



SOCIO-ECONOMIC BENEFITS

10.1 Introduction

The report to this point has focused on developing the high speed rail system concept and analysing the fundamentals of the system, including capital cost, ridership and revenue projections and operating costs. Chapter 9 brought all these elements together and analysed the financial viability of the system, confirming that projected revenues can cover all operating costs and completely or partly repay the system's capital cost depending on which high speed rail alternative and financing option are chosen.

Regardless of these choices, implementation of high speed rail requires a very large upfront capital investment of public funds for which there are undoubtedly many competing demands. For this reason, it is important not only to address the financial viability of the system but the social, economic and environmental benefits that high speed rail can bring to Alberta; more specifically, how high speed rail could change the social and economic environment of the corridor as it exists today and, especially, how it could reshape social and development patterns and the economy in the future to Alberta's betterment.

This Chapter draws on three sources – a socio-economic assessment carried out by Colledge Transportation Consulting, Economic Development Research Group and DRE Transportation Solutions; additional information supplementing and corroborating this work based on socio-economic quantification measures developed by the Canadian Institute for Tourism Research and EarthTech for VIA Rail; and, commentary and analysis by Dr. Alain Verbeke, holder of the McCaig Chair in Management at the Haskayne School of Business at the University of Calgary.

This Chapter describes the social, economic and environmental benefits associated with the high speed rail alternatives, including ridership, capital cost and operating costs described previously in this report. Wherever possible, these benefits have been quantified but, in some instances, data or information is lacking to permit quantification and benefits are addressed in qualitative terms.

10.2 User Benefits

User benefits are fundamental to justifying any transportation investment and intuitively underlie the decisions that consumers make to use the service. The two primary quantifiable user benefits associated with high speed rail are travel time and cost savings relative to existing transportation modes. Other benefits, including less stress for car drivers, more space and comfort, more productive use of time and improved travel reliability, particularly in winter, have not been quantified as specific research on these factors is needed, which can only be meaningfully carried out after the service is in operation. Nevertheless, these concerns factor into customer decisions to use the service and result in positive benefits to system users that should not be overlooked.

10.2.1 Travel Time Savings

Given the multitude of origins and destinations associated with both current travellers and forecast riders, travel time savings can only be approximated at this stage of analysis without either very complex transportation modeling or post-operation before-and-after surveys of users, both of which were beyond the scope of this study. For the purpose of this study, a simplified approach was taken to calculate travel time savings.

Travel time savings were calculated based on the following categories:

- Calgary-Edmonton⁴⁹ and Red Deer-Calgary/Edmonton riders;
- Business and Non-Business riders; and,
- Time savings relative to use of car, air and bus by diverted passengers.

Travel time savings were estimated looking at door-to-door travel time based on assumptions about average access and egress time for all modes and in-terminal and waiting time for air, bus and high speed rail in addition to en-route travel time. For example, car travel time between Calgary and Edmonton was estimated to be on average 180 minutes of driving time (assuming a speed of 100 km per hour) plus 15 minutes of total access/egress time allowing for the driver to get to their vehicle, find parking and walk to their destination or both. While some drivers may travel faster and make this trip in less time, others may have to stop for gas, be delayed by traffic or simply travel more slowly. Regardless, the key issue is the comparative difference between car and high speed rail travel time that has been calculated with the same kind of logic and assumptions. The following table outlines the average door-to-door travel times estimated for each mode.

ESTIMATED DOOR-TO-DOOR TRAVEL TIMES (MINUTES)					
Calgary-Edmonton	Car	Air ¹	Bus	CPR HSR	Greenfield Electric HSR
In-Vehicle	180	55	200	130	97
Access/Egress	15	75	30	30	30
In-Terminal	0	65	15	15	15
Total	195	195	245	175	142
Red Deer					
In-Vehicle	90	N/A	90	65	48
Access/Egress	15	N/A	15	15	15
In-Terminal	0	N/A	15	15	15
Total	105	N/A	120	95	78

¹ Assumes flights between Calgary International and Edmonton International Airports.

⁴⁹ Time savings for travellers using the two suburban stations in Calgary and Edmonton were assumed to equal those using the downtown stations.

Based on the above, the CPR alternative offers a 20 minute or 10 percent travel time saving relative to both car and air travel and 70-minute or 29 percent travel time saving compared with bus travel between Calgary and Edmonton. With the Greenfield Electric alternative, travel time savings increase to 53 minutes or 27 percent compared with car and air travel, and 103 minutes or 42 percent compared to bus travel. These estimates, however, are most likely conservative as high speed rail users are more likely to comprise individuals whose origin and/or destination are close to the stations, issues that are factored into the ridership modeling from the market research but generalized in the above estimate. Furthermore, they are based on current estimates of comparative door-to-door travel time, whereas future in-vehicle travel time required for both car and bus are likely to increase due to growing congestion while high speed rail will remain the same.

The value of time for business travellers is based on the June 2004 average wage for adults age 25 to 54 in Alberta of \$20.58⁵⁰ plus 25 percent for benefits to reflect the total cost to employers. The value of time for non-business travellers used is approximately 50 percent of the June 2004 average wage without benefits.⁵¹

Based on these assumptions, the net present value⁵² (NPV) of travel time savings associated with the CPR alternative are \$317 million, and with the Greenfield Electric are \$332 million over the 30-year life of the project. While some might discount the monetary value of non-business travel as being theoretical, business traveller time savings are very tangible and make up more than three-quarters of this benefit.

10.3 Travel Cost Savings

Unlike travel time savings, cost savings resulting from using high speed rail instead of other existing modes are relatively straightforward to calculate. Whether for business or non-business travel, cost savings represent the net difference between the current cost of travel by other modes and the cost of high speed rail. However, while air and bus fares are published, car costs again require estimation.

Albertans spend \$8,828 per year (2001) or 13 percent of their total household budget on transportation.⁵³ Some 90 percent of this is spending on private vehicles (based on national estimates). The average number of vehicles per family is 1.66 and the average distance traveled is 18,900 km per year, resulting in an average vehicle operating cost of 25 cents per km. By comparison, the Canadian Automobile Association reports the 2003 average operating cost to be 14 cents per km based solely on variable operating costs, and 42 cents per km based on total ownership costs, with these costs varying according to type of vehicle. The latter figure of 42 cents per km also reflects the mileage cost commonly accepted by government and many businesses for reimbursement of their employees.

⁵⁰ Statistics Canada, *Labour Survey*, June 2004.

⁵¹ 50% represents a blended rate to reflect a mix of drivers and passengers for which the US Federal Highway Administration requirements specify 60% of average wage without benefits for drivers and 45% for passengers. Transportation Research Board, *Guidebook for Assessing Social and Economic Effects of Transportation Projects*, 2001.

⁵² All Net present value calculations are based on a 6 percent discount rate.

