

APPENDIX B—CAPACITY PROJECT PRIORITY SETTING PROCESS

The Capacity Project Priority Setting Process was developed during the 2030 Regional Transportation Plan (RTP) and the basic principles of the process will remain the same unless amended through RTC Board action. The process itself will be applied to the projects contained in this RTP.

This document provides a description of the process used to identify and prioritize capacity improvement projects undertaken or supported by the Regional Transportation Commission (RTC). The document provides background on the policy direction on capacity improvements given by the RTC Board through the 2030 Regional Transportation Plan (RTP) and other RTC Board guidance and improvements to the current process made possible by advances in technology. In addition, the document will discuss significant practical issues relating to capacity priority and the various factors that were considered in arriving at the process identified herein.

Background Information

The Regional Transportation Plan (RTP) identifies hundreds of capacity improvement projects that will be needed over the next 20-30 years to meet the community's goals for mobility, congestion and air quality. Funding is not available to construct all of these projects at one time. Even if the funding were available, there is insufficient industrial capacity to do this much work all at once. Finally, doing all the projects immediately would be economically inefficient since many of the improvements will not be needed for many years and maintaining unneeded facilities would squander valuable public resources. Ideally, a capacity project priority setting process will reasonably address these issues so that available funding is spent on building those projects having the greatest benefit for the community at the time they are needed, that is, building the right project at the right time.

Policy Guidance

The primary purpose of capacity improvements is to address traffic congestion within the community. The 2030 RTP contains the following objectives and policies related to this purpose:

Street and Highway Congestion Objectives

1. Average per capita daily delay increase will not increase above 2000 levels more than 20% in 2007, 30% by 2012; 40% by 2020 and 50% by 2030.
2. All signalized intersections will be within policy level of service by the year 2012 and maintained at that policy level of service thereafter.

Street and Highway Congestion Policies

- Existing and future traffic needs for the Regional Road System (RRS) will be determined through technical analyses and prioritized based upon the most cost effective solutions to congestion.
- Assure adequate right-of-way for the construction of future streets and widening of existing streets through timely advance planning and preliminary design, property acquisition, dedication of easements and development setbacks.
- The level of service standards (see **Table 3-3, Chapter 3**) will be used for assessing the need for and location of future street and highway improvements for Washoe County at a planning level. As appropriate, design of facilities will be based upon more detailed operational analysis.

In addition to the above stated congestion related objectives and policies, the RTP also includes policy guidance to consider factors in addition to congestion in prioritizing capacity improvements.

- Prioritize street and highway funding for capacity improvements to promote in-fill development and higher intensity development along transit-oriented development corridors and within downtown, regional and emerging employment centers.

Conceptual guidance for updating the RTC's historic capacity priority setting process was received from the RTC Board in July 2005 as follows:

While the current methodology of identifying project priorities has served the community well, advances in the capability of the RTC's travel forecasting tools and other technology offer opportunities to further evolve and improve this process. The improved process should be developed in consultation with the affected local governments and incorporate the following conceptual recommendations as far as they prove technically feasible:

1. *The RTP should continue to be used identify and time stratify regional capacity projects. The projects from the first planning horizon (currently 2005-2102) should be supplemented, in consultation with local governments, with the specific intersection and signal projects that will be needed within the planning horizon.*
2. *All projects identified in Step 1 should be ranked using a BCA process that will consider the benefits of reduced travel time, reduced delay time and safety, and the costs of designing, constructing and maintaining the project.*
3. *The BCA ordered projects should be assigned to the best-fit funding categories and prioritized within those categories according to their BCA rankings.*
4. *The priorities by funding type should be further adjusted based upon other considerations as outlined in this memo above, e.g., conflicts with other work, coordination/integration with private development, etc.*
- 5 *The prioritized projects should be presented to the board periodically for its review and approval.*

Key Concepts

Time Stratification of Projects. Perhaps the best place to start a discussion of project priorities is to identify the “right” time for building a project. Time stratifying projects based upon when they will be needed is a valuable method for identifying reasonable priorities. Without time stratification, it is possible that a project not needed to address congested conditions for 30 years would be given a higher priority over a project that addresses current needs, a result that makes little sense. This is not to ignore the fact that some projects are evolutionary, that is, a project built as an initial phase to meet an immediate need may later be evolved to a higher order facility to meet a future need. Further, a project may need to be broken into components that are executed over many years and must be treated as discrete projects for the purpose of priority setting. For instance, it may make sense to breakout preliminary design and right-of-way acquisition for a large project from the final design and construction so that the project can be in-place when needed. The Regional Transportation Plans (RTP) created by the RTC identify needed regional capacity improvements and assign them to time strata typically from 5-10 years in length with the shorter periods addressing more near term needs.

