CALIFORNIA DEPARTMENT OF TRANSPORTATION

Benefit-Cost Analysis

Rosecrans/Marquardt Grade Separation Project

6/1/2015

Overview

The California Department of Transportation (Caltrans) is seeking financial assistance to supplement funding for the construction of the Rosecrans/Marquardt Grade Separation Project (Rosecrans/Marquardt). The project is located in the City of Santa Fe Springs at the intersection of Rosecrans and Marquardt Avenues and BNSF Railway Company's (BNSF) mainline track in what is known as the triple track project service area of the Pacific Surfliner Corridor (Corridor). In 2014, the Rosecrans Avenue/Marquardt Avenue intersection was rated by the California Public Utilities Commission (CPUC) as the most dangerous crossing in California. Over 130 trains and over 45,000 vehicles a day use this crossing, and coupled with the geometric challenges of the tracks crossing the intersection on a diagonal, this has led to a high rate of incidents.

The concept of constructing a third mainline track, including grade separations, began in the late 90's as the Corridor began to experience significant growth in both passenger and freight service. In order to facilitate funding and minimize construction impacts on the surrounding communities, the planned expansion was originally divided into eight track segments and six grade separations. Seven triple track segments are complete and in service. The eighth and final segment is under construction with an anticipated completion date of 2016. Two grade separations are complete, and three received CPUC authority to build through. Rosecrans/Marquardt is the remaining grade separation to be built on this triple track segment of the Corridor in the foreseeable future. Rosecrans/Marquardt's benefits have been quantified over a 20-year period by conducting a benefit-cost analysis (BCA) to illustrate the monetary user benefits that this project would produce.

Methodology

The BCA for Rosecrans/Marquardt was completed using Caltrans' Life-Cycle Benefit-Cost Model (Cal-B/C). The model was developed in accordance with the U.S. Department of Transportation and the American Association of State Highway and Transportation Officials (User and Non-User Benefit Analysis for Highways) guidance. Information regarding the model can be found in Cal-B/C Technical Supplement to User's Guide, Volumes I through III, which can be located on the Caltrans' Webpage: (http://transplanning.onramp.dot.ca.gov/life-cycle-benefit). Additionally, highway capacity and service principles applied in the model conform to the Transportation Research Board's Highway Capacity Manual. The model reflects the standardized monetization values provided in the TIGER Benefit-Cost Analysis Resource Guide, as revised April 2, 2015, and conform to the 2015 Benefit-Cost Analysis Guidance for TIGER Grant applications. The attachment included highlights the costs and benefits of constructing this project at 3 and 7 percent discount rates.

BCA Variables and Assumptions

In addition to applying analytical standards outlined in the TIGER Grant application, the analysis relies on Metrolink, Amtrak, Caltrans, and academic resources. This BCA involved an at-grade intersection analysis and a transit service improvement analysis. Both analyses were aggregated and measured against the estimated $120.8 million cost of the project. Detailed information about the assumed inputs can be found under the "project information" tab and the

"parameters" tab of the Cal-B/C excel spreadsheet. Listed below are highlighted variables and assumptions used for each analysis:

General Variables and Assumptions

- Average trip length for transit passengers is 37.2 miles;[1] and
- A 1% growth for the baseline "no build" scenario was applied for a 20 year projection.
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At-grade Crossing Variables and Assumptions

- Four fatalities, six injuries, and five property damage only incidents have occurred over 10 years that involve this at-grade intersection;
- An average of 47,450 passenger and freight trains travel through this segment; and
- It is assumed that there will no longer be at-grade incidents and transit ridership grows to 13,357,000 by Year 20.
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Transit Service Improvement Variables and Assumptions

- Ridership is approximately 6,674,000 a year and will grow to 13,357,000 in 20 years according to Caltrans' Division of Rail and Mass Transportation;
- Approximately, 16,800 passenger trains travel this segment and will grow to 23,500 in 20 years;
- 22 percent of car trips are removed from parallel freeways during peak periods;[2] and
- Average transit travel time on transit for this segment is approximately 56 minutes during peak hours and 50 minutes during non-peak hours according to Metrolink and Google Transit;
- Passenger wait time was derived on a bus stops study;[3] and
- Approximately, 244,000 vehicles travel on I-5 (average of eight lanes, two-way directional), which is parallel to this railroad track segment, and will grow to 294,800 in 20 years.

BCA Results

The Rosecrans/Marquardt project provides benefits to the corridor by significantly improving safety, eliminating delays, and improving the environment. Further, completion of Rosecrans/Marquardt allows the operation of five additional round trip Amtrak intercity passenger trains and up to 22 additional Metrolink commuter trains over this segment.