⁵³ Statistics Canada, *Market Research Handbook*, 2003 Edition.

Perceived vehicle operating cost and its effect on travel choice tends to differ for business and non-business travel. For non-business travel, the choice of car or rail is strongly influenced by out-of-pocket or variable costs made up principally of fuel cost. As a result, the low end cost of 14 cents per km was adopted for non-business travellers, and the high end cost of 42 cents per km was used for business travellers.

ONE-WAY TRAVEL COSTS (including access/egress cost) ¹					
Calgary-Edmonton	Car	Air ²	Bus ³	CPR HSR	Greenfield Electric HSR
Business	\$126	\$210	\$63	\$67.50	\$67.50
Non-Business	\$42	\$172.50	\$47	\$48.50	\$48.50
Red Deer – Calgary/Edmonton					
Business	\$63	N/A	\$47	\$45	\$45
Non-Business	\$21	N/A	\$31	\$35	\$35

¹ Access/egress cost for business travel by air is assumed to be \$75 by bus and HSR \$10. For non-business travel, access/egress cost are assumed to be zero for bus and rail and half the cost of business for air on the premise that travellers will for the most part be dropped off or picked up by friends or family, or share costs with other travel companions and they will be negligible.

² Assumes flights between Calgary International and Edmonton International Airports.

³ Business bus fare is based on Red Arrow's business-oriented service fare and non-business is based on Greyhound's fare.

Based on these assumptions, the net present value of travel cost savings associated with the CPR alternative is between \$603 million and \$1,128 million depending on assumed car occupancy⁵⁴. With the Greenfield Electric alternative, the net present value of travel cost savings is between \$756 million and \$1,258 million over the 30-year life of the project.

10.4 Economic Development

Judging from high speed rail experience elsewhere in the world, its introduction to the Calgary–Edmonton corridor has the potential to fundamentally change the level and types of economic activities that occur within the region. By reducing travel time and cost, high speed rail would effectively shrink the distance between Calgary, Red Deer and Edmonton, thus integrating distinct markets and helping to create a more unified economic region⁵⁵. It would also add transportation choice and promote competitive pricing for travel in the region, while improving the efficiency of the overall transportation network. In turn, these changes would lead to shifts in business and residential location, development patterns and improvements to quality of life.

Reduced travel time for existing businesses increases their access to labor, customer and supplier markets. This can both reduce business costs and enhance business efficiency by providing

⁵⁴ The low end assumes average car occupancy of 1.25 persons per vehicle. However, high speed rail users are more likely to otherwise be single car occupants. As a result, cost savings would tend to be at the high end.

⁵⁵ Studies on the recently opened high speed rail line in Korea that this change in perception was profound and has had a strong impact on businesses.

access to larger numbers of workers as well as better access to suppliers of materials and services. By enhancing access and interchange with the region's international airports, high speed rail offers opportunities to rationalize air services and develop partnerships with airlines that could lead to lower air operating costs⁵⁶ and expansion of the overall range of flight destinations from the region as well as improved access for international visitors. Reduced travel time for residents would also increase access to job opportunities as well as choices of where to live and lifestyle and expand options for shopping, services and tourism.

More importantly, these fundamental changes can re-shape the region's future development and, either by themselves or in concert with economic development strategies and marketing, elevate the region's attractiveness to more people and new types and scales of businesses in the future. These changes would allow Alberta to build on its existing competitive advantages, and could catapult it to the "next level" where the region is, or is seen to be fundamentally different and move it up a level in terms of its attractiveness to both people and business.

HIGH SPEED RAIL'S POTENTIAL ROLE IN CREATING A MORE INTEGRATED, DYNAMIC ECONOMIC REGION

STAGE 1 – SHORT TO MEDIUM TERM CHANGES

- ▶ **Reduce travel times** and the costs of economic interactions in the region.
- ▶ **Shift business location patterns**, area economic specialization and demands on infrastructure.
- ▶ **Change perceived quality of life** for those who work and reside in the region and offer an attractive location for firms considering investments in the region.

STAGE 2 – FUNDAMENTAL STRUCTURAL CHANGES

- ▶ **Reshape development patterns.**
- ▶ **Attract more people and new types and scales of businesses**

10.4.1 Short to Medium Term Business Attraction

Investment in a high speed rail system in Alberta in both the short and long term is likely to have two primary consequences:

- **External attraction** - business growth and attraction to Alberta, relative to the rest of Canada, may be enhanced with the result that high speed rail draws business activity to the region that might have otherwise located outside Alberta.

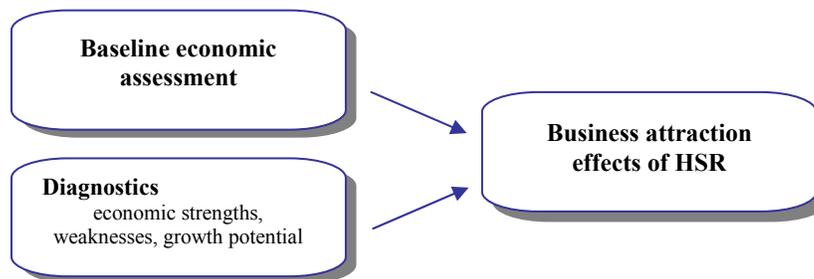
⁵⁶ This has been the case in France with the Paris-Lyon-Marseilles TGV line where airlines such as Continental now offer joint travel packages with SCNF rail operator. Similarly, Virgin Airlines are a proposed operating partner in the Florida high speed rail project.

- Intra-provincial (distributional) - the specific location of business growth and attraction within the high speed rail corridor (e.g., affects the location of new businesses in Red Deer, Calgary or Edmonton) may change as a result of the new service.

The short to medium term economic growth effects of high speed rail were modeled using a business attraction model. The model captures the effects of changes in travel times and travel costs on current businesses, and assesses corresponding effects on business attraction. The model contains economic profiles, trends and growth projections for more than 80 industries, and evaluates each industry for economic performance gaps and thus potential for local business attraction by rating local area advantages and disadvantages.

Advantages and disadvantages are defined in terms of 1) costs of labour, materials, utilities, transportation and taxes; 2) size and characteristics of the local workforce; and, access time and costs for highway, air and rail transport, as well as the sensitivity of each industry to these factors. In addition, the model evaluates the effects of high speed rail on the size of the labour, product and final markets that can be accessed from local sites and then calculates the likely business attraction effects of high speed rail.

HSR Business Attraction Model



However, the model does not address long term structural changes to the region, including changes to development patterns, resident and business behaviour and business cost base, as well as efficiencies and rationalization in transportation and their effects on business attraction. Nor does it address other effects such as enhanced competitive image or changed perceptions about the province. These long term or secondary effects are dealt with separately later in this Chapter.