Benefit-Cost Analysis. Once projects have been time stratified, the next level of analysis is to determine which of the projects in the first time stratum, e.g. 2004-2012, should be built first. Benefit-Cost Analysis (BCA), which ranks projects by calculating the ratio of their benefits to costs, is a methodology typically employed for this type of screening. Classical BCA reduces all benefits and costs to dollar values. Variations of classical BCA using other types of units and multiple measures have also been used. While the details of BCA vary depending upon whether it is being used for broad planning purposes or detailed analysis of alternatives for a single project, the principles are the same:

1. Establish objectives
2. Identify constraints and specify assumptions
3. Define the base case and identify alternatives
4. Set analysis period
5. Define the level of effort for screening alternatives
6. Analyze traffic effects
7. Estimate benefits and costs relative to the base case
8. Evaluate risk
9. Compare net benefits and rank alternatives
10. Make recommendations

While application of BCA is theoretically simple, it can quickly become a very complex matter in reality. An almost infinite range of benefits can be identified for any project and each one of these benefits could be analyzed to an infinite level of detail. Typically, only a handful of benefits are really significant and an effective BCA process must focus on cost effectively identifying and quantifying these. To legitimately compare projects using BCA, the benefits considered the level of analysis and the methodology need to be consistent across all the projects.

The types of benefits typically considered in highway projects are:

Benefits and Costs Typically Considered in Benefit-Cost Analysis			
Agency Costs	User Costs/Benefits Associated With Work Zones	User Costs/Benefits Associated With Facility Operations	Externalities (non-user impacts, if applicable)
Design and Engineering Land Acquisition Construction Reconstruction/Rehabilitation Preservation/Routine Maintenance Mitigation, e.g., noise barriers	Delay Crashes Vehicle Operating Costs	Travel Time and Delay Crashes Vehicle Operating Costs	Emissions Noise Other impacts

Source: Federal Highway Administration

BCA measures the direct benefits and costs that a project causes for highway agencies, travelers (users) and, in the case of externalities, to nonusers affected by the project. Direct benefits and costs are the first order or immediate impacts of the transportation project on users and nonusers including changes in travel time, crashes, vehicle operating costs, agency construction costs and pollution costs.

Other Considerations in Establishing Priority. As stated above, BCA requires that comparable data be available for all projects being ranked. This does not mean that other factors cannot be considered, but simply that they must be considered outside of the BCA process as part of the larger discussion of establishing priorities. Such considerations include:

Economic impacts. BCA typically does not measure how direct project benefits and costs are converted into indirect effects on the economy, such as changes in employment, wages, business sales or land-use. When appropriate, these indirect effects are typically considered in a separate economic impact analysis. Since economic impact analyses are expensive and time consuming, they are not typically done for every project. Under these circumstances, since data is not available for all projects being compared, the consideration of economic impacts needs to occur outside of the BCA process.

Project funding. Probably the most significant other factor is the type of funding that may be used for a project. Funds for highway projects can come from a variety of local, state and federal sources, each with their own eligibility processes and criteria. A project that has the highest benefit-cost ratio may not be the best fit or even eligible for those funds that are immediately available. It is then prudent, or perhaps necessary, to defer execution of this project until the best fit funding does become available. For example, impact fees cannot be used for making improvements to the mainline freeway. In this case, the project is simply not eligible. While fuel tax funds could be used for a freeway project, this might not be a very good fit since federal or state funds would be more appropriate.

Miscellaneous factors. A high priority project may need to be deferred until major underground utility work is performed. In other cases, the private sector may request a delay to enable better coordination and/or integration of the project with their adjacent development activities.

Practical Considerations

Limits of the RTP Process. While capacity improvements to roadway segments, including intersection and signal improvements within those segments, can be fairly accurately identified through the RTP process, the specific locations of isolated intersection and signal improvements cannot. However, the RTP includes financial placeholders for these anticipated spot improvements. The specific locations of these isolated projects are typically identified empirically in collaboration with the local governments or through intersection traffic counts, and subsequently incorporated during the development of the Regional Transportation Improvement Program (RTIP). Spot intersection/signal improvements are also not amenable to the same type of analysis that can be performed on roadway segments by the RTC's traffic forecasting tools and, as a result, the array of benefit data for spot intersection/signal improvements is not comparable to the roadway segment projects. For this reason, separate priority setting tracks have been established for these two categories of projects.