Based on a 20-year BCA, the benefits of this grade separation project would produce a 3.1 benefit-cost ratio at 3 percent and a 1.6 benefit-cost ratio at 7 percent. The individual at-grade intersection analysis produced a 20-year safety value of $60.1 million at a 3 percent discount rate and $38.1 million at a 7 percent discount rate. The model captures the growth in travel as induced travel and can potential increase accident exposure and disbenefits. The model does not capture other safety benefits such as improved reliability. Thus, the aggregated safety disbenefits result is overinflated and valued at $836.9 million at 3 percent and $439 million at 7

[1] Metrolink. (2015). Metrolink Fact Sheet for Q1. Metrolink. Retrieved from http://www.metrolinktrains.com/pdfs/Facts&Numbers/Fact_Sheets/Fact_Sheet_2015_Q1.pdf
[2] ibid
[3] Mishalani, Rabi G., Mark M. McCord, and John Wirtz. "Passenger wait time perceptions at bus stops: Empirical results and impact on evaluating real-time bus arrival information." Journal of Public Transportation 9.2 (2006): 89.

percent; the overall BCA ratio may be conservative. A summary of the benefits can be found below, along with the aggregated BCA.

Rosecrans/Marquardt Grade Separation Benefits

Change to Baseline/Alternatives	Types of Impacts	Population Affected by Impacts	Economic Benefit	Summary of Results
Double tracking of a 17 mile segment	Travel time and vehicle operation savings, and reduces accidents and air pollution	Passengers who use Amtrak and those who travel along HWY 99	Monetized value of travel time savings, vehicle operations cost reductions, accidents, and air pollution	Travel time savings, vehicle operation savings, air pollution cost reduction, and safety benefits

BCA 3% Discount Rate Results

District: 7

PROJECT: Rosecrans/Marquardt Grade Separation

EA:
PPNO:

3

INVESTMENT ANALYSIS
3% DISCOUNT RATE SUMMARY RESULTS

Life-Cycle Costs (mil. $)	$115.5
Life-Cycle Benefits (mil. $)	$359.2
Net Present Value (mil. $)	$243.8
Benefit / Cost Ratio:	3.1
Rate of Return on Investment:	10.1%
Payback Period:	17 years

ITEMIZED BENEFITS (mil. $)	Average Annual	Total Over 20 Years
Travel Time Savings	$52.6	$1,052.9
Veh. Op. Cost Savings	$6.6	$132.7
Accident Cost Savings	-$41.8	-$836.9
Emission Cost Savings	$0.5	$10.6
TOTAL BENEFITS	$18.0	$359.2
Person-Hours of Time Saved	5,778,301	115,566,012
CO_2 Emissions Saved (tons)	12,847	256,949
CO_2 Emissions Saved (mil. $)	$0.3	$5.4

Should benefit-cost results include:

1) Induced Travel? (y/n)	Y	Default = Y
2) Vehicle Operating Costs? (y/n)	Y	Default = Y
3) Accident Costs? (y/n)	Y	Default = Y
4) Vehicle Emissions? (y/n) includes value for CO_2e	Y	Default = Y

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Cal-B/C - 3% Discount Rate Results
Rosecrans-Marquardt_Time Savings and Safety_Final Calcs.xlsm

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BCA 7% Discount Rate Results

District: 7

PROJECT: Rosecrans/Marquardt Grade Separation

EA:
PPNO:

3

INVESTMENT ANALYSIS
7% DISCOUNT RATE SUMMARY RESULTS

Life-Cycle Costs (mil. $)	$109.1
Life-Cycle Benefits (mil. $)	$178.7
Net Present Value (mil. $)	$69.6
Benefit / Cost Ratio:	1.6
Rate of Return on Investment:	10.1%
Payback Period:	17 years

ITEMIZED BENEFITS (mil. $)	Average Annual	Total Over 20 Years
Travel Time Savings	$27.0	$540.1
Veh. Op. Cost Savings	$3.6	$71.7
Accident Cost Savings	-$21.9	-$439.0
Emission Cost Savings	$0.3	$5.8
TOTAL BENEFITS	$8.9	$178.7
Person-Hours of Time Saved	5,778,301	115,566,012
CO_2 Emissions Saved (tons)	12,847	256,949
CO_2 Emissions Saved (mil. $)	$0.1	$2.8

Should benefit-cost results include:

1) Induced Travel? (y/n)	Y (Default = Y)
2) Vehicle Operating Costs? (y/n)	Y (Default = Y)
3) Accident Costs? (y/n)	Y (Default = Y)
4) Vehicle Emissions? (y/n) includes value for CO_2e	Y (Default = Y)