External Business Attraction Effects

The business attraction model estimates that an additional 1,600 jobs would be drawn to the region in the short to medium term based on the CPR alternative, and up to 2,600 jobs with the Greenfield Electric alternative. The corresponding growth in employment income is estimated to be \$49 million per year for the CPR alternative, and \$73 million per year for the Greenfield Electric alternative.

Assuming that some lag may occur before business reacts to high speed rail implementation, a ramp-up period comparable to that for system ridership was assumed. On this basis, the net

present value of incremental employment over the 30-year life of the project is estimated to be \$619 million with the CPR alternative and \$922 million with the Greenfield Electric alternative. Please note that these jobs do not include direct, indirect or induced employment resulting from construction or operation of high speed rail, which are identified separately later in this Chapter under Financial Benefits.

Intra-provincial Business Attraction Effects

In the short to medium term, high speed rail is likely to result in strong business attraction to Red Deer, as firms wishing to serve the Calgary and/or Edmonton markets or take advantage of their skilled labour pools will be able to do so more easily from Red Deer. As the smallest of the affected cities, Red Deer will have better linkages to two cities with populations about seven times larger than its own. For Calgary and Edmonton, however, the linkage with Red Deer would increase their effective market sizes by 15 percent at present. Thus, Red Deer also experiences a far larger increase in access to new markets, an advantage magnified by its strong cost advantage in two important input factors, labour and land. Furthermore, Red Deer would also benefit from the introduction of a non-highway linkage as it does not currently have an international airport. Its linkage to both Calgary and Edmonton International Airports would be substantially improved with high speed rail.

The modeling results suggest that the introduction of high speed rail would initially shift about 1,500 jobs to Red Deer based on the CPR alternative, and about 2,600 jobs based on the Greenfield Electric alternative. In both cases, about half of these jobs would be re-distributed from Calgary and Edmonton. However, the intra-provincial shift in immediate new business attraction towards Red Deer could be larger if labour market interactions between Red Deer and Calgary and Edmonton are high, either through high levels of actual commuting between those cities, or through improved access by Red Deer firms to skilled labour in Edmonton and Calgary and vice versa.

NET EXTERNAL & INTRA-PROVINCIAL BUSINESS ATTRACTION SUMMARY			
	Calgary	Red Deer	Edmonton
Estimated 10-yr employment growth without HSR	203,700	26,500	173,000
▶ External business attraction effect:			
- CPR alternative	835	109	709
- Greenfield Electric alternative	1,307	170	1,109
▶ Intra-provincial attraction shift:			
- CPR alternative	-589	1,508	- 919
- Greenfield Electric alternative	-779	2,025	-1,246
Annual employment growth			
- without HSR	2.70%	2.70%	2.70%
- CPR alternative	2.70%	2.85%	2.70%
- Greenfield Electric alternative	2.71%	2.90%	2.70%

However, this attraction to Red Deer is not expected to result in net employment loss to Calgary or Edmonton. Based on current trends in employment growth, the combined increase in jobs in Red Deer, Calgary, and Edmonton is expected to be about 400,000 within the next ten years. With the CPR alternative, Red Deer's annual employment growth rate increases by 0.2% (from 2.70% to 2.90%) while it stays the same for Calgary and Edmonton (2.70%).

In other words, Red Deer will tend to attract businesses seeking to take advantage of its lower cost base and improved accessibility, while Calgary and Edmonton continue to attract new business that require city amenities and proximity to other like businesses. The result would be tempered demand in Edmonton and Calgary for industrial and commercial real estate, municipal infrastructure, and workers. By slowing price pressures in land and labour in Calgary and Edmonton, the overall attractiveness of the cities for business investment and expansion will be increased, in turn encouraging other businesses to expand or locate there.

10.4.2 "Second Stage" Effects of High Speed Rail

The short to medium term shifts in business attraction would also set in motion longer term effects, including economic complementarity and changed perception of Alberta in the international business community that could influence the future economic growth trajectories of Calgary, Edmonton and Red Deer.

Calgary-Edmonton Complementarity

Historically, Calgary and Edmonton have been highly complementary cities. In the oil and gas sector, for example, they developed different complementary roles with Calgary as the location of corporate headquarters and Edmonton as the operations centre. In the 1980s, the corresponding rate of travel between the two cities was believed to be as high as any city pair in North America⁵⁷.

Over the years, the relationship between Edmonton and Calgary has evolved as the business community has grown and become more sophisticated. In the 1970s and early 1980s business was heavily focused on development opportunities within the province. This resulted in significant regional travel and contributed to Pacific Western Airline's highly successful Airbus service between Edmonton and Calgary.

Throughout the late 1980s and into the present, global trade in products and services increased in importance to the Alberta business community. The emerging focus on export markets outside of the corridor made regional travel relatively less important than long-haul inter-regional travel. At the same time, policy decisions decreased Edmonton's share of provincial government employment and new communication technologies emerged. As a consequence of these changes, the demand for transportation between Edmonton and Calgary may have diminished relative to the level of business activity in the province.

Calgary and Edmonton will continue to depend on each other because of shared interests in the future development of the energy sector. The future importance of northern energy also implies greater interaction between Edmonton and northern cities such as Fort McMurray. The TD Bank

⁵⁷ Alberta Transportation.

Economics group recently observed that cities in general are responding to global forces by building strong relationships with each other and suggested that communities in the Calgary-Edmonton corridor are becoming more “economically intertwined as flows of trade and labour move freely within the region.”⁵⁸

Another important consideration is the size of the cities. When Calgary and Edmonton were smaller, neither could fully support all of the functions of industry. This produced a certain degree of specialization as each city shared/traded services and resources. As the cities grew, they were able to support a wider range of activities and reach internal economies of scale. As a result, they became less specialized and less dependent on the other. High speed rail could catapult the region to the “next level” by transforming it from a region with two major centres of one million population each to a more cohesive regional economy possessing a greater critical mass that is seen as an integrated unit of 2 to 3 million population, and whether this will positively influence international companies seeking these attributes.

Competitive Image

Local economic development officials in the region emphasize that high speed rail could help Alberta achieve greater status and attention as a competitive, ultra-modern business region. This would act as a catalyst for economic growth and development, create new employment opportunities and help attract greater international investment to the province. It would also reshape development and growth.

By changing the perception of the region to a single integrated economic unit, economic development officials will be able to “sell” the region internationally as a unified metropolitan market of three million persons, instead of two separate cities of one million people, or in the case of Red Deer 72,700 people.

The second effect would be to change the economic development model used in the region from a competitive one in which Calgary, Edmonton, and Red Deer each separately recruit businesses, to a cooperative one, where the three cities jointly promote the whole region. Although local development officials report that such cooperation has already begun, implementation of high speed rail could accelerate and intensify the process, thereby maximizing the efficacy of economic development resources and making the region more attractive to outside firms and people.

