

NEVADA DEPARTMENT OF TRANSPORTATION

FFY 2014 RESEARCH PROBLEM STATEMENTS

External Submission Form (Not to exceed 3 pages with font size 12)

I. PROBLEM TITLE

Determination of the Benefit-Cost Ratio of NDOT's Freeway Service Patrol (FSP) Program.

II. PROBLEM DESCRIPTION

Every month, more than 2,000 motorists are assisted by the DOT's FSP on Nevada freeways in Reno and the Las Vegas valley. This service is an integral part of the Freeway Incident Management system and it plays a critical role in reducing the impacts of the incidents on the freeways. Prompt attendance of FSP vehicles and personnel to stranded motorists and freeway incidents result in significant time and monetary savings to the freeway driving public, reduced fuel consumption and vehicle emissions that are a product of the reduction in incident duration and the associated freeway congestion impacts. As with other public investments, for the FSP program to have continued support of NDOT management, elected officials and the general public, documentation and quantification of the benefits realized by the service relative to its cost is crucial. This study proposes to quantify the *overall* benefits of the FSP program and the *incremental* benefits of service expansion by increasing the network coverage, time periods covered and/or increased number of service patrol vehicles. The study will also evaluate FSP's data collection and recording procedures and recommend improved process.

III. OBJECTIVE:

The objectives of this study are

- (1) To determine the benefit-cost ratio of NDOT's FSP program based on its current level of operation.
- (2) To determine the incremental benefit-cost ratio of FSP expansion in terms of network coverage, times of operation and/or increased service patrol vehicles.
- (3) To evaluate NDOT's FSP's current data collection procedures and storage and identify and recommend an improved procedure.

Quantification of the benefits for the study will partly be based on a recently completed UNLV study funded by NDOT (Kaseko, et al, 2014). Standard rates use by NDOT for evaluation of the values of travel time, fuel consumption and vehicle emissions will be used in the study.

IV. CURRENT PRACTICE and RELATED RESEARCH

Several studies across the nation have evaluated the benefits of FSP programs and have reported benefit-cost ratios ranging from 2.1:1 to as high as 23:1 (US DOT). The wide variation in benefit-cost ratios is due to the different types of FSP implementations and the methodologies used to calculate the benefit-cost ratios. Some of the differences in the FSP programs include the size of the freeway networks served, the times of operation, the number of service vehicles deployed and the type of incidents responded to. For example,

some of the FSP program are fully integrated into the incident management system, meaning that they respond and assist in management and clearance of all freeway incidents, while other FSP program respond only to limited types of incidents, typically stranded motorists. Due to these differences in the implementation of the FSP programs, the methods for evaluations and the results are dependent of the type and extent of each program. Benefit-cost values from one jurisdiction cannot be directly used in other jurisdictions.

Several different methodologies have been used to quantify and calculate the benefit-cost ratios of FSP programs. Generally, these studies have evaluated incident impacts with and without FSP service. For example Skabardonis, et. al (1998) evaluated the effectiveness of the FSP on a 7.8 mile section of I-10 freeway (Beat 8) in Los Angeles using field data from loop detectors and probe vehicles. Analysis indicated that FSP assisted incidents were shorter than non-assisted incidents by 7 to 20 minutes on the average. The estimated benefit-cost ratios based on delay and fuel savings for a range of typical reductions in incident durations was greater than 5:1. In addition, the reduction in incident duration was estimated to translate to daily reductions in air pollutant emissions.

Similar studies were conducted by Hagen et al. (2005) to evaluate the benefits of the Road Ranger freeway service patrol (FSP) program of the Florida Department of Transportation and Dougald and Demetsky (2008) to quantify the benefits of safety service patrols (SSPs) for the Northern Virginia region. Both studies used the simulation-based Freeway Service Patrol Evaluation (FSPE) model to estimate the delay savings. The Hagen study reported benefit-cost ratio in excess of 25:1 while the Dougald and Demetsky reported a benefit-cost ratio of 5.4:1

V. RESEARCH METHODOLOGY

- Task 1: Extensive literature review of relevant past studies.
- Task 2: Collecting current FSP operational, cost and performance data from both Southern and Northern Nevada freeways.
- Task 3: Evaluating the current FSP data collection procedures and storage and recommending an improved process.
- Task 4: Designing a data collection strategy and collecting the data that is necessary for estimating the benefits of the FSP program.
- Task 5: Using the data from Tasks 2 and 4 and quantification of incident impacts using the earlier NDOT study (Kaseko, et.al), the benefit-cost ratio of the FSP program will be estimated.
- Task 6: Modeling response times as function of the number of FSP vehicles on the road and the number of incidents to be attended to and the network coverage. Using the models to determine the incremental user benefits and hence the incremental benefit-cost ratios.
- Task 7: Report writing.

VI. IMPLEMENTATION POTENTIAL

This research is at the concept stage of deployment (Stage 1) and falls under Expert Task Group 4: “*Efficient and Safer Traffic Operations*”. The final report will consist of:

1. Recommended improved procedure for FSP data collection and storage.
2. Estimated benefit-cost ratio of the current FSP program. The methodology for calculating these estimates will also be presented.

3. Recommended methodology for estimating the incremental benefit-cost ratios of planned service expansion.

VII. URGENCY AND PAYOFF POTENTIAL.

The results of this study will provide the necessary data for economic justification of the current FSP program and for planning and budget requests for potential future expansion of the service.

VIII. ESTIMATED BUDGET

\$90,000

IX. DATE AND SUBMITTED BY

June 30, 2014

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X. NDOT CHAMPION, COORDINATION AND INVOLVEMENT

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REFERENCES

1. Dougald, Lance and Demetsky, Michael (2008). Assessing Return on Investment of Freeway Safety Service Patrol Programs. TRR no. 2047, pp. 19-27
2. Hagen, L., Zhou, H. and Singh. H. (2005). Road Ranger Benefit Cost Analysis. Florida Department of Transportation.
3. Kaseko, Teng, Kumaresan and Chigurupati (2014) “ Development of an Analysis Tool for Evaluation of Marginal Impacts of Freeway Incidents in the Las Vegas Area using FAST’s Dashboard Freeway Data”, Final Report Submitted to NDOT, January 2014.
4. Skabardonis, Alexander; Petty, Karl; Varaiya, Pravin; and Bertini, Robert. (1998) Evaluation of the Freeway Service Patrol (FSP) in Los Angeles. *PATH Research Report* UCB-ITS-PRR-98-31. University of California, Berkeley.
5. U.S. Department of Transportation, “Intelligent Transportation Systems for Traffic Incident Management”, available at http://ntl.bts.gov/lib/jpodocs/brochure/14288_files/14288.pdf