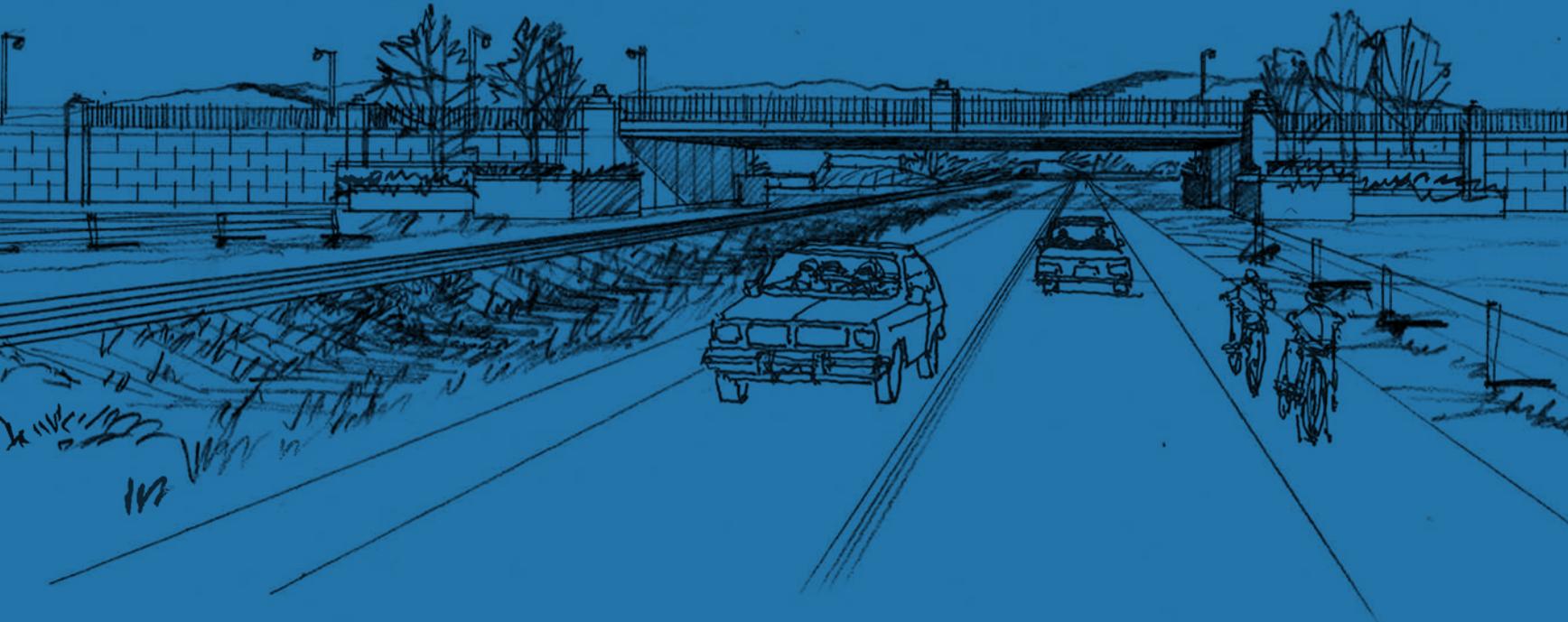


SUNIGA/LEMAY MULTI-MODAL AND FREIGHT CONNECTIVITY PROJECT

TIGER Discretionary Grant Application

June 4, 2015

APPENDIX C: BENEFIT/COST ANALYSIS



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SUNIGA/LEMAY MULTI-MODAL AND FREIGHT CONNECTIVITY PROJECT BENEFIT/COST ANALYSIS

BASE CASE ASSUMPTION

The benefit cost analysis focuses on the option of building an overpass where Lemay Avenue intersects Suniga Drive and the BNSF railroad tracks, thereby eliminating the significant wait times caused when a train goes through the area. This option is compared against a “no build” scenario, which assumes the intersection remains as-is, and becomes the base case assumption for the analysis. The base case assumes Lemay Avenue continues to cross the railroad tracks at grade. Due to the City of Fort Collins’ policy which requires Adequate Public Facilities for new development to occur, development in the area is significantly stunted unless this intersection issue is resolved. Existing and future traffic would continue to experience significant wait times when a train is in the area, causing excessive idling and vehicle emissions.