Although it is not possible to translate these types of impacts into job estimates, these benefits could be significant future generators of employment in the corridor, perhaps meeting or exceeding the estimated employment impacts suggested previously in Section 10.4.1.

10.5 Property Values

Changes in property values reflect shifts in demand for residential or commercial properties relative to their available supply. Generally, high speed rail does not lead to change in region-wide housing or commercial land/building demand and increased prices but rather to localized impacts, including

⁵⁸ TD Bank Economics, *The Calgary-Edmonton Corridor*, Special Report, April 2003.

new and higher density development around station locations, which in turn tends to increase property values in those areas. General evidence from Europe, Japan and the US suggests that:

- Where high speed rail stations are located at existing intercity rail stations in the built-up downtown areas, they tend to stimulate little or no new development and hence have no significant impact on land/building values. However, if a new rail station is developed, land/building values around the site will benefit from the increased traffic flow.
- Where new high speed rail stations are constructed at urban fringe locations, providing major improvement in access to downtown or airport areas, new commercial and mixed-use development (and hence change in land/building values) is often stimulated in surrounding areas.
- Where a new high speed rail station is constructed at a medium-size community located along the route between larger cities, there can also be significant new commercial office development and hence increases in land values. This depends largely on the relative magnitude of changes in access times, volumes of additional riders passing through the area, and the nature of surrounding land use and buildings at that location.
- Increased attraction of business and population to a medium-size community located along the route between larger cities as a result of its improved accessibility can also lead to increased demand for commercial, retail and residential development with corresponding increases in land values. Initially, much of this will depend on the value of property in the mid-sized city being lower than similar properties in the large cities so as to offset transportation costs. However, once the economy of the mid-sized centre grows and becomes increasingly self-sustaining rather than a commuter shed this differential value becomes less important.

In this context, we would expect to see relatively small increases in land development and property values at the downtown Edmonton and Calgary stations, but larger potential for increases at the South Edmonton and Calgary airport locations, as well as in Red Deer, although that will depend on the specific location for that station and surrounding land availability. Red Deer should also benefit from higher demand for business locations and housing.

Unfortunately, quantifying land value increases is not possible at this stage of investigation in part because detailed station location studies have not been undertaken to determine the precise station locations, and in part due to lack of precise information on additional demand for residential, commercial and industrial land.

10.6 Transportation Network Optimization

The introduction of high speed rail into the Calgary-Edmonton corridor would add another transportation option for travellers, thus diversifying the transportation network and creating more competition within this market. The benefits to high speed rail users have already been addressed. However, the effects of introducing high speed rail on other elements of the transportation system also require attention. Potential benefits include easing of road congestion and the possible deferral of highway infrastructure investment, improved inter-modal connectivity, and improved

reliability and efficiency for rail freight operations as a result of track upgrades, particularly in the case of the CPR alternative.

10.6.1 Road Congestion and Highway Infrastructure

By diverting some travellers from cars, including those now driving to the airports, and shifting future growth towards Red Deer, high speed rail would reduce the demand on existing roads. As a result, it may ease congestion, particularly on some of the main access routes to Calgary and Edmonton. In so doing, it may improve traffic flow and delay the need for infrastructure expansion and investment. All three cities are expected to experience high employment and population growth in the future, which means that any relief provided by high speed rail will increase in value over time.

Unfortunately, it is impossible to quantify the longer term effect of high speed rail's role in shifting growth and development patterns on traffic congestion due to the many other parameters and resulting dynamic changes that affect travel. Similarly, the immediate effect of diverting car trips to high speed rail cannot be quantified without complex and detailed traffic modeling, which was beyond the scope of this study. However, a rough assessment of potential immediate benefits can be provided, although these are likely to be relatively small compared to the longer term effect.

Based on the ridership estimates, an estimated 0.9 to 1.2 million Calgary-Edmonton passenger-trips, depending on the high speed rail alternative, would have been diverted from cars if it had been in operation in 2003. This represents about 18 to 21 percent of the origin-destination car passenger trips between Calgary and Edmonton.⁵⁹ To this figure, another 0.3 million Red Deer to Calgary/Edmonton car passenger-trips and 0.2 million car passenger-trips to the airports by diverted air passengers can be added, bringing the total to 1.3 to 1.5 million⁶⁰ fewer car passenger-trips on the approaches to Calgary and Edmonton last year, and 1.1 to 1.3 million fewer car passenger-trips in the mid-section of Highway 2 (i.e. beyond the airports).

HSR VEHICLE REDUCTION ON APPROACHES TO CALGARY/EDMONTON (2003)		
	CPR Alternative	Greenfield Electric
HSR Annual Passengers:		
Calg-Edm – from cars	934,000	1,251,000
Calg-Edm – from air	186,000	224,000
Red Deer to Calg/Edm – from cars ¹	164,000	164,000
Total Passengers Diverted from approaches to Calgary & Edmonton	1,284,000	1,639,000
Annual Vehicle Reduction @ Avg. 1.25 persons/vehicle	1,027,000	1,311,000
Weekday Vehicle Reduction (divided by 300 days) rounded	3,500 VPD	4,000 VPD

¹ One-half of total diverted car passengers.

⁵⁹ Source: Ipsos-Reid Market Research Survey, *HSR Pre-Feasibility Study*.

⁶⁰ 50% of Red Deer trips to each city is assumed.

Based on an assumed vehicle occupancy of 1.25 persons per vehicle⁶¹, the reduction in road traffic would be about 1.0 to 1.2 million vehicle-trips a year, or 2,800 to 3,200 vehicles/day (VPD) near Calgary and Edmonton (2,400 to 2,800 vehicles/day in the mid section). By comparison, the Highway 2 traffic volume ranges from a low of about 18,000 VPD at Morningside (just north of Red Deer) to about 50,000 VPD near the Calgary and Edmonton city boundaries.⁶² Therefore, the VPD reduction due to the introduction of high speed rail represents about 6 to 16 percent of the average total daily traffic on Highway 2, depending on location. Assuming that high speed rail use is skewed to weekdays, the trip reduction could be about 3,500 to 4,000 VPD (1.0 -1.2 million/300 days per year), or 7 to 24 percent of the average weekday traffic volume again depending on location.

The benefit of this reduction in terms of congestion relief and the degree to which this relief is felt depends on several location-specific factors, including road configuration, current congestion (level of service), local traffic patterns, time of travel and the concentration of diverted high speed traffic. Benefits will be felt most at choke points in the road system or where traffic flow is poor, and where all of the high speed rail traffic reductions combine. Conversely, where traffic is free flowing, and traffic diverted to high speed rail is dispersed through the city streets and mixed with local traffic, the effect of the diverted traffic will be minimal.