Funding Allocation. As noted above, strictly comparable BCA analyses of road segments and spot intersection/signal improvements is problematic and the relative merit of these projects one to another is difficult to quantify. To insure adequate funding for both vital categories, it is recommended that available local and federal/state capacity funding be allocated to each category of projects based upon the proportion of

funding anticipated in the nearest time horizon of the RTP. The current 2004-2012 percentage breakdown for local funding would be 89% to road segments and 11% to spot intersection/signal improvements. The percentages for federal/state funding would be 66% for road segments and 34% for spot intersection/signal improvements. These percentages should be considered a guideline for the time period and may need to be varied from year-to-year due to lumpiness, project readiness, etc. Similarly, these allocation guidelines should not be applied to each individual source but to the collective funding available.

Limitations of the Data. Application of BCA requires that comparable data be available for all projects. As a practical matter, the need for data must also be balanced against the cost of acquiring it. While having a detailed design for every project would insure greater accuracy in the BCA process, this would cost tens of millions of dollars and take years to prepare. By the time the later projects were ready to go to construction, many of the plans would be out of date and need to be redone. At this time, data of sufficient quality is available for determining project benefits for travel time reductions, delay time reductions, crashes and emissions for all new roadways or roadway widenings. Some of this data is provided directly from the RTC's traffic forecasting tools and others are derived from other local and national sources. Cost estimates for design, construction, ROW and maintenance are typically based upon unit historical cost information or, in some cases, estimates from more detailed project studies are available. For spot intersection/signal improvements, the data set available for benefit comparison across all of this type of project is limited to delay reduction; costs data is comparable to that available for road segment projects.

Significance of BCA Benefit Elements. As stated above, a staggering number of different types of "benefits" can be identified. The vast majority of these, however, will have little, if any, impact on the relative outcome of BCA. The literature indicates that for highway projects, the benefits of travel time reduction and delay reduction are typically much greater than any other benefits. Analysis based upon local data indicates that these two benefits typically account for more than 90% of total benefits. Crashes and emissions benefits combined typically account for less than 10% of total benefits and other factors, such as operating costs, fall off dramatically in importance. Based upon this and the cost of acquiring data across all projects, the RTC priority setting process for roadway segments considers only reduced travel time, reduced delay time, crashes and emissions in the BCA. The parallel BCA process for spot intersection/signal improvements considers only delay time. BCA should not be confused with the analysis of benefits that may be undertaken through the National Environmental Policy Act (NEPA) process. In this process, BCA is used to distinguish the relative merits of a group of projects to establish priorities. Further, the factors that are considered in this BCA are limited to travel time reduction, delay time reduction, crashes, emissions and costs. The NEPA process typically identifies reasonable alternatives for a single project and documents their environmental impacts. Also, the NEPA process may look at many more issues than just those being examined in the priority setting process, e.g., wetlands, waters of the US, cultural impacts, etc.

The Meaning of BCA Results. One output of classical BCA is the benefit cost ratio. The benefit cost ratio is the dollar value of project benefits divided by the dollar value of project costs. Theoretically, a cost benefit ratio greater than 1 indicates that it provides more benefits than it costs and is, therefore, worth doing. There are several significant pitfalls with putting this theory into practice when we are considering large numbers of projects at a planning level of analysis: First, the estimates of benefits and costs are never 100% accurate. Construction and ROW cost estimates are based upon very preliminary information. Secondly, the assumptions made for the value of delay time, crashes emissions, useful life, etc. can make a significant impact on the order of magnitude of the benefit numbers. Finally, other factors not considered in the formal BCA, e.g., economic benefits, may be of sufficient magnitude to justify undertaking a project. Nonetheless, if reasonably consistent data and assumptions are used across the spectrum of projects the resulting benefit cost ratios are a good indicator of the relative merits of one project compared with another; it simply must be kept in mind that, at this level of analysis, a benefit cost ratio of less than 1 does not necessarily mean that the project is not worth doing.

Amendment and Consistency of the Capacity Priority Setting Process. The priority setting process will incorporate the best cost data and methodologies available from reputable sources. As better methodologies and data become available or as problems encountered with the practical application of this process dictate the need for adjustments, these may be incorporated into the process by the RTC Director of Planning. The above notwithstanding, in each iteration of the priority setting process, a consistent set of data, assumptions and methodologies will be used in the analytical elements of the process. Contact the RTC Planning Department for a copy of Appendix A.

Priority Setting Process for Roadway Segments

Step 1 Time Stratification of Projects

Based upon the RTP analysis, a list of candidate projects for roadway segment capacity improvement projects would be created from the nearest term time stratum. All projects that were included in any previously prioritized list of capacity priorities would be included in this list unless work had begun on project development and environmental (PD&E) activities. This list would also include any very large projects from later time strata for which, because of their long lead times, it would be advisable to commence PD&E activities, ROW acquisition, etc.