BENEFITS

Travel Time Savings Benefits

The Suniga/Lemay/BNSF intersection is an important connection between northeast Fort Collins and the rest of the city. It provides primary access for residents and visitors to access Downtown. The number of vehicles has increased annually. The capacity for this intersection to accommodate existing and future traffic is significantly compromised because of its proximity to the railroad tracks. There is a switching yard close to the intersection which significantly extends the time it takes for trains to cross the intersection, causing significant time delays for travelers. Delay is reduced by eliminating train blockages and by providing more capacity at the new Suniga/Lemay intersection. Reduction in delay for train blockages was calculated as follows:

$1,570 \text{ minutes/day} \times 320 \text{ days/year} (<365 \text{ to account for lower traffic volumes on weekends}) = 502,400 \text{ minutes/year}$ or $8,373 \text{ hours/year} \times \$20.15/\text{vehicle-hour value of time per person}$ ($\$16.79/\text{person}$ assuming an average occupancy of 1.2) = $\$168,723/\text{year}$.

Reduction in delay from intersection improvements calculated at $2,772 \text{ minutes/day} \times 320 \text{ days/year} \times 1 \text{ hour}/60 \text{ min.} \times \$20.15 = \$297,898/\text{year}$.

Total delay reduction = $23,157 \text{ hours/year} \times 20.15/\text{hour} = \$466,614/\text{year}$.

Accident Reduction Benefits

The grade separated intersection would reduce train/car crashes and other intersection crashes. The calculation of benefits was generated as follows:

Reduction in train crashes estimated at:
0.0146 property damage only crashes/year
0.0074 injury crashes/year
0.0008 fatal crashes/year

at the following costs:
PDO - \$9,700

Injury - \$84,100
Fatal - \$5,377,400

Reduction in train/car crashes = \$ 5,066/year.

Reduction in other intersection crashes estimated at 5.03 property damage only crashes/year and 1.16 fatal or injury crashes/year at the following costs:

PDO - \$9,700
Fatal or Injury - \$103,200

Reduction in other intersection crashes = \$168,500/year.

Total crash reduction cost savings = \$173,570/year.

Fuel Savings Benefits

Improved operations would generate fuel consumption reductions as follows:

Reduction in fuel consumption from elimination of idling at the railroad = 20.4 gallons/day * 320 days/year = 6,531 gallons/year

Reduction in Fuel Consumption from intersection improvements = 80.3 gallons/day * 320 days/year = 25,698 gallons/year

Total = 100.7 gallons/day * 320 days/year = 32,224 gallons/year @ \$3.50/gallon = \$112,784/year

Vehicle Emissions Reduction Benefits

When vehicles are waiting at the intersection for a train to pass, emissions such as nitrogen oxides, volatile organics (VOCs) and carbon dioxide pollute the air. Reduced air emissions due to the grade separated intersection were calculated based on factors applied to the avoided VHT resulting from the "no-build" scenario. Emission reduction benefits would be as follows:

From elimination of idling at the railroad:

CO – 1.4 kg/day * 320 days/year = 456 kg/year

NOx – 0.28 kg/day * 320 days/year = 89 kg/year

VOC – 0.3 kg/day * 320 days/year = 106 kg/year

From intersection improvements:

CO – 5.8 kg/day * 320 days/year = 1,856 kg/year

NOx – 1.1 kg/day * 320 days/year = 352 kg/year

VOC – 1.3 kg/day * 320 days/year = 416 kg/year

Total:

CO – 7.2 kg/day * 320 days/year = 2,312 kg/year

NOx – 1.38 kg/day * 320 days/year = 441 kg/year

VOC – 1.6 kg/day * 320 days/year = 522 kg/year

At-Grade Railroad Maintenance Savings Benefits

By removing the at-grade railroad crossing, savings will be seen from the on-going maintenance that otherwise would have occurred.

Other Benefits

Although not quantified for the purpose of the benefit-cost analysis, there are other benefits associated with the project that deserve mention. The first being improved access for emergency vehicles. With the current at-grade crossing, when a train is crossing there is not a viable alternative to allow emergency vehicles to cross from north to south, or vice versa. Depending on the length and direction of the train, an emergency vehicle could travel one mile to the east or west to attempt to cross the tracks; however, this may not be possible if the train is long and covers multiple intersections, or it causes a delay.

Another benefit to note is the development potential for the area near the Suniga/Lemay intersection. Development is currently stunted because of the condition of the at-grade crossing. The area directly to the north and northeast, also known as the Mountain Vista area, is the largest area of Fort Collins that remains undeveloped; and it will stay undeveloped unless the Suniga/Lemay intersection is improved. According to the 2009 Mountain Vista Subarea Plan, the area will accommodate a population increase of 13,347 by 2030. During the same time period, the area is planned to accommodate 15,065 jobs.

EFFECTS ANALYSIS METHODOLOGY

The U.S. Bureau of Economic Analysis (BEA) developed regional input-output multipliers, known as RIMS (Regional Input-Output Multiplier System). Originally developed in the 1970's, BEA completed an enhancement a decade later, known as RIMS II, which provided the data for this particular analysis. RIMS II is based on an accounting framework called an input-output (I-O) table. For each industry, an I-O table shows the distribution of the inputs purchased and the outputs sold. A typical I-O table in RIMS II is derived mainly from two sources: BEA's national I-O table which shows the input-output structure of nearly 500 U.S. industries, and BEA's regional economic accounts which are used to adjust the national I-O table to reflect a region's industrial structure and trading patterns.