A recent review of the Highway 2 corridor between Calgary and Edmonton for the Alberta Ministry of Transportation assessed the corridor as follows:

“High traffic volumes and related congestion (level of service C and D) are currently prevalent during peak periods in the Deerfoot Trail section of the corridor. Over the longer term, with continued growth forecast and no new alternate routes planned for implementation in the foreseeable future (within 10 years), the level of service provided on this facility will continue to degrade.

The suburban sections of the corridor (e.g. Airdrie to Calgary and Leduc to Edmonton, Anthony Henday Drive) currently experience limited congestion in peak hours. This congestion is likely to increase over the longer term as volumes continue to increase. The majority of the Highway 2 corridor is rural in nature and carries relatively light traffic volumes. Congestion is not prevalent during peak hours.”⁶³

On this basis, the primary area of benefit from high speed rail would be during peak hours in the Deerfoot Trail section of the corridor and choke points on access routes to Highway 2 in Calgary and Edmonton, and to a lesser extent, the suburban sections between Airdrie and Calgary, and between Leduc and Edmonton. Assuming 60% of the 3,500 to 4,000 diverted trips are in the predominant direction and 20% of these trips occur in the peak hour, some 500 vehicles/hour

⁶¹ Average vehicle occupancy in Alberta ranges from 1.25 to 1.75 persons/vehicle.⁶¹ However, as those passengers diverted to rail would likely be from lower occupancy vehicles.

⁶² Source: Alberta Transportation vehicle classification, travel and statistics report, 2003.

⁶³ Delcan Corporation, ATIS and ATMS Blueprint for Highway 2 between Edmonton and Calgary, Alberta Transportation, October 2003.

would be removed from the system during the peak⁶⁴. While seemingly a small number relative to the overall traffic volume, this reduction would have a noticeable effect by improving those sections of the highway and urban access roads and choke points operating with unstable flows (level D through F) to stable flows (level C).

The following table summarizes the current peak hour traffic levels on these key congested links on the Deerfoot Trail section of Highway 2 and impact that a 500 vehicle reduction would have on traffic flow in the peak hour.

IMPACT OF HSR ON DEERFOOT TRAIL CONGESTION					
	Pk Hr Vehicles	Adj. Pk Hr Vehicles ¹	Current Level of Service ⁶⁵	% reduction by 500 vehicles	Impact of 500 vehicle reduction on Level of Service
Hwy 2					
N of Memorial	7088	7592	D	7%	C
N of 16 th	6779	7288	D	7%	C
N of 32 nd	5761	6216	C	9%	B
N of McKnight	5381	5785	C	9%	B
N of 64 th	5215	5600	C	10%	C
N of Beddington	2994	3281	B	17%	A
N of Country Hills	2609	2846	B	20%	B

¹ Trucks are counted as two passenger vehicles.

Within the main access corridors to Highway 2 in both Calgary and Edmonton, peak hour congestion is also a problem, particularly at choke points such as the Langevin Bridge over the Bow River and Memorial Drive in Calgary, and the High Level, Low Level and Walterdale Bridges over the North Saskatchewan River and Gateway Boulevard in Edmonton. The practical effective capacity of each of these bridges is governed by the downstream limitation of signals and number of arterial lanes. Nevertheless, removal of 500 vehicles represents a 10 percent reduction of current traffic on the Langevin Bridge and 18 to 21 percent reduction on the three Edmonton bridges.

Furthermore, this benefit would be expected to increase over time as traffic demand and congestion grows. In 2012, the third year of operation (i.e., the first stable year of high speed rail operation), diverted traffic from the approaches to both cities is estimated to represent 1.7 to 2.1 million car passenger-trips⁶⁶ per year. By 2021, diverted traffic would represent 2.2 to 2.8 million car passenger-trips per year. As there are no immediate plans to expand capacity of the section Deerfoot Trail from Memorial to Country Hills Drive, or the key choke points on access routes to

⁶⁴ Train seated capacity is 512 to 640 passengers and, therefore, this is roughly equivalent to one fully loaded train arriving in the peak hour, whereas two trains one from Red Deer and the other from Calgary/Edmonton would likely arrive at each terminus in the peak hour.

⁶⁵ Level of Service A = free flow; B = stable flow upper speed range; C = stable flow; D = approaching unstable flow; E = unstable flow; F = forced flow.

⁶⁶ Using same assumptions as those for the 2003 estimate.

Highway 2 in both Calgary and Edmonton, the potential reduction of traffic demand by high speed rail becomes all the more significant in future.

Naturally, latent traffic demand would most likely lessen perceptible congestion relief as vehicles from the shoulders of the peak period or suppressed demand take advantage of the capacity relief. Nevertheless, the ability of the overall transportation network to accommodate travel demand will be expanded.

A further consideration is the extent to which traffic reduction by high speed rail could affect expansion and investment in road infrastructure. As previously indicated, Highway 2, although well traveled, is far from reaching its capacity in much of the corridor. The current plan for the next twenty years is to spend \$80 million on rehabilitation work related to weather, ageing and some use-related defects. An additional \$200 million is planned for capital upgrades to expand the road from four to six lanes beginning sometime towards the end of this timeframe.

The following table presents the average annual growth of daily vehicle volumes on Highway 2 and critical points on the main access routes to Highway 2 that are the most likely to benefit from traffic diverted by high speed rail. As the table illustrates, a reduction of 4,000 vehicles per day represents between 3.5 and 6 years average annual daily traffic (AADT) growth over the past several years depending on location.

AADT GROWTH & NO. YRS OF GROWTH = 4,000 VPD							
Calgary	1999	2000	2001	2002	2003	Avg Growth	4,000 VPD = Yrs Growth
N of Memorial Drive AADT			138960	139690	141100		
Annual Growth				730	1410	713	5.6
S of 566E of Balzac AADT	44460	45490	47210	48120	50130		
Annual Growth		1030	1720	910	2010	1134	3.5
Edmonton							
5.9 km N of 2 & 19 AADT	48200	48560	52710	50630	51300		
		360	4150	-2080	670	620	6.5

Construction of the Calgary and Edmonton ring roads, which are intended to improve local traffic distribution around these cities, has been committed. As a consequence, it is unlikely to be affected by high speed rail. Although high speed rail is expected to have little or no impact on the need for Highway 2 improvements or their costs, it could serve to delay some of these expenditures for a period of time. If, for example, one assumed that the \$200 million in capital

upgrades were spread equally between 2032 and 2037, and that they were postponed by two years, a net present value of the deferral would be \$62 million.⁶⁷

10.6.2 Inter-modal Connectivity and Competition

The potential relationship between high speed rail and other public transportation carriers in the corridor is likely to be both competitive and complementary. On the one hand, the ridership forecasts project that high speed rail will divert a significant portion of existing air and bus users. On the other hand, potential exists for high speed rail to provide improved connections to air service at the two international airports, and to contract or receive feeder services from the intercity bus companies.

