckloads of ready-mix concrete to build foundations for buildings or the gravel pit providing gravel for the road bed. Indirect impacts also include the suppliers of the concrete plant and the suppliers of those suppliers, etc. Hence, they include the sales and employment of firms providing fuel, repairs, etc. to the concrete plant. As a whole, indirect impacts represent the total economic benefits of business to business purchases.

Induced Impacts: Consumer Expenditures

Induced economic impacts are generated by the consumer expenditures of employees of all the firms that benefited from the direct and induced impacts. Since consumer expenditures represent over 60% of the Gross Domestic Product, it is essential to have an accurate assessment of the induced impacts in order to fully comprehend the overall economic benefits generated by hydraulic fracturing, road construction or tourism expenditures.

Gross Domestic Product (GDP) and Sales

The Gross Domestic Product (GDP) is the measure, in dollars, of the total production in a given economy. The impact statistics on GDP shown in this report include the following elements:

- Indirect taxes on goods and services, such as the HST;
- Indirect taxes on production, such as excise taxes on alcohol and tobacco;
- Subsidies to businesses, including to the agriculture sector;
- Wages and salaries;
- Supplementary Labour Income: Employer's contributions for Employment Insurance, Canada Pension Plan, private pension plans, medical and dental plans, etc.
- Revenues of unincorporated businesses (professionals, home-based businesses, etc.)
- Profits and depreciation allowance for incorporated firms.

Assumptions and Limitations

The models used to calculate the economic benefits are based, like any model, on certain assumptions and have some limitations. Some of the known limitations of Input-Output models are:

- Fixed technology. Technology is assumed constant over time.
- No supply constraints. Suppliers within the province and within Canada are able to provide for all requirements of both scenarios of hydraulic fracturing, road construction and tourism expenditures.