RIMS II multipliers by industry aggregation were purchased for the Fort Collins-Loveland Metropolitan Statistical Area (MSA) to estimate the total economic impact of projects on regional output, earnings, and employment. For the purposes of this analysis, type II multipliers were used, which account for direct, indirect, and induced economic impacts.

Construction Impacts

One side of the analysis looks at the impacts of the actual construction of the transportation improvements. Industry aggregate multipliers were used for the construction industry. The estimated budget (project cost, or change in final demand) was multiplied by the total multipliers for output, earnings and employment; 1.7077, .4938, and 12.0873 respectively. For example, a \$1,000,000 project would result in a \$1.7 million change in output for all industries in the region, and a \$493,000 change in earnings. The employment multiplier represents the total change in number of jobs that occurs in all industries for each \$1 million investment. Thus, 12 jobs would be created as a result of this \$1 million project.

The total project cost of \$27,000,000 was used for the analysis. See Table 1 for the results.

Table 1: Economic Impacts for Construction of Improvements¹

Construction Costs:	
Grade Separation of Suniga/Lemay/BNSF and Realignment of Lemay	\$27,000,000
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Final-demand multiplier:	
Output (\$)	1.7077
Earnings (\$)	.4938
Jobs per \$1 million	12.0873
Impact on:	
Regional output (\$)	\$46,017,900
Regional earnings (\$)	\$13,332,600
Regional employment (jobs)	600

Long-Term Impacts

In addition to the impacts that result from the physical construction of the improvements, the long-term economic impacts were estimated using similar methodology. As previously mentioned, the Mountain Vista Subarea Plan projected the area to accommodate 15,065 jobs by 2030, which assumes full build out of the land. Assumptions were made regarding the distribution of job types based on the zoning for particular land uses, as follows:

Total acres of commercial/employment land = 1,256

- 53% zoned for Employment, or office type use
- 46% zoned for Industrial, or manufacturing type use
- 9% zoned for School, or educational service type use
- 2% zoned for Commercial, or retail, service type uses

The percentage distribution of job type was then applied to the total 15,065 jobs projected for the area, and the appropriate RIMS II multipliers were used. In some cases, multiple industry multipliers were averaged. For example, multipliers for professional services, administrative services, and financial services were averaged and that average multiplier was used to produce the economic impacts for that particular land use.

Total jobs projected by 2030 = 15,065

- 53% or 7,984 jobs = professional/administrative/financial services
- 46%, or 5,423 jobs = manufacturing
- 9% or 1,356 jobs = education
- 2% or 301 jobs = food services/other services

¹ The data used provides impacts on an annual basis; therefore, the analysis provides an overall snapshot of the economic impacts for a one-year period, and may not be accurate over the entire span of the project.

Multiplier Industry	Final-Demand Multiplier			Direct-Effect Multiplier	
	Value added	Earnings	Employment	Direct Earnings	Direct Jobs
Professional/admin/financial services	0.9629	0.50733	14.7534	1.5659	1.6187
Manufacturing	0.8277	0.3724	9.1724	1.5942	1.685
Food services/other services	0.95115	0.51415	18.23085	1.50255	1.42695
Education	1.1196	0.6596	24.3277	1.4145	1.307

Employment Category	Final-Demand Change (millions)	Value Added (millions)	Earnings (millions)
Professional/admin/financial services	\$876	\$ 843.5	\$444.4
manufacturing	\$996.3	\$824.6	\$371.0
Food services/other services/	\$23.5	\$22.4	\$12.1
Education	\$72.8	\$81.5	\$48.0
Total	\$1,968.7	\$1,772.1	\$875.6

It is important to understand the results of this analysis are based on critical assumption that constructing the improvements will open up development in the Mountain Vista area and ultimately result in the full build-out projected during the 2009 planning process. In all likelihood, some development will occur in the area regardless of whether the improvements are made. The results provided here should be used cautiously; they are estimates based on a number of assumptions from the latest information available.

SUMMARY OF BENEFITS

BENEFIT CATEGORY	MEASURED BENEFIT
Travel Time Savings/Total delay reduction	23,157 hours/year \$466,614/year
Total Crash Reduction Cost Savings	\$173,570/year
Fuel Savings	32,224 gallons/year \$112,784/year
Emission Reductions	CO = 2,312 kg/year NOx = 441 kg/year VOC = 522 kg/year
Other Benefits (Not Quantified)	Road Maintenance Savings Emergency Vehicle Response Time Reduction, Increased Population +13,347 Additional Jobs +15,065