Effect on Inter-City Bus Transportation

The corridor is served by two inter-city bus companies, Greyhound and Red Arrow. Greyhound Canada has about a two-thirds share of the market and Red Arrow about a one-third share.⁶⁸ Greyhound provides scheduled daily departures in the corridor and also operates a charter service and a parcel express service that accounts for about 50 percent of its Alberta revenues. The Calgary-Edmonton service is supported by an extensive feeder system drawing passengers from many rural communities, and links to Greyhound's national network. The company employs approximately 500 people in Alberta.

Red Arrow focuses almost exclusively on the business traveller segment and also has some courier and parcel operations. The company provides scheduled service between Calgary-Red Deer-Edmonton-Fort McMurray as well as non-stop runs between Calgary and Edmonton. Red Arrow's parent company, Pacific Western Transportation, also provides transportation for workers to oil sands projects and operations with a fleet of about 100 buses. Information on employment by Red Arrow was not provided.

Ridership forecasts for high speed rail predict that it could capture all business trips and more than half of all non-business trips currently made by bus. There could be employment losses, if bus services are reduced significantly. However, losses, if any, cannot be calculated at this stage as potential exists to offset these losses, if bus companies reallocated their resources to service other markets or began providing feeder services to high speed rail. Opportunities to contract services (e.g., reservation and ticket sales) or develop partnerships with the bus companies should be explored to mitigate these job losses, if high speed rail proceeds to the next stage.

Air Transportation

In 2003, the Calgary Airport Authority handled 8.1 million revenue passengers and Edmonton International Airport Authority, 3.9 million revenue passengers. The vast majority of this traffic is domestic travel between Alberta and other points in Canada.

⁶⁷ 6% used as discount rate.

⁶⁸ Interview with Greyhound Canada, March 2004.

Air travel in the Calgary-Edmonton corridor is estimated at about 540,000 passengers per year of which about one-half relates to connecting flights to destinations outside the region. As a result, the Calgary-Edmonton route does not depend on intra-Alberta air travel but rather on connecting flights at both Calgary and Edmonton International. Discussions with Calgary Airport Authority suggest little or no net impact on revenues (or jobs) as a result of high speed rail as airlines would likely reallocate their resources and add more flights from some other point. Similarly, no job losses would be expected at Edmonton International Airport.

With respect to airport infrastructure, Edmonton International Airport has the capacity to handle about 8 million passengers (vs. existing volume of about 4 million revenue passengers). Edmonton International Airport has completed a major expansion with the construction of a new terminal. Current plans are underway to upgrade and modernize the old section of the terminal to present day standards and décor. There is also a plan to expand the parking facilities at the airport.

Calgary has capacity for about 15 million passengers (vs. 8 million today). Total enplaned/deplaned passenger activity is forecast to reach 14.6 million by 2022. Calgary International Airport has completed a parking expansion and the addition of a second terminal in the past five years. Current major expansion plans are to add a second runway to accommodate volume growth. Calgary is fast becoming a distribution centre for western Canada and significant growth will continue in the air freight segment.

In summary, high speed rail is unlikely to impact or delay the need for upgrades and improvements at Calgary or Edmonton airports because existing capacity and/or planned improvements are expected to be sufficient to meet forecasted growth.

10.6.3 Rail Freight Operations and Shipper Benefits

The infrastructure improvements required for a high speed passenger rail service, particularly for the CPR alternative, will benefit Alberta shippers through faster and more consistent freight services. This will result primarily from a significant reduction in freight train delays that arise today because of the speed limitations of the single track system and, for some trains, from somewhat higher speeds due to the more favourable alignment.

The upgraded infrastructure will also make a new type of freight service physically possible that is not today. In Central Canada, CPR operates a short haul, high performance intermodal service geared to providing trucking firms with an alternative to using the highway for moving their trailers. This type of service requires freight trains to operate at highway-like speeds with few delays from other trains. This type of service is impossible on the present infrastructure but would be straightforward on the improved infrastructure. Naturally, the economic feasibility of such a service would have to be assessed at the time, taking into account market size, freight rates and the cost to operate the service. However, with Alberta's growth, it is quite likely that such a service is financially feasible or, if not, that it is just a matter of time before such a service could work. However, this new service could never be contemplated with the infrastructure that is in place today.

The trade route between Alberta producers and the US is very important to the province. The only direct route south is on CPR's system south of Calgary to connections to two western US Class 1 railways – BNSF at Coutts, Alberta and Union Pacific at Kingsgate, British Columbia. However, CPR's network south of Calgary is secondary mainline and has not had the level of investment of the east/west mainline, nor even of the Calgary/Edmonton corridor, which has a higher train density. Some track speeds, for example, are as low as 40 km/hr (25 mph), and the spacing between sidings is large by mainline standards.

If the high speed rail project proceeds, CPR states that it will at its expense re-deploy the existing Calgary/Edmonton main track materials made surplus by the project to upgrade the quality and capacity of the network south of Calgary to the US interchanges. This will complement the improved freight service that will be possible in the Edmonton to Calgary segment, completing a service improvement for the whole export corridor from Edmonton to the US border.

The resulting benefits to Alberta industries in terms of transportation cost savings, expanded business opportunities and new business potential cannot be quantified given the many players that could be involved. Nevertheless, the side benefit of improved rail infrastructure for high speed rail to freight operations and industry, particularly with the CPR alternative, is an important additional advantage that should not be overlooked.

10.7 Social Benefits

The primary social benefits offered by high speed rail include accident reduction due to the diversion of primarily car drivers and passengers to the service, accident reduction as a result of rail crossing eliminations and safety upgrades and the re-shaping of growth and development, provided, of course, that this growth and development is controlled and does not just result in urban sprawl.

10.7.1 Accident Reduction

Highway 2 between Calgary and Edmonton is a limited access four-lane divided highway. The accident rate in this corridor is significantly lower than the rate on other divided highways in Alberta. Each year, there is an average of 10 fatalities, 296 persons injured, 883 collisions and 697 property damage only claims in the corridor.⁶⁹

High speed rail would improve road safety by reducing accident exposure (i.e., vehicle-km traveled) and lead to a corresponding reduction in the number of collisions. Assuming reduced auto travel of 247 million vehicle-km, a 5-year average accident rate in the Calgary-Edmonton corridor of 40.37 collisions per 100 million vehicle-km traveled, it is estimated that the number of collisions would be reduced by about 11 percent.

In addition, there have been 3.5 accidents at level crossings on the existing CPR line on average each year since 1994. Of these, two on average are fatalities and three involve serious injuries. With CPR alternative, 72 out of the 125 public road crossings are eliminated, another 46 are grade-

⁶⁹ Source: Alberta Transportation statistics for 1998-2002.

separated and the remainder are upgraded. As a result, level crossing accidents are expected to be virtually eliminated.

With the Greenfield alternatives, the benefit is far less as only 38.5 km of the existing CPR line would be subject to safety improvements. However, as the full length of dedicated portion of the Greenfield alternatives would be protected, no additional accidents would be anticipated. In addition, some benefit would result from the safety improvements in the section using the CPR right-of-way to access both Calgary and Edmonton, which are the most densely developed.

ROAD SAFETY BENEFITS DUE TO REDUCED TRAVEL ON HIGHWAY 2				
	Fatalities	Persons Injured	Collisions	Property Damage
Hwy 2 Avg # per year:				
- existing	10	296	883	698
- estimated with HSR	9	264	786	621
Net benefit	-1	-38	-118	- 91
Rail Crossing Avg # per year:				
- existing	2	3	3.5	
- estimated with CPR	0	0	0	
Net benefit	-2	-3	-3.5	

Using an average cost per accident⁷⁰ of \$4.4 million per fatality, \$30,000 per serious injury and \$10,000 for collisions and property damage, the CPR alternative yields \$215 million in net present savings over the 30-year life of the project. To be conservative, no accident reduction due to level crossing upgrades was assumed for the Greenfield alternatives, explaining why the benefits for this alternative are only \$72 million over the 30-year life of the project.

10.7.2 Re-shaping of Growth and Development

High speed rail can potentially have a positive effect on growth and development but only if land use policies and plans properly control development to avoid unplanned sprawl. To the good, high speed rail would reshape development by improving access to the central part of the corridor (e.g., Red Deer). This area would benefit from improved convenience and accessibility that would draw increased residential, commercial and industrial demand, and expand the region's land base of properties attractive for development in a more focused and concentrated way than that currently associated with highway development alone.

This potential invites opportunities for planned communities and development. In addition, by increasing developable land with accessibility comparable to areas closer to both Calgary and Edmonton, pressures on suburban areas adjacent to the cities would be lessened.

⁷⁰ Source: Transport Canada.

However, given the potential for high speed rail to dramatically change access to Red Deer and the ensuing development in that area, it would require proper planning and controls so as to avoid urban sprawl. If left unchecked, some of these changes could have negative implications and put pressure on agricultural land and residential land values.

10.8 Environmental Benefits

The principal benefits of high speed rail are its potential to reduce air emissions and noise relative to existing transportation modes that are available for inter-city travel.

10.8.1 Air Emissions

Greenhouse gas (GHG) and other emissions are produced when fossil fuels are burned. However, with the introduction of high speed rail, automobile and air travel will be reduced. Furthermore, the *JetTrain* technology assumed for the CPR and Greenfield Non-Electric alternatives also offers benefits over existing transportation modes as its air emissions are relatively less. In theory, the Greenfield Electric alternative offers the most benefit since it does not directly produce GHG emissions. However, this ignores the fact that more than 60 percent of power generated today in Alberta is derived from burning coal.

GHG EMISSION COMPARISON			
Auto	Air	JetTrain 125 mph	300 km/hr Electric
126 g of GHG/ passenger km	201 g of GHG/ passenger km	50% less than automobiles; 82% less than aircraft	Zero direct GHG emissions

Source: Transport Canada GHG data and Bombardier fuel consumption data, assumes a direct correlation between fuel and GHG.

Based on ridership projections for the high speed rail alternatives, the cumulative reduction in GHG emissions over the 30-year life of the project will be just less than 1.8 million metric tonnes. Based on a value of \$72 per metric tonne⁷¹, the net present value of this reduction is just over \$56 million. For the Greenfield Electric alternative, this benefit is a 3.1 million metric tonne reduction, resulting in \$98 million over 30 years less emissions resulting from additional power generation.

10.8.2 Noise

The Greenfield Electric alternative offers greater benefits than the other alternatives using *JetTrain* technology, as noise tends to be confined to wheel-to-rail friction as opposed to both wheel-to-rail friction and engine noise. Furthermore, the dedicated portions of Greenfield alternatives are away from populated areas, resulting in little or no noise impacts. As for the *JetTrain* technology, its noise impact must be looked at relative to existing transportation modes from which it is expected to divert passengers, as well as changes in location where the noise occurs.

⁷¹ Source: EarthTech, 2003 Emissions Study for VIA Rail.

Noise pollution from automobiles and aircraft may be reduced by passenger diversion to high speed rail but this gain would be off-set by the noise introduced by the high speed rail equipment itself.⁷² Automobile noise occurs near the highway, and is minor compared to that produced by truck traffic. Aircraft noise is a nuisance at or near airports and is generally confined to take-off and landing activities.

High speed rail would produce noise near the track. This may be an issue in the small towns and cities along the CPR alternative route. However, freight trains already produce noise at these locations and, as a result, the addition of twelve trains a day might not result in a measurable increase in daily average noise levels. Moreover, as the high speed rail service would be confined to waking hours, it might not result in discernible increases in average noise levels during these periods. In addition, should noise issues become a problem, noise impacts along this alignment could be mitigated with the installation of acoustic walls, as required.

NOISE LEVEL COMPARISON				
Auto	Air	JetTrain 200 kph ¹	JetTrain 240 kph ¹	300 km/hr Electric ²
65 dB	72-77 dB	86 dB	88 dB	92 dB

¹ Sound levels measured at 30 m while train was in motion.

² Sound levels measured at 25 m while train was in motion.

Source: European Research News Centre Transport, Bombardier and Calgary Airport Authority.

10.9 Financial Benefits

Construction and operation of high speed rail, along with incremental economic development that it would generate (which were discussed previously in this Chapter), would accrue financial benefits to residents and businesses in Alberta as well as the federal, provincial and local governments. This would take the form of employment income, sales of goods and services and taxes, including building permits, licenses and development charges. While some of these benefits, such as local revenues for development are difficult to quantify, employment income and expenditures for goods and services are relatively straightforward and are outlined in the following sections.

10.9.1 Capital Costs and Economic Benefits

The estimated capital cost of the CPR alternative is \$1.7 billion (\$2004) over a five-year construction period. This cost includes major capital items such as permanent trackwork, grading, signaling, grade crossings, rolling stock, property, station facilities and engineering costs. The capital project activity is expected to generate 25,500 person-years of employment and \$983 million in employment income.⁷³

⁷² The decibel (dB) is a measure of sound intensity on a logarithmic scale. For example, an increase of 10 dB is ten times as loud.

⁷³ Includes direct, indirect and induced effects; multipliers used in this analysis are from *Alberta Economic Multipliers, 2000* (Government of Alberta, 2004).

The comparable capital cost of the Greenfield Electric alternative is \$3.4 billion over a six-year construction period. This alternative would generate an estimated 52,000 person-years of employment and \$1,950 million in employment income.

In addition to employment income a significant portion of the material and equipment costs to build the high speed rail system would also be sourced in Alberta. The key supply components for this project are rail, concrete ties, fastenings and tie plates, grading and ballast, rolling stock and signaling equipment. Alberta-based firms would have major opportunities to supply many of these items.

While specialized equipment, including the rolling stock, may require both foreign and extra-provincial supply and manufacture, contracts for these types of projects typically include requirements for specified amounts or percentages of expenditures to be directed to Alberta goods and service suppliers. Furthermore, a construction project of this magnitude can also act as a catalyst for new investment and either the establishment of new enterprises or expansion in the scale of existing businesses.

10.9.2 Operating Costs and Economic Benefits

The cost of operating high speed rail service in the first “steady state” year of operations (i.e. year three) is estimated to be \$72 million per year for the CPR alternative, and \$97 million for the Greenfield Electric alternative. About 500 to 550 direct employees would be employed with the CPR alternative, and an additional 160 direct employees would be required for the Greenfield Electric alternative. Most of these jobs are relatively high-paying positions. As a result, the net present value of direct employment income over the 30-year life of the project is estimated to be \$181 million with the CPR alternative and \$316 million with the Greenfield Electric alternative.

In addition, jobs would be created in industries supplying goods and services to the high speed rail operation (e.g. wheel truing) and through the wage spending associated with both direct and indirect employment. All of these additional jobs and wages would result in economic spin-offs for Alberta firms because of the infusion of money either to existing businesses, or as stimulus for new enterprises.

Total direct, indirect and induced employment from operations associated with the CPR alternative is estimated to be about 1,000 to 1,100 jobs and \$491 million in employment income using standard Alberta multipliers. For the Greenfield Electric alternative, total direct, indirect and induced employment 1,350 to 1,450 jobs and \$861 million in employment income⁷⁴.

The net employment effect will depend on potential offsetting job losses from inter-city bus operations. However, as previously indicated, these potential losses, in any, may be mitigated by changes in the business model for these companies and/or services under contract or providing feeder services to high speed rail and, therefore, cannot be calculated at this time.

⁷⁴ However, if rail industry specific multipliers are used, these figures increase to 2,600 to 2,900 jobs for the CPR alternative (\$2.0 billion NPV), and 3,400 to 3,800 jobs for the Greenfield Electric alternative (\$2.6 billion NPV). (Source: Canadian Tourism Research Institute).

10.9.3 Revenues to Government

High speed rail would generate significant additional tax revenues for both the federal government and Alberta over the course of 30 years. These revenues would include income taxes on incremental employment in construction, operations and new non-rail related businesses attracted to the corridor as well as possibly corporate taxes, if a shared public-private financing arrangement is chosen to finance the project.

Excluding corporate taxes, which would only be paid if shared public-private financing was chosen, Alberta would benefit from an additional \$172 million (NPV) with the CPR alternative, and \$365 million (NPV) with the Greenfield Electric alternative. In addition, the federal government would receive an additional \$378 million with the CPR alternative, and \$800 million with the Greenfield Electric alternative.

INCREMENTAL GOVERNMENT REVENUES (\$ MILLIONS)		
	CPR Alternative	Greenfield Electric Alternative
Provincial Revenue Gains	\$172 – \$343	\$365 - \$565
Federal Revenue Gains	\$378 – \$707	\$800 - \$1,185

If, however, shared public-private financing is chosen and corporate taxes on return on equity were paid, Alberta would receive an additional \$343 million with the CPR alternative and \$565 million with the Greenfield Electric alternative, whereas the federal government would receive an additional \$707 million with the CPR alternative and \$1,185 million with the Greenfield Electric alternative.

10.10 Summary of Social, Economic and Environmental Benefits

The following table summarizes the estimated range of benefits associated with implementation of high speed rail in the Calgary-Edmonton corridor.

SUMMARY OF QUANTIFIABLE BENEFITS		
	CPR Alternative	Greenfield Electric
User Benefits:		
Travel Time Savings (\$M NPV)	\$317	\$332
Travel Cost Savings (\$M NPV)	\$603 – 1,319	\$756 – 1,258
Economic Development:		
Employment Expansion (# jobs)	1,600 jobs	2,600 jobs
Employ. Exp. Income (\$M NPV)	\$619	\$922

Social Benefits:		
Accident Reduction (\$M NPV)	\$215	\$72
Environmental Benefits¹:	1.8 million metric tonnes	3.1 million metric tonnes
Reduction in GHG		
Value (\$M NPV)	\$56	\$98
Financial Benefits²:		
Construction Employment	25,500 person-years	52,000 person-years
Const. Employ. Income (\$M NPV)	\$983	\$1,950
Operations Employment (# jobs)	1,000 -1,100 jobs	1,350 -1,450 jobs
Ops. Employ. Income (\$M NPV)	\$491	\$861
	\$172 - \$343	\$365 - \$565
Tax Revenues - Alberta	\$378 - \$707	\$800 - \$1,185
Tax Revenues - Canada		
NON-QUANTIFIABLE BENEFITS		
Economic Development :		
Competitive Image	<ul style="list-style-type: none"> ▪ Positive – catalyst for economic growth ▪ Potential for corridor to be perceived internationally as a single economic unit ▪ Opportunity for greater economic cooperation and development between communities in the corridor. 	
Property Values	<ul style="list-style-type: none"> ▪ Increases in Red Deer and near suburban stations 	
Transportation Network Optimization:		
Road Congestion & Hwy Infrastructure	<ul style="list-style-type: none"> ▪ Could ease congestion particularly at chokepoints; may result in deferral of infrastructure 	
Inter-city Bus Transportation	<ul style="list-style-type: none"> ▪ May result in reduced service and job losses unless mitigation applied. 	
Air Transportation	<ul style="list-style-type: none"> ▪ Likely to spur specialization, increased choice & better service; no deferral of infrastructure or job losses expected. 	
Rail Freight Operations & Shippers	<ul style="list-style-type: none"> ▪ Reduced freight delays and improved speeds; potential for new intermodal freight service; and, enables upgrading of line south of Calgary using surplus rail materials 	

	<ul style="list-style-type: none"> May result in shipping costs savings, expanded business opportunities and/or new business potential for Alberta industries. 	
<p>Social Benefits: Re-shaping of growth & Development</p>	<ul style="list-style-type: none"> Shifts and focuses development to central area of corridor and relieves pressure on land and prices in Calgary and Edmonton but requires planning and controls to avoid urban sprawl. 	
<p>Environmental Benefits: Noise</p>	<p>Some reduction in hwy noise but may increase noise along rail corridor</p>	<p>Some reduction in hwy noise and less noisy than CPR alternative due to electric propulsion and dedicated portion of corridor away from settlements.</p>

¹ Greenfield Electric reduction is based on direct emissions only; adjustment for emissions from power generation would reduce this reduction and its associated value.

² Includes all direct, indirect and induced employment, employment income and taxes on this income.