Step 2 Benefit Cost Analysis (BCA)

A formal benefit cost analysis would be performed on each project included in the list created by Step 1. All benefit and cost values will be stated in constant year dollars and the same constant year will be used for all projects when compared.

Benefits. The benefits considered for this step would include: travel time reduction, delay reduction, crashes and emissions. Forecasts of the changes in total system travel time, system delay and average daily traffic (ADT) with and without the project (build/no build) would be made at the nearest future planning horizon year (currently 2012) and the last planning horizon current timing horizon in the plan (currently 2030). These forecasts will be made assuming all other RTP identified improvements and services are in place at the time of need indicated. Total changes in travel time, delay time and ADT will be calculated for a 20-year period by interpolating/extrapolating the forecasting tool outputs. For large projects being considered from later time strata, the time horizons would be adjusted as appropriate to develop the 20-year forecasts.

Unit values or methodology for calculating unit values of the various benefits will be made using the best guidance available from the Federal Highway Administration (FHWA), Environmental Protection Agency (EPA), reliable local information or other statistically/scientifically valid studies. For any BCA iteration, the same data sources and methodology will be used for all projects.

The cumulative 20-year value of benefits for each project in constant year dollars will be summed to create the numerator for the benefit cost ratio for each project.

Costs. The cost elements to be considered in the BCA process are: design (including environmental studies, permitting, etc.), right-of-way acquisition, construction including environmental mitigation, engineering during construction (EDC) and facility maintenance and operations. For design, right-of-way and EDC costs, the unitized cost estimates from the RTP shall be utilized unless more specific engineering studies have been performed that contain estimates of cost deemed more reliable. For maintenance and operations, the annualized unit life cycle costs for facility type and the unit

operations costs developed by the local governments in conjunction with Lorick and Associates (or similar successor efforts) will be used.

The cumulative 20-year costs for each project in constant year dollars will be summed to create the denominator for the benefit cost ratio for each project.

Preliminary Project Ranking by Benefit Cost Ratio. Upon completion of the BCA analysis, a preliminary rank ordered project list will be developed based upon the cost benefit ratios.

Step 3 Consideration of “Other” Factors

The projects on the rank ordered BCA list will be examined in light of other factors that may make it appropriate to adjust the relative rankings either up or down. Other factors to be considered include but are not limited to the following:

- Relationship to other projects including: replacement/expansion of utility infrastructure, rehabilitation or reconstruction of adjacent existing roadways, private projects that may have a significant impact on roadway access, potentially concurrent projects that may have a cumulatively significant impact on access/disruption to a specific neighborhood.
- Special events including: major sporting, cultural or civic events that either the lack of a timely completed project or the disruption of an active project might have significant, long-term impacts.
- Economic development: Significant, documented economic benefits or disbenefits to be gained by expediting or postponing a project.
- Project funding incentives: Significant project funding commitments from a reliable source that would tap funds not accessible to the RTC.
- Project impact on achieving other policy objectives of the Regional Transportation Plan, the Truckee Meadows Regional Plan (TMRP) or other agency adopted plans.
- Decisions to adjust priority from the BCA rankings based upon other factors will be documented.

Step 4 Assignment of Projects to “Best Fit” Funding Categories

Following adjustments to the BCA ranked list based upon other factors, projects will be assigned in priority order to their “best fit” funding categories based upon such factors as the type of work, jurisdiction (locally-owned roads, state roads, federal aid highway system, etc.), competitiveness for special program funds at either the state or federal level and other funding source restrictions, limitations and eligibility requirements.

Step 5 Review of Recommended Capacity Priorities by the RTC Technical Advisory Committee (TAC)

The prioritized list of projects assigned to “best fit” funding categories will be presented to the RTC’s Technical Advisory Committee (TAC) for review and a recommendation to the RTC Board. Some complex projects may be broken into components and assigned to multiple funding categories, if deemed prudent.

Step 6 Presentation and Recommendation to the RTC Board of Road Segment Capacity Project Priorities

Prioritized lists of road segment capacity improvement projects matched to “fit funding” will be presented to the RTC Board following the adoption of a new/updated RTP or more frequently, if circumstances warrant. Documentation regarding recommended adjustments to the BCA ranked list based upon “other” factors and the assignment of projects to “best fit” funding categories will be provided along with the recommended priority list.

Step 7 Subsequent Programming Actions

Following action by the RTC Board setting the final priorities, projects shall be programmed at the appropriate time into the various RTC programs of projects (POPs), the Regional Transportation Improvement Program (RTIP), the State Transportation Improvement Program (STIP) and other relevant programmatic documents subject to the availability of funds.

Priority Setting Process for Spot Intersection/Signal Improvements

Step 1 Time Stratification of Projects

A list of candidate projects for spot intersection/signal improvements at locations currently experiencing level of service (LOS) deficiencies or projected to be deficient within the nearest RTC time stratum, e.g. 2004-2012, would be identified through the RTC traffic count program or other comparable analyses. All projects that were included in any previously prioritized list of spot intersection/signal projects would be included in this list unless work had begun on project development and environmental (PD&E) activities. This list would also include any very large projects from later time strata for which, because of their long lead times, it would be advisable to commence PD&E activities, ROW acquisition, etc.

Step 2 Benefit Cost Analysis (BCA)

A formal benefit cost analysis would be performed on each project included in the list created by Step 1. All benefit and cost values will be stated in constant year dollars and the same constant year will be used for all projects when compared.

Benefits. The benefits considered for this step would include delay reduction. Twenty-year estimates of delay reduction compared with a no-build scenario would be made using appropriate intersection operations analysis tools.

Unit values or methodology for calculating the unit value for each hour of delay will be made using the best guidance available from the Federal Highway Administration (FHWA) or other statistically/scientifically valid studies. For any BCA iteration, the same data sources and methodology will be used for all projects.

Costs. The cost elements to be considered in the BCA process are: design (including environmental studies, permitting, etc.), right-of-way acquisition, construction, engineering during construction (EDC) and facility maintenance and operations. For design, right-of-way and EDC costs, the unitized cost estimates from the RTP shall be utilized unless more specific engineering studies have been performed that contain estimates of cost deemed more reliable. For maintenance and operations, the annualized unit life cycle costs for facility type and the unit operations costs developed by the local governments in conjunction with Lorick and Associates (or similar successor efforts) will be used.

Preliminary Project Ranking by Benefit Cost Ratio. Upon completion of the BCA analysis, a preliminary rank ordered project list will be developed based upon the cost benefit ratios.

Step 3 Consideration of “Other” Factors

The projects on the rank ordered BCA list will be examined in light of other factors that may make it appropriate to adjust the relative rankings either up or down. Other factors to be considered include the following:

- Intersection safety index as ranked by the Nevada Department of Transportation (NDOT).
- Relationship to other projects including: replacement/expansion of utility infrastructure, rehabilitation or reconstruction of adjacent existing roadways, private projects that may have a significant impact on roadway access, potentially concurrent projects that may have a cumulatively significant impact on access/disruption to a specific neighborhood.
- Special events including major sporting, cultural or civic events that either the lack of a timely completed project or the disruption of an active project might have significant, long-term impacts.

- Economic development: Significant, documented economic benefits or disbenefits to be gained by expediting or postponing a project.
- Project funding incentives: Significant project funding commitments from a reliable source that would tap funds not accessible to the RTC.
- Project impact on achieving other policy objectives of the Regional Transportation Plan, the Truckee Meadows Regional Plan or other agency adopted plans.
- Decisions to adjust priority from the BCA rankings based upon other factors will be documented.

Step 4 Assignment of Projects to “Best Fit” Funding Categories

Following adjustments to the BCA ranked list based upon other factors, projects will be assigned in priority order to their “best fit” funding categories based upon the such factors as the type of work, jurisdiction (locally owned roads, state roads, federal aid highway system, etc.), competitiveness for special program funds at either the state or federal level and other funding source restrictions, limitations and eligibility requirements.

Step 5 Review of Recommended Capacity Priorities by the RTC Technical Advisory Committee

The prioritized list of projects assigned to “best fit” funding categories will be presented to the RTC’s Technical Advisory Committee (TAC) for review and a recommendation to the RTC Board. Some complex projects may be broken into components and assigned to multiple funding categories, if deemed prudent.

Step 6 Presentation and Recommendation to the RTC Board of Spot Intersection/Signal Capacity Project Priorities

Prioritized lists of spot intersection/signal capacity improvement projects matched to “fit funding” will be presented to the RTC Board following the adoption of a new/updated RTP or more frequently, if circumstances warrant. Documentation regarding recommended adjustments to the BCA ranked list based upon “other” factors and the assignment of projects to “best fit” funding categories will be provided along with the recommended priority list.

Step 7 Subsequent Programming Actions

Following action by the RTC Board setting the final priorities, projects shall be programmed at the appropriate time into the various RTC programs of projects (POPs), the Regional Transportation Improvement Program (RTIP), the State Transportation Improvement Program (STIP) and other relevant programmatic documents subject to the availability